

Choosing a digital camera for clinical photography

Choosing a digital camera for dental clinical photography can be a daunting task with there being a huge range of cameras available all with varying specifications. In addition, the models on offer seem to change almost week by week. The choice of which camera is best for you will depend on a number of factors, namely:

- Your budget
- The quality of the images you require
- The magnification or macro facility you require – i.e. how much of the tooth or teeth do you want to fill the frame?
- What you are going to use the images for, i.e. are they for publication, in which case high resolution may be required, or for placing on a website, in which case low resolution will suffice.

An often quoted specification, and therefore a selling feature of many cameras, is the number of Megapixels on the CCD (charged couple device) or the CMOS chip within it. It is this chip that converts the light entering the camera into an electrical signal, which eventually ends up as the digital image. The individual areas on the CCD or CMOS chip, which register the light falling onto them, are photodiodes, otherwise known as pixels. Megapixels are therefore millions of such pixels. A chip with 1600 pixels x1200 pixels will be a 2 Megapixel camera, whilst a camera with 3200x 2400 pixels on the chip will be 4 Megapixel and so on. These days the cheapest cameras are often 3+ Megapixels, with the most expensive cameras having 16 or more Megapixels.

The number of Megapixels is important, particularly if the pictures are to be printed. Generally, a 3 Megapixel or greater camera will easily be able to produced 8 x 10 inch prints of high quality. Such high quality images are not required if the images are to be used for lectures or placed on the web. This is particularly so if they are to be viewed using a data projector or a computer screen, where the resolution will be determined by the projector or computer monitor.

However, the number of megapixels is not the sole criterion by which to judge the suitability of a camera for clinical use. Other important features are the quality of the optics and the macro facilities; in particular the presence of an optical zoom rather than a digital (electronic) zoom. An optical zoom will magnify the image directly onto the CCD or CMOS chip of the camera, producing a large image using lots of pixels. If an optical zoom is not present then the image may only be projected onto a small area of the chip, therefore using only a small number of pixels. A digital zoom will only magnify this small image, which is on the small number of pixels. Therefore the image will be enlarged, but the number of pixels will still be small and the resolution will be low – the image will not be so sharp. The more pixels making up an image the sharper the picture. To see this in action click on the following hyperlink and use you cursor to move the slider through optical on to digital zoom:

http://images.bestbuy.com/BestBuy_US/images/media/flash/d/digitalimaging/demo3v2.swf

An example of the effect of using a digital zoom to get a close up of a tooth is illustrated in the pictures below. The picture on the right is a digital zoom image of the picture on the left. Because, in effect, the number of pixels making up the small area of the original picture are stretched over a larger area, the resolution is reduced and the picture appears less sharp. Indeed the individual pixels are almost visible, giving what is called a pixellated appearance.



Original picture



After zooming in using a digital zoom. This picture is less sharp

Types of camera

There are two broad types of camera, namely:

- Those based on a compact design where the lenses are not interchangeable.
- Those based on the single lens reflex (SLR) design with interchangeable lenses

Compact cameras

Compact cameras can cost in the region of £80 to £500. For clinical use three such cameras worth considering are:

- Fujifilm Finepix S5600 - 5.2 megapixels, 10x optical zoom. Cost - £155
- Fujifilm Finepix S6500fd - 6.3 megapixels, 10x optical zoom. Cost - £250
- Nikon Coolpix P3 – 8.1 megapixels, 3.5x optical zoom. Cost - £265
- Sony Cybershot DSC H5 – 7.2 megapixels, 12x optical zoom. Cost £349

Although reasonably good results can be obtained using compact digital cameras, the minimum aperture size (around f8) is usually larger than on an SLR type camera (around f32), where the operator has more control over the camera settings. A larger aperture leads to a smaller depth of field. This means that although teeth at the front of the picture might be in focus, those

at the back of the picture are likely to be out of focus. Using a high quality SLR camera, with a minimum aperture size of perhaps f32, will mean all the teeth at both the front and back of the picture will be in focus.



This intraoral picture was taken using a compact camera with a relatively large minimum aperture. Notice how the central incisors are in focus, but the patient's upper right first molar is not.

Another problem with the relatively large minimum aperture of compact cameras is that when a ring flash is used it tends to produce an overexposed picture. If the output of the ring flash is adjustable then this problem can be overcome. It may also be necessary to fit a neutral density filter to the camera lens, which is like fitting it with sunglasses, in order to reduce this tendency to overexposure.

SLR type cameras

The single lens reflex based cameras consist of a camera body, a separate macro lens (e.g. 105mm macro) and a separate ring flash.

The best lens for intra-oral photography is the Nikon 105mm macro, which will fit Nikon and Fuji cameras. This lens will also allow you to take portrait photographs and costs around £600. The ring flash suitable for these two cameras is the Nikon SB29 macro ring flash costing around £295.



The quality of the image produced using the Fuji S2 Pro camera body, the Nikon 105mm macro lens and the SB29 macro ring flash is very high indeed. This is illustrated well in this close up picture.

For those of you who may already own a macro lens and ring flash from the time when you used a conventional film SLR camera, now is the time to consider buying just a digital SLR body which is compatible with them. Prices are dropping dramatically and you don't necessarily need anything but a new digital camera body with your old accessories to obtain great pictures.

Examples of digital SLR camera bodies are:

- Canon D350 – 8 megapixels (CMOS), Cost - £399
- Fuji S3 Pro – 6.17 megapixels, Cost - £680
- Nikon D200 – 10.2 Megapixels, Cost - £880
- Nikon D50 – 6.1 megapixels, Cost £320
- Nikon D2X – 12 megapixels (CMOS), Cost - £2600
- Sigma SD14 – 14 megapixels (triple layer CMOS), Cost £1100
- Pentax istDL - 6 megapixels, Cost £443

Accessories

In addition to the camera you will also need:

- A ring flash – The ring flash for the SLR camera is the Nikon SB29 as has already been discussed, and on the SLR type camera it produces excellent images. In the case of the compact cameras the Yuzo Ring flash is available for the Fuji cameras and costs in the region of £200 – 300. It can be difficult to get pictures that are not overexposed using this ring flash on compact cameras. Another alternative is a constant illumination LED light ring. This looks like a ring flash, but as the name suggests, the LEDs are on all the time to aid focussing and taking the picture. Some light rings are available as combined constant illumination and flash units. Information on such light rings is available at: <http://www.dentalfotografie.info/>

and

<http://www.srelectronics.com/>

Some compact SLR style cameras do not have a screw thread capable of accepting a ring flash and this is worth checking before buying one of these cameras.

If you are considering using the old ring flash from your previous film camera on a new digital camera, be sure to check that's the trigger voltages are compatible. If the trigger voltage on the old ring flash is too high it can damage the electronics on the digital camera. A useful website which lists the trigger voltages of many old flash units is:

<http://www.botzilla.com/photo/strobeVolts.html>

- A memory card - the camera usually comes with a small card, which will hold relatively few images. You may wish to purchase a larger one and there are some good deals available if you buy a larger card at the

time of purchase of the camera. Memory cards are available in different formats such as Compact Flash, Smart Media, XD cards and Microdrives. They can reach up to 8Gb in size and can store thousands of images dependent on the image format (e.g. TIFF, JPEG) that is used at the time the picture is taken. Not all cameras take all cards, but some will accept more than one type. It is worth noting that Microdrives greater than 4Gb in size require a camera capable of using the FAT-32 system.

- If there is an internal thread on the lens it is worth buying a screw on filter in order to protect it, such as a Skylight 1B filter for £15. Personal experience has shown that the earlier Fuji compact cameras didn't have the capability to accept one of these filters. Although the SLR cameras have removable lenses they are very expensive and worth protecting with a relatively inexpensive filter.
- Batteries – one feature common to virtually all digital cameras is their avid use of battery power. It is therefore worth buying an additional set, of the correct size, NiMH rechargeable batteries and a quick charger, so that you always have a fresh set of charged batteries. The Lithium batteries of the more expensive cameras are not rechargeable and so it is worth carrying a spare. They usually cost £5 – 6 each.
- Camera bag – this is useful to protect the camera when not in use and costs £15 – 30.