Royal College of Surgeons of England
ADVANCING SURGICAL CARE

2021

SURGICAL RESEARCH REPORT

CONTENTS

CHAIR'S INTRODUCTION

Professor Tim Rockall, Chair 2019–2020 Research Committee.

Last year we celebrated a quarter of a century of the Research Fellowship Scheme. The achievement was celebrated at a wonderful event in London that brought together RCS England officers and council both past and present, research department staff, benefactors, donors and research fellows past and present.

The breadth and quality of the surgical research that has been spawned by the scheme was conveyed through a series of rapid dynamic presentations from some of the most accomplished researchers going back to the time of the Audit Unit developed by Brendan Devlin and including the phenomenal work of the Clinical Effectiveness Unit (CEU) directed by Professor David Cromwell and individual researchers across the spectrum of surgical speciality. The remarkable achievements of Martyn Coomer who has run the Fellowship scheme at the College since its inception was loudly applauded.

It is worth repeating the magnitude of the contributions from charities and individuals who continue to make this most successful of College ventures possible. £50 million pounds, supporting 700 researchers and nine new chairs of surgical trials in the UK. This is a unique activity for a medical royal college and something we are immensely proud of. The award of a RCS England Research fellowship is highly sought after for the prestige that it brings with it that transcends the financial award.

Surgical research in the whole of the UK is in a place unrecognisable from the situation 25 years ago, in no small part as a result of the RCS England activities. This can only be built upon by the endowed surgical research units in Bristol, Birmingham, Oxford, Hull/York, Manchester, Liverpool and Leeds that have now come to be across the UK through the generous support of the Bowel Cancer UK, The Rosetrees Trust, The Freemasons, The Mary Kinross Trust, The Linder Foundation and The George Drexler Charitable Foundation and The Sir John Fisher Foundation.

Our supporters and donors have been joined this year by new joint fellowships with HEIW in Wales and the Society of British Neurological Surgeons to look at their outcomes, (embedded in the CEU), the Circulation Foundation, Crohn's and Colitis UK. The CEU also continues to produce robust national audit reports in the fields of vascular disease, prostate cancer, oesophageal cancer, bowel cancer and cleft lip and palate, and is supporting an MSc in Health Data Science with the London School of Hygiene & Tropical Medicine.

Other achievements include the appointment of two specialty leads in Robotics – Professor Simon Bach and Professor Naeem Soomro through the generosity of The Saven Research and Development Programme.

The College is hosting a large grant from The Moondance Foundation to Professor Jared Torkington and colleagues to improve outcomes of Bowel Cancer in Wales including a two year RCS England research fellowship. The College is also supporting the NIHR Collaboration in Acute Care led by Professor Mike Grocott, looking at chronic conditions across the specialties of surgery, anaesthesia and critical care.

In an international collaboration RCS England also supported Professor Dion Morton and Professor Tom Pinkney to visit The Royal Australasian College of Surgeons to help them establish their own clinical research network and further collaboration with the College.

Professor Sir Peter Ratcliffe, Nobel Laureate and Clinical Research Director of the Francis Crick Institute addressed the Research Committee about the strategic priorities of the Crick. Namely to collaborate creatively across disciplinary boundaries and accelerate translation research with a purpose to improve peoples' health and wellbeing. Subsequently the Research committee enjoyed a wonderful tour of the Crick Institute when they hosted one of our committee meetings. The Francis Crick Institute PhD for Clinicians has recently been advertised in association the RCS England fellowship scheme.

A huge amount of the work that resulted in this, was achieved by Dion Morton in the role of Director of Clinical Research, who stepped down last year. We are delighted that the position has been filled by Professor Peter Hutchinson, Professor of Neurosurgery at Cambridge University and who is successfully continuing the good work and will undoubtedly fill the very large shoes vacated by Dion.

Another memorable event of the past year was the invitation of myself and others to speak at the House of Lords celebrating seven decades on innovation in the NHS. The evening was hosted by Lord Ribeiro – past President of the Royal College of Surgeons of England with a distinguished audience including the Secretary of State of Health Matt Hancock. I would like to thank Miss Jenny Isherwood, Professor Tim Briggs, Professor Lorna Marson, Ms Zita Jessop and Professor Tim Underwood for their impressive, uplifting and informative contributions.

My time as Chair of the Research Committee has come to an end this year and I am followed by another member of council Professor Peter Friend, Transplant Surgeon at Oxford University. I have very much enjoyed the role of Chairing such an interesting and successful committee and I am very much indebted to the work of Martyn Coomer and his industrious team Sarah King, Louise Duncan, Linda Slater and Murat Akkulak who make the role so easy and enjoyable. I continue in the role of Deputy Chair and I have no doubt that Peter will steer the committee masterfully.

CHAIR'S INTRODUCTION

Professor Peter Friend,
Chair 2020
Research Committee.

It is a great privilege to be writing this RCS England Research Report as the incoming Chair of the Research Committee, and I would like to start by thanking my predecessor Tim Rockall for the commitment, initiative and hard work that he brought to this role.

I pay tribute and thanks to our wonderful donors, whose generosity and commitment to the future of surgery has enabled surgical research to become one of the singular successes of The Royal College of Surgeons of England. We are exceedingly fortunate as well as enormously grateful to have such amazing supporters.

We welcome new funders joining our Research Fellowship scheme: the Barrow Foundation; the Guinea Pigs Memorial Trust; ORUK (Orthopaedic Research UK) and Sir Roy and Lady Calne. We are also happy to support prizes run by HealthWatch (a charity is presided over by Nick Ross), testing the ability of medical students to assess papers and research proposals.

We are delighted to announce two Consultant Research Fellowships, funded through the generosity of Rosetrees Trust: these will provide dedicated academic time specifically for NHS consultants who wish to re-launch their research activities after being out of research for five years or more.

Following a fascinating tour of the Crick Institute by the Research Committee, we are very excited to announce a new initiative: a joint six Year RCS England/Crick Doctoral Clinical Research Fellowship. This will provide an extraordinary opportunity for a surgical research fellow to be embedded in an established research group at the Crick. This collaboration between the College and a research institute of global eminence is an important step for us, reinforcing the emerging role of the College in surgical research of the highest calibre.

The Research Committee is delighted to note that some of its long standing supporters have been awarded various honours in the recent Queen's Birthday and New Year's Honours lists.

In particular Mr Richard Ross, Chair of the Rosetrees Trust has been awarded a CBE, Mr Myrddin (Merv) Rees an OBE for services to liver cancer surgery, and an OBE to Professor Farah Bhatti for services to diversity in the NHS in Wales. Professor Dion Morton been awarded an OBE and Professor Helen Rodd Chair of the FDS Research Committee (and former RCS England Research Fellow), an MBE for services to Paediatric Dentistry.

Professor Morton has brought a new dynamic to surgeons' engagement in trials: at least 15,000 doctors and medical students from over 130 countries worldwide have entered thousands of patients into collaborative studies. Over 100 papers have been published and more than £45 million achieved in competitive funding by these surgical collaborative groups. We also wish to send our heartiest congratulations to Lord Ribeiro, former PRCS and huge supporter of the RCS England research programme, who has been appointed to be the next Chancellor of Anglia Ruskin University.

A huge thanks is due to Professor Peter Hutchinson, our Clinical Director of Research: in addition to overseeing the RCS England Surgical Trials Initiative, he has established, with the able support of Murat Akkulak, an RCS England COVID-19 Research Group. This has brought together more than 50 COVID-related projects across surgical specialties: these are already producing important outcomes. On the clinical trials front, we have now 20 Surgical Specialty Leads, appointed to drive the numerous trials, with a further appointment in bariatric surgery soon to be advertised.

The Clinical Effectiveness Unit now has six surgical trainees undertaking full-time research in health services fields, supervised by epidemiologists, statisticians and other academics from the London School of Health and Tropical Medicine. We are grateful to Professor David Cromwell and his colleagues for their excellent work in this field, and the impact it is having on surgical practice.

Further news, the Centre for Evidence in Transplantation, established by Sir Peter Morris, relocated last year to Oxford.

Special praise is due to the small but dynamic band of staff in the Research Department; Sarah King, Louise Duncan and Linda Slater, for their behind-the-scenes work to ensure that all applications are properly assessed, financed, reported and correctly awarded. As is evidenced by the range of awards included in this report, this is always a major undertaking, and it is one that has been particularly well handled by Sarah and Louise during the last academic year. As a result of the COVID pandemic, we needed to reschedule the research fellowship vivas from in Germany (at the BBraun headquarters) to an on-line process, using Zoom over a series of evenings in July. We also rely totally on the commitment of a whole plethora of surgeons, scientists, engineers, and many other professionals, all of whom play a huge part in assessing and interviewing the masses of applications received each year – a huge thank you to them all…

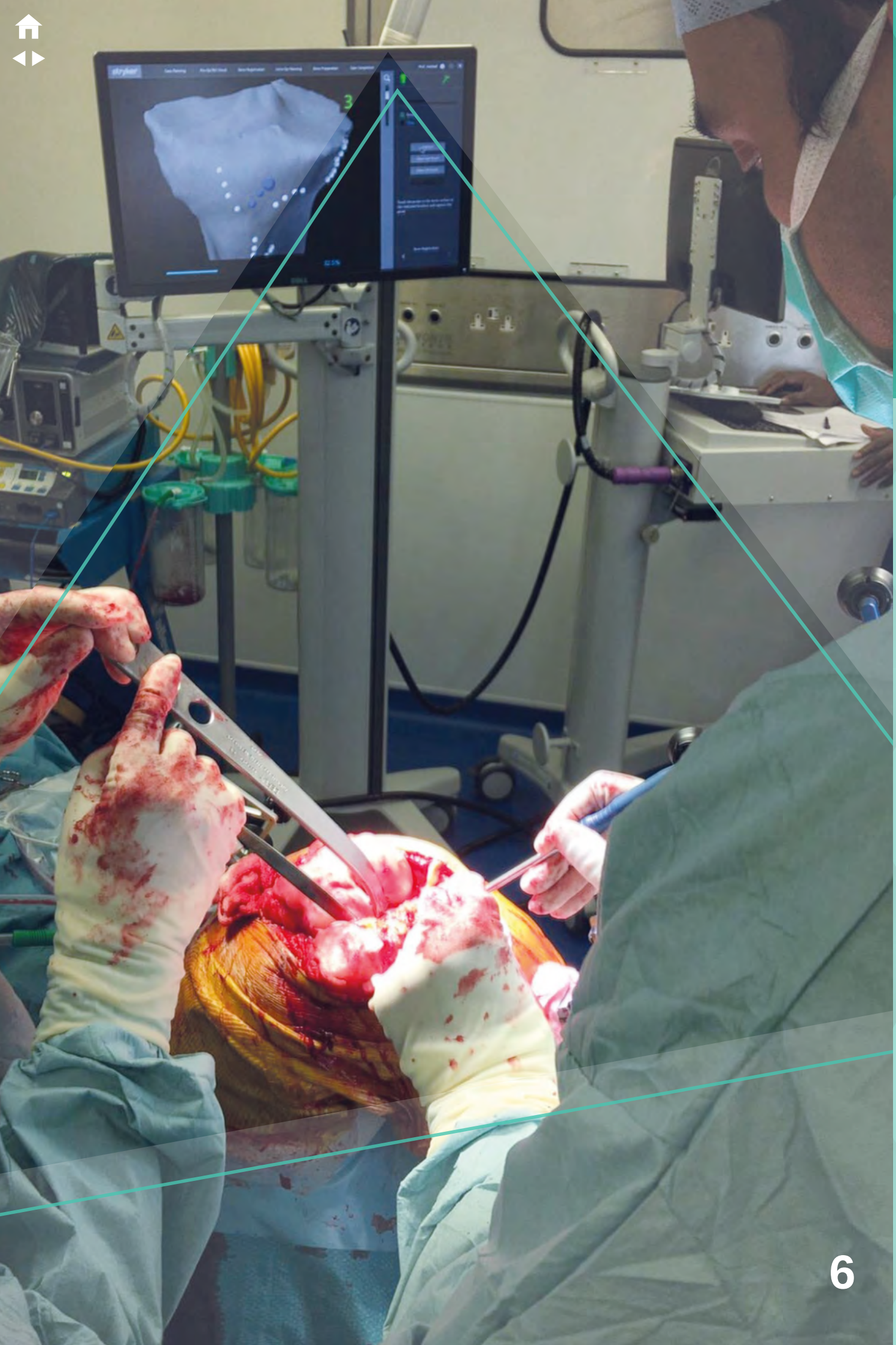
And finally, on a note of great sadness, Martyn Coomer will retire in March 2021. It is difficult to imagine the College without Martyn at its heart, and even more impossible to imagine RCS England Research without Martyn at its helm. His vision, indomitable energy, interpersonal skills and sheer personality have made our Research Department what it is. He will leave a huge legacy and will be greatly missed, not just for what he has achieved, but particularly for the way the has achieved it.

He will be missed not only by those of us who work with him, but by all the many generations of research fellows for whom the College has provided a life-changing opportunity. We will have the opportunity to thank Martyn more formally and to mark his extraordinary contributions.

RESEARCH FELLOWS' REPORTS

Fellowships are awarded to subscribing members of the College in a training post, or trainees who have passed MCQ papers and will sit the final MRCS examination at this College. All applications are rigorously assessed by a panel of experts to ensure that the research, surgeon, supervisor and facilities are of a high standard, and that the proposed work will be valid, beneficial and original. The fellowships cover salary, on-costs and some running expenses. Fellows may study any aspect of surgery or surgical care including basic science, diagnosis, treatment, surgical technology, logistics or audit.

Kavit Amin
Julia Blackburn
Piers Boshier
William Breakey
Christopher Bretherton
Joshua Burke
Kevin Cao
Rachael Clifford
Liam Convie
Donald Davidson
Benjamin Davies
Jinendra Ekanayake
David Eldred-Evans
Francisca Ferreira
James Fletcher
James Glasbey
Sally Hallam
Adam Hexter
Michelle Johnpulle
Ian Jones
Meera Joshi
Thomas Jovic
Anna Kamocka
Babar Kayani
Thomas Layton
Matt Lechner
Matthew Lee
Daniel Lin
Kartik Logishetty
Rishi Mandavia
Isabel Martin
Charlotte McIntyre
James Meacock
William Muirhead
Jameel Muzaffar
Joseph Norris
Sam Parker
Kat Parmar
Roshani Patel
Karl Payne
Marta Penna
Lay Ping Ong
Ioannis Sarantitis
Rob Staruch
Anisha Sukha
Anthony Thaventhiran
Ronak Ved
John Whitaker
Akira Wiberg
Catherine Zabkiewicz
Ardalan Zolnourian



THE OPTIMISATION OF AN EX-VIVO LIMB PERFUSION PROTOCOL FOR TRANSPLANTATION

Kavit Amin

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship

SUPERVISORS:
Dr Jason Wong, Dr James Fildes.
Head of Department: Tracey Hussell

SITE OF WORK:
University of Manchester

PUBLICATIONS:
1. Amin KR, Ball AL, Chhina C, Edge RJ, Stone JP, Critchley WR, et al. Ex-vivo flush of the limb allograft reduces inflammatory burden prior to transplantation. J Plast Reconstr Aesthet Surg. 2017

2. Amin KR, Wong JKF, Fildes JE. Strategies to Reduce Ischemia Reperfusion Injury in Vascularized Composite Allotransplantation of the Limb. J Hand Surg Am 2017

PRESENTATIONS:
1. Refining a Protocol for the Preservation of Amputated Extremities, 27th International Congress of the Transplantation Society, Madrid, Spain July 2018

2. Ex-Vivo Flush Of The Vascularised Limb Allograft Reduces Inflammatory Burden Prior To Transplantation, (International Society for Vascularised Composite Allotransplantation Meeting, Salzburg, Austria) Oct 2017

FURTHER FUNDING:
FESSH (Federation of European Societies for Surgery of the Hand)

BSSH (British Society for Surgery of the Hand)

Kavit Amin with military veteran on the ward that had a lower limb amputation. He has had over 30 operations to manage nerve related pain and stump revisions to enable him to better manage his non-functional prosthesis.

What is life like for patients with this condition?

Limb amputation both in the civilian and military arena can be a catastrophic life-changing event. Depression, anxiety and suicidal ideations are often incurred as a consequence of functional impairment and disfigurement after injury. For some, transplantation provides the only means to satisfy functional and aesthetic goals.

How will it improve their quality of life?

Limb transplantation has recently become an approved treatment option within the NHS. Despite being the largest publicly funded hand transplant programme in the world, there remains two limitations to successful limb transplantation:

1. Preserving the limb during transport.

2. Graft rejection following transplantation.

These complications are causally related, as the time without blood supply into the donor limb is directly related to cell injury, which in turn directly contributes to rejection of the limb. We have developed a technique called ex-vivo limb perfusion that we are confident addresses both of these problems.

Methodology

Our system functions like a cardiac bypass circuit and we have experimented with over 70 pig limbs using this system. Metabolic function was be supported with the addition of a critical mix of substrates (e.g. glucose, bicarbonate, nutrients). A bespoke oxygenated modified blood (perfusate) was recirculated from the same animal and infused it via the arteries supplying the limb.

Preliminary findings

Limbs preserved using the circuit are better preserved over six hours than had they been kept preserved using conventional methods over the last 75 years. We have defined the optimal temperature, pressure and composition of the circulating perfusate to better preserve pig forelimbs which has a strong degree of translatability to human.

Kavit checking equipment.

Is it a long-term project that others will continue to develop?

Yes, there are less than 10 groups performing this research worldwide but this is a growing area of interest for the military and reconstructive surgeons.

Up to 85% of those that have a face (deformities) or hand transplant (loss of the upper limb) will incur acute rejection of their transplanted tissues within the first year.

TREATING DEPRESSION IN PATIENTS WITH DE QUERVAIN'S TENOSYNOVITIS AN INTEGRATED WEB-BASED SKILLS INTERVENTION AND DECISION AID

Julia Blackburn

FELLOWSHIP/SPONSOR:
RCS England Fulbright Scholar Award supported by the Sorab (Soli) Jamshed Lam Legacy

SUPERVISORS:
Dr Neal Chen and
Dr Ana-Maria Vranceanu

SITE OF WORK:
Hand and Arm Center and Integrated Brain Health Clinical & Research Program, Massachusetts General Hospital, Boston, MA

PUBLICATIONS:

1. Blackburn J, van der Oest MJW, Poelstra R, Selles RW, Chen NC, Feitz R, Three-ligament tenodesis for chronic scapho-lunate injuries: a prospective study of 203 patients, Accepted for publication in Journal of Hand Surgery European Volume, Oct 2019

2. Blackburn J, van der Oest MJW, Selles RW, Chen NC, Feitz R, Vranceanu AM, Porsius JT, Which Psychological Variables Are Associated With Pain and Function Before Surgery for de Quervain's Tenosynovitis? A Cross-sectional study. Accepted for publication in Clinical Orthopaedics & Related Research, Sept 2019

3. Blackburn J, Fischerauer SF, Talaei-Khoei M, Chen NC, Oh LS, Vranceanu AM, What are the implications of excessive internet searchers for medical information amoung orthopaedic patients? Accepted for publication in Clinical Orthopaedics & Related Research, June 2019

PRESENTATIONS:

1. Blackburn J, van der Oest MJW, Poelstra R, Selles RW, Chen NC, Feitz R A Cohort Study of 209 Patients with Three-Ligament Tenodesis for Chronic Scapho-lunate Interosseous Ligament Injury, BSSH meeting, Swansea, 24-26 Apr 2019

As a 2018–19 Fulbright-RCS England Scholar, I spent six months conducting post-doctoral research in Boston, Massachusetts. I set up a randomized controlled trial (RCT) to help improve care for patients with de Quervain's tenosynovitis.

De Quervain's is a painful thickening of the tendons on the thumb side of the wrist that help move the thumb. In many patients the symptoms improve with time, but this can sometimes take more than 12 months. Treatment options include non-steroidal anti-inflammatory medication (NSAIDs), splints, steroid injections and rarely surgery.

Attending the American Society for Surgery of the Hand (ASSH) Annual meeting in Boston.

In the first part of this study, we developed a Decision Aid (DA) to help patients make choices about their treatment. Decision Aids are designed to provide patients with balanced, complete and understandable information about their options for management of their condition, as well as risks and benefits. We are interested to know if this helps people feel more confident in their treatment choices.

Additionally, research has shown that depression affects pain and disability experienced by patients with de Quervain's. Our DA includes questions about symptoms of depression that may affect patient's recovery from de Quervain's.

Martyn Coomer and Julia Blackburn at Fulbright 70th anniversary reception at US Embassy.

In the second part of the study, we want to see whether a web-based skills intervention (Toolkit) is more effective than usual medical care in improving pain and disability in patients with de Quervain's and symptoms of depression. The Toolkit is delivered online and can be accessed at home. Similar skills interventions in patients with musculoskeletal injury have been shown to improve pain and function.

My Fulbright scholarship allowed me to work with a team who conduct research into psychological interventions in hand and wrist surgery, and develop an international collaborative program of research into improving outcomes in hand surgery. I also enjoyed volunteering, including helping at the Storybook Ball to raise money for the MassGeneral Hospital for Children.

Between 10 and 50% of patients with de Quervain's tenosynovitis experience symptoms of depression that can affect their recovery.

INFLUENCE OF NUTRITION AND SARCOPENIA ON ESOPHAGEAL CANCER OUTCOMES (INSPECT STUDY)

Piers Boshier

FELLOWSHIP/SPONSOR:
Joint RCS England/Ryan Hill Research Fellowship with support from Sorab (Soli) Jamshed Lam Legacy

SUPERVISORS:
Dr Donald Low

SITE OF WORK:
Virginia Mason Medical Centre (Seattle, USA)

PUBLICATIONS:
1.Hagens ERC, et al., Influence of body composition and muscle strength on outcomes after multimodal oesophageal cancer treatment. J Cachexia Sarcopenia Muscle. 2020;11:756-767

2.Boshier PR, et al., Assessment of body composition and sarcopenia in patients with esophageal cancer: a systematic review and meta-analysis. Dis Esophagus. 2018;1;31(8)

PRESENTATIONS:
1. Boshier PR, et al. Assessment of Body Composition and Sarcopenia in Patients with Esophageal Cancer: a Systematic Review and Meta-Analysis. ISDE World Congress 2018, Vienna. Poster Presentation

2. Boshier PR, et al. ariation in Body Composition in Esophageal Cancer Patients Receiving Supplementary Jejunostomy Feeding during Neoadjuvant Chemoradiotherapy. ISDE World Congress 2018, Vienna. Poster Presentation

PRIZES:
Distinguished abstract, 2018 Clinical and Translational Research Symposium. Benaroya Research Institute at Virginia Mason

FURTHER FUNDING:
Wilske Pioneer Award, Benaroya Research Institute at Virginia Mason

Imperial Biomedical Research Centre Project Grant, Imperial College London

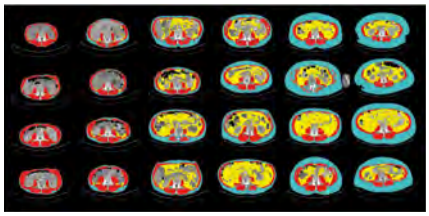
Pump Priming Grant, Royal College of Surgeons

Recently there has been an increase in the number of studies adopting methods of body composition (muscle and fat) assessment in patients diagnosed with oesophageal cancer for the purpose of nutritional evaluation and prognostication. This interest is borne out of an appreciation for inadequacies in current methods of assessing nutrition in cancer patients. Broad variation in methods of assessing and defining parameters of body composition has however served as a barrier to routine clinical adoption.

Our research seeks:

1. to develop a standardised method for the assessment of body composition in oesophageal cancer patients, and;
2. to understand how these measurements impact upon important clinical outcomes, including survival.

Patients who had undergone esophagectomy for cancer, were recruited from fourteen centres in North America (n=3), Europe (n=7) and Asia (n=4). In total 3812 pre and post treatment CT scans were acquired from 1753 patients. CT scans were analysed using advanced software to determine both the amount and quality of muscle and fat. Data has provided for the first time a global snapshot of body composition in oesophageal cancer including racial, gender and disease specific variability. Muscle loss was found to be associated with increased rates or postoperative complications, hospital stay and poorer survival. Separate studies have also discerned the effects of nutritional intervention and pre-operative exercise on parameters of body composition.



Oesophageal Cancer inter patient variation in body composition (red, skeletal muscle/yellow, visceral adiposity/blue, subcutaneous adiposity).

The next step of our work is to develop a standardised pathway for the interpretation of CT body composition that can be used routinely in clinical practice (an application for further funding has been submitted). If successful we will apply this approach to other cancers (e.g. gastric, pancreatic, colorectal and lung). This work is intended to benefit patients through the development of better methods to assess and monitor nutrition to aid of clinical decision-making during cancer treatment.

Malnutrition commonly affects patients with esophageal cancer and has the potential to negatively influence treatment outcomes, including survival.

WHAT VOLUME IS NEEDED FOR THE MANAGEMENT OF RAISED INTRACRANIAL PRESSURE IN CHILDREN WITH CRANIOSYNOSTOSIS

William Breakey

FELLOWSHIP/SPONSOR:
Blonde McIndoe Research Fellowship

SUPERVISORS:
Silvia Schievano

SITE OF WORK:
UCL GOSH Institute of Child Health

PUBLICATIONS:

1. Correlation of Intracranial Volume With Head Surface Volume in Patients With Multisutural Craniosynostosis (The Journal of Craniofacial Surgery 2020)

2. Intracranial Volume and Head Circumference in Children with Unoperated Syndromic Craniosynostosis (Plastic and Reconstructive Surgery 2018)

PRESENTATIONS:

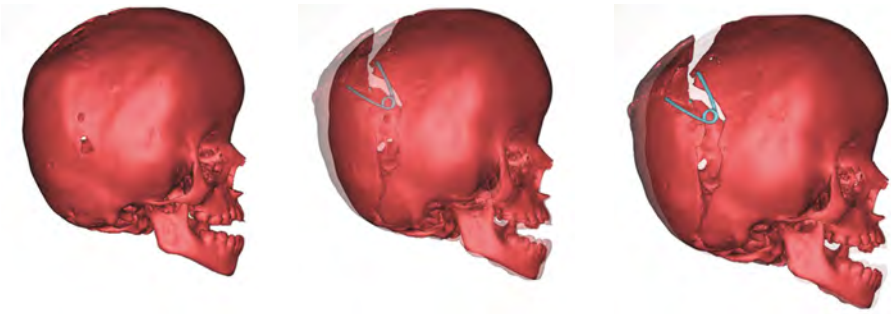
1. Comparison of operative parameters and volume expansion following three techniques for syndromic posterior cranial vault expansion. BAPRAS Winter meeting 2019, Monaco

2. Volumetric changes of grey matter, white matter and cerebrospinal fluid following 87 posterior vault expansion cases in patients with craniosynostosis. ISCFS Paris 2019

When we are born, the different bones of the skull are not tightly joined together. The loose connections between the bones are called 'sutures' and as we grow these gradually fuse together to form a solid skull. Craniosynostosis causes early fusion of one or more of these sutures which may cause the pressure to rise within the skull, a dangerous situation which can cause blindness and ultimately death. At Great Ormond Street Hospital, the treatment of choice is expansion of the back of the skull (cranial vault expansion), despite its success, the reasons behind its benefits are not fully understood. The aim of this project was to use advances in three-dimensional imaging to provide novel information on the volume changes that occur following cranial vault expansion, to combine this information with clinical data and achieve a greater understanding of the causes of raised intracranial pressure, why cranial vault expansion treats them and whether there is an optimal volume expansion.

By studying 172 cranial vault expansion cases; age at first expansion, syndromic diagnosis and post-operative skull volume were found to be important factors in whether or not a patient will require a repeat expansion surgery. Three different techniques were studied in a joint project with the Seattle Children's Hospital which found that modern techniques using springs or expanding devices required significantly less blood to be transfused than traditional skull remodelling procedures, and also required fewer repeat vault expanding procedures.

The world of Craniofacial surgery research is a small however patients with craniofacial syndromes require multiple operations before they reach their teenage years. This research will guide clinicians as to how and when these procedures should be undertaken to give the highest chance of success and cause the minimal amount of trauma.



Spring assisted posterior vault expansion.

The majority of children with syndromic craniosynostosis will require at least one cranial vault expansion at some point in their childhood.

WEIGHT-BEARING IN ANKLE FRACTURES

Chris Bretherton

FELLOWSHIP/SPONSOR:
Joint RCS England/Rosetrees Trust Research Fellowship

SUPERVISORS:
Professor Xavier Griffin

SITE OF WORK:
Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences

PUBLICATIONS:
1. Weight-bearing in ankle fractures: An audit of UK practice. BONE Collaborative Foot (Edinb). 2019 Feb 14;39:28-36. doi: 10.1016/j.foot.2019.02.005

PRESENTATIONS:
1. WAX Trial Protocol, NIHR UK Trauma Trials Day & Orthopaedic Trauma Society Annual Conference 2020, Gateshead

2. Trainee-led Trials, National Research Collaborative Meeting 2019, Gateshead

PRIZES:
1. Best Oral Presentation, National Research Collaborative Meeting 2018, Manchester, The WAX trial protocol

FURTHER FUNDING:
Sir Richard Stapley Educational Trust, AOUK&I R&PD Research Grants

Qualitative Research Training.

Around 180 people break their ankle every day in the UK. About 40% need surgery to fix their bones in the right place with plates and screws. After surgery, patients are usually told not to walk on the affected leg for six weeks to allow the bones to heal. We know patients find limiting their walking distressing. On the other hand, some patients are wary of pain and fearful of causing damage once they are allowed to walk on their ankle. There is little research or advice to help them when they first start walking.

Our team in Oxford have designed a clinical trial called “The Weight-bearing in Ankle Fractures (WAX) trial” which aims to determine when patients should start walking after surgery (e.g. after just two weeks). My embedded research aims to find out how patients can be supported to walk after their surgery.

With the help of the RCS England Fellowship, I have set-up the WAX trial in 20 hospitals around the UK and trained the local surgeons and research team. Between January and November 2020, over 150 participants have been recruited to the trial. I have also developed new ways to engage junior doctors with research. This includes “how-to-guides”, collaborative authorship guidelines and certificates for recruitment; all of which are serving as templates for future Trauma and Orthopaedic Studies.

The RCS England Fellowship has also enabled me to train in qualitative and behavioural research methods. I am using this training, to find out how patients’ experience of pain affects their recovery after ankle fracture surgery and design a support package to help them get walking again safely. This may be by producing a booklet, a website or verbal advice from surgeons or physiotherapists: Patients will have a key role in deciding which method we chose.

WAX team at Dorset County Hospital.

180 people break their ankle every day in the UK, 80% of patients are currently told to avoid walking on their affected leg for 6 weeks after surgery.

THE EVALUATION OF COLORECTAL ANASTOMOTIC LEAK AND NOVEL MITIGATION AND PREVENTION STRATEGIES

Joshua Burke

FELLOWSHIP/SPONSOR:
Bowel Cancer UK/Saven Research and Development Programme

SUPERVISORS:
Professor David Jayne

SITE OF WORK:
The University of Leeds

FURTHER FUNDING:
Leeds Cares research Charity

Joshua and colleague in the lab.

Whenever two ends of bowel are joined together during surgery there is a risk that the join (anastomosis) may leak due to poor healing. Leakage from the bowel (anastomotic leak) can occur in up to one in eight cases, and is the most feared complication of bowel surgery. The patient becomes unwell and often requires further surgery with the formation of a stoma, which is often permanent. Around one in five patients die as a result of an anastomotic leak. In patients that survive a leak, there can be long term consequences that impact on quality of life. New treatment strategies are required if we are going to reduce the risk of this serious complication. The project aimed to harness the healing capabilities of fat derived regenerative cells combined with a rapid setting gel to develop an implant that will be applied around a join between two ends of bowel to promote healing and prevent leakage.

This project investigated a new intervention combining fat containing regenerative cells with a rapid setting gel and applied this directly to a pig model of anastomotic leak with promising early results. The efficacy of this intervention now needs to be tested prior to first in man clinical trials.
The methodologies developed will be of use to researchers in the field of regenerative medicine, providing an alternative source of regenerative cells with optimised protocols for harvesting and application. This will be the first time that regenerative cell/gel implants have been developed and their efficacy tested in animal models of wound healing.
This will open many other avenues for the use of the technology as a promotor of wound healing at other sites of the body.

Leakage from the bowel (anastomotic leak) can occur in up to one in eight cases, and is the most feared complication of bowel surgery. Around one in five patients die as a result of an anastomotic leak.

THE MOLECULAR BASIS OF BLADDER DYSFUNCTION IN POSTERIOR URETHRAL VALVES

Kevin Cao

FELLOWSHIP/SPONSOR:
Joint BAPS/RCS England Research Fellowship with support from the Rosetrees Trust

SUPERVISORS:
Chris Fry, David Long

SITE OF WORK:
UCL GOSH Institute of Child Health

PUBLICATIONS:
1. Johal NS, Cao KX, Arthurs C, Millar M, Thrasivolous C, et al. Contractile function of detrusor smooth muscle from children with posterior urethral valvese.g. The role of fibrosis. J P Urol – Nov 3 2020, corrected proof in press

2. Johal NS, Arthurs C, Cuckow P, Cao K, Wood DN, et al. Functional, histological and molecular characteristics of human exstrophy detrusor. J Pediatr Urol. 2019 Apr;15:154.e1-154.e9. doi: 10.1016/j.jpurol.2018.12.004. Epub 2018 Dec 27. PMID: 30745011

PRESENTATIONS:
1. International Continence Society 2020 – online, now

2. Society of Paediatric Urology 2019 – Chicago, July

PRIZES:
1. RSM Malcom Coptcoat prize – 1st place (May 2020, online)

FURTHER FUNDING:
1. The Urology Foundation

2. St Peter's Trust

The three objectives of this body of research are to:

1. understand posterior urethral valves (PUV) in comparison against other developmental bladder disorders
2. to develop new therapies to improve bladder and kidney function in PUV and
3. to discover new ways to investigate the disorder. The RCS England fund has helped start the first two of those objectives.

With laboratory colleagues – at patient-public engagement day for families at the ICH.

In the fellowship year, I collected samples from children undergoing surgery, evaluating them using physiology equipment as well as conventional histology, hoping to compare the differences between PUV and other bladder disorders. I found that PUV bladders display significantly more scar tissue, leading to greatly increased stiffness biomechanically. During the fellowship, I grew several of those bladder specimens into cell cultures that I am now treating with anti-scarring medicines.

This research builds on work performed by my collaborators evaluating bladder exstrophy, evaluating anti-scarring medicines and investigating new ways of imaging three-dimensional tissue.

This is a project that begins the process of further investigation into PUV. This step, funded by the RCS England has focused on comparative understanding. My current focus is on deepening translational research with anti-fibrotic compounds, working with PUV animal-models as well as new imaging methods to better understand PUV, working eventually towards new diagnostics and therapies for children.

PUV remains a condition with one of the worst outcomes in urology. It occupies most spots on kidney transplant waiting lists throughout the developed world, being no longer a fatal condition, but one of severe bladder and kidney dysfunction. Finding new diagnostic and therapeutic solutions for this condition can help us to steer these patients away from the path of progressive kidney disease and towards normality.

Bladders from children with Posterior Urethral Valves are ⅔ more scarred than normal bladders, explaining their stiffness and clinical dysfunction. This scarring is potentially reversible with novel agents.

CRISPR MANIPULATION OF ACID CERAMIDASE IN A 3D IN-VITRO MODEL OF RECTAL CANCER

Rachael Clifford

FELLOWSHIP/SPONSOR:
Honorary Research Fellowship

SUPERVISORS:
Mr Dale Vimalachandran

SITE OF WORK:
The University of Liverpool

PUBLICATIONS:

1. Govindarajah N, Clifford R, Bowden D, Sutton P, Parsons J, Vimalachandran D. Sphingolipids and acid ceramidase as therapeutic targets in cancer therapy.Critical Reviews in Oncology / Haematology. 2019 June; 138:104-111

2. Clifford R, Govindarajah N, Parsons J, Gollins S, West N, Vimalachandran D. Systematic review of treatment intensification using novel agents for chemoradiotherapy in rectal cancer. British Journal of Surgery. 2018 Nov;105: 1553-1572

PRESENTATIONS:

1. Does pharmacological and plasmid manipulation of acid ceramidase effect radiosensitivity for locally advanced rectal cancer? SARS (Patey prize session) London January 2019

2. Over expression of acid ceramidase; Building evidence for its potential use as a biomarker for locally advanced rectal cancer BASO-ACS (BJS prize session); Glasgow November 2018

PRIZES:

1. William Lloyd Jones Tankard; Liverpool North West Surgical Society November 2018

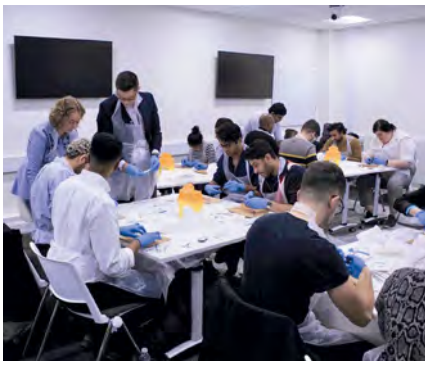
2. BJS proffered paper prize; BASO November 2018

There are 14,000 new cases of rectal cancer in the UK per year. Patients with locally advanced cancers undergo chemoradiotherapy in an attempt to shrink their tumours before surgery, however despite much research we have no way of predicting which patients will respond to this treatment. >12-15% undergoing chemoradiotherapy will have no evidence of cancer cells when the bowel is examined under the microscope after surgery. These patients have better overall outcomes and could possibly have avoided high risk surgery, often with stoma formation, all together.

Rachael preparing some colorectal cells to be irradiated.

The aim of our research is to identify biomarkers to enable us to predict which patients will respond to chemoradiotherapy and target those markers to improve response.

After taking biopsies from patients with rectal cancer along their treatment journey our group identified a protein called Acid Ceramidase (AC), which was highly expressed in tumours responding poorly to radiotherapy. Looking back at over 100 historic tissue samples from patients having already undergone their surgery also confirmed those findings. My work within the laboratory, using immortalised colorectal cancer cells, has demonstrated that if we manipulate this protein to 'switch it off' or over express it then we can directly affect response to radiotherapy. Using existing chemotherapy agents and novel small molecular inhibitor drugs to target AC in 2D and 3D cell models has also significantly improved response to radiotherapy, which could be translated into clinical practice.



Rachael teaching medical students at a colorectal surgical skills workshop.

Improving response to pre-operative chemoradiotherapy may lead to improved rates of downstaging of tumour size, leading to the need for less aggressive surgery and preservation of anal sphincter muscles, significantly improved quality of life and potentially even avoiding major surgery for a cohort of patients.

Rachael, with the rest of the team, on a trip to Sri Lanka to deliver RCS England surgical courses and present her research.

>12% of patients with locally advanced rectal cancer undergoing pre-operative chemoradiotherapy have no evidence of cancer cells under the microscope after their surgery.

DETERMINING THE OUTCOMES TO MEASURE IN RESEARCH INTO INFORMED CONSENT FOR THERAPY

Liam Convie

FELLOWSHIP/SPONSOR:
Honorary Research Fellowship

SUPERVISORS:
Professor Stephen Kirk and
Professor Mike Clarke

SITE OF WORK:
Ulster Hospital Dundonald

PUBLICATIONS:

1. Convie LJ, Carson E, McCusker D, McCain RS, McKinley N, Campbell WJ, Kirk SJ, Clarke M. The patient and clinician experience of informed consent for surgery: a systematic review of the qualitative evidence. BMC Medical Ethics. 2020 Dec;21(1):1-7

2. Convie LJ, McCain S, Campbell J, Kirk SJ, Clarke M. Evaluating interventions for informed consent for surgery (ICONS): Protocol for the development of a core outcome set. Trials. 2018 Dec;19(1):609

PRESENTATIONS:

1. SARS Annual Meeting 2018: University of Nottingham

2. ASGBI Annual Congress. United Kingdom. Telford 2019

PRIZES:

1. Stefan & Anna Galeski Travelling Fellowship, June 2019

2. The Ulster Hospital Dundonald, Bronze Medal. November 2019

Taking a patient through the informed consent process in clinic.

Shortcomings in the informed consent process can lead to patient complaints, litigation, unmet expectations and poor outcomes. Consent research has focused on developing tools to improve patient recall and understanding. However, the definitions and methods of measurement vary widely across the studies that have been done. Although a Cochrane review reported that many of these interventions appear to work, the high level of heterogeneity in outcome reporting prevents the identification of those interventions that work best and why they do so. It is also not clear which outcomes are most important to each party involved in the consent process and why. Core Outcome Sets (COS) aim to define a set of outcomes that should be considered essential in the evaluation and reporting of a particular intervention or condition.

There are 9 features most important to patients,surgeons, lawyers and bioethicists in determining the quality of the informed consent process.

The development of this COS comprises four phases:

1. Collecting data on the outcomes reported in existing consent research.
2. Determining which additional outcomes could be measured.
3. Organising those outcomes that have been measured and could be measured into a consent outcomes taxonomy.
4. Determining the outcomes that are ‘core’ for evaluating informed consent using an international Delphi survey and a series of consensus webinars.

At the conclusion of the study, we identified nine outcomes that patients, surgeons, lawyers and consent researchers agreed were essential to record in all future trials of a tool designed to improve the consent process. Interestingly, six of these nine outcomes had not been reported in existing consent research demonstrating that the outcomes of greatest importance have not been consistently measured.

Conducting an online consensus webinar.

THE CHARACTERISATION OF BACTERIAL BIOFILM IN PERIPROSTHETIC JOINT INFECTION

Donald Davidson

FELLOWSHIP/SPONSOR:
Freemasons' Royal Arch Fellowship

SUPERVISORS:
Mr Alex Liddle

SITE OF WORK:
Eastman Dental Institute & Institute of Orthopaedic and Musculoskeletal Science, University College London

PUBLICATIONS:
1. Davidson DJ, Spratt D, Liddle AD. Implant materials and prosthetic joint infection: the battle with the biofilm. EFORT Open Rev. 2019;4(11):633-639. Published 2019 Nov 5. doi:10.1302/2058-5241.4.180095

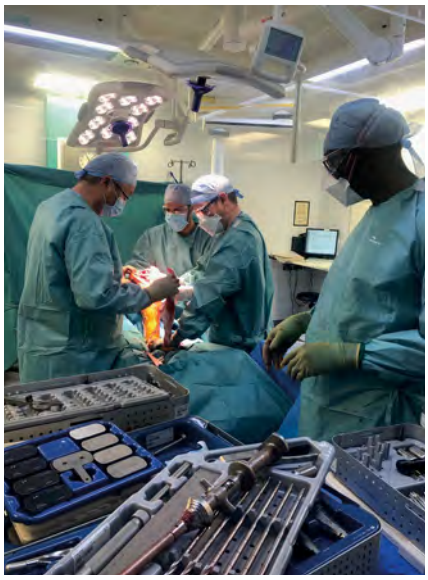
PRESENTATIONS:
1. The Creation of an In Vitro Prosthetic Joint Infection Model and the Assessment of Non-Toxic Dyes for Visual Macroscopic Biofilm Disclosure. 20th EFORT Congress Lisbon 2019. Davidson DJ, Liddle A, Spratt D.e.g.

FURTHER FUNDING:
Orthopaedic Research UK

Prosthetic joint infection (PJI), deep infection around joint replacements, occurs following 1-2% of hip and knee replacements. Due to the large numbers of joint replacements performed each year, approximately 250,000 in the UK, PJI has a great socioeconomic impact with significant morbidity experienced by the individual patient. In PJI the infective micro-organisms colonise the implants forming microbial communities, called biofilms, which remain poorly understood in this context. The principal project aim was to develop and trial a multi-scale imaging protocol to map and characterise adherent bacterial biofilm on colonised implants.

The project objectives were to develop a technique to cultivate reproducible bacterial biofilms grown on implant material; to find a reliable method to identify and locate the presence of biofilm on orthopaedic implant material which would not alter the biofilm characteristics; to trial different imaging techniques to characterise the biofilm structure; and finally to combine successful techniques into a multimodal imaging protocol and test its efficacy.

Over the course of the RCS England Research Fellowship year I made great advances in achieving my project objectives. I established a technique to reliably grow clinically relevant biofilms to test the disclosure and characterisation techniques. I was also able to demonstrate the utility of different biofilm disclosure agents to demonstrate its presence on different implant materials. I used a combination of three advanced imaging techniques (optical coherence tomography, confocal laser scanning microscopy and scanning electron microscopy) to develop the multimodal imaging protocol and finally, using this protocol, I was able to characterise adherent bacterial biofilm on colonised implants. In the laboratory setting, I was able to demonstrate that the biofilm established by infective bacteria differed depending on the implant surface characteristics. This research is the first step in developing new diagnostic tests and therapeutic techniques for PJI which could profoundly impact patient care.



An intraoperative image, showing Donald and other members of the surgical team operating on a patient with PJI.

Deep infection around implanted joint replacement components occurs following 1-2% of all hip and knee replacements and is a disastrous surgical complication with outcomes invariably poor including chronic pain, stiffness, further surgery, amputation and even death.

3D GAIT ANALYSIS FOR DEGENERATIVE CERVICAL MYELOPATHY

Benjamin Davies

FELLOWSHIP/SPONSOR:
The Sir Robert E Kelly Fellowship

SUPERVISORS:
Dr Mark Kotter

SITE OF WORK:
Cambridge University Hospital

PUBLICATIONS:
1. Pope D, Mowforth OD, Davies BM, Kotter MRN. Diagnostic delays lead to greater disability in degenerative cervical myelopathy and represent a health-inequality. Spine 2019 2020 Mar 15;45(6):368-377. doi: 10.1097/BRS.0000000000003305

2. Davies B, Mowforth O, Sadler I, et al Recovery priorities in degenerative cervical myelopathy: a cross-sectional survey of an international, online community of patients BMJ Open 2019;9:e031486. 10.1136/bmjopen-2019-031486

PRIZES:
1. Points of Light (from Prime Minister Boris Johnson) – Feb 2020 – https://www.pointsoflight.gov.uk/myelopathy/

2. AO Spine Discovery and Innovation Award, June 2019 – https://bit.ly/33C5tUc

FURTHER FUNDING:
NIHR – Clinical Doctoral Research Fellowship

Ben working with a mixed group of patients and professionals.

DCM occurs when wear and tear arthritis ('degenerative') changes in the neck ('cervical') compress and injure the spinal cord ('myelopathy'). It affects up to 2% of adults, causing a progressive loss of dexterity, walking, balance, and sometimes total paralysis.

Currently, surgery to remove compression is the only treatment and is able to stop further injury. However, for a full recovery, it must occur before there is irreversible spinal cord damage. Current assessments cannot provide this information and today, 95% of patients are left disabled; 50% dependent and 50% unable to return to work. The aim of this project was to evaluate whether more accurate, numeric, measures of walking could be used to measure DCM and would be considered useful:

- Would this be useful? We conducted an international James Lind Alliance, multi-stakeholder research priority setting partnership (recode-dcm.com). This was selected amongst the top 10 priorities (number four). The process involved gathering >3400 research ideas from surgeons, other healthcare professionals and people with DCM. These were gradually shortlisted. This initiative was recently recognised by Prime Minister Boris Johnson.

"It gives the doctor something quantitative rather than relying on anecdotal evidence and thinking 'its all in your head"

- Could it work? We used a gait-laboratory to assess 20 individuals with DCM: a participant is asked to walk over a specialist walkway, which in combination with cameras around the room, is able to accurately measure walking. Specifically, we identified that measures such as speed, stride length variability and joint position correlated with disease severity.

The findings and support provided by this fellowship has helped secure onward funding with the National Institute of Healthcare Research. I hope to use this time to further develop clinical assessments for myelopathy. Fundamentally, if we can develop tools to optimise the timing of surgery, outcomes would improve immediately.

Spatio-temporal (Position and Time) and biomechanical (Joint Position and Angle) properties of walking correlate with disease severity in cervical myelopathy.

REALTIME FMRI NEUROFEEDBACK TRAINING OF THE SUPPLEMENTARY MOTOR AREA AS A DYNAMIC INTERVENTION IN PATIENTS UNDERGOING DBS SURGERY FOR PARKINSON'S DISEASE

Jinendra Ekanayake

FELLOWSHIP/SPONSOR:
Philip King Charitable Trust Research Fellowship

SUPERVISORS:
Professor Ludvic Zrinzo

SITE OF WORK:
1. Wellcome Trust Centre for Human Neuroimaging

2. National Hospital for Neurology and Neurosurgery

PRESENTATIONS:
1. Applying realtime fMRI neurofeedback learning in STN-DBS patients. Real-Time Functional Imaging and Neurofeedback meeting, Nara, Japan. December 2017

2. 'Short-term neurofeedback training in pre-operative Parkinson's Disease'. European Society for Stereotactic & Functional Neurosurgery, Madrid Spain. September 2016

FURTHER FUNDING:
National Brain Appeal

Aims and Objectives:

Non-surgical brain stimulation techniques that allow diseased brain areas to be modulated to improve function represent a vital therapeutic prospect in Parkinson's disease (PD). Realtime fMRI-based neurofeedback is one such 'neuromodulation' technique -patients learn to voluntarily control their own brain activity during MRI brain scanning. It has been successfully implemented in PD patients with mild disease symptoms. We applied neurofeedback training in PD patients undergoing Deep Brain Stimulation surgery, with the aim of improving their symptoms associated with movement.

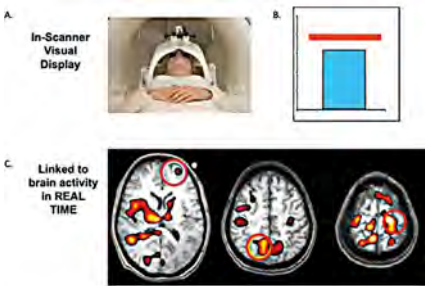
What do we know that we didn't before?:

We demonstrate for the first time the use of Realtime fMRI neurofeedback as a potential treatment in patients with disease severe enough to require surgery. Crucially we achieved this by targeting a region close to the brain surface, the supplementary motor area, a key region in PD pathophysiology. Our findings provide support for:

1. therapeutic stimulation of supplementary motor area in PD in severe disease;
2. the use of supplementary motor area as an easier-to-access target for neuromodulation.

What does this mean for patients?:

Realtime fMRI neurofeedback may represent an alternative to medical and surgical treatments for PD. It is a safe, non-invasive and personalised therapy



A. Image showing typical set-up for a patient inside the MRI scanner during a neurofeedback brain scan. The patient is looking ahead at a screen.

B. Image as seen on screen inside the scanner – a 'thermometer' bar which fluctuates relative to the level of activity in the target brain region.

C. Image as seen on screen outside the scanner-patient's brain activity.

which could be offered to a range of patients, including those who are unable to undergo surgery. Additionally, it could be added in to reduce treatment limiting side-effects.

Conclusions and future directions:

We demonstrate, for the first time, the feasibility of intensive neurofeedback training in pre-surgical patients with linked improvement in motor symptoms. This effect, which was not apparent in the control group, could motivate a larger clinical trial for validation. An area for future surgical work would be the use of the supplementary motor area as an alternative surgical target in PD, avoiding the risks associated with deeper brain access.

Parkinson's disease (PD) is the second most common neurodegenerative condition. and the fastest growing in prevalence and deaths. Existing medications and surgical treatments, such as deep brain stimulation (DBS), are constrained by serious side-effects. As such patient controlled therapies which reduce or have no side-effects are a key goals for treatment.

NOVEL IMAGING TECHNIQUES TO SCREEN FOR PROSTATE CANCER

David Eldred-Evans

FELLOWSHIP/SPONSOR:
Honorary Research Fellow

SUPERVISORS:
Professor Hashim Ahmed

SITE OF WORK:
Imperial College

PUBLICATIONS:
1. Eldred-Evans, D. Tam, H. Sokhi H et al., Rethinking prostate cancer screening: Could MRI be an alternative screening test?, Nature Reviews Urology (2020)

2. Eldred-Evans, D, Winkler M, Ahmed, HU, MRI screening for prostate cancer: a step towards a 'prostagram', Urology News (2020)

PRESENTATIONS:
1. Presented at American Society of Clinical Oncology Annual Meeting 2020, 29 May – 2 June, Chicago (Virtual Meeting)

2.Presented at American Urological Association's 2020 Annual Meeting, May 15 – 19, Washington (Virtual Meeting) September 2016

PRIZES:
1. TUF Medal for best research application (2018)

2. TP Gunton and Helen H Lawson Awards (2019)

FURTHER FUNDING:
BMA Foundation for Medical Research

Prostate cancer is the most common male cancer and one-in-23 men will die from the disease. In recent years, prostate cancer deaths have overtaken those from breast cancer. The challenge is that current methods to test for prostate cancer are not reliable. One of the most frequently used methods is a blood test called PSA. However, this can miss some cancers and tends to find slower growing low-risk cancers, which do not cause harm or shorten life.

The aim of this research was to look at new imaging techniques to screen for aggressive prostate cancer.
We wanted to find an imaging technique, like mammograms for breast cancer, which were less invasive and more accurate than the PSA test. We piloted different methods of scanning the prostate in a study of over 400 men across the UK. This included a fast MRI scan which provides a detailed picture of the prostate without radiation and an ultrasound test measuring the stiffness of the prostate.

A patient whose prostate cancer was found and treated following a prostagram.

David and his supervisors (Professor Ahmed, Mr Winkler and Dr Tam). Developing the Prostagram by scanning themselves as healthy volunteers.

The results suggested that a fast MRI scan could be a simple, non-invasive method to screen for prostate cancer. It was more accurate at finding aggressive prostate cancer than PSA which missed around 50% of the cancers. This might be because the scan was able to detect cancer at an earlier stage before the PSA had become abnormal. The men who had prostate cancer found by the prostagram were treated at an earlier stage when treatment can be less invasive with better outcomes. This was a pilot study and the next step is to complete a larger study of over 4,000 men to and we are in the process of seeking funding for this study.

Prostagram was capable of detecting double the number of prostate cancers as PSA.

MACHINE LEARNING AND MULTIMODAL IMAGING TO BUILD PREDICTIVE MODELS OF DEEP BRAIN STIMULATION FOR MOVEMENT DISORDERS

Francisca Ferreira

FELLOWSHIP/SPONSOR:
Freemasons' United Grand Lodge of England Research Fellowship

SUPERVISORS:
Professor John Ashburner,
Mr Harith Akram,
Dr Christian Lambert,
Professor Gary Zhang

SITE OF WORK:
Unit of Functional Neurosurgery, National Hospital for Neurology and Neurosurgery, London, UK

PUBLICATIONS:
1. Ferreira F. el al, Ventralis intermedius nucleus anatomical variability assessment by MRI structural connectivity, bioRxiv 2020.08.05.236679; doi: https://doi.org/10.1101/2020.08.05.236679

PRESENTATIONS:
1. 2020 Organization for Human Brain Mapping (OHBM) Annual meeting – 23 June - 3 July. Online event due to pandemic

FURTHER FUNDING:
Engineering and Physical Sciences Research Council (EPSRC)

Deep brain stimulation (DBS), the placement of electrodes in deep structures of the brain, can be highly effective in the treatment of Parkinson's disease (PD), when medication is not effective. Certain target structures for DBS are invisible on scans and electrodes may be placed in non-ideal locations, reducing the efficacy of DBS. The aim of this research is to develop a tool that allows the choice of ideal location of electrodes for each patient.

Vim variability research presented at poster session at UCL.

One of the targets for DBS in PD is Ventralis intermedius nucleus (Vim). As this structure is not visible on brain scans, an approximate location is targeted. Utilizing the brain wiring diagrams of healthy individuals, this research was able to pin-point the individual location of Vim and established the pattern of variation from the approximate location. This technique will be applied to other brain structures targeted in PD treatment. The gained information will be combined with scan, genetic and clinical data to create a machine learning algorithm to predict which patients will improve with surgery and to choose the ideal location of electrodes for each patient. Once the predicting algorithm is developed, it will continually be developed in cooperation with other UK and internationally based Functional Neurosurgery units.

Many patients become severely disabled with poor response to medication. Increasing difficulty with movement and resulting loss of independence are risk factors for injuries and complications, which frequently shorten patients' lives and may make patients feel frustrated and depressed; family members or carers will inevitably by impacted by patients' decline. UK annual care-home cost for Parkinson's disease is £600-800 million. By helping deliver more precise DBS to patients, this research sets out to improve motor problems, promote patient quality of life and independence, reducing the burden on carers and the impact of PD disability in society.

Parkinson's disease affects one adult in every 350 in the UK, with many patients becoming severely disabled; deep brain stimulation can be a highly effective treatment when precisely tailored to patients' anatomy.

OPTIMISING SCREW FIXATION

James Fletcher

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship with support from the Vandervell Trust and the Rosetrees Trust

SUPERVISORS:
Ezio Preatoni

SITE OF WORK:
University of Bath

PUBLICATIONS:
1. Fletcher et al. Non-locking screw insertion: no benefit seen if tightness exceeds 80% of the maximum torque. 2019. Clinical Biomechanics 70, 40-45

2. Fletcher et al. Surgical performance when inserting non-locking screws–a systematic review. 2020. EFORT Open Reviews [Epub ahead of print]

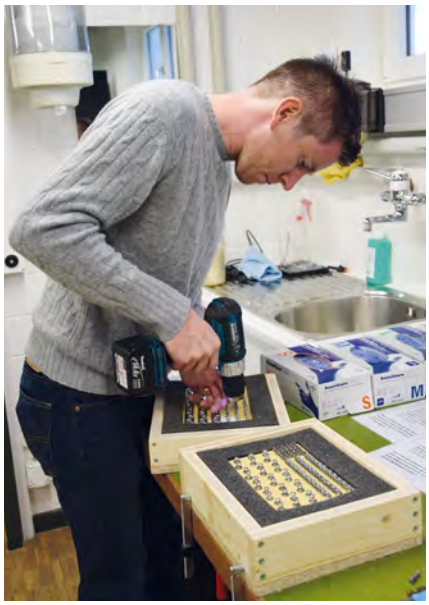
PRESENTATIONS:
1. TightRight : augmenting screwdrivers to reduce bone stripping rates and optimise tightness when inserting non-locking screws. Orthopaedic Research Society, Phoenix, February 2020

2. What is the optimum tightness for non-locking cortical screws, and how can this be predicted prior to insertion? British Orthopaedic Research Society, Cardiff, September 2019

PRIZES:
1. AOUK&I Best Trauma Research Prize November 2019

2. BORS/BRS 2nd Prize Podium presentation – September 2019

One in three women and one in five men will have a fracture (broken bone) in their lifetime. Frequently, operations are required to fix the fracture and to restore function. Screws are the most commonly used orthopaedic implant used to fix fractures, with millions inserted each year in the UK alone. Screws are tightened to gain compression of bone fragments, to hold them in place whilst the bones heal. Although there have been investigations into surgeons techniques, previous work has not indicated how tight screws should be, perhaps as the role of screws has been trivialised, and their importance underestimated. However, we found that more than one in four screws are overtightened when inserted, considerably reducing the strength of the fixation. This dramatically increases the costs of surgery and worsens outcomes for patients.



Preparing jigs for testing screw tightness.

James and colleagues testing surgeons.

The aim of this project was to identify the optimum tightness for screw insertion, and develop a method for predicting this for a screw hole prior to insertion.

We found that by modifying an engineering equation, the maximum tightening force a screw hole could take could be predicted prior to screw insertion. We then found that inserting screws to more than 80% of this maximum force gave no further benefits, whilst increasing the risks of irreversibly damaging the screw hole.

This technique was tested on 302 surgeons at the largest international orthopaedic training courses in Davos, Switzerland. Here we showed that by using this technique and an augmented screwdriver (that indicated when the optimum tightness had been reached) it significantly improved the proportion of good screws that were inserted.

Already these findings are increasing the awareness of optimum tightness in surgery and changing surgical practice. In turn, this should be improving operative outcomes. This work will be used to design a clinical trial analysing the clinical benefits to patients in more detail.

Optimum tightness for non-locking screws is 70-80% of the maximum torque.

IMPROVING THE DELIVERY SURGICAL TRIALS ACROSS LOW-RESOURCE SETTING

James Glasbey

FELLOWSHIP/SPONSOR:
RCS England Research Fellow with support from the RCS 2019 ASICS 10k Team

SUPERVISORS:
Mr Aneel Bhangu, NIHR Clinical Scientist in Global Surgery, University of Birmingham

SITE OF WORK:
NIHR Global Health Research Unit on Global Surgery, University of Birmingham

PUBLICATIONS:
1. Glasbey JC, Bhangu A; COVIDSurg Collaborative. Elective Cancer Surgery in COVID-19-Free Surgical Pathways During the SARS-CoV-2 Pandemic: An International, Multicenter, Comparative Cohort Study. J Clin Oncol. 2020 Oct 6:JCO2001933

2. NIHR Global Health Research Unit on Global Surgery. Pragmatic multicentre factorial randomized controlled trial testing measures to reduce surgical site infection in low- and middle-income countries: study protocol of the FALCON trial. Colorectal Dis. 2020 Sep 13. doi: 10.1111/codi.15354

3. COVIDSurg Collaborative. Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study. Lancet. 2020 Jul 4;396(10243):27-38

PRESENTATIONS:
1. Outcome assessment for surgical site infection across diverse settings. Wound Research Network Conference/ European Wound Management Association (WReN/EMWA) – Denmark (Virtual), 17th November 2020

2. Protecting patients from perioperative SARS-CoV-2 infection: the role of COVID-19 free surgical pathways. European Society of Surgical Oncology – Portugal (Virtual), 12th October 2020

3. Feasibility of telephone follow-up for surgical site infection across low and middle-income countries. Ghanaian College of Surgeons and Physicians – Ghana (Virtual), 26th November 2020

4. Adapting a patient reported questionnaire to diagnose wound infections after surgery around the world. NIHR Academy Conference – London (Virtual), 23rd November 2020

FURTHER FUNDING:
NIHR Doctoral Research Fellowship (Global Surgery)

Whilst surgery is getting safer each year thanks to new research and technologies, sadly many patients around the world still die or suffer serious complications after an operation. Risks of surgery are particularly high in low and middle-income countries where health resources are limited. Research is urgently needed to test relevant and cost-effective methods to improve care for surgical patients in these settings.

An infection in the cut ('wound') made in the tummy ('abdomen') during surgery is the most common problem that patients face during their recovery. Correct diagnosis of infection after a patient has left hospital is important, both to keep them safe at home and for research purposes.

Complex collaborative teams have been essential to delivering this global study.

The RCS England Fellowship has allowed me to work with surgeons in seven different low and middle-income countries to develop new ways to assess a patient's wound at home, without the need for a face-to-face meeting. This included using a specialised questionnaire over the telephone, and video calls. Working with the community, I created a toolkit to capture patients' experiences across different cultures – from rural Rwanda, to the urban cities of India. This study was embedded into two international randomised trials, and included over 1300 patients in total.

I have also contributed to the COVID-19 response both clinically and academically. I co-led a global collaborative study (COVID Surg-Cancer) which created evidence to protect patients from the risks of COVID-19 when undergoing elective surgery. Our research has been featured in many major news stations including The Wall Street Journal, The Daily Mail and The Economist. You can read a summary of our COVID-19 research at: https://redcap.link/siureport.

Over the past year, I also enjoyed representing the College for the Vitality 'Big Half' marathon, raising money to support future RCS England research (uk.virginmoneygiving.com/RCSbighalf).

I have now been awarded a Doctoral Research Fellowship from the NIHR (the NHS research charity) which will allow me to complete my PhD studies in Global Surgery.

Many thanks to the College and its generous partners for helping to fund this work to improve outcomes of surgery around the world.

Death after surgery is the third leading cause of death worldwide, with 4.2 million people dying within 30 days of an operation each year.

ESTABLISHING A CLINICAL, MOLECULAR CLASSIFIER FOR PERITONEAL MALIGNANCY – IMPROVING OUTCOMES FOR ADVANCED BOWEL CANCER

Sally Hallam

FELLOWSHIP/SPONSOR:
Freemasons' Royal Arch Fellowship

SUPERVISORS:
Mr Andrew Beggs and Mr Haney Youssef

SITE OF WORK:
The Institute of Cancer and Genomic Sciences, The University of Birmingham

PUBLICATIONS:
1. Identifying prognostic factors for patients with colorectal peritoneal metastasis undergoing Cytoreductive surgery and Heated Intraperitoneal chemotherapy, a systematic review and meta-analysis. BJS open, (in press)

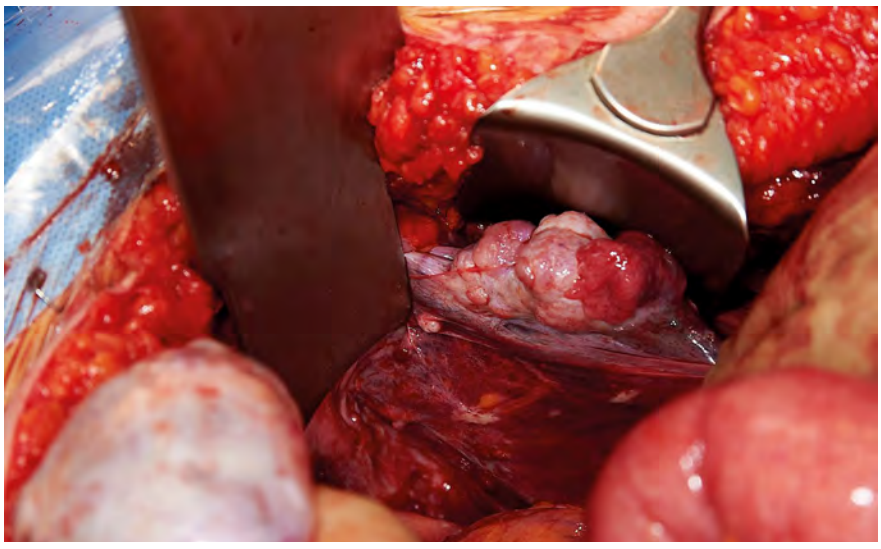
FURTHER FUNDING:
The University Hospitals Birmingham Hospital charity for 18 months

Bowel cancer spreads to the peritoneum in 15% of cases. Traditional treatments aim to relieve symptoms but not cure the cancer. 'Cytoreductive surgery' and 'heated intra-operative intra-peritoneal chemotherapy' (CRS & HIPEC) is an operation which improves survival in selected cases. Survival following CRS & HIPEC however, can be difficult to predict, five-year overall survival ranges from 20-65%. Additionally, CRS & HIPEC is a large operation with long hospital stay and many side effects.

This research aimed to improve patient selection for CRS & HIPEC and to develop alternate treatments for patients unlikely to respond. To achieve this, I identified bio-molecular markers of prognosis, tested a bio-marker of peritoneal metastasis using cell free circulating tumour DNA (ccfDNA) and developed a three-dimensional cell culture model or organoid.

Genetic signatures were identified which predict the development of peritoneal metastasis as well as prognosis and response to CRS & HIPEC. Common mutations identified within the signature suggest patients will have a good response to novel medications not currently in use in peritoneal metastasis. A three-dimensional cell culture model was developed which will allow testing of these medications prior to trialling them in humans. A blood test for ccfDNA was taken before CRS & HIPEC. The ccfDNA test contains microscopic tumour fragments, ccfDNA closely reflected tumour mutations as well as identifying additional mutations. This suggests that ccfDNA can be used as a liquid biopsy, giving a better overview of the mutations within the tumour than a tumour sample.

This is the first basic science study of its kind to examine the biology of colorectal peritoneal malignancy. The results of this project will require validation on a further cohort of patients. Once this is complete these results can be used to develop clinical studies testing personalised treatments targeted towards individual genetic signatures.



Colorectal peritoneal metastasis in the pelvis.

Survival following CRS & HIPEC can be difficult to predict with 5-year overall survival ranges from 20-65%.

THE NOVEL USE OF DEMINERALISED CORTICAL BONE FOR ANTERIOR CRUCIATE LIGAMENT (ACL) RECONSTRUCTION

Adam Hexter

FELLOWSHIP/SPONSOR:
Linder Foundation Research Fellowship

SUPERVISORS:
Professor Gordon Blunn &
Professor Fares Haddad

SITE OF WORK:
Institute of Orthopaedic & Musculoskeletal Science, University College London

PUBLICATIONS:
1. Hexter, A. T., et al. (2018). "Biological augmentation of graft healing in anterior cruciate ligament reconstruction." Bone Joint Journal 100-b(3): 271-284

2. Hexter, A. T., et al. (2017). "Demineralized Bone Matrix to Augment Tendon-Bone Healing." Orthopaedic Journal of Sports Medicine 5(10): 2325967117734517

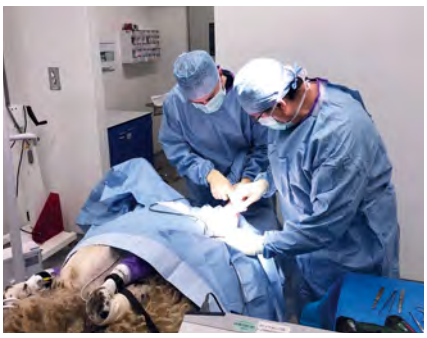
PRIZES:
1. University College London Patient and Public Involvement Starter Grant, July 2018

The aim of my fellowship was to determine if Demineralised Cortical Bone (DCB), a biomaterial used in orthopaedics, can be used to surgically reconstruct the anterior cruciate ligament (ACL).

Adam introducing the new ACL graft into a sheep's knee joint.

In the UK 60,000 people rupture their ACL every year. When injured the knee joint becomes painful and unstable. The ACL is not capable of repairing itself and consequently patients usually get their ACL fixed surgically in an operation called ACL reconstruction. There are 30,000 ACL reconstructions every year in the UK and 80% using the patient's own hamstring tendon. However the results of ACL reconstruction are suboptimal. In the short-term 9% of grafts "fail" and the knee becomes unstable again. In the long-term nearly 80% of patients develop arthritis of the knee. The problem is thought to be due to the fact the hamstring tendon graft does not integrate well to bone, which leads to slower rehabilitation, graft ruptures and joint damage.

UCL's Institute of Orthopaedics has previously shown that DCB can repair patella tendon injuries in sheep. My fellowship expanded upon this work in order to determine if DCB can be used as an ACL graft and achieve better graft integration than tendon grafts. In this work I have considered both biomechanical and biological properties of DCB. I have shown that DCB derived from tibia has superior mechanical properties than DCB derived from femur. I have also shown DCB can cause bone marrow stem cells to differentiate into cartilage, an important tissue present in the ACL insertion. Ongoing research, in collaboration with the Royal Veterinary College, now seeks to determine if DCB can improve graft integration in a sheep model.



Adam and Professor Blunn performing an ACL reconstruction on a sheep.

Demineralised bone is already widely used in orthopaedics. If DCB can improve graft integration after ACL reconstruction, patients will benefit from earlier return to function and fewer graft ruptures.

40% of patients after ACL reconstruction do not return to their baseline level of physical activity, which in part is due to poor graft-to-bone integration.

MONO-NUCLEAR PHAGOCYTES IN CARTILAGE REPAIR

Andrew Hotchen

FELLOWSHIP/SPONSOR:
Linder Foundation Research Fellowship

SUPERVISORS:
Professor A W McCaskie,
Professor M R Clatworthy,
Dr M Birch

SITE OF WORK:
Department of Surgery,
University of Cambridge

PRESENTATIONS:
1. Bone Research Society / British Orthopaedic Research Society, Cardiff, September 2019

FURTHER FUNDING:
Addenbrooke's Charitable trust, Versus Arthritis

Joints in the body, such as the knee and the hip, are lined by cartilage. Cartilage helps joints move in a smooth, painless way. In osteoarthritis, the cartilage gradually roughens and becomes thin resulting in joint pain and stiffness.

Harvesting articular cartilage from human tibial plateau.

The body uses different cells for healing and repair when tissues are damaged. I have developed a way of observing the cells that repair damaged cartilage in mice.

I looked at two types of cells:

1. cells from the immune system and

2. stem cells that become specialist cartilage forming cells.

I wanted to know:

1. which of these cell types become active when cartilage is damaged and

2. their location in the joint during cartilage repair.

I observed that when cartilage is injured, the number of immune cells in the knee joint increases. During the first 15 days of repair, these cells changed from being in a resting state to an active state and stay at the area of cartilage that is repairing. I also observed that the number of stem cells within the knee also increases. This suggests that these cell types are important to the cartilage repair process.

This research required development of specific techniques and protocols. In future work, I will exploit these skills to interrogate the genes expressed in many thousand of immune and stem cells during cartilage repair. This will tell us the precise genes that are expressed during cartilage repair thereby undercovering potential therapeutic targets for early-stage osteoarthritis.

By completing this research, specific cells that are involved in cartilage repair have been identified. Continuing this research is essential to understand whether such treatments can delay or prevent the need for complex reconstructive surgery. This has potential to improve the quality of life for patients and help them to continue to lead an active life.

In the UK, one in three people aged over 45 have sought treatment for osteoarthritis, which costs the health service £5.2 billion per year.

THE DEVELOPMENT OF 3D COLORECTAL CANCER MODELS TO TEST CANCER TREATMENTS

Michelle Johnpulle

FELLOWSHIP/SPONSOR:
Bowel Cancer UK/RCS England Research Fellowship

SUPERVISORS:
Dr Fiona Errington-Mais and Professor Giles Toogood

SITE OF WORK:
St James' Hospital Leeds

PRESENTATIONS:
1. Short Paper Oral Presentation: "Fighting chemotherapy colorectal cancer" ASGBI Telford, 7th May 2019

FURTHER FUNDING:
Rays of Hope Charitable Foundation (The Yorkshire Liver Research Fund) for 2 years

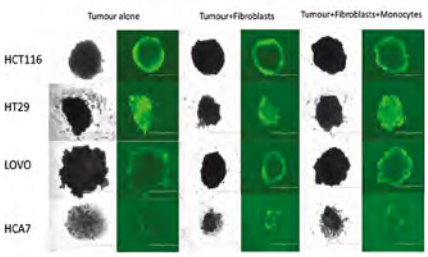
Colorectal cancer (CRC) is the second leading cause of cancer-related death in the UK with more than 40,000 new diagnoses each year. Treatment options such as chemotherapy can be limited due to drug resistance. 50% of patients are resistant to the most commonly used drug 5-fluorouracil (5FU).

Oncolytic viruses (OVs) specifically kill tumour cells. Our previous research has shown that OVs are safe, well tolerated and can selectively replicate in and kill CRC cancer cells. However, this research has focused on two dimensional (2D) pre-clinical models and these models lack the variety of cells and cell to cell interactions that are present in human disease. Three dimensional (3D) multicellular models more closely represent human disease and therefore are a better preclinical model for testing anti-cancer therapies.

This project aims to generate a 3D multicellular tumour spheroid model for CRC and use this model to compare the efficacy of chemotherapy and OVs in 2D and 3D models as well as investigate whether an oncolytic virus (MG-1) replicates in this 3D model. A panel of CRC cells were grown incorporating a variety of different cell subtypes such as stromal and immune cells into the 3D model.

Virus replication in this 3D model was determined using a green fluorescent protein labelled virus and cell viability following virus and chemotherapy treatment were tested using 3D viability assays.

Results confirm that a variety of cells can be successfully incorporated into this complex 3D model. Viability assays confirm that 3D CRC cells are more resistant to virus and 5FU than less complex 2D cells. Since OV's could still replicate in this complex 3D model we aimed to use these viruses as a vehicle to transport molecules into CRC cells to enhance chemo-sensitivity and therefore combat chemotherapy resistance in CRC patients and improve their long-term survival.



Incorporating virus into the 3D colorectal cancer spheroid model.

50% of patients with metastatic colorectal cancer develop resistance to the commonly used chemotherapy agent 5-FU.

REMOTE ISCHAEMIC CONDITIONING AS A NOVEL THERAPY FOR EXPERIMENTAL NECROTISING ENTEROCOLITIS

Ian Jones

FELLOWSHIP/SPONSOR:
Freemasons' United Grand Lodge of England Research Fellowship

SUPERVISORS:
Nigel Hall

SITE OF WORK:
University of Southampton

PRESENTATIONS:
1. Remote Ischaemic Conditioning as a Novel Therapeutic Intervention for Experimental NEC – poster presentation, Canadian Association of Paediatric Surgeons Annual Meeting, Toronto 2018

2. Contemporary Outcomes of Necrotising Enterocolitis – A Systematic Review – poster presentation, Canadian Association of Paediatric Surgeons Annual Meeting, Toronto 2018

PRIZES:
1st Prize for best poster, Canadian Association of Paediatric Surgeons Annual Meeting, Toronto 2018: Remote Ischaemic Conditioning as a Novel Therapeutic Intervention for Experimental NEC

Necrotising enterocolitis (NEC) is a devastating disease involving severe inflammation and necrosis (death) of part or all of the bowel. It afflicts new-born babies: one in six die and a third of survivors are left with life-long disability as being so unwell at this early stage damages the developing brain.

The causes of NEC are complicated: gut immaturity, infection, inflammation and inadequate oxygen/blood supply to the bowel are all important. This results in what is called ischaemia-reperfusion injury (IRI). 'Ischaemia' means that there is insufficient blood supply to a tissue.

Remote Ischaemic Conditioning (RIC) involves making part of the body mildly 'ischaemic' for a short period of time to provide protection to a different organ. This can be achieved by simply inflating a blood pressure cuff on a limb for a few minutes, stopping the inflow of blood without injury or damage. It has been used to improve outcomes in a number of human diseases.

I am using an established model to induce an NEC-like illness in anaesthetised newborn rats. Before giving them the NEC like illness, I induced RIC with a tourniquet around the leg for short period since there is no blood pressure cuff small enough.

Overall, my results show animals pre-treated with RIC have less bowel injury, both in terms of how much of the bowel is affected and when examining the bowel under a microscope.

The next stage is to alter the time at which RIC is given to see how long the effect lasts for and if it is possible to refine the intervention so that it can be used in small babies. I will also use samples I have from these animals to study the protective mechanisms involved. This will provide the necessary data to design a clinical trial for using RIC in human babies.

Ian in surgery.

Necrotising enterocolitis (NEC) affects 500-1500 babies a year in the UK, with one in three needing emergency surgery, one in six dying and many survivors left with lifelong consequences.

OPTIMISING THE IDENTIFICATION OF ACUTE DETERIORATION AND SEPSIS THROUGH DIGITAL TECHNOLOGY

Meera Joshi

FELLOWSHIP/SPONSOR:
Freemasons' Royal Arch Research Fellowship with support from the Fletcher Legacy

SUPERVISORS:
Dr Sadia Khan, Professor Graham Cooke & Professor Ara Darzi

SITE OF WORK:
West Middlesex University Hospital & Department of Surgery & Cancer, Imperial College London

PUBLICATIONS:
1. Wearable sensors to improve detection of patient deterioration. Joshi M, Ashrafian H, Aufegger L, Khan S, Arora S, Cooke G, Darzi A. Expert Rev Med Devices. 2019 Feb;16(2):145-154. doi:10.1080/17434440.2019.1563480. Epub 2019 Jan 6. Review PMID:30580650

2. Is it time for hospitals with smart wards? Joshi M, Ashrafian H, Darzi A. J R Soc Med. 2018 Oct;111(10):345-346. doi: 10.1177/0141076818800793. No abstract available. PMID:30318998

PRESENTATIONS:
1. Digital systems for monitoring vital signs, European Resuscitation Council, Bologna September 2018 (International Oral presentation)

2. Reliability of continuous digital vital sign monitoring through wearable sensors in acute patients, Hamlyn Symposium, 23rd June (International Poster presentation)

PRIZES:
1. Second Place overall PhD winner at Imperial Summer Showcase 12th July 2019

2. Winner of Imperial Industry xChange: Transformative Innovation 25th April 2019

FURTHER FUNDING:
CW Plus Charity

Sepsis is the 'body's overwhelming and life-threatening response to infection that can lead to tissue damage, organ failure and death'. The chance of death in severe sepsis is as high as one in four. Most sepsis research thus far has been on treatments. There is still much that is unknown in sepsis.

Wearable sensors may identify unwell patients and sepsis sooner by providing more detailed information and increased monitoring frequency to current standards. We aimed to determine if wearable sensors were reliable and enabled earlier identification of unwell patients. Currently ward patients routinely have observations measured at four to six hourly intervals. Deterioration in this interval can be missed leading to poorer outcomes. The sensor used is a low cost, wireless, lightweight device with a five-day battery life measuring heart rate, respiratory rate and temperature every two minutes offering more continuous monitoring than current standards.

Participant wearing the wearable sensor.

Presentation to the European Resuscitation Council, Bologna, 2018.

A large study has been completed with 500 acutely unwell patients wearing the sensor in addition to routine monitoring. Comparisons were made between sensor readings to nurse's ward observations and sensor reliability was confirmed. Preliminary results show earlier detection of deterioration on vital signs using the sensor in unwell patients including those with sepsis.

Patients' experience was explored with 453 patient questionnaires analysed and 12 detailed interviews performed. Feedback was positive with many agreeing to wear the sensor again in hospital and that it was comfortable. 48 staff interviews identified problems with current monitoring and staff had an overall positive view of the technology.

A further trial has commenced on the use of wearable sensors and real-time digital alerts sent to nursing staff on a busy surgical ward at a London hospital. This project will continue and additional support has been secured. Wearable sensors could cause a paradigm shift in future patient monitoring with safer, smarter wards.

Sepsis is the 'body's overwhelming and life-threatening response to infection that can lead to tissue damage, organ failure and death'. Sepsis is a major health problem with a chance of death as high as one in four in severe cases. In the UK 52,000 lives are lost yearly to sepsis. For every hour's delay in sepsis treatment the chance of death increases by 7.6%, yet with early diagnosis it is easily treatable.

ADIPOGENIC AND CHONDROGENIC POTENTIAL OF NOVEL NANOCELLULOSE BIOMATERIAL

Thomas Jovic

FELLOWSHIP/SPONSOR:
Freemasons' United Grand Lodge of England Research Fellowship

SUPERVISORS:
Professor Iain S Whitaker

SITE OF WORK:
Swansea University

PUBLICATIONS:

1. Jovic, T. H., Kungwengwe, G., Mills, A., & Whitaker, I. S. (2019). Plant-Derived Biomaterials: A Review of 3D Bioprinting and Biomedical Applications. Frontiers in Mechanical Engineering, 5, 19

2. Jovic, T. H., Jessop, Z. M., Al-Sabah, A., & Whitaker, I. S. (2018). The clinical need for 3D printed tissue in reconstructive surgery. In 3D Bioprinting for Reconstructive Surgery (pp. 235-244). Woodhead Publishing

PRESENTATIONS:

1. BAPRAS Winter Scientific Meeting – The search for the ideal candidate bioink in extrusion based 3D bioprinting for reconstructive surgery. Nov 2018, London

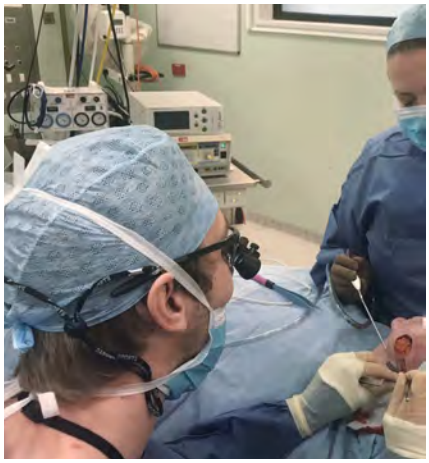
2. BAPRAS Winter Scientific Meeting – Donor Site Morbidity following costochondral grafting for head and neck reconstruction: a systematic review. Dec 2017, London

PRIZES:

1. 3 Minute Thesis – Swansea University Medical School – 1st Prize (Mar 2019)

2. Microtia UK Research Award – (Jan 2019)

3. Swansea University Poster Prize – Winner (May 2019)



Thomas performing facial reconstructive surgery.

Diseases of the head and neck can be severely disfiguring, with functional and psychological implications for patients. Reconstruction of the ear and nose requires cartilage to be taken from ribs which is associated with lengthy, complex surgeries and damage to the rib cage.

The aim of this research project was to explore the potential of a novel material: nanocellulose, as a possible biological ink for 3D printing cartilage for facial reconstruction. To determine its suitability as a biological ink, human cartilage cells were grown inside the nanocellulose material blended with alginate (a seaweed derivative) or hyaluronic acid (a native component of cartilage tissue) for 21 days and thereafter their ability to produce cartilage tissue was determined through analysis of cartilage-specific gene expression and microscopy. It was noted that the inclusion of the nanocellulose material improved the flow of the biological ink, strengthened its form as a solid for 3D printing purposes and encouraged greater cartilage tissue formation by 100-fold. Enhanced structural integrity was observed with the nanocellulose and hyaluronic acid blend, with evidence of denser cartilage formation under microscopy.

The culmination of these findings has led us to refine the material composition for cartilage 3D printing, which we are now testing extensively for its suitability for use in humans, specifically its toxicity, degradation profile and tolerance by the immune system. It is hoped that further robust evidence of safety will enable us to commence animal studies and ultimately clinical trials using this technology. We also hope to determine the material's suitability for printing fat and bone, increasing the range of tissue types we could 3D print for reconstructive surgery.

3D printed ear using nanocellulose material and human cartilage cells.

This initial research has been very promising, and future efforts to prove safety of this technology in humans could revolutionise the practice of facial reconstruction for both surgeons and patients.

One in 100 individuals are affected by diseases that affect the form and function of the face, many of whom would benefit from reconstructive surgery.

DIABETES REMISSION AFTER A GASTRIC BYPASS WITH A LONG BILIOPANCREATIC LIMB. THE LONG LIMB TRIAL

Anna Kamocka

FELLOWSHIP/SPONSOR:
The Frances and Augustus Newman Research Fellowship

SUPERVISORS:
Prof Tricia Tan, Dr Alexander Miras, Prof Sir Stephen Bloom

SITE OF WORK:
Imperial College London, King's College London

PUBLICATIONS:
1. Miras AD*, Kamocka A*, Patel D, Dexter S, Finlay I, Hopkins JC, Khan O, Reddy M, Sedman P, Small P, Somers S, Cro S, Walton P, le Roux CW, Welbourn R. Obesity surgery makes patients healthier and more functional - real world results from the United Kingdom National Bariatric Surgery Registry. Surg Obes Relat Dis., 2018 Feb; *Joint first authors

2. Kamocka A, McGlone ER, Pérez-Pevida B, Moorthy K, Hakky S, Tsironis C, Chahal H, Miras AD, Tan T, Purkayastha S, Ahmed AR. Candy cane revision after Roux-en-Y gastric bypass. Surg Endosc. 2019 Aug

PRESENTATIONS:
1. Impact of Long Biliopancreatic Limb in Roux-en-Y Gastric Bypass on Glucose Metabolism in Type 2 Diabetes. Presented at: Obesity Week, Las Vegas, Nov 2019

2. Long vs standard biliopancreatic limb Roux-en-Y gastric bypass for type 2 diabetes. The LONG LIMB Trial. Presented at: International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) Annual Meeting, Madrid, Sept 2019

3. Total small bowel length varies considerably among patients with obesity and diabetes: is there a role for individualization of limb lengths in Roux- en-Y gastric bypass? Presented at: World Congress on Interventional Therapies for Type 2 Diabetes, New York, April 2019

PRIZES:
1. Foster Schauer Award, Obesity Week, Las Vegas, Nov 2019

2. The Department of Medicine PhD Travel Award, Imperial College London, May 2018

3. Best Poster Award at the British Obesity and Metabolic Surgery Society (BOMSS) Annual Meeting, Alton, Jan 2017

FURTHER FUNDING:
National Institute for Health Research Efficacy and Mechanism Evaluation grant (NIHR EME)

There are an estimated 4.1 million people with type 2 diabetes mellitus in the UK. This alarming figure is expected to rise due to the epidemic of obesity. The yearly cost of diabetes to the NHS is predicted to rise to £40 billion by 2035. We urgently need more effective treatments for people with both diabetes and obesity.

Anna with trial participant during a clinical follow up visit.

Weight-loss operations, like the gastric bypass, have a very favourable safety record and enable patients to lose a quarter of their body weight. More impressively, in half of these people diabetes goes into remission. This means that these patients start having normal blood glucose and can stop taking diabetes medications including insulin. Despite these impressive effects of surgery, half of patients will not go into remission and, in those that it has, diabetes will reappear in 30%. This is frustrating for people with diabetes and clinicians alike.

The aim of my research was to increase the proportion of people whose diabetes goes into remission. In this Fellowship I conducted a proof-of-concept study to test whether a modified gastric bypass procedure is superior to the standard gastric bypass for glucose control.

I recruited 50 people and allocated them randomly to undergo either the standard or the modified gastric bypass with a longer segment of bypassed intestine (called a biliopancreatic limb) in order to test whether the latter is better for glucose control. I found that trial participants had excellent outcomes at one year, with 70% of them achieving type 2 diabetes remission, alongside with 30% total body weight loss. The modified bypass was not shown to be superior for glucose control at one year however, the follow up continues. If the longer-term results confirm this finding, the next step will be to change the length of a different segment of the gastric bypass design (the alimentary limb) in an attempt to make it more effective. Such a discovery could have a major positive impact on patients' health and quality of life.

A gastric bypass with a standard biliopancreatic limb causes diabetes remission in seven out of 10 people with type 2 diabetes and obesity at 12 months, and a gastric bypass with a long biliopancreatic limb is not superior.

THE USE OF ROBOTIC TECHNOLOGY AS A SURGICAL ADJUNCT AND AN INVESTIGATIVE TOOL FOR ASSESSING KNEE BIOMECHANICS DURING TOTAL KNEE ARTHROPLASTY

Babar Kayani

FELLOWSHIP/SPONSOR:
The Arthritis Research Trust Fellowship

SUPERVISORS:
Professor Fares S Haddad

SITE OF WORK:
University College London Hospital

PUBLICATIONS:

1. Posterior cruciate ligament resection in total knee arthroplasty: Effect on flexion-extension gaps, mediolateral laxity, and fixed flexion deformity. Kayani B, Konan S, Horriat S, Ibrahim MS, Haddad FS. Bone Joint J. 2019 Oct;101-B(10):1230-1237. PMID:31564152

2. An assessment of early functional rehabilitation and hospital discharge in conventional versus robotic-arm assisted unicompartmental knee arthroplasty. Kayani B, Konan S, Tahmassebi J, Rowan FE, Haddad FS. Bone Joint J. 2019 Jan;101-B(1):24-33. PMID:30601042

PRESENTATIONS:

1. Robotic total knee arthroplasty is associated with improved early functional recovery and reduced time to hospital discharge compared with conventional jig-based total knee arthroplasty: A prospective cohort study. Kayani B, Konan S, Tahmassebi J, Pietrzak JRT, Haddad FS. International Society of Computer assisted Orthopaedic Surgeon (CAOS). New York, USA. 19th-22nd June 2019

2. Posterior cruciate ligament resection in total knee arthroplasty: Effect on flexion-extension gaps, mediolateral Laxity, and fixed flexion deformity. Kayani B, Konan S, Horriat S, Ibrahim MS, Haddad FS. EFORT, Lisbon, Portugal, 5th-7th June 2019

PRIZES:

1. Royal London Hospital Charles Fixsen prize for best original scientific paper - Robotic-arm assisted total knee arthroplasty has a learning curve of seven cases for integration into the surgical workflow but no learning curve effect for accuracy of implant positioning. Kayani B, Konan S, Huq SS, Tahmassebi J, Haddad FS. Percival Pott Meeting, Royal London Hospital, UK, 9th November 2018

2. International Society for Technology in Arthroplasty (ISTA) Young Investigator Scholarship - Iatrogenic bone and soft Tissue trauma in robotic-arm assisted total knee arthroplasty compared with conventional jig-based total knee arthroplasty: A prospective cohort study and validation of a new classification system. Kayani B, Konan S, Pietrzak JRT, Haddad FS. 1st December 2018

Developments in surgical technology have led to evolution from conventional manual total knee arthroplasty (CO TKA) to robotic-arm assisted total knee arthroplasty (RO TKA). However, the effects of this technology on accuracy of implant positioning, intraoperative soft tissue injury and postoperative functional rehabilitation remain unknown. The objectives of this research were to compare a range of perioperative and radiological outcomes in CO TKA versus RO TKA, and use optical motion capture technology during RO TKA to assess the effects of anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) resection on knee biomechanics.

Knee arthritis affects one in six people and knee replacement surgery is performed in 90,000 patients per year in the United Kingdom.

A series of prospective cohort studies were undertaken in patients with established knee osteoarthritis undergoing CO TKA versus RO TKA. Predefined study outcomes were recorded by independent observers. This research found that RO TKA was associated with improved accuracy of achieving the planned implant positioning, faster postoperative functional rehabilitation, and reduced systemic inflammatory response compared to CO TKA. Robotic TKA had a learning curve of seven cases for operative times but there was no learning curve effect for achieving the planned implant positioning. The Macroscopic Soft Tissue Injury (MASTI) classification system was developed and validated for grading intraoperative periarticular soft tissue injury during TKA. ACL resection created flexion-extension mismatch by increasing the extension gap more than the flexion gap, whilst PCL resection increased the flexion gap more than the extension gap and created mediolateral laxity in knee flexion but not in knee extension.

In summary, RO TKA increased the accuracy of achieving the planned radiological objectives and improved perioperative outcomes compared to CO TKA. ACL and PCL resection created unique changes in knee biomechanics that must be appreciated for flexion-extension gap balancing during TKA. On the basis of this research, further clinical trials have been established to determine the long-term clinical significance of these findings.

Intraoperative photo showing the research fellow using optical motion capture technology to assess gap measurements during robotic-arm assisted total knee arthroplasty.

SINGLE CELL ANALYSIS OF THE FIBROTIC LANDSCAPE IN DUPUYTREN'S DISEASE

Thomas Layton

FELLOWSHIP/SPONSOR:
Honorary Research Fellowship

SUPERVISORS:
Professor J Nanchahal

SITE OF WORK:
Kennedy Institute,
University of Oxford

PRESENTATIONS:
1. Single cell Biology Conference (2019), Denver Colorado, USA

2. BSSH Annual Meeting (2018), London

PRIZES:
1. BSSH One Year Research Fellowship

2. Best Oral presentation – Royal Society of Medicine, Surgery Section (2018)

FURTHER FUNDING:
BSSH for One Year

Dupuytren's disease is a fibrotic or scarring condition, caused by the development of scar tissue in the palm. Over time, this scar tissue often contracts and can lead to severe deformities of the fingers. Dupuytren's disease remains a common condition, effecting up to 10% of the population in the UK, but despite this no treatment is available to halt disease progression. A major barrier to identification of novel targets and successful clinical translation is a poor understanding of microenvironment in this condition. Given this, the major goal of this project was to improve our understanding of the cells that make up Dupuytren's disease.

Image showing hand with Dupuytren's disease.

For this project, we obtained Dupuytren's disease tissue and applied an advanced gene profiling technology called single cell sequencing. This method allows us to isolate single cells from the diseased tissue, obtain a readout of the entire set of genes expressed in each cell and build a single cell atlas of the condition. Applying this technique to Dupuytren's disease we were able to describe two new cell types, never reported in this condition. Subsequently, we have validated our findings based on gene profiling with several experiments and demonstrated that these new cell types were functionally distinct.

Our single cell atlas of Dupuytren's disease provides important insights into the cells contained within this condition. We describe multiple therapeutic targets and report two new cell types. Moving forward, this project will be an important resource for future studies in Dupuytren's disease and may have relevance across several other scarring conditions.

Up to one in 10 people in the UK are affected by Dupuytren's Disease and currently the only effective treatment remains surgical excision.

SOMATOSTATIN RECEPTOR 2 IN SINONASAL CANCERS AND NASOPHARYNGEAL CANCER – PROGNOSIS, IMAGING AND THERAPY

Matt Lechner

FELLOWSHIP/SPONSOR:
The Colledge Family Research Grant

SUPERVISORS:
Prof. Valerie J. Lund

SITE OF WORK:
UCL Cancer Institute, Royal National Throat and Ear Hospital, University College London Hospital

PUBLICATIONS:
1. M. Lechner, J. Liu V.J. Lund. Novel Biomarkers in Sinonasal Cancers: From Bench to Bedside. Current Oncology Reports; 2020; vol.22

2. M. Lechner, V.J. Lund.; Somatostatin receptor 2 expression in nasopharyngeal cancer is induced by Epstein Barr virus infection: impact on prognosis, imaging and therapy; in revision

PRESENTATIONS:
1. Multi-center analysis of clinical outcomes and biomarkers of esthesioneuroblastoma. Presented at: North American Skull base Society Meeting 2020; February 2020; San Antonio

2. SSTR2 in sinonasal cancer – prognosis, imaging and therapy. Presented at: Rhinoworld meeting; June 2019; Chicago

PRIZES:
1. AHNS Best Prevention and Early Detection Paper Award (AHNS Meeting 2017, San Diego, US)

2. Joint Winner of the HHNCA/AHNS International Outreach Cancer Prevention Award, 2018

FURTHER FUNDING:
Rhinology and Laryngology Research Fund, UCL/UCL Biomedical Research Centre

Sinonasal cancers are a heterogenous group of rare cancers for which histopathological diagnosis can be very challenging. Typically, initial presentation includes unilateral nasal obstruction and serosanguinous nasal discharge/epistaxis. The symptoms can be misconstrued as more common benign nasal processes, leading to an increased time between symptom presentation and diagnosis. Complete surgical resection with negative margins is the treatment of choice for most cancers but this is not always possible and surgery can be challenging due to the complex sinonasal anatomy and tumour extension into neighbouring structures such as the orbit and/or brain.

Donation of equipment for the NPC Early Detection Programme in 2016.

Our research has mainly focused on olfactory neuroblastoma, a rare nasal neoplasm which usually originates from the olfactory neuroepithelium in the upper portion of the nasal cavity, and on nasopharyngeal cancer. Nasopharyngeal cancer is a malignant tumour, endemic in Southeast Asia. It occurs most frequently at the back of the nose (fossa of Rosenmuller), an area that is extremely difficult to access surgically due to the anatomical constraints in creating open access for surgical resection.

We report a high rate of expression of Somatostatin receptor 2 (SSTR2) in a large sample of sinonasal cancers and nasopharyngeal cancer. In nasopharyngeal cancer we show that SSTR2 expression is induced by Epstein-Barr virus (EBV). We show that a special imaging technique, 68Ga-DOTA-peptide scanning, may be used as a non-invasive marker to select patients for a novel targeted therapy, monitor its response and possibly surveillance of NPC, surgical and radionuclide therapy planning and as an application for intraoperative navigation systems via integration of functional imaging data.

As nasopharyngeal cancer is a cancer endemic in Southeast Asia, our collaborators include centres in Singapore, Hongkong, Shenzhen and Yogyakarta, Indonesia. In Indonesia we have also engaged in an early detection programme, surgical teaching and supplied equipment, thanks to Mrs. Storz from the company KARL STORZ.

Around 80% of olfactory neuroblastoma tumours and nasopharyngeal cancer express Somatostatin receptor 2 which can be used as a prognostic biomarker, for in vivo imaging and as a target for novel therapies.

DEVELOPING A DECISION AID FOR PATIENTS UNDERGOING SURGERY FOR CROHN'S ANAL FISTULA

Matthew Lee

FELLOWSHIP/SPONSOR:
Crohn's and Colitis UK/
RCS England Research Fellowship supported by the Vandervell Trust

SUPERVISORS:
Prof Steven Brown/Prof Alan Lobo/
Prof Lynda Wyld

SITE OF WORK:
University of Sheffield

PUBLICATIONS:

1. Lee MJ, Marshall JH, Jones GL, Lobo AJ, Brown SR. The informational and decision preferences of patients undergoing surgery for Crohn's anal fistula: A qualitative study. Colorectal Disease 2019 Dec 23. doi: 10.1111/codi.14936

2. Lee MJ, Freer C, Adegbola S, Parkes M, Hart AL, Fearnhead NS, Lobo AJ, Brown SR. Patients with perianal Crohn's fistulae experience delays in accessing anti-TNF therapy due to slow recognition, diagnosis and integration of specialist services: lessons learned from three referral centres. Colorectal Diseases 2018 20(9):707-803 doi: 10.1111/codi.14102

PRESENTATIONS:

1. Association of Coloproctology of Great Britain and Ireland, Bournemouth, July 2018

FURTHER FUNDING:
Received funding from CCUK to develop work into the parallel decision of surgery vs medicine in ulcerative colitis as a project grant (co-applicant)

Around one in three people with Crohn's disease will develop a problem called an anal fistula. This is where a connection forms between the inside of their back passage and the skin. This can be a chronic condition and difficult to treat. It has a significant impact on quality of life as it can cause ongoing symptoms and affect work and relationships. It is treated with a mix of drugs and operations. However, none of these is perfect, and people have to trade off different aspects of treatments to select the best one for them. Most of the research in this field has focussed on trials of medical therapy, or outcomes of surgical operations. There is limited information on how patients want to make decisions about their treatment for this condition.

In this study we interviewed people who had undergone surgery for a fistula in this setting. We explored what things mattered to them when making decisions. We then used this information, along with reviews of the literature, to undertake a survey of patients across several hospitals. This allowed us to test out the findings of our interviews on a wider scale.

Delivering course on research design to trainees at association of surgeons in training.

The study found that people wanted to be involved in making decisions about their treatment, but felt this wasn't always offered. They were able to trade off different treatments and outcomes based on their experience. The surveys showed that patients wanted to know about wound and aftercare, effect on perianal symptoms, and severity of surgery in order to make decisions.

Talking to CCUK members about the role of a surgeon in inflammatory bowel disease.

This work has provided us with the information we need to investigate this field further, and move towards developing a decision aid to help people think about different options to treat their fistula. This will allow people to play a greater role in decisions about their healthcare.

EXPLORING IDO IN HEAD AND NECK CANCER

Daniel Lin

FELLOWSHIP/SPONSOR:
Shears Foundation Northern Research Fellowship

SUPERVISORS:
Prof Andrew L Mellor, Prof Janet A Wilson, Mr James O'Hara, Dr Max Robinson, Dr Lei Huang

SITE OF WORK:
Institute of Cellular Medicine (ICM), Newcastle University

PUBLICATIONS:
1. Abstract LB-184: The immunotherapeutic role of indoleamine 2,3-dioxygenase (IDO) in head and neck squamous cell carcinoma: a systematic review. DJ Lin, JCK Ng, L Huang, M Robinson, J O'Hara, JA Wilson, AL Mellor [https://cancerres.aacrjournals.org/content/79/13_Supplement/LB-184]

2. The immunotherapeutic role of indoleamine 2,3-dioxygenase (IDO) in head and neck squamous cell carcinoma: a systematic review. DJ Lin, JCK Ng, L Huang, M Robinson, J O'Hara, JA Wilson, AL Mellor [Manuscript under review with Clinical Otolaryngology]

PRESENTATIONS:
1. National Poster Presentation: BAHNO 2019 Annual Scientific Meeting, Royal College of Physicians, London, UK. May '19. The immunotherapeutic role of indoleamine 2,3-dioxygenase (IDO) in head and neck squamous cell carcinoma: a systematic review. DJ Lin, JCK Ng, L Huang, M Robinson, J O'Hara, JA Wilson, AL Mellor

2. International Poster Presentation: AACR Annual Meeting 2019, Atlanta, USA. Mar-Apr '19. The immunotherapeutic role of indoleamine 2,3-dioxygenase (IDO) in head and neck squamous cell carcinoma: a systematic review. DJ Lin, JCK Ng, L Huang, M Robinson, J O'Hara, JA Wilson, AL Mellor

PRIZES:
1. Munro Black 2019 Regional ENT Meeting Best Oral Presentation Prize – November 2019. Preliminary results: Prospective study of IDO immune status in head and neck squamous cell carcinoma

2. Munro Black 2018 Regional ENT Meeting Best Oral Presentation Prize – December 2018. The immunotherapeutic role of IDO in head and neck squamous cell carcinoma

FURTHER FUNDING:
Oracle Cancer Trust

Head and neck cancer (HNC) incidence is increasing in both middle and later life. Symptoms include neck lump, hoarse voice, pain, and difficulty swallowing. Over 8,000 new cases occur annually in the UK and roughly 50% of patients die from disease. HNC survivorship is challenging for patients and carers, due to the profound functional and cosmetic consequences of treatment.

Mr Daniel Lin recruiting a patient to the study (Photo with patient permission).

Immune-based treatments, termed immunotherapy, have come to the forefront of cancer research and new treatment strategies. Despite this, nearly 80 percent of patients on immunotherapy do not respond to the treatment. Indoleamine 2,3-dioxygenase (IDO) is an enzyme in the immune signalling pathway and its activity can be measured in the blood. In this project we explored the potential for IDO to be used as a biomarker in HNC.

In this study I aimed to address the following questions:

1. What is the baseline activity of IDO measured in the blood of newly diagnosed patients with head and neck cancer?
2. How does IDO activity vary during radiation therapy for HNC?

A total of 87 patients were recruited and their IDO activity measured. During radiation therapy there was a group of patients found to have high IDO activity and another group with low IDO activity. This is consistent with the findings from a previous IDO study in lung cancer patients mapped throughout radiation therapy. The preliminary findings suggest that IDO may be a useful marker of immune status in HNC patients and supports the further investigation of IDO activity in a larger cohort of patients to determine whether IDO is a viable clinical biomarker for HNC.

Improved understanding of the immunotherapeutic role of IDO immune status will mean that IDO activity can potentially be used as a pre-treatment prognostic biomarker or a predictor of response to treatment for patients with HNC.

Preliminary results from 87 head and neck cancer patients show a significant change in IDO activity during radiation therapy and support its potential use as an immune marker to predict response to treatment.

ENHANCED REALITY TO IMPROVE SURGICAL SKILLS

Kartik Logishetty

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship with support from the Carol Rummey and Dorothy Hardman Legacies

SUPERVISORS:
Prof Justin Cobb

SITE OF WORK:
MSk Lab, Imperial College London

PUBLICATIONS:
1. LOGISHETTY, K., GOFTON, W. T., RUDRAN, B., BEAULE, P. E. & COBB, J. P. 2020a. Fully Immersive Virtual Reality for Total Hip Arthroplasty: Objective Measurement of Skills and Transfer of Visuospatial Performance After a Competency-Based Simulation Curriculum. J Bone Joint Surg Am

2. LOGISHETTY, K., GOFTON, W. T., RUDRAN, B., BEAULE, P. E., GUPTE, C. M. & COBB, J. P. 2020b. A Multicenter Randomized Controlled Trial Evaluating the Effectiveness of Cognitive Training for Anterior Approach Total Hip Arthroplasty. J Bone Joint Surg Am, 102, e7

PRESENTATIONS:
1. American Academy of Orthopaedic Surgeons, Las Vegas, USA, March 2019

2. The Association for Medical Education in Europe (AMEE) Conference, Vienna, Austria, 2019

PRIZES:
1. Young Investigator Award – International Society of Technology in Arthroplasty (ISTA), October 2019

2. Simulation in Surgery Prize – British Orthopaedic Association, September 2018

Virtual Reality (VR) is an imaging technology typically viewed through a head-mounted display. It fully immerses the wearer into a computer-generated environment and may be suitable for simulation-based education (SBE) in surgical training. While SBE is de rigueur in keyhole surgical training, open surgery has relied largely on learning from operation manuals, practicing on dry-bones or donor bodies, and coaching during real surgery. Total hip replacement (THR) is a hugely successful procedure relieving pain and restoring function in patients with hip arthritis. However, it is complex to perform, and training opportunities are limited. This project aimed to develop VR as a tool for training surgeons to perform THR.

Undergraduate students in MSk Lab's Virtual Reality Lab.

Cognitive task analysis – a process which systematically distils experts' knowledge of complex procedures – was used to create a blueprint for how to perform THR. From this, an immersive VR platform was developed to simulate performing THR in a virtual operating theatre. VR was deployed in a six-week training curriculum to surgical trainees and compared to the current methods for learning in a randomised controlled trial. These studies showed that VR-based SBE was feasible and led to improvements in technical and non-technical skills. VR-trained surgeons far outperformed non-VR surgeons when performing THA on a donor body.

Surgical trainee using Virtual Reality to perform Total Hip Replacement.

This project was performed in collaboration with Johnson & Johnson. The development and validation of VR for THR in this project led to a partnership with Facebook-Oculus, the creation of a VR catalogue of other open surgical procedures including for specialties other than orthopaedics, and the launch of VR training in educational centres worldwide. While VR-training is being integrated into how surgeons are educated, further research is now being conducted into how the surgical team can learn together, and what the impact of training is on patient outcomes.

Working-time restrictions, improved focus on patient safety, and the impact of COVID-19 has reduced surgical training opportunities by as much as 50% compared to 2005. Novel training methods are required which can safely, efficiently and effectively train the next generation of surgeons.

PREPARING FOR THE FUTURE OF HEARING THERAPEUTICS

Rishi Mandavia

FELLOWSHIP/SPONSOR:
The Colledge Family Memorial Trust Research Fellowship

SUPERVISORS:
Professor Anne Schilder,
Professor Carl May,
Professor Maroeska Rovers

SITE OF WORK:
NIHR UCLH Biomedical Research Centre Hearing Theme

PUBLICATIONS:
1. Mandavia R, Horstink Y, Grutters J, Landry E, May C, Rovers M, Schilder A, Scholte M. An Early Health Economic Model on Hearing Loss: the potential added value of Novel Hearing Therapeutics. Otology Neurotology 2020;41:1033-1041

2. Mandavia R, Hannink G, Ahmed MN, Premakumar Y, Chu TS, Blackshaw H, Ferdous T, Mehta N, Manjaly J, Khan M, Schilder A. Prognostic factors for outcomes of idiopathic sudden sensorineural hearing loss: protocol for the SeaSHeL national prospective cohort study. BMJ Open 2020; 28:10(9):e038552

PRESENTATIONS:
1. An Early Health Economic Model on Hearing Loss: the potential added value of Novel Hearing Therapeutics. Association for Research in Otolaryngology (ARO), US, January 2020

2. Preparing for the adoption of novel therapeutics in hearing loss – an early health economic model International Symposium on Inner Eat Therapeutics (ISIET), Germany, November 2019

FURTHER FUNDING:
North Thames Applied Research Collaboration (ARC) Innovation and Implementation Science Theme Fellowship, December 2019

NIHR University College London Hospital (UCLH) Biomedical Research Centre (BRC) Clinical Research Fellowship, December 2019

Hearing loss has a considerable personal, social and economic impact; the health and quality of life of people with hearing loss is poorer than that of the general population, and hearing loss has been directly linked to dementia.

Rishi presenting his work at an international conference.

Current treatments for hearing loss make sounds louder but not clearer and do not treat the underlying cause. Novel therapeutics for hearing loss are rapidly being developed recognising this unmet need, and if proven effective, will radically change hearing services in the next decade. It is essential to start planning for novel hearing therapeutics to maximise patient access and minimise waste. Early health economic modelling can be used as a tool to help prepare healthcare systems for novel therapeutics by providing an understanding of their likely cost-effectiveness, and by informing market access. My research aimed to construct the first ever early health economic model to assess the potential added value of novel hearing therapeutics, compared to the current standard of care.

Using data from the scientific literature and information from experts in the field, I developed a health economic model to assess the costs and impacts of using novel hearing therapeutics for patients with hearing loss. This was compared to the current standard of care. This economic model showed that novel hearing therapeutics can improve the care provided to patients with hearing loss and can be cost-effective for the NHS. My economic model can also be used by companies developing novel hearing therapeutics and by NHS decision makers to determine the maximum price point for novel hearing therapeutics so that they represent value for money.

This work will form an integral part of my PhD, where I am uniquely combining health economics and implementation science to develop a toolkit that will guide the successful implementation of novel hearing therapeutics within healthcare systems.

The added monetary value of a novel hearing therapeutic to a 50-year old with hearing loss is £39,000 compared to the existing standard of care.

ENVIRONMENTAL INFLUENCES ON GASTROINTESTINAL NEOPLASIA IN ADENOMATOUS POLYPOSIS

Isabel Martin

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship

SUPERVISORS:
Prof Susan Clark, Dr Andrew Latchford, Mr Alex von Roon

SITE OF WORK:
St Mark's Hospital, Barts Cancer Institute, Imperial College London and Curileum Discovery (Ltd)

PUBLICATIONS:
1. Duodenal Adenomas and Cancer in Familial Adenomatous Polyposis, I Martin, C Anele, R Patel, V Cuthill, B Saunders, A von Roon, S Clark, A Latchford, Familial Cancer 2019 18:S1-S88 (published abstract)

2. Patient derived intestinal mucosal organoids: a new technology to study pathogenesis in familial adenomatous polyposis, R Patel, I Martin, P Kalra, Y Wu, S Clark, A Latchford, J Moore, A von Roon, Familial Cancer 2019 18:S1-S88 (published abstract)

PRESENTATIONS:
1. A novel bowel disease model: phenotypic diversity of controls vs FAP organoids, I Martin, Y Wu, R Patel, P Kalra, S K Clark, A von Roon, A Latchord, JG Moore, Oral Presentation, SARS (Society of Academic and Research Surgery) Dublin, Ireland, March 2020

2. Duodenal Adenomas and Cancer in Familial Adenomatous Polyposis I Martin, C Anele, R Patel, V Cuthill, B Saunders, A von Roon, S Clark, A Latchford, Oral Presentation InSiGHT (International Society for Gastrointestinal Hereditary Tumours) Auckland, New Zealand, March 2019

FURTHER FUNDING:
Imperial Biomedical Research Centre

FAP is an inherited condition where patients develop multiple pre-cancerous polyps throughout their gut and develop bowel cancer at a young age. Patients face uncertainty, lifelong endoscopic screening and multiple surgical procedures throughout their lifetime.

Isabel Martin working in the Lab.

Duodenal cancer is concentrated in areas exposed to high concentrations of bile and bile acid concentrations differ in patients with and without FAP. Samples from over 150 patients recruited to the study are being processed by the various methods below:

Aims & progress:

1. To examine the composition of bile, blood and gut bacteria in patients with and without FAP

Metagenomics and metabonomics are being used to identify bacteria and possible biomarkers of duodenal cancer in tissue and blood. Samples are currently being processed in the laboratory.

2. Use genetic sequencing to identify duodenal cancer mutational signatures

Data from whole genome sequencing of polyps is being analysed by bioinformaticians at the Barts Cancer Institute.

3. Develop a personalised bowel disease model of FAP

We have developed 3D models (organoids) and used fluorescence immunohistochemistry to demonstrate the presence of small bowel markers.

We hope our work will further the understanding of generic cancer pathways and develop ways of predicting those at risk of duodenal cancer.

Isabel Martin presentation.

The rate of duodenal cancer is 300 times that of the general population in patients diagnosed with familial adenomatous polyposis (FAP).

A PRE-OPERATIVE TOOL ASSESSING THE POTENTIAL BENEFIT OF SURGERY IN RETROSTERNAL GOITRE PATIENTS

Charlotte McIntyre

FELLOWSHIP/SPONSOR:
The Dr Shapurji H Modi Memorial Research Fellowship

SUPERVISORS:
Prof Tolley and Prof Doorly

SITE OF WORK:
Ear nose and throat department, Imperial College NHS Healthcare Trust and Aeronautics department, Imperial College London

PUBLICATIONS:
1. Assessing Changes in Airflow and Energy Loss in a Progressive Tracheal Compression Before and After Surgical Correction, Annals of Biomedical Engineering, volume 48, pages 822–833, 2020

2. A critical review of thyroidectomy consent in the UK, Int J Surg, volume66, pages 84-88, 2019

PRESENTATIONS:
1. 'A prospective CFD study assessing patients with retrosternal goitres', International conference for the Society of CFD Of the Nose and Airway (SCONA), April 22, 2018

2. 'The use of CFD in the surgical planning of patients with retrosternal thyroid goitres', Imperial National Thyroid Conference, Feb 1, 2020

PRIZES:
1. British Journal of Surgery prize presentation award, Annual conference for the British Association of Endocrine and Thyroid Surgeons, awarded 2018

2. Entrepreneur of the year award, Imperial College London, from the WeInnovate programme, Enterprise lab, Imperial College London, awarded March 2018

More than 10,000 thyroid surgeries take place every year in the UK. A large number of these are for enlarged thyroid glands which can cause symptoms such as difficulty breathing. At present, we don't have a diagnostic tool to help us decide which patients will benefit from surgery. Surgery comes with significant risks and therefore this decision-making process is extremely important. We have researched a clinical tool to aid the surgical decision-making process and predict which patients will benefit from surgery and thereby reducing un-necessary surgery.

Determining which patients will benefit from surgery requires a way of measuring airflow through the trachea (windpipe). Measuring tracheal airflow is difficult and invasive. Computational fluid dynamics (CFD) is a technique aeronautical engineers use to model airflow. We have used it to model airflow in the trachea and measure airflow in patients with enlarged thyroid glands.

All patients undergoing surgery for retrosternal thyroid goitres had a CT scan and completed quality of life questionnaires. We used CFD to assess the severity of the compression on the patient's trachea. Following surgery, we looked to see which patients had improved symptoms. We have found that CFD can be a useful tool in assessing the severity of patient's airway compression prior to undergoing this major surgery.

Operating in theatre.

CFD has a wide application for use in surgical planning in the airway and further research is needed to assess if the technique can be used for other airway conditions. The aeronautics team at Imperial College London has a long history of collaboration with the Ear Nose and Throat surgical department at Imperial College Healthcare NHS Trust and will continue to investigate and evaluate the use of CFD in other areas of the speciality.

More than 10,000 thyroid surgeries take place every year in the UK. A large number of these are for enlarged thyroid glands which can cause symptoms such as difficulty breathing.

ASSESSING CERVICAL FORAMINAL STENOSIS USING IMAGING TECHNIQUES

James Meacock

FELLOWSHIP/SPONSOR:
Joint Rosetrees Trust/Fellows' Fellowship Fund Research Fellowship

SUPERVISORS:
Mr Simon Thomson, Dr Stuart Currie, Prof Deborah Stocken, Prof David Jayne

SITE OF WORK:
Leeds General Infirmary

PUBLICATIONS:
1. Title: Systematic review of radiological cervical foraminal grading systems – Journal: Neuroradiology

FURTHER FUNDING:
NIHR as Part of the FORVAD Randomised Control Trial

When a nerve is trapped in the neck it causes neck and arm pain. This is called brachialgia and it is common affecting around 110,000 people in the UK every year. It can occur at any age but most frequently between the ages of 40 and 60. Imaging, using magnetic resonance (MR) scans, is frequently required and is used to help decide whether surgery is indicated and which of two common operations is more likely to work.

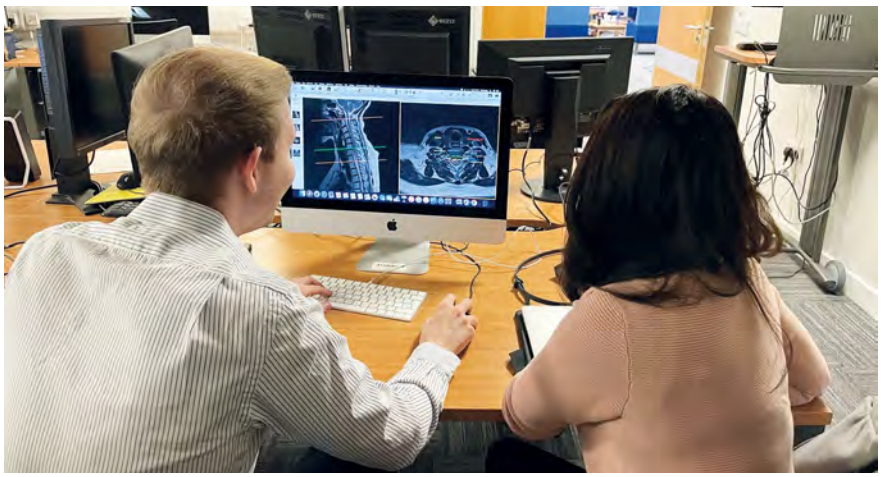
Standard MR images for this condition are presented in horizontal and vertical slices 2 mm apart. The trapped nerve is only 2-3 mm in diameter and runs through a canal that is not orientated exactly horizontally or vertically. Standard MR images may not always demonstrate the anatomy of the canal adequately. Our research is aimed at improving the quality of the images so they can be used to improve surgical decision making.

We have performed a systematic literature review that has been accepted for publication.

We have conducted a retrospective study of 50 surgical patients to determine how accurately radiologists, surgeons and trainee surgeons assess the severity of disease on MR scans. This study is nearing completion.

We have obtained ethical approval and will shortly begin recruiting healthy volunteers into a small study to obtain three dimensional MR scans of the neck bones that can then be digitally sliced at different angles to improve the demonstration of disease. We will assess how well our team of radiologists, surgeons and trainee surgeons are able to interpret these scans.

Finally, we have obtained ethical approval to recruit patients into a trial where they will have a further research MR scan pre-operatively and we will assess whether this scan can be used to predict their surgical outcome.



James and Dr Laulloor assessing cervical MRI scans.

Brachialgia commonly affects around 110,000 people in the UK every year. It can occur at any age but most frequently between the ages of 40 and 60.

MCKINSEY HEALTHCARE MANAGEMENT

William Muirhead

FELLOWSHIP/SPONSOR:
Joint RCS Egnland and McKinsey Healthcare Management Fellowship

SUPERVISORS:
Natasha Stern

SITE OF WORK:
McKinsey & Company, London

The RCS England/McKinsey fellowship gives surgeons an overview of how different elements of care fit together.

The RCS England/McKinsey fellowship provides surgeons in training with a unique opportunity to gain exposure to how healthcare management and strategy agendas are designed and led at the highest levels of the health service.

McKinsey is an international management consultancy firm that delivers its client work using small teams, typically working on an engagement for between three-four months weeks. During my time I worked on projects as varied as the quality and financial improvement of a hospital trust, reconfiguration of services commissioned by a CCG and the regional implementation of an electronic care record.

The move from clinical work straight into the deep end of consulting is an undeniable culture-shock and late nights hunched over laptops finishing slide decks and excel models soon become the rule rather than the exception. However, for surgical trainees who have an interest in improving the healthcare systems they work in, there are some great reasons to undertake the fellowship.

Firstly, fellows gain exposure into how healthcare management decisions are made, the factors that influence those decisions and the different models of care in use around the world.

Secondly, McKinsey provides a great opportunity to develop non-technical skills which are often forgotten within surgical training. If you are interested in the logical structuring of problems, what makes teams work or the steps needed to change people's behaviour there is no better place to learn.

Finally, McKinsey gives fellows first-hand experience of how high-functioning organizations operate. After years working in our resource-starved NHS, it is perhaps inevitable that we start to accept the status-quo. Stepping into an organization with a completely different set of values – one that is fiercely competitive and unwavering in its belief in the possibility of improvement – gives a different perspective into how we can do better at delivering healthcare that works for our patients.

Digital implementation in healthcare is a potentially a powerful way to improve patient outcomes and experience as well as improving productivity.

A unique opportunity to gain exposure to how healthcare management and strategy agendas are designed and led at the highest levels of the health service.

COCHLEAR SYNAPTOPATHY AND HIDDEN HEARING LOSS IN THE ACUTE AND CHRONICALLY NOISE EXPOSED

Jameel Muzaffar

FELLOWSHIP/SPONSOR:
Fellows' Fellowship Fund
Research Fellowship

SUPERVISORS:
Prof Manohar Bance, Prof Brian Moore, Mr Chris Coulson, Lt Col Linda Orr

SITE OF WORK:
University of Cambridge/Queen Elizabeth Hospital Birmingham/Royal Centre for Defence Medicine

PUBLICATIONS:
1. Muzaffar J & Orr L. Management of Acute Acoustic Trauma in Mass Casualty Environments. J R Army Med Corps. June 2019. doi: 10.1136/jramc-2019-001187 PMID: 31239365

2. Muzaffar J, Lee JDE, Coulson C & Orr LE. "Acoustic Trauma & Blast Related Hearing Loss" in Downrange: Fundamentals of Frontline Surgery. CRC Press. 2020

PRESENTATIONS:
1. Feb 2020 Muzaffar J & Orr L. Glucocorticoid therapy for acute acoustic trauma: Current and emerging evidence from the UK Military Hearing Research Programme. National Hearing Conservation Association Annual Meeting (Florida, USA) – Oral Presentation

2. Feb 2020 Muzaffar J, Gosling A & Orr L. UK Military Perspective on Boothless Audiometry. National Hearing Conservation Association Annual Meeting (Florida, USA) – Oral Presentation

PRIZES:
1. 2020 National Hearing Conservation Association – Student Conference Award

2. 2019 Best Poster Presentation, Jesus College Cambridge Graduate Conference

FURTHER FUNDING:
Royal Centre for Defence Medicine (UK MoD)

The use of systems that produce high levels of noise and blast is potentially hazardous to hearing. The effects of this include reduced job performance, reduced employability after service and significant wellbeing reduction for those affected and their families. Animal studies have shown that damage from noise exposure may happen in parts of the hearing system that are not well detected on normal hearing tests, termed “Hidden Hearing Loss”. This study explores the use of a wide and detailed battery of hearing tests, including several new tests, designed to look for the earliest signs of hearing damage and, if it is found, to identify which part(s) of the hearing system have been damaged.

This is particularly important as there are several promising new therapies in development to regenerate parts of the hearing system that have been damaged, whether due to noise, aging or toxic drug therapies, such as chemotherapy. Understanding which parts of the hearing pathway are not working well in any individual patient is the key to putting the right people into trials of new medicines and ultimately to match the right patient to the right medicine(s), when these become routinely available. This holds the promise of enormous benefit to serving and veteran members of the Armed Forces as well as the wider public. This project has allowed us to characterise the effects of high levels of noise/blast on people not previously exposed and for groups chronically exposed to noise, as well as developing “normal” and "noise/blast exposed" population data for the novel tests and validating new pieces of equipment, such as boothless headsets for testing outside traditional hearing testing environments.

Jameel demonstrating experimental setup.

This work has been an important stepping stone to better understand the potential effects of noise/blast exposures and how hearing damage can be mapped to areas of the hearing system.

Almost all members of the Armed Forces are exposed to potentially hazardous levels of noise at some point during their service. Veterans under the age of 75 are more than three times as likely to complain of hearing difficulties as the rest of the population.

USING MRI TO IMPROVE DIAGNOSIS OF PROSTATE CANCER: MODELLING PROSTATE BIOPSY STRATEGY IN THE ERA OF MRI-GUIDANCE

Joseph Norris

FELLOWSHIP/SPONSOR:
Freemasons' United Grand Lodge of England Research Fellowship

SUPERVISORS:
Professor Mark Emberton,
Mr Clement Orczyk

SITE OF WORK:
University College London

PUBLICATIONS:
1. Norris JM, Kinnaird A, Margolis DJ, Padhani AR, Walz J, Kasivisvanathan V. Developments in MRI-targeted prostate biopsy. Current Opinion in Urology. 2020 Jan;30(1):1-8. PMID: 31644434

2. Norris JM, Simpson BS, Parry MA, Kasivisvanathan V, Allen C, Ball R, Freeman A, Kelly D, Kirkham A, Whitaker HC, Emberton M. Genetic correlates of prostate cancer visibility (and invisibility) on mpMRI: It's time to take stock. British Journal of Urology International. 2020 Mar;125(3):340-2. PMID: 31600865

PRESENTATIONS:
1. Norris JM, Allen C, Kirkham A, Heffernan Ho D, Briggs TP, Sooriakumaran P, Moore CM, Emberton M, Orczyk C. Be prepared: A multidisciplinary, mpMRI-guided wsurgical planning meeting for localised prostate cancer. 54th International Congress of European Society for Surgical Research 2019 (Geneva, Switzerland)

2. Norris JM. Histopathological basis: Correlation of mpMRI with histology to define the margin. Imperial Prostate: Prostate Imaging & Focal Therapy Masterclass 2019 (London, UK)

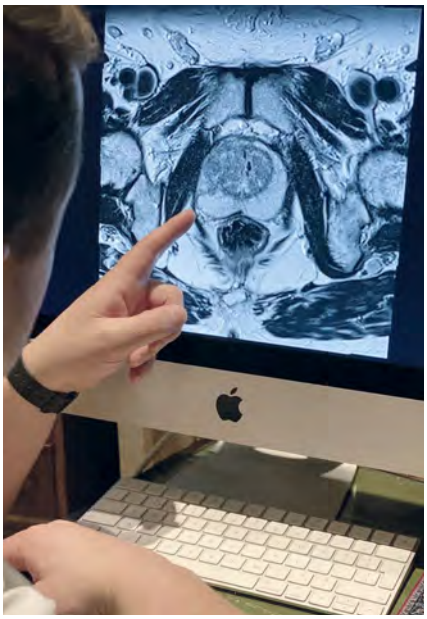
PRIZES:
1. MRC Clinical Research Training Fellowship Award (January 2019)

FURTHER FUNDING:
The Medical Research Council (MRC)

Prostate cancer is the commonest cancer in men, and can greatly affect the quality and length of a man's life; indeed, it now results in more deaths of men in the UK, than women who die from breast cancer. The aim of my research is to improve how we diagnose prostate cancer with MRI scans, so that the disease can be detected in a more accurate and timely manner. This would enable the most effective and appropriate treatment to be given to each patient. My particular interest is to explore the "invisible" prostate cancers that we cannot see on MRI – at present, we do not know much about these tumours and I hope my work will change this.

The first element of my research is focussed on improving the way in which we take samples (biopsies) of prostate cancers. By precisely comparing tumour appearances on MRI scans to how they look under the microscope, I hope to develop instructions for surgeons on how best to obtain samples from tumours, so that we don't miss invisible cancers (particularly those that hide around tumour edges). This important work is currently being continued by another urology research fellow at UCL.

The second element of my research is to examine the true nature of prostate cancers that are invisible on MRI scans. So far, I have discovered that invisible cancers tend to be both smaller and less aggressive than visible cancers. Interestingly, I have also found that invisible cancers seem to have 'reassuring genetics;' which may mean that men with invisible disease could have better outcomes (e.g. life-expectancy) than men with visible cancer. I am currently continuing this research on a three-year research fellowship from the Medical Research Council (MRC), and one day I hope to develop techniques to detect these challenging, hidden cancers.



Joseph demonstrating prostate cancer on an MRI scan.

Multiparametric MRI scans detect over 80-90% of the most important prostate cancers, even before a biopsy is performed. However, 10-20% of important prostate cancers can be "invisible" on MRI.

ABDOMINAL WALL RECONSTRUCTION: IMPROVING RESEARCH QUALITY AND IDENTIFYING THE PREDICTORS OF VENTRAL HERNIA RECURRENCE

Samuel Parker

FELLOWSHIP/SPONSOR:
Honorary Research Fellowship

SUPERVISORS:
Professor Steve Halligan

SITE OF WORK:
Charles Bell House, UCL

PUBLICATIONS:
1. Parker S.G, Halligan S, Liang M.K, et al. International classification of abdominal wall planes (ICAP) to describe mesh insertion for ventral hernia repair. British Journal of Surgery 2020;107(3):209-17

2. Parker S.G, Halligan S, Liang M.K. Definitions for Loss of Domain: An International Delphi Consensus of Expert Surgeons. World Journal of Surgery 2019;44(4):1070-78

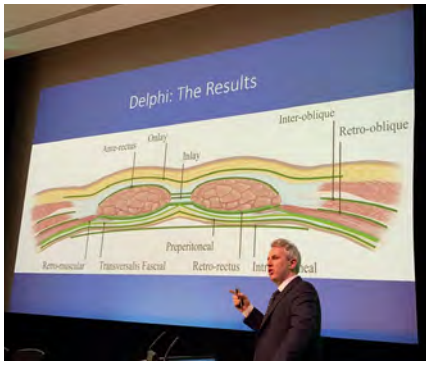
PRESENTATIONS:
1. Parker S.G. An International Classification for Loss of Domain. Virtual American Hernia Society Conference September 26th 2020

2. Parker S.G. An International Classification of Abdominal Wall Planes. Virtual European Hernia Society May 28th 2020

3. Parker S.G. An International Classification of Abdominal Wall Planes. European Hernia Society September 12th 2019, Hamburg, Germany

FURTHER FUNDING:
NIHR research for patient benefit programme (ref PB-PG-0816-20005), Allergan PLC, British Hernia Society

Abdominal wall reconstruction (AWR) is an emerging subspecialty within general surgery. To date, research has focused mostly on surgical reconstruction techniques without sufficient regard to research quality. Consequently, much published work has produced spurious data with inconsistent nomenclature, unstandardized variable definitions and detection methods, varying patient reported outcomes, and erratic study/trial follow-up times. Published data is therefore challenging to interpret by both narrative review and meta-analysis, giving little robust evidence to guide AWR surgeons.



Presenting ICAP (International Classification of Abdominal Wall Planes) at AWR Europe 2020.

Pre-operative cross-sectional scan of a large ventral hernia.

Post-operative cross-sectional image after repair.

To rectify this, my initial work focused on the terms used to describe the planes of the abdominal wall, and I published an editorial review illustrating current inconsistencies in the literature. I then performed a Delphi study with 20 international hernia experts to create "ICAP", an International Classification of Abdominal wall Planes. Next, I targeted "loss of domain" (LOD) and published a systematic review and a clinician survey which revealed current inconsistent definitions, both in the literature and amongst practicing surgeons. Again, using Delphi methodology, I performed a consensus study, establishing new standardised written and volumetric definitions for LOD. I then focused on AWR interventional trials, performing two systematic reviews demonstrating the current heterogeneous reporting of perioperative variables and post-operative outcomes. Using the Nominal Group Technique, I performed a third consensus study to establish minimum datasets for primary ventral hernia and incisional ventral hernia interventional trials, aiming to standardise perioperative variable reporting, outcomes reporting, follow-up duration as well as improving trial methodology.

The final part of my research used systematic review and meta-analysis across 20 years of AWR literature to identify those peri-operative factors that significantly predispose to hernia recurrence after apparently curative repair. This systematic review forms the evidence-base from which to create a prognostic model of ventral hernia recurrence. This prognostic model is currently under development at UCL.

Over the past decade there has been a 13% increase in the number of ventral hernia repairs being performed in the UK. Recurrence rates after repair vary from five to 40% at two years follow-up, leading to a requirement of further reconstructive surgery. Rigorous high-quality research is required to reduce hernia recurrence rates.

THE CLIFF AND CONOR STUDIES: CHANGE IN LIVER FUNCTION AND FAT IN PRE-OPERATIVE CHEMOTHERAPY FOR COLORECTAL LIVER METASTASES / COLORECTAL LIVER METASTASES: NOVEL ASSESSMENT TOOLS FOR RESECTABILITY

Kat Parmar

FELLOWSHIP/SPONSOR:
Linder Foundation Research Fellowship

SUPERVISORS:
Prof Andrew Renehan, Prof Derek O'Reilly, Prof Juan Valle, Dr Mike Braun, Prof Steve Williams, Dr Jo Nais

SITE OF WORK:
Manchester Cancer Research Centre

PUBLICATIONS:
1. Parmar KL, O'Reilly D, Valle JW, et al. Prospective study of change in liver function and fat in patients with colorectal liver metastases undergoing preoperative chemotherapy: protocol for the CLiFF Study. BMJ Open 2020;10:e027630. doi: 10.1136/bmjopen-2018-027630

PRESENTATIONS:
1. International oral presentation: Colorectal Liver Metastases - Novel Assessment Tools for Technical Resectability (the CoNoR study). Presenter: KL Parmar. Conference: Alpine Liver and Pancreatic Surgery (ALPS) Meeting. Date: 6 February 2020. Venue: Carlo Magno Hotel, Madonna di Campiglio. Country of Conference: Italy

2. International oral presentation: The CLiFF and CoNoR Studies. Presenter: KL Parmar. Conference: Society of Academic and Research Surgery Meeting 2020.* Date: 19 March 2020.* Venue: Royal College of Surgeons in Ireland, Dublin.* Country Of Conference: Ireland*

*(Due to the COVID-19 pandemic, this conference was rescheduled to be held as a virtual meeting later in the year. The rescheduled oral presentation was subsequently delivered at the virtual meeting on 8th October 2020)

PRIZES:
1. Alpine Liver and Pancreatic Surgery Meeting Travel Bursary Prize, February 2020. Prize for best submission from a surgical trainee Awarded for oral presentation: The CoNoR Study

2. Society of Academic and Research Surgery, October 2020. Research Fellows Symposium Prize for Best RCS England Report Research Fellow Presentation Awarded for oral presentation: The CLiFF and CoNoR Studies

FURTHER FUNDING:
1. Humedics GmBH

2. Momentum Award from North West Innovation Service

3. Charitable funding from the Christie NHS Foundation Trust

4. Charitable funding from Manchester University Foundation Trust

5. Perspectum Diagnostics

Over 42,000 people are diagnosed with bowel cancer every year in the UK, with around 268,000 people living in the UK today having been diagnosed in the past. It is most common in people over the age of 50, but can affect people of any age.

People diagnosed with bowel cancer deposits in their liver can have a challenging time travelling between multiple different specialists, waiting to find out if they have a chance of being offered curative treatment. The liver surgeons, oncologists and bowel surgeons are often situated in different hospitals, making this a logistically as well as personally challenging time. Waiting to find out if they are eligible for liver surgery is especially difficult as without surgery, they have no chance of cure and are unlikely to survive for longer than a year. Some people find that they eligible for surgery at the outset; others are not eligible at first, but later become eligible after chemotherapy and reassessment. For those who have the bowel cancer deposits removed from their liver successfully, they have a good chance of going on to lead a normal healthy life afterwards.

There has been a significant amount of research looking at the effect of chemotherapy on the liver, where it is thought that chemotherapy might lead to increased liver fat and decreased liver function. Previous research has been limited by difficulties in measuring changes in liver fat and function repeatedly over time, as traditional liver tests do not detect minor changes in liver function, and it is difficult to accurately measure liver fat repeatedly. Concerns regarding these potential chemotherapy-related changes to the liver are one of multiple different factors that influence the decision as to whether an individual patient will be offered liver surgery.

A number of recent studies have analysed the decisions made by liver surgeons when deciding if bowel cancer deposits can be removed by surgery in individual cases, and found that there are significant differences in the decisions made by different surgeons. Recent recommendations suggest that any new tests that might help to standardise decision-making should be investigated, to ensure that all patients who can potentially be cured are offered surgery.

This project has the potential to improve decision-making regarding whether surgery can be offered to cure bowel cancer deposits in the liver. This could help more patients to be offered curative surgery, and help personalise the decision-making about the best timing of surgery and the most suitable surgical option.

RESTORATIVE PROCTOCOLECTOMY IN FAMILIAL ADENOMATOUS POLYPOSIS – CAN WE PREDICT OUTCOME?

Roshani Patel

FELLOWSHIP/SPONSOR:
Joint RCS England/Bowel Cancer UK Research Fellowship

SUPERVISORS:
Dr Andrew Latchford, Mr Alexander von Roon and Professor Sue Clark

SITE OF WORK:
St Mark's Hospital and Imperial College London

PRESENTATIONS:
1. Oral Presentation: Patient derived intestinal mucosal organoids: a new technology to study pathogenesis in familial adenomatous polyposis. The International Society for Gastrointestinal Hereditary Tumours 2019, Auckland, New Zealand R Patel, I Martin, P Kalra, Y Wu, SK Clark, A Latchford, J Moore, A von Roon

2. Oral presentation: Indications and outcomes for pouch excision in patients with familial adenomatous polyposis. The International Society for Gastrointestinal Hereditary Tumours 2019, Auckland, New Zealand. R Patel, C Anele, A von Roon, SK Clark, A Latchford

Familial Adenomatous Polyposis is an inherited condition causing precancerous growths (polyps) to develop on the lining of colon with 100% risk of cancer. One operation to prevent this removes the large bowel and replaces it with an internal pouch made of small bowel. After a pouch is made, most develop polyps (and sometimes cancer). This requires annual monitoring of the pouch with removal of polyps and sometimes major surgery to remove the pouch.

Cutting edge genomic technology was evaluated for potential future use for surgical decision making.

Polyps might appear in the pouch after surgery due to changes in the bowel content. It is not understood why some polyps progress to cancer. By understanding pouch-polyp development, strategies to prevent/treat it, and distinguish patients at high-risk of cancer can be made.

I analysed the long-term outcomes using data from the St Mark's Polyposis Registry database and found that of 249 patients, 29% developed a high-risk polyp. Five patients developed pouch cancer. High-risk polyps usually occurred after ten years from surgery. A scoring system to predict risk after ten years was developed; patients most at risk were those with a previous history of a polyp, and those with worse duodenal disease.

I used genomic technology to find mutational 'fingerprints' in the DNA of the polyps and to identify potential environmental causes of polyp development. Pattern-recognition algorithms on pouch tissue discovered that in some patients the mutational patterns in polyps changed from the upper to lower part of the pouch.

I successfully grew FAP 'pouchoids' (3D mini-guts) from the patient' stem cells.

This research in the short-term, has for the first time provided data to allow safe stratification for pouch surveillance regimes according to a patients' personal risk.

In the long-term, genomic and organoid technology could be combined for surgical decision making and guiding surveillance by combining mutational patterns into clinical predictive models.

Dissemination of results from this project to an international and interdisciplinary audience at the InSiGHT conference, 2019, New Zealand.

We will be able to change current recommendations for surveillance. Patients could have biennial surveillance for the first ten years, and thereafter pouch surveillance can be tailored to the individual.

A LIQUID BIOPSY IN HEAD AND NECK CANCER

Karl Payne

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship

SUPERVISORS:
Professor Hisham Mehanna,
Dr Paul Nankivell,
Dr Graham Taylor,
Professor Chris Yau

SITE OF WORK:
Institute of Head and Neck Studies and Education,
University of Birmingham

PUBLICATIONS:
1. Payne K, Pugh M, Brooks J, et al. Circulating Tumour Cell Expression of Immune Markers as Prognostic and Therapeutic Biomarkers in Head and Neck Squamous Cell Carcinoma: A Systematic Review and Meta-Analysis. Int J Mol Sci 2020; 21(21):8229

2. Payne K, Brooks J, Spruce R, et al. Circulating Tumour Cell Biomarkers in Head and Neck Cancer: Current Progress and Future Prospects. Cancers 2019; 11(8):1115

PRESENTATIONS:
1. Payne K, et al. High-throughput methylation profiling of cell-free plasma DNA in head and neck cancer. British Association of Oral and Maxillofacial Surgeons Annual Scientific Meeting; Birmingham, 2019

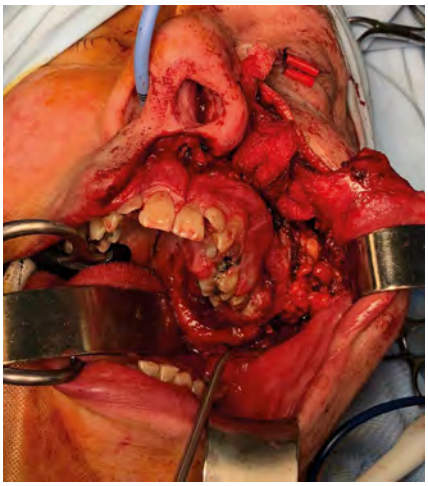
2. Payne K, Brooks J, Spruce R, et al. Microfluidic based circulating tumour cell isolation using the Parsortix platform in head and neck squamous cell carcinoma. British Association of Oral and Maxillofacial Surgeons Annual Scientific Meeting, 2020

FURTHER FUNDING:
Cancer Research UK

Head and neck cancer affects 600,000 patients a year worldwide. It is particularly devastating with poor survival and significant impact upon swallowing, speech and quality-of-life. Our research looks for cancer cells and pieces of cancer DNA in the blood that have been released by the tumour – the concept of a 'liquid biopsy'. This non-invasive blood test is less traumatic for patients than a normal 'tissue biopsy' and provides a way of assessing cancer DNA genetic changes, detect cancer recurrence and guide treatment. The focus of our research is to characterise the expression of proteins on cancer cells in the blood – termed 'circulating tumour cells' (CTCs).

Previous research has been able to successfully identify and count these cells and only recently start to identify different proteins of interest expressed by these CTCs. We are working with Parsortix CTC enrichment technology from ANGLE which enables us to successfully capture different CTC sub-groups. We have identified a 'pro-metastasis' CTC sub-group that has undergone a complex switch in its cell behaviour and is present in large numbers in patients with advanced large cancers and lymph node metastases. We are now performing advanced single-cell sequencing of the protein forming RNA code of these cells to give us a depth of information previously unseen in head and neck cancer.

The Parsortix CTC enrichment machine.



A patient with a large oral cavity tumour of the upper jaw. Surgical treatment of this disease has a significant impact upon quality of life. Improved treatment decision making using a liquid biopsy may benefit such patients (image courtesy of Mr Sat Parmer, published with patient consent).

Our hope is that by identifying protein markers on CTCs of patients with advanced or recurrent/metastatic cancer we can better guide treatment, such as newer immunotherapy drugs. Currently these drugs are effective in around 20% of patients, however we have no accurate method of assessing which patients will benefit most from such treatment. A liquid biopsy blood test could have a profound impact upon outcomes and quality of life for head and neck cancer patients.

Head and neck cancer incidence has increased by 20% over the past decade, but mortality has remained static at 50%.

HUMAN RELIABILITY ANALYSIS OF TRANSANAL TOTAL MESORECTAL EXCISION (TaTME)

Marta Penna

FELLOWSHIP/SPONSOR:
Joint RCS England/Bowel Cancer UK Research Fellowship

SUPERVISORS:
Professor George Hanna

SITE OF WORK:
Imperial College London

PUBLICATIONS:

1. Incidence and Risk Factors for Anastomotic Failure in 1594 Patients Treated by Transanal Total Mesorectal Excision: Results From the International TaTME Registry Penna M, Hompes R, Arnold S, Wynn G, Austin R, Warusavitarne J, Moran B, Hanna GB, Mortensen NJ, Tekkis PP; International TaTME Registry Collaborative. Ann Surg. 2019 Apr;269(4):700-711

2. Penna M, Hompes R, Arnold S et al. Transanal Total Mesorectal Excision: International Registry Results of the First 720 Cases. Ann Surg 2017; 266:111–117

PRESENTATIONS:

1. European Association of Endoscopic Surgery Congress, Seville, Spain, June 2019

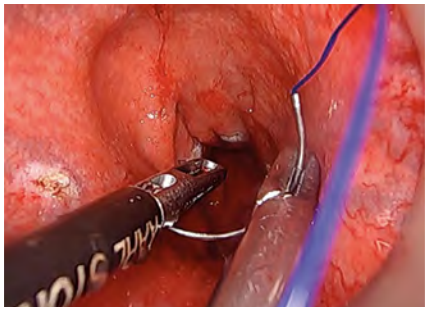
2. Belgian Group for Endoscopic Surgery Congress, Antwerp, February 2018

Sharing technical 'pearls' on TaTME during the national training programme workshop.

Surgery remains the gold standard approach with the greatest chance of cure for resectable rectal cancer. The latest surgical technique pioneered to tackle challenges posed by this type of cancer is called Transanal Total Mesorectal excision (TaTME). Whereas rectal cancers were traditionally removed only through the abdomen, TaTME offers the added benefit of operating on the tumour through the anus (back passage). This provides better views of this complex area, allowing a more accurate dissection and removal of the cancer while protecting important surrounding structures, especially nerves that control bowel, urinary and sexual function.

TaTME quickly gained great interest amongst surgeons worldwide. However, as with any new technique, it must be performed safely, ensuring that the potential benefits hypothesized hold true. Surgical outcomes collected on the international TaTME registry were analysed showing very promising results with >95% of rectal cancers being completely removed and complication rates after TaTME surgery similar to those seen from traditional abdominal operations.

The research project delved deeper into understanding the actual surgical technique by utilising a detailed, systematic method of video analysis called Observational Clinical Human Reliability Analysis (OCHRA).



Transanal surgery – inside view.

OCHRA was performed on 100 TaTME videos providing an enlightened view of the technique highlighting manoeuvres that work well and understanding why and how errors occur. Results were shared with 18 international expert TaTME surgeons and a technical manual with error-reducing mechanisms and technical recommendations was created. These technical 'pearls' are used to enhance the training of surgeons learning the technique and have been incorporated into the national TaTME training programme.

The best possible care and chance of cure for patients with rectal cancer is early diagnosis and accurate surgery by a well-trained surgeon. Structured training with knowledge of outcomes and deeper understanding of the technique will facilitate surgeons to provide that best possible care.

Over 95% of rectal cancers can be completely removed using the new surgical technique TaTME.

ROLE OF HUMAN EMBRYONIC STEM CELL-DERIVED (HESC) EPICARDIUM IN CARDIAC REGENERATION

Lay Ping Ong

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship

SUPERVISORS:
Dr Sanjay Sinha

SITE OF WORK:
Cambridge University/University of Washington, Seattle, USA

PUBLICATIONS:
1. Liu YW, Chen B, Yang X et al. Human embryonic stem cell-derived cardiomyocytes restore function in infarcted hearts of non-human primates. Nature Biotechnology. 2018; 36(7):597-605

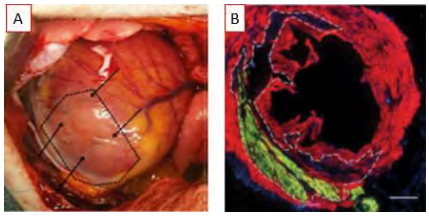
2. Iyer D, Gambardella L, Bernard WG et al. Robust derivation of epicardium and its differentiated smooth muscle cell progeny from human pluripotent stem cells. Development. 2015; 142(8):1528-41

PRESENTATIONS:
1. Frontiers of Cardiovascular Biology, Vienna, Austria (20-22nd April, 2018)

2. European Society of Cardiology (ESC) Congress, Barcelona, Spain (26-30th August, 2017)

FURTHER FUNDING:
Wellcome Trust for 3 years

Myocardial infarction (MI) results in the irreversible loss of cardiac cells with the corresponding loss of function, leading to reverse remodelling and heart failure. Primary remuscularization with human embryonic stem cell-derived (hESC)-cardiac cells showed the return of functional benefit post-infarction. However, significant challenges such as ~90% cell death and lack of vascularization remain. Epicardium, a thin lining covering the heart, has crucial cross-talk with the cardiac cells during development and disease. Our preliminary results showed that co-injecting cardiac cells with hESC-epicardium lead to improved graft size, proliferation, vascularization and functional benefit in rats post-MI. Similar benefits were observed in our 3D-engineered heart tissues (EHT), composed of hESC-epicardium and cardiac cells.



Human embryonic stem-cell derived (hESC) Cardiac cells regenerate non-human primate hearts after MI. 1. Arrows point to site of injection and infarct. 2. The resulting hESC-cardiac graft is represented by the green (GFP-labelled). (Courtesy of our collaborator, Professor Charles E Murry, University of Washington, Seattle, USA).

In order to pave the way to clinical therapy, we optimized the 3D-EHT platform and various measurement endpoints (Force generation, calcium handling) by studying the effect of singular lineage on cellular co-cultures. Based on our pilot animal studies, we also observed that acute MI is not the optimal animal model for cellular therapy and propose that chronic MI animal model is clinically more relevant.

Artistic interpretation of Ms.LP Ong at tissue culture, a process of growing the human embryonic stem-cell derived (hESC)-cardiac and epicardial cells for experiments investigating heart regeneration.

This would be novel and carry a huge translational potential to fulfil a clinical need. Despite the benefits observed with hESC-epicardium, the exact mechanism underlying the epicardial-myocardial cross-talk remains elusive. From further studies utilising ribonucleic acid (RNA)-data, fibronectin (Fn1) has revealed itself as a potential key mediator.

The next steps involve the mechanistic study of Fn1 with our 3D-EHT platform, alongside exploring the effects of co-injection therapy in a chronic MI rat model. Both efforts in concert may edge us closer towards clinical translation.

Heart Failure carries a 50% 5-year mortality and stem cell therapy for cardiac regeneration carries great potential to halt or reverse heart failure.

REDUCING THE CARBON FOOTPRINT OF SURGERY

Chantelle Rizan

FELLOWSHIP/SPONSOR:
The Dr Shapurji H Modi Memorial Research Fellowship

SUPERVISORS:
Professor Mahmood Bhutta, Professor Malcolm Reed, Professor Rob Lillywhite

SITE OF WORK:
Brighton and Sussex University Hospitals NHS Trust, Brighton and Sussex Medical School

PUBLICATIONS:

1. Rizan C, Steinbach I, Nicholson R, Lillywhite R, Reed M, Bhutta MF. The carbon footprint of operating theatres: a systematic review. Annals of Surgery. 2020. Available online ahead of print. PMID: 32516230

2. Rizan C, Mortimer F, Stancliffe R, Bhutta MF. Plastics in healthcare: time for a re-evaluation. Journal of the Royal Society of Medicine. 113(2):49-53

PRESENTATIONS:

1. The carbon footprint of processing reusable surgical instruments. Life Cycle Innovation Conference 2020; Aug 2020; Berlin (virtual), Germany

2. Rizan C. Sustainability in surgery. Royal College of Surgeons of England Future Surgery; Oct 2020; Virtual, UK. (Invited lecture)

FURTHER FUNDING:
Health Education England (Kent Surrey and Sussex)

Examples of bulky single-use equipment frequently used in our most common operations.

Whilst climate change poses a major threat to human health, providing healthcare itself is responsible for 4% of greenhouse gases in England, directly contributing to global warming and climate change. Surgery is a resource intensive area, and the aim of this research was to identify ways to reduce the carbon footprint of surgery, to build an evidence-based approach for meeting the Greener NHS target of reaching net zero by 2045 whilst maintaining surgical care.

Here we examined the items used to perform the five most common operations; knee replacement, gallbladder removal, inguinal hernia repair, carpal tunnel release, and tonsillectomy. The biggest carbon contributors were single-use items alongside their packaging, whilst reusables had relatively small impacts (despite accounting for sterilisation, and laundering).

We identified opportunities to reduce consumables, through removing infrequently used items from single-use, pre-prepared sets. However, we found that, counterintuitively, streamlining reusable sets increased the carbon footprint and cost, as a fixed amount of resources were used per set during sterilisation.

Major carbon hotspots included large, single-use plastic items such as surgical gowns, patient and trolley drapes, and suction tubing. We identified simple switches that can be made, for example opting for reusable aluminium containers instead of single-use polypropylene tray wrap for housing instrument sets reduced the carbon footprint by two-thirds. We examined surgical scissors in more detail, finding the carbon footprint of reusable scissors could be reduced by a further 20% through repairing these instead of purchasing new ones. We found that the carbon footprint of recycling surgical waste was just 2% that of high temperature incineration.

During her fellowship, Chantelle was a co-founder of the RCS England Sustainability in Surgery working group. Chantelle frequently delivers invited lectures to national and international audiences on improving healthcare sustainability, and she guest edited the July 2020 planetary health edition of RCS England's Bulletin.

A single operation generates six-814 kg CO2e, with the largest value being equivalent to driving up to 2273 miles in an average petrol car.

CLINICAL SIGNIFICANCE OF SPINK1 p.N34S GENETIC VARIANT IN IDIOPATHIC PANCREATITIS

Ioannis Sarantitis

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship supported by the Harold Bridges Bequest and the Rosetrees Trust

SUPERVISORS:
Professor Chris Halloran

SITE OF WORK:
Dept of Molecular and Clinical Cancer Medicine, Institute of Translational Medicine, University of Liverpool & Royal Liverpool University Hospital

PUBLICATIONS:

1. Natural history of SPINK1 germline mutation-related pancreatitis. Nelly Müller*; Ioannis Sarantitis*; Marie Rouanet; Louis de Mestier; Christopher Halloran; William Greenhalf; Claude Férec; Philippe Ruszniewski; Philippe Lévy; John Neoptolemos; Louis Buscail; Vinciane Rebours, MD PhD. EBioMedicine. 2019 Oct;48:581-591
* These authors share first authorship

2. Sheel A, Baron R, Sarantitis I, Ramesh J, Ghaneh P, Raraty M, Yip V, Sutton R, Goulden M, Farooq A, Healey P, Jackson R, Halloran C, Neoptolemos J. The diagnostic value of the Rosemont and Japanese diagnostic criteria for 'indeterminate', 'suggestive', 'possible' and 'early' chronic pancreatitis. Pancreatology. 2018 Oct;18(7):774-784

PRESENTATIONS:

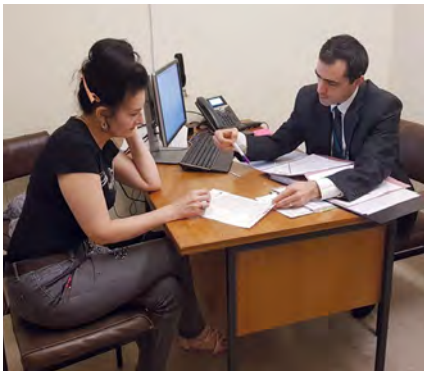
1. The role of SPINK1 p.N34S variant is associated with early onset idiopathic recurrent acute pancreatitis progressing to chronic disease, but not with more rapid progression to other disease outcomes such as diabetes mellitus. 50th European Pancreatic Club jubilee meeting, 13-16 June 2018, Berlin

2. Symptom and diabetes onset in idiopathic pancreatitis: The role of SPINK1 p.N34S mutation. 49th European Pancreatic Club meeting: June 28th – July 1st 2017, Budapest, Hungary

PRIZES:

1. European Pancreatic Club Travel Scholarship July 2017

2. European Pancreatic Club Travel Scholarship June 2018



Outpatient clinic: Consultation with a patient suffering with idiopathic pancreatitis. Patients donated blood samples and consented for future research including DNA sequencing.

The aim of my research project is to describe the natural history of idiopathic pancreatitis (pancreatitis of unknown cause) and develop a prediction model for disease progression with a focus on long-term, life-changing and debilitating complications. Patients with idiopathic pancreatitis suffer with recurrent and occasionally life-threatening acute attacks which occur in a totally unpredictable manner. Patients feel frustrated and anxious as currently clinicians cannot provide an accurate prognosis of their condition.

The central research question of my project is whether people with pancreatitis who carry the SPINK1 p.N34S genetic mutation have a different course of the disease compared with those without the mutation. Furthermore, I investigated whether other lifestyle factors have an impact on disease progression.

The methods used to approach these research questions included a construction of a large patient database followed by rigorous collection of genetic, clinical, biochemical and radiological data. Analysis was performed using advanced statistics in order to draw accurate and meaningful conclusions. Preliminary results suggest that patients with pancreatitis who also carry the SPINK1 p.N34S mutation have an earlier onset of symptoms and are much more likely to progress to chronic pancreatitis with complications. Furthermore, these data suggest that the presence p.N34S mutation may be associated with increased risk for pancreatic cancer in the background of idiopathic pancreatitis.

The prediction model developed as a result of my research will support clinicians' decision making when dealing with patients suffering with idiopathic pancreatitis. The model will provide guidance on the need for genetic testing, additional specialised imaging investigations and finally the need for close surveillance in tertiary pancreatic units. Finally, a sample biobank built in parallel with the clinical database will lead to further translational research including DNA sequencing in order to reveal the biological mechanisms underlying the link between the SPINK1 genetic mutation and pancreatitis.

By the age of 50 years old, 76% of patients with pancreatitis and SPINK1 p.N34S mutation had radiological evidence of chronic pancreatitis. Furthermore 52.4% of those had developed pancreatic insufficiency and 26.3% had diabetes as a result of pancreatitis.

THE MECHANOBIOLOGY OF BLAST

Rob Staruch

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship

SUPERVISORS:
Professor Rory Rickard ,
Professor Mark Thompson,
Professor Robin Cleveland,
Professor Sarah Snelling,
Dr Abigail Spear

SITE OF WORK:
Dstl, Porton Down & Botnar Research University of Oxford

PRESENTATIONS:
1. Society of Academic & Research Surgery, October 2020, Online

PRIZES:
1. Drummond Research Foundation

2. Galeski Fellowship from the Royal College of Surgeons

FURTHER FUNDING:
The Drummond Foundation

The role of blast shock wave in skeletal muscle damage remains unknown. The latent effects of blast injury have been seen in military patients who require more proximal amputations after injury as a result of a progressive tissue necrosis. Skeletal muscle is central to this tissue loss, not only as one of the predominant tissues in the human body, but also being critical for human locomotion and axial support. Mechanotransduction and mechanobiology is a field of cell biology and engineering focused on understanding how mechanical forces drive cell signalling and cell fate. Gaining insights on the fundamental mechanisms of how blast shock wave or 'high strain rate' loading interacts with cellular signalling and homeostasis will provide the foundation upon which both an understanding of tissue necrosis, and potential countermeasures can be built.

Teaching in Dhaka, Bangladesh as part of the British Foundation for Reconstructive Surgery (BFIRST) charity mission on burns reconstruction.

Teaching in Egypt as part of the Galeski Travelling Fellowship.

Models for investigating blast mechanobiology are limited to monolayers, or cell laden hydrogel scaffolds. However these are not physiologically relevant or biomimetic of the in vivo environment. We employed bioengineering approaches and developed a biomimetic 3D printed model of skeletal muscle for high strain rate blast loading. We then undertook imaging and genomic sequencing techniques in order to characterise the mechanobiology of the model, as well as that from high strain rate injury. This work has impact not only in blast injury, but also in understanding the tissue interaction with shock waves from other sources – such as shock wave lithotripsy. This work represents discovery science for defence, as part of the regenerative medicine programme, in unlocking the tissue response to blast for future investigation.

Military Clinicians treating casualties from operations in Afghanistan observed a progressive necrosis of tissue after Blast Injury. The mechanism of this necrosis remains unknown.

NOVEL BIOMARKERS TO PREDICT COLORECTAL CANCER RISK

Anisha Sukha

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship

SUPERVISORS:
Dr Adam Humphries,
Professor Trevor Graham

SITE OF WORK:
St Mark's Hospital,
Barts Cancer Institute

PRESENTATIONS:
1. The evolution of sporadic colorectal adenomas: Copy number alterations (CNA) in progressors vs non-progressors. British Society of Gastroenterology, Glasgow, May 2021

2. Surveillance guidelines: long-term adenoma incidence following polyp excision at index colonoscopy. British Society of Gastroenterology, Glasgow, May 2021

FURTHER FUNDING:
40tude (3 years fully funded),
Wates Foundation

Colorectal polyps are common and found in one in five people. If left untreated they have the potential to develop into colorectal cancer (CRC). For this reason, all individuals over the age of 55 are enrolled into the bowel cancer screening programme.

A patient's cancer risk following the removal of a polyp is primarily based on the size and number removed, which is used to determine colonoscopy surveillance. However, we know that not all patients' cancer risk is the same. In just the high-risk group less than 5% go on to develop cancer, the risk being even lower in other groups; leading to thousands of unnecessary invasive and costly procedures.

A image of the polyp removed is reviewed on screen and reported by size.

We know genomic aberration occurs early in the disease development and the aim of my research is to identify molecular biomarkers of cancer risk using Next Generation Sequencing (NGS), which is a new, cheap and reliable technique.

Human genome is a complex blueprint for life. DNA is highly structured into chromosomes. There are several known events that can alter or damage this structure. Chromosomal instability is a key factor in cancer development, causing chromosomal aberrations; these are known as copy number alterations (CNA).

Anisha is performing a colonoscopy to detect and remove bowel polyps.

In this case-control study, adenomas from patients who subsequently developed CRC (progressors) were matched adenomas from patients who remained cancer-free for over five years from the date of polypectomy (non-progressors). The CNA profiles of the progressors highlighted specific changes in chromosomes; chromosomes 7,9 and 13 have increased copy number profiles while 18 show loses; these are likely to play a role in CRC progression.

These exciting and promising findings are being validated nationally using cases from several other UK hospitals. In the future, it is conceivable that we utilise molecular analysis to improve risk stratification and reduce the burden of colonoscopy to patients and the health care system.

The UK's current cancer risk stratification model is unspecific and results in many patients having unnecessary procedures.

DISCOVERING NOVEL THERAPEUTICS FOR ACUTE TRAUMATIC COAGULOPATHY (ATC)

Anthony Thaventhiran

FELLOWSHIP/SPONSOR:
Joint Rosetrees Trust/Vandervell Trust Research Fellowship

SUPERVISORS:
Dr Ross Davenport

SITE OF WORK:
Royal London Major Trauma Centre/ Blizard Institute, Barts and the London School of Medicine and Dentistry

PUBLICATIONS:
1. Vulliamy P, Thaventhiran AJ, Davenport RA. What's new for trauma haemorrhage management? Br J Hosp Med (Lond). 2019 May 2;80(5):268-273. doi: 10.12968/hmed.2019.80.5.268. PMID: 31059346

PRESENTATIONS:
1. Society of Academic & Research Surgery (SARS) Annual Conference, Discovering Novel Therapeutics to Treat Acute Traumatic Coagulopathy, Royal College of Surgeons of Ireland, Dublin, 19/03/2020

2. Royal Society of Medicine (RSM) MIA Laboratory Surgical Research Annual Conference, London, 12/09/2019

PRIZES:
1. Association of Medical Research Charities (AMRC) lay communication prize, 24/6/20, 3rd place

2. Royal Society of Medicine (RSM) MIA Laboratory Surgical Research prize 12/9/19, Runners Up

FURTHER FUNDING:
British Medical Association Foundation for Medical Research

Barts Charity

Approximately 17000 people die in the UK from severe injury each year, and uncontrolled bleeding is the most common cause of preventable death. Bleeding can be made worse by a condition called acute traumatic coagulopathy (ATC) where there is reduced blood clot formation and increased clot breakdown. Current treatments for ATC, including blood transfusion and a drug called tranexamic acid, do not fully correct the condition and the mortality rate for these patients remains around 45%. Patients who do survive require more blood transfusions, are more prone to complications such as infection and have a longer hospital stay.

(Simulated incident at the Royal London Hospital) Myself taking tissue and enrolling a patient into a trauma trial.

ATC develops when there is immediate inappropriate activation of the protein C pathway following severe injury. In health, the protein C pathway is essential in keeping blood vessels patent by preventing blood clots forming inappropriately and encouraging the breakdown of clots when they develop. This makes targeting the protein C pathway challenging. We have developed a mouse model to understand why and how ATC occurs, and to test new drugs that target protein C directly or alter its effects on clot formation and break down.

Centre for Trauma Sciences in the Blizard Institute.

Thanks to the fellowship I have been able to test a drug designed to be resistant to the effect of the protein C pathway. I have shown increased blood clotting and improved survival in our mouse model. It has demonstrated that clot breakdown is the dominant pathway in ATC and has provided insight into an alternative pathway that could be targeted to develop a new treatment in future. The results will help prioritise a novel treatment to be trialled in human subjects. Ultimately, I aim to produce a new treatment for ATC to reduce death in severely injured patients that can be easily administered pre-hospital or in the emergency department.

Those patients affected by Acute Traumatic Coagulopathy (ATC) have a mortality approaching 50%, with no current effective therapy to reverse the effects once established.

IDENTIFYING NEW DRIVER GENES IN WELL DIFFERENTIATED RETROPERITONEAL LIPOSARCOMA

Robert Tyler

FELLOWSHIP/SPONSOR:
Freemasons' Royal Arch Fellowship

SUPERVISORS:
Professor Andrew Beggs

SITE OF WORK:
University of Birmingham

PUBLICATIONS:
1. Tyler R, Wanigasooriya K, Taniere P, Almond M, Ford S, Desai A, Beggs A. A review of retroperitoneal liposarcoma genomics. Cancer Treatment Reviews. 2020 Mar 28:102013

PRESENTATIONS:
1. Tyler R, Tan D, Desai A. Tumour necrosis is significantly associated with recurrence-free survival after curative resection of GIST. Presented at: British Sarcoma Group, London 2019

2. Tyler R, Tan M, Desai A. Impact of nephrectomy on post-operative renal function in retroperitoneal sarcoma. Presented at British Sarcoma Group, Glasgow 2020

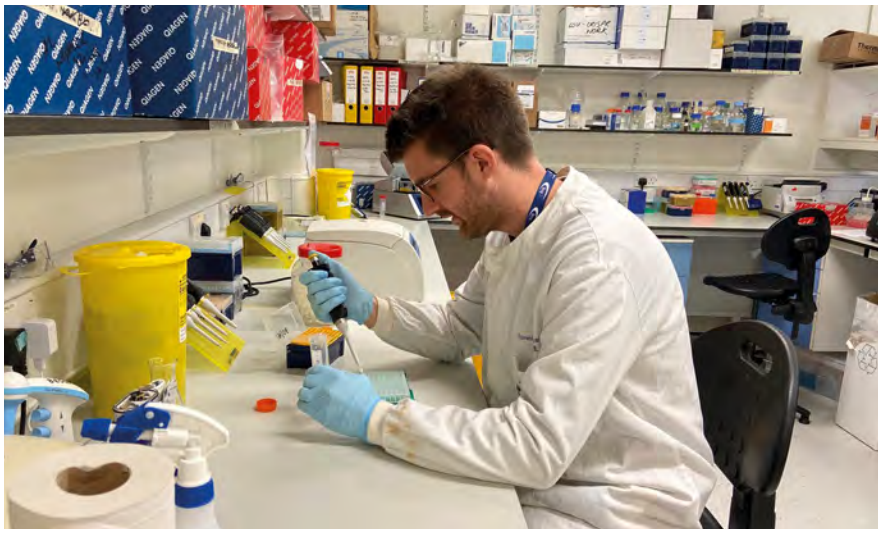
PRIZES:
1. European Society of Surgical Oncology Travelling Fellowship 2019

Well differentiated retroperitoneal liposarcomas (WDLS) are a rare form of cancer, which arise behind the abdominal cavity. These tumours are the largest on record and can weigh up to 20 kgs when removed. The surgery carries significant risk, often removing additional organs such as the kidney and colon, and takes a considerable time to recover from. Unfortunately, even when the tumour is removed with clear margins, a large number will recur within five years which can be inoperable and result in death.

New efforts are being made to try and understand the genetic code of these tumours which may reveal weaknesses within the tumours that can be targeted and prevent their recurrence. We are particularly interested in a gene called SDHA which is involved in the TCA cycle - the main pathway that cells use to create energy to divide and grow.

We believe faults in this gene, limit the tumour cells ability to use this pathway. As this is unique to tumour cells only, any efforts to target this would not harm healthy cells.

One of several experiments I set up to investigate this, was a study to look at the metabolic pathways in patients tumours as they undergo surgery. This involved giving a glucose 'tracer' through an infusion during surgery, which allowed us to identify all the components of the TCA cycle. Analysis of the results are ongoing, but preliminary data shows us significant differences between healthy and tumour tissue. Next in this project is to see whether these metabolic differences exist in more tumour samples. If this is validated, WDLS treatment could benefit from existing work carried out by other scientists as some of these differences have been illustrated in other tumour types and are starting to be targeted therapeutically.



Robert pipetting samples onto a plate prior to analysis.

Local recurrence is responsible for 75% of liposarcoma deaths.

HMGB1 REDUCES THE NUMBERS OF OLIGODENDROCYTE PROGENITOR CELLS AFTER TRAUMATIC INJURY IN VITRO

Ronak Ved

FELLOWSHIP/SPONSOR:
RCS England Research Fellowship

SUPERVISORS:
Dr M Zaben and Prof W Gray

SITE OF WORK:
Cardiff University

PUBLICATIONS:
1. HMGB1 Acts via TLR2/4 receptors to reduce the numbers of oligodendrocyte progenitor cells after traumatic injury in vitro – currently under review with Nature: Scientific reports

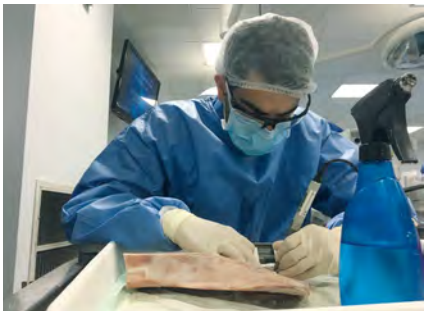
PRESENTATIONS:
1. British Neurosurgical Research Group Meeting (Poster) Edinburgh 2019

PRIZES:
1. Cardiff Institute for Tissue Engineering and Repair Meeting (CITER) Best Oral presentation – 2020

Traumatic brain injury (TBI) is a leading cause of death and disability in young people. It contributes to ~50,000 deaths and >1.5 million hospital visits in the UK/year.

Whilst much TBI research has focussed upon injury to neurones, trials in human studies have been limited by poor efficacy of neuroprotective agents. There has thus been a shift to also consider the impact of neurotrauma upon tissue that facilitates connections between neurones – that is, the white matter of the brain and its cell populations: oligodendrocytes and oligodendrocyte precursor cells (OPCs). Elucidating how these cells are influenced by TBI could help identify pathways which might guide the development of novel therapeutic agents to improve clinical outcomes after TBI. The aims of the present study were to identify the impacts of an in vitro model of TBI upon OPC number, death, proliferation, and morphology (appearance).

Winner of the Cardiff University Rising Teaching Star Award – 2019–2020.



Practicing neurosurgical skills.

Rat brain cell cultures underwent a mechanical scratch injury to simulate TBI. The neuroinflammatory mediator High Mobility Group Box Protein 1, (HMGB1) was released by the cells following this scratch injury.

OPC numbers were reduced by two-thirds in cultures subjected to scratch injury Vs control cultures. The number of OPCs normalised when scratched cultures were given the HMGB1 blocker BoxA.

OPC proliferation was significantly reduced following scratch injury, but cell death remained unchanged. Scratch injury induced ~70% of OPCs to change their appearances; they had reduced cell processes and thus lesser potential to contact neurones to support their connections with each other. BoxA returned the proportion of OPCs with normal appearances to levels comparable with control cultures.

Neurotrauma may impact upon OPC proliferation and morphology. This may be mediated via the neuroinflammatory substance HMGB1. Validating these findings in human cultures, in vivo models of TBI, and correlations with neuroimaging data, could progress these findings towards translational goals.

The neuroinflammatory mediator HMGB1 is released after traumatic brain injury in vitro, and reduces oligodendrocyte precursor cell numbers by over two thirds compared to control cultures.

TRAUMA SYSTEM EVALUATION IN LOW AND MIDDLE INCOME COUNTRIES

John Whitaker

FELLOWSHIP/SPONSOR:
RCS England Fellows' Fellowship

SUPERVISORS:
Andy Leather

SITE OF WORK:
Field work carried out with Malawi Epidemiology and Intervention Research Unit, Chilumba, Karonga, Malawi

PUBLICATIONS:
1. J Whitaker et al. Assessing barriers to quality trauma care in low and middle-income countries: A Delphi study. Injury 51 (2020) 278–285 https://doi.org/10.1016/j.injury.2019.12.035

2. Whitaker et al. Assessing trauma care health systems in low- and middle-income countries, a protocol for a systematic literature review and narrative synthesis. Systematic Reviews (2019) 8:157 https://doi.org/10.1186/s13643-019-1075-8

PRESENTATIONS:
1. The Colt Foundation Meeting, Royal Society of Medicine, London, UK, 5 Dec 2019

FURTHER FUNDING:
The Drummond Committee of the RAMC charity

Local health facility colleagues engaging in process mapping workshop to identify care processes and health system barriers.

Trauma represents a major global health problem with injuries accounting for 8% of global deaths, more than TB, malaria and HIV combined, with 90% of these deaths occurring in Low and Middle Income Countries (LMICs). If the survival rates following injury in LMICs were to be improved to the rates seen in High Income Countries (HICs), it is estimated one third of annual global trauma deaths could be avoided, making a strong case for research and investment in health systems caring for injured patients. Militaries also inevitably engage, across the spectrum of deployments, in activities that continuously impact global health and health systems. Better assessment of such systems, a relatively neglected field of global health, is necessary to assess risks, understand system and population needs for development and the effect of system level interventions. The aim of this study is to develop ways to rapidly assess trauma care health systems in LMICs.

A mixed-method assessment of the injury care health system in Karonga, Malawi has been undertaken using several concurrent and complimentary study methodologies. Community based studies included a household survey, focus group discussions, photovoice and verbal autopsy analysis. Health facility based studies included care process mapping, health care worker survey, clinical vignettes and facility resource readiness assessments. Additionally geographical information analysis of facility and population locations was performed. Initial household survey results have shown injuries to affect almost one third of the local population each year, of whom three quarters accessed the health care system.

As well as providing a rich picture of the injury care health system in Karonga, Malawi, this study will further provide evidence of which methodological approaches for injury care health system assessment are most valuable in this and similar settings globally. It has broad potential application to policy makers, researchers and civil and military stakeholders involved in Global Health.

Trauma represents a major global health problem with injuries accounting for 8% of all deaths, more deaths than TB, malaria and HIV combined, with 90% occurring in Low and Middle Income Countries (LMICs).

THE GENETIC ARCHITECTURE OF CARPAL TUNNEL SYNDROME

Akira Wiberg

FELLOWSHIP/SPONSOR:
Honorary Research Fellowship

SUPERVISORS:
Prof Dominic Furniss and
Prof David Bennett

SITE OF WORK:
Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences (NDORMS), University of Oxford

PUBLICATIONS:
1. Wiberg A, Ng M, Schmid AB, et al. A genome-wide association analysis identifies 16 novel susceptibility loci for Carpal Tunnel Syndrome. Nature Communications 2019 Mar 4;10(1):1030

2. Schmid AB, Baskozos G, Windsor K, et al. Molecular and cellular correlates of human nerve regeneration: ADCYAP1/PACAP enhance nerve outgrowth. Brain 2020 Jul 1; 143(7):2009-2026

PRESENTATIONS:
1. "The polygenic architecture of Carpal Tunnel Syndrome". Peripheral Nerve Society (PNS) Annual Meeting, Genoa, Italy, June 2019

2. "A Genetic Risk Score for Carpal Tunnel Syndrome". Plastic Surgery: The Meeting (American Society of Plastic Surgeons annual congress), Chicago, USA, September 2018

PRIZES:
1. Max Perutz Science Writing Award, Medical Research Council, October 2019

2. Best Speaker Prize, University of Oxford Medical Sciences Division DPhil Day, July 2019

FURTHER FUNDING:
MRC (Clinical Research Training Fellowship

Carpal tunnel syndrome (CTS) is caused by compression of the median nerve as it travels through a narrow anatomical tunnel in the wrist. Patients experience pain, tingling and numbness in the fingers, and thumb weakness, which eventually leads to impairment of hand function. CTS is very common, affecting about one in twenty people at some point in their lives. Carpal tunnel surgery is the commonest elective hand operation performed worldwide; while surgery is successful in the majority of patients, a significant number either do not improve, or get recurrent symptoms.

A patient undergoing carpal tunnel surgery – a bruised median nerve can be seen. Photograph by Prof D. Furniss.

Despite being such a common disease, the causes of CTS are poorly understood. Specifically, genetic risk factors that contribute to the disease have not been investigated previously.

My DPhil (PhD) project focused on understanding the role played by genetics in the development of CTS. I performed the first ever genome-wide association study (GWAS) in CTS, using a powerful computer to compare the DNA sequences between thousands of patients with CTS against thousands of people without CTS. We discovered 16 regions in the genome where these two groups have (on average) significant differences in their DNA sequences, and this allowed us to identify several genes and molecular pathways that are important in CTS. We then looked for these genes in the tissues surrounding the median nerve in the hands of patients undergoing carpal tunnel surgery, and found that many of these "CTS risk genes" are overactive in CTS patients.

Following my DPhil, I moved on to an NIHR Clinical Lectureship in Plastic Surgery. I am currently building on my doctoral work to build a genetic risk score to help identify patients who are more likely to have a severe form of CTS. I am also working to identify potential drug targets that could slow down the progression of the disease.

Extracting RNA from tissues collected during surgery.

About one in twenty people will develop carpal tunnel syndrome.

A GREMLIN IN THE WORKS: THE ROLE OF GREMLIN IN HER2 BREAST CANCER

Catherine Zabkiewicz

FELLOWSHIP/SPONSOR:
Freemasons' United Grand Lodge of England Research Fellowship

SUPERVISORS:
Miss Rachel Hargest, Dr Lin Ye

SITE OF WORK:
Cardiff China Medical Research Collaborative, Cardiff University

PUBLICATIONS:
1. Abstract Publication UK Interdisciplinary Breast Cancer Symposium 2020. Breast Cancer Res Treat 180, 527–596 (2020)

2.' Bone morphogenetic proteins mediate crosstalk between cancer cells and the tumour microenvironment at primary tumours and metastases' (Review). International Journal of Oncology. 2020 Jun;56(6):1335-1351

PRESENTATIONS:
1. UK Interdisciplinary Breast Cancer Symposium, Birmingham UK January 2020

2. Society for Academic and Research Surgeons(SRS), Dublin Ireland October 2020(virtual)

PRIZES:
1. Association of Breast Surgery Prize presentation SRS October 2020

2. Finalist Royal Society of Medicine Trainee of the Year Jan 2019

20% of breast cancer patients have high HER2 in their tumours, and this is associated with worse survival. There is treatment given to these patients that blocks HER2, but this has significant side effects, and some patients do not respond to treatment, or relapse later. We cannot yet select which patients with HER2 tumours will benefit most from these treatments, as we do not yet fully understand all the functions and interactions HER2 has within breast cancer cells.

Due to the aggressiveness of HER2 tumours, many patients will undergo extensive surgery after chemotherapy.

My research investigates a protein called Gremlin, which can control the 'behaviour' of breast cells, such as how fast a cell grows. Gremlin's functions have been linked to HER2 in Stomach cancers, and lung cancers but it has never been looked at in breast cancers. It is therefore a completely novel research area with exciting potential in terms of helping to improve treatment for HER2 breast cancer patients.

I have identified that patients with HER2 breast cancer that also have high levels of Gremlin in the tumour are more likely to have spread to other organs and have much worse survival. To support this finding, I determined that when HER2 breast cancer cells have high levels of Gremlin they grow faster and can move more, which is how cancer cells first start to spread. I found this may happen through a specific cell signalling pathway that Gremlin affects. I was able to perform 'pre-clinical' pilot studies in mice; this forms the foundation before research can be applied to patients in the clinic or operating theatres. I found mice with high Gremlin HER2 breast cancer cells had larger breast tumours and were more likely to show cancer cells forming tumours around the body. Gremlin could be a useful future marker of poor prognosis in HER2 cancer patients and could help select patients for treatments that would benefit them most.

State of the art PET CT scanning was essential for examining tumours in mice, and is used for the same reason in patients, although the human scanner is much larger!

20% of breast cancer patients will have a receptor called HER2 on their tumour, which makes the cancer more likely to spread, or come back after treatment.

USE OF SYNTHETIC SULFORAPHANE AFTER SUBARACHNOID HAEMORRHAGE & EVALUATION OF MRI FINDINGS IN UNDERSTANDING ITS PATHOGENESISLIPOSARCOMA

Ardalan Zolnourian

FELLOWSHIP/SPONSOR:
Sorab (Soli) Jamshed Lam Research Fellowship with support from the Rosetrees Trust

SUPERVISORS:
Diederik Bulters

SITE OF WORK:
University Hospital Southampton

PUBLICATIONS:

1. Neuroprotective Role of the Nrf2 Pathway in Subarachnoid Haemorrhage and Its Therapeutic Potential. Zolnourian A, Galea I, Bulters D.Oxid Med Cell Longev. 2019 May 2;2019:6218239. doi: 10.1155/2019/6218239. eCollection 2019. Review

2. Study protocol for SFX-01 after subarachnoid haemorrhage (SAS): a multicentre randomised double-blinded, placebo controlled trial. Zolnourian AH, Franklin S, Galea I, Bulters DO.BMJ Open. 2020 Mar 25;10(3):e028514. doi: 10.1136/bmjopen-2018-028514

PRESENTATIONS:

1.Relationship between brain volume and intracranial iron after subarachnoid haemorrhage, International Subarachnoid haemorrhage meeting, Netherlands

2. Increased incidence of dilated perivascular spaces after subarachnoid haemorrhage, International Subarachnoid haemorrhage meeting, Netherlands

3. SFX-01 after Subarachnoid haemorrhage (SAS): A phase-II multi-centre randomised double-blinded placebo-controlled trial, International Subarachnoid haemorrhage meeting, Netherlands

Subarachnoid Haemorrhage (SAH) is a bleed in the brain affecting 7000 patients in the UK annually. It is due to ruptured abnormal blood vessel called aneurysm. It carries a high mortality of around 30% and only half of the survivors live independently. Following SAH, treatment is primarily directed to securing the aneurysm. This however does nothing to ameliorate the morbidity due to the haemorrhage. Neurocognitive deficits are particularly common resulting in difficulty with social reintegration and functioning in the workplace. After decades of research the only treatment has only small effects.

Furthermore, there is substantial evidence that a new anti-oxidant medicine, based on an active anti-oxidant called sulforaphane found in cruciferous vegetables such as broccoli, can potentially improve their recovery. Multiple animal studies have shown improved neurological recovery after its use. We ran a multi-centre randomised controlled trial using this in patients with SAH. All survivors underwent an MRI with special sequences.

We hypothesised that SAH causes brain toxicity through iron deposition in the brain which may be the main cause of poor outcome. Our team had shown this direct relationship in a post-mortem study. However, my aim was to objectively measure the brain iron using MRI which had not been done in SAH. I learned the technique by spending a month with a leading professor of medical physics in the USA.

Ardalan reviewing MRI.

Analysis of the MRI showed that patients with SAH have a significantly higher iron volume deposited on their brain which could explain the extensive brain damage. The use of synthetic sulforaphane was associated with no significant clinical differences in their outcomes. However, the imaging finding have the potential of being incorporated in clinical setting to give us better understanding of disease process and will provide further input in a potential prognostic prediction model, which we are currently developing.

Subarachnoid haemorrhage is a type of stroke causing a bleed into the brain that has a high mortality of around 30%. Half of those who survive will no longer be independent or may be left severely disabled. Even those with small bleeds usually suffer long-term problems with memory, concentration, anxiety and personality causing relationships to break down and prevent resumption of work.

THE MCINDOE'S GUINEA PIGS MEMORIAL TRUST

The McIndoe's Guinea Pigs Memorial Trust is funding a Royal College of Surgeons research project for the first time. The Trust seeks to remember the service of the Guinea Pigs: World War II aircrew who were burnt while flying. Their burns were severe, often the result of extreme temperatures produced when high winds in crashing planes fanned high-octane fuel flames. These badly burnt men were selected for treatment by Sir Archibald McIndoe who rebuilt them physically and gave them the confidence to rebuild their lives. Of necessity, he had to develop new surgical techniques and novel approaches to rehabilitation: collectively, these revolutionised plastic surgery. Every injured flier participated in a series of experiments: they were the subjects on whom these tools and techniques were tried, tested and improved, so they called themselves 'Guinea Pigs'.

With this heritage, the McIndoe's Guinea Pigs Memorial Trust funds medical research in Britain into reconstructive surgery following personal injury. For several years it supported work based at the Queen Victoria hospital in East Grinstead, where Guinea Pigs were originally treated. The Memorial Trust now looks forward to a long term partnership with the Royal College of Surgeons.

Fadi Issa and Daisy Ryan.

Daisy Ryan and Martyn Coomer.

Our first project will investigate the immune response to transplanted skin in burn injury which can have a huge impact on scar outcomes and quality of life. The work will be carried out by a surgeon setting out on a research career, Miss Daisy Ryan. She will be working at the Department of Burns and Plastic Surgery at Stoke Mandeville Hospital and with the Transplantation Research & Immunology Group at the Nuffield Department of Surgical Sciences, in the John Radcliffe Hospital, Oxford.

DOCTORAL CLINICAL FELLOWSHIPS AT 'THE CRICK'

Sir Peter Ratcliffe.

The College is exceedingly pleased to have established a new joint Doctoral Clinical Fellowship with The Francis Crick Institute.

The 'Crick' is a biomedical research centre which opened in 2016 in London. It houses over 1500 scientists and support staff and has in-house facilities equipped with latest technologies to enable interdisciplinary collaborative research with an important emphasis on translational research to help turn discoveries rapidly into treatments.

Under the leadership of Professor Sir Peter Ratcliffe, Director of Clinical Research at The Crick, a close bond has been formed between basic and clinical research through sharing of ideas and providing interdisciplinary training to the best scientists and doctors.

We are particularly grateful to Sir Peter for his personal efforts in facilitating this new partnership and wish to use this opportunity to congratulate him on receiving the joint 2019 Nobel Prize in Medicine for his ground-breaking work at Oxford discovering the key mechanisms that our cells use to detect, and respond to low oxygen levels, known as 'hypoxia'. He shares the Prize in collaboration with William Kaelin of Harvard and Gregg Jemenza of John Hopkins.

The Joint Doctoral Clinical Fellowship offers an opportunity for an exceptional trainee surgeon to embed themselves within a research group of the Crick where members of the biomedical community aim to develop new discoveries and lead them towards becoming safe and effective new therapies for patients.

PUMP PRIMING REPORTS

The Pump Priming award is given to assist newly appointed consultants, senior lecturers and post-doctoral trainees in surgery, who are working at hospitals and universities within the UK, in the early stages of their independent research careers. Awards are usually exclusive to support the award holder's own research and not for personal salaries. They may be used, amongst other things, for small items of equipment, for consumables or for technical assistance. All award winners are members or fellows of the Royal College of Surgeons of England.

Matt Gardiner

Victoria Giblin

Nick Hamilton

Stephen McDonnell

Reza Motallebzadeh

Christopher Peters

Chris Pring

OFF-LOADING THE BASE OF THUMB JOINT TO TREAT OSTEOARTHRITIS

Matthew Gardiner

BLOND MCINDOE PUMP PRIMING AWARD

SPECIALTY:
Hand and Plastic Surgery

CURRENT POSITION:
Locum Consultant Plastic Surgeon, Frimley Health NHS Foundation Trust

SITE OF WORK:
Kennedy Institute of Rheumatology, University of Oxford

PRIZES:
1.PLASTA Trainee of the Year 2017

Osteoarthritis of the thumb is painful for many patients. It can reduce the ability to work, to care for others and or be independent. There is no cure available for hand OA. Non-surgical treatment includes pain relief and removable orthoses (splints). Simple trapeziectomy is recommended for base of thumb OA resistant to conservative treatment. However, the evidence base for this and related surgical options is poor.

Treatments aim to relieve pain and improve function. In severe cases, surgery is performed to remove the bone at the base of the thumb. The surgery carries risk and some patients have no improvement in pain or function. The aim of this project was to assess whether it is acceptable to patients to use a new distraction splint for treating the condition.

Thumb base OA X-Ray.

Rachel Harrison and Matthew Gardiner on way to hand clinic at Wexham Park.

The project engaged patients from the Oxford University Hospitals NHS Trust and Frimley Health NHS Foundation Trust in a Patient and Public Involvement process. This was run with the support of the RCS England Surgical Interventions Trials Unit in Oxford. Patients came to Oxford for sessions exploring aspects of splint design and trial design. This has led to the refinement of the splint and future trial protocol.

This is a new approach to treating thumb base OA and builds on surgical studies demonstrating long term benefits of surgical distraction for large joint arthritis (e.g. knee and ankle).

The next step is to complete regulatory approvals and apply for a grant to run a feasibility study of the device. Alongside the possible benefit to patients, we hope that the distraction device will provide an insight into the disease process by access to tissue samples following a period of distraction.

Hand osteoarthritis (OA) is a very common degenerative joint condition that causes pain and disability. The estimated lifetime risk of symptomatic disease is 40%, and almost one in two women and one in four men will develop the condition.

SUGAR LOADED DRESSINGS TO PROMOTE WOUND HEALING

Victoria Giblin

BLOND MCINDOE PUMP PRIMING AWARD

SPECIALTY:
Plastic Surgery

CURRENT POSITION:
Consultant Plastic Surgeon

SITE OF WORK:
Sheffield Teaching Hospitals/ University of Sheffield

PUBLICATIONS:

1. Dikici S. Mangir, N. Claeyssens. F. Yar, M. MacNeil, S. Exploration of 2-deoxy-D-ribose and 17β-Estradiol as alternatives to exogenous VEGF to promote angiogenesis in tissue-engineered constructs. Regenerative medicine: 14(3)

2. Yar, M. Shahzadi, L. Mehmood, A. Raheem MI, Román, S. Chaudhry, AA, Rehman, I. Douglas I, MacNeil, S. Deoxy-sugar releasing biodegradable hydrogels promote angiogenesis and stimulate wound healing. Materials today communications. 2017: 13;295-305

PRESENTATIONS:

1. Assessment of 2-Deoxy-D-Ribose Loaded Silicone Rings to Promote Angiogenesis Using the CAM (Chick chorionic-allantoic membrane) Assay. Presented at the Biomaterials & Tissue. Engineering Group 20th Annual White Rose Work in Progress Meeting. University of Sheffield, United Kingdom. Presented 17th December 2018

Miss Giblin discussing the lower limb reconstructive procedure planned for a patient following soft tissue loss.

Skin wounds require a good blood supply to heal efficiently and effectively. Unfortunately in many patients with burns or chronic wounds the blood supply is inadequate, therefore novel techniques to increase new vessel growth (angiogenesis) are required. This project investigated the ability of a low cost natural sugar, 2 deoxy-D-ribose (2dDr), to promote new angiogenesis. The sugar was combined with a Vaseline gauze dressing (Jelonet®) which is routinely used in wound management, to assess its ability to increase blood vessel growth which could in turn reduce healing times.

The MacNeil group at the University of Sheffield have previously shown 2dDr can promote angiogenesis and aid wound healing by stimulating blood vessel cells (endothelial cells) (Dikici et al,2019). The group have also shown that alginate dressings, loaded with 5 or 10% sugar, can accelerate wound healing in diabetic rat models (manuscript accepted).

The MacNeil group have developed an assay called the 'Chick Chorioallantoic Membrane' (CAM) assay to test the ability of substances to promote angiogenesis using fertilized chicken eggs. In this project the CAM assay was first used to assess the angiogenic effect of 2dDr on its own which demonstrated that 2dDr increased the number of new blood vessels compared to controls.

The 2dDr sugar was next loaded into Jelonet® dressing and the amount of sugar bound to the dressing and released from the scaffold over time was measured. This confirmed 2dDr could be loaded onto Jelonet® with measurable release occurring over 24 hours. Finally, 2dDr loaded Jelonet® dressings were placed on the CAM and we observed a greater increase in angiogenesis with 2dDr loaded Jelonet® compared to control Jelonet® dressings.

To our knowledge, this is the first project investigating the ability to load 2dDr onto Jelonet®. We observed that 2dDr can be successfully loaded onto Jelonet® dressings with data demonstrating sugar release and proangiogenic properties using the CAM assay.

Low cost, effective dressings to improve wound healing are needed worldwide especially in areas without plastic surgery recourse, and in developing countries. By reducing wound healing time, suffering is diminished, while quality of life and patient function is improved.

Burns and chronic wounds have the potential to cause significant morbidity and mortality for patients. With approximately 130,000 people attending accident and emergency departments due to burn injuries and 575,600 patients being treated for chronic wounds each year, the requirement for research into treating these two groups is clear.

THE DELIVERY OF CORD DERIVED STEM CELLS TO FIBROTIC AREAS OF THE THROAT

Nicholas Hamilton

SPECIALTY:
Otorhinolaryngology

CURRENT POSITION:
NIHR Clinical Lecturer,
University College London

SITE OF WORK:
University College London

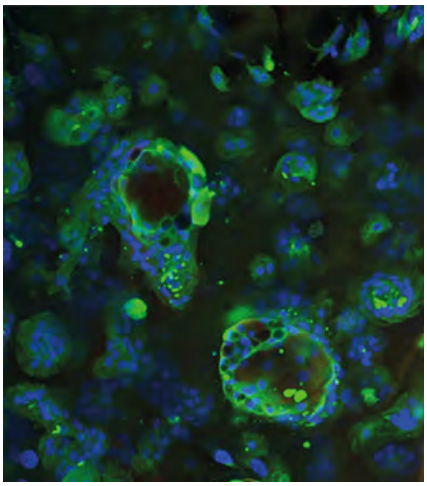
PRIZES:
David Howard Prize for Laryngology (British Laryngology Association)

FURTHER FUNDING:
National Institute for Health & Research

This project aimed to design a novel method for delivering stem cells into scarred areas of the voice box and upper airway.

Biomaterials were tested for their suitability in sustaining stem cells in a culture dish. Whether anti-scarring mediators were released from the stem cell / biomaterial composite was examined. The optimised stem cell / biomaterial composite was implanted onto muscle to assess for biointegration and cells survival.

The optimal starting cell concentration and biomaterial was determined. Anti-scarring nanoparticles and signalling proteins were found to be released from the cell after it was combined with the biomaterial. The cells survived the implantation onto muscle for fourteen days and the material revascularised.



Cells grown from a patient's airway lining and made suitable for reimplantation using an extracellular matrix enriched scaffold.

Does the research build upon other investigations?

This research further progresses this technology closer to being used in a human trial to alleviate the suffering of chronic scarring of the vocal cord and/or airway.

Is it a long-term project that others will continue to develop?

The project is entering the final translational stages with an anticipated first-in-human study towards the end of 2022.

What is life like for patients with this condition?

Scarring of the vocal cord results in a severe voice handicap resulting in substantial difficulties in everyday communication. This significantly impacts on the sufferers' quality of life, mental health and employability. Patients with recurrent airway scarring require multiple operations to keep their airway open are at risk of life-threatening airway obstruction due to difficulties in clearing secretions.

How will it improve their quality of life?

This therapy aims to overcome treatment resistant vocal cord and airway scarring to alleviate the symptoms and suffering of those affected.

Using the designed method, stem cells can be delivered to a fibrotic area and survive implantation.

HIGH RESOLUTION MOLECULAR AND MORPHOLOGICAL INSIGHT INTO THE INJURED ANTERIOR CRUCIATE LIGAMENT

Stephen McDonnell

ARTHRITIS RESEARCH TRUST
PUMP PRIMING AWARD

CURRENT POSITION:
University Lecturer & Consultant Knee Surgeon

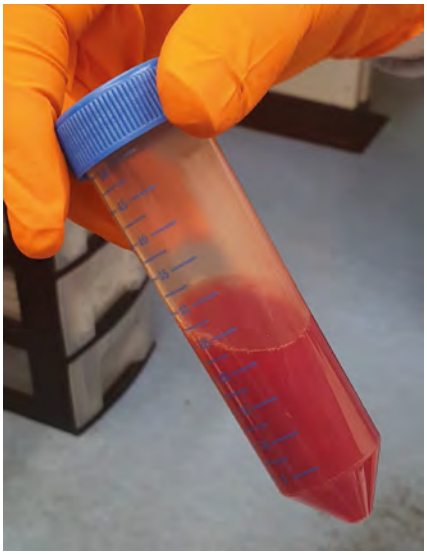
SITE OF WORK:
University of Cambridge/ Addenbrookes Hospital

Acute knee injuries are common in people who play sports. The most common injury in the knee is the anterior cruciate ligament (ACL). These injuries are increasing in frequency, and are commonly seen in people who play football, rugby and netball. Injury to the ACL can lead to ongoing problems of instability and the knee giving way. This causes damage to other structures and may lead to development of post traumatic arthritis at a younger age.

Magnetic resonance imaging (MRI) shows which structures have been injured within the knee. There have been recent advances in MRI using stronger magnets which provide extra detail about the pattern of injury and structures which have been injured. My research focuses on stratification of patients with ACL injuries and understanding what additional information can be gained when using the latest MRI technology.

Using these scans, we can identify structures that have been injured in addition to the damaged ACL. We are hoping to gain a greater understanding of how these relate to the degree of injury and the impact of these additional injuries on the pathway to recovery.

Acute Knee Clinic.



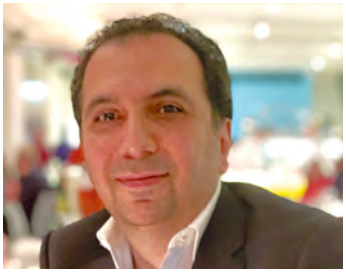
Hemarthrosis aspirated from the knee.

Furthermore, our work is directed at gaining an understanding of the local environment within the knee at the time of injury and how the knee recovers. Fluid is aspirated from the knee and the inflammatory profile mapped against known inflammatory markers. This provides us with more information about whether there is a time point during healing that may be optimal for repair of the damaged ACL within the joint.

This work has kick-started a research programme providing preliminary data for further NIHR funding. This would translate into greater understanding of patient factors, radiological factors and an understanding of the healing and repair process within acute knee injuries.

An anterior cruciate ligament (ACL) tear is a common injury, with an incidence in the UK of around 30 cases per 100,000 each year.

INFLUENCE OF THE HOST URINARY AND GASTROINTESTINAL MICROBIOTA ON CLINICAL OUTCOMES AFTER KIDNEY TRANSPLANTATION



Reza Motallebzadeh

SPECIALTY:
Renal Transplantation

CURRENT POSITION:
Consultant Renal Transplant Surgeon & Associate Professor

SITE OF WORK:
Research Department of Surgical Biotechnology, Division of Surgery, UCL & Institute of Immunity & Transplantation, UCL

PRIZES:
Senior Clinical Fellowship, The Wellcome EPSRC Centre for Interventional and Surgical Sciences, UCL

FURTHER FUNDING:
Inflammation, Immunity and Immunotherapeutics NIHR UCL Hospitals Biomedical Research Centre grant

St Peter's Trust Royal Free Charity grant

When a recipient receives a donor kidney ('graft'), their body identifies it as foreign and mounts a response against it (immune response), potentially resulting in graft rejection and eventual graft loss. To prevent this, the immune response is suppressed using drugs ('immunosuppressive drugs'). Despite advancements, medium-/long-term survival of transplanted kidneys has remained unchanged for the last two decades, and strategies to improve long-term outcomes have become essential.

Kidney rejection.

The normal human gut and urinary system have ecological communities (e.g. bacteria) consisting of over 100 trillion microbes, known as the microbiota. The microbiota and our immune system are at a constant interplay and microbial disruption is associated with a variety of cancers, heart and liver diseases. The composition of the microbiota could elicit signals that promote either an enhanced or diminished immune response against a kidney transplant, and it remains unknown if alterations in the gut microbiota cause changes in immune responses that accumulate before graft rejection become obvious.

The study, the first in the UK, aims to characterise the changes to the gut and urinary microbiota and immune markers in 100 recipients before and after kidney transplantation. By understanding the changes that occur in the microbiota and recipients' immune system, we hope to qualify the effect of the microbiota on graft rejection. We have so far recruited 50 kidney transplant recipients and have shown that profound changes to the gut microbiota occur soon after surgery. We are extending the study to follow up participants to over a year to determine if the changes to the microbiota are long-lasting. We hope the results of our work will open up new treatment opportunities that can influence the microbiota in order to reduce the incidence of rejection and improve the long-term survival of kidney transplants.

Golf Charity Presentation.

A kidney transplant offers the best treatment for patients with end-stage kidney disease.

DEVELOPMENT AND VALIDATION OF PROGNOSTIC INDEX CONTAINING BOTH CLINICAL AND MOLECULAR FEATURES TO PREDICT OUTCOME IN OESOPHAGEAL ADENOCARCINOMA

Christopher Peters

SPECIALTY:
Upper GI Surgery

CURRENT POSITION:
Clinical Senior Lecturer and Consultant Upper Gi Surgeon

SITE OF WORK:
Imperial College London/ St Mary's Hospital Paddington

DNA fingerprinting to predict a cancer's future.

Cancers of the oesophagus or gullet are becoming dramatically more common in the UK, 10x more common than 30 years ago, meaning there are now about 9000 cases/year. Whilst we try to predict how bad a cancer is by how it looks, patients with superficially the same cancer can have hugely different outcomes. By looking at the fingerprint like changes to the DNA that created the cancer we can get far more information about how it might behave and help patients make better decisions about their care-improving their chances of cure.

Previous work had identified that alterations of three cancer genes in particular may help us identify cancers with a particularly bad outcome, so we combined these three genes with the classical way we assess oesophageal cancers to create a new scoring system. This system can sort patients into one of four groups with very different outcomes but also uses the data from over 1000 patients to make a prediction of how likely an individual patient is to survive one, two, three, four and five years.

This Royal College of Surgeons funded research project tested this system in a new independent group of 460 patients from across Europe and showed that it was able to accurate divide up the patients and that the survival predictions made seems to match what happened in real life.

This work has directly led onto another bigger study testing it in over 3000 patients. If this also proves the system works then we can start using it with our patients as they go through their treatment journey, meaning we can have better conversations with patients about what they might expect and be able to make better decisions about what treatments we would recommend. Making better treatment choices should directlyimprove patients' outcomes.

By combining the standard features of a cancer with molecular fingerprinting of the tumour we can make more accurate predictions of a patient's chance of being cured.

A PILOT STUDY TO INVESTIGATE WHETHER THE PERMEABILITY OF INTESTINAL MUCOSA IS ALTERED AFTER GASTRIC BYPASS SURGERY IN PATIENTS WITH TYPE 2 DIABETES

Chris Pring

CURRENT POSITION:
Consultant Bariatric Surgeon

SITE OF WORK:
St Richard's Hospital, Chichester

PUBLICATIONS:
1. Effects of bariatric surgery on gut permeability in humans: a systematic review Obesity Surgery (submitted)

2. A prospective cohort study assessing gut permeability with obesity and glycaemic control Obesity Surgery (submitted)

PRESENTATIONS:
1.The Nutrition Society, Royal Society of Medicine, December 2019

The aim of the study was to assess changes in gut permeability following the rapid weight loss and metabolic changes resulting from laparoscopic gastric bypass (bariatric surgery).

Obesity and type 2 diabetes are recognised conditions that increase gut permeability. As such, 'leaky' gut can have a significant affect on body metabolism and bacterial translocation.

Nuclear Medicine Team at St Richard's Hospital.

We recruited adults with an established diagnosis of obesity and type 2 diabetes who were proceeding with laparoscopic gastric bypass surgery. The study received ethical approval from the South Central – Hampshire B Research Ethics Committee. Intestinal permeability was assessed by measuring urinary excretion of ingested radio-labelled EDTA. Measurements were taken 1 month before surgery and 4 months after surgery. Each participant underwent standardised laparoscopic gastric bypass.

22 participants were recruited into the study; 13 completed it. Mean weight and body mass index dropped from 128kg, BMI 47.8kg/m^2 to 96kg, BMI 36.4kg/m^2. There was no change in small bowel permeability, but a statistically significant increase in colonic permeability was noted four months after surgery (see Figure 1).

Interactions between diet, gut microbiota, the immune system, adipose tissue and hormones are the main framework underlying altered intestinal permeability in obesity. However it appears from this pilot study that one or more of these factors are contributing to an increase in colonic permeability at the very time when body weight is reducing. In other words, a reduction in obesity is actually increasing colonic permeability (but not small bowel permeability) following gastric bypass surgery. So it may be that colonic permeability is not directly dependent on body weight, but rather on diet and changes in gut microbiota.

This leads into a more extensive cohort study examining the mechanisms of altered gut permeability that occur in obesity and type 2 diabetes. Bariatric surgery patients provide a good model for this study.

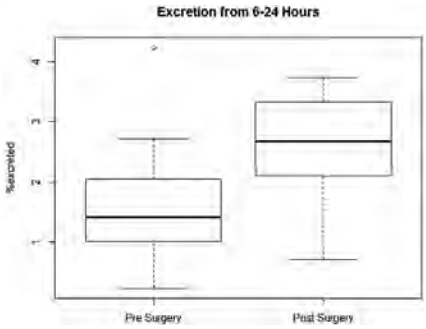


Figure 1.

Following laparoscopic gastric bypass surgery, colonic permeability increases in patients with pre-operative type 2 diabetes.

SURGICAL TRIALS INITIATIVE

Professor Peter Hutchinson.

The start of 2020 was very encouraging with strong recruitment to trials and the prospect of expanding the surgical trials initiative, both in terms of current and new projects. Then the COVID-19 pandemic struck, and it rapidly became apparent that as a result of the virus this would be a very different year presenting challenges but also opportunities.

The challenges have been to continue recruitment to surgical trials, many of which have been affected due to the impact on both patients and staff. On a background of the 2019–2020 epoch with an incredible 52,088 patients being entered into surgical trials, it rapidly became apparent that we would need to adapt. Although recruitment did cease during the first lockdown it is encouraging that trials have been able to recommence recruitment, or recruit elsewhere, for example the SUNRRISE trial, as part of our joint RCS England-Australian New Zealand Clinical Trials Initiative. It is also encouraging that during the pandemic we have been able to expand the RCS England clinical trials initiative with new Surgical Specialty Lead appointment in bariatric surgery and three new Surgical Specialty Leads appointed in Vascular Surgery. We have also appointed Prof Michael Jenkinson as the Chair in Surgical Research at the University of Liverpool, with generous support from the Sir John Fisher Foundation.

The pandemic has had a major impact on patients with or without suspected SARS-CoV-2 infection, and patients with other conditions in terms of access to surgical care. There has also been a major effect on staff in terms risk of transmission and wellbeing with operating in very difficult environments. With this in mind in March 2020 we launched the RCS England COVID Research Group, a weekly and now monthly meeting of surgical researchers who have built up a portfolio of 50 projects providing data to assist in the management of surgical patients during the pandemic. Work from members of the group has provided data on the outcome of patients infected with SARS-CoV-2 during the peri-operative period, data to support alternative, including non-operative ways of managing patients, and data demonstrating that certain procedures can be performed under local anaesthesia. Other projects are looking at the well-being of staff, novel PPE and aerosol science in terms of virus transmission. We have also started a clinical informatics subgroup to interrogate HES data. Our aims include using data to assist in the management of the recovery phase, given the exponential growth in waiting lists.

2020 has also seen growth in our other projects, both in the UK and globally. In terms of international collaborations, the five RCS England NIHR global health unit/groups presented an update of their activities at a virtual Surgical Global Health meeting in the autumn and it is encouraging that there are new surgical groups being created and applying for the current NIHR global round. There is no doubt that the surgical global initiatives have provided important data on the management of surgical conditions in low and the middle income countries, but we recognise that we now need to take this to the next stage, that of policy implementation, with an exciting collaboration with the London School of Economics to be launched in 2021.

2020 has also been a successful year for our robotics initiative with the launch of RADAR, part of the Commission on the Future of Surgery initiative. We acknowledge the amazing growth in robotic technology and the challenges this brings in terms of implementation, demonstration of both efficacy and safety and training. During 2021 we plan to appoint the first RCS England-Robotics fellow.

2020 was also a year that heightened our concerns in relation to the safety and monitoring of surgical implants. The Cumberledge report highlighted this in relation to vaginal mesh implants. We recognise that there are many questions to be addressed and are therefore starting a RCS England device science and registries group. This has a number of aims: to collate the current portfolio of surgical registries, to define the core criteria for a successful registry, and explore ways that we can combine registries with research, by embedding trials within registries.

In conclusion, while 2020 has been a turbulent year for surgical research, specifically recruitment to trials, it has provided other opportunities to increase our understanding of surgical conditions and improve the management of patients through research, both in the UK and internationally.

RCS England Clinical Research Initiatives
Surgical Trials Initiative
Covid Research Group and Clinical Informatics Subgroup
Global Surgery Group
Device Science and Registry Group
Robotics and Digital surgery initiative (RADAR) in collaboration with the Commission on the Future of Surgery

Peter Hutchinson, Murat Akkulak, Sarah King, Martyn Coomer.

Mary Kinross Trust and Royal College of Surgeons Chairs in Surgical Trials and Health Sciences

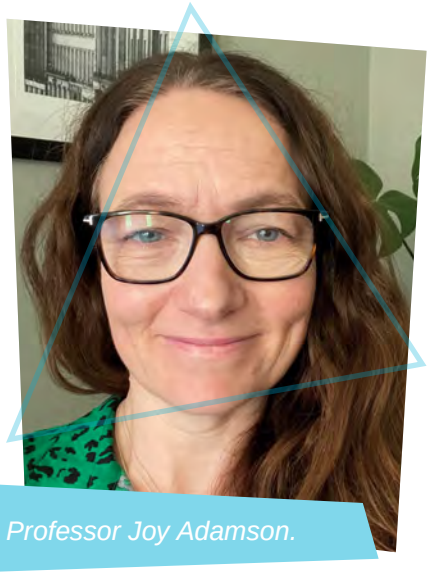
Professor Amar Rangan.

I feel privileged to have been appointed to an important RCS England Chair generously supported by The Mary Kinross Trust. This is a joint appointment between the Department of Health Sciences and Hull York Medical School at the University of York. The purpose of the Chair is to develop high quality research programmes in Orthopaedics to help improve the surgical and peri-operative care received by people with musculoskeletal problems.

I commenced work in October 2019, and my first year has been particularly challenging due to the restrictions imposed by the COVID-19 pandemic. I have contributed to research related to the pandemic, and I am a registered collaborator on the COVIDSurg project. I am also part of a clinical team involved in evaluating a new bedside test for rapid detection of Coronavirus from saliva samples.

A highlight this year was the recent publication in The Lancet of the largest surgical trial to date comparing interventions for treating frozen shoulder, for which I was the Chief Investigator and we recruited from 35 NHS hospitals across the UK.

Despite the challenges this year, we have made considerable progress in identifying our research priorities, engaging with clinical networks and developing new clinical trials. I am currently working with a James Lind Alliance Priority Setting Partnership to identify top research priorities in surgery for elbow problems. Going forward, I look forward to working closely with the RCS England surgical trials forum and The Mary Kinross Trust to focus on research that ranges from identifying effective Orthopaedic interventions to improving surgical care pathways; and developing the next generation of researchers in my specialty.



Professor Joy Adamson.

It is exciting to be based within one of the RCS England Surgical Trial Centres, working alongside colleagues with an established track record in Orthopaedic surgical research. I am delighted to be working alongside Amar to develop high quality research for patient benefit supported by the RCS England and The Mary Kinross Trust.

In the last year, I have been involved in the delivery of two NIHR funded orthopaedic surgery trials: completion of the PRESTO pilot study of surgical versus non-surgical treatment of stable thoracolumar fractures; and the successful progression of the ACTIVE trial from pilot to full-trial phase. The ACTIVE trial is testing external frame versus internal locking plate for articular pilon fracture fixation. Both studies are interesting clinically, but also have enabled me to continue to build my portfolio of research outputs relating to methodological aspects of trials – with the aim of enhancing trial methodology and improving the experience of patients participating in trials.

I see a key feature of my work to support capacity building in orthopaedic surgical research across all grades – to this end, I have enjoyed working with a number of clinicians to support research across a range of topics including pre and post-surgical care. For example, working alongside Consultants in Orthopaedic Surgery and Geriatric Medicine we have been successful in obtaining NIHR funding to run a feasibility study of mouth care to prevent pneumonia in hip fracture patients. I am an academic supervisor for ST4 Trauma and Orthopaedics surgeon for a PhD of a RCT comparing the use of a passive warming gown against usual care perioperative warming in patients undergoing primary hip and knee arthroplasty; and for a FY1 junior doctor to conduct a scoping review of surgical management of osteomyelitis and mal/non-unions of the lower limb. I have been excited to work with colleagues from different surgical specialities as part multi-disciplinary working, in the development of research grants.

In the coming year, despite the challenges we are facing in the delivery of research due to COVID-19 restrictions, I look forward to continue developing new research proposals on topics identified as important to patients, that will ultimately enhance patient care. In addition to delivery of high quality trials, it is important to incorporate research relating to implementation of trial evidence into patient care and to consider research that focuses on service delivery aspects of orthopaedic surgery and optimal provision of evidence-based best practice via the most appropriate care pathways.

Professor Robert Hinchliffe.

Ms Natalie Blencowe.

Professor Jane Blazeby.

Surgical Trials Centres: Bristol

The RCS England Surgical Trials Centre in Bristol conducts some of the UK's most advanced surgical trials research. We work with qualitative data, digital images, and health services research methods to understand and improve the design and conduct of randomised controlled trials (RCTs) and early phase studies. We encourage clinicians of all specialities, surgeons in training and trials methodologists from variety of disciplines to work with us. In 2020 we appointed Professor Robert Hinchliffe and Ms Natalie Blencowe to the Linder Foundation Chair and senior lectureship in clinical trials, respectively. Here we reflect on vision, highlights, and multi-disciplinary working.

Randomised controlled trials

Our vision is that NHS surgical practice be based on evidence. We want good access to effective and cost-effective surgical care. A key method by which we are achieving this is collaboration. We work with new chief and principal investigators (PIs), and surgical trainees to design and deliver surgical trials. This experiential model allows surgeons to learn about clinical equipoise, teamwork and bias. An example is the NIHR Sunflower Study. Sunflower has an efficient design to examine the effectiveness of magnetic resonance imaging of the common bile duct before laparoscopic cholecystectomy. Currently open in 48 centres it includes 48 consultant PIs and 50 associate PIs (surgeons in training). Some 2000 patients were randomised within a year. Over the past eight years we have opened many multi-centre surgical trials with different teams. We hope that participating in the creation of evidence will lead to surgeons implementing evidence-based practice in the future.

Training

We aim to provide a creative and supportive environment for training and development for all career stages in rigorous research methods relevant to the evaluation of surgery. This includes training in RCT methods, appraisal of evidence, outcome and quality assurance methodology and methods to optimise communication and informed consent for surgery. We support PhD and MD students and early and mid-career NIHR applications. Academic clinical trainees (AF2s, ACFs, ACLs) are linked to the centre and we currently host three clinician scientists (Shelley Potter and Angus McNair NIHR and Natalie Blencowe MRC). In addition to the annual BOSTiC course (run with SITU, Oxford) we enjoy delivering one-off training and discussion workshops (e.g. pilot and feasibility studies). Working with the Birmingham Surgical Trials Consortium we designed the popular Granule recruitment into trials course which has had nationwide uptake.

Teams

Our centre is located within the university. We work closely with the Bristol Trials Centre led by Professor Chris Rogers which is home to two UKCRC-registered Clinical Trial Unit hubs. In addition, we liaise with the Surgical Innovation theme of the Bristol Biomedical Research. Members of our centre are part of the Qualitative Research Integrated within Trials group (QuinteT) led by Professor Jenny Donovan, the Centre for Ethics in Medicine led by Professor Richard Huxtable and the Health Economics in Bristol group led by Professor Will Hollingworth. NHS collaborations extend locally with both Trusts in Bristol and nationally we work with over 100 PIs and NHS Trusts. Close collaborations with the COMET initiative (Core Outcomes Measures in Effectiveness Trials), the MRC TRMP (Trials Methodology Research Partnership), and the IDEAL collaboration exist. The intellectual generosity within and between these organisations inspires ongoing research. The RCS England support combined with these multi-disciplinary collaborations leads to more and better surgical trials which in turn leads to better health and patient benefit. We are grateful for all the support we receive.

Professor Susan Moug.

Mr Dale Vimalachandran.

RCS England Surgical Specialty Leads: Colorectal

Susan Moug and Dale Vimalachandran took over from Simon Bach in July 2018 and inherited a very well established colorectal portfolio and collaborative network. Much of this activity grew from the first sub-speciality Delphi research initiatives that involved over 100 members from the Association of Coloproctology of Great Britain and Ireland. This Delphi yielded research questions in both benign disease and cancer, which the colorectal community have overwhelmingly adopted.

Surgical trainees have always played an active role in colorectal research. From medical students to foundation doctors and core trainees, the colorectal research community continues to engage everyone in research audits through to interventional studies. Utilisation of the NIHR associate PI scheme has been of particular benefit to those studies in the emergency setting such as SUNRRISE, ROSSINI2 and PPAC2 all of which conceptually evolved from trainee led collaborative studies through to major NIHR funded multicentre RCT's. More recent studies have also evolved to look at other fundamental areas of colorectal practice rarely researched such as surgical personality and decision-making (PLATO), pre-habilitation (PREPARE-ABC, DISCO), frailty (ELF), parastomal hernias (CIPHER) and diverticular disease (DAMASCUS). Many of these studies have international collaborators and recruitment, highlighting our increasing international network.

Patient and public involvement is a particular strength of the colorectal research community, and patients have been involved in study design and delivery of research topics from diverticular disease through to parastomal hernia management. We are particularly proud of Sue Blackwell, one of the patient liaison group members, who has progressed through to funding her own study as chief investigator (PAPOOSE), a national first and a true reflection of how fundamentally important patients are to colorectal research.

The colorectal response to the recent COVID-19 has resulted in an amazing national and global effort. Studies such as ReCaP, SafeSurgery, COVIDHAREM, COPE have been developed in an incredibly short time. Indeed the COVIDSurg collaborative have produced a hugely impressive global effort with a number of high impact publications that have guided surgical management during these complex times.

We are hugely grateful to both the Association of Coloproctology of Great Britain and Ireland and also Bowel Research UK charity who support the funding of these valuable research roles in colorectal surgery. We are also grateful for the support of the research department at the RCS England and also our Associate SSL's Abi Vallance and Nick Heywood, with their ongoing support the colorectal research future is bright.

Mr Vimalachandran at the DAMASCUS Patient and Public Involvement event at the College in January 2020.

Professor Tom Pinkney.

NIHR CRN National Specialty Lead for Surgery

Professor Tom Pinkney, the George Drexler & Royal College of Surgeons Chair of Surgical Trials at University of Birmingham has been appointed as the new NIHR CRN National Specialty Lead (NSL) for Surgery.

Tom replaces Professor Nigel Bundred, who has been the Surgical NSL since the re-formation of the NIHR Clinical Research Network (CRN) in 2015.

In announcing the news, Professor Matt Seymour, National Cluster Lead, of NIHR CRN wrote: “We would like to express our deep appreciation for the energy, dedication and tenacity shown by Nigel over the past five years. On his watch, we have seen a nearly eight-fold increase in the number of research studies managed and supported by Surgery in England, from 46 to 367, and an increase from under 7,000 to over 44,000 in annual recruitment to those studies. These figures tell the story of many important research questions being addressed and answered, so improving standards of care for patients; they also indicate a sea-change in attitudes to surgical research, and a new generation of research-active surgeons and AHPs who will carry this work forward in the years ahead.

Tom is part of that new generation. An academic consultant surgeon in the West Midlands since 2012, he was last year appointed as Professor of Surgical Trials in Birmingham. As well as leading his own clinical trials, Tom has helped develop the next generation of researchers through Trainee Collaboratives and the Associate PI Scheme, and as Surgical Specialty Lead has been key to bringing CRN West Midlands to the top of the league table for surgical recruitment.”

Tom took over in this role in August 2020, at the height of the COVID-19 pandemic and the resultant unprecedented impact on clinical research. After helping oversee the successful restart of clinical research in surgery, Tom hopes to strengthen active linkages between the NIHR CRN and the highly successful parallel RCS England clinical research structures including the surgical trials centres, SSLs, trainee collaborative groups and the new Professors of Clinical Research, to further enhance both the quantity and quality of clinical surgical research across the country.

GLOBAL SURGERY REPORT

This section of the report is dedicated to Prof Hosni Khairy Salem who sadly passed away in 2020. Prof Salem was a prominent and enthusiastic member of the GlobalSurg network and will be greatly missed by colleagues who had the pleasure of working with him on projects tackling global surgical issues in Low and Middle Income Countries across the globe.

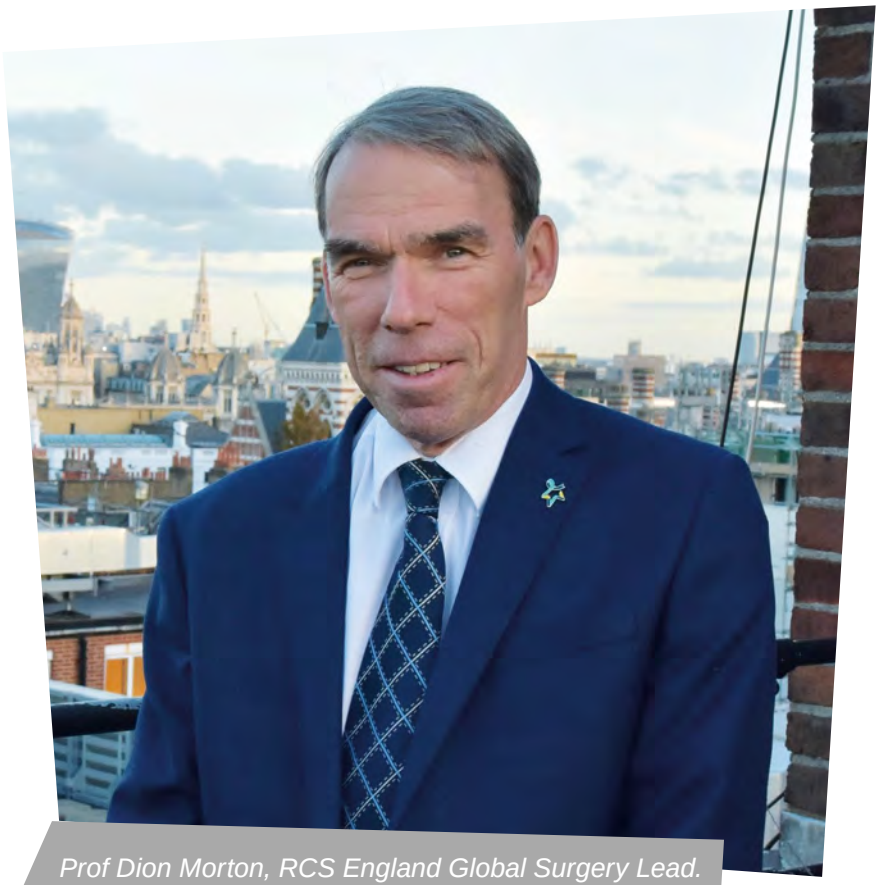
The RCS England Global Surgical Group aims to promote surgical research worldwide, but particularly in low and middle income countries. The first meeting was convened at the RCS England in January 2019 following recognition that surgery required more advocacy in Global Health Research and that joining forces would allow for a more powerful voice leading to the required changes.

After the success of the first meeting we have expanded the group and convened the second RCS England NIHR Surgery Groups and Units Meeting which took place virtually on 18th Sept 2020 bringing together representatives of the: NIHR Global Health Research Unit on Global Surgery (Birmingham), NIHR Global Health Research Group on Neurotrauma (Cambridge), NIHR Global Health Research Group on Surgical Technologies (Leeds), NIHR Global Health Research Group on Burn Trauma (Swansea), NIHR Global Health Research Unit on Improving Health in Slums (Warwick), NIHR Global Health Research Group on Post Conflict Trauma (Imperial College London), ASSET NIHR Unit on Health System Strengthening in sub-Saharan Africa King's College London, RCS England and London School of Economics Global surgery Policy Unit and the NIHR.

The aim of this meeting was to explore synergies between ongoing research into global surgery and exploring the role of RCS England and NIHR in nurturing global surgical research.

We focussed on sharing experiences and success stories as well as challenges and lessons learned across a wide range of topics we all share in our daily work:

- Sustainability and local ownership and looking beyond the lifetime of the Groups and Units. Effective promotion of projects and development of accessible toolkits.
- Community Engagement and Involvement – importance of including local communities, including rural.
- Education and training of the next generation of surgeons and researchers in LMICs (hands-on training courses, online/video lectures and meetings, free access to online resources, providing specific courses, e.g. statistical analysis, qualitative data collection and analysis).
- Health Economics and issues around improving access to care – highlighting extreme context sensitivity.
- Maximising impact and uptake through improving dissemination, pragmatic aspects of effective introduction of practice change and influencing healthcare systems and governments.



Prof Dion Morton, RCS England Global Surgery Lead.

The meeting was also an opportunity to reflect on the year 2020 and the impact of the pandemic on both surgery and research world-wide and to discuss the best way forward in these challenging times.

The group agreed that consistent investing of time and money in education and in training as well as nurturing research capacity in LMICs leads to increased research output on locally identified issues and needs which can lead to data driven policy changes and we are looking forward to continuing our work and further supporting each other in this task.

We also recognised that there is a need to take Global Surgery to the next level. One of our main activities for 2021 is therefore to establish a collaboration between the RCS England and the London School of Economics. Our ambition is to create a Global Surgery Policy Unit, which will enable us to translate academic findings into clinical practice and policy change. This will help to address the major on going concerns in terms of access to surgical care as raised by the Lancet Commission.

RCS ENGLAND COVID-19 RESEARCH GROUP

Prototype design for a device to confine and extract at source aerosols generated from the mouth or nose.

The RCS England COVID-19 Surgical Research Group: Influencing surgical practice through rapid research collaboration.

Andrew J. Beamish

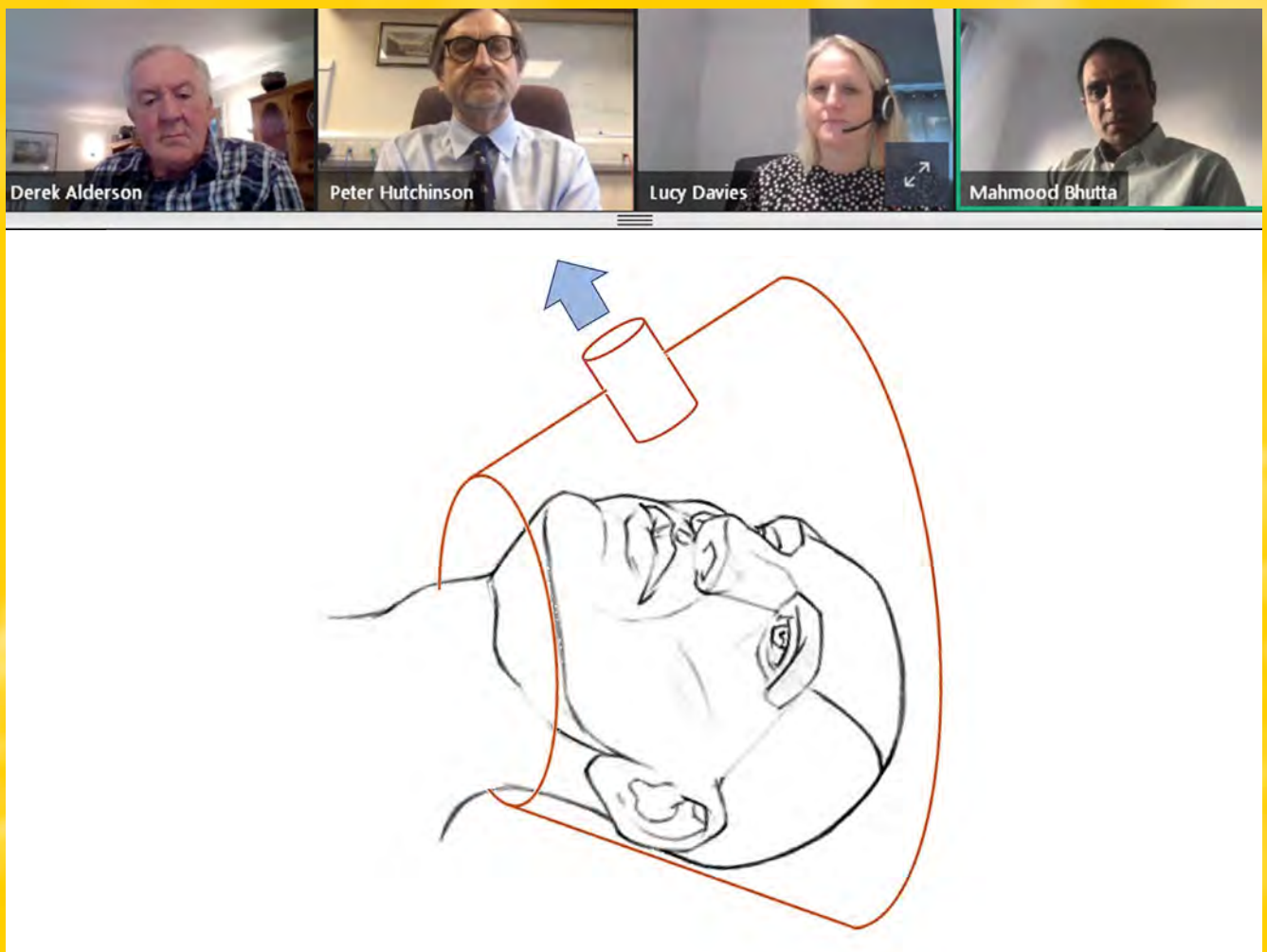
On behalf of the RCS England COVID-19 Surgical Research Group.

As reports began to emerge of cases of COVID-19 in Europe, surgeons across the United Kingdom recognised a need to understand and react to this new threat to people and healthcare systems alike. Early in the spring of 2020, while case numbers were small but rapidly rising, the RCS England Research Department began assisting a small group of academic surgeons with COVID-19 related research as they sought to share expertise, skills and common objectives.

Under the leadership of Professor Peter Hutchinson, and with active support from the recently demitted RCS England President, Professor Derek Alderson, the RCS England COVID-19 Research Group rapidly grew into a broad network of researchers encompassing more than 50 research groups.

Members of the the Group have conducted wide ranging projects, yielding crucial insights into the behaviour of the SARS-CoV-2 pathogen, its impact on patients and staff, the challenges it presents to surgical practice and investigating methods to adapt and overcome such challenges. The group's work ranges from lab-based investigation of the behaviour of the virus particles, through effects on staff health, wellbeing and surgical education, to the well-known COVID-Surg projects describing early surgical outcomes in patients with COVID-19. A number of common themes have been evident across the whole portfolio, including the rapid development and delivery of projects, wide multidisciplinary participation and international collaboration, and avoidance of duplication of academic activity. Research and development departments have been quick to grant permissions and support these urgent projects, and this has allowed teams to capture data right from the early stage of the pandemic. This has been particularly important in influencing and observing changes to clinical practice to accommodate the new threat, which included a substantial excess mortality associated with SARS-CoV-2 infection in the peri-operative period. The prospective evaluation of the impact of such profound changes to practice, which would never have been possible in the absence of COVID-19, has allowed the surgical research community to learn not only about the virus and its effects, but also the effects on patients staff and systems associated with these practice changes.

The early establishment of this formal network under the auspices of the RCS England has assisted efficient research collaboration and delivery, while avoiding academic duplication between groups. This has led to a high and impactful research output, directly informing and substantially influencing practice throughout and beyond the pandemic.



Screenshot from the RCS England COVID Research Workshop highlighting some of the projects from RCS England COVID Research Group.

CLINICAL EFFECTIVENESS UNIT

Professor David Cromwell, Director of the Clinical Effectiveness Unit

The Clinical Effectiveness Unit (CEU) is an academic collaboration between the College and the Department of Health Services Research and Policy within the London School of Hygiene and Tropical Medicine (LSHTM). Since its creation in 1998, it has become a national centre of expertise on conducting large-scale studies into the quality of surgical care, something that has been built on its multi-disciplinary approach and its close relationship with the College and Specialty Associations. Another key aspect of its success has been its ability to give opportunities to surgical trainees to work on national studies and enrol in higher research degrees. The CEU currently has six surgical trainees working among its staff, working on research in general surgery, breast surgery, neuro-surgery, urology, and vascular surgery.

Professor David Cromwell.

Audit and research within the CEU

The core activity of the CEU is to conduct national clinical audits and research projects. One of the national audits run from the CEU examines the care received by older patients with breast cancer in England and Wales. Ms Yasmin Jauhari took time out from her surgical training to join this audit and she recently submitted her PhD thesis based on the research she undertook. The focus of Yasmin's work was understanding the impact of frailty on the treatment patterns of older women with breast cancer.

Differences in how health services manage the breast cancer of older women with decreased levels of fitness are often cited as contributing to variation in patterns of care.

When the audit began, the team was hampered in investigating this issue because patient frailty was not routinely recorded in the available data. Yasmin developed a frailty index that can be derived from routine hospital data in England and Wales, and demonstrated that the index improved the performance of statistical models to predict, firstly, the likelihood of women with breast cancer receiving surgery and, secondly, survival after diagnosis. The index provides a consistent way of describing the burden of frailty in patient populations, and has the potential to be widely used as it is applicable to many patient groups beyond breast cancer.

A brief description of the major CEU projects undertaken in 2020 is given in Box 1.

Supporting quality improvement within NHS hospitals

The National Prostate Cancer Audit (NPCA) ran a quality improvement workshop in December 2019 to share results from its sixth Annual Report with prostate cancer teams in England and Wales. One of the things reported by the audit has been the potential 'under-treatment' of men with high-risk/locally advanced disease (men who were eligible for curative treatment but did not receive this option). The proportion of these men not receiving treatment has declined markedly since the start of the NPCA in 2013, but now looks to be plateauing around 30%. This proved surprising to participants at the workshop and was an important point of discussion. Clinicians in the room agreed that some apparent

Jemma Boyle teaching in Cairo.

under-treatment could be due to patients being unfit for treatment or patients choosing other options. Participants agreed that the audit should continue to monitor this issue and actively communicate their findings with prostate cancer teams.

Partnership between the RCS England and LSHTM

There have been a series of surgical trainees who initially joined the CEU and who then used this experience to apply successfully for NIHR PhD fellowships. The fellowships awards are located at the LSHTM, but the partnership between the RCS England and the School has allowed the surgeons to maintain their collaborations with CEU staff and also access its resources. Surgical trainees Matthew Parry and David Wallace have both benefited from this arrangement and they submitted their PhD theses (on prostate cancer and liver transplantation, respectively) at the end of their fellowships in 2020.

Teaching

Each year, the CEU runs a course for surgeons and other health care professionals on clinical research methods and medical statistics.
The course uses a mixture of teaching methods including lectures to interactive seminars to educate participants about how to practice evidence-based surgery. The course is run for the surgical fellows that have been awarded an RCS England Research Fellowship and is delivered by a CEU methodologists and clinicians.

SELECTED PUBLICATIONS BY CEU STAFF IN 2019 AND 2020

[1] Jauhari Y, Gannon MR, Dodwell D, Horgan K, Clements K, Medina J, Tsang C, Robinson T, Tang SS, Pettengell R, Cromwell DA. Construction of the secondary care administrative records frailty (SCARF) index and validation on older women with operable invasive breast cancer in England and Wales: a cohort study. BMJ Open. 2020;10(5):e035395. doi: 10.1136/bmjopen-2019-035395.

Fitzsimons KJ, Deacon SA, Copley LP, Park MH, Medina J, van der Meulen JH. School absence and achievement in children with isolated orofacial clefts. Arch Dis Child. 2020: archdischild-2020-319123. doi: 10.1136/archdischild-2020-319123.

Johal AS, Loftus IM, Boyle JR, Heikkila K, Waton S, Cromwell DA. Long-term survival after endovascular and open repair of unruptured abdominal aortic aneurysm. Br J Surg. 2019; 106(13):1784-1793. doi: 10.1002/bjs.11215.

Parry MG, Sujenthiran A, Cowling TE, Nossiter J, Cathcart P, Clarke NW, Payne H, Aggarwal A, van der Meulen J. Impact of cancer service centralisation on the radical treatment of men with high-risk and locally advanced prostate cancer: A national cross-sectional analysis in England. Int J Cancer. 2019; 145(1):40-48. doi: 10.1002/ijc.32068.

Vallance AE, Keller DS, Hill J, Braun M, Kuryba A, van der Meulen J, Walker K, Chand M. Role of Emergency Laparoscopic Colectomy for Colorectal Cancer: A Population-based Study in England. Ann Surg. 2019; 270(1):172-179. doi: 10.1097/SLA.0000000000002752.

Wallace D, Walker K, Charman S, Suddle A, Gimson A, Rowe I, Callaghan C, Cowling T, Heaton N, van der Meulen J. Assessing the Impact of Suboptimal Donor Characteristics on Mortality After Liver Transplantation: A Time-dependent Analysis Comparing HCC With Non-HCC Patients. Transplantation. 2019; 103(4):e89-e98. doi: 10.1097/TP.0000000000002559.

Box 1.

MILITARY RESEARCH AND TRIALS

The medical care of those injured during combat operations has measurably improved over the last fifty years, driven by continual capability development in the delivery of complex trauma care, strongly underpinned by research and innovation. Towards the end of the United Kingdom's contribution to NATO-led operations in Afghanistan, British servicemen and women were likely to survive injuries almost twice as severe as those survivable at the start. Lessons learned in those conflicts are inculcated into NHS practice and have transformed trauma care across the United Kingdom.

Appointed by the Royal College, the Professor of Military Surgery is a uniformed surgeon who heads this effort across five of the six surgical specialities presently in regular and reserve Service. The chair has a long history, with the establishment of Regius chairs of Military Surgery in Edinburgh and in Dublin during the reign of George III, and subsequent re-establishment as a uniformed position in 1860, shortly after the end of the Crimean War. The first incumbent was Surgeon General Sir Thomas Longmoor, a veteran of that war and it remains one of the oldest, continually-appointed surgical chairs in the United Kingdom.

I hold the honour of serving in that chair, having been appointed in 2014. I am a Royal Navy officer, a Plastic Surgeon by training, a Sarcoma Surgeon by practice, a veteran of conflicts in the Baltics, Iraq and Afghanistan, and most recently the UK's Senior Medical Advisor and Director of a remote tented hospital on the edge of the White Nile, as part of the United Nations Peacekeeping Mission in Bentiu, South Sudan. In the UK, together with my small team of three part time Senior Lecturers and Lecturers, I lead a broad programme of research that is

Professor Rory Rickard.

firmly focussed on operational trauma care and organised within my themes of Operational System Design, Primary Injury Management, Secondary Injury Prevention, Brain Injury, Noise-Induced Hearing Loss and Regenerative Medicine.

Our results are delivered in part by internal, MoD research effort funded through the Surgeon General's Department and through Defence Science and Technology. Allocations fund research programmes within RCDM, at the Defence Science and Technology Laboratories (dstl) and through the Defence and Security Accelerator programme (DASA). I am particularly proud of the inclusive and collaborative process that has focused our efforts in Regenerative Medicine, facilitated by Lt Col Graham Lawton working in close collaboration with Dr Abigail Spear at dstl, and of the game-changing work of Lt Col Linda Orr in tackling noise-induced hearing loss through her hearWell programme. Linda's work has stepped beyond discovery science and proof of

concept, to truly deliver for casualties of acute acoustic trauma, and I am delighted that she was recognised for her work by the award of an OBE in the 2020 New Year's Honours List. Lt Col Mark Foster continues to pursue his Trauma Physiology portfolio with the co-funded Surgical Reconstruction and Microbiology Research Centre in Birmingham. These areas are each expanded on in subsequent pages.

Internal medical research effort, however, is small, comprising only 1% of Britain's military R&D budget.

Much greater capacity is harnessed by partnering with academic centres of excellence in the UK and abroad in collaborative programmes of palpable military benefit, resourced in partnership with the NIHR and UKRI and through charitable funding, together currently totalling in the region of £30M across all medical disciplines. Surgical Research contributes a significant sum to that figure at £12.5M of external funding across my portfolio.

Alongside research carried out in the United Kingdom, I have been honoured to work with allies within NATO, and in particular our principle ally, the United States of America. British Military Research Fellows have pursued programmes at the US Army's Institute of Surgical Research in San Antonio, Texas, and at the Uniformed Services University in Bethesda, Maryland and I am delighted also that we have been able to host American surgical residents in the UK – at the Royal Centre for Defence Medicine at Queen Elizabeth Hospital, Birmingham, and within the Vascular Surgery team at the James Cook University Hospital, Middlesborough. 2020 celebrates the 400th Anniversary of the sailing from Plymouth of the Mayflower, and I am particularly grateful to Professor Alderson and Professor Mortensen for celebrating that transatlantic relationship this year through the award of two Honorary Fellowships of our College; to Captain Eric Elster USN, Professor and Chair of Surgery at USU and Col Michael Davis UASF, formerly Deputy Commander in San Antonio.

Central to the continual development of Defence's medical capability are, of course, its people. Time out of surgical training in the pursuit of doctorates develops military surgeons in scholarship; in critical and divergent thinking, in communication and in project delivery. Over the last six years, three fifths of uniformed surgical trainees have accessed programmes of research at nine universities in the United Kingdom and United States of America, co-supervised or mentored from within my department. Fourteen doctorates have been awarded in that time, four in FY 19/20. Nine more (eight PhD/DPhil and one MD) are ongoing or near completion at the time of writing.

The College's Research Fellowship programme has been central to researchers' development and I am delighted that, since 2015, military candidates have been judged amongst their civilian peers on a level playing field. The standard of applicant, civilian and military is very high indeed and the competition is stiff. I am proud that, of the nine military doctorates ongoing at the time of writing, eight researchers are or have been College Research Fellows, and readers will have enjoyed their reports in this and in previous years' editions. I am enormously grateful to Martyn Coomer and his team for their support to our uniformed trainees and to Martyn specifically for his encouragement. I wish you well Martyn in your retirement – you will be a hard act to follow!

Martin Bricknell and Philip Spreadborough at Department of Defense.

It is superficially attractive to exact a 'peace dividend' when we are no longer fighting, by reducing the support to military medical services and to our research programmes. This leads to a dip in capability at the start of the next, inevitable conflict, in turn paid for in lives lost as denuded military medical services are forced to rapidly readapt and regain that capability. I argue that now is in fact the time for research and innovation in the delivery of trauma care; not when the bombs and the bullets start arriving. I am hugely grateful therefore to the College and to its generous benefactors for their continued support in delivering that research. Our people are of a very high quality and the future of research across the surgical disciplines is bright. We must continue to drive it.

Anton Fries at a College event.

Rob Staruch, Research Fellow.

Trauma Physiology & Surgical Reconstruction and Microbiology Research Centre (SRMRC)

Lt Col Mark Foster FRCS(Plast) PhD

The Trauma Physiology Theme has dovetailed into the NIHR SRMRC to enhance delivery of military related projects. The SRMRC objective is to deliver a high quality, integrated programme of multi-disciplinary trauma research relevant to military and NHS trauma care, that is flexible to emerging trauma research needs. The centre has established a strong multi-disciplinary team (military/civilian), both clinical and academic, working within and across the three partner organisations, located on the same campus: University of Birmingham (UoB), University Hospitals Birmingham NHS Foundation Trust (UHB) and the Royal Centre for Defence Medicine (RCDM). The QE site (UHB) is a busy Major Trauma Service (MTS), served by military and civilian personnel, and provides a rich cohort to recruit to research trials embedded within clinical excellence.

This year the SRMRC has shown exceptional responsiveness when the COVID-19 pandemic hit in March 2020, with UHB being one of the most affected hospitals. All clinical trials and research studies were rapidly and safely paused in a matter of days, and non-COVID-19 research laboratories at UoB closed. Clinical staff were re-deployed into key frontline positions (e.g. ICU) and some of the delivery team moved to support the new UHB COVID-19 research trial delivery team. In late May/June 2020, following the release of the NIHR's Restart Framework, a viability/prioritisation/safety review was performed of paused studies for re-opening, in close liaison with the relevant clinical service leads; the process was governed and approved via UHB's Research Assessment and Prioritisation group in R D & I. As of September 2020 all re-deployed staff have repatriated to their home departments, the majority of trials were re-opened, and UoB laboratories and staff working back on site.

Smart Triage Data box

Prof Toni Belli, Maj Nabeela Malik , Col Doug Bowley, Lt Col M Foster, Prof George Ghoutos & Lt Col Damian Keene.

Project objective was to develop a secondary and mass casualty triage tool that could be used in military and civilian major incidents. The Team have validated a system of assigning Major Incident Triage categories using 195,000 patients from the national trauma registry (TARN) and have retrospectively assessed the performance of 10 existing international primary and secondary triage tools. Having created a meta-model using machine learning that outperforms existing tools, the team are in the process of validating this in external military and civilian datasets prior to adapting the model for clinical use as a novel Secondary Triage Tool.

Lt Col Mark Foster FRCS(Plast) PhD.

Improving the metrics for assessment of injury burden to improve patient stratification

Dr Animesh Acharjee, Prof George Ghoutos & Lt Col M A Foster

The challenges of evaluating new strategies to treat major injuries begins with understanding the burden and complexity of the injury. Outcome measures of mortality, while noble, fail to appreciate how the immediate treatment will impact on the long-term rehabilitation and ultimately when the patient returns to work. Our work is tackling the very challenging area of stratifying the injury in order to develop robust outcome measures and ultimately test novel treatments.

The Team have developed and applied a framework that consisted of a suite of machine-learning algorithms to segment a mixed civilian and military major trauma cohort (SIRS) into multiple time frames and identified metabolite markers for each of the segments. Then combined these metabolites with clinical features, and managed to identify a number of biomarkers linked to particular outcomes, including length of ICU stay. Further work is underway to analyse pathways using key parts of the metabolome and identify targets in order to develop unique metabolomic outcomes[1]. By understanding the trajectory of metabolome over the course of the patients recovery we hope to define end-states that can be used in the establishment of new management and treatment strategies.

A prospective, phase II, single centre, cross-sectional, randomised study investigating Dehydroepiandrosterone (DHEA) and Pharmacokinetics in Trauma – ADaPT

Mr Conor Bentley, Flt Lt Peter Bird, Prof Janet Lord, Prof Wiebka Arlt & Lt Col M A Foster

36 patients have been enrolled in this dose escalation CTIMP. Using an early sex steroid (DHEA) that has both immunogenic, as well as androgenic effects that ameliorates the immunoendocrine response to severe injury.

Paused during COVID-19, the trial reopened in August and is recruiting well. The trial will run to DHEA drug expiry in July 2021. This feasibility study will form the basis of a EME Grant application to deliver a Multi-centre double blinded RCT using DHEA to treat severely injury young and elderly hip fractures to reduce catabolism, improve rehabilitation and reduce infections[2].

1. Laura Bravo-Merodio, Animesh Acharjee, Jon Hazeldine, Conor Bentley, Mark Foster, Georgios V Gkoutos, Janet M Lord. ***Machine learning for the detection of early immunological markers as predictors of multi-organ dysfunction.*** *Sci Data 2019;* ***6****: 328.*

2. Bentley C, Hazeldine J, Greig C, Lord J, Foster MA. ***Dehydroepiandrosterone: a potential therapeutic agent in the treatment and rehabilitation of the traumatically injured patient.*** *Burns & Trauma 2019;* ***7****: 26.*

Reconstruction and Regenerative Medicine Research Report

Graham Lawton

Regenerative Medicine at the Front Line has been an exemplar of how modern military research is collaboratively conceived, constructed, funded and delivered.

Projecting regenerative medical technologies forward onto the battlefield in an austere environment is novel, and the antithesis of how its utility is currently envisaged. The program concentrates our efforts into three themes:

1. Bioengineered blood;

2. The exploitation of mechanobiology and other physical phenomena for wound regeneration, and;

3. Harnessing the endogenous regenerative response in severe traumatic injury. More detail is available here.

Five projects were funded in 2018 through the Defence and Security Accelerator (DASA), under the Regenerative Medicine at the front line umbrella, examining the first two themes. These then competed and two were taken into Phase two, with an additional £0.5M of funding. This collaboration between ADMST, DASA and Dstl is financing projects in the Universities of Bristol and Nottingham to generate trauma-focused scientific outputs in the fields of immunologically-naïve engineered red blood cells with enhanced properties and the promotion of soft tissue regeneration using gene therapy delivered through topical negative pressure. Additional funding was found to support a third project at the University of Cambridge investigating platelet production in vitro.

Experimental modelling of combat wounds needs to change if we are to advance the science in this domain and to improve treatments. ADMST, alongside Dstl have sponsored an NC3Rs CRACK-IT challenge to produce a complex skeletal muscle model of significant injury with up to £0.9M available from DST(Dstl) and UKRI(EPSRC). Innovative modelling is also at the heart of a research project being undertaken by a College Research Fellow, Major Rob Staruch, examining the mechanobiological effects of blast as part of a UK StratCom/EPSRC-Dstl iCASE funded PhD at Oxford University.

We have also helped conduct and advise efforts by the Scar Free Foundation to define the research agenda and funding call for the Centre for Conflict Wound Research at the University of Birmingham.

The COVID-19 pandemic necessarily required the cancellation of scientific events at Tissue Engineering and Regenerative Medicine (TERMIS) and Trauma Hemostasis and Oxygenation Research (THOR) which we were heavily involved in delivering and hosting. We look forward to picking these up as the world adapts.

The common thread of this program has been one of partnership with external academic agencies, charities and government agencies to map out the regenerative medicine landscape and focus efforts on to those military-specific challenges.

1. npj Regenerative Medicine (2018)3:13 ;doi:10.1038/s41536-018-0053-4, available at https://www.nature.com/articles/s41536-018-0053-4

Lieutenant Colonel Linda Orr

The hearWELL research collaboration has been led since its' inception by Lt Col Linda Orr, Senior Lecturer in the Academic Department of Military Surgery and Trauma and ENT Consultant at the Queen Elizabeth Hospital, Birmingham.

The hearWELL research portfolio has leveraged £2.9M of competitively-awarded grant funding. The collaborative model of delivery we have developed is predicated on a core multi-professional team which, in addition to delivery of individual research projects, acts as the central academic 'hub' facilitating mutual support between a wide range of national and international subject matter experts in hearing research and areas as diverse as engineering, material science and machine learning. Partners are made aware of funding calls, opportunities for joint resource efficient working, early results of key studies, evidence based best practice guidelines and a vehicle through which collaborators can jointly influence international research strategy. This model has given a unique understanding of individual members priorities and allowed UK Defence and the hearing research community to focus on complementary, rather than competing work.

As part of a project supported by a £300K pump priming LIBOR award, the team are also exploring the possibility of establishment of a Military Institute of Hearing Health, with the overarching aim being to translate discovery science and technology innovation into tangible clinical delivery for Defence and the Nation. This includes integration into new, flexible and resilient, higher quality models of hearing health care which extended to support the delivery of emerging hearing rescue treatments and procedures in Noise Induced Hearing Loss (NIHL).

Research themes supported and delivered by the hearWELL Collaboration have already successfully translated across to clinical delivery in both the military firm base and deployed operations and now influence, with increasing international reach, both within and outside the military arena into civilian clinical practice, helping address unmet needs within the NHS, commercial and third sectors. The size and scope of the collaboration is significant and increasing; inclusive of UK governmental bodies such as Public Health England, the National Emergency Preparedness, Resilience and Response (EPRR) committee, Gold Command, Office of the CSO, Department of Health and Social Care, and the Health and Safety Executive. Many NHS groups and UK and international universities are represented, and strong relationships exist with NATO partners including the US Department of Defence, Hearing Center of Excellence, Collaborative Audio-vestibular Research Network and the International Pharmacological Interventions in Hearing Loss collective.

Early projects have delivered for Defence in areas as diverse as pharmacological interventions for tinnitus, 'smart' materials in hearing protective devices, and new technology to assessing hearing loss remotely and support the delivery of hearing rescue treatments. Collaborations proved invaluable when the core hearWELL team coordinated and delivered part of the Military Aid to the Civil Authorities (MACA) task resulting from the Manchester Arena bombing; rapid, new evidence-based SME guidance for the clinical management of mass acoustic casualties and associated logistic considerations, now included within the NHS England, EPRR - Clinical Guidelines for Major Incidents and Mass Casualty Events.

Operating overseas with the portable toolkit on AAT

The UK Military Hearing Health Pathway (MHHP) is the final mesh of several major research work strands. Basic science discovery, brought together by the department, has identified treatment options for acute noise induced hearing loss. This has stimulated the drive to identify innovative technology that allows translation of this new capability to provide a robust British military hearing assessment programme, interdigitated electronically with delivery of secondary care surgical opinion capable of extension to manage acoustically injured patients irrespective of their location. The pathway has recently translated across to directly support the NHS in the delivery of otology services under unprecedented pressures due to COVID-19.

For service personnel who suffer a hearing loss secondary to an acute acoustic trauma (AAT), it is now recognised that there are 'rescue' treatment options available. The key to success is timely identification of those injured through a robust assessment tool which we have developed. The portable toolkit uses innovative technologies capable of delivering gold standard hearing assessment inclusive of history, imaging and audiology data to inform and support a clear management pathway to remote SME review, with resultant individual stratification and provision of treatment when required, whether the patient be on board a warship at sea, a jungle overseas or a GP surgery in the UK.

Linda teaching medics to use the kit.

It is now possible to deliver full hearing assessments and rescue treatments at the point of injury without the need for sophisticated medical facilities. This has fundamentally changed the treatment landscape for NIHL, not only for military personnel but all those who suffer the loss of this vital sense acutely as a result of war, terrorist incidents or natural disasters.

hearWELL's success has been built on collaboration, and maintains the central core value the Department places on its people, reflecting this in the support and encouragement given to individuals to allow them to develop their own research interests and gain their higher degrees. Included in the wider clinical team are SSgt Rita St Ange QARANC, who has also been awarded a Queen's Commission and Mr J Muzaffar who is undertaking a PhD, delivered in collaboration with Cambridge University, investigating site of lesion testing and 'hidden hearing loss' within the auditory pathway. The core hearWELL team have had some other notable successes in 2019/20, Amy Gosling and Ros Parker have received recognition from the NIHR CRN for their development of PPI networks, and Jameel Muzaffar has been awarded an RCS England Research Fellowship and the United States, National Hearing Conservation Association Student Award.

RESEARCH IN THE FACULTY OF DENTAL SURGERY

Professor Helen Rodd.

Many can testify to the role that an FDS grant played in shaping a career pathway, myself included. It is therefore important that these success stories and research findings are widely publicised in both professional and public domains, which will be one of our priorities in the coming year.

One of my first tasks as the new FDS Research Chair was to provide this update for the RCS England Surgical Research Report and I would like to start off by acknowledging the astute leadership of the outgoing Chair, Professor Stephen Porter, and his predecessor, Professor Paul Speight. I have been fortunate to learn from the very best, and I hope to continue their wise but innovative custodianship of the Faculty's research funds. The FDS is committed to supporting talented oral health researchers, early on in their careers, investing not only in their ideas but also in them as individuals. A research career can be a difficult one to access, but the FDS research fellowships and pump-priming grants can offer an attainable but prestigious starting point. Many can testify to the role that an FDS grant played in shaping a career pathway, myself included. It is therefore important that these success stories and research findings are widely publicised in both professional and public domains, which will be one of our priorities in the coming year.

In 2019 we received a plethora of high calibre applications for FDS pump-priming grants. It was very encouraging to see that applications were not London-centric but had wide geographical spread as well as excellent representation from female and BAME candidates. The research proposals encompassed laboratory, clinical and social science research themes with good evidence of potential patient benefit. Following a rigorous and independent ranking process by all Research Committee members, three pump-priming grants were awarded (see table on the next page for successful applicants). In addition, an FDS fellowship award (spread over a two-year period) was awarded to Mohammad Owaise Sharif, from UCL Eastman Dental Institute. Dr Sharif impressed the interview panel with his innovative research to explore the effectiveness of an App ('My Braces') in supporting orthodontic patients through their treatment journey.

Summary of Research Grants awarded by FDS RCS England (2019–2020)

Applicant	Host Institution	Research Title
2019 FDS Pump Priming Grants		
Anna Pritchard	University of Central Lancashire	Periodontitis-Alzheimer's disease axis: Understanding virulence factors of the oral microbiome and transport across the blood brain barrier
Federico Moreno Sancho	UCL Eastman Dental Institute	Angiogenesis in vivo: bone scaffolds with or without tissue-specific cell-based therapy in a chick embryo model
Krupali Patel	University College London	Investigating the role xenophagy and LC3-mediated phagocytosis in orofacial granulomatosis
2019 FDS Research Fellowship		
Mohammad Owaise Sharif	Eastman Dental Institute, University College London	Personalised provision of orthodontic treatment information in the digital age
2020 FDS Pump Priming Grant		
Robert Kennedy	Guy's Hospital	Intra-tumoral distribution of tumour infiltrating lymphocytes in head and neck cancer
2020 FDS-BSPD Pump Priming Grant		
Laura Timms	University of Sheffield	Children as co-designers: innovating research into the use of silver diamine fluoride for caries management

As part of our grant's terms and conditions, recipients are required to submit a final report at the end of their funding year. In 2019, a number of such reports were received by the FDS and demonstrated the exciting and productive research outputs of the awardees (as shown in the accompanying case stories). Going forward, the FDS Research Committee would like to offer more supporting terms of mentorship for these early career researchers, particularly those who intend to apply for personal fellowships, such as those offered by the NIHR. It was evidently clear from the feedback of over 100 attendees at the Faculty's successful 2019 Research Symposium that we have an important role in supporting our 'junior' colleagues in their obvious enthusiasm for oral health research.

MUTATIONAL ANALYSIS OF OSSIFYING FIBROMAS OF THE JAWS

Lisette Collins

SUPERVISORS:
Professor Paul Speight

SITE OF WORK:
University of Sheffield

PUBLICATIONS:

1. Martin LHC & Speight P (2018) Mutational analysis of ossifying fibromas of the jaws and craniofacial skeleton. VIRCHOWS ARCHIV, Vol. 473 (pp S47-S47)

2. Martin LHC, Zegalie N, Speight P (2017) Ossifying fibromas of the head and neck: A clinical, radiological and histopathological review, Virchows Archiv. 471:S156

PRESENTATIONS:

1. European Congress of Pathology, Euskalduna Conference Centre, Bilbao, Spain, 2019

2. British Society of Oral and Maxillofacial Pathology Annual Scientific Meeting, The Edge, Sheffield, UK, 2018

PRIZES:

1. Genomic Medicine Prize, University of Sheffield, 2019

2. StR/Early Career Researcher/ Postgraduate Research Prize, British Society of Oral and Maxillofacial Pathology, 2018

FURTHER FUNDING:
Health Education England funded the MSc, which this research project contributed towards

Ossifying fibroma is a benign (non-cancerous) bone tumour that exclusively affects the bones of the face and jaws. These tumours do not spread to other parts of the body, but they do need to be surgically removed as they continuously grow, causing facial deformity which can be distressing for the patient.

Ossifying fibroma is one of a group of bone conditions called the 'fibro-osseous lesions' which are made up of fibrous tissue and abnormal bone. Studies have shown that tissue biopsies for all fibro-osseous lesions look very similar under the microscope, making them very difficult to diagnose correctly. Often the only way to tell them apart is by their x-ray appearance, which can be unreliable.

Dr Max Robinson awards the Str/Post-graduate Research Prize on behalf the British Society of Oral and Maxillofacial pathology (BSOMP), Sheffield, 2018.

It is important to get the right diagnosis so the patient can get the correct treatment, as quickly as possible. Genetic tests can help diagnosis, however there is no test for ossifying fibroma. This is one of very few studies looking into the genetics of ossifying fibroma.

Our aims:

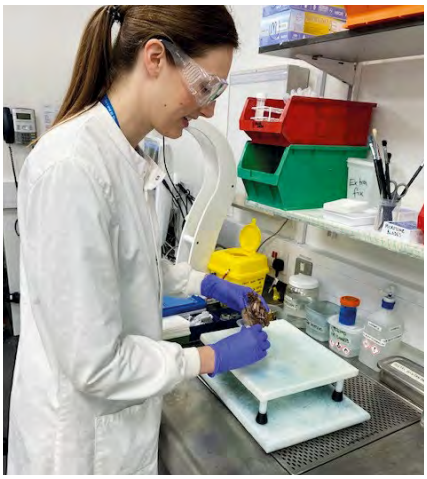
- Extract DNA from ossifying fibroma samples
- Analyse the DNA code to look for gene changes which we could use for future genetic tests.

Presentation of research, European Congress of Pathology, Bilbao, 2019.

We successfully extracted ossifying fibroma tumour DNA from old tissue samples. When we compared the tumour DNA to that to normal human DNA, we found numerous changes. Using computer software, we narrowed the large number of changes down to just seven altered genes by selecting them on whether they changed the protein product of the gene and whether this was predicted to cause disease.

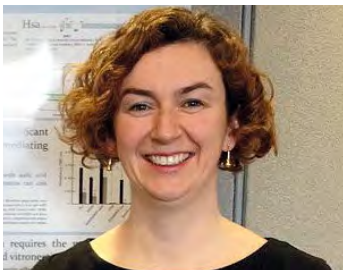
The seven genes we found all had roles in cell death or growth, which are often abnormally increased in tumours.

Helping to narrow down to just seven genes of interest allows further research in this area, opening new avenues of scientific investigation.



Macroscopic assessment of a patient's jaw.

MECHANISMS OF ORAL STREPTOCOCCUS–INDUCED PLATELET ACTIVATION



Jennifer Haworth

FELLOWSHIP/SPONSOR:
Faculty of Dental Surgery of The Royal College of Surgeons of England Small Grants Scheme

SUPERVISORS:
Dr Angela Nobbs

SITE OF WORK:
Oral Microbiology, Bristol Dental School, University of Bristol

PUBLICATIONS:
1. From orthodontic separators to the heart: a laboratory-based study of oral streptococcal blood survival mechanisms (in draft)

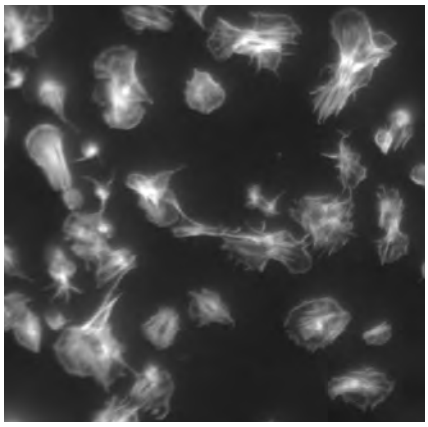
PRESENTATIONS:
1. Poster presentation at British Orthodontic Conference, Manchester, 2017

FURTHER FUNDING:
Starter Grant for Clinical Lecturer (Academy of Medical Sciences)

Bacteria normally found in the mouth can sometimes enter the bloodstream. This can allow them to cause infections at other sites within the body. One example is a rare but serious form of heart disease known as infective endocarditis (IE). Oral Streptococcus bacteria are associated with IE because, once in the bloodstream, they can activate blood platelets, increasing the risk of clots forming on the heart valves. However, a detailed understanding of how these bacteria can survive in blood is currently lacking. The aim of this study was therefore to investigate the role of proteins found on the bacterial cell surface in promoting bacterial survival in blood.

Oral bacterium Streptococcus gordonii and mutant versions that lacked different surface proteins were incubated in blood obtained from healthy volunteers, and survival was measured over time. The ability of these bacteria to interact with components of the blood was also determined. The results of this project showed that IE pathogen S. gordonii can persist in human blood for at least six hours. Moreover, surface proteins known as PadA and Hsa may contribute to this survival by binding vitronectin and Factor H found in blood. Specifically, these interactions could allow S. gordonii to evade killing by the immune system.

Mechanisms for survival of Streptococcus bacteria in the bloodstream, such as those identified in this project, may be suitable targets for the prevention or treatment of IE in the future. Further studies aim to better understand these interactions, and the mechanisms by which oral Streptococcus bacteria can interact with platelets and heart tissue to promote unwanted clot formation.



Platelet spreading induced by Streptococcus gordonii.

Bacteria normally found in the mouth can survive in human blood for more than six hours, allowing them to cause infections at other sites within the body, such as the heart.

FACULTY OF DENTAL SURGERY SMALL GRANT

John Perry

SUPERVISORS:
Hashmat Popat, Specialist Orthodontist, Ilona Johnson, Senior Clinical Lecturer and Honorary Consultant in Dental Public Health

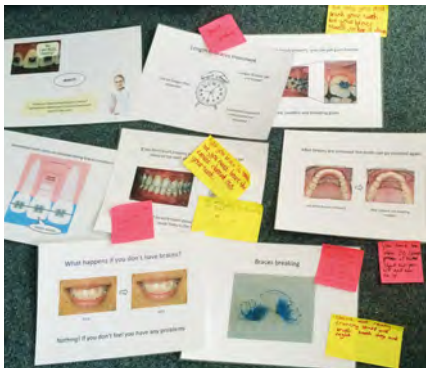
SITE OF WORK:
Cardiff University School of Dentistry

PUBLICATIONS:
1. Perry J, Popat H, Johnson I, Morgan M, Farnell D. Professional consensus on orthodontic risks – what orthodontists should tell their patients. American Journal of Orthodontics and Dentofacial Orthopaedics (accepted, publication Jan 2021)

2. Perry J, Johnson I, Popat H, Morgan M, Gill P. Adolescent perceptions of orthodontic treatment risks and risk information. Journal of Dentistry. 2018; 74: 61-70

PRESENTATIONS:
Oral presentation 'Establishing the evidence base for risk communication in orthodontics' British Orthodontic Conference, University Teachers' Group Session. Manchester. 14.9.17

John was awarded a Faculty small grant in 2016 which enabled him to carry out research to develop an evidence base for risk communication in orthodontics. This work was undertaken as part of his MScD at Cardiff University School of Dentistry, completed 2017 and received the British Orthodontic Society Houston Postgraduate Research Scholar, 2018.



Macroscopic assessment of a patient's jaw.

John's faculty-funded research has established a professional orthodontic consensus about the information that should be discussed with patients as part of consent for orthodontic treatment. In addition, a deep understanding of adolescents' values and beliefs in relation to the risks of orthodontic treatment was obtained through group interviews. This evidence base will be used to guide the development of risk communication tools, professional guidelines and patient resources.

The FDS grant has allowed John to publish his work in peer reviewed journals and present nationally.

Following completion of his specialist training in orthodontics, John completed a Craniofacial and Cleft Fellowship, Great Ormond Street Hospital, and currently works in specialist practice and is Consultant Orthodontist, Christchurch Hospital, New Zealand.

A QUALITATIVE STUDY INVESTIGATING OUTCOMES OF ORTHODONTIC TREATMENT FROM THE PERSPECTIVE OF PATIENTS AND PARENTS

Rupal Shah

FELLOWSHIP/SPONSOR:
FDS Small Grant

SUPERVISORS:
Professor Susan J. Cunningham

SITE OF WORK:
Eastman Dental Hospital

PUBLICATIONS:
1. Parents' perceptions of outcomes of orthodontic treatment in adolescent patients: a qualitative study. R. Shah, N. AlQuraini, S.J. Cunningham. European Journal of Orthodontics 2019; 41 (3): 301-307

2. Perceptions of outcomes of orthodontic treatment in adolescent patients: a qualitative study. N. AlQuraini, R. Shah, S.J. Cunningham

PRESENTATIONS:
1. June 2018: Parents' perceptions of outcomes of orthodontic treatment in adolescent patients: a qualitative study R. Shah*, N. AlQuraini, S. J. Cunningham European Orthodontic Congress, Edinburgh, UK

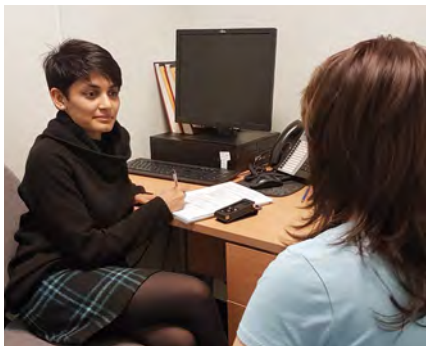
2. September 2018: Orthodontic treatment outcomes in adolescents from the parent perspective R. Shah*, N. AlQuraini, S. J. Cunningham UTG session, British Orthodontic Conference, London

PRIZES:
1. September 2018: UTG Research presentation 2nd prize, awarded by the British Orthodontic Society (London)

2. June 2018: Selected for participation in the Houston oral research award, by the European Orthodontic Society

There is general acceptance that patients, and their parents, seek treatment for reasons including improvements in aesthetics, function, and quality of life. However, there is still little high-quality evidence regarding how these are affected by treatment. The aim of this qualitative study was to investigate the outcomes associated with orthodontic treatment from the perspective of adolescent patients and their parents/guardians.

This was a prospective qualitative study in which 20 adolescent patients (aged 13–18 years), and 22 parents, were interviewed using semi-structured in-depth interviews to assess how they felt about the outcomes of their treatment. The interviews were digitally recorded and then transcribed verbatim, and a content thematic analysis was undertaken using a framework approach.



Undertaking a qualitative interview with a parent.

Thematic analysis identified three main themes, and associated subthemes, relating to outcomes of treatment: health-related behavioural change, dental health, and psychosocial influences. The majority of patients and parents discussed health-related behavioural changes, including an improved focus on oral hygiene and an improved diet. However, this topic has not really been discussed to any great extent in the literature before, but was discussed by almost all of the patients and parents interviewed indicating the potentially great importance of this outcome, not only for patients but also for the orthodontic profession. The themes also support the quality of life benefits of treatment, for example, increased self-confidence and improved social and personal interactions as a result of this.

In conclusion, the interviews have identified important positive, and potentially long-term, benefits of orthodontic treatment. The results provide invaluable information, which increases our understanding of the treatment we provide and gives information that can be used when managing expectations during the informed consent stage. It is hoped that this may allow enhanced satisfaction following treatment.

Patients and parents in this study reported three main benefits of orthodontic treatment: dental health, health-related behavioural change and psychosocial health/influences.

The theme associated with health-related behavioural change was discussed by almost all of the patients and parents, indicating the potential importance of this outcome in both the short and longer term.

PERSONALISED PROVISION OF ORTHODONTIC TREATMENT INFORMATION IN THE DIGITAL AGE

Mohammad Owaise Sharif

FELLOWSHIP/SPONSOR:
Royal College of Surgeons of England, Faculty of Dental Surgery 70th Anniversary Special Research Fellowship

SUPERVISORS:
Professor Susan Cunningham,
Dr Fiona Ryan,
Professor Tim Newton

SITE OF WORK:
Eastman Dental Hospital

PUBLICATIONS:
1. Sharif M.O. Newton T. Cunningham S.J. A systematic review to assess the effectiveness of interventions delivered by mobile phones in improving adherence to oral hygiene advice for children and adolescents. British Dental Journal. Sep 2019; 227(5): 375-382. PMID: 31520040

2. Siddiqui N. Hodges S. Sharif M.O. Availability of orthodontic smartphone apps. Journal of Orthodontics, Jun 2019; PMID: 31169046

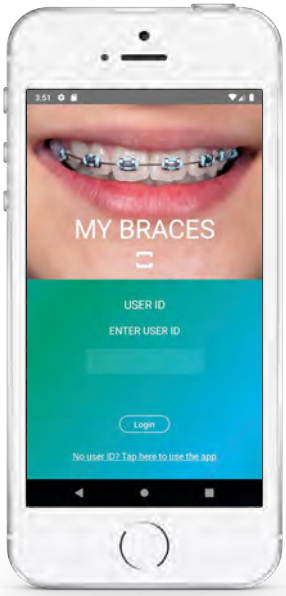
FURTHER FUNDING:
Royal College of Surgeons of England, Faculty of Dental Surgery

Adherence to treatment advice is essential for successful orthodontic treatment outcomes. Adherence to treatment advice is essential for successful orthodontic treatment outcomes. Available evidence suggests that Apps may improve adherence to advice by increasing appointment attendance, reducing breakages of the brace and improving oral hygiene measures (e.g. toothbrushing). There is also increasing evidence that Apps with a personalised healthcare communication based on behaviour change theory are more effective than non-personalised interventions. On commencing this fellowship, there were no randomised controlled trials assessing the effectiveness of personalised Apps for orthodontic patients. The aim of this fellowship was therefore to develop a personalised mobile App, informed by patients and professionals.

During the course of the fellowship I attended the UCL Centre for Behaviour Change summer school (2017), this provided me with a unique opportunity to develop a theoretical and practical knowledge of behaviour change theory.

Subsequently, a patient and professional engagement (PPE) panel was convened to inform the development of “My Braces”, such that it is grounded in behaviour change theory. The My Braces App provides generic orthodontic treatment information and there is also a personalised element of the app which allows patients to input their own treatment information (including progress photographs), set goals (such as keeping teeth clean), develop plans for achieving these goals and monitor progress. Ultimately, this App aims to improve adherence to treatment advice.

The next stage of this research is to feasibility test the My Braces App and assess its effectiveness by way of a randomised controlled trial. Ethical approval has been obtained for this (Ref: 19/LO/1555) and a further Royal College of Surgeons of England, Faculty of Dental Surgery Fellowship has been obtained to support this. If found effective, the methodology utilised to develop the My Braces App has wide applicability across healthcare to improve adherence and thus provides an exciting prospect.



My Braces App home page.

As many as 43% of patients fail to complete a course of orthodontic treatment for a wide range of reasons: delivering personalised treatment information via a mobile App may help to improve patient adherence to treatment advice.

TRAVEL AWARDS

Jemma Boyle, Dame Sue Street – daughter of Stefan and Anna Galeski and Kat Parmar at the Surgical Skills workshop, Cairo.

The College is pleased to be able to offer a variety of awards as a result of the generous support of companies and individuals. These awards give surgeons the opportunity to work in an overseas institution to learn more about a particular surgical technique or area. The main benefit of the travelling awards is that the surgeon who benefits can translate the experience and know-how gained during the overseas fellowship to his or her own knowledge base, to benefit future patients in this country. The committees that decide the recipients of the travelling awards always include leading surgeons.

Rex and Jean Lawrie Fellowship and Stefan & Anna Galeski Fellowship

Each year the families of Rex and Jean Lawrie, and Stefan and Anna Galeski, fund a number of surgeons to undertake various surgical skills workshops and other such activities to help improve surgical skills, and thus surgical care, for people in low and middle income countries throughout the world. Such generosity is deeply appreciated by the College, the numerous UK surgeons who receive the fellowships' support and most importantly the surgeons who learn various surgical skills in the host countries.

Recipients 2019

- Kat Parmar – Egypt
- Jemma Boyle – Egypt
- Nigel Day – Ghana
- Chantelle Rizan – Ghana

Recipients 2020

- Jody Parker – Guatemala

Chantelle Rizan – Ghana.

Ethicon Foundation Fund

The Ethicon Foundation Fund was established by the generosity of Ethicon Limited. The Fund provides financial assistance towards the cost of the travel to and from a research or training fellowship, thereby promoting international goodwill in surgery. Applicants should be sufficiently advanced in their training to benefit from such an experience or be within one year of their appointment as consultant surgeon.

Recipients May 2019

- Muhammad Javed, Royal Adelaide Hospital, Australia
- Kavan Johal, South Korea and China Medical University Hospital, Taiwan
- Siong-Seng Liau, University of Pittsburgh Medical Centre and Carolinas Medical Centre, US
- Gareth Lloyd, Queensland Children's Hospital, Brisbane, Australia
- Robert MacFarlane, The Institut de la Main, Paris, France
- Navin Mani, Hanyang University Hospital, Seoul, South Korea
- Ananth Vijendren, University Malaya Medical Centre, Kuala Lumpur, Malaysia

Recipients December 2019

- Richard Cobb, Royal Melbourne Hospital, Australia
- Shan Jing, The Ganga Hospital, Coimbatore, India and Shandong Provincial Hospital, Jinan, China
- Luke McGuinness, Kulkarni Endo Surgery Institute and Reconstructive Urology Center, India
- Omar Mirza, Memorial Sloan Kettering Cancer Center, New York, USA
- Kiki Mistry, The Royal Melbourne Hospital, Australia
- Kshemendra Senarath-Yapa, Asan Medical Center, Seoul, Korea
- Paul Sutton, Royal Prince Alfred Hospital, Sydney, Australia

Recipients May 2020

- Zafar Ahmad, University of Western Ontario, Canada
- Aiman Alassar, Stanford University Medical Centre, California, USA
- Eleanor Atkins, Flinders Medical Centre, Adelaide, Australia
- Heman Joshi, Kyungpook National University Medical Center, Daegu, South Korea
- Aadil Mumith, Sunnybrook Holland Orthopaedic & Arthritic Centre, Toronto, Canada
- Robin Som, Vancouver General Hospital, Canada
- Nicholas Ventham, Royal Brisbane Hospital, Brisbane, Australia

Colledge Family Memorial Fellowship Fund

The Colledge Memorial Travelling Fellowship was established by Miss Cecilia Colledge in 1979 in memory of her father, the distinguished surgeon Lionel Colledge and her brother Maule who died in active service during the Second World War. The Fellowship was founded to promote and advance the study and knowledge of surgery, in particular head and neck surgery, for the benefit of patients. Applicants must be senior trainees or new consultants and plan to a study for a period overseas.

Recipients 2019

- Omar Mirza, Memorial Sloan Kettering Cancer Center, New York, USA
- Jason Fleming, University of Alabama, Birmingham, AL, USA
- Gaurav Chawdhary, QEII Health Sciences Centre, Halifax, Nova Scotia, Canada
- Jagdeep Virk, Peter MacCallum Cancer Centre, Melbourne, Australia
- Lakhbinder Pabla, Department of Paediatric Otolaryngology, Royal Children's Hospital, Melbourne, Australia

The Rosetrees Trust Prize

The Rosetrees Trust Prize was established in 2009 and applicants are asked to write an essay to 'describe how your research project will contribute to improvements in patient care within the next five years'.

2018 Winner

- Miss Natalie Allen MRCS 'Defining molecular signatures to personalise management of patients with early breast cancer'

2018 Runners-up

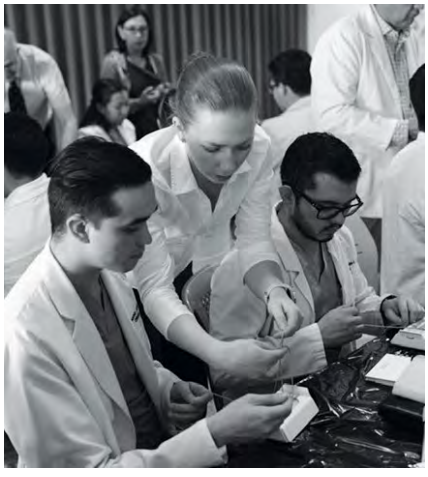
- Miss Vanessa Brown MRCS 'Can beetroot juice improve fitness before and outcomes after major surgery?'
- Mr Paul Vulliamy MRCS 'Zombie platelets trigger dysfunctional blood clotting after major trauma'

2019 Winner

- Mr Kartik Logishetty MRCS 'The development and validation of Virtual Reality simulation to improve trainee performance of complex open surgical procedures'

2019 Runners-up

- Mr Timothy Biggs MRCSH DOHNS 'Targeting intracellular bacteria to improve outcomes in Chronic Rhinosinusitis'
- Ms Meera Joshi MRCS 'Optimising the identification of acute clinical deterioration and sepsis through digital technology'



Jody Parker teaching in Guatemala.

Harry Morton Travel Award, RCS

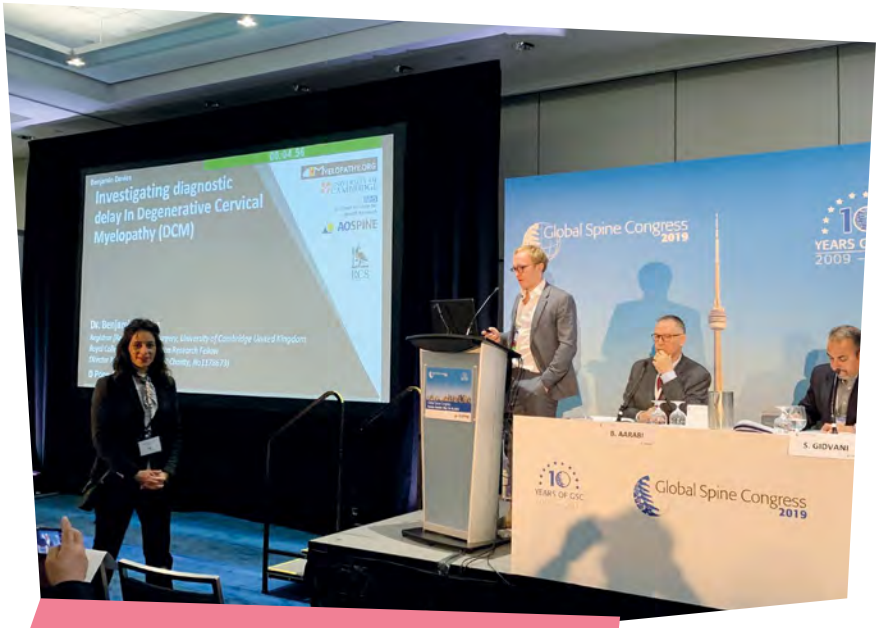
Global Spine Congress, 2019, May 13–18, Toronto Canada

Mr Benjamin Davies
Specialist Registrar Neurosurgery, University of Cambridge

I was given the opportunity by the College to attend the GSC, in Toronto this year. I was attending to present five pieces of work, and be inaugurated into the AO Spine, Spinal Cord Injury Knowledge Forum. I was also awarded the AO Spine Discovery and Innovation Award.

The GSC is the largest spine conference in the world, hosting almost 1000 delegates from over 100 countries. It attracts some of the biggest names in spinal surgery, hosts both academic forums, but also practical small group discussion. It was fantastic to see leading experts debating cutting edge surgical techniques – for example lumbar discectomy via endoscope or spinal fusion using robot guided instrumentation. These techniques have not really reached the UK at this time. I would thoroughly recommend this conference to any spine minded individual.

The AO Foundation is a major non-profit organisation, committed to the generation and dissemination of new knowledge. Much of this work is orchestrated by specialist knowledge forums and I look forward to supporting international work in myelopathy and spinal cord injury in my new role. I would thank again the RCS, who made this possible.

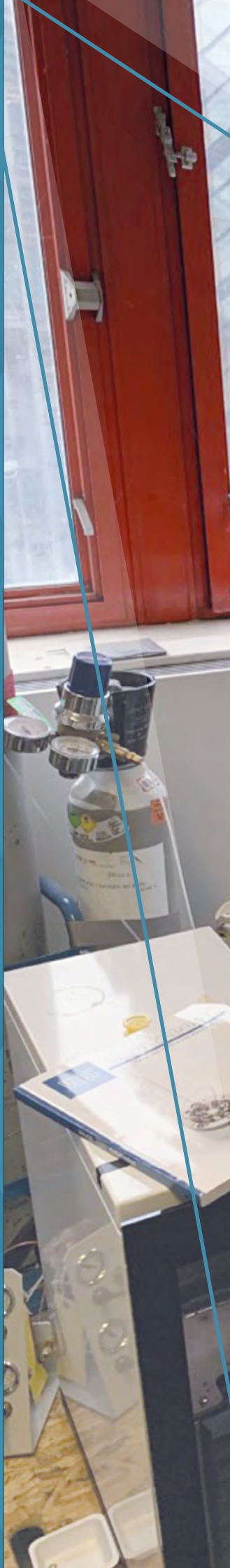


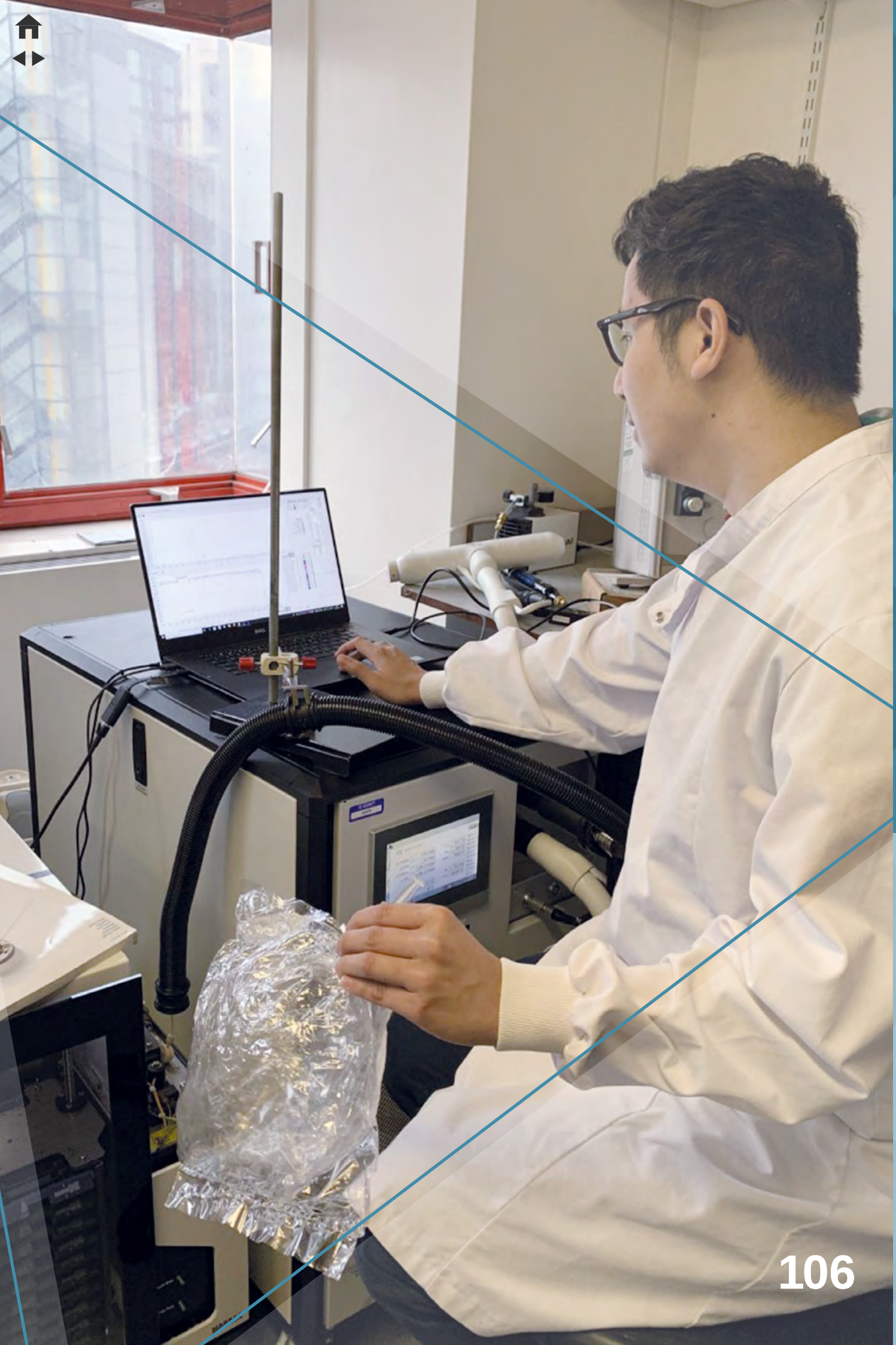
Ben presenting at the Global Spine Congress, Toronto.

HIGHER DEGREES FOR INTERCALATED MEDICAL STUDIES

Medical students grants are awarded to medical students wishing to undertake an Intercalated Bachelor of Science degree related to surgery. Owing to the variation in the ways students are funded or not funded for such degrees, students require additional support in areas such as bench fees, consumables or subsistence. Each award is worth up to £5000.

Archie Allen
Claudia Chan
Mary Goble
Urvi Karamchandani
Danny Kazzazi
Shivank Keni
David Li
Magdalena Markiewicz
Inaam Mian
Alexander Ng
Uchenna Odunukwe
Aya Riad
Oliver Salazar





BARRIERS TO ACCESSING AND PROVIDING LOWER LIMB AMPUTATION REHABILITATION SERVICES IN THE WESTERN AREA, SIERRA LEONE

Archie Allen

MEDICAL SCHOOL:
University of Leeds

LOCATION OF RESEARCH:
Freetown, Western Area,
Sierra Leone

Sierra Leone's civil war saw many atrocities being committed including the use of amputations by rebels as a form of humiliation. This has resulted in a large amputee population that has continued to grow due to a rising prevalence of diabetes and a high rate of road traffic accidents. The RCS England grant I was awarded helped fund a research project into the barriers and facilitators to accessing and providing amputations and amputation rehabilitation services for lower limb amputees in the Western Area of Sierra Leone. The project has highlighted multiple challenges faced by amputees and service providers, a critical lack of governmental support and diminishing support from international partners. Once disseminated the results may be used to inform future interventions to improve access to and use of amputation rehabilitation services.

The National Office for the Amputee and War Wounded Association was set up to advocate and support amputees in Sierra Leone. While the association is dedicated to its aims a current lack of funding makes it difficult to fulfil them.

THE NORMAL RANGE OF MOVEMENT OF DART THROWER'S MOTION AT THE WRIST IN A HEALTHY ADULT POPULATION

Claudia Chan

MEDICAL SCHOOL:
The University of Edinburgh

LOCATION OF RESEARCH:
The University of Edinburgh Medical School, Edinburgh

The award has supported my research project on establishing a normal range of movement of the Dart Thrower's Motion (DTM) at the wrist in a healthy adult population during my intercalated year at the University of Edinburgh. DTM is one of the most common functional actions of the wrist during activities of daily living. The compound movement ranges from maximum radial extension (RE) to maximum ulnar flexion (UF). There is limited literature and no standardised range of motion (ROM) for DTM, this study aimed to define the normal ROM for DTM and associated influential factors. We measured 146 healthy volunteers age ranged from 18–25 and produced a normal RE and UF range. The study will be carried out further with an increased sample size for publication. I would like to express my gratitude towards the College for their generous support and allowing me to gain valuable research skills.

Claudia demonstrating the dart thrower's motion to a volunteer.

DEVELOPMENT AND TESTING OF AN ONLINE MOTOR IMAGERY TRAINING TOOL FOR SURGICAL SKILLS

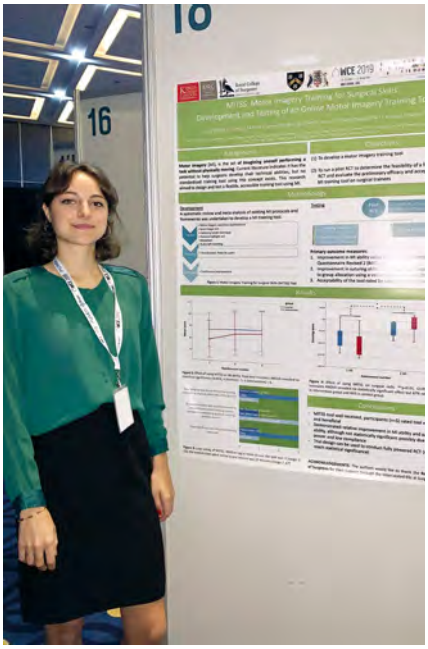
Mary Goble

MEDICAL SCHOOL:
Kings College London

LOCATION OF RESEARCH:
Guy's and St Thomas' Hospital, London, UK

I developed an online training tool to complement surgical skills teaching. The tool is based on the principle of motor imagery, or the act of imagining oneself performing a skill without physically moving, to improve performance. The tool was then tested on a group of medical students in a pilot randomized control study, where they focused on improving their suturing ability.

Funding from the RCS England enabled me to conduct this study and have access to the resources I needed to teach students and allow them to practice suturing skills. I was also able to accept an invitation to present my research at the World Congress of Endourology in Abu Dhabi, which was an invaluable opportunity to receive feedback for this work from experts in surgical education. I hope to take this project further in the future, and am very grateful for the opportunities which this grant has allowed.



Presentation of research at the World Congress of Endourology 2019.

COMPARISON OF GAZE PATTERNS IN ENDOSCOPY USING A VALIDATED OBJECTIVE ASSESSMENT SCALE

Urvi Karamchandani

MEDICAL SCHOOL:
Imperial College London

LOCATION OF RESEARCH:
Imperial College NHS Healthcare Trust

For my BSc Project, we used eye-tracking glasses to profile the gaze patterns of trainee endoscopists during live colonoscopies and compared areas of interest with scores from skill assessments. We aim to use this during training and examination of future surgeons to provide a simple and standardised objective assessment of polyp surveillance in colonoscopy. The award was used to purchase equipment and software required for data analysis. Results from this study will be submitted for presentation at an international conference and subsequently sent for publication. This experience was invaluable to my ongoing learning in surgical research and confirmed my desire to pursue academic surgery as a career.

I would like to thank the Royal College of Surgeons of England for making my project possible and my supervisors Mr Mikael Sodergren and Dr Jonathan Hoare.

Data collection using the eye tracking glasses.

3D PRINTING BIODEGRADABLE SCAFFOLDS FOR SKIN & HAIR FOLLICLE GENERATION

Danny Kazzazi

MEDICAL SCHOOL:
University College London (UCL)

LOCATION OF RESEARCH:
UCL Division of Surgery and Interventional Science, Royal Free Hospital, London

I am grateful to RCS England for this generous award, which funded experimental consumables for my lab-based research project on skin regeneration, as part of my intercalated BSc in Surgical Sciences.

Skin wounds & burns are a significant cause of morbidity in the UK and full-thickness skin damage rarely heals spontaneously. The project's aim was to develop novel collagen scaffolds for skin regeneration using 3D-printing. Collagen scaffolds with different hydrogel compositions (variable crosslinkers and concentrations) were fabricated using the inverse 3D-printing technique utilising thermal-induced phase separation (3D-TIPS). The metabolic activity of human dermal fibroblast (HDF) cells on Glutaraldehyde (GA) crosslinked collagen scaffolds was investigated. These techniques/results were compared to current knowledge.

Overall, the study identified suitable scaffolds that grew viable cells and warrant further investigation for their efficacy for skin regeneration. I look forward to continuing my research.

Using the EVOS Microscope to assess/ compare properties of developed scaffolds.

INTERTUMOURAL AND INTRATUMOURAL HETEROGENEITY IN GLIOMA

Shivank Keni

MEDICAL SCHOOL:
The University of Edinburgh Medical School

LOCATION OF RESEARCH:
Chancellor's Building, University of Edinburgh Medical School, Edinburgh Royal Infirmary

Gliomas are the most common type of brain tumours and are almost always incurable. They are typically graded from least (grade I) to most aggressive (grade IV). Even after gliomas are surgically removed surgically, they inevitably return, in a process known as recurrence. What is poorly understood is how tumour structure varies across grades and whether recurrent tumours differ to the pre-surgical ones. An increasing body of evidence implicates a group of cells and blood vessels, collectively known as the neurovascular unit, in tumour growth. We explored the structure of the neurovascular unit in gliomas using patient biopsies. We find that there are important differences in the structure of the neurovascular unit across tumour grades. Perhaps most importantly, we discovered differences between pre-surgical tumours and recurrent tumours, which might explain the failure of chemotherapies.

Karina McDade (Technician) on the left, Paul Brennan (Primary Supervisor) in middle and Shivank Keni (Student) on the right, in the lab.

BSC OF SURGICAL DESIGN, TECHNOLOGY AND INNOVATION

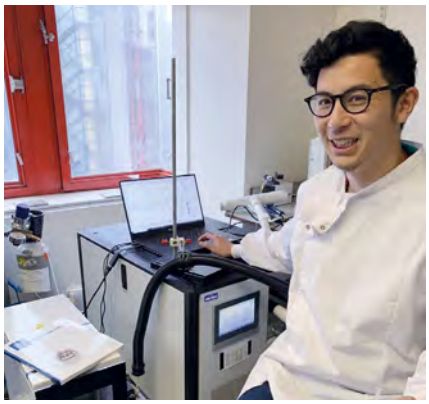
David Li

MEDICAL SCHOOL:
Imperial College London

LOCATION OF RESEARCH:
St Marys Hospital

Oesophageal squamous cell carcinoma (OSCC) is related to high incidence and mortality despite significant improvements in treatment. Early diagnosis is key to improving survival. Novel methods to diagnose OSCC is essential. Metabolic literature has demonstrated branched chain compound (BCC) deregulation in OSCC which are potential biomarkers. During my research I investigated volatile and non-volatile aspects of this pathway. This was performed by analysing samples with a high throughput technology, the Proton-Transfer-Reaction-Time-of-Flight-Mass-Spectrometry (PTR-ToF-MS). The volatile organic compounds (VOC) identified have high diagnostic potential for OSCC detection. Our next step would be to perform a large scale discovery study in patients to investigate the role of these VOCs in cancer.

I am very grateful for this RCS England award as it helped to fund my laboratory consumables. This enabled me gain a deep insight into research methodologies and the translation of work from bench to bedside.



David in the laboratory.

INVESTIGATION INTO RANGE OF DART THROWER'S MOTION AT THE WRIST IN DAILY ACTIVITIES

Magdalena Markiewicz

MEDICAL SCHOOL:
University of Edinburgh

LOCATION OF RESEARCH:
Hooper Hand Unit, St. John's Hospital, Livingston, United Kingdom

Dart thrower's motion (DTM) is a wrist movement from radial extension to ulnar flexion; it resembles throwing a dart. As DTM is the most functional and natural wrist movement, it is important to preserve the range of motion for DTM when surgically treating wrist disorders and injuries. However, the literature is limited and a standard reference range for DTM has not been established nor comprehensively examined.

Measuring the range of dart thrower's motion (DTM) using goniometry.

During my intercalation, I conducted a cross-sectional study, kindly supported by the Royal College of Surgeons of England, using goniometry to determine the normal range of DTM in a healthy adult population aged 25–45 years and investigate associated demographic factors. The findings of the study provide a basis for the development of a standard reference range for use in clinical practise. A standard reference range will serve to objectively evaluate wrist function, set rehabilitation goals and modify rehabilitation protocols to expediate functional recovery following wrist surgery.

AN EVALUATION OF THE COST EFFECTIVENESS OF ROBOTIC RADICAL NEPHRECTOMY VS. LAPAROSCOPIC RADICAL NEPHRECTOMY

Inaam Muneer Mian

MEDICAL SCHOOL:
King's College London

LOCATION OF RESEARCH:
King's College Hospital,
Guy's Hospital

Robotic surgery offers increased precision, dexterity and range of motion compared to laparoscopic surgery. Within the UK, the usage of robot-assisted nephron surgery is significantly lower than international trends, particularly due to the perception of significant cost barriers. The comparative cost analysis in this report investigated the total cost of consumables for robotic vs. laparoscopic surgery carried out at Guy's Hospital and King's College Hospital respectively. It was discovered that there is no significant difference between the total consumables costs for the two procedures. This study can therefore encourage institutions with existing robotic systems to increase their utilisation of robotic surgery. This report also reviews new payment plans offered by the robotic system suppliers which allow institutions without existing robotic programmes to opt for a "per-case" payment scheme. A similar study has not been performed before in the UK and it is hoped that this can inform local practice significantly.

Inaam presenting his work.

MERGING NANOTECHNOLOGY WITH SONODYNAMIC THERAPY FOR PANCREATIC DUCTAL ADENOCARCINOMA

Alexander Ng

MEDICAL SCHOOL:
University College London

LOCATION OF RESEARCH:
Royal Free Hospital, London

Pancreatic cancer remains one of the most lethal cancers, with a 1% 10-year survival rate. The aggressive nature of late stage pancreatic ductal adenocarcinoma means conventional treatment is often ineffective. Sonodynamic therapy is a novel treatment approach, combining a sonosensitising agent and ultrasound for inducing localised tumour ablation. In this study, we have demonstrated increased sonosensitiser cellular uptake using our nanoparticle formulation, and when activated by ultrasound, we have demonstrated a 59% decrease in cancer cell viability. The project now continues to the in vivo stage. The grant has supported the purchase of consumables and my project-relevant training, and to present my many surgical projects this year at 9 undergraduate, national and international conferences. My progress in the iBSc in Surgical Sciences has been productive with significant academic/research output due to the support of The Royal College of Surgeons, and my supervisors, Dr Nikolitsa Nomikou and Ms Maryam Mohammad-Hadi.

Alexander Ng with best poster presentation at DUSS 2019, Scotland.

A LEGO INNER EAR: DEVELOPMENT AND ASSESSMENT OF ITS UTILITY AS AN ANATOMICAL TEACHING TOOL

Uchenna Odunukwe

MEDICAL SCHOOL:
University of Birmingham

LOCATION OF RESEARCH:
University Hospitals Birmingham

The inner ear is a conceptually difficult area of the body and current teaching modalities for the region are passive and struggle to represent what is complex three-dimensional anatomy in two-dimensions. Previous research has also found that active participation by learners promotes superior learning outcomes. Therefore, during my Intercalated BSc I designed a magnified LEGO model of the inner ear for anatomical education. This three-dimensional model was built by medical students during teaching sessions to investigate its potential as an anatomical teaching tool.

Initial results showed that students enjoyed using the LEGO model as it offered a novel and effective way of learning anatomy. I am extremely grateful to the RCS England for their award which helped to fund the materials needed for this research and its dissemination; preliminary results of this research have been presented at conferences, and I am currently working towards publication with the help of my supervisors.

Uchenna presenting his research at an international surgical conference.

THE EFFECT OF MALNUTRITION ON EARLY OUTCOMES AFTER CANCER SURGERY: A GLOBAL SURG3 INTERNATIONAL PROSPECTIVE COHORT STUDY

Aya Riad

MEDICAL SCHOOL:
Edinburgh Medical School

LOCATION OF RESEARCH:
Surgical Informatics, Centre for Medical Informatics, University of Edinburgh, United Kingdom

This study aimed to look at the effect of malnutrition on patient recovery after cancer surgery worldwide using the Global Surg3 dataset. We found that patients who were underweight and had recently lost weight were two times more likely to die within 30 days of their operations, and patients in low and lower-middle income countries were over four times more likely to be severely malnourished. These results suggest that nutritional support might improve outcomes in malnourished patients. This is particularly promising in lower income settings as this is a very sustainable intervention which is affordable and requires little training.

I am very grateful for the RCS England grant for enabling me to undertake this project and was delighted to be awarded Best Project on my programme. We are currently working on a manuscript for publication and I am presenting this work virtually, and am looking forward to doing so in person when possible.

Aya presenting at a conference.

COMPARISON OF SURGEON GAZE BEHAVIOUR AGAINST OBJECTIVE SKILL ASSESSMENT IN OPEN INGUINAL HERNIA REPAIR

Oliver Salazar

MEDICAL SCHOOL:
Imperial College London

LOCATION OF RESEARCH:
Imperial College Healthcare Trust, London, UK

I would like to thank the RCS England for supporting my project, which aimed to validate eye-tracking as an assessment of surgical skill. This is an important topic as surgical skill is associated with post-operative outcomes. However, there are limited objective assessment tools of surgical skill.

Unfortunately, due to COVID-19, my study ended early but the skills and expertise I learnt from my work are invaluable. In addition, it has reaffirmed by plan to pursue a career in surgery.

The award has helped develop the project through the collection of pilot data to inform power calculations and that necessary equipment was able to be purchased. This pilot data was presented in my dissertation which was awarded a 1st class.

Oliver performing analysis on the eye tracking data to determine gaze patterns.

This award will help me to return to complete my work, once elective hernia surgery resumes, with the aim of presenting the findings in a peer-reviewed journal and presentation at a conference.

Eye tracking glasses.

ELECTIVE PRIZE REPORTS

The Elective Prize in surgery is awarded to clinical students at a UK medical school wishing to pursue a career in surgery and planning to undertake their elective attachment in surgery in the developing world.

Each award is worth up to £500. This award is possible thanks to the kind donations from the Preiskel, PKK families and the Darlow fund.

Caroline Daniel

Hatem Azet Salman Sadik

Francesca Leone

Zachary Millar

Nicola Newall

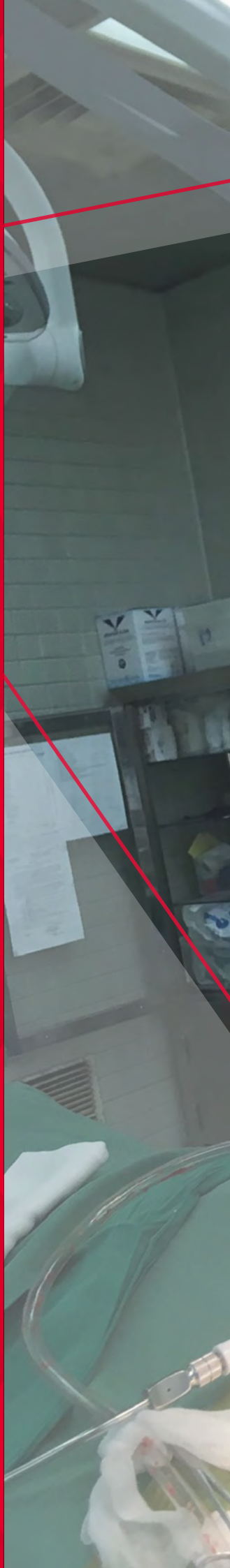
Clara Salice

Riya Sawhney

Thomas Charles Shortland

Rachel Thavayogan

Katarzyna Wcislo



GENERAL SURGERY IN MALTA

SK PRIZE

Caroline Daniel

MEDICAL SCHOOL:
University of Cambridge

LOCATION OF ELECTIVE:
Mater Dei Hospital, Msida, Malta

Mater Dei is the government-run hospital in Malta, providing care for the whole island. I had opportunities to clerk patients in A&E, attend outpatient clinics and endoscopy lists, and scrub in to assist in theatre on elective and emergency procedures. I enjoyed the busy A&E and had valuable learning opportunities in seeing patient journeys through from admission, investigation and surgery to discharge. Amongst the patients were several presenting with advanced disease, and through speaking to them and the team, I was privileged to be exposed to palliation in a different country, including surgical management and holistic care as an inpatient.

Caroline (centre) with the team in theatre.

NEUROSURGERY IN POST-CONFLICT BAGHDAD

ELECTIVE PRIZE

Hatem Azet Salman Sadik

MEDICAL SCHOOL:
University of Cambridge

LOCATION OF ELECTIVE:
Neurosurgical Teaching Hospital, Baghdad, Iraq

The first time I visited the city of Baghdad, my parents' war-ravaged homeland, was shortly following the peak of Sunni-Shia sectarian conflict, my second visit fell in the midst of the Daesh surge on the country. Today, Baghdad is experiencing a relative period of security. I saw an elective in the city as the perfect opportunity to combine my passion for surgery, the brain and a deep desire to understand more about the country my parents fled from in the '80s, as well as improve my proficiency in the Arabic language. I was extremely lucky to spend four weeks in Iraq's largest neurosurgical hospital, the 135-bed Baghdad Teaching Hospital, which has received critically ill patients from all over Iraq during recent conflicts, particularly those affected by severe traumatic injuries in warfare. I was able to see how surgeons continued to perform the most high-stakes procedures in a turbulent environment and how neurosurgeons have adapted to the heavy burden of traumatic injuries despite shallow resources.

Neurosurgical trainees.

AN EXPERIENCE OF SURGERY IN AN LEDC

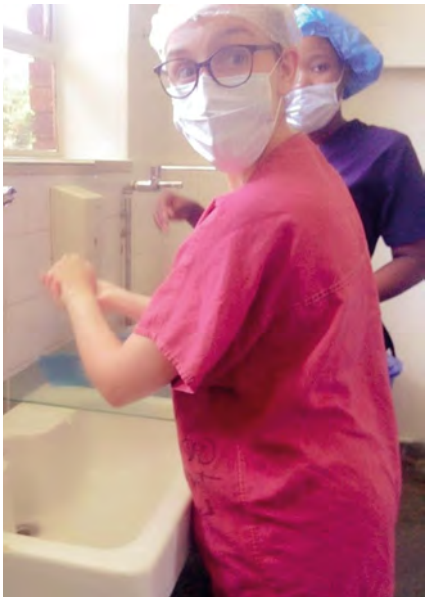
PREISKEL PRIZE

Francesca Leone

MEDICAL SCHOOL:
University of Leicester
Medical School

LOCATION OF ELECTIVE:
Livingstone Central Hospital,
Livingstone, Zambia

On elective in Zambia, I had an enlightening experience which solidified my passion for surgery. The generalist practice exposed me to an assortment of pathologies, including crocodile bites. With the same team of surgeons I assisted on general, orthopaedic, plastic and urological procedures, exposing me to many different surgical techniques. Resources were minimal therefore preventing waste in theatre and informed improvisation were key practices. Notably, movement away from single use items like in Zambia may become essential in the UK with our stretched NHS, damaged environment and wasteful surgical culture. In Zambia I was taught how to use my hands instead of fancy equipment, how to better tackle surgical emergencies and that wherever you are in the world, comradery in theatres is consistent.



Francesca scrubbing up with hard soap.

A NEUROSURGERY ELECTIVE IN HO CHI MINH CITY, VIETNAM

PREISKEL PRIZE

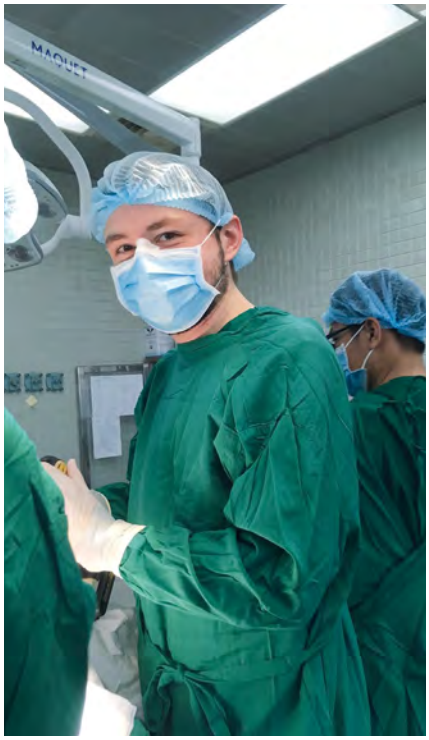
Zachary Millar

MEDICAL SCHOOL:
University of Cambridge

LOCATION OF ELECTIVE:
Cho Ray Hospital,
Ho Chi Minh City, Vietnam

I travelled to Vietnam aiming to observe world-class neurosurgery performed with limited resources. I spent much of my time in theatre assisting in a huge variety of cases with presentations far more advanced than we would see typically in the UK. I was able to develop my surgical skills and expand the breadth of cases to which I have been exposed. I also crossed over to the anaesthetic side and was hands-on there. All of the surgeons I met were extremely welcoming and gave as full explanations as their English allowed. Cho Ray proved an excellent choice for my elective!

Zachary (right) closing a scalp incision.



Zachary in one of the neurosurgical theatres.

EPIDEMIOLOGY AND PATTERN OF TRAUMATIC BRAIN INJURIES AT ANNAPURNA NEUROLOGICAL INSTITUTE & ALLIED SCIENCES, KATHMANDU, NEPAL

ELECTIVE PRIZE

Nicola Newall

MEDICAL SCHOOL:
University of Aberdeen

LOCATION OF ELECTIVE:
Annapurna Neurological Institute & Allied Sciences, Kathmandu, Nepal

My elective at the Annapurna Neurological Institute & Allied Sciences, Nepal, allowed me to gain a greater insight into neurosurgery in a developing country and further my knowledge in neurosurgery.

During my elective, not only did I undertake research studying the epidemiology of traumatic brain injury but I gained invaluable experience is neurosurgery. I was able to see neurosurgical pathologies I'd never come across in the UK and see a range of neurosurgical presentations. I attended a number of neurosurgical operations, scrubbed in and assisted.

It was the experience of a lifetime and I cannot recommend it enough.

Nicola with the neurosurgical team at the Annapurna Neurological Institute & Allied Sciences.

Nicola assisting in neurosurgery.

FINAL YEAR ELECTIVE IN COLOMBIA´S COFFEE-GROWING REGION

ELECTIVE PRIZE

Clara Salice

MEDICAL SCHOOL:
St George's University of London

LOCATION OF ELECTIVE:
Bive con Bienestar, Manizales, Colombia

I independently organised a month long elective in Colombia's central coffee-growing region through a doctor I met in London. I succeeded in my aims to learn Spanish and to experience healthcare in a different context – Colombia is a middle-income country with an insurance-based system.

I shadowed a number of doctors in contexts ranging from specialist surgery in private clinics in the capital city of Manizales to rural healthcare brigades for coffee-farmers working in isolated regions, and voluntary clinics for the growing population of undocumented Venezuelan refugees who have no access to healthcare.

The month was an invaluable and unforgettable experience.

Assisting Dr Jorge Alejandro Garcia Ramirez in a voluntary clinic for Venezuelan refugees.

Delivering a talk at the University of Caldas about medicine and healthcare in the UK.

EVALUATING THE USABILITY OF A LOW-COST LAPAROSCOPIC SIMULATOR FOR TRAINING MEDICAL STUDENTS AND SURGICAL TRAINEES IN LOW- AND MIDDLE-INCOME COUNTRIES

SK PRIZE

Riya Sawhney

MEDICAL SCHOOL:
University of Leeds

LOCATION OF ELECTIVE:
Maulana Azad Medical College (MAMC), New Delhi, India

The NIHR-funded, Leeds-based, Global Health Research Group in Surgical Technologies developed an ultra-low-cost laparoscopic box-trainer called Lap-Pack. We evaluated its usability as a training tool in New Delhi. In addition to carrying out this research, I spent time interacting with medical students at MAMC, learning that medical education in India is at the cusp of exciting changes. This elective was an interesting amalgamation of my Indian roots and British education. It brought together my passions for research, medical education and global surgery, aligning closely with my experience of the two healthcare systems, work environments, people and cultures.

Riya with Dr. Anurag Mishra (co-supervisor and Associate Professor of Surgery, MAMC) on campus.

TRAUMA CARE IN MEXICO CITY

PKK PRIZE

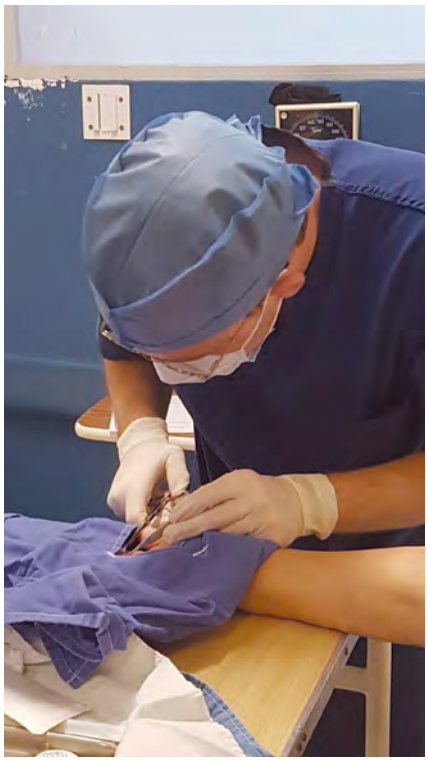
Thomas Charles Shortland

MEDICAL SCHOOL:
Warwick University

LOCATION OF ELECTIVE:
Red Cross Hospital Polanco, Mexico City, Mexico

When your Mexican colleague tells you that your first 26-hour shift was “leve” (light) you know the following six weeks are going to be busy. During my time in the trauma department of the Red Cross Hospital Polanco Mexico City, I worked very long hours but also learnt a fantastic amount. I significantly improved my practical clinical skills and gained experience in the management of an extensive variety of trauma patients from gunshots to road traffic collisions and stabbings. I am indebted to the trauma team and grateful for the knowledge and confidence that this experience has given me.

Thomas with the team on the night shift.



Thomas performing one of many sutures.

AN ELECTIVE IN TRAUMA AND GENERAL SURGERY

ELECTIVE PRIZE

Rachel Thavayogan

MEDICAL SCHOOL:
University of Nottingham

LOCATION OF ELECTIVE:
Tygerberg Hospital, Cape Town, South Africa

As an aspiring surgeon I wanted a hands-on elective, with ample opportunities to develop my clinical skills, which is why I chose the general surgery department at the Tygerberg Hospital. Tygerberg sees a larger number and variety of trauma cases, than what is ordinarily seen in a UK hospital. This provided me with a multidimensional perspective into surgical practice, in a developing country and exposed me to a variety of trauma presentations. This was a fantastic opportunity to learn and strengthen my basic surgical skills, in a busy and pressurised environment. I would recommend this for an elective placement.

Me and the Head of Trauma Surgery at the Tygerberg Hospital, Prof Steyn.

TRAUMA AND GENERAL SURGERY IN SOUTH AFRICA

ELECTIVE PRIZE

Katarzyna Wcislo

MEDICAL SCHOOL:
University of Southampton

LOCATION OF ELECTIVE:
Tygerberg Hospital, Cape Town, South Africa

My elective in Cape Town was based in trauma and general surgery. Even though, it had to be shortened by the outbreak of COVID-19 global pandemic, I was provided with a unique opportunity to experience acute surgery. I was able to scrub in on unique surgeries and learn about the management of patients with a breadth of different types of trauma such as stab or gunshot wounds.

I was truly inspired by the South African doctors and their ability to work with limited resources and would recommend this experience to anyone wishing to pursue a career in surgery!

A surgical theatre in Tygerberg Hospital, carrying out a hernia repair.

RCS ENGLAND SENIOR CLINICAL FELLOWSHIP SCHEME

The Senior Clinical Fellowship Scheme enables trainees at around the time of completion of their specialist surgical training to undertake a practical Fellowship lasting between 6–18 months to focus on expert training in a surgical sub-specialty. Fellowship programmes in the Scheme are jointly approved by the RCS England and the appropriate Surgical Specialty Associations. Fellows often undertake research and audit activities, in addition to receiving a high quality training experience.

While most of the approved Fellowship programmes are in the UK, one is in Ireland and two are in India.

The tables below list the Fellows who successfully completed their programme and were awarded the Fellowship Certificate in 2018–2019.

Certificates awarded in July 2018

Fellow	Fellowship	Supervisor	Date of Fellowship
Greg Taylor	Swansea Advanced Pelvic Oncology Fellowship – Swansea Bay University Health Board	Mr Martyn Evans	October 2016 – October 2017
James Gillespie	Harrogate Hip Fellowship – Harrogate & District NHS Foundation Trust	Mr Jon Conroy	August 2016 – July 2017
Chris Hunter	St Mark's Laparoscopic Colorectal Fellowship – London North West Healthcare NHS Trust	Mr Ian Jenkins	October 2016 – April 2017
Katrine Emmertsen	St Mark's Laparoscopic Colorectal Fellowship – London North West Healthcare NHS Trust	Mr Ian Jenkins	April 2016 – September 2016
Akash Mehta	St Mark's Laparoscopic Colorectal Fellowship – London North West Healthcare NHS Trust	Mr Ian Jenkins	October 2017 – April 2018
Haris Markakis	Bariatric Surgery Fellowship – Imperial College Healthcare NHS Trust	Mr Ahmed Ahmed	October 2016 – November 2017
Phoebe Roche	Imperial Advanced Head & Neck Fellowship – Imperial College Healthcare NHS Trust	Mr Alasdair Mace	June 2017 – June 2018

Certificates awarded in October 2018

Fellow	Fellowship	Supervisor	Date of Fellowship
Shashank Gupta	DMH Clinical Fellowship in Laryngology – Deenanath Mangeshkar Hospital, Pune, India	Dr Sachin Gandhi	June 2017 – June 2018
Catalin Constandache	Dublin Beaumont Renal Transplantation Fellowship – Beaumont Hospital, Dublin	Ms Dilly Little	June 2017 – June 2018
Aleix Rovira-Casas	Guy's Advanced Head and Neck Surgical Oncology Fellowship – Guy's & St Thomas' NHS Foundation Trust	Mr Ricard Simo	June 2017 – June 2018
Asim Sheikh	Leeds Anterior Skull Base Endoscopic Fellowship – Leeds Teaching Hospitals NHS Trust	Mr Nicholas Phillips	August 2017 – July 2018
Deligiannis Dimitrios	Leeds Pelvic Uro-Oncology Fellowship – Leeds Teaching Hospitals NHS Trust	Mr Sunjay Jain	June 2017 – May 2018
Grace Khong	Liverpool Rhinology Fellowship – Aintree University Hospital NHS Foundation Trust	Mr Samuel Leong	August 2017 – July 2018
Edward Bayley	Nottingham Advanced Spinal Surgery Fellowship – Nottingham University Hospitals NHS Trust	Mr Khalid Salem	August 2017 – August 2018
Jane Halliday	Oxford Pituitary and Anterior Skullbase Senior Clinical Fellowship – Oxford University Hospitals NHS Foundation Trust	Mr Simon Cudlip	August 2017 – July 2018
Alex Leggate	Salford Royal Neuro-oncology Surgery Fellowship – Salford Royal NHS Foundation Trust	Ms Konstantina Karabatsou	August 2017 – August 2018
Kenneth Keogh	Swansea Advanced Pelvic Oncology Fellowship – Swansea Bay University Health Board	Mr Martyn Evans	October 2017 – June 2018
Ian Robertson	Dublin Beaumont Renal Transplantation Fellowship – Beaumont Hospital, Dublin	Ms Dilly Little	July 2016 – July 2017
Sleiman Haddad	The Nottingham Advanced Spinal Fellowship – Nottingham University Hospitals NHS Foundation Trust	Mr Khalid Salem	February 2016 – October 2017
Malik Ahmed	The Nottingham Advanced Spinal Fellowship – Nottingham University Hospitals NHS Foundation Trust	Mr Khalid Salem	September 2016 – January 2018

Certificates awarded in January 2019

Raghbir Singh Khakha	Basingstoke Knee Fellowship – North Hampshire Hospitals NHS Foundation Trust	Mr Adrian Wilson	October 2016 – June 2017
Sumanta Dutta	Chichester St Richard's Bariatric Fellowship – Western Sussex Hospitals NHS Foundation Trust	Mr Will Hawkins	October 2017 – August 2018
Katy Wallis	Coventry Microsurgery and Major Trauma Fellowship – University Hospitals Coventry and Warwickshire NHS Trust	Miss Joanna Skillman	August 2017 – August 2018
Abren Santocildes	DMH Clinical Fellowship in Laryngology – Deenanath Mangeshkar Hospital, Pune, India	Dr Sachin Gandhi	July 2017 – June 2018
Teck-Wei Tan	Guy's Bladder Cancer Fellowship – Guy's & Thomas' NHS Foundation Trust	Professor Muhammad Shamim Khan	October 2017 – September 2018
Ben Haughton	Harrogate Hip Fellowship – Harrogate & District NHS Foundation Trust	Mr Jon Conroy	August 2017 – July 2018
Eleni Maratos	King's Neurosurgical Endoscopic Pituitary and Skull Base Fellowship – King's College Hospital NHS Foundation Trust	Mr Sinan Barazi	August 2017 – March 2018

Certificates awarded in January 2019 (cont.)

Fellow	Fellowship	Supervisor	Date of Fellowship
Sandeep Solanki	Leeds Neuro-Oncological Surgery Fellowship – Leeds Teaching Hospitals NHS Trust	Mr Simon Thomson	September 2017 – August 2018
Peter Mekhail	Musgrove Park Post-CCT Fellowship in Bariatric and Benign UGI Surgery – Somerset NHS Foundation Trust	Mr Richard Welbourn	October 2017 – October 2018
Alessandra Lazzaro	North Middlesex Senior Colorectal Fellowship – North Middlesex University Hospital NHS Trust	Mr Lee Dvorkin	October 2017 – October 2018
Samer-ul Haque	Peterborough Laparoscopic Colorectal Fellowship – North West Anglia NHS Foundation Trust	Mr Rohit Makhija	October 2017 – September 2018
Mazhar Iqbal	Salford Royal Neurosurgery Spine Fellowship – Salford Royal NHS Foundation Trust	Mr Kuriakose Joshi George	August 2017 – July 2018
Chris Gee	Ashford & St Peter's Sports Hip & Knee, Lower Limb Arthroplasty Senior Orthopaedic Fellowship – Ashford and St Peter's Hospitals NHS Foundation Trust	Mr Paul Trikha	January 2018 – October 2018
Jihène El Kafsi	UCL Bariatric and Metabolic Fellowship – University College London Hospitals NHS Foundation Trust	Mr Marco Adamo	October 2016 – October 2017

Certificates awarded in March 2019

Max Almond	Birmingham Post-CCT Abdominal and Retroperitoneal Sarcoma Fellowship – University Hospitals Birmingham NHS Foundation Trust	Mr David Gourevitch	October 2016 – October 2017
Mohammad Hassan Mobasheri	Chichester St Richard's Fellowship in Laparoscopic Colorectal Surgery – Western Sussex Hospitals NHS Foundation Trust	Mr Guy Harris	April 2018 – October 2018
Rebecca Seton	Colchester Laparoscopic Colorectal Fellowship – The ICENI Centre Colchester Hospital	Mr Tan Arulampalam	March 2018 – February 2019
Shofiq Islam	Coventry Post-CCT Fellowship in Thyroid / Parathyroid Surgery – University Hospitals Coventry and Warwickshire NHS Trust	Mr Raj Sandhu	August 2018 – February 2019
Rasheed Afinowi	Frimley Park Hip Fellowship – Frimley Health NHS Foundation Trust	Mr Seb Sturridge	September 2017 – March 2018
James Clark	Imperial Bariatric Surgery Fellowship – Imperial College Healthcare NHS Trust	Mr Ahmed Ahmed	November 2017 – October 2018
Rob Iorga	Imperial Skull Base Fellowship – Imperial College Healthcare NHS Trust	Mr Nigel Mendoza	February 2018 – August 2018
Mihai Danciut	Leeds Neurovascular Fellowship – Leeds Teaching Hospitals NHS Trust	Mr Kenan Deniz	January 2018 – January 2019
Liviu Nicolae	North Bristol Surgical Neuro-Oncology Fellowship – North Bristol NHS Trust	Mr Venkat Iyer	August 2017 – July 2018
Naghman Choudhry	South Tees Fellowship in Shoulder & Elbow Surgery – South Tees Hospitals NHS Foundation Trust	Professor Amar Rangan	February 2018 – January 2019
Muneer Junejo	Leeds St James Laparoscopic Colorectal Fellowship – Leeds Teaching Hospitals NHS Trust	Professor Peter Sagar	April 2018 – October 2018
Jamish Ghandi	St Mark's Minimally and Maximally Invasive Colorectal Cancer (MiMICC) Fellowship – London North West Healthcare NHS Trust	Mr Ian Jenkins	April 2018 – October 2018
Alastair Reid	Sunderland Bariatric Fellowship – City Hospitals Sunderland NHS Foundation Trust	Mr Peter Small	October 2017 – September 2018

Certificates awarded in June 2019

Fellow	Fellowship	Supervisor	Date of Fellowship
Mohamed Abd Alazeez	Addenbrooke's Uro-oncology Fellowship – Cambridge University Hospitals NHS Foundation Trust	Mr Nimish Shah	April 2018 – March 2019
Biborka Bereczky	EMBMI Senior Bariatric and Metabolic Surgery Fellowship – University Hospitals of Derby & Burton NHS Foundation NHS Trust	Mr Sherif Awad	April 2018 – March 2019
Dan Foley	Guy's Oesophago-gastric Cancer Fellowship – Guy's & St Thomas' NHS Foundation Trust	Mr Andrew Davies	April 2018 – March 2019
Rasheed Afinowi	Harrogate Hip Fellowship – Harrogate & District NHS Foundation Trust	Mr Jon Conroy	August 2018 – January 2019
Frances Burge	Newcastle Female and Functional Urology Fellowship – Newcastle upon Tyne Hospitals NHS Foundation Trust	Mr Christopher K Harding	September 2018 – March 2019
Oded Hershkovich	Nottingham Advanced Spinal Surgery Fellowship – Nottingham University Hospitals NHS Trust	Mr Khalid Salem	February 2018 – January 2019
Dan D'Aquino	Nottingham Advanced Spinal Surgery Fellowship – Nottingham University Hospitals NHS Trust	Mr Khalid Salem	August 2017 – February 2019
Andreas Nowacki	Oxford Fellow of Functional Neurosurgery – Oxford University Hospitals NHS Foundation Trust	Mr Alexander Green	February 2018 – February 2019
Mohamed Ibrahim	St Mary's Post-CCT Upper GI Fellowship – Imperial College Healthcare NHS Trust	Mr Krishna Moorthy	March 2017 – March 2019
Anna Solth	Wessex Neuro-Oncology Fellowship – University Hospital Southampton NHS Foundation Trust	Mr Paul Grundy	May 2018 – April 2019
Adnan Sheikh	Leeds St James Laparoscopic Colorectal Fellowship – Leeds Teaching Hospitals NHS Trust	Professor Peter Sagar	October 2014 – March 2015

Certificates awarded in August 2019

Raj Thakrar	Basingstoke Knee Fellowship – North Hampshire Hospitals NHS Foundation Trust	Mr Sam Yasen	August 2018 – February 2019
Arun KC	DMH Clinical Fellowship in Laryngology – Deenanath Mangeshkar Hospital, Pune, India	Dr Sachin Gandhi	July 2018 – June 2019
Supreetha Shenoy	DMH Clinical Fellowship in Laryngology – Deenanath Mangeshkar Hospital, Pune, India	Dr Sachin Gandhi	July 2018 – June 2019
Jag Virk	Imperial Advanced Head and Neck Fellowship – Imperial College Healthcare NHS Trust	Mr Alasdair Mace	July 2018 – July 2019
Dritan Pasku	Nottingham Advanced Spinal Surgery Fellowship – Nottingham University Hospitals NHS Trust	Mr Khalid Salem	February 2015 – February 2017
Manar Malki	Frimley Park Renal Cancer Fellowship – Frimley Health NHS Foundation Trust	Mr Neil Barber	February 2018 – May 2019
Isaac Phang	Salford Royal Neuro-oncology Surgery Fellowship – Salford Royal NHS Foundation Trust	Ms Konstantina Karabatsou	August 2018 – August 2019

Certificates awarded in October 2019

Fellow	Fellowship	Supervisor	Date of Fellowship
Amr Mohamed	Oxford Pituitary and Anterior Skullbase Senior Clinical Fellowship – Oxford University Hospitals NHS Foundation Trust	Mr Simon Cudlip	August 2018 – July 2019
Basel Alromhain	Leeds Anterior Skull Base Endoscopic Fellowship – Leeds Teaching Hospitals NHS Trust	Mr Nicholas Phillips	August 2018 – July 2019
Ati Ferede	Beaumont Hospital Renal Transplantation Fellowship – Beaumont Hospital, Dublin	Ms Dilly Little	July 2018 – July 2019
Vrettos Ierodiakonou	Birmingham Post-CCT Abdominal and Retroperitoneal Sarcoma Fellowship – University Hospitals Birmingham NHS Foundation Trust	Mr Anant Desai	July 2018 – December 2018
Mark Ferguson	Charing Cross & Royal Brompton Rhinology Fellowship – Charing Cross & Royal Brompton Hospitals	Mr Hesham Saleh	October 2018 – September 2019
Tan Yew Wei	Chelsea and Westminster Paediatric Colorectal Fellowship – Chelsea and Westminster NHS Foundation Trust	Mr Simon Clarke	June 2018 – August 2019
Luigi Volpini	Guy's Advanced Head and Neck Surgical Oncology Fellowship – Guy's & St Thomas' NHS Foundation Trust	Mr Ricard Simo	June 2018 – June 2019
Iwan Bennett	Imperial Skull Base Fellowship – Imperial College Healthcare NHS Trust	Mr Nigel Mendoza	August 2018 – August 2019
Ranjan Arianayagam	Lister Urological Robotic Fellowship – East & North Hertfordshire NHS Trust	Mr James Adshead	March 2018 – May 2019
Gaurav Shankar Medikeri	Liverpool Rhinology Fellowship – Aintree University Hospital NHS Foundation Trust	Mr Samuel Leong	August 2018 – August 2019
Andrew Robertson	Musgrove Park Post-CCT Fellowship in Bariatric and Benign UGI Surgery – Somerset NHS Foundation Trust	Mr Richard Welbourn	October 2018 – September 2019
Hani Marcus	NHNN Pituitary Fellowship – University College London Hospitals NHS Foundation Trust	Mr Neil Dorward	August 2018 – August 2019
Anwer Abdullakutty	Nottingham Post CCT Fellowship in Temporo-mandibular Joint Surgery – Nottingham University Hospitals NHS Trust	Mr Andrew Sidebottom	October 2017 – January 2018
Lawrence Toquero	Peterborough Laparoscopic Colorectal Fellowship – North West Anglia NHS Foundation Trust	Mr Rohit Makhija	October 2018 – October 2019
Md Tanveer Adil	Luton Bariatric and Metabolic Surgery Fellowship – Bedfordshire Hospitals NHS Foundation Trust	Mr Omer Al-Taan	July 2018 – August 2019

Certificates awarded in December 2019

Fellow	Fellowship	Supervisor	Date of Fellowship
Grace Khong	Alder Hey Paediatric Otolaryngology Fellowship – Alder Hey Children's NHS Foundation Trust	Mr Ravi Sharma	August 2018 – July 2019
Hayat Khan	Frimley Park Hip Fellowship – Frimley Health NHS Foundation Trust	Mr Seb Sturridge	September 2018 – September 2019
Sami Mansour	Imperial Bariatric Surgery Fellowship – Imperial College Healthcare NHS Trust	Mr Ahmed Ahmed	October 2018 – October 2019
Rohan Bidaye	Imperial College Laryngology Fellowship – Imperial College Healthcare NHS Trust	Mr Guri Sandhu	May 2018 – May 2019
Ahilan Kailaya-Vasan	King's Neurovascular Fellowship – King's College Hospital NHS Foundation Trust	Mr Christos Tolias & Mr Daniel Walsh	August 2018 – August 2019
Haytham Abudeeb	Leeds St James Laparoscopic Colorectal Fellowship – Leeds Teaching Hospitals NHS Trust	Professor Peter Sagar	April – September 2019
Christos Anagnostopoulos	North Bristol Surgical Neuro-Oncology Fellowship – North Bristol NHS Trust	Mr Venkat Iyer	August 2018 – August 2019
Dinesh Balasubramaniam	North Middlesex Senior Colorectal Fellowship – North Middlesex University Hospital NHS Trust	Mr Lee Dvorkin	November 2018 – October 2019
Aziz Gulamhusein	Royal Free Renal Cancer Fellowship – Royal Free London NHS Foundation Trust	Mr Faiz Mumtaz	September 2018 – September 2019
Nehemiah Samuel	Sunderland Bariatric Fellowship – City Hospitals Sunderland NHS Foundation Trust	Mr William Carr	October 2018 – September 2019
Andrew Robinson	Coventry Microsurgery and Major Trauma Fellowship – University Hospitals Coventry and Warwickshire NHS Trust	Miss Joanna Skillman	August 2018 – August 2019

SHORTENING SURGICAL TRAINING THROUGH ROBOTICS: A RANDOMISED CONTROLLED TRIAL OF LAPAROSCOPIC VERSUS ROBOTIC SURGICAL LEARNING CURVES

RESEARCHER:

Ms Tamara Gall

Imperial College Robotic Hepatopancreaticobiliary Fellow

SUPERVISORS:
Professor Long Jiao, Consultant HPB Surgeon, Imperial College, London

SITE OF WORK:
The Royal Marsden Hospital, London, UK

PUBLICATIONS:
This research has been published in the British Journal of Surgery, Open

https://bjssjournals.onlinelibrary.wiley.com/doi/full/10.1002/bjs5.50353

PRESENTATIONS:
To be presented at the virtual international Hepato-Pancreato-Biliary Association meeting, 27th November 2020

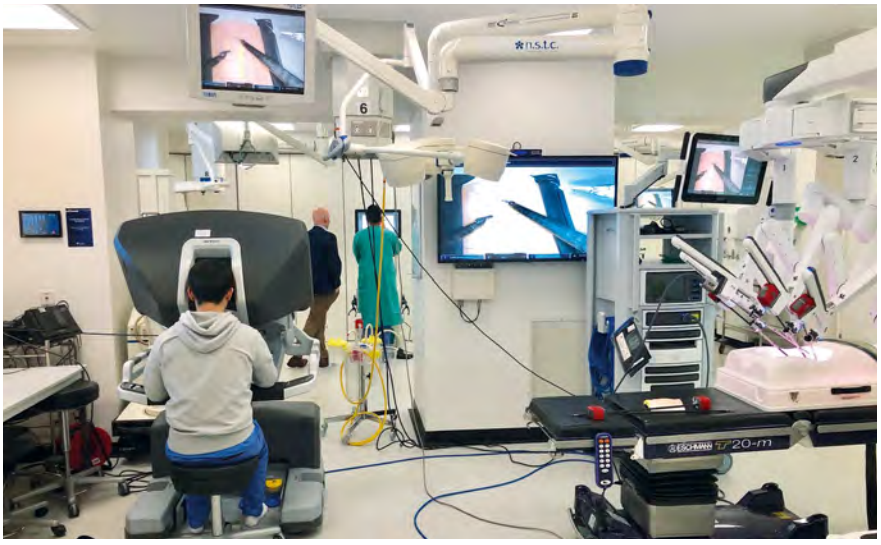
Minimally invasive surgery is the gold standard technique for many operations however, laparoscopic training has a long learning curve before safe operating can be achieved. Robotic solutions may shorten this training pathway, allowing trainees to concentrate on learning the steps of the operation, and tissue handling, rather than basic skills.

Twenty surgical trainees (F2 to CT2) were randomised to receive 6 hours robotic or laparoscopic training on both a simulator and box trainer. The following day they performed three surgical tasks (cholecystectomy; continuous suture closure of gastrostomy; and interrupted sutured small bowel anastomosis) on fresh frozen cadaveric specimens. Twenty medical students with no surgical experience were randomised to two hours robotic or laparoscopic simulation training followed by interrupted suture closure of a gastrostomy. The Global rating scale (GRS) score, number of suture errors (Van Sickle assessment) and time to complete each procedure was recorded by two independent assessors from video analysis.

The median GRS score was significantly better for each procedure after robotic training compared to laparoscopic training for surgical trainees and students. Surgical trainees in the robotic group made fewer errors than the laparoscopic group for both continuous and interrupted sutures. The medical student robotic group completed more than double the number of interrupted sutures, with less than half the number of errors, than their laparoscopic counterparts in the allocated time. Further, fatigue and physical comfort levels were significantly better after robotic operating compared to laparoscopic operating.

We concluded that the acquisition of surgical skills in surgical trainees and the surgically naïve takes less time with a robotic compared to laparoscopic platform.

Laparoscopic Simulator training.



Robotic box training.

MALIGNANT SALIVARY GLAND TUMOURS – THE CHARING CROSS EXPERIENCE

RESEARCHER:

Mr Akshat Malik

Imperial College Advanced Head & Neck Fellow

SUPERVISORS:
Mr Alasdair Mace, Ear, Nose and Throat Consultant

SITE OF WORK:
Imperial College Healthcare NHS Trust, London

PRESENTATIONS:
Research accepted for poster presentation to European Congress on Head and Neck Oncology (ECHNO 2020), 6-9 May, 2020, Brussels, Belgium (could not proceed due to COVID-19)

Mr Akshat Malik, left, and Mr Alasdair Mace.

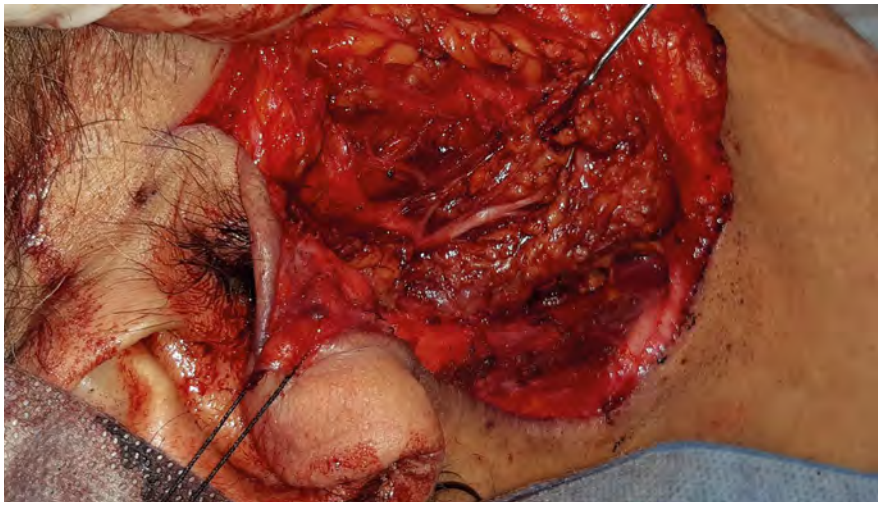
Salivary gland malignancies are rarely encountered tumours and there is limited data on their clinico-pathological profile and prognosis. My colleagues and I carried out a retrospective analysis of patients with salivary gland malignancies who were treated at Imperial College Healthcare NHS Trust, London. We included 108 patients with malignant salivary gland tumours treated by curative intent with surgery from 2004 to 2019.

77 (71.3%) presented with early pT classification and 81 (75%) of were node-negative. The parotid was the commonest site of malignancy (86, 79.6%). Perineural invasion was present in 40 (37%) and lymphovascular invasion was present in 20 (18. 63 (58.3%) underwent adjuvant therapy.

Median follow up was 36 months. Five-year overall survival (OS) and disease free survival (DFS) were 81.7% and 71%. Age ≥50, pT classification 3-4, high tumour grade, PNI, and advanced TNM stage were all associated with worse OS and DFS, and LVI with worse DFS. There was no survival difference between a close (1-<5 mm) or negative (≥5 mm) resection margin.

This study will improve the further understanding of disease process and prognosis. It will help with rationalising treatment, particularly the extent of surgery. Furthermore, there was no difference in OS or DFS between patients with negative and close resection margins, indicating that close margins may be adequate for maintaining good oncologic outcomes in this group of patients.

Patient with a right parotid tumour with surgical incision marking.



Surgical field after superficial parotidectomy showing all the facial nerve branches.preserved.

WHOLE GENOME SEQUENCING OF HEAD AND NECK CANCERS

RESEARCHER:

Dr Anand Subash

Consultant Head and Neck Oncologist, HCG Cancer Centre, Bangalore, India (former HCG Bangalore Head & Neck Surgical Oncology Fellow)

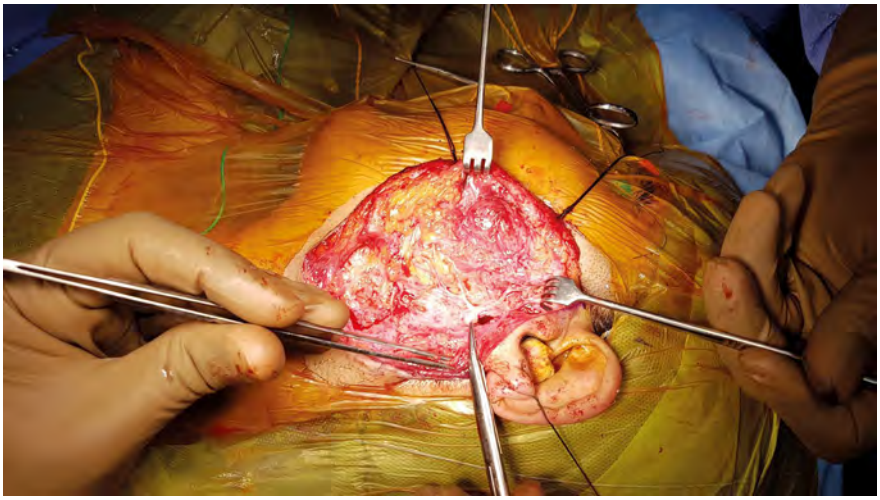
SUPERVISORS:
Prof. Vishal Rao US, Regional Director and Chief of Head and Neck Services, Healthcare Global Cancer Centre, Bangalore;
Dr. Bibha Chaudhary, Adjunct Faculty, Institute of Bioinformatics and Applied Biotechnology, Bangalore

SITE OF WORK:
Healthcare Global Cancer Centre, Bangalore; Institute of Bioinformatics and Applied Biotechnology (IBAB), Bangalore

PRESENTATIONS:
Molecular Profiling of Head and Neck Carcinoma in Indian Population. presented at NextGen Genomics, Biology, Bioinformatics and Technologies (NGBT 2019), Mumbai, 30 September – 2 October, 2019

Head and neck squamous cell carcinoma (HNSCC) encompass a heterogeneous group of tumours. In India it accounts for about 40% of all the malignancies. HNSCC in the subcontinent behaves differently as compared to the western world. As heterogenous as they are so are their responses to treatment. Deciphering the human genome has indeed been one of the biggest contributions to science. Genomic profiling would help identify the variants that distinguish these HNSCC patients and facilitate development of newer targeted therapies. The study was conducted at Healthcare Global Cancer Centre, Bangalore, in collaboration with the Institute of Bioinformatics and Applied Biotechnology, Bangalore. We retrospectively analysed 35 cases of Head and Neck squamous cell carcinoma as a pilot. Whole exome analysis of the patient samples was done using the Illumina Hi-Seq 2500 machine with a depth of 70-100X.

It was observed that the maximum number of variations were mis-sense mutations. Known oncogenic proteins like TP53 and NOTCH1 showed a mutation frequency of more than 50%, while DNA damage and repair genes like XRCC1 and ERCC2 were seen to have almost 90% mutation frequency, some of which have not been previously documented in literature. The preliminary data have brought to light some very novel mutations, many of them until now unknown to be implicated in HNSCC. This study holds the potential to predict response to treatment and factors which contribute to this. We have further classified these novel mutations into different pathways so that specific targeted therapies can be developed in future.



Left Superficial Parotidectomy done for Pleomorphic Adenoma – the Facial nerve trunk and branches have been identified and preserved.

SURGICAL TRIALS INITIATIVE MEETING

In the summer of 2019, The Law Society kindly hosted us their facilities, whilst our redevelopment progresses, to allow us to showcase our achievements to date with our Surgical Trials Initiative. In particular, it provided an opportunity for a number of our generous supporters to meet face to face with the trialists.

Hosted by The President, Professor Derek Alderson, an audience of donors, researchers, trialists and staff learnt of the extraordinary magnitude of work Professor Dion Morton and his many colleagues had undertaken in the past five years. They learnt from some of the new RCS England Chairs of their vision to take the initiative forward, the exciting lead sprouting in global surgery, the plethora of trainee research collaboratives established, and the future pathways led by Professor Peter Hutchinson, the new RCS England Clinical Director of Research. It was a very upbeat, encouraging meeting, enjoyed by all!


1


2


3


4


5

1. Professor Peter Brocklehurst and Professor Dion Morton
2. Mrs Elizabeth Shields of Mary Kinross with Professor Joy Adamson and Professor David Torgerson, Director of the RCS England York Trials Unit
3. Mr Michael Edgar of the Drexler Foundation meeting Professor Tom Pinkney
4. Mr Johnny Fountain Chair of The Linder Foundation with Professor Peter Hutchinson
5. Mr Richard Ross and Mrs Ann Berger of Rosetrees with the Rosetrees' Chairs, Professor David Beard and Professor Michael Douek

HUNTERIAN, ARRIS & GALE, ARNOTT & LIONEL COLLEDGE MEMORIAL LECTURES

2019

Arris & Gale	Anita Mohan, Bridging the Gap between Microvascular Anatomy and Flap Physiology in Autologous Breast Reconstruction with the use of Advanced Imaging Technologies: Implications for Flap Perfusion and Design, SARS, London, 08 January 2019
Hunterian	Nicholas Ventham, Epigenetic biomarker discovery in Inflammatory Bowel Disease: unearthing clues for disease pathogenesis? ACPGBI, Dublin, 01 July 2019
Hunterian	Umar Sadat, Morphological, biochemical and functional assessment of atherosclerosis with magnetic resonance imaging, Vascular Society AGM, Manchester, 29 November 2019
Hunterian	Paul Sutton, Tumour heterogeneity, biomarkers and novel therapeutic targets: Implications for the treatment of advanced colorectal cancer, Liverpool and North West Society of Surgeons Annual Meeting, Liverpool, 06 December 2019
The Lionel Colledge Memorial Lecture	Prof Bradley Welling, Head of Otolaryngology at Massachusetts Eye and Infirmary: "How to stay out of trouble during ear surgery". March 2019. Annual meeting of ENT UK in Chester.

Due to COVID-19 a number of scheduled delivery of lectures has been postponed and we expect many more next year.

Presenting at Liverpool and North West Society of Surgeons Annual Meeting.

Nicholas Ventham – Presenting at ACPGBI, Dublin.

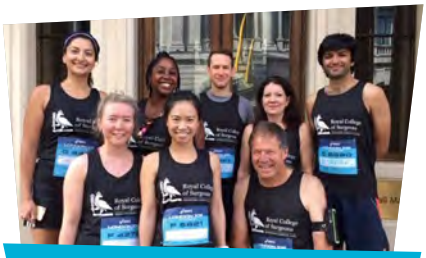
Nicholas Ventham.

FUNDRAISING IN FOCUS

Make a donation or leave a legacy to Surgical Research

Research at the College relies exclusively on voluntary income that has been gifted through donations, legacies and grants. We need your help if this work is to continue and flourish. Future innovations in surgery will continue to be driven by research and surgical research continues to provide significant advances in a wide range of areas.

Currently we are unable to support 80% of those applying for research grants due to lack of funds. If you would like to make a donation or discuss a legacy, please contact the College's Development Office on 0207 869 6086, or by email at fundraising@rcseng.ac.uk



ASICS 10k Runners who fundraised and helped fund one of our Fellows.

Grants are not restricted to research fellowships and we are delighted to discuss opportunities to encourage and develop the potential of young surgeons through education, training and research by way of travel and educational grants or annual prizes and awards.

James Glasbey after completing the Big Half fundraising for the College.

Funding Partnerships:

- Association of Breast Surgery
- Association of Coloproctology of Great Britain & Ireland
- Association of Upper Gastrointestinal Surgeons of Great Britain & Ireland
- Ballinger Charitable Trust
- Blond McIndoe Foundation
- Bowel Cancer UK
- Bowel Disease Research Foundation
- Breast Cancer Now
- British Association of Oral and Maxillofacial Surgeons (BAOMS)
- British Association of Paediatric Surgeons (BAPS)
- British Association of Plastic, Reconstructive & Aesthetic Surgeons (BAPRAS)
- British Association of Surgical Oncology (BASO)
- British Association of Urological Surgeons (BAUS)
- British Obesity & Metabolic Surgery Society (BOMSS)
- British Orthopaedic Association (BOA)
- British Society of Endovascular Therapy (BSET)
- British Society of Surgery of the Hand
- Cancer Research UK
- Circulation Foundation
- Colledge Family Fund
- Dame Sue Street
- Dinwoodie Charitable Company
- Dunhill Medical Trust
- Edwin George Robinson Charitable Trust
- ENT UK
- Facial Surgery Research Foundation (Saving Faces)
- Frances & Augustus Newman Foundation
- Freemasons' Fund for Surgical Research

- Gilbert & Eileen Edgar Foundation
- Golden Bottle Trust
- Heartburn Cancer UK
- Health Education and Improvement Wales
- The Linder Foundation
- L F D Group Limited
- Mary Kinross Charitable Trust
- Masonic Charitable Foundation
- Miss L Kapila OBE FRCS
- Moondance Foundation
- National Joint Registry
- Orthopaedic Research UK
- Pancreatic Cancer Research Fund
- Pancreatic Cancer UK
- Rosetrees Charitable Trust
- Saving Faces
- Shears Foundation
- Sir John Fisher Foundation
- Sir Roy and Lady Calne
- Society for Cardiothoracic Surgery in Great Britain and Ireland
- Society of British Neurological Surgeons
- St Jude's Charitable Trust
- Vascular Surgical Society of Great Britain & Ireland
- Westminster Foundation for Research into Intestinal Disease
- Wyndham Charitable Trust

Endowments, restricted and legacy funds:

- Arthritis Research Trust Fund
- Blond McIndoe Fund
- Buckston Browne Gift
- Doctor Shapurjui H Modi Memorial ENT Fund
- Fellows Fellowship Fund
- Harold Bridges Bequest
- Philip and Lydia Cutner Fund
- Preiskel Family Fund
- Saven Research and Development Programme
- Sorab (Soli) Jamshed Lam Research Fund
- Vandervell Research Fund
- The legacy of Mr C C Boot

Research Department visited the Royal London to meet some of our Fellows.

PHOTO GALLERY

1

2

3

4

5

6

7

8

9

1. Mr Bjorn Saven learning about the some of the research he has supported
2. Professor Derek Alderson and Professor Mark Emberton listening to the President of the Karolinska Institute at the Swedish Embassy
3. Mr Fadi Issa addressing Blond McIndoe Research Foundation Trustees.
4. Dr Lorena Aguilera, Mr Bill Thomas and Mr Tim Goodacre preparing tendon repair for the Surgical Skills Workshop at Hospital General San Juan de Dios, Guatemala City.
5. Mr Hans Hux, Chair and CEO, B Braun at his retirement in Sheffield
6. Professor Derek Alderson and Professor Sir Michael Rawlins at RCS England CRISC meeting
7. Lt Col Linda Orr assessing at our 2019 Research Fellowship Vivas
8. Professor Martin Birchall assessing at our 2019 Research Fellowship Vivas
9. The Research Department Louise Duncan, Linda Slater, Martyn Coomer, Sarah King, Murat Akkulak
10. Professor Simon Bach presenting his robotics work to Mr Bjorn Saven
11. 2020 – Virtual Vivas for our One Year Research Fellowships (L-R) P.Hutchinson, L.Duncan, S.King, L.Slater, T.Rockall, L.Orr, D.Alderson, M.Coomer
12. Mr Anthony Thaventhiran and Mr Ross Davenport providing the Research Department a tour of the Blizard Institute at The Royal London Hospital.
13. Mr Ian Sabin and The President touring The Wellington Hospital
14. Professor Paul Johnson, Professor Neil Mortensen and Professor Michael Nicholson touring The Francis Crick Institute
15. Professor Iain Hutchinson making a point at the Research Committee meeting hosted by The Francis Crick Institute

Royal College of Surgeons of England
ADVANCING SURGICAL CARE

MAKE SURGERY YOUR LEGACY

The lives of tens of thousands of people throughout the UK are saved and transformed daily by surgery. Almost five million surgical patients are admitted to hospital every year in England alone, for procedures ranging from straightforward gallbladder removal and joint replacements, to complex transplants and emergency trauma repair.

The Royal College of Surgeons of England safeguards the experience, treatment and outcomes of the UK's surgical patients through the ongoing state-of-the-art training of our surgeons and pioneering research.

Research at RCS England relies almost exclusively on legacies, gifts and donations. We need your help if this work is to continue and flourish. Making a will is a significant personal responsibility and the people and causes you remember in your will are a positive recognition of all that is important to you.

We understand that the welfare and concern for your family and friends comes first. Just as a will brings security to those closest to you, a legacy to surgical research at the Royal College of Surgeons of Engdland will play a crucial role in maintaining and improving the surgical care for patients.

Please contact us to find out how leaving a gift to RCS England in your will would advance our work.

t 020 7869 6086 e fundraising@rcseng.ac.uk
w www.rcseng.ac.uk/fundraising #surgerysaveslives

Registered charity no 212808

Royal College of Surgeons of England
ADVANCING SURGICAL CARE

For information on donating
visit **www.rcseng.ac.uk/donate**
email **fundraising@rcseng.ac.uk**
or call **020 7869 6086**

To contact the research department
email **research@rcseng.ac.uk**
or call **020 7869 6614**

The Royal College of Surgeons
@RCSnews