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# Introduction to clinical digital photography

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#### Introduction

Dental photography is not a new revelation. It has been the cornerstone of aesthetic and restorative treatment planning for many years. Traditional 35mm photography in general, not just in dental environments, was always regarded as somewhat of a specialist art in itself (Ahmad, 2009).

The monetary cost of a single exposure, once you added up the cost of the film and the processing, was such that it would put most clinicians off photographing every case.

Waiting several weeks for negatives to be returned from processing, only to find that the picture was inaedquate, was a further disincentive.

Digital photographic technology has made dental photography much more accessible and practical for everyday use.

Instead of costly negatives and film processing, which takes weeks before seeing the results, we have reusable memory cards and LCD screens on the backs of the camera, enabling us to see our photographs instantly, allowing us to guickly rectify any mistakes.

Although digital dental photography can still be daunting, with the appropriate basic kit, basic standardised settings, a little basic camera knowledge and some practice, everyone is able to take beautiful and consistent dental photographs.

#### **Basic Kit**

When buying a camera for clinical dental photography, there may be a temptation to get an off-the-shelf compact 'point and shoot' camera or one of the more specialised dentally orientated 'point and shoot' cameras.

However, one of the cornerstones of good clinical dental photography is consistency, and compact setups can make it difficult to achieve consistent results. The author recommends a customised setup consisting of a DSLR camera body, a dedicated macro lens, and a macro flash. This combination of equipment allows complete control of all aspects of the photograph and as your dental photography evolves, the setup can be adjusted and adapted to suit your growing needs and skills.

#### DSLR camera body

If you are a keen photographer and envisage yourself using your camera outside of work as a hobby, then by all means go for a high-end full frame camera. If, however, the camera will only be for use in your surgery, then a lower-end cropped sensor camera body is perfectly adequate.

Most DSLR cameras have sensors that exceed the minimum requirements in respect of megapixels count – 10 megapixels or more will be sufficient. The most important aspect is that the camera is comfortable to hold, as once you have attached the lens and flash, the setup becomes quite heavy.

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Some of the lower-end models have a smaller hand grip, which can be awkward to hold, but otherwise the photograph quality is more than adequate.

#### Lens

After choosing the camera body, you will need to select a macro lens. The strict definition of a macro lens is 'a lens which will produce a life-sized image on a full frame sensor when taken at a magnification ratio of 1:1' - a bit like a dental periapical radiograph.

It is important that the lens has a 'fixed focal length', ie, not a zoom lens. The macro lens needs to have a manual focus override so you can set the magnification ratios and have a ratio window so you can consistently set these ratios. This is important for you to keep the consistency of each exposure you take.

Some cheaper lenses have only fully automatic focusing. The ideal macro lens to have is one with a focal length of 100 or 105mm, as this will enable the operator to stand at comfortable distance from the patient.

A 50mm or 60mm lens would also work; however, the operator would need to be positioned very close to the subject to obtain only the smile on the image.

#### Flash

With macro photography, it is important to have enough light in order for photographs to be properly exposed and give a shadowless image. The inbuilt flash on the camera tends to produce a shadow over the lower teeth figure from the upper incisors, and the surgery lighting alone is insufficient for dental photography.

The ideal is using a separate flash that is positioned towards the front of the lens. A ring flash variant is the traditional option for dental photography and these flash units come in both 'wired' and 'wireless' options, depending on your camera functionality.

#### Setup

In order to obtain consistent photographs, the camera must be set in manual mode, not automatic mode. This gives the operator complete control over all aspects of the photograph rather than the camera altering settings on its own.

#### **Image Quality**

A camera is capable of recording multiple different image formats. The two useful formats for dental needs are JPG and RAW. A JPG is a lower quality image; however, it is acceptable for most clinical situations. A RAW file is effectively a digital negative. It is a very large file size (up to 10 times the size of a JPG) and is sometimes requested for awards entries, exam case presentations, and medicolegal cases.

It is possible to set your camera to record JPG, RAW, or both at the same time, depending on your preferences.

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#### **Glossary of terms**

- DSLR digital single-lens reflex camera. Digital version of the traditional SLR high-end film camera
- Sensor the light sensitive area inside the camera that records the image. Effectively the 'film' in a digital camera
  Available in 'cropped' or 'full frame'
- Full frame sensors are the size of a 35mm film negative whereas a cropped sensor is a smaller sensor and only records a portion of the image of a full frame sensor, hence the term 'cropped'
- This article will assume 'cropped sensor' as there is little clinical benefit of a full frame sensor over a cropped sensor
- Megapixel (one million pixels) sensors will be described as having 'X' megapixels
- The total number of pixels that make up the recorded image
- The larger the number, the sharper the image
- Unless photos are being enlarged to billboard size or being cropped (where you only show a small part of the original image, the number of pixels is not clinically relevant as long as the camera has more than 10 megapixels
- Exposure two definitions:
- Taking a photograph can also be referred to as 'an exposure', ie, you have exposed the film/sensor to light
- In photography, the term 'exposure' refers to how bright the image is. 'Over exposed' means too bright or too much light; 'underexposed' means too dark, or too little light
- Depth of field this describes how much of the image is 'in focus'

#### White Balance

The 'white balance' is the setting that allows the camera to reproduce objects that are white in real life, as white in the photograph. If the camera is set to auto white balance (AVVB), often the resulting image is either too orange (warm) or too blue (cold), but more importantly may not be consistent in before and after images, which can be problematic when recording colour.

Natural daylight is in the region of 5,500K (Kelvin), similar to the colour temperature to the light from the ring flash. Depending on the functionality of your camera, you will be able to set you camera to record close to this. Changing the settings from AWB to the 'flash' or 'daylight' settings will give a realistic colour temperature for dental photography.

#### **Basic settings**

Consistently well exposed and in focus pictures rely on three elements: ISO, shutter speed, and aperture. A change in one of the three will have an impact on the others, so all three elements must be set in harmony for the type of photograph you wish to take. Luckily for dental photography, as we are shooting in a very controlled environment, we only ever need to change aperture. The ISO and shutter speed always stay the same.

#### ISO

Sometimes called ASA, ISO is a measure of the sensor's sensitivity to light. The lower the number, the less sensitive

the sensor, but the less grainy (noisy) the image. ISO follows a common scale across all cameras: 100, 200, 400, 800, 1,600, etc. The more advanced the camera, the higher the ISO will go. Increasing the ISO allows for a photograph to be taken in lower light conditions; however, the higher the ISO the more 'image noise' there is, resulting in a grainy photograph.

As we are working with a flash at close range, there is plenty of light, so the ISO can be set to 200 and in most cases this will never need to be changed.

#### Shutter speed

Shutter speed is a measure of the amount of time that the sensor is exposed to light. It is measured in fractions of a second, eg, 1/125 or 8 milliseconds. The longer the shutter is open, the greater the chance of motion blur.

In dental photography, you will always be working with a flash, so the shutter speed can be kept high, which reduces the chance of motion blur. A shutter speed of 1/125 should be used if the camera is capable of syncing to the flash at that speed. Some lower-end models are only capable of synching the flash at 1/60.

#### Aperture

The aperture is the size of the hole at the end of the lens when the photo is being taken. It is expressed in 'f' numbers or 'f-stops', ie, f2.8, f4, f5.6. The smaller the number, the larger the aperture, and the more light is allowed to enter

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Figure 3

the camera. The larger the aperture, the smaller the depth of field, ie, the less of the photograph that is in focus (Figure 1).

If too large an aperture is selected for intraoral photography, often the posterior teeth will not be in focus compared with a smaller aperture, where both the posterior and anterior teeth will be in focus (Figures 2 and 3). This is the only camera setting that will be changed on a regular basis:

- Full face more light is needed as you are standing further back from the subject. Set aperture to f10
- Smile and all intraoral shots aperture of f25.

#### **Clinical Kit**

There are some additional accessories required to aid in the taking of high quality, reproducible clinical photographs.

#### Retractors

Retractors are necessary as it is not professional to have fingers (gloved or ungloved) visible in photographs. Retractors come in many shapes and sizes. In the author's opinion, the best are the 'V-shaped' type as they allow full retraction of the buccal segment, allowing for visualisation of the molar relationship. The standard 'C-shape' retractors



Figure 2



Figure 4

often do not retract far enough, hence hiding the first molars (Figures 4 and 5).

#### High quality intraoral dental mirrors

A large occlusal adult mirror is preferable as this allows the mirror to be positioned without fingers present in the photograph. If only small occlusal mirrors are available, the use of a mirror handle is advised, as again this allows for positioning with no fingers in the shot. For buccal segment shots, thinner buccal mirrors are also available.

The use of a mirror cage is advised as these mirrors are easily scratched while cleaning, rendering them useless.

#### Contrastors

Contrastors are used to improve the quality of the upper anterior views by obscuring the tongue and teeth in the lower arch (Figure 6). They are available in ridged metal and flexible silicone. The silicone is preferable due to lower reflection and improvement in patient comfort.

#### Backdrop

A dedicated photo studio is the ideal setup but is not always a possibility in general practice. Having a blue or black cloth







Figure 5

Figure 6





to hold behind the patient's head while full-face shots are being taken is an inexpensive and effective way of improving the quality of the shots (Figure 7).

#### Conclusion

Digital photography done correctly can have a huge positive effect on your dental practice. It can help you communicate with your patients and gain their confidence in you. It also provides a detailed record of your cases.

#### **Further reading**

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