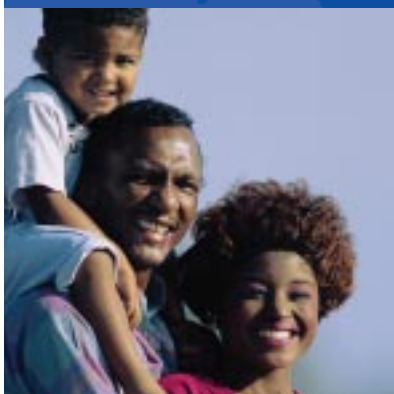


Faculty of Dental Surgery



National Clinical Guidelines 1997



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1. Turning Clinical Guidelines into effective Commissioning

Why Clinical Guidelines ?

The purpose of Clinical Guidelines is to improve the effectiveness and efficiency of clinical care through the identification of good clinical practice and desired clinical outcomes.

The Guidelines are statements intended to assist clinicians in making decisions about appropriate management of specific conditions.

This publication, produced by the Faculty of Dental Surgery, with financial assistance from the Department of Health, contains three guidelines related to each of the specialties of Oral and Maxillofacial surgery, Orthodontics, Paediatric Dentistry, Restorative Dentistry, and Dental Public Health.

The aim has been to produce Guidelines which deal with commonly encountered clinical situations and make recommendations on their management. In many areas of practice there is a shortage of reliable research data, so that while some recommendations are supported by robust data, others are made with a lesser degree of confidence, and may represent only “best current practice”.

It is hoped that these Guidelines, produced by experts who have reviewed the available evidence, will be welcomed by clinicians and encourage interest in providing the highest possible standards of care. An anticipated benefit is that shortage of data will be highlighted, so stimulating research aimed at improving the scientific foundation of our clinical activity.

It will be important to refine the existing Guidelines as further information becomes available, and the intention is to add to the number of guidelines in future publications.

John Williams

Chairman of Faculty of Dental Surgery Audit Committee

THE PROCESS OF NATIONAL CLINICAL GUIDELINE PRODUCTION

In 1994 the Department of Health requested the Royal College of surgeons to produce National Clinical Guidelines. The Faculty of Dental surgery delegated this task to the respective Clinical Audit Committees in each of the Dental disciplines of:-

**ORAL AND MAXILLOFACIAL SURGERY
ORTHODONTICS
PAEDIATRIC DENTISTRY
RESTORATIVE DENTISTRY
DENTAL PUBLIC HEALTH**

Draft authors were asked to review the scientific literature on selected topics and produce a draft guideline which was then circulated to an “Expert Panel” for comment and opinion. Expert panels varied according to the subject of the guideline and consisted of individuals who were identified as having a particular expertise in that subject.

A final Guideline was eventually produced which was assessed, according to the Scottish Intercollegiate Guideline Network (SIGN) classification, as to whether it was based on proven scientific evidence or currently accepted good clinical practice with limited scientific evidence, (See table below).

Levels of Evidence

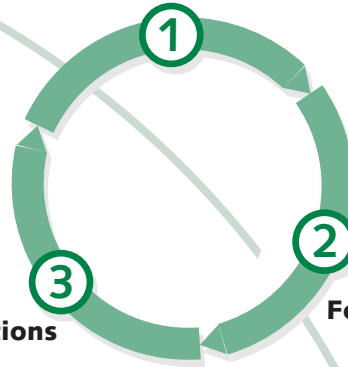
Level	Type of evidence
Ia	Evidence obtained from meta-analysis or randomised control trials
Ib	Evidence from at least one randomised control trial
IIa	Evidence obtained from at least one well designed control study without randomisation
IIb	Evidence obtained from at least one other type of well designed quasi-experimental study
III	Evidence obtained from well designed non-experimental descriptive studies, such as comparative studies, correlation studies and case control studies
IV	Evidence from expert committee reports or opinions and/or clinical experience of respected authorities

Grading of Recommendations

Grade	Recommendations
A (Evidence levels Ia, Ib)	Requires at least one randomised controlled trial as part of the body of the literature of overall good quality and consistency addressing the specific recommendations
B (Evidence levels IIa, IIb, III)	Requires availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation
C (Evidence level IV)	Requires evidence from expert committee reports or opinions and/or clinical experience of respected authorities. Indicates absence of directly applicable studies of good quality.

Diagnosis and M

Diagnosis & Management



Additional Clinical Considerations & References

Follow-up Management

Where applicable each guideline consists of three broad sections. The first section is a series of recommendations for diagnosis and management. Each recommendation is graded according to the SIGN classification and is clearly marked in the margin - A, B or C.

The second section contains explanatory notes relating to the evolution of these recommendations.

The third section contains references and comments to assist further research into the subject.

It should be understood that a Clinical Guideline is intended to assist the clinician in the management of patients in an effective and efficient way. It is not intended to restrict clinical freedom in the management of an individual case.

Management

Explanatory notes

Discussion and References

Oral and Maxillofacial Surgery

- 1. The Management of Patients with Impacted Third Molar (syn. Wisdom) Teeth**
- 2. Management of Pericoronitis.**
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THE MANAGEMENT OF PATIENTS WITH IMPACTED THIRD MOLAR (syn: WISDOM) TEETH

INTRODUCTION




This document which is a précis of a more comprehensive overview commissioned by the Department of Health is designed to provide guidance on current best clinical practice in the United Kingdom. It has been prepared following consultation with the profession nationally² in the light of published reviews on the effectiveness of removal of impacted third molars(M3)^{3,77} and is consistent with authoritative recommendations from the USA.^{1,4,14,15}

Appraisal criteria based on those devised by the Agency of Health Care Policy and Research of the US Department of Health and Human Resources⁸⁰ have been applied to each of the main items of the guideline in order to indicate the quality of evidence provided by the literature and thus the strength of recommendation.

Levels of Evidence

Ia	meta-analysis or randomised control trials (RCT)
Ib	at least one randomised control trial (RCT)
IIa	at least one well designed control study without randomisation
IIb	at least one other type of well designed quasi-experimental study
III	well designed non-experimental descriptive studies (eg: comparative correlation or case control studies)
IV	expert committee reports or opinions and/or clinical experience of respected authorities

Grading of Recommendations

	Evidence levels Ia/Ib	Requires at least one RCT as part of good quality literature consistently addressing specific recommendations
	Evidence levels IIa/IIb/III	Requires well conducted clinical studies short of RCT on topic of recommendation
	Evidence level IV	Requires expert committee reports/opinions or clinical experience of respected authorities. Indicates absence of directly applicable good quality studies

Although on this basis evidence is graded at levels II and III with strengths of recommendation graded B/C published opinion has internationally over the years remained remarkably similar with only limited areas of discussion. The main variation in practice relates to removal vs retention and observation of pathology free impacted M3.

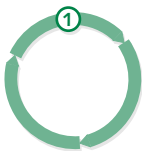
Definition

Impaction occurs where there is prevention of complete eruption into a normal functional position of one tooth by another, due to lack of space (in the dental arch) obstruction by another tooth or development in an abnormal position.^{56,57,10}

M3 emergence normally occurs between 18-24 years but eruption is not uncommon outside these limits.^{7,16,18,58,59} However one or more M3 fail to develop in approximately 1:4 adults.

Epidemiological studies often fail to distinguish between the prevalence of one impacted M3 and two or more. Despite this M3 impaction is clearly a common condition. The prevalence of impaction of at least one impacted lower M3 has been reported as 72.7% in an age 20-30 years cohort. Prevalence of upper M3 impaction was 45.8% of this series from Sweden.¹¹ The final results of a longitudinal study of M3¹⁷ have not yet been published but a study by Hugoson and Kugelberg¹¹ shows a sharp decline in the numbers of M3 between age 20-30 principally due to operative removal. Other studies confirm these findings.^{60, 61, 17, 62}

Impaction is an abnormality of development which predisposes to pathological changes such as pericoronitis, caries, resorption and periodontal problems. Cysts and tumours may also arise and can proceed to an advanced stage before the presentation of symptoms. Although not pathological in itself^{2, 13} a consensus development conference of the National Institute of Health in the USA (November 1979)¹⁴ considered that impaction or malposition of a M3 is an abnormal state which may justify its removal; such treatment not being considered 'prophylactic'. It is nevertheless important to draw a distinction between an abnormal state and pathology. Under these circumstances the decision to recommend removal must be based on a balance between the risk of observing a tooth until it becomes associated with pathology against that of removal before overt disease develops.^{2, 4} Relative risks have been estimated in two decision analyses both of which have suggested that surgical intervention in the absence of pathology is generally not justified.



1. MANAGEMENT

Presurgical assessment includes as a minimum the taking of a history plus clinical examination and diagnostic imaging. A dental panoramic tomographic (DPT) radiograph is generally sufficient for the management of M3. If this provides inadequate information or there is doubt alternative supplementary films may include intraoral periapical or oblique lateral views of the relevant areas plus in exceptional cases CT scanning to determine with greater precision relationship with the inferior alveolar canal.^{2, 10}

1.1 Procedures for the management of M3 are not listed in order of preference:^{2, 4}

1.1.1 Surgical removal/excision of tooth/teeth: procedure variable dependent upon status of tooth including degree/complexity of impaction. Generally involves raising of soft tissue flaps for adequate exposure prior to removal of bone and/or tooth division (utilising water-cooled/irrigated rotary instruments +/- chisel/osteotome) prior to delivery by hand held elevator +/- forceps

Partial excision to avoid damage to the IAN in high-risk cases is not recommended on account of the high complication rate.^{97, 100, 101}

1.1.2 Operculectomy/surgical periodontics:^{2, 4} in carefully selected cases with proviso that subsequent excision may be required

1.1.3 Observation:^{2, 4, 14} in cases where impacted teeth do not meet the indications for surgery. Periodic clinical and radiographic examination should be ensured.

1.1.4 Surgical exposure:^{2, 4} in selected cases in liaison with experienced orthodontic opinion

1.1.5 Surgical reimplantation/transplantation:^{2, 4} in selected cases with co-operation of experienced orthodontic opinion

Orthodontics prior to surgical treatment to avoid IAN damage remains incompletely evaluated.⁹⁸

In all cases adequate instructions for post-treatment care and follow-up should be provided.

1.2 Anaesthesia²

Surgical management may be carried out utilising:

1.2.1 Local analgesia (LA)

1.2.2 LA supplemented by intravenous sedation/analgesia/relative analgesia

1.2.3 General anaesthesia with airway protection achieved by endotracheal intubation or by laryngeal mask. This may be supplemented by local analgesia with vasoconstrictor to reduce haemorrhage and post-operative pain.

M3 procedures are generally suitable for day care management and it is recognised that treatment under local analgesia and sedation is associated with reduced complication rates.⁷⁸

1.3 Perioperative medication²

Drugs prescribed will vary according to local and/or individual policies and also for specific patients. However as a guide those in common use include:

1.3.1 Conventional sedative/antiemetic premedication

1.3.2 Topical local anaesthetic cream at site of planned intravenous injection

1.3.3 Non steroidal anti-inflammatory drugs (NSAIDs) for analgesia and to reduce oedema and trismus

1.3.4 Steroids (eg: dexamethasone) to reduce oedema and trismus

1.3.5 Antibiotics to reduce incidence of local osteitis /infection which may cause prolonged pain and swelling^{81, 82}

1.4 Indications for Removal^{2, 4}

There has been disagreement about the appropriateness of removal of M3 unassociated with local pathology but there is no controversy about the value of removal when they are associated with pathological changes.¹⁴ One or more indications may be applicable in each case.^{4, 14}

1.4.1 Overt or previous history of infection including pericoronitis.^{14, 16, 20, 21, 22, 99} This indication will generally exclude transient/self-limiting 'inflammation' that may be associated with normal eruption of any tooth.

Prevalence: In 7 studies of prevalence of pathology related to M3 reporting of pericoronitis was not undertaken with clarity or consistency although it is the most common stated reason for removal. Von Wovorn¹⁶ found 10% of a sample of 130 students followed over 4 years developed pericoronitis. In a similar student group age 18-21 years Richardson⁹⁵ noted that in 76 subjects with 112 teeth, 17 lower third molars in 9 subjects were removed for recurrent episodes of pericoronitis (ie: 11% or 3-4% pa). A prospective study by Bruce et al confirmed pericoronitis to be the most frequent reason (in 40% of patients) for M3 removal in different age groups⁶³ while the proportions in other studies have varied between 8-59%.^{64, 65, 96}

1.4.2 Unrestorable caries^{14, 20, 23, 24, 66, 67}

Prevalence: Van der Linden et al 1995 in a review of 1001 patients whose M3 were removed aged 13-75 years reported caries in 7.1% of impacted M3 and in 42.7% of adjacent molars (204 and 1227 of 2872 teeth respectively).⁸⁰

1.4.3 Non-treatable pulpal and/or periapical pathology^{2, 4, 14}

1.4.4 Cellulitis, abscess and osteomyelitis^{2, 4, 14}

Prevalence: of infective disease (including pericoronitis) between 4.7%⁶⁹ and 5%⁶⁸

1.4.5 Periodontal disease¹⁴

Impacted M3 associated with periodontally involved adjacent (usually second molar) teeth should be removed early as the disease may be irreversible by 30 years.²⁵ This is particularly important in smokers where periodontal disease may progress rapidly.

Prevalence: between 1% - 4.5%²⁰





1.4.6 Orthodontic abnormalities.

In some patients there may be an indication for removal of unerupted upper M3 before the commencement of maxillary retraction which would result in their impaction. However there is little rationale based on present evidence for excision of lower M3 solely to minimise present or future crowding of lower anterior teeth.^{20, 24, 26, 27, 28, 29, 30, 31}



1.4.7 Prophylactic removal in presence of specific medical and surgical conditions.

These include endocardial/valvular scarring/abnormality predisposing to bacterial endocarditis, organ transplants, alloplastic implants, chemotherapy/radiotherapy.^{15, 32}



1.4.8 Facilitation of restorative treatment including provision of prosthesis.

Erupted M3 which can be maintained in a state of health may be retained as potential abutment teeth or for the maintenance of vertical dimension.¹⁴



1.4.9 Internal/external resorption of tooth or adjacent teeth^{14, 20, 24, 26, 33, 34, 35, 36}

Prevalence: in the range 2% - 5%^{64, 68, 69, 70}



1.4.10 Pain directly related to M3¹⁵

It is important to avoid an erroneous diagnosis of M3 related pain which may in reality be associated with the temporomandibular joint and masticatory musculature.

Prevalence: great variation has been reported between 5 - 53%¹⁶ and 18.4%⁶⁹



1.4.11 Tooth in line of bony fracture or impeding trauma management^{37, 38}

On occasions it is recommended that a M3 be left in situ at the time of initial fracture treatment. However in most cases removal is required at a later time.



1.4.12 Fracture of tooth^{2, 4, 14}

1.4.13 Disease of follicle including cyst/tumour^{14, 20, 24, 29, 30, 31, 39, 40}

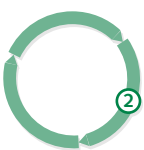
Prevalence: 2-11% for cyst and between 0.0003-2% for odontogenic tumour^{71, 75, 76, 92}

1.4.14 Tooth/teeth impeding orthognathic surgery or reconstructive jaw surgery^{2, 4}

1.4.15 Tooth involved in/ within field of tumour resection^{15, 41}

1.4.16 Satisfactory tooth for use as donor for transplantation¹⁵

2. EXPLANATORY NOTES



2.1 *An impacted tooth which is totally covered by bone and which does not meet the above indications for surgery should not be removed; however it is generally recognised that it should be monitored periodically by clinical and radiographic examination (usually dental panoramic tomograph) because of the potential for change in position and/or development of pathology.⁴ The relative risk of retaining/delaying removal of impacted M3 should be considered in all cases. However surgical intervention in the absence of pathology is not usually indicated.*

2.2 *Consideration may be given to removal of an unerupted M3 by the third decade when a high probability of disease or pathology exists and when the risks associated with early removal are less than the anticipated risks of later removal (ie:increased morbidity 4). It is however emphasised that currently there is little evidence (based on randomised controlled trials) which differentiates those likely to become associated with disease from those unlikely to do so.*

Two situations in which a high probability of consequential local disease is present are:

2.2.1 *When a vertical or distoangular impacted tooth is at or close to the occlusal plane but the occlusal surface has been half or more covered for an extended period by soft tissue pericoronitis is more likely^{93, 94}*

2.2.2 *When a partly-erupted impacted M3 in mesio-angular or horizontal impaction has a contact point at or close to the amelocemental junction of the second molar the risk of caries of the latter is increased^{2,80} especially in the absence of a high standard of oral hygiene.*

2.3 *In a patient who has borderline indications for M3 excision and whose occupation will necessitate long periods away from civilisation (eg astronauts, nuclear submariners and explorers) consideration may be given to earlier rather than later removal. Results are awaited of prospective study undertaken by the UK Tri-Services, USA and Canadian Services Dental Corps and of a Swedish study of school children followed to age 26.^{11,79}*

2.4 *Opposing and contralateral teeth:*

If there are indications for removal of one M3 it is in the patient's best interests to determine whether the other three are present and if so whether their excision is required on the grounds of the clinical indications listed under items 1.4.1-16 above.²

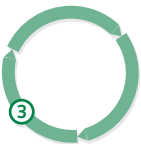
It is suggested that removal of other teeth should only be carried out when treatment under general anaesthetic is planned or selected by the patient and where there is no evidence of increased risk of post-operative complications such as sensory nerve impairment. It is important to recognise that medico-legal cases have arisen in relation to complications arising from removal of such opposing and/or contralateral teeth.

DISCUSSION and REFERENCES

Although in a recent assessment of published reviews^{3,77} two papers concluded that it may be appropriate to remove impacted M3 prophylactically^{23,24} the methodological quality of these was deemed to be less satisfactory than others which found there to be lack of evidence to support this line of management.^{13,20,21,26,27,28,29,30,31,47} In particular Mercier and Precious²⁰ clearly lay out the risks and benefits of surgery and conclude that the best general approach in growing individuals is to remove on the basis of clinical judgement some teeth early when the chances of eruption are minimal. With others periodic examination is more appropriate when the patient has been fully informed of the relevant risks and benefits. However in the absence of good evidence to support prophylactic removal it seems reasonable at this time to avoid removal of "pathology-free" impacted M3.

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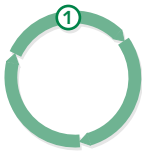
MANAGEMENT OF PERICORONITIS

INTRODUCTION

Pericoronitis is inflammation of the soft tissues associated with the crown of a partially erupted tooth and is seen most commonly in relation to the mandibular third molar. The common symptoms and signs are pain, bad taste, inflammation of, and pus expressible from beneath, the pericoronal tissues and aggravation by trauma from an opposing tooth. It is one of the agreed criteria by the NIH (National Institute of Health, of America) for removal of third molars and is the commonest cited reason for removal of wisdom teeth in the UK though its presence does not necessarily mean that the associated tooth requires removal.

Unless the cause is removed, pericoronitis may present as a recurrent condition requiring multiple episodes of treatment. In severe episodes an acute pericoronal abscess may develop which may remain localised or spread to involve one or more of the adjacent deep surgical spaces and may be associated with systemic as well as local signs and symptoms.

Pericoronitis is a condition that presents to both Primary and Secondary care sectors and these guidelines are intended to assist in the management of the condition and the prevention of recurrent episodes.



MANAGEMENT

1. Risk Factors

- 1.1** Presence of unerupted/partially erupted tooth/teeth in communication with the oral cavity. Vertical and distoangular mandibular third molars most commonly affected.
- 1.2** Pathological periodontal pocketing adjacent to unerupted/partially erupted teeth.
- 1.3** Opposing tooth/teeth in relation to pericoronal tissues surrounding unerupted/partially erupted tooth/teeth.
- 1.4** Previous history of pericoronitis.
- 1.5** Poor oral hygiene.
- 1.6** Respiratory tract infections.

2. Diagnostic Criteria

- 2.1** Presence of unerupted/partially erupted tooth/teeth in communication with the oral cavity.
- 2.2** Cardinal signs/symptoms of inflammation associated with the pericoronal tissues:
 - 2.2.1** Local pain/discomfort.
 - 2.2.2** Swelling.
 - 2.2.3** Erythema.
- 2.3** Associated signs/symptoms (variable expression):
 - 2.3.1** Pus expressible from beneath the pericoronal tissues.

- 2.3.2** Restricted mouth opening.
- 2.3.3** Abnormal taste.
- 2.3.4** Halitosis.
- 2.3.5** Cervical lymphadenopathy.
- 2.3.6** Presence of associated disease - pericoronal/cervical abscess.
- 2.3.7** Systemic signs and symptoms.
- 2.3.8** Evidence of trauma by opposing tooth/teeth.



3. TREATMENT

The following should be considered in the acute phase:

- 3.1** Irrigation of pericoronal space.
- 3.2** Use of local agents to cauterise the soft tissues.
- 3.3** Removal of opposing tooth/teeth if traumatic occlusion with pericoronal tissues present.
- 3.4** Use of appropriate analgesia.
- 3.5** Use of appropriate antibiotics in the presence of severe local disease or if systemic symptoms identified.
- 3.6** Give advice regarding oral hygiene.
- 3.7** Use of 0.12% chlorhexidine mouthwash.

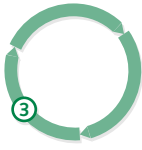


The following should be considered following resolution of the acute phase:

- 3.8** Local soft tissue surgery.
- 3.9** Removal of associated tooth/teeth

EXPLANATORY NOTES

- 3.1** *Irrigation of the pericoronal space mechanically removes any debris that may have collected within the space. The irrigant should be sterile. Irrigants used include; water for injection, normal saline, chlorhexidine and local anaesthetic solutions.*
- 3.2** *Caustic agents to cauterise the local tissues, if used, should be applied with caution and appropriate care to avoid injury to adjacent tissues.*
- 3.3** *Pericoronitis is an inflammatory condition and the NSAIDs should be considered the analgesic of choice unless contra-indicated.*
- 3.4** *The use and choice of antibiotics is controversial. The bacterial flora is a complex mixture of gram-positive and gram-negative organisms and consideration should therefore be given to the use of broad spectrum or combinations of antibiotics dependant upon the clinical situation.*



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MANAGEMENT AND PREVENTION OF DRY SOCKET

INTRODUCTION

Dry socket, also termed alveolar osteitis is a well recognised complication of tooth extraction. It is characterised by increasingly severe pain in and around the extraction site, usually starting on the second or third post-operative day and which may last for between ten and forty days. The pain may radiate and typically pain in the ear is one of the symptoms of a dry socket in the mandible. The normal post-extraction blood clot is absent from the tooth socket(s), the bony walls of which are denuded and exquisitely sensitive to even gentle probing. Halitosis is invariably present. The condition probably arises as a result of a complex interaction between surgical trauma, local bacterial infection and various systemic factors.

There is great variation in reported incidence rates (1%-65%) between series usually due to inconsistency in diagnostic criteria, variation in microbial prophylaxis and study sample heterogeneity. The true incidence rate probably lies somewhere between 3% and 20% of all extractions with lower pre-molar and molar sockets most commonly involved.

These guidelines are intended to assist in the prevention and management of the condition.

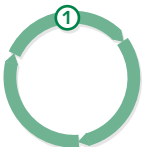
MANAGEMENT

1. Risk Factors

- 1.1 Extraction of mandibular rather than maxillary teeth.
- 1.2 Extraction of third molars especially impacted lower third molars.
- 1.3 Singleton extractions.
- 1.4 Traumatic and difficult extractions.
- 1.5 Female sex especially if using oral contraception.
- 1.6 Poor oral hygiene and plaque control.
- 1.7 Active or recent history of acute ulcerative gingivitis or pericoronitis associated with the index tooth(teeth).
- 1.8 Smoking, especially if > 20 cigarettes per day.
- 1.9 Increased bone density either locally or generally (eg Paget's disease and osteopetrosis).
- 1.10 Previous history of dry sockets following extractions.

2. Preventive Measures

- 2.1 A comprehensive history with identification of risk factors.
- 2.2 Wherever possible pre-operative oral hygiene measures to reduce plaque levels to a minimum should be instituted.
- 2.3 Where the clinical history and/or radiographic examination suggests a particularly difficult extraction consideration should be given to an elective trans-alveolar approach.



2.4 All extractions should be completed with the minimum amount of trauma, the maximum amount of care and as rapidly as possible commensurate with the degree of difficulty and experience of the operator. If the extraction is beyond the capability of the clinician then the patient should be referred to an appropriate capable clinician.

2.5 Avoid extracting lower third molars in the presence of active infection or ulcerative gingivitis.

2.6 For difficult lower third molar bony impactions, for immunocompromised patients and for patients with a history of previous pericoronitis or ulcerative gingivitis, appropriate antibiotic prophylaxis should be administered.

2.7 Patients who smoke should be enjoined to cease the habit pre-operatively and for at least two weeks post-operatively whilst the socket(s) heals.

2.8 Wherever possible, for female patients using the oral contraceptive extractions should be performed during days 23 through 28 of the tablet cycle.

2.9 Patients should be advised to avoid vigorous mouth rinsing for the first 24 hours post extraction and to use gentle toothbrushing and mouth rinses for 7 days post-extraction.

2.10 Patients should be advised to return to the surgery/hospital immediately if they develop increasing pain or halitosis.

2.11 Pre- and post-operative verbal instructions should be supplemented with written advice to ensure maximum compliance.

3. Diagnostic Criteria

3.1 Severe and persistent pain arising 24 - 48 hours following tooth extraction localised to the extraction socket(s) which is(are) sensitive to even gentle probing. Typically the pain radiates to the ear with mandibular lesions.

3.2 Absence of a normal healthy post-extraction blood clot in the socket(s) which may be empty or contain fragments of disintegrating blood clot.

3.3 Halitosis.

3.4 Trismus.

4. Treatment

4.1 All patients with signs and symptoms suggestive of a possible dry socket should be reviewed immediately by the operating clinician.

4.2 If appropriate patients should be x-rayed to exclude the possibility of retained fragments of tooth or foreign body.

4.3 The affected socket(s) should be gently irrigated with 0.12% warmed chlorhexidine and all debris dislodged and aspirated. In extremely painful cases local anaesthesia may be required and in this instance regional nerve blocks should be employed wherever possible.

4.4 The socket should be lightly packed with a dressing that contains an obtundant for pain relief and a non-irritant antiseptic to inhibit bacterial and fungal growth. The dressing should prevent the accumulation of food debris and protect the exposed bone from local irritation. Ideally the dressing should resorb and should not excite a host inflammatory or foreign body response.

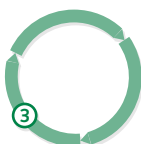


4.5 Appropriate analgesics should be prescribed. Members of the Non Steroidal Anti-inflammatory Group of drugs are recommended provided there are no individual medical contraindications for their use.

4.6 Patients' progress should be reviewed the following day but they should be informed to return sooner if problems worsen in the intervening period. Admission to hospital is rarely required.

4.7 Steps 4.3 and 4.4 should be repeated as frequently as necessary to keep the patient comfortable and pain free. Analgesic efficacy should be reviewed and analgesic regimes altered appropriately. When it is considered that socket dressings are no longer required the patient can be instructed in home socket irrigation techniques using an appropriate appliance and 0.12% chlorhexidine.

4.8 Patients should be kept under review until they are pain free and socket healing is ensured.



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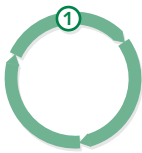
MANAGEMENT OF UNILATERAL FRACTURES OF THE CONDYLE

INTRODUCTION

Isolated mandibular condylar fractures are relatively common and these guidelines are intended to assist in the management and treatment of such injuries as there is evidence to suggest that unsatisfactory outcome can occur in certain subgroups undergoing routine management in the UK.

The guidelines are presented in an algorithmic format with the prime determinant being the patient's age. It is acknowledged that there is an overlap between the three algorithms and that the cut-off age constitutes a grey area.

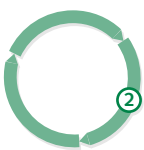
The purpose of treatment is to achieve, as far as possible, the patient's pre-trauma appearance, occlusion and mandibular and oral function.



MANAGEMENT

1. Diagnostic Criteria

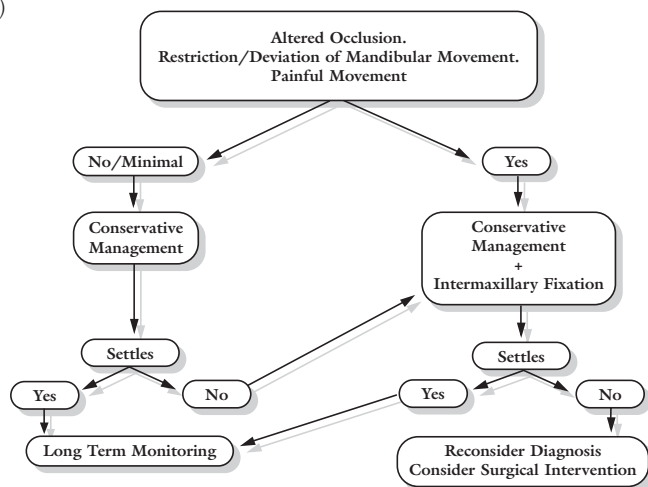
- 1.1 History of external violence. The rare occurrence of a pathological fracture may not be preceded by external violence.
- 1.2 Pain on mandibular movement with or without soft tissue swelling in the region of the condyle.
- 1.3 Restriction of mandibular movement.
- 1.4 Deviation of mandibular movement.
- 1.5 Alteration of the occlusion.
- 1.6 Laceration of the anterior wall of the external auditory meatus with blood in the canal.
- 1.7 Imaging evidence of condylar head/neck fracture:



2. Treatment

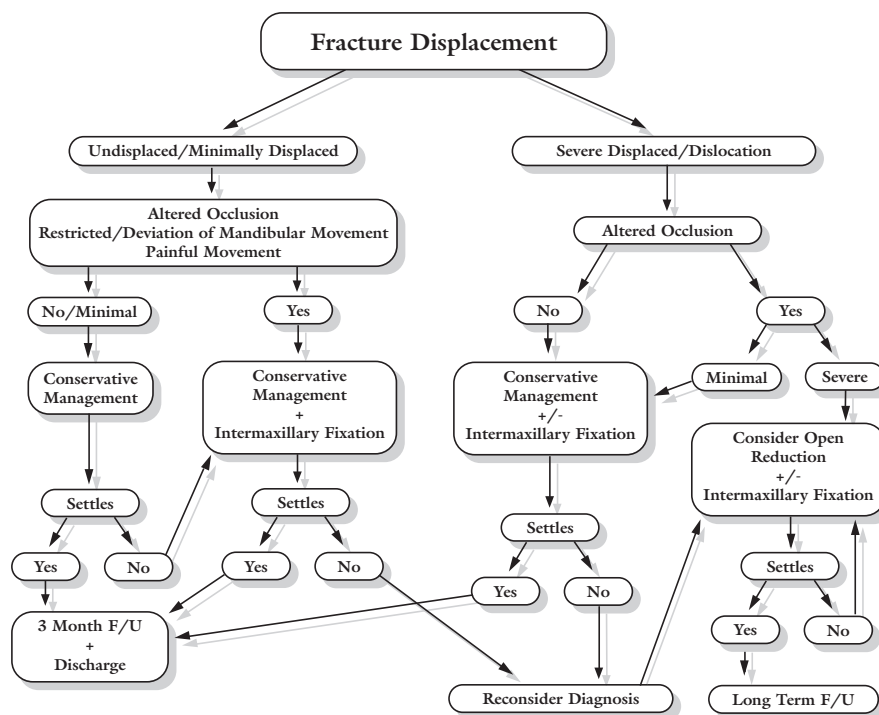
2.1 Diagram 1

(Patients aged 12 years and less)

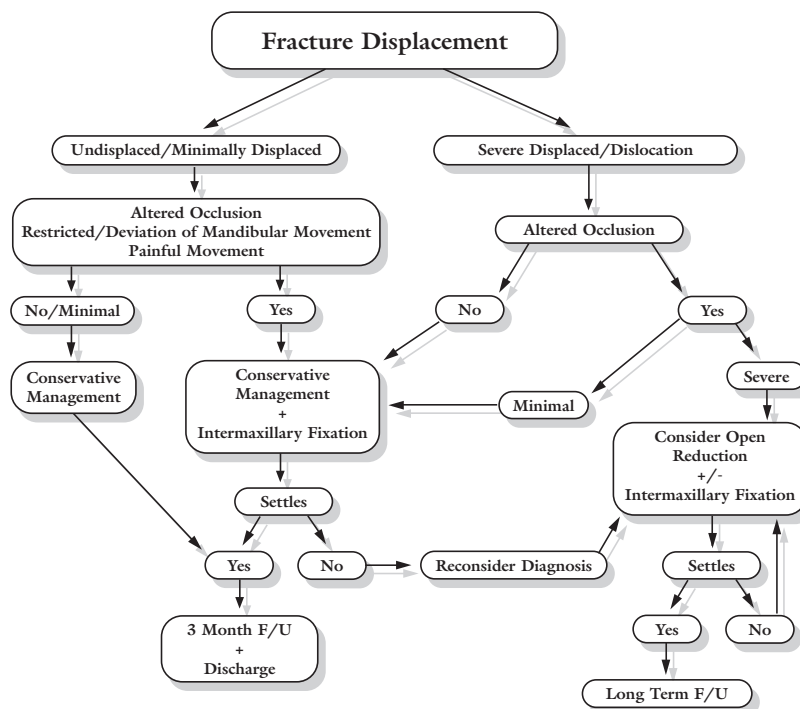




2.2 DIAGRAM 2
(Patients aged 12 to 20 years)



2.3 DIAGRAM 3
(Patients aged 20 years plus)



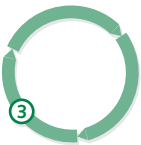
EXPLANATORY NOTES

- 2.1** *Patients aged 12 years and under have enormous capacity for condylar remodelling and occlusal development. The short anatomical neck of the mandible in this group predisposes towards intracapsular fractures and immobilisation and/or open reduction should be avoided if possible (diagram 1).*
- 2.2** *Patients aged 12 to 20 years constitute a grey area where considerable remodelling potential exists but complete healing and restoration to function is less predictable. Depending upon the type of fracture and severity of derangement of the occlusion these patients may require conservative or surgical management (diagram 2).*
- 2.3** *Considering patients aged 20 years and over undisplaced/minimally displaced fractures heal to produce excellent functional outcomes with either conservative management or minimally invasive closed reduction and functional elastic intermaxillary fixation. It has however been recognised that the functional outcome may be better than the radiographic. Severely displaced, dislocated and severely telescoped fractures are likely to require open reduction and fixation in order to achieve optimal outcomes (diagram 3).*

"Conservative Management" concerns the use of appropriate analgesics and the provision of dietary advice.

"Intermaxillary Fixation" relates to the use of functional elastics though it is recognised that rigid wire fixation may be required on occasion.

There is currently no clear indication as to the superiority of any one technique for open reduction and fixation over another.



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Orthodontics

- 1. The Management of the Palatally Ectopic Maxillary Canine.**
- 2. The Management of Unerupted Maxillary Incisors**

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THE MANAGEMENT OF THE PALATALLY ECTOPIC MAXILLARY CANINE

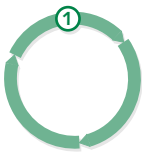
INTRODUCTION

The maxillary canine is second only to the mandibular third molar in its frequency of impaction. The prevalence is about 1.7%. The canine becomes ectopic more often palatally than buccally in a ratio of 6:1.¹ Management of this condition often faces general dental practitioners and orthodontic specialists. Mismanagement and failures in diagnosis may be costly in terms of clinical time (both for the practitioner and patient) and in litigation (if damage occurs to adjacent teeth and proceeds unchecked).

The aetiology of the canine ectopia remains unclear. However, it has been reported that palatal canine ectopia is more common in spaced arches² or where the adjacent lateral incisor is missing or anomalous/abnormal in shape or size.³ Also there is some evidence that palatally ectopic canines occur more often among family members.⁴ The erupting maxillary canines should be palpable in the buccal sulcus from ten to eleven years of age. Those maxillary canines erupting after 12.3 years in girls and 13.1 in boys may be considered late.⁵

Sequelae of canine ectopia

It has been estimated that 0.7% of children in the 10-13 year old age group have permanent incisors resorbed, as a result of canine ectopia.⁶ Root resorption can be expected in about 12.5% of the incisors adjacent to ectopic maxillary canines.⁷



DIAGNOSIS AND MANAGEMENT

1. History and Examination

The success rate associated with early diagnosis and treatment of the palatally ectopic canine has been highlighted in recent years.^{8,9} Practitioners should become suspicious of the possibility of canine ectopia if the canine is not palpable in the buccal sulcus by the age of 10-11 years of age or if palpation indicates an asymmetrical eruption pattern. The patient with an ectopic maxillary canine must undergo a comprehensive assessment of the malocclusion including accurate localisation of the ectopic canine.

1.1 Radiographic examination

This usually involves taking two radiographs (Orthopantomogram or equivalent and Standard Upper Anterior Occlusal)¹⁰ and the use of the principle of vertical or horizontal parallax

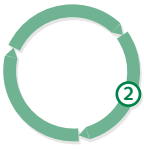
Horizontal Parallax

1. Anterior Occlusal and Periapical
or
2. Two Periapicals

Vertical Parallax

1. Anterior Occlusal /OPT
or
2. Periapical / OPT

It has been suggested that radiographic procedures prior to the age of 10 years are of little benefit in terms of the knowledge gained.¹



2. Treatment

Radiographic examination should be carried out initially to confirm the position of the unerupted canine. Patient and parent counselling on the various treatment options is essential.

2.1 Interceptive treatment by extraction of the deciduous canine

- The patient should be aged between 10-13 years.
- The need to space maintain requires consideration.
- Better results are achieved in the absence of crowding.
- If radiographic examination reveals no improvement in the ectopic canine's position 12 months after extraction of the deciduous canine, alternative treatment should be considered.



2.2 Surgical exposure and orthodontic alignment

- The patient should be willing to wear fixed orthodontic appliances.
- The patient should be well motivated and have good dental health.
- The patient is considered to be unsuitable for interceptive extraction of the deciduous canine.
- The degree of malposition of the ectopic canine should not be too great to preclude orthodontic alignment.



2.3 Surgical removal of the palatally ectopic permanent canine

- This treatment option should be considered if the patient declines active treatment and/or is happy with their dental appearance.
- Surgical removal of the ectopic canine should be considered if there is radiographic evidence of early root resorption of the adjacent incisor teeth. Exposure and alignment of the ectopic canine is usually indicated in cases where severe root resorption of the incisor teeth has occurred necessitating the extraction of the incisor.
- The best results are achieved if there is good contact between the lateral incisor and first premolar or the patient is willing to undergo orthodontic treatment to substitute the first premolar for the canine.



2.4 Transplantation

- This treatment option should be considered if the patient is unwilling to wear orthodontic appliances or the degree of malposition is too great for orthodontic alignment to be practical.
- Transplantation would not normally be considered unless interceptive extraction of the deciduous canine has failed or is considered to be inappropriate.
- There should be adequate space available for the canine and sufficient alveolar bone to accept the transplanted tooth.
- The prognosis should be good for the canine tooth to be transplanted with no evidence of ankylosis. The best results are achieved if the ectopic canine can be removed atraumatically.¹¹





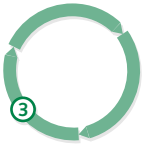
2.5 No active treatment/leave and observe

- The patient does not want treatment or is happy with their dental appearance.
- There should be no evidence of root resorption of adjacent teeth or other pathology.
- Ideally there should be good contact between the lateral incisor and first premolar or the deciduous canine should have a good prognosis.
- Severely displaced palatally ectopic canines with no evidence of pathology may be left in-situ, particularly if the canine is remote from the dentition. If the ectopic canine is left in-situ radiographic monitoring is recommended to check for cystic change or root resorption.

EXPLANATORY NOTES

Treatment planning for patients with palatally ectopic maxillary canines is not straightforward due to the large number of patient factors and orthodontic factors which must be considered. It is strongly recommended that practitioners seek the opinion of an orthodontic specialist prior to initiating any of the above treatment options.

- 2.1** *Inspection and palpation in the canine region is recommended annually from the age of eight years.⁷ It is probable that early diagnosis and treatment of ectopic canine eruption will reduce the potential for root resorption of the adjacent incisors. An initial study found that 78% of palatally ectopic canines reverted to a normal path of eruption following the extraction of the primary canine.⁸ A more recent study found the success rate to be slightly lower (62%).¹² Nonetheless, in many cases interceptive extraction of the adjacent deciduous canine can be a highly successful and cost-effective method of correcting canine ectopia.*
- 2.2** *Much of the evidence supporting surgical exposure and orthodontic alignment as a treatment approach is derived from case studies. However, clinical experience has shown that surgical exposure and orthodontic alignment of a palatally ectopic canine is a highly successful treatment approach. As with all orthodontic treatment the cooperation and motivation of the patient is paramount. The general dental health should be good since the treatment time is often prolonged. It is generally agreed that the optimal time for surgical exposure and orthodontic alignment is during adolescence.^{13,14}*
- 2.3** *Surgical removal of the ectopic canine is most often considered when dental aesthetics are acceptable with good contact between the lateral incisor and the first premolar. If necessary fixed orthodontic appliances can be used to bring the first premolar forward to simulate a canine tooth. Mesio palatal rotation of the premolar, and grinding of the premolar palatal cusp can also help to improve aesthetics. The prognosis for primary canines which are left in the arch remains unknown due to a lack of longitudinal research. Clinical experience would indicate that there is a large variation in the life-expectancy of retained deciduous canines.*
- 2.4** *Transplantation is sometimes considered for grossly displaced ectopic maxillary canines or when prolonged orthodontic treatment is unacceptable to the patient. Early studies revealed disappointing long-term results when this approach was adopted with a high frequency of root resorption occurring. More recent studies using a meticulous atraumatic surgical technique and stabilisation of the transplanted tooth with a sectional archwire for six weeks have reported better results.¹¹ However, the long-term (> 5 years) prognosis of transplanted palatally ectopic canines has yet to be evaluated.*
- 2.5** *It has been reported that root resorption of incisors by palatally ectopic canines rarely starts after 14 years of age¹⁵ and that root resorption occurs most frequently between 11 and 12 years.¹⁶ The frequency of cystic degeneration associated with palatally ectopic canines is unknown but is thought to be low.^{17,18}*



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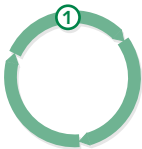
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MANAGEMENT OF UNERUPTED MAXILLARY INCISORS

INTRODUCTION

Missing and unerupted maxillary incisors can have a major impact on dental and facial aesthetics. Visibly missing anterior teeth was considered to be the most unattractive deviant occlusal trait in one American study.¹ There are very few studies reporting any functional problems from missing anterior teeth although some speech difficulties have been reported.^{2,3,4} Most of these studies were undertaken during the transition of the dentition from deciduous to permanent dentitions. Difficulties were reported with the “s” sound. There have been no studies reporting functional disturbances on older children or adults. As missing upper incisors are regarded as unattractive this may have an effect on self esteem and general social interaction and it is important to detect and manage the problem as early as possible.⁵

This guideline has been written based on current evidence. As with any guideline it will be continually developed as further clinical evidence is made available.



1. DIAGNOSIS AND MANAGEMENT

1.1 Definition

Delayed eruption of maxillary incisors requires monitoring or intervention when:

- eruption of contralateral teeth occurred 6 months previously (with both incisors unerupted – lower incisors erupted one year previously).
- deviation from normal sequence of eruption e.g. lateral incisors erupt prior to the central incisor.

1.2 Causes of delayed eruption

The delayed eruption can be classified into two groups.⁶

1.2.1 Hereditary factors:

Supernumerary teeth, cleft lip and palate, cleidocranial dysostosis, odontomes, abnormal tooth/tissue ratio, generalised retarded eruption, gingival fibromatosis.

1.2.2 Environmental factors:

Trauma, early extraction or loss of deciduous teeth, retained deciduous teeth, cystic formation, endocrine abnormalities, bone disease.

2. INCIDENCE/PREVALENCE



The true incidence of unerupted maxillary incisors is not known. However, the prevalence in the 5 – 12 year old age group has been reported as 0.13 per cent.⁷

In a referred population to regional hospitals the prevalence has been estimated as 2.6 per cent.⁸

3. DETECTION OF CAUSES OF FAILURE OF ERUPTION

Dental and Medical history

A detailed dental and medical history should be obtained to determine possible hereditary or environmental factors which may be contributory to the delay in eruption.

4. EXAMINATION



An intra-oral examination should be undertaken to identify retained deciduous teeth, buccal or palatal swelling and availability of suitable space for the incisor (9mm for a central and 7mm for lateral incisors).⁹

If an obvious cause cannot be identified, radiographs should be taken. An anterior occlusal radiograph can be taken for general assessment purposes. For detailed assessment of position, root and crown morphology two peri-apical radiographs should be taken using the parallax technique.^{10, 11}

5. MANAGEMENT PRINCIPLES

5.1 *Remove retained deciduous tooth.*

The retained deciduous tooth should be extracted.



5.2 *Create and maintain sufficient mesial and distal space*

75 per cent of incisors erupt spontaneously, of these, 55 per cent align spontaneously. 34 per cent will require orthodontic alignment.^{12, 13}



5.3 *Physical obstruction*

The presence of supernumerary tooth and odontome does not necessarily cause delayed eruption of incisors. Tuberculate supernumerary teeth are more likely to cause an obstruction than conical supernumerary teeth (1 in 5 compared to 1 in 1).¹⁴ In addition, one third of compound odontomes and one half of complex odontomes prevent eruption of teeth (Compound odontomes are four times more common than complex odontomes).¹⁵ If there is an obstruction it should be removed. In 54 - 78 per cent of supernumerary teeth removal the incisors should erupt spontaneously within an average time of 16 months.^{16, 17} The incisor may also be exposed at the same time as the supernumerary tooth is removed.¹⁷

If the incisor fails to erupt with no obvious obstruction there are two possible options:



5.3.1 *Exposure*

The minimalistic approach can be employed in which a small window could be created if the incisor is close to the surface and if attached gingiva is wide and enough can be preserved at the gingival margin.¹⁸ Otherwise, palatal or buccal mucosa flaps should be raised to reveal the tooth. In the case of a buccal flap, as much attached gingiva as possible should be preserved using an apically positioned flap.¹⁸ The exposure may need to be maintained using a non-eugenol based periodontal dressing.¹⁹ A whiteheads varnish pack may cause discoloration of the underlying tooth.¹³ A chlorhexidine mouthwash could be prescribed to reduce gingival inflammation.²⁰



5.3.2 *Closed eruption technique*

A flap is raised on a bracket attached to a gold chain,²² steel ligature,^{17, 22} magnet²³ or elastomeric material bonded to the tooth followed by the palatal flap being replaced. Orthodontic traction should then be applied.²⁴ The bracket should be bonded as palatally as possible so that early buccal fenestration does not occur to avoid unfavourable gingiva contour.



5.4 *Unfavourable root formation*

A study of 41 dilacerated unerupted maxillary central incisors revealed that 7 per cent were associated with cysts or supernumerary teeth, 22 per cent resulted from trauma to the deciduous predecessor and the remaining 71 per cent were developmental in nature.²⁵ The dilacerated incisor may be brought into the line of the arch by exposure and closed technique.^{26, 27} Elective root filling and apicectomy may be undertaken on unfavourable labial root dilaceration. If the dilaceration is severe the incisor could be removed.



5.5 Incisor removal

If a permanent incisor has to be removed (e.g. if it is ankylosed) space must be maintained initially with a fixed or removable prosthesis.²⁸ An implant should be considered as a long term solution.^{29, 30} Auto-transplantation of lower premolars should also be considered if there is crowding in the lower arch.³¹

6. DISCUSSION

The strength of a guideline is only as good as the evidence made available. In the search through the literature there were no controlled trials. There were 21 retrospective case studies reporting on 12 to 213 cases 4 epidemiological studies reporting on 41 to 48,550 individuals, 40 case reports and 12 articles portraying clinical techniques, overviews and personal impressions.

The occurrence of unerupted maxillary incisors are associated with hereditary and environmental factors, however, the relevant importance of possible factors is not known. For example, the presence of supernumerary teeth does not necessarily mean that the incisor will be prevented from eruption. The prevalence of supernumerary teeth in cleft lip and palate children has been reported as 42 per cent.³² In addition, 5.5 per cent of supernumerary teeth become cystic.³³ The accumulation of certain factors or variables will heighten the problem and impact.

The management of unerupted incisors is based on referred population samples recorded in either or both theatre operation records and orthodontic records. Often there are patients with incomplete or missing records and these cases are often excluded from the study which therefore tends to focus on treatment and is therefore creating an obvious bias.

For instance, one study in the Netherlands¹⁷ reported 54 per cent of incisors erupted when supernumerary teeth were removed. However, this finding was determined from a group of 56 children from a larger sample of 110 children, therefore the success of eruption of incisors could possibly be worse or much better than the reported 54 per cent. Another study in the U.K. looked at 96 patients and reported 78 per cent of delayed teeth spontaneously erupted after supernumerary removal.¹⁶ However, the number of patients without complete records were not included in the sample and therefore may also affect the result. The success rate has a direct bearing on the cost of treatment and will undoubtedly vary between patients, clinicians and centres. A success rate of greater than 70 per cent would arguably indicate supernumerary tooth removal first. If the tooth does not erupt, exposure and closed technique may be appropriate at a later date.

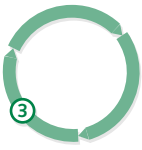
Often the position of impacted incisors determines the surgical procedures (distance from alveolar crest, rotation, angulation and inclination) however one study of 30 patients suggested that the closed technique resulted in more aesthetically pleasing gingiva than the apically repositioned flap.¹⁸ However, there was no significant difference between the techniques regarding periodontal attachment.

The method of closed eruption has never been subject to a randomised controlled trial and the cost-effectiveness of techniques such as gold chain, wire and elastic has obvious implications. The use of magnets would not necessarily be recommended at this time.

The timing of intervention has been suggested as being important several studies suggesting that the younger the age the quicker the tooth erupts^{12, 34} and other studies suggesting that age of intervention has no effect.^{8, 17} To some extent the differences can be explained by the small mean time difference of about 3 months in eruption, inadequate sample sizes and unmatched age groups.

7. SUMMARY

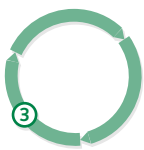
Because of the nature of the problem, low prevalence across the age group 3 years to 14 years, the findings of the studies reviewed did not tend to model the data sufficiently to be confident of which factors singularly or in combination were important in affecting the eruption and management of maxillary incisor teeth. Further studies should be undertaken to assess the cost-effectiveness of various clinical management procedures for the unerupted maxillary central incisor.



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Paediatric Dentistry

- 1. Prevention of Dental Caries in Children.**
- 2. Treatment of Avulsed Permanent Teeth in Children.**
- 3. Treatment of Traumatically Intruded Permanent Incisor Teeth in Children.**
- 4. Continuing Oral Care - Review and Recall.**

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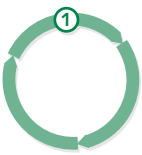
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PREVENTION OF DENTAL CARIES IN CHILDREN

INTRODUCTION

Although children are at risk from conditions affecting both dental and soft-tissues, by far the commonest of these in childhood is dental caries, therefore, these guidelines consider the prevention of dental caries which is a multifactorial disease. Prevention requires a multifactorial approach including dietary factors and eating habits, the use of appropriate fluoride therapy, the application of fissure sealants and the implementation of effective oral hygiene.



MANAGEMENT

1. Indications for Preventive Therapy

Preventive dental care is important for all children and adults but there are certain circumstances which are indicative of increased risks of disease or its consequences. (See table 1).

1.1 General factors

1.1.1 Low socio-economic group¹

1.1.2 Medically compromised patients², at risk from caries and its sequelae

1.1.3 Children with special needs, including learning difficulties

1.1.4 Children on long term medication containing sugar³

1.2 Local factors

1.2.1 Evidence of past caries experience

1.2.2 Greater than 3 sugary intakes per day - Greater than 10% of energy from non-milk extrinsic sugar consumption⁴

1.2.3 Poor oral hygiene

1.2.4 Lower salivary flow

1.2.5 Orthodontic appliance therapy

2. Preventive Therapy Methods and Techniques

2.1 Dietary Control

Recommendations:

2.1.1 For “at risk” children, a 3-4 day dietary diary should be completed and discussed.

2.1.2 Give dietary counselling which is specific to the child and family, based on the dietary diary.

2.1.3 Set limited, obtainable targets initially.

2.1.4 Monitor compliance.



2.1.5 Infants should not be left to sleep with a bottle containing sugary liquids or those with a low pH which may also cause erosion. Prolonged use of feeding bottles should be avoided. Fruit flavoured sugar containing drinks should be limited to meal-times. Thirsty children will drink water.⁸

2.1.6 Educate the public, particularly through school health education programmes about the known association between frequent consumption of sugars and dental caries.

2.1.7 Support future research and education to promote balanced diets and the use of sugars in moderation.

2.1.8 Paediatric medicines should be sugar free.

2.1.9 Prolonged breast feeding should be discouraged.

2.2 Fluoride Therapy

Recommendations:

2.2.1 *Water Fluoridation*

Optimal fluoride in drinking water supplies remains the cornerstone of any preventive dentistry strategy.

2.2.2 *Fluoride Toothpaste*

All children should regularly use a correctly formulated fluoride toothpaste according to the manufacturers and dentists instructions.

To reduce the risk of opacities, children under the age of 6 years and considered to be at low risk of developing dental caries should use a toothpaste containing no more than 600 ppm of fluoride. Those with a higher risk of developing caries should use a standard (1000 ppm) paste.¹⁰ Children over the age of 6 years should be encouraged to use a standard (1000 ppm) or higher (1450 ppm) fluoride level paste.¹¹

Toothpastes accredited by the British Dental Association should be recommended.¹¹

Children under 6 years should use an amount of toothpaste no greater than a small pea.¹¹

An adult should supervise the amount of toothpaste used and tooth brushing technique, up to at least 7 or 8 years.¹¹

Toothpaste packaging must include clear labelling to indicate the amount of fluoride present, expressed consistently as ppmF.

2.2.3 *Fluoride Supplements*

For children at risk of dental caries (see table 1) dietary fluoride supplements should be considered. The small potential risk of mild enamel opacities may be outweighed by the benefits of fluoride supplements.⁷

When fluoride is given as tablets, these should be allowed to dissolve slowly in the mouth in order to give a topical as well as a systemic effect. They should preferably be given at a time separated from toothbrushing to help to reduce the peaks of fluoride ingestion and to maximise the topical effect.

For children living in an area where there is no more than 0.3 ppm fluoride in the drinking water, the currently recommended dosage schedule should be used (as of 1995).¹¹

2.2.4 *Professionally applied topical fluoride treatment*

Topical fluoride varnishes are of proven benefit in preventing caries and in helping to arrest caries in children with “nursing bottle caries” and cervical decalcification. These are highly concentrated

vehicles for fluoride and the recommended dose must not be exceeded.^{9,12}

Other forms of professionally applied fluoride gels (1.23% acidulated phosphate fluoride APF) and solutions (8% stannous fluoride) are recommended by some authorities⁶ but have been shown to be of poor cost benefit,^{9,12} although clinically beneficial.

Children at high caries risk should be considered for application of topical fluorides twice yearly.



2.2.5 Self or parent-applied fluoride for children at high caries risk

Home fluoride treatments using mouthrinses can be recommended for daily use in children over 6 years.

If a high caries risk patient cannot comply with home fluoride therapy then frequent professional fluoride treatments should be substituted.

2.3 Fissure sealants

Recommendations



2.3.1 *Patient selection*

Children with special needs are a priority for the use of fissure sealants. They should be considered for those who are medically compromised, physically or dentally disabled, together with those having learning difficulties or those from socio-economically disadvantaged backgrounds.

Children with extensive caries in their primary teeth should have all permanent molars sealed as soon as possible after eruption.

Children with caries free primary dentitions and who do not fall into one of the categories above do not need to have first permanent molars sealed routinely.



2.3.2 *Tooth selection*

Fissure sealants have greatest benefit on the occlusal surfaces of permanent molar teeth. However, other surfaces with pits, particularly the buccal pits in lower molars and cingulum pits in upper incisors, should also be considered.

Fissure sealing of primary molars is not normally advised.

Sealants should usually be applied as soon as the teeth have erupted sufficiently to permit moisture control.

Any child with occlusal caries in one first permanent molar should have the other molars sealed. Occlusal caries affecting one or more first molars indicates a need for the second permanent molars to be sealed.



2.3.3 *Clinical circumstances*

When there is doubt about the integrity of an occlusal surface on clinical examination a bite-wing radiograph should be taken.

If early dentine involvement is suspected the fissure should be investigated using small burs. If minimal caries is discovered, a composite resin restoration should be placed and the whole surface sealed. If extensive caries is discovered a more conventional occlusal restoration should be placed.



2.3.4 *Long term follow up*

Sealed teeth should be monitored clinically at appropriate intervals supported by radiographs. Defective sealants should be investigated and re-sealed if appropriate.

Fissure sealants need to be maintained and this must be explained to parents.

2.4 Oral Hygiene

Recommendations:

2.4.1 Toothbrushing skills should be taught to children of all ages. The precise technique is less important than the effectiveness of removal of plaque, the use of disclosing tablets or liquids is helpful.

2.4.2 Use of a fluoride toothpaste with effective toothbrushing is important (see 2.2.2).

2.4.3 Parents should supervise toothbrushing.

EXPLANATORY NOTES

2.1 *The Committee on Medical Aspects of Food Policy has validated the relationship between sugar and dental caries in the clearest terms.⁵ This has been reinforced by reports such as the Scientific Basis of Dental Health Education and the Oral Health Strategy for England.⁷*

Children who have already experienced dental caries or who are at risk from the consequences of dental caries should have a dietary diary completed over a 3 to 4 day period. Analysis of this should enable dietary counselling to be given which is specific and matched to the needs and circumstances of the child and family.

Non-sugar sweeteners are safe for teeth and useful substitutes for sugar when it is not possible to discourage a liking for sweetness. They are not permitted for use in foods and drinks for infants.

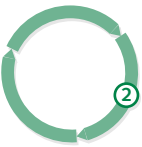
2.2 *The use of fluorides for the prevention and control of dental caries is documented to be both safe and highly effective. Optimising fluoride in water supplies is an ideal public health measure because it is effective, relatively inexpensive, is not socially divisive and does not require conscious daily co-operation from individuals.⁹ In many areas of the UK, however, failure to implement this measure means that fluoride needs to be supplied as a dietary supplement, as fluoride toothpaste, and in children at risk of developing dental caries, as topical applications.*

There has been some concern regarding enamel mottling and the ingestion of fluorides. It must be made clear that it is the misuse, rather than the use, of such fluoride agents as toothpastes and supplements which constitutes the main fluorosis risk.

2.3 *The British Society of Paediatric Dentistry published revised guidelines on the use of fissure sealants in 1993.¹³ First and second molar teeth continue to be the most caries susceptible permanent teeth with the pattern of caries now principally involving the pits and fissures.*

The decision to carry out fissure sealants should be made on clinical grounds, based on a thorough clinical examination of both the child and his/her teeth, supported by radiographs where appropriate and taking into consideration the patient's co-operation, medical history, past caries experience and the family environment.

2.4 *The achievement and maintenance of high levels of oral hygiene are particularly important as far as a healthy periodontium is concerned. There is little scientific evidence to support the theory that toothbrushing per se will prevent dental caries, as normal brushing inevitably leaves some plaque in fissures and other stagnation sites where caries occurs. However, the use of a fluoride toothpaste with the toothbrush is obviously of benefit. Children cannot clean effectively until they are able to undertake such tasks as writing their own names legibly. Until this time parents should clean their child's teeth.*





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Table 1 FACTORS THAT AFFECT THE LEVEL OF CARIES RISK IN CHILDREN

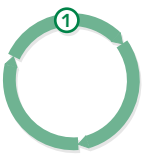
	LOW RISK	HIGH RISK
GENERAL		
Social	Mother's education: secondary, tertiary Good attendance pattern Family: nuclear, social class I, II, IIINM, employment	Mother's education: secondary only Poor attendance pattern Family: single parent, social class IIIM, IV, V, unemployment
General health	Good health No sugar-containing medication	Poor health / chronically sick Medication containing sugar
LOCAL		
Oral hygiene	Good oral hygiene, regular brushing twice per day with assistance	Poor oral hygiene, irregular brushing without assistance
Diet	≤ 3 sugary intakes per day	≥ 3 sugary intakes per day
Fluoride experience	Regular brushing with fluoride toothpaste Optimally fluoridated water	Irregular use of fluoride toothpaste No fluoridated water supply
Past caries experience	dmft ≤ 1, DMFT ≤ 1 No initial lesions Caries free first permanent molars at 6 - 8 years of age 3 year caries increment ≤ 3	dmft ≥ 5, DMFT ≥ 5 ≥ 10 initial lesions Caries in first permanent molars at 6 years of age 3 year caries increment ≥ 3
Orthodontic Treatment	No appliance therapy	Fixed appliance therapy

TREATMENT OF AVULSED PERMANENT TEETH IN CHILDREN

INTRODUCTION

The following guidelines are intended to assist in the management and treatment of avulsed teeth in children. They should be used by practitioners in combination with their own professional judgement. Although it is impossible to guarantee a good long term prognosis or permanent retention of a tooth which has been re-implanted following avulsion, timely treatment of the tooth in the appropriate manner maximises the chance of success. Further detail is available under “Explanatory Notes”.

INITIAL MANAGEMENT



1. Management at Site of Accident

1.1 If telephone advice is sought, and re-implantation is appropriate (see Additional Considerations) advise re-implantation of the tooth immediately. If the tooth is contaminated, rinse in milk or tap water prior to re-implantation. The tooth may be held in place by gently biting on a clean folded handkerchief until splinting can be carried out. Advise to attend a dental surgeon immediately.



1.2 If immediate re-implantation is not possible, place tooth in a vessel containing suitable storage medium - in order of preference

- cold fresh milk
- normal saline
- saliva (in buccal sulcus)

Advise to attend a dental surgeon immediately

2. Initial Management by Dental Surgeon

2.1 *History*

During examination place tooth in cold fresh milk or normal saline to prevent unnecessary drying. Elicit careful medical, dental and accident history, clearly written. Be alert to concomitant injury including head injury, facial fracture or lacerations. Seek medical examination as necessary. Avoid unnecessary delay before re-implantation.

2.2 *Re-implantation*

Replant as soon as possible if re-implantation is appropriate (see Additional Considerations). Local anaesthesia is required if there is alveolar fracture and manipulation is required. Local anaesthetic is also preferable in some cases to enable accurate re-implantation but it is still possible to re-implant a tooth if patient compliance prevents the administration of local anaesthetic.

Preparation of socket - avoid unnecessary manipulation. If clot is present gently irrigate socket with saline in syringe and use suction to remove clot, but avoid curettage.

Handling of tooth - handle by crown NOT root. Do not scrape or scrub root surface. If contaminated wash in normal saline, and only if necessary gently dab with gauze soaked in saline to remove stubborn debris.

If alveolar bone fragments prevent re-implantation withdraw tooth and replace in saline. Introduce a blunt instrument into the socket to reposition bone, and once again attempt re-implantation.

DO NOT COMMENCE ROOT CANAL TREATMENT PRIOR TO RE-IMPLANTATION except in special circumstances - see 4.4 Additional Considerations.





2.3 Splinting

Splint to adjacent teeth non-rigidly for 7-10 days. Acid etch/resin either alone or in combination with soft arch wire is most commonly recommended, however other types such as a removable acrylic splint or orthodontic brackets and wire are also acceptable.

All patients should be reviewed following re-implantation within 48 hours, at which time the splint is checked and modified if necessary.

Home care advice during splinting includes avoidance of biting on splinted teeth, consumption of a soft diet, and maintenance of good oral hygiene by tooth brushing and rinsing with chlorhexidine mouthwash.

If excessive mobility persists after ten days replace splint until mobility acceptable.

2.4 Antibiotics and Tetanus

Prescribe appropriate systemic antibiotics to commence as soon as possible. A tetanus booster may be required if environmental contamination has occurred. If in doubt refer to physician within 48 hours.

3. Follow-up Management by Dental Surgeon



3.1 Endodontic Treatment - Open apex teeth in young patients - short extra-oral time

In open apex teeth in young patients when the tooth has been out of the socket for a short period only it is acceptable to delay endodontic intervention to allow for the possibility of pulp revascularisation.

Review in two weeks then at three to four week intervals; at review look for clinical signs of non-vitality (tenderness, tooth discolouration, swelling/sinus), test vitality and take intra-oral radiograph. If clinical and radiographic signs of non-vitality develop commence endodontic treatment. Thorough mechanical cleansing of the canal is essential regardless of which dressings are used. Clean canal mechanically and fill with calcium hydroxide. An antibacterial intra-canal dressing may be placed for one to two weeks prior to placement of calcium hydroxide to help to ensure that the canal is free from infection. If calcium hydroxide is used alone then this should be placed no sooner than 7 days following re-implantation. The access cavity should be temporarily sealed with fast setting zinc oxide and eugenol or glass ionomer cement.

Calcium hydroxide is left inside the canal until apexification has occurred. Regular clinical and radiographic review is necessary. It may be necessary to place fresh calcium hydroxide if follow-up radiographs reveal that there are voids in the existing calcium hydroxide root canal dressing. Some authorities recommend renewing the calcium hydroxide root canal dressing every 3 months but this is not proven to be absolutely necessary.

3.2 Endodontic Treatment - All other teeth

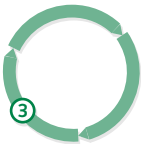
Commence endodontic treatment in all teeth with closed or almost closed apex regardless of extra-oral time and open apex teeth with prolonged extra-oral time.

Remove pulp as soon as tooth stable enough for access cavity to be prepared - ideally within 10 days. If an acid etch/resin splint has been used endodontic treatment can be commenced prior to its removal.

Thorough mechanical cleansing of the canal is essential regardless of which dressings are used. Clean canal mechanically and fill with calcium hydroxide. An antibacterial intra-canal dressing may be placed for one to two weeks prior to placement of calcium hydroxide to help to ensure that the canal is free from infection. If calcium hydroxide is used alone then this should be placed no sooner than 7 days following re-implantation. The access cavity should be temporarily sealed with fast setting zinc oxide and eugenol or glass ionomer cement.



Calcium hydroxide is left inside the canal for a period of 6 - 12 months before final obturation with gutta percha. Regular clinical and radiographic review is necessary. It may be necessary to place fresh calcium hydroxide if follow-up radiographs reveal that there are voids in the existing calcium hydroxide root canal dressing. Some authorities recommend renewing the calcium hydroxide root canal dressing every 3 months but this is not proven to be absolutely necessary.



4. Additional Considerations

4.1 When NOT to replant - in most cases re-implantation of an avulsed tooth is the best treatment. However, in a few cases re-implantation is not appropriate. These are as follows:

- Primary tooth
- Where other injuries are severe and warrant preferential emergency treatment/intensive care
- Where medical history indicates that the patient would be put at risk by re-implantation of a tooth
- Where an immature permanent tooth with a short root and wide open apex is involved, and the extra-oral time is extremely prolonged, the prognosis is very poor.

In many of these cases re-implantation may not be warranted (see explanatory notes 4.1).

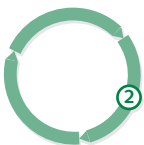
4.2 Replanted permanent teeth require follow-up evaluation for a minimum of 2 - 3 years to determine outcome. Inflammatory resorption, replacement resorption, ankylosis, infraocclusion, and discolouration are all potential complications which may occur. If progressive resorption occurs prosthetic assessment, and/or orthodontic assessment may be required.

4.3 At follow up visits adjacent teeth should also be examined as these may have been damaged as a result of the same accident and should not be overlooked.

4.4 In cases of extremely prolonged periods of extra-oral time in teeth with closed apices, where an undesirable storage medium has been used (i.e. tap water, or dry storage) a different method of treatment has been suggested. The treatment involves complete removal of the periodontal membrane and immersion of the tooth in a fluoride solution. As further drying and handling of the tooth root is unlikely to worsen the prognosis in such a case, some authors suggest that endodontic treatment may be completed extra-orally before re-implantation.

4.5 Some recent articles have suggested soaking of avulsed teeth in a pH balanced solution prior to re-implantation to reconstitute periodontal ligament cells. Further, it has been suggested that soaking of avulsed teeth in an antibiotic solution prior to re-implantation improves the prognosis and may be more effective than systemic antibiotics. These suggestions remain controversial.

EXPLANATORY NOTES

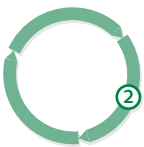


The incidence of traumatic avulsion of teeth has been reported as 0.5 - 16% of all traumatised teeth.^{1,2} Upper central incisor teeth are most frequently avulsed, and in the age group 7 - 9 years.^{1,3} It has long been recognised that it is possible to replant a tooth following avulsion, and that replanted teeth may function for many years. Andreasen found in monkeys that, under ideal conditions, complete healing of the pulp and periodontal ligament of replanted teeth can occur.¹ However such conditions do not occur in the real life situation and healing of replanted teeth is subject to complications. The main complication is that of root resorption which is related to necrosis of part or all of the periodontal ligament and may be further complicated by necrosis of the pulp and/or infection. Although the damage caused directly by the injury is beyond the control of the clinician, the provision of appropriate treatment both immediately and upon review improves the prognosis of replanted teeth.

1.1 *The period between tooth avulsion and re-implantation is normally outwith the control of a dentist but this period is important with regard to the prognosis of the tooth. It has been reported that the length of time that a tooth spends out of the mouth influences the development of root*

resorption and pulpal healing. Andreasen and Hjorting-Hansen found that 90% of teeth replanted within 30 minutes did not develop root resorption when reviewed at an interval ranging between 1 - 13 years, however this much quoted finding was based on 10 teeth and as such the reporting of this as a percentage may be misleading.⁴ Andersson and Bodin found that teeth replanted within 15 minutes following the avulsion have a favourable long term prognosis, and furthermore that most of the teeth with no resorption had been replanted within 10 minutes.⁵ Andersson, Bodin and Sorensen concluded that teeth replanted after 60 minutes would become ankylosed and resorbed within 3 - 7 years in young patients whereas a tooth replanted under similar conditions in older patients might remain in function for a considerably longer time.⁶ However Mackie and Worthington found no significant relationship between the time that the avulsed tooth was out of the mouth and root resorption.⁷ In terms of pulpal healing Andreasen et al found that the likelihood of pulpal revascularisation was reduced as the extra-oral dry time increased, and similarly with storage in a moist medium for longer than 5 minutes.⁸

- 1.2** The medium in which the tooth has been stored prior to re-implantation has been shown to affect the incidence of root resorption and pulp healing. Prolonged drying of the root presents the worst prognosis because of loss of vitality of the periodontal ligament^{9,10,11} and dehydration of the pulp.⁸ Ideally the tooth should be re-implanted into the socket as soon as possible, but in cases where this cannot be carried out, maintaining the root in a moist environment has been shown to improve the prognosis. However storage in tap water has been demonstrated to be an unsatisfactory medium.⁹ A critical period of dry storage has been reported to be between 18 and 30 minutes after which a marked increase in root resorption is seen.¹² Cold fresh milk appears to be the best medium for storage of the tooth during transportation to a dentist¹³ although alternatives such as saliva, blood, saline and an "emergency tooth preserving system" have all been suggested.¹⁴ The "emergency tooth preserving system" contains a pH-balanced cell reconstitution fluid called Hank's Solution. Recent U.S.A. literature has found that avulsed teeth soaked in this solution prior to re-implantation suffer less resorption.¹⁵ Also, increased pulp revascularisation has been claimed following soaking of avulsed teeth in a 5% doxycycline solution prior to re-implantation.¹⁶



- 2.1** As with all cases of trauma it is essential to record details of the accident clearly in writing because of the possibility of legal action on the part of the patient. A thorough history should be taken and examination should exclude facial fracture. Mucosal lacerations may require suturing. The parent/carers should be alerted to be suspicious of any subsequent dizziness, neck pain, amnesia, headache or symptoms of head injury. If there are symptoms of head injury a medical assessment should be arranged immediately.

- 2.2** The handling of the tooth prior to re-implantation is highly important to avoid further damage to the periodontal membrane.¹ Therefore during examination of the patient prior to re-implantation the tooth should be placed in a safe place in milk or saline. Re-implantation of a tooth may be carried out without local anaesthesia, especially if presentation to the dentist is soon after avulsion, and a soft blood clot only is present. In many cases local anaesthetic is desirable to enable adequate socket preparation and positioning of the tooth. If there is a clot present in the socket this can be washed out with a syringe and saline and an aspirator. It is not desirable to curette the socket as this will cause further damage to or removal of the periodontal ligament cells which remain in the socket.

A past favoured method of treatment involved carrying out root canal treatment of avulsed teeth prior to re-implantation. In most cases this method of treatment is no longer acceptable as it imparts a poorer prognosis because of increased damage to the periodontal ligament cells by prolonged drying and handling. It is also desirable to maintain a patent root canal as a vehicle for application of medicaments to reduce infection and/or resorption. However, in a few special cases it may be acceptable to complete endodontic treatment prior to re-implantation - see section 4. Additional Considerations.

- 2.3** It has been suggested that minimising the time duration of splinting and using a non-rigid splint will improve the outcome of the re-implanted tooth and reduced the occurrence of ankylosis.^{8,17,18}

There are a number of suitable types of non-rigid splint^{19, 20, 21, 22} which will depend on the facilities available. Care must be taken in application i.e. avoid impinging on gingivae or creating areas of stagnation. The immediate splint is often placed in an emergency situation and requires to be simple but effective. In such cases a review appointment should be arranged ideally within 48 hours of the accident. At this review the splint should be checked and if necessary modified or removed and replaced.

2.4 *It has been suggested that the provision of systemic antibiotics reduces the occurrence of root resorption and in particular inflammatory resorption if taken promptly.^{23, 24} In cases of environmental contamination a tetanus booster may be required.*

3.1 *Early removal of the pulp has been advocated as this will prevent the production of inflammatory products by a necrotic pulp, and thus minimise the chance of inflammatory resorption.²⁵ Although the advice regarding teeth with a wide open apex is to delay endodontic treatment on the basis that revascularisation of the pulp is possible, this involves a risk of failure due to inflammatory root resorption²⁶, and clinicians must be aware of the consequences of too conservative an approach. Inflammatory resorption appears to occur more rapidly in young patients and the proposed reason for this is that the dentine tubules, which have not yet become less patent as is the case with advancing age, readily transmit inflammatory products from the pulp to the root surface.²⁷ Therefore it is proposed only to delay endodontic treatment in those cases where the apex is wide open and the tooth has been re-implanted promptly. In cases where delay of endodontic treatment has been chosen, the clinician must carry out careful review of the patient so that pulp removal can be carried out at the first sign of inflammatory resorption. All other re-implanted teeth should have endodontic treatment. Pulp removal as soon as the tooth is stable enough for an access cavity to be prepared is advisable, and ideally within 10 days. It may be helpful to do this prior to removal of the splint. A past favoured method of treatment involved carrying out root canal treatment of avulsed teeth prior to re-implantation. This method of treatment is no longer acceptable as it imparts a poorer prognosis because of increased damage to the periodontal ligament cells by prolonged drying and handling. It is also desirable to maintain a patent root canal as a vehicle for application of medicaments which may help to reduce infection and/or resorption. However, in only a few special cases it may be acceptable to complete endodontic treatment prior to re-implantation - see section 4. Additional Considerations.*

3.2 *Use of an intra-canal medicament has been advocated as this has been shown to reduce the occurrence of root resorption.^{23, 24} Inflammatory resorption may be arrested by endodontic treatment which removes the source of inflammation, but ankylosis may still occur because of irreversible damage to the periodontal ligament.²⁷ The high pH of calcium hydroxide renders it bacteriostatic and therefore a suitable intra-canal dressing where inflammatory resorption has occurred. It may be that placing calcium hydroxide in the root canal encourages healing, however there is no conclusive evidence regarding this and some authors have shown that presence of calcium hydroxide in the root canal may in some circumstances increase the occurrence of ankylosis.^{28, 29} Also, in experimentally induced inflammatory resorption placement of an intra-canal antibiotic and corticosteroid paste was found to eliminate the inflammatory resorption.³⁰ Some authorities recommend the use of an intra-canal polyantibiotic paste used containing neomycin sulphate, polymyxin B sulphate, nystatin, polyethylene glycol 1300 and polyethylene glycol 1500. This is also acceptable. If an antibiotic dressing is used this should be replaced by calcium hydroxide after a period of 1 - 2 weeks. If calcium hydroxide is placed as the sole dressing this should not be placed until the tooth has been replanted for over 7 days as insertion of calcium hydroxide any sooner than this can in fact cause damage to the healing periodontal ligament.^{1, 31} Different authors have suggested varied periods of placement of calcium hydroxide. Some suggest that in closed apices early obturation with gutta-percha is as acceptable as delaying this until calcium hydroxide has been placed for several months.³² Although this is controversial, most still advise the latter, therefore it is recommended that calcium hydroxide should be left in the root canal for 6 to 12 months before obturation, and changed during this time if indicated. An indication to replace with fresh calcium hydroxide would be if radiographically there*

was no evidence of any material present in the root canal, or if there are voids in the existing dressing. Some authorities recommend renewing the calcium hydroxide root canal dressing every 3 months but this is not proven to be absolutely necessary. As well as preventing inflammatory resorption, calcium hydroxide stimulates apexification in open apex cases. No matter which medicaments are used it is of the greatest importance that the root canal is thoroughly mechanically cleansed.

- 4.1 Although in many cases a replanted tooth survives only a matter of years, during this period it serves as a natural space maintainer whilst growth occurs, and also enables alveolar height to be preserved. Therefore in most cases re-implantation of an avulsed tooth is the best treatment. However, in certain instances of excessively prolonged extra-oral time/poor storage medium, or where the tooth is grossly carious/ general oral condition is poor, or patient co-operation is poor, a clinician may judge that re-implantation is better not to be attempted. In a few cases re-implantation is clearly not appropriate. These are as follows:

Primary teeth - these should not be replanted because of the possibility of damage to an underlying developing permanent tooth.

Other injuries - where other injuries are severe and require preferential emergency treatment or intensive care.

Medical history - avulsed teeth should not be replanted in cases where to do so would place the patient at risk. For example, patients with depressed immunity as in acute lymphoblastic leukaemia who are at risk from infection. It may be possible in some cases to safely re-implant teeth in such individuals but this should only be carried out in liaison with the specialist physician in charge of their medical care, and a follow-up review and treatment regime must be strictly adhered to.

Immature permanent tooth with short root, wide open apex and prolonged dry extra-oral time - if the dry extra-oral time is long then replacement resorption is inevitable. As replacement resorption occurs at a higher rate in a young person, and these teeth already have a short root, the prognosis is very poor. In most of these cases re-implantation is not warranted, however in some cases one may feel that for psychological reasons it is worth replanting even though the tooth will only last for a short time.

- 4.2 Inflammatory resorption may be detected as early as two weeks post-re-implantation.¹ Radiographically inflammatory resorption is characterised by loss of root surface accompanied by loss of adjacent bone and an area of radiolucency. Clinically a tooth with inflammatory resorption may be mobile and tender.

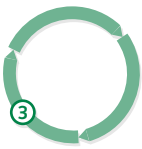
Replacement resorption may be diagnosed within two months of re-implantation, however frequently is not detected until more than 6 months have elapsed.¹ Radiographically replacement resorption is characterised by loss of root surface with loss of periodontal ligament space and lamina dura, and bone is seen to be in direct contact with the root surface. Clinically the tooth has no physiological mobility and may give a high note on percussion. If no form of resorption has been detected in the first two years following re-implantation then the risk of root resorption occurring is considerably reduced.¹ Successive visits for radiographs to identify root resorption are required so that any necessary plans may be made for prosthetic replacement of the tooth should its loss become inevitable.

- 4.3 It is necessary at follow up visits to examine adjacent teeth which may also have suffered damage as a result of the same accident and should not be overlooked. They should be examined for signs and symptoms of loss of vitality.

- 4.4 In cases of extremely prolonged periods of extra-oral time in teeth with closed apices, where an undesirable storage medium has been used (i.e. tap water, or dry storage) a different method of treatment has been suggested.^{1,15,33} In such circumstances of delay and poor storage, replacement resorption is inevitable as few or no periodontal ligament cells remain viable, and as such treatment is aimed to retard the resorptive process. The treatment involves complete removal of the periodontal membrane and immersion of the tooth in a fluoride solution. The fluoride incorporated in the root

surface is thought to retard replacement resorption. As further drying and handling of the tooth root is unlikely to worsen the prognosis in such a case, some authors suggest that under these circumstances endodontic treatment may be completed extra-orally before re-implantation.^{1,33}

- 4.5 Some recent articles have suggested soaking of avulsed teeth in a pH balanced solution prior to re-implantation to reconstitute periodontal ligament cells.¹⁵ Also, increased pulp revascularisation has been claimed following soaking of avulsed teeth in a 5% doxycycline solution prior to re-implantation.¹⁶



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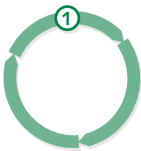
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TREATMENT OF TRAUMATICALLY INTRUDED PERMANENT INCISOR TEETH IN CHILDREN

INTRODUCTION

There is a lack of general agreement and scientific evidence concerning the best treatment for traumatically intruded permanent teeth in children. Although these injuries may be very severe, they occur relatively rarely and this factor has made it difficult to determine the most appropriate treatment for these injuries.

The following guidelines are intended to be of assistance to practitioners who may be involved in the management of such cases. It is difficult to predict the long term prognosis for these injuries as they are frequently of a severe nature but the appropriate decisions and treatments can minimise the chances of difficult complications and consequent loss of teeth. Further details are available under 'Explanatory Notes'.



DIAGNOSIS AND MANAGEMENT

1. History and Examination

A careful medical and dental history should be obtained along with details of the accident and they should be carefully recorded. A large degree of force is required to severely intrude permanent incisor teeth. One should be alert to the possibility of other injuries, including injuries to the head and facial region.

In the established dentition, diagnosis is based on a difference in the the position of the incisal edges of affected and unaffected teeth while in the mixed dentition a high metallic note on percussion is indicative of intrusion or lateral luxation. Radiographic examination is needed and may reveal differences in apical levels, alveolar fractures or signs of damage to adjacent teeth.

2. Treatment

Extra-oral and intra-oral lacerations and wounds should be cleaned and sutured as appropriate. Systemic antibiotic treatment and tetanus boosting may be required if external contamination has occurred. Decisions regarding treatment vary according to the severity of intrusion and whether the tooth has a complete or incomplete root. The aim of treatment is that the tooth be maintained if possible, but very severe injuries may require tooth extraction in some circumstances.

2.1 Repositioning of teeth with incomplete Apex

2.1.1 Mildly intruded (less than 3mm) incisors with incomplete apex

These teeth can normally be managed conservatively due to their excellent eruptive potential. Leave to re-erupt and review.

2.1.2 Moderately intruded (3-6 mm) incisors with incomplete apex

These teeth may re-erupt if managed conservatively. Alternatively these teeth may be orthodontically repositioned by bonding an orthodontic bracket to their labial or incisal region depending on access and isolation, and by applying a sufficient force to extrude the tooth to its normal position in approximately 2 weeks. The relative benefits of either treatment is unproven scientifically and treatment choice is by clinical judgement and preference.

2.1.3 Severely intruded (greater than 6mm) incisors with incomplete apex

In this case the alveolus is grossly dilated labially and occasionally fractured and there is often severe soft



tissue displacement and the crown may be completely buried. In this instance orthodontic repositioning is difficult or impossible. Consideration should be given to surgically repositioning the tooth. The child's level of cooperation should be taken into consideration. When possible local anaesthesia should be administered and the tooth should be gently repositioned. Repositioning can normally be accomplished by very gentle movements using sterile flat plastic instruments. In resistant cases consider the possibility of bony impaction and release of the impediment prior to repositioning of the labial plate of bone and soft tissue closure and suturing.

In some cases sedation or even general anaesthesia may be necessary. If in doubt consider getting advice from, or referring to, a specialist centre.

2.2 Repositioning of teeth with complete Apex

2.2.1 Mildly intruded (less than 3mm) incisor with complete root

These teeth may be orthodontically repositioned over a period of approximately 2 weeks. Alternatively conservative management can be used. The relative merits of these two treatments is unproven and treatment choice is by personal preference.

2.2.2 Moderately intruded (3-6mm) incisor with complete root

These teeth should be repositioned orthodontically.

2.2.3 Severely intruded (greater than 6mm) incisor with complete apex

These teeth may need to be repositioned surgically and appropriate tissue repair carried out and this is best undertaken in a specialist centre.

3. Splinting of Repositioned Teeth

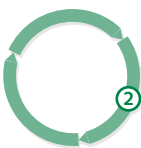
Intruded teeth that are surgically repositioned require appropriate splinting. There are a number of types of non rigid splints 1-3 and the choice may depend on the facilities available and by the difficulties imposed by haemorrhage. An intruded short rooted tooth with severe damage to the alveolar bone may pose special difficulty. The splinted tooth should be out of traumatic occlusion. In all cases a review appointment should be arranged, ideally within five days of the accident. At this review the splint should be checked and modified if necessary. In line with other forms of severe subluxation, splinting for these injuries would normally vary from 1 week to 2 weeks. Splinting for longer periods with rigid splints should normally be avoided as this may increase the risk of ankylosis.⁴ The benefit of antibiotic treatment is unproven and their use is governed by clinical judgement and preference.

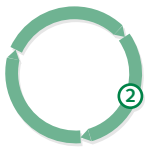
4. Follow Up Management

4.1 Root Canal Therapy

In view of the very high risk of loss of pulpal vitality, root canal treatment is often indicated in cases of severe intrusion. There is a high risk of root resorption in these teeth. The optimum time to enter the root canal is approximately 2 weeks after injury and following thorough mechanical cleaning and debridement, calcium hydroxide paste should be placed in the canal. In severely intruded teeth this early endodontic treatment is facilitated by rapid repositioning. Placement of calcium hydroxide in severely intruded teeth may inhibit root resorption and its use in cases where apical development is incomplete, should induce apical barrier formation. Maintenance of calcium hydroxide paste in the root canals for 6-12 months (with appropriate replacement as required) is advised, prior to the final obturation of the root canal.

These cases should be kept under regular review on a 6 monthly basis with occurrences of root resorption being noted and managed appropriately. Ankylosis as evidenced by disappearance of the periodontal space with fusion of root surface and bone and is an unfavourable sign.

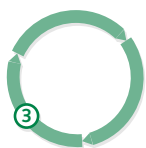




EXPLANATORY NOTES

The optimal treatment for intruded permanent teeth is not yet clear.⁴ Treated cases of intruded incisor teeth have not been reported frequently enough nor with sufficiently high numbers for definitive protocols to be developed.^{5,6} The largest series were 25 teeth reported from Scandinavia^{7,8} and 29 cases reported from Belfast.⁹ In these reports there was a high experience of loss of vitality and there was also a high prevalence of progressive root resorption. In addition loss of marginal bone support was also cited as a complication in a significant number of cases. Data on the survival of intruded teeth is scant although the Belfast study indicated that 20 out of 29 were retained after a 2 year period. The nature of the intrusion injury is somewhat unique. In cases of severe intrusion the degree of bony dilatation and displacement of the labial plate is quite marked and soft tissue tears in the superficial gingiva and mucosa are common. In the case of the severely intruded and buried incisor tooth, the degree of movement of the apex and apical vessels is 6mm or more and consequently there is a high risk of pulpal necrosis. In addition damage to the marginal bone is a risk and marginal bone defects are found to be present in between a quarter and half of all cases.^{8,9} The nature of the crush injury to the periodontal membrane and root surface is quite severe and progressive root resorption is commonly seen, the figures varying from 38% to 52%.^{8,9}

- 2.1** *Teeth with incomplete root development will often re-erupt spontaneously.^{4,8,10,11} Some authors advocate gingival surgery to provide early access for root canal treatment in order to prevent development of infection following pulpal necrosis.^{11,12} and they report satisfactory spontaneous eruption provided periapical infection is treated promptly. Orthodontic extrusion is described as an option where the degree of intrusion is more substantial.⁴ Turley et al investigated spontaneous re-eruption and orthodontic extrusions as options for experimentally intruded permanent teeth in dogs. While less severely intruded and mobile teeth responded well to orthodontic extrusion, deeply embedded teeth became ankylosed and failed to respond to orthodontic extrusion. He suggested that elective luxation and surgical repositioning of ankylosed teeth may facilitate orthodontic extrusion in some cases.^{13,14} If intruded permanent incisors are managed conservatively there is a risk of such ankylosis.*
- 2.2** *Traditionally many authors advocate a cautious approach and suggest they be allowed to re-erupt^{6,7} and others suggest that surgical repositioning may increase the risk of loss of marginal bone support.⁴ It is important that the tooth should be sufficiently repositioned within three weeks to allow treatment of necrotic pulps and thus minimise the risk of inflammatory root resorption.^{4,12} For mature incisors Andreasen advocates rapid orthodontic movement of such teeth over a two to three week period and if the crown is completely buried (equivalent to our severe classification) he suggests partial repositioning to allow orthodontic bracket fixation and subsequent full repositioning via the orthodontic method.⁴ However the Belfast study indicated that full surgical repositioning of severely intruded teeth was not associated with an increased experience of root resorption or marginal sequestration of bone.⁹ Unlike other forms of injuries long term prognosis seems to be positively related to the degree of apical closure and root development i.e. the best prognosis is seen in teeth where root development is most complete.⁹*



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CONTINUING ORAL CARE - REVIEW AND RECALL

INTRODUCTION

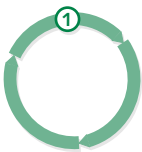
Although the commonest oral disease of childhood is dental caries the dental role should encompass the whole of oral care for children. The aims of such care are firstly to ensure that all children are free from pain, sepsis and the destruction of dental tissues; secondly, to monitor the developing dentition; thirdly, to support children and their families in forming good oral health habits, practices and behaviours which can be carried forward into adulthood.

This care should be provided for both those children who are able-bodied and those who have impairment, be they physical, mental, medical, social or emotional.

The corner-stone of preventive care is professional supervision. Continuing care, review and recall are an essential part of that supervision and these guidelines should be read in conjunction with other such, relating to particular items.

Review is defined as an attendance at a further appointment within a course of treatment.

Recall is defined as the planned, unprecipitated return of a patient who, when last seen was in good oral health.



MANAGEMENT

1. Review and recall frequency

Recommendations:

1.1 In initiating the continuing care process, there should be no lower age limit to the first visit for a child which should, if possible, be within the first year of life.

1.2 There is considerable debate, with little factual basis, regarding the cost benefit of a specified recall period. There is such variation in the circumstances pertaining to an individual child that social, rather than medical, conventions probably have a greater importance in setting such a standard. In this context, there should be a recall at least once a year; 6 months is a convenient interval which provides for continuity of care. A proportion of child patients, for whom underlying conditions make additional demands, or local disease is progressing rapidly, will need to be seen at intervals far shorter than this at the clinician's discretion.



2. Variations in recall frequency

Recommendations:

2.1 Milestones in dental development (e.g. the expected eruption of particular primary and permanent teeth, the detection of displaced permanent canine teeth) should trigger recall in children under regular care. There is merit in the concept of specific age milestones at 3, 6, 9 and 12 years.

2.2 Particular attention should be paid to the eruptive sequence of teeth, especially with regard to symmetry, or whether an individual tooth is more than 6 months delayed.

2.3 Where a child shows obvious signs of active oral disease or its predisposing factors - a high level of individual or family previous decay experience, poor oral hygiene, enamel demineralisation, high sugar intake - review at not greater than four-monthly intervals is required until the factors are controlled.



2.4 Specific oral conditions (e.g. periodontal disease, other soft tissue disease, eruptive disorders, developmental dental conditions, dental injuries) will require attendance at variable intervals. Readers are referred to the guidelines for those specific conditions.

2.5 Compromised children should be seen on review or recall at intervals directly related to the severity of their underlying impairment and the oral findings.



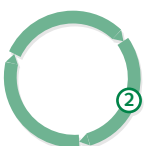
3. The nature of the review and recall processes.

Recommendations:

4.1 Wherever possible, recall and review should be to the same clinician.

4.2 Recall or review should give adequate time to establish child confidence and compliance, to update findings and to reinforce preventive instruction where required.

4.3 Records should be maintained in a standardised manner and stored in a recoverable form to make comparison easy and realistic.



EXPLANATORY NOTES

- 2. Children inevitably change in stature, in psyche and in what they eat and drink throughout the fifteen years from infancy to adolescence. Specific social, medical, oral or dental conditions will modify the period of attendance for either review or recall. Provision must be made for variation in the frequency of appointments in response to these pressures. Radiography is of importance in the assessment of disease progress and the reader is referred to the guideline on that subject.*
- 3. Review and recall should give the patient or the carer both the time and the opportunity to present any changes in their situation since the last visit and to discuss the progress of their condition. It should permit the clinician time to carry out a clinical examination (sic), to determine patient compliance with any previous prescription, to make adequate record of progress and to reinforce preventive advice (vide the guideline Prevention of dental caries for Children).*

Restorative Dentistry

1. **Screening of Patients to detect Periodontal Diseases.**
2. **Guidelines for Selecting Appropriate Patients to Receive Treatment with Dental Implants: Priorities for the NHS.**
3. **Restorative Indications for Porcelain Veneer Restorations.**

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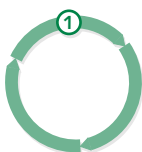
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Screening of Patients to Detect Periodontal Diseases

INTRODUCTION

The following guidelines are intended to assist in the detection, diagnosis, initial management and selection of cases for specialist referral for patients with periodontal diseases. They should be used by practitioners in combination with their own professional judgement. The document is based upon a previous guideline document PERIODONTOLOGY IN GENERAL DENTAL PRACTICE IN THE UNITED KINGDOM A FIRST POLICY STATEMENT.¹



1. Basic Periodontal Examination



1.1 All patients should be screened for the presence of periodontal diseases as part of dental examination. The BASIC PERIODONTAL EXAMINATION (BPE) represents the minimum examination and data recording to constitute a screening for periodontal diseases.

1.2 BPE consists of a clinical assessment of periodontal status using COMMUNITY INDEX OF PERIODONTAL TREATMENT NEEDS (CPITN)² as detailed in Appendix 1 and appropriate radiographic examination as indicated in Appendix 2.



1.3 Periodontal screening should be performed at initial dental examination for all patients.

1.4 Patients with insignificant periodontal disease on initial screening should be screened again at regular routine dental inspections. The frequency should be at least every 12 months.



1.5 It is advisable that, in addition to routine screening, assessment for all items of advanced restorative or orthodontic treatment should include BPE. The rationale for this suggestion is the recognition that the failure of such forms of treatment may be due to periodontal diseases and related factors.



1.6 In view of the evidence for early periodontal breakdown in susceptible individuals³ screening of children and young adults is advised. When used as a preliminary screening system the CPITN may require modification. Problems exist with false pocketing in young individuals and this should be taken into account by identifying the location of the cement enamel junction.



1.7 The BPE will need augmentation by more detailed periodontal examination and recording of appropriate indices in cases where initial screening has revealed the presence of significant disease. In sextants where CPITN grade 3, 4 or asterisk is scored the following should be noted using an appropriate clinical index

- plaque
- gingivitis
- pocket depth
- bleeding on probing
- mobility
- furcation involvement
- recession.

2. INITIAL PERIODONTAL THERAPY



2.1 Initial periodontal therapy or Cause Related Therapy (CRT) has wide application in the management of periodontal diseases. CRT in addition to achieving control of chronic periodontitis (where pocketing is less than 6mm) serves to select cases for advanced restorative and orthodontic treatment planning, both of which are dependent on excellent patient compliance in relation to oral hygiene practices for successful outcome. CRT also serves to identify patients and specific sites which may benefit from periodontal surgical therapy.

B

2.2 CRT consists of

- patient motivation
- demonstration of oral hygiene techniques
- supragingival scaling
- removal of plaque retention factors
- subgingival scaling with root surface debridement.
- chemotherapeutic adjuncts may be appropriate
- occlusal adjustment if appropriate

B

2.3 The motivation of patients to control plaque in supragingival sites is a prerequisite for successful periodontal therapy.⁴ An explanation of the nature of periodontal disease in terms appropriate to each individual's age and ability to comprehend should be given before professional intervention commences. Sites of plaque and calculus deposits, gingival bleeding and pocketing should be demonstrated in the patient's mouth using a mirror.

B

2.4 Smoking is a significant factor in the exacerbation of periodontal diseases and compromises the success of both surgical and non-surgical therapy. Smoking cessation advice should be given at the start of periodontal therapy.⁵

C

2.5 Plaque should be disclosed and the patient allowed to brush with guidance given to modify technique until adequate plaque removal is demonstrated to the dentist or hygienist or dental health educator. A plaque index will serve to monitor compliance with self-performed plaque control and motivate the patient at subsequent appointments.

C

2.6 Conditions most frequently predisposing to supragingival plaque retention are

- caries
- overhanging restoration margins
- defective margins
- ill-fitting margins of crowns and inlays
- unpolished fillings
- composite fillings
- supragingival calculus

These should be rectified prior to commencing subgingival instrumentation.

B

2.7 Subgingival instrumentation with hand and ultrasonic instruments should be performed using local analgesia if required. Subgingival calculus, pocket and root morphology should first be identified using a probe. The root surface should be carefully checked to confirm adequate calculus removal after instrumentation.

A

2.8 Short term use of chemical plaque control may be included in initial periodontal therapy. Chlorhexidine gluconate 2% as a mouthrinse twice daily is the most effective agent.⁷

B

2.9 Adjunctive systemic antimicrobial therapy is indicated in the case of Early Onset Periodontitis but has no role in initial therapy for Chronic Adult Periodontitis.⁶ Topical antibiotic gels and fibres are not indicated in initial therapy in periodontal diseases but may be used in individual non-responding sites at a later stage.

C

2.10 Occlusal forces should be assessed with reference to

- wear facets and signs of abrasion (parafunction)
- tooth mobility
- premature contacts in centric and in intercuspation
- TMJ symptoms

Occlusal adjustments are best made after careful analysis of study models mounted on an adjustable articulator.

C

2.11 The time required for provision of CRT is significant and should be scheduled appropriately.



3. Monitoring Response To Therapy

3.1 Following subgingival instrumentation a period of 6 to 8 weeks should elapse before any probing is performed. Indeed healing is not complete for six months⁸.



3.2 Response to therapy should always be monitored and include an assessment of

- patient compliance (plaque and calculus)
- gingival status
- recession
- bleeding on probing
- pocket depth
- mobility



3.3 Patients demonstrating adequate response to CRT with adequate oral hygiene, control of gingivitis and absence of evidence of pocket activity (no bleeding on probing, stable pocket depth) will require a maintenance regime to conserve the improvement achieved.



3.4 Patients with inadequate response to CRT related to poor compliance with self performed plaque control will not benefit from surgical intervention but may show health gain from regular professional dental prophylaxis.



3.5 Patients with adequate levels of oral hygiene and local residual active periodontal pockets (as indicated by continued bleeding on probing or suppuration, static or increasing pocket depth > 6mm and radiographic evidence of further bone loss) may benefit from more complex therapy including periodontal surgery or the use of local antimicrobial therapy as an adjunct to further non-surgical debridement.

4. Criteria For Specialist Referral

4.1 In general the following groups of patients are at risk of severe periodontal disease or complications from therapy and early referral for specialist opinion upon detection of periodontal breakdown should be considered.



4.2 Patients with medical conditions predisposing to periodontal disease

- e.g. organ transplant
- diabetes
- immunosuppression
- renal disease



4.3 Patients at special risk of complication from dental treatment

- e.g. anticoagulant therapy
- risk of bacterial endocarditis
- immunosuppression



4.4 When a diagnosis of Early Onset Periodontitis is suspected

- e.g. Rapidly Progressive Periodontitis
- Localised Juvenile Periodontitis
- Prepubertal Periodontitis



4.5 Complex restorative treatment planning is required

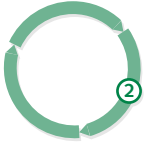
- e.g. combined periodontal and endodontic lesions
- combined periodontal and orthodontic treatment
- planning of fixed prosthodontics and implants for periodontitis cases



4.6 Where residual active periodontitis persists after CRT in a patient with good compliance referral for complex therapy is appropriate.



4.7 Patients with inadequate oral hygiene and a diagnosis of chronic adult periodontitis should receive CRT and demonstrate motivation to improve plaque control prior to specialist referral.



EXPLANATORY NOTES

- 1.1** *Research conducted over the last few decades has indicated that periodontitis is one of the commonest human diseases. The direct causal relationship between microbial colonisation and inflammatory destruction of periodontal tissues has been clearly demonstrated.¹¹*
- 1.2** *Periodontitis in the early stages rarely causes symptoms which would cause a patient to seek care. When periodontal disease is untreated recession, cervical sensitivity, root caries, mobility, periodontal abscess and drifting are the long term outcomes which may eventually alert the patient to seek professional advice.¹² Connective tissue attachment loss precedes bone loss in the progression of periodontal breakdown hence clinical and radiographic examinations are both necessary for diagnosis of periodontal diseases. The absence of bleeding on probing¹⁶ is strongly indicative of low levels of inflammation. A limitation of the use of bleeding as an indicator of active disease is the fact that healthy tissues may bleed with increasing probing pressure.^{17,18}*
- 1.3** *Datum recording only disease incidence are of little value either in planning dental services for populations or to screen individuals. Data must take account of disease severity and localisation of the specific sites with attachment loss. Loe and coworkers¹² recorded the course of attachment loss in a group of Norwegian students and academics and a group of tea plantation workers from Sri Lanka. An average annual loss of attachment of 0.1 mm was detected in the Norwegian population with 0.2-0.3 mm in the Sri Lankan workers. The CPITN permits an assessment of disease severity. The study of 11,305 subjects in Hamburg¹³ revealed only 2.8% with totally healthy periodontal tissues (code 0). Nine percent had bleeding on probing (code 1). Calculus without pockets was present in 28% of the sample (code 2). Some 44% of individuals had pocket of 3.5-5.5 mm depth (code 3). Probing depths of 6mm or greater were present in only 16% of the study population (code 4). The inference of these findings is that only simple non-surgical periodontal therapy performed by either a dentist or dental hygienist would be required to treat 81% of patients with periodontal disease and that some 97% of the population have either gingivitis or periodontitis. Although in some individual patients gingivitis does not progress it may well precede future periodontitis. Early detection and treatment of gingivitis and periodontitis is effective in preventing further loss of periodontal tissues.¹⁹ CPITN based periodontal profiles in adults from Europe¹⁴ and world-wide¹⁵ indicate significant clinical improvements could result from improved standards in oral hygiene control with limited professional intervention providing screening is routinely practiced.*
- 1.4** *Results from epidemiological studies and long term clinical trials in human populations originally led to the conclusion that, in the presence of plaque and calculus, periodontal disease increased in severity with age and that once initiated continued at a constant rate throughout life.²⁰ Subsequently it has been shown²¹ that periodontal disease progresses at different rates in different sites of the mouth and may undergo periods of relative lack of progression. Haffajee²² observed untreated periodontitis and confirmed a great variation in progression not only between individuals but also at specific sites. In view of the random nature of bursts in active disease progression regular screening is required.*
- 1.5** *Combined periodontal and prosthetic treatment has been shown to be dependent on technical and biophysical factors in relation to restorations provided that a reduced healthy periodontium remains.²⁵ Osseointegrated implants may fail due to peri-implant infection which is associated with pathogenic bacteria typical of periodontitis.²⁷ In partially dentate cases the bacterial species colonising implant sites reflects that of natural teeth and tends therefore to more periodontal pathogens where periodontitis is present untreated. Orthodontic treatment carries a risk of damage to the periodontium which is most significant in*

younger patients prone to early onset periodontitis or in adults with chronic adult periodontitis which is present prior to commencing orthodontic therapy.²⁴ Thus periodontal screening and appropriate therapy should be undertaken prior to orthodontic intervention.

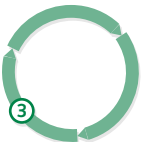
- 1.6** *Although early onset periodontitis (EOP) is rare, accounting for 2-5% of periodontal disease, progression is rapid, in a young age group and in general disease levels are not commensurate with level of oral hygiene. Thus screening is essential for early detection of EOP.^{28, 29, 30}*
- 1.7** *The CPITN is not a suitable index to monitor individual site response to periodontal therapy and should be considered as a preliminary screening index.³¹ In sextants with significant disease presence as identified by CPITN code 3, 4 or any code plus an asterisk more sensitive indices are required to make a full diagnosis and allow assessment of response to therapy.³²*
- 2.1** *Longitudinal investigations suggest that subgingival instrumentation alone is as effective as that used in combination with surgical techniques in the management of chronic adult periodontitis.^{33, 34, 35} Epidemiology studies have indicated a high incidence of periodontitis but with only a relatively small proportion of individuals with advanced periodontal breakdown.^{13, 15} Thus non-surgical therapy has wide application. Since periodontal diseases are plaque-associated diseases, surgical treatment can only be considered as an adjunct to cause related therapy which permits improved access for root planing.*
- 2.2** *A positive gain in periodontal health as demonstrated by effects on subgingival microbial flora and gingivitis can be seen following optimal supragingival plaque control,^{37, 38} with or without professional support. Supragingival scaling further improves clinical and histological responses above that achieved by improved oral hygiene alone.³⁹ Periodontal pockets shown only limited response to supragingival plaque control and scaling in the absence of subgingival instrumentation.⁴⁰*
- 2.3** *Whilst it is recognised that periodontal therapy is effective, success depends on patient motivation to achieve and maintain acceptable levels of self performed oral hygiene.^{37, 38} Whether a patient can be motivated will depend on many factors including personality, behaviour patterns, intelligence, socio-economic status and the patients own self image.*
- 2.4** *Smoking is a significant risk factor for periodontitis. Irrespective of oral hygiene status smokers develop periodontitis of a more severe form at an increased frequency in comparison to non-smokers (odds ratio for significant disease is 2.9). In addition response to both surgical and non-surgical therapy is poor in smokers.⁵*
- 2.7** *The role of subgingival calculus in the initiation and progression of periodontal disease is not fully determined⁴¹ however sites with subgingival calculus are associated with a higher rate of progression of attachment loss compared with calculus free sites.⁴² The observations that endotoxins and associated bacterial flora adherent to root cementum⁴³ may be removed by polishing and that 99% of lipopolysaccharide associated with periodontally involved root surface is present in loosely adherent plaque⁴⁴ suggest that calculus may not incorporate significant amounts of bacterial endotoxin. It is also recognised that clinical root planing is unlikely to achieve the objective of removing all calculus and cementum⁴⁵. Hand and ultrasonic instruments have been shown to be equally effective in subgingival plaque, calculus and endotoxin removal.^{46, 47} Ultrasonic instruments may have advantage in relation to plaque removal,⁴⁸ cavitation activity and better access to furcation defects.⁴⁹*
- 2.8** *The short term use of agents such as chlorhexidine has been well researched^{50, 51} and proven effective in controlling supragingival plaque. Mouthwash preparations have a role in prevention of gingivitis and as an adjunct to other aspects of initial therapy to assist supragingival plaque control however topical agents applied by mouthrinse may have minimal effects on periodontal pockets. Chlorhexidine is the most effective agent but should be used in well defined professionally supervised situations.*

- 2.9** *The composition of subgingival plaque in destructive forms of periodontitis is not the same in all individuals. There are variations in both quantity and quality of subgingival flora⁵² reflecting different clinical forms of periodontitis. Thus periodontitis may be considered a group of diseases with differing aetiology. Early onset periodontitis includes prepubertal, juvenile and rapidly progressive periodontitis. There may well be a genetic predisposition to such forms of periodontitis⁵³ in which defects in polymorphonuclear leucocyte function exist. In addition evidence supports the concept of selected periodontopathogenic species in association with clinically aggressive forms of periodontitis.^{54, 55, 56} Numerous systemic diseases by indirect effects on immune function predispose to rapid periodontal breakdown. Chronic periodontitis represents the response of an intact immune response to a non-specific microflora in which disease incidence correlates with quantity of plaque deposit. The rationale for antibiotic therapy is as an adjunct to mechanical therapy since 1) not all patients respond equally to periodontal therapy 2) repeated non-surgical therapy is often required to prevent progression of disease 3) the need for surgical therapy is reduced 4) control of progression in recurrent disease is more predictable.^{57, 58} There are no data to support the use of systemic antibiotics without prior mechanical debridement. In chronic adult periodontitis mechanical treatment alone will arrest further progression of periodontal breakdown. If patients do not maintain an adequate level of oral hygiene further breakdown will occur and the use of antibiotics will not influence outcome. There is evidence that antibiotics will be beneficial as adjuncts to mechanical therapy in disease which has recurred in the presence of good oral hygiene.*
- 2.10** *Whilst it is recognised that trauma from the occlusion has no role in the initiation of gingivitis or periodontitis it is accepted that it may influence the progression of existing deep periodontal pockets⁵⁹ and any occlusal discrepancy should therefore be removed as part of initial therapy.*
- 2.11** *The Periodontal Treatment Needs System⁶⁰ made suggestions for time allocation for various phases of periodontal treatment e.g. oral hygiene education 60 min, scaling 30 min per quadrant, surgery 60 min per quadrant. The time taken for thorough mechanical therapy should not be underestimated.*
- 3.1** *The ideal outcome from initial therapy is resolution of gingivitis and healing of periodontal pockets by the formation of a long junctional epithelium. The junctional epithelium has a rapid turnover rate and colonises the root surface within 48 hours of intervention. However cell turnover rates remain elevated for several weeks and the reformation of supracrevicular collagen fibres with eventual bone infill of the defect may take several months.⁸ Thus probing of treated sites within 6-8 weeks after subgingival debridement may prevent ideal outcome.*
- 3.2** *Response to initial therapy will vary with factors such as pocket depth, furcation defects, operator skill in subgingival instrumentation and compliance with oral hygiene. Monitoring will permit identification of non-responding sites and appropriate further treatment planning. In addition evidence of reducing pocket depths, resolution of gingivitis and compliance with oral hygiene control are indicators of resolution. The absence of bleeding on probing in particular is a reliable predictor of future periodontal stability.¹⁶*
- 3.3** *Longitudinal clinical investigations confirm that repeated oral hygiene instruction, scaling and prophylaxis maintain low plaque levels, reduce gingival inflammation, reduce pocket depth and increase attachment levels after periodontal therapy regardless of the actual form of initial therapy.⁶¹*
- 3.4** *Periodontal therapy using different surgical techniques have been shown to be effective in controlling chronic periodontitis. However postoperative plaque control is the most significant factor in determining outcome. Regardless of technique employed recurrent periodontal disease will occur in the absence of good plaque control.⁶²*
- 3.5** *Since the ability to adequately debride a pocket is related to pocket depth, then in the presence of good plaque control, a residual pocket >6mm showing signs of inflammation by persistent bleeding on probing, suppuration, increasing pocket depth and with possible radiographic evidence of further bone loss may benefit from surgical treatment by virtue of improved access for subgingival debridement.⁶²*

Antimicrobial agents, designed for topical administration adjunctive to mechanical therapy, are most effective in deep periodontal sites where they may reduce the need for further surgery.⁵⁷

- 4.1** *Periodontal disease results from an imbalance between bacterial load and host response. The presence of pathogenic bacteria are necessary but alone insufficient for disease activity to occur.⁶³ A number of host related risk markers are recognised which are associated with increased probability of disease, these are not in themselves causative factors.⁶⁴*
- 4.2** *Patients with a range of systemic diseases are prone to aggressive periodontitis and require careful assessment and treatment planning. In general diseases reducing immune function will predispose to periodontitis.*
- 4.3** *Most patients requiring adjustment of anticoagulant therapy or antibiotic cover to prevent endocarditis can be successfully treated in general dental practice, however advice may be of benefit in treatment planning. Immunosuppressed patients may require antibiotics prior to invasive dental treatment and care is required to avoid exposure to water contaminants (e.g. cryptosporidium) considered harmless to the general population.*
- 4.4** *Early onset periodontitis^{28, 29, 30} carries the risk of significant tooth loss and requires careful assessment and treatment which is likely to involve adjunctive antimicrobial therapy and surgical care. Early referral is therefore appropriate.*
- 4.5** *Periodontal aspects of combined care will determine success or failure and must therefore be carefully assessed. See explanatory note 1.5.*
- 4.6** *The presence of residual activity in these circumstances are indications for surgical periodontal therapy.⁶²*
- 4.7** *There is no long term benefit from the use of either antimicrobials or surgical therapy in the presence of poor oral hygiene.⁶² Patients will however benefit to some extent from repeated cause related therapy in these circumstances.^{37, 38}*

APPENDIX 1. COMMUNITY PERIODONTAL INDEX OF TREATMENT NEEDS. (CPITN) Alternative II.



- The CPITN provides the basis for a simple and rapid screening. It does not replace the need for more detailed clinical measurements in cases with significant periodontal disease (pocketing >6mm), uneven distribution of disease or severe recession.
- CPITN cannot be used to monitor response to therapy.
- The CPITN combines a dichotomous scoring principle, the treatment needs concept and the division of the whole dentition into sextants. The sextants are divided as in Table 1
- Table 2 summarises the CPITN codes and their significance in relation to treatment needs.
- To qualify for recording a sextant must contain at least two functional teeth. Observations made from only one remaining tooth in a sextant are included in the recording for the adjacent sextant.
- CPITN Alternative II for use with individual patients involves the examination of all teeth in a sextant.
- The third molars are excluded from scoring.
- A CPITN probe has a sphere 0.5 mm at the tip and a black marking between 3.5 and 5.5 mm. Probes with additional markings at 8.5 mm and 11.5 mm are also available.

- The probe is applied by moving it around the buccal then the lingual and interproximal surfaces of all teeth with a force of approximately 20g.
- When a code 4 is observed in a sextant the examiner records the score and moves onto the next sextant. If code 4 is not detected then it is necessary to examine all the teeth to be certain to record the highest possible score.
- In patients under 19 years of age one tooth per sextant only need be examined, these are 16, 11, 26, 36, 31, 46.
- In older individuals recession or furcation involvement may be present. Where total attachment loss exceeds 7mm or if a furcation can be probed the sextant score is accompanied by an asterisk. An asterisk denotes that a full periodontal examination of the sextant is required regardless of the CPITN score.

TABLE 1 DIVISION OF SEXTANTS FOR CPITN

International Dental Federation (FDI) notation.

17-14	13-23	24-27
47-44	43-33	34-37

TABLE 2 CPITN CODES

CPITN	CODE CLINICAL	FINDING TREATMENT
0	Healthy periodontium	Repeat screen in 12 months
1	Plaque and gingival bleeding no pockets >3mm colour coded portion of probe all visible no calculus	I Oral hygiene instruction Repeat screen in 12 months.
2	Supragingival and/ or subgingival calculus iatrogenic plaque retention factors (PRF) no pockets >3mm colour coded portion of probe all visible	II I + Removal of plaque retention factors by scaling supra and subgingival and adjustment of iatrogenic PRFs.
3	Shallow pocketing 5mm or less, colour coded portion of probe partially visible	III I + II + Periodontal charting (plaque index, bleeding index, probing pocket depths) pre and post treatment. Root planing.
4	Pockets exceeding 6mm colour coded portion of probe disappears into pocket.	IV I + II + III + complex treatment.

**APPENDIX 2
SELECTION CRITERIA FOR PERIODONTAL RADIOGRAPHY**

Radiographs should only be prescribed when the outcome of the examination be it positive or negative is likely to change the patients treatment.

There is lack of consensus as to which type of radiographic examination, bitewing, full mouth periapical series or panoramic is appropriate to clinical periodontal practice. Osborne and Hemmings¹⁰ have demonstrated that panoramic radiography is an acceptable alternative to full mouth periapical radiography on the basis of its diagnostic yield of clinically unsuspected pathology. However a large proportion of the disease identified does not affect clinical care. There is little support for routine application of panoramic radiography as a screening tool for all dental patients.³⁶ There is a close correlation between CPITN screening codes and bone loss as measured on dental panoramic radiographs.²⁶

Radiographic selection criteria for periodontal disease should take into account the provisional diagnosis obtained from clinical examination, with particular reference to pocket depth measurements and the overall state of thee patients dentition.

The selection criteria in Table 3 were suggested by Hirschmann et al.⁹

TABLE 3

DISEASE STATUS	RADIOGRAPHS
Uniform pocketing < 5mm	Posterior bitewings
Uniform pocketing > 5mm + symptomatic ectopic third molars	Panoramic radiograph
Uniform pocketing > 5mm + otherwise sound dentition	Vertical bitewings (one each of premolars and molars) or panoramic radiograph.
Irregular pocketing > 5mm or multiple crowned and / or heavily restored teeth or history of endodontic treatment.	Full mouth periapicals series or Panoramic radiograph and additional periapicals.



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GUIDELINES FOR SELECTING APPROPRIATE PATIENTS TO RECEIVE TREATMENT WITH DENTAL IMPLANTS: PRIORITIES FOR THE NHS.

INTRODUCTION

The aim of these Guidelines is to assist clinical providers and Health Authority purchasers to make informed assessment of patients who may be considered suitable for treatment with dental implants within the National Health Service. A number of Health Authorities and providers have produced initial patient selection guidelines for their own use but there is a general lack of consistency and it would be useful to establish nationally acceptable Guidelines. The remit of these Guidelines is therefore quite distinct from the recent one produced by the BAOMS and the BSSPD (Guidelines in Prosthetic and Implant Dentistry, Quintessence Publishing, London. Ed.Ogden A, 1996) considering standards of treatment with osseointegrated implants, which is a useful companion document.

The clinical situations in which osseointegrated implant retained prostheses can be recommended has expanded enormously over the past 10-15 years¹. Initially, the main focus was on individuals who were edentulous, but the demand for treatment of partially dentate subjects has grown and is now possibly the more common. In addition, there are a number of people who have more extensive loss of oral and facial tissues for whom osseointegrated implants can offer an improvement over previous treatment modalities.^{2,3} Osseointegrated implants have been shown to be a highly successful and predictable treatment modality to replace missing teeth by providing support for fixed bridge prostheses^{4, 5, 6, 7} individual crowns^{8,9} and overdentures.^{10, 11, 12} They are also used to provide support for obturators¹³ and related maxillofacial prostheses¹⁴.

These Guidelines consider three main subject groups who may benefit from treatment:

- i. People who are edentulous in one or both jaws
- ii. Partially dentate individuals
- iii. Those requiring replacement of hard and soft tissues of the maxillofacial and cranial region.

The above listing is a convenient clinical categorisation and in no way implies priority rating. Considerable thought has been given to this but it is not possible to easily compare the disabilities and potential benefit of treatment between subjects in the various groups. Patients may have missing teeth and oral hard/soft tissue deficiency due to developmental disorders, dental disease, trauma or following maxillofacial surgery. The magnitude or impact of the patient's disability does not necessarily correlate with the aetiology or the size of the deformity.

MANAGEMENT

1. Patient Factors

There are a number of general medical and oral/dental factors which should be taken into consideration which may contraindicate or modify treatment^{15, 16, 17}.

1.1 General Medical Factors

- Age and life expectancy
- General Health including Diabetes
- Irradiation of Jaws
- Tobacco smoking
- Psychoses/ Neuroses



- 1.2 General Oral/Dental Factors**
- Mucous membranes
 - Teeth
 - Periodontal tissues
 - Oral hygiene
 - Parafunctional activities
 - Available bone

2. Patient Groups



2.1 Group 1: Edentulous In One Or Both Jaws

2.1.1 Clinical indication - Severe denture intolerance

2.1.1.1 Physical due to severe gagging.

2.1.1.2 Physical due to severe ridge resorption with unacceptable stability or pain.

2.1.1.3 Psychological.



2.1.2 Clinical indication - Prevention of severe alveolar bone loss.

2.1.2.1 Moderate ridge resorption in young individuals - under 45yrs.

2.1.2.2 Moderate ridge resorption in one jaw opposing natural teeth with a good prognosis.

2.2 Group 2: Partially Dentate

2.2.1 Clinical indication - Preservation of remaining healthy intact teeth in individuals with otherwise healthy dentitions. The teeth may be missing due to the following factors:

2.2.1.1 Developmental

2.2.1.1.1 Oligodontia/Anodontia

2.2.1.1.2 Cleft palate

2.2.1.2 Trauma



2.2.2 Clinical indication - Complete unilateral loss of teeth in one jaw where dentures are not tolerated or an edentulous span is considered too difficult to manage by other means.

2.3 Group 3: Maxillofacial and Cranial Defects

This group can be divided into those requiring an intraoral prosthesis (2.3.1) and those requiring an extraoral/cranial prosthesis (2.3.2).



2.3.1 Intraoral prostheses

This group of patients have missing considerable amounts of hard and soft tissues and teeth. They result from developmental disorders, trauma and treatment of tumours. The defects may be categorised as:

- Extensive ridge deformities (>3cm span)
- Patent clefts
- Major jaw resections



2.3.2 Extraoral/ Cranial prostheses

- 2.3.2.1** Ears
- congenital absence or deformity of pinna
 - loss of pinna following trauma or surgical ablation of malignant disease

2.3.2.2 Eyes -loss of globe of eye with exenteration of orbit due to malignant disease

2.3.2.3 Nose -partial or total loss of nose following trauma or surgical ablation of malignant disease

EXPLANATORY NOTES

1.1 General Medical Factors

- There is no upper age limit providing the patient has a good life expectancy. However, implant treatment should be delayed in young individuals until growth is complete.¹⁸
- General health should be good enough to undergo surgical and prosthodontic treatment
- Subjects with Diabetes mellitus should be adequately controlled.
- Special precautions should be taken with patients who have undergone irradiation to the jaws (See section 2.3.1.2)
- Tobacco smoking compromises treatment success. Failure rates have been reported to be approximately twice as high in smokers.¹⁹ Subjects should be counselled to quit or reduce their smoking habits or be refused treatment, especially where other factors could contribute to failure of implant treatment.
- Treatment is usually contraindicated in subjects with severe psychoses/neuroses
- Other factors which contraindicate treatment include immunodeficiency, bleeding disorders, drug/substance misuse (including alcohol) and bone disorders (not osteoporosis). Implants may be contraindicated in subjects who are at high risk of developing infective endocarditis.

1.2 General Oral/Dental Factors

- The patient should have healthy mucous membranes, it is inadvisable to treat patients with severe erosive or ulcerative lesions
- Dentate subjects should have healthy periodontal tissues and sound teeth.
- Poor oral hygiene and untreated periodontal disease and uncontrolled caries are contraindications
- Caution should be exercised in accepting patients with suspected bruxism or other parafunctional activities.^{20, 21}
- There should be adequate bone quality and volume in relation to anatomical structures and the planned prosthesis.

1.3 Informed Consent

Patients should be fully informed of the treatment alternatives (including non-replacement), the advantages and disadvantages of the treatment approach, the likely outcome and success rates, the potential complications and long term care required. The patient should be motivated, have realistic expectations and be able and willing to care for the prosthesis.

2. PATIENT GROUPS

2.1 Group 1: Edentulous in one or both jaws

Patients may be edentulous in both jaws, or in either the maxilla or mandible. Patients with maxillary natural teeth opposing a lower complete denture present particular difficulties. Patients may be assessed by the amount of bone resorption²² or the patients reported degree of discomfort, functional disability or intolerance, for which no objective criteria are available.

2.1.1 Clinical indication - Severe denture intolerance

2.1.1.1 Physical due to severe gagging. This normally applies to the upper denture and in the severest cases patients are unable to wear the denture at all. Reduction of palatal coverage to overcome this problem will often result in a denture with unacceptable retention.

2.1.1.2 *Physical due to severe ridge resorption with unacceptable stability or pain. This problem is seen most frequently in the lower jaw. The degree of ridge resorption would be class v to vi according to the classification of Cawood and Howell.²² The denture bearing mucosa is also often severely compromised.*

2.1.1.3 *Psychological. Patients who claim to have a psychological aversion to dentures are very difficult to assess.²³ They should be seen by a clinical psychologist or psychiatrist. It is important to differentiate these patients, from those with severe psychiatric problems in whom implants are contraindicated (See section 1.1 above).*

2.1.2 *Clinical indication - Prevention of severe alveolar bone loss.*

Subjects who have demonstrated a tendency towards severe bone loss should be considered for early treatment intervention before management becomes very difficult or impossible without major bone grafting. Moderate ridge resorption would be class iii according to Cawood and Howell.²²

2.1.2.1 *Moderate ridge resorption (class iii) in young individuals - under 45yrs.*

2.1.2.2 *Moderate ridge resorption (class iii) in one jaw opposing natural teeth with a good prognosis. This problem is most severe where upper natural teeth oppose an edentulous lower jaw.*

2.1.3 *Priorities within Group 1*

It is not possible to differentiate subjects within 2.1.1. who would generally be considered higher priorities than 2.1.2. Many patients in Group 1 would have a psychological benefit from provision of an implant retained prosthesis.^{24, 25}

2.1.4 *Treatment Options for Group 1 - There are basically two alternatives: an implant supported overdenture or a fixed bridge prosthesis. The overdenture may be the treatment of choice in 2.1.1.2 and 2.1.2.1 (especially in the lower jaw), and could produce satisfactory results in 2.1.1.1, 2.1.1.3 and 2.1.2.2.*

2.1.5 *Prerequisites for treatment for Group 1*

*- existing complete dentures would otherwise be judged as satisfactory for most patients or attempts should be made to provide satisfactory dentures by an experienced clinician.
- the treatment plan should take into account the effect on the stability/retention of the prosthesis in the opposing jaw.e.g. the provision of a lower implant supported bridge may cause problems with an opposing complete maxillary denture. This could in turn lead to more bone loss in the opposing jaw and make future management difficult or impossible. The aim should be to produce a stable occlusion between the opposing prostheses (or teeth if present).*

2.1.6 *Check list for Group 1*

*- Existing dentures - of satisfactory/unsatisfactory construction
- Opposing dentition
- Gag reflex - brisk/normal
- Ridge resorption upper class ___ /lower class___
- Condition of mucosa
- Potential stability/retention and functional disability
- Pain/discomfort
- Medical/social history*

2.2 **Group 2: Partially Dentate**

2.2.1 *Clinical indication - Preservation of remaining healthy intact teeth*

2.2.1.1 *Developmental*

2.2.1.1.1 *Oligodontia/Anodontia - This category ranges from young patients with 1 or 2 developmentally*



missing anterior teeth²⁶ to those who have very few permanent teeth.²⁷ In these latter cases the few permanent teeth are often small and conical, providing poor retention for conventional bridges or dentures. This group also includes subjects who have misplaced canines in whom correction is not possible or treatment has failed.

2.2.1.1.2 Cleft palate - Repaired clefts with sufficient bone are often amenable to implant placement. Unrepaired clefts and those requiring bone grafts are more complex and may be considered in Group 3 - Maxillofacial defects.

2.2.1.2 Trauma

Loss of one or more anterior teeth in cases where the alveolar bone is mostly intact can be readily treated. Patients who have suffered more major bone loss through trauma may require bone grafts (see 2.3.1).

2.2.2 Clinical indication - Complete unilateral loss of teeth in one jaw where dentures are not tolerated or an edentulous span is considered too difficult for conventional bridgework, and other forms of tooth replacement are considered undesirable. In many patients with a free end saddle situation, the shortened dental arch is acceptable.²⁸

2.2.3 Priorities within Group 2

The patients in group 2.2.1.1 (Developmental) and those in 2.2.1.2. (Trauma) may be considered to be of equal priority. However, it is important to be aware that those in group 2.2.1.2 (Trauma) may be pursuing damages through the legal/insurance system which include costs for implant treatment. Those in 2.2.2 would generally be considered to be of a lower priority, where tooth loss is attributable to caries or periodontal disease.

2.2.4 Treatment Options for Group 2

Single teeth units, fixed bridge prostheses and overdentures.

2.2.5 Prerequisites for Group 2

- simpler/conventional treatment options should have been considered
- conventional approaches such as resin bonded bridges have been tried and shown to fail
- remaining teeth are healthy and periodontal status is good
- position of existing teeth within the arch, opposing arch and interocclusal relationships are satisfactory

2.2.6 Checklist for Group 2

- Age of patient - growth complete
- Reason for missing teeth
- Health of remaining teeth/periodontium
- Poor retention/stability provided by existing teeth for alternative treatments
- Alternative treatments considered - advantages and disadvantages
- Patients ability to cope with aftercare
- Medical/social history

2.3 Group 3: Maxillofacial and Cranial Defects

2.3.1 Intraoral prostheses

2.3.1.1 Priorities in Group 2.3.1

The size of the defect varies widely but it does not necessarily follow that the larger the defect the more it would benefit from implant support or the higher the priority. As in other cases the non-implant retained prosthesis should be considered and ideally provided before deciding upon the need for additional support and retention provided by implants. The lower jaw defects are more

likely to provide suitable bone for implant placement and greater possibilities for purely implant supported prostheses.^{3,29} An unsuccessful outcome may have a greater impact in this very difficult treatment group.

2.3.1.2 Treatment options in Group 2.3.1

These special cases require detailed treatment planning to provide prostheses such as fixed bridge prostheses, intraoral frameworks and obturators. Prostheses may be purely implant supported or combined mucosal and implant support. These cases are more likely to be complicated by:

- Lack of adequate bone volume and quality requiring large and complex grafting procedures.
- Lack of good mucosal support
- Irradiation in patients treated for malignancy. These patients should receive hyperbaric oxygen therapy³⁰ to try to overcome the detrimental effects of irradiation on the bone vasculature.³¹
- Poor quality mucosal tissues resulting from irradiation.

Implants placed in grafted bone and irradiated bone have a significantly higher failure rate³¹ and the following recommendations are given:

- Placement of additional implants to compromise for failure rate
- Careful consideration of the effects of failure on the patient

2.3.1.3 Checklist for Group 2.3.1

- Cause of deformity and success of related treatment
- Health of any remaining teeth/periodontium
- Retention/stability provided by existing teeth
- Available mucosal support and bone volume
- Effect of irradiation - consider hyperbaric oxygen
- Alternative treatments considered - advantages and disadvantages
- Patients ability to cope with aftercare
- Medical/social history
- Life expectancy

2.3.2 Extraoral/ Cranial prostheses

This group of patients is included here for completeness in terms of utilisation of osseointegrated implants. They are a specialised group covering maxillofacial, Craniofacial, ENT and Plastic Surgery. **They should be considered separately from the preceding groups in terms of funding sources and priorities for treatment.** Craniofacial implants can be used to anchor prosthetic replacements for ears, eyes and noses in case of congenital deformity or following their loss due to trauma or surgery.^{14, 32, 33} Such rigidly fixed prostheses are readily tolerated and accepted by the patient and represent a substantial improvement on previously used methods of attaching prostheses or attempts by plastic surgery to reconstruct these tissues.

3. PROVIDER RECOMMENDATIONS

Provider units would be expected to have experienced teams of surgeons, prosthodontists/restorative dentists and suitably trained ancillary staff. They should treat sufficient numbers of patients (with a good case mix) annually to maintain expertise in this demanding area. Experienced implant teams should be able to make the difficult selection decisions more readily. They should audit the selection process and continue to audit treatment outcome.



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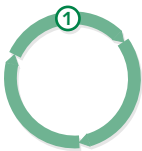
RESTORATIVE INDICATIONS FOR PORCELAIN VENEER RESTORATIONS

INTRODUCTION

Since the introduction of the porcelain laminate technique in the early 1980s, there has been a rapid increase in use and application of these restorations. The porcelain veneer offers a minimally invasive, colour and contour stable restoration capable of restoring discoloured, fractured malformed or mal-aligned teeth.

The restoration comprises a thin facing of porcelain bonded to the surface of teeth by a combination of mechanical and chemical means. The use of porcelain allows life-like aesthetics, colour and morphological stability whilst at the same time providing soft tissue acceptability.

In comparison to conventional crowning techniques, the preparation is conservative of tooth structure. Hence, the potential for pulpal involvement is reduced. As the palatal and proximal surfaces of the teeth remain largely untouched, there is less risk of altering the anterior guidance inadvertently or causing tooth movement.



INDICATIONS

1. Masking of discolouration

1.1 Porcelain veneers have been advocated as a treatment to mask teeth with a poor appearance resulting from discolouration. This may have been caused by trauma, endodontic treatment, tetracycline administration or staining from previous restorations.

The ability of a veneer to successfully mask the underlying tooth colour is influenced by several factors. These include the colour of the underlying tooth, the opacity of the porcelain, the luting cement used and the thickness of the restoration.

1.2 In several countries, the use of tooth bleaching techniques have been advocated as a method of improving discolouration either as a treatment in its own right or as a precursor to the placement of veneers. A considerable amount of literature exists indicating the safety and effectiveness of these materials. However, at present, their use in the UK is banned under current EU Regulations. The porcelain veneer is therefore an important restoration in the treatment of tooth discolouration.



2. Restoration of fractured teeth

The use of porcelain veneers has been suggested as a conservative alternative to porcelain jacket crowns to restore fractured teeth. The use of veneers as coronal splints to strengthen incomplete enamel fractures or weakened tooth-crown structure following trauma has also been reported.



3. Improvement of morphology, alignment or position of teeth.

3.1 One of the common forms of localised microdontia affects the maxillary lateral incisor, (commonly referred to as the "peg lateral"). As a limited amount of tooth structure is available, it is essential that a conservative restoration be used. The bonded veneer lends itself ideally to this situation.

3.2 In some individuals, the presence of a median diastema is regarded so unaesthetic that treatment is sought to eliminate the space. Orthodontic treatment provides excellent results in many cases

particularly if there is concurrent overcrowding and malalignment. However, this treatment requires frequent visits and has a significant rate of relapse. Laminate veneers may be used to close a median diastema either in the form of a restoration covering the entire labial surface or by using small additions bonded to the mesial surface of the teeth.

3.3 The use of veneers may be extended to teeth which are rotated or mal-positioned. If significant alteration to the surface of teeth is required, this will often lead to a considerable area of dentine exposure. Even in situations where a 0.5 mm reduction is planned, the depth of enamel at the cervical margin of anterior teeth is insufficient to prevent dentine exposure. This is particularly so if a "freehand" approach is applied to veneer preparations. Recently, clinicians have become increasingly aware of the importance of preparing teeth to preserve an intact enamel periphery (in view of the conflicting evidence of the ability of dentine bonding agents) to prevent microleakage of porcelain veneers cemented on dentine margins. In situations where, preoperatively, dentine or cementum is exposed at the margin there has been a suggestion that the patient should be informed that he or she is not an ideal candidate for the procedure and short term failure may occur more readily.

3.4 In all cases when the morphology or alignment of teeth is being altered, it is advisable to carry out a diagnostic wax up of the proposed changes. This gives the clinician, technician and patient an opportunity to visualise the planned treatment.



4. Restoration of the worn dentition

4.1 The literature describes the use of porcelain veneers in patients with palatal tooth surface loss resulting from erosion. The requirement of a conservative restoration able to bond to a dentine surface surrounded by a rim of enamel makes the veneer a useful restoration. As the veneer margin may finish on the labial surface of the teeth, it is often difficult to produce a restoration with ideal aesthetics. Hence, clinicians often recommend the use of dentine bonded crowns, an extension of the veneer concept, in these situations.

4.2 Patients exhibiting worn dentitions with large areas of exposed dentine, edge to edge anterior incisal relationships or parafunctional habits have until recently been regarded as unsuitable candidates for restoration with porcelain veneers. Several authors have now described the use of this restoration in such situations. However, very few long term studies have been performed.



5. Intra-oral repair of fractured crown and bridge facings

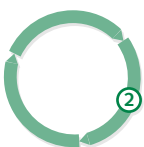
With the advent of equipment and techniques which allow sandblasting and tin plating at the chairside, it is now possible to bond porcelain veneers to existing crown and bridge restorations which have suffered failure due to fracture or deterioration of their acrylic or porcelain facings. As in all cases, it is important to diagnose the cause of the failure. If this was due to flexure of the present restoration under loading, any new facing will be subject to similar loads.

ADDITIONAL NOTES

Types of Porcelain Veneer System

Four different types of veneers systems exist: refractory die, platinum foil, castable glass and heat pressed systems

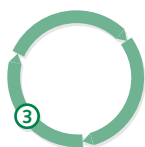
Both refractory die and platinum foil systems use baked feldspathic porcelain and for the majority of situations are regarded as the material of choice. Using these systems, an increase in incisal length of up to 2mm may be achieved without significantly changing the fracture resistance of either the tooth or



the tooth-veneer complex. It has been reported, however, that feldspathic porcelain veneers are brittle and prone to time-dependent stress failure. When comparing marginal fit of the two systems, platinum foil veneers have been shown to have a significantly better vertical marginal fidelity but significantly more overcontouring than refractory die veneers.

Castable glass ceramics exhibit several properties which make them useful as a veneering system. These include hardness, abrasion resistance, a coefficient of thermal expansion and translucency similar to that of enamel. This translucency may be a disadvantage if masking of discolouration is required. In addition should chairside adjustment be required, the shade and porcelain glaze are compromised to an extent that restraining may be required.

Heat pressed leucite-reinforced ceramic techniques create an additional 50% increase in strength, allowing for thicker areas of porcelain with less risk of fracture. As with the castable glass ceramic, heat pressed ceramics have a coefficient of wear similar to that of enamel. Unfortunately, veneers constructed by this technique lose strength when thinner than 0.5mm due to pressing difficulties, hence, preparations need to be 0.6-0.8mm in depth. The use of heat pressed leucite-reinforced ceramic may offer advantages when veneers require bulk or are of variable thickness and may be used in cases of parafunctional activity.



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Dental Public Health

1. Turning Clinical Guidelines into Effective Commissioning

Authors and Contributors:

D. Edwards on behalf of North Thames and Northern Audit Groups



TURNING CLINICAL GUIDELINES INTO EFFECTIVE COMMISSIONING

INTRODUCTION

Clinical effectiveness has been described as 'doing the right thing' and 'doing the thing right'. 'Doing the right thing' stems from research evidence but there is often an implementation gap with practice lagging behind research. 'Doing the thing right' is about ensuring that the best practice is performed by all, consistently. This has been the basis of a recent emphasis on evidence based practice and guidelines have been developed as one tool to address this problem. Guidelines aim to improve health care outcomes and reduce inappropriate practice and inefficiency.¹

'Clinical Guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances.'²

Guidelines have development and implementation costs and need to be used effectively and appropriately. This guideline will highlight the key recommendations from the published evidence and supplement these with issues to consider in relation to specific areas such as dentistry or commissioning.

MANAGEMENT OF GUIDELINES

1. Choosing the guideline:

The development of national guidelines and their local adaptation and implementation as protocols is recommended.^{3,4} Priority should be given to developing national guidelines in areas where there is⁵:

- 1.1 Potential for improvement in patient outcomes.
 - An important area of clinical practice- high mortality or morbidity or large numbers of people affected
 - When current practice varies from the evidence available
 - Where change is achievable
 - In a high cost area of practice.
- 1.2 Good evidence available.
- 1.3 An area of new technology.⁷
- 1.4 Practice in the primary-secondary care interface.⁷

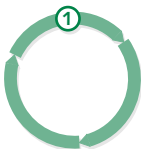
2. Features of good guidelines^{1,2,8--10}

2.1 Guidelines should be:

- | | |
|------------------|-------------------------|
| • Valid | Meticulously documented |
| • Cost effective | Have recognised status |
| • Reproducible | Clinically adaptable |
| • Reliable | Clinically flexible |
| • Clear | Have a scheduled review |

2.2 Guidelines should normally contain³:

- Graded recommendations on key issues
- Appropriate outcome indicators



- A minimum data set
- A draft quick reference guide
- Patient specific reminders for consideration for inclusion in local protocols.



2.3 Guidelines can be based on:

- Informal consensus,
- Formal consensus,
- Evidence or
- Explicit guideline methods⁴

Guidelines should be based on evidence where possible.

3. Local Adaptation

Guidelines cannot be introduced into all areas of practice simultaneously and decisions need to be made at a local level on which guidelines to adapt and implement.



3.1 Local criteria for choosing which guideline to implement should be based on^{5,7}:

- Availability of a valid national guideline.
- Status and credibility of national guidelines
- Identification of a local problem.
- Potential for improvement in patient outcomes.
- Potential cost savings.
- Potential for change at primary secondary care interface.

In addition the following may need to be considered:

- Timeliness- in terms of the pace of change
- Timescale for change- it is possible to change practice quickly?
- Type of change- is it confined to clinical practice within the consultation only or are structural changes to services needed which may be more difficult to implement?
- Commissioning- is it possible to follow up the implementation of guidelines by changes in service specifications.



3.2 Process of adaptation

The process of ownership and consultation is particularly important at a local level. This should include⁷:

- Development of a process by purchasers, providers, referrers and patients to agree local priorities.
- Establishment of a number of groups for guideline adaptation.
- Agreement of a strategy for dissemination and implementation.
- Evaluation using clinical audit or other tools.



3.3 Local issues which affect the involvement of purchasers, providers, primary care practitioners and patients should be considered.

4. Process of implementation

4.1 Strategy for Implementation

There should be an active strategy for the implementation of guidelines.^{2-4,5,7,12-16}



4.1.1 This should be based on the most effective means available. Multiple means should be used where possible.

4.1.2 The strategy should take into account the stages in the adopting of guidelines by clinicians⁹:

4.1.3 Strategies should take be adapted to the differing propensity to change of clinicians.





4.2 Evaluation

Guidelines should be evaluated, monitored and reviewed.

- The validity of the guideline should be evaluated using tools available.^{8,10}
- The implementation also needs to be evaluated both in terms of process and outcome. The outcome should include both professional adherence to the guideline and patient outcomes. Rigorous design of evaluation is needed to overcome Hawthorne and time effects.³



5. Dental Public Health input into guidelines

The consultant in dental public health (CDPH) should be involved in each stage of guideline implementation. Their input should be audited against these stages which include:

5.1 *Identifying the issues:* The CDPH is in a position to identify issues from research literature, analysis of activity data and consultation with clinicians and patients.

5.2 *Search for and critical appraisal of national guidelines:* The CDPH is a resource to research existing guidelines and appraise their validity, reliability and their appropriateness for local adaptation.

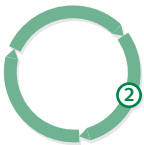
5.3 *Developing local guidelines:* The CDPH will work with clinicians, primary care practitioners and patients in developing referral guidelines. Treatment protocols may be developed with specific groups of clinicians.

5.4 *Education:* This may involve referring dentists, doctors, other clinicians and the public.

5.5 *Service specifications:* The contracting process should follow and support the implementation of guidelines.

5.6 *Monitoring:* This is important to ensure dissemination and adoption. If compliance is poor, action should be undertaken to remedy the situation.

EXPLANATORY NOTES



3.3 Local issues

Provider issues may include:

- *Number of other guidelines being implemented*
- *Existence and work of audit and peer review groups*
- *Size and manpower of unit affected by the guideline*
- *Facilities in unit*
- *Training and structure within speciality or trust*
- *GP and GDP views*
- *Competition between trusts*
- *Cost implications of guideline implementation and change in practice.*

Purchaser issues

- *Importance of clinical area in terms of patient benefit and costs*
- *Dental Public Health availability and involvement in adaptation of guideline*
- *Financial climate of health authority*
- *Ability to integrate guideline into contracting process.*

Primary care issues- GDP and CDS

- *Change in referral patterns*
- *Costs- Patient charges and NHS fees*
- *Representation on group developing guideline*
- *Relevance to clinical practice*

Public Issues

- Representation in development and views considered in evaluation
- Improved outcomes
- Access, waiting times, information and choice
- Costs (e.g. difference in charges between primary and secondary dental care)

4 Implementation strategy

Active implementation strategies have often been lacking in guidelines developed to date.⁵ The strategy adopted in any local situation will depend on the target group, the timescale and the area of practice and the results of any pilots. In general multiple strategies and those involving outreach visits, active educational and interactive strategies have been shown to be more effective than passive methods. Guidelines which involve the patient consultation and patient specific reminders have also been shown to be effective.³ There is now a better understanding of the processes of change in clinical practice and the effectiveness of different strategies.

4.1 Lonbarts has described 4 stages in the adopting of guidelines by clinicians⁹:

- Orientation: becoming aware of the existence of the guideline.
- Understanding the guideline and feeling the need to incorporate it into practice.
- Accepting the guideline- positive attitude to guideline and intention to change.
- Change: Guideline incorporated into practice.

To achieve change the implementation strategy would need to involve both a change in information and attitudes.

4.2 Five groups have been described in terms of adopters of new practice and each need different strategies.¹⁶ Innovators and early adopters are likely to respond to valid evidence alone. The early and late majority groups are more sceptical and respond better to peer influence such as local opinion leaders. Late adopters may only respond to changes in contract or regulations.



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Notes

Notes

the 1990s, the number of people in the UK who are employed in the public sector has increased from 10.5 million to 12.5 million (12.5% of the population).

There are a number of reasons for this increase. One is that the public sector has become a more important part of the economy. Another is that the public sector has become more efficient. A third is that the public sector has become more attractive to workers. A fourth is that the public sector has become more diverse.

The public sector has become a more important part of the economy. This is because the public sector has become more efficient.

The public sector has become more efficient. This is because the public sector has become more attractive to workers.

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Acknowledgements

Faculty of Dental Surgery Clinical Audit Committee

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M. Corrigan, J. Muir, T.A. Gregg, R.I. Joshi, A. Lawrence

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Published by

The Faculty of Dental Surgery of the Royal College of Surgeons of England

with support from

The Department of Health

Editor T.A. Gregg