Clinical digital photography. Part 1: Equipment and basic documentation

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By Dr. Eduardo Mahn, DDS, DMD, PhD
Universidad de los Andes
Clínica CIPD Santiaguino, Chile

Abstract: The use of photography is becoming a standard in modern dental practice. The sharing of pictures is not only essential for communication between dentist, laboratory technician and patient, but also for communication between professionals, undergraduate and postgraduate students with their teachers and for documenting of clinical procedures in cases you want to show to both patients and work colleagues at scientific meetings. This article will describe the necessary equipment for clinical photography, explain its uses and deliver the foundation for basic documentation and structure for clinical cases. The second part will discuss the step by step documentation and show practical examples to improve your results.

Introduction
The first process of photography was presented to the world by Louis J. M. Daguerre at the Paris Academy of Sciences on January 7, 1839. In that same year, Alexander S. Wolcott, a manufacturer of dental instruments, designed and patented the first camera producing images on a silver-coated copper plate.4 Thanks to the documentation that this allowed, it created the first dental journal, the American Journal of Dental Science.5

Due to the advancement in technology, we now have the privilege of having digital photography that allows an immediate view of the results and not having to wait for the processing of films as was the case of old movies, utilising silver halide ions in a gelatine emulsion on a strip of celluloid film to capture latent images. The advantage of digital images is that in addition to instantly seeing them through a viewfinder, there is less cost of developing film negatives and their storage is easy and fast. The power of viewing and saving images in computers also saves space and access to a database is almost immediate. By developing different virtual media files and almost universal use of email, information sharing is almost instantaneous anywhere in the world.

Because many of the procedures performed in dentistry represent established protocols that should be read, learned and then practiced, it becomes clear that photography aids us in teaching or explaining to our patients what we think are common, but to them are complex and mysterious procedures.

Digital Cameras
There are currently hundreds of cameras on the market. If we compare their features and capabilities, we can divide them into 3 groups:

- Compact cameras (point and shoot), interchangeable lens cameras (mirrorless system cameras) and reflex cameras, SLRs DSLR (Digital Single Lens Reflex).

Initially, compact cameras (Figure 2) may seem appealing, but they have many limitations. They do not have a consistent image control, the position of the flash is not suitable for introral photography, distorted images from utilization of an insufficient macro lens in the wide-angle position, lack of manual exposure and focus problems. One of the biggest problems is the inability to change the lens, which gives its design a wide angle or medium distance, causes distortion of perspective, as the clinician would have to stand close to the patient. This has another negative effect of poor lighting.6,7

The second group seems promising, but is still in development, and the third group, DSLR cameras (Figure 5), are those with greater advantages for clinical use, thanks to the sensor size and the many options in manual mode, lenses and flashes.

These cameras use a lens for both image composition and image capture. This design, which allows direct viewing and focusing without parallax error, is ideal for dental photography.7,8 One of the biggest advantages is the ability to exchange lenses. For example, you can take pictures of landscapes, portraits, and all dental treatments with the same camera, by just changing the lens. The same applies with changing the flash. All professional cameras more than meet the requirements. Semi-professional cameras (with a more affordable price) that meet these requirements are for example Nikon D7000, D90, D5100, D3200, Canon EOS 40D, 50D, 5D4 or other similar brands.

Flash
The discussion with which flash, macro lateral or twin flash light (Figure 4) or ring flash (Figure 5), is most suitable for intraoral photography, and has been quite a discussed topic for many years.8

The ring flash light is the favourite amongst inexperienced dental photographers and it is considered the universal flash system for general macro photography.8,9 On the one hand, it is true that the greater the distance between the ring flash and the subject, the flatter, less texturised and refined the photos are, while a twin flash generates pictures with more texture, contrast and looks more alive.10

The macro lateral flash shows more variability in light direction, allowing certain details to be highlighted. The overall hue of colour, cracks and also transitions are best captured with the macro lateral flash.11 Probably the only drawback, besides its higher cost, is when photographing posterior regions, where access and space is limited. In these cases, the homogeneous light and easy handling of the ring flash has an advantage. In the author’s experience, when a clinician decides to begin clinical photography, a ring flash is more...
than adequate; the extra cost of the macro lateral flash is not justifiable, since differences in the early stages of the learning curve will not be substantial. Then once they handle certain techniques, the macro lateral flash is a great contribution.

Lenses

Basically, macro lenses from 50 to 200mm in focal length are used for clinical photography. In the author’s experience, macro lenses of about 100 mm in focal length provide the ideal combination of magnification ability and convenience working distance for dental purposes. Teleconverters or zoom lenses can be used, but not recommended. The same goes for lenses with autofocus mode. If this is the case, the automatic mode must be switched off and put on manual. Focusing is done manually and moving the ring lens near a sharp image, and with small movements to and fro, achieves perfect focus. A high quality lens is paramount to capturing crisp and bright photos. This aspect should not be compromised. It is ideal to have a magnification ratio of 1:1. In the author’s experience a good lens to start off with at a reasonable cost is the Sigma 105mm f: 2.8 EX DG macro (Figure 6), which is compatible with different brands of cameras. On the other hand, for the seasoned and professional photographer, who does not want to compromise quality, a Nikkor micro lens and the AF-S 105mm E: 2.8 ED, NC, VR (Figure 7), would be recommended, though costing more than doubled compared with the aforementioned Sigma.

Black background or contrastors

The second aspect to show in most of the photographs is a black background, or more correctly, a thin line which is not right, you see the lips and the appearance of the tongue. In contrast, Figure 21 is a better picture, having the proper exposure and no distracting elements and the correct angle was taken.

In the occlusal view, both mandibular and maxillary, one must keep in mind, a good mandibular occlusal photo is far more difficult than the maxilla by several factors: Firstly, the tongue needs to be retracted, secondly, the retainer or occlusal splint of the patient makes the clinician act quickly and without hesitation and, thirdly, the angle of the photo.

In Figure 22 you notice, in addition to being inadequately illuminated, the axis of the arch is not correctly related with the photo. We can see the jaws and teeth as well as the edges of the mirror. In contrast, Figure 23 shows an image best achieved where the picture is centered, well lit, and in the presence of other distracting structures.

Case report

One of the main objectives of the documentation process, is to express properly either to patients or students what steps were performed to reach certain results. It is also beneficial to graphically present and compare new and already established techniques. The following is simple case of two composite restorations with sectional matrices and a centripetal layering technique (Figures 24-27). This shows the detailed documentation and standardization that images should demonstrate.

Another objective of a systematized and documented treatment is to have graphic material, either for patients to understand or for treatment results objectively, so they have no obstructed treatment expectations. These types of aesthetically documented treatments will be discussed and presented with documented cases in a step by step manner in the next chapter of this series, in addition to discussing common mistakes and how to solve them.

Editorial note: References are available from the author.