Florida's Outlook On the Dental Laboratory Profession
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Digital Dental Photography:

Techniques and Tips for the Laboratory Technician

At first glance, the world of digital dental photography may seem overwhelming and intimidating, especially for those individuals without much experience behind the camera. Fortunately, all that is necessary to begin making excellent photographs are a few pieces of inexpensive equipment, a handful of core skills, a little practice and just a bit of imagination.

Photographic Equipment

Camera Body

The first piece of equipment that needs to be acquired is the camera body. There are several brands to choose from, and the most popular are Canon, Nikon, and Sony. The company which makes the camera is not very important since most contemporary digital cameras today are capable of producing high-quality images. The type of camera matters more, and it is important to spend the extra money on a DSLR/system camera rather than a point and shoot model or a prosumer/bridge camera with a zoom lens permanently fixed in place (**Figure 1**). A DSLR camera will provide greater flexibility and control over the settings as well as allow for a wider variety of lenses and flash accessories to be attached. To achieve the highest resolution possible, a camera body with a full-frame sensor should be selected for dental photography. Not only is the rendering of color exceptionally accurate, but the final image on a full-frame sensor camera does not suffer from the cropping that occurs with the diminutive APS-C sensor format cameras (**Figure 2**).

Figure 1 *(above) Camera Types: Introductory level point and shoot, advanced beginner level prosumer/bridge, and professional level system/DSLR.*

Figures 2a - 2b *Same subject photographed with an APS-C cropped sensor versus full-frame sensor. The cropped-sensor displays clipping of the image and less vibrant colors than the full-frame sensor. (From left to right: APS-C cropped sensor and full-frame sensor)*

Lenses

Camera lenses, or glass, are undoubtedly the most expensive camera equipment required for digital dental photography. Most DSLRs are purchased as a package deal and include a standard zoom kit lens. These lenses are not capable of revealing the infinitesimal nuances of the many small dental laboratory objects that will be photographed, and for this reason, a dedicated macro lens is a must in the photographic arsenal of every technician. A true macro lens can focus at extremely close distances to the subject, thus allowing for the acquisition of exquisite image detail (**Figure 3**). A macro lens in the range of 90mm-105mm is recommended, and as a bonus, the 90mm-105mm focal length allows these lenses to excel at portrait photographs (**Figure 4**). It should be noted that not all lenses are created equal. For example, Canon has two different 100mm macro lenses (**Figure 5**). However, the redline L-series or luxury lens will cost roughly 25 percent more than the standard lens. The image quality from the luxury lenses is indeed sharper, but may not justify the increased cost for use in a dental setting. A wide-angle lens in the range of 10mm-22mm is quite useful and recommended in the laboratory for capturing the broader context throughout the documentation of a specific patient case or technique (**Figure 6**).

External Flash

The key to every great photograph is the ability to control and manipulate the light. One of the benefits of a system camera is the ability to add an external flash to the hot shoe mount on top of the camera body. The saying less is more is a good general rule to follow when adding a light source to dental photographs. Too much light on the subject results in blow-out and overexposure of the image, while not enough light results in a dark and underexposed image (**Figure 7**).

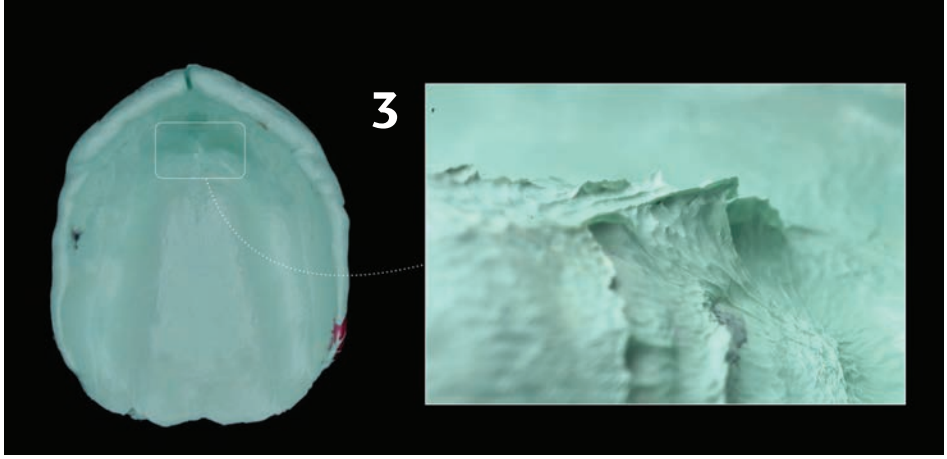


Figure 3
Standard view of a maxillary denture final impression with polysulfide. Inset shows the amount of detail that can be achieved at a close focusing distance with a dedicated macro lens. (From left to right: standard kit lens image and highly-detailed macro image)

Figure 4
A macro lens in the range of 90mm-105mm also doubles as an excellent lens for portrait and profile photographs.

Figure 5
Many companies make lenses with identical focal lengths, however, the build quality and the clarity of the optics varies.

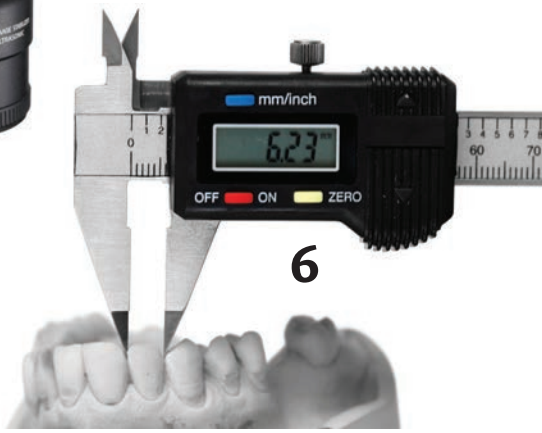


Figure 6
A wide-angle lens has the ability to place the subject within a broader context.

Figure 7
Too much light on the subject results in over-exposure and lost information (white areas). Not enough light on the subject results in under-exposure (dark, shadowy areas). Having the correct lighting set-up allows for proper contrast and image detail. (From left to right: over exposed, under exposed, correctly exposed)

A problem typically encountered when taking intraoral photographs of patients in the laboratory is the harsh glare created by the reflection of the flash against the glossy enamel surfaces. An easy way to soften the light source in these situations is to place standard white sheets of printer paper over the flash heads (**Figure 8**). To achieve an incredibly wet and silky look on materials, such as acrylic and ceramic, an inexpensive ring diffuser over a Speedlite flash can be utilized. When small objects, such as crowns, are photographed with this lighting set-up on a standard hand-held mirror, the result is an image containing an inky-black background and a beautiful and illustrious reflection (**Figure 9, Figure 10**).

Figure 8
White paper placed over the external flash heads creates a soft and diffuse look. The photo above (top right) demonstrates the harsh glare of a flash. The photo below (bottom right) demonstrates the effect of flash diffusers on the highly reflective surface of the dentition.

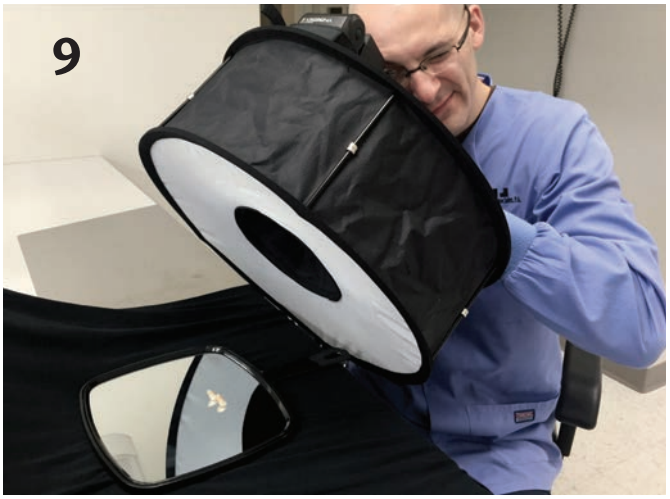
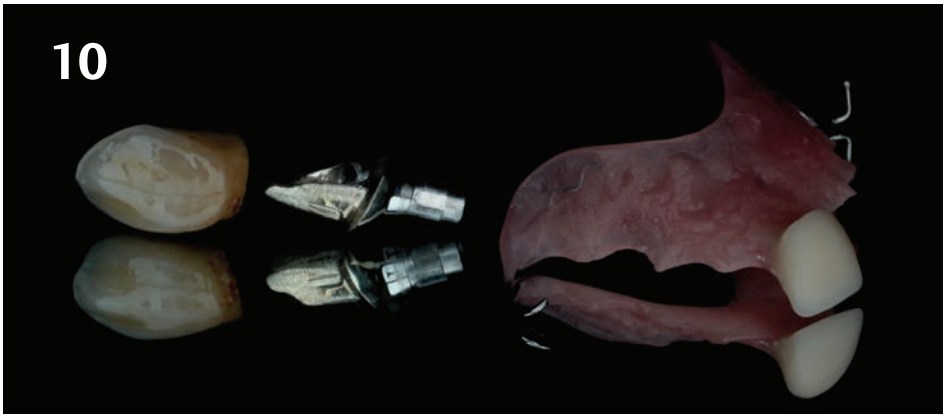


Figure 9
A Speedlite, flash ring diffuser, and a hand-held mirror are an inexpensive way to create stunning images.

Figure 10
Dental materials such as ceramic, metal, and acrylic appear wet and silky when the harsh glare of an external flash has been reduced with a ring-flash diffuser. A hand-held mirror creates a beautiful natural reflection of each object.



Core Camera Skills

Anyone can purchase expensive photographic equipment, however, without a basic understanding of the foundational camera settings that control the exposure of the final image, the investment will be time and money wasted.

Camera Settings

There are essentially three main settings on a DSLR that will need to be understood and taken into consideration by the dental technician:

1. Aperture (f-stop)
2. Shutter speed
3. ISO

These three settings are frequently referred to as the exposure triangle, and they form the foundational basis for everything in dental photography.

Aperture

The aperture is simply the opening inside a lens, and it controls the amount of light that enters through the lens and passes into the camera. The size of the aperture opening is represented by a value called the f-stop (e.g., f/1.4, f/16, f/32, etc.). The smaller the number, the larger the aperture, and hence, the more light will be allowed to enter the camera. Likewise, the larger the number, the smaller the aperture becomes, and, therefore, a reduction in light entering the camera results. Smaller f-stop numbers also tend to have a shallower depth of field. This means that only a limited amount of the subject will be in focus, while the rest will be blurred out. Sometimes this look has a very desirable effect and can create an artistic feel to the image. However, when the maximum detail is required, a larger f-stop number will be necessary to keep more of the subject in focus (**Figure 11**). A good starting place for many dental projects is in the range of f/16- f/22.

Shutter Speed

Inside the body of every DSLR camera is a small mechanical curtain, called a shutter. The shutter opens and closes at various speeds, measured in seconds, and acts like a faucet valve controlling the quantity of light reaching the camera sensor. A relatively fast shutter speed, measured in fractions of seconds (e.g., 1/4000th), opens and closes the curtain at such a rapid rate that very little light can reach the sensor. Conversely, a slow shutter speed (e.g., two seconds), allows far more light to reach the sensor. The aperture and shutter speed work together and should ideally balance each other out. Faster shutter speeds, which let in less light to the camera may be more appropriate to use with wide open apertures (e.g., f/1.4), which allow a flood of light into the camera, and vice-versa. For most applications in the dental laboratory, a shutter speed between 100-200th/sec is ideal. At rates slower than this, there is a risk of blurring the final image due to slight shaky hand movements while holding the camera body. At rates faster than this, it will be difficult for the sensor to absorb enough light and the final image will often be too dark.

ISO

ISO is not an acronym, but rather a shorthand notation for the Greek word, ISOS, which means equal. The ISO value represents the sensitivity of the camera sensor to light. The larger the number, the more sensitive to light the sensor becomes. Increasing the ISO value in a dimly lit laboratory setting, for example, will dramatically enable a greater visualization of the work environment and the subject matter. This method of enhancement does have an inherent shortcoming, however. As the ISO value increases, so does the addition of unwanted noise or grain to the image (**Figure 12**). It is recommended to keep the ISO as close to 100 as possible to maintain a clear and sharp image. However, experimentation with higher values and in combination with simultaneous adjustments to the aperture size and shutter speed are also encouraged.

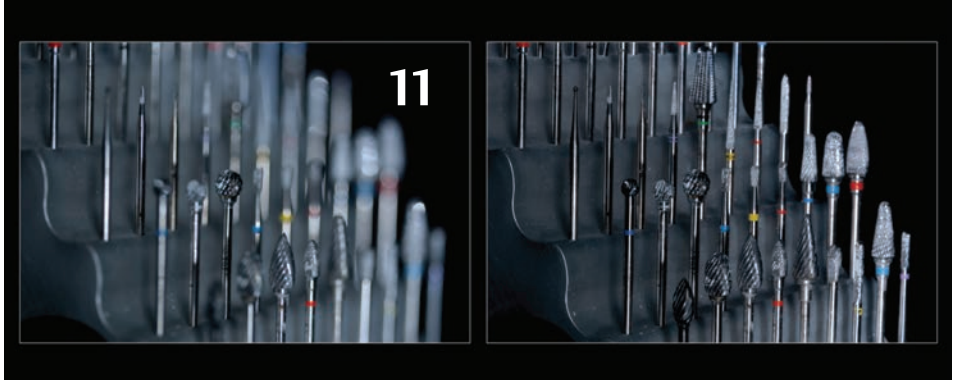


Figure 11
Smaller aperture numbers result in an isolated area of focus and a blurry background, while larger aperture numbers provide greater depth of field and focus throughout the entire image. The ISO must also be increased with larger aperture numbers because less light is reaching the sensor when the aperture narrows. (From left to right: small aperture, f/2.8, ISO 100, and large aperture, f/32, ISO 640)

Figure 12.
In dimly lit environments, the ISO setting can be increased to make the sensor more sensitive to any trace amounts of light that may be present. The resulting image will be brighter, however, at very high ISO values, the photograph will show a grainy artifact. (From left to right: ISO 100 and ISO 25,600)

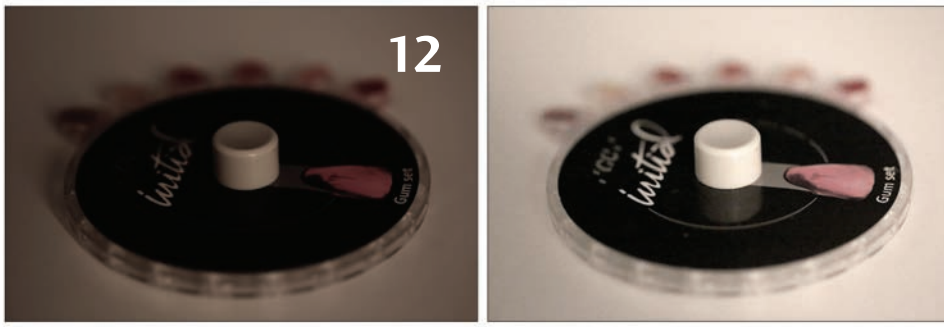


Figure 13
The use of creative angles, subject framing, and lighting are all a part of producing great photographic composition. These images achieve their final touch-up during the post-processing phase in photo editing software.

Composition

Once the fundamental photography skills are in place, the next step is to learn composition. There are many technically sound photographers in the dental community, what is frequently lacking, however, is the creative ability to reveal the magic in the mundane. Great composition is a combination of both technical mastery and imaginative vision—and it takes practice. Finding a creative angle to take the photograph, framing the subject just right in the viewfinder, adjusting the lighting, and fine-tuning the camera settings all create the potential for extraordinary images (**Figure 13**).

Final Touches

Editing Software

Right out of the camera, even the best dental photographers tweak their images, and no photograph would be complete without a few modifications to the size (cropping), orientation (rotation) and adjustments to the various color parameters (exposure, contrast, saturation). Fortunately, most computers come standard with basic photo editing tools built into their slideshow presentation software (e.g., PowerPoint for PCs, and Keynote for Apple computers). Editing photos in this way is recommended based on ease of use and program availability, compared to more robust and advanced for sale image editing software, such as Adobe Photoshop. Once the image has been dragged and dropped into the slide show editing software (**Figure 14**), any unnecessary background distractions should be cropped out. Next, the image should be correctly rotated and aligned. Finally, test out the various global image adjustments (**Figure 15**) and make a note of the after effects, recognizing that increasing the contrast will create a darker background, increasing the exposure will brighten light gray areas into a uniform white color, and reducing the saturation to zero will produce a black and white image.

The equipment needed to obtain phenomenal dental laboratory photographs is minimal and inexpensive, and the skills necessary to learn this craft are few and straightforward. The camera lens further provides a remarkable outlet for the technician to tell a story and document a case from their unique point of view. For these reasons, the mastery of digital dental photography is a skill that every dental laboratory technician would be wise to endeavor towards.

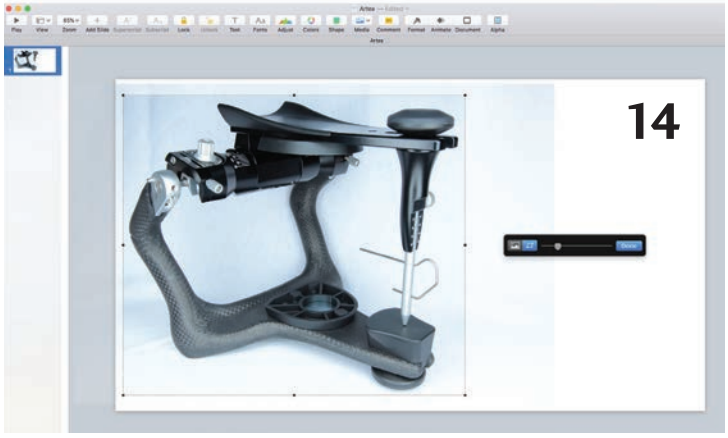


Figure 14
Original, unedited photograph imported into Apple Keynote. Cropping and resizing of the image are completed to remove as much unnecessary background distractions as possible.

Figure 15
Following image adjustments (levels, exposure, contrast, saturation, highlights, and temperature), the final image is ready for publication to social media, webpage, journal, or company advertisement.

About the Author

Dr. Cone is a graduate of Tufts University School of Dental Medicine, and completed a three-year prosthodontic residency program while serving in the United States Army before being honorably discharged as a field grade officer in the rank of major. Cone's current role revolves around his position as a clinician and founder of Nuance Dental Specialists. He is one of only three prosthodontists in the state to have achieved board certification and diplomate status within his specialty. Also of note, he is one of only two prosthodontists in the entirety of New England to have obtained additional qualifications as a Certified Dental Technician. As an active member of the local dental community in Portland, Maine, he continuously provides pro-bono treatment for Maine residents in need and takes time out from his private practice at Nuance to teach prosthodontics several days a week at the University of New England College of Dental Medicine. At the state level, Cone holds a seat on the Maine Dental Association's Council for Government Relations, and is frequently invited to present his work at study clubs and dental meetings. Nationally, Cone partakes as a guest speaker at several of the top academic institutions, with recent venues including Harvard, Iowa, Stony Brook, San Francisco, Buffalo, and Maryland. Additionally, he serves as a moderator and lecturer at numerous dental conferences, including the American Dental Association, the American College of Prosthodontists, the American Prosthodontic Society and the American Academy of Cosmetic Dentistry.

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