



Clinical Digital Photography Today: Integral to Efficient Dental Communications

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ABSTRACT Digital clinical photography today allows clinicians to take advantage of the power of visual communication. The advent of digital imaging is a leap forward for clinical photography because of the elimination of the considerable delay between image capture and review noted with previous film-based photography. In a short span of seven years, digital photography has overcome its shortfalls and can rival film photography for quality images.

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Vision is a powerful tool in human communication. Studies show that the visual pathway for learning using images is more memorable and has greater speed and precision than written or auditory learning alone.¹⁻⁴

Over the course of history, humans have harnessed the power of images through graphic sketches, drawings, paintings, and photography. Medical and dental professionals adopted the use of photographic images for clinical documentation as far back as the beginning of photography.^{5,6}

The first dental journals gained mainstream popularity at the same time as photography emerged to augment the written word. For a long time, film photography has been considered a useful

documentation and communication tool respected by professionals and laypersons alike. However, drawbacks to the use of film have been the lag time between the capture and viewing of images, cost, film processing, and storage issues. The general principles of photography are the same for film-based cameras and digital cameras.⁷

What makes the advent of digital imaging a new leap forward for clinical photography is the elimination of the considerable delay between image capture and review. The ability to see digital images immediately and appraise their composition, focus, and exposure cannot be equaled by film cameras that require time-consuming film development and expense before the results can be evaluated. Digital photography allows greater freedom for trial and error adjustments, eliminates



FIGURE 1. Two entry-level Canon SLR clinical camera bodies. The Canon XSi (12 megapixel) on the left and XTi (10 megapixel) on the right. Both cameras are light and have a small profile. Canon ring flash and 60 mm macro lens attached to complete the system as a close-up clinical camera.



FIGURE 2. Aligning the X-ray head to make a precision exposure is necessary to avoid distortion of the image.



FIGURE 3. Revealing the anatomy and aligning the camera for a proper anterior image.

the additional expense of retakes, and facilitates the creation of duplicate images.

Intraoral video cameras were a step forward in the 1980s and 1990s, and they still play a role in the dental practice. They provide real-time results that can be shared with patients; they are relatively simple to operate; and they can provide a source for archival digital images. However, video cam systems have several shortfalls. Most video cam systems have relatively low resolution and distorted image presentation.⁸ Patients have a difficult time understanding the images because they are close-ups and significant landmarks are missing. Consequently, patients often cannot comprehend the image orientation without explanation.⁹

In addition, most video cam systems are considerably more expensive than quality entry-level clinical single-lens reflex, SLR, camera systems (**FIGURE 1**). While the upfront cost for a digital clinical camera setup may be greater than a similarly configured film camera, the expense can be offset by the ultimate savings from unnecessary film processing, duplication, and storage.¹⁰

It is the authors' opinion that now, more than ever, the efficiency and affordability of digital imaging make clinical photography a viable clinical tool that can be used routinely by the average dentist and support staff. Time has become a precious commodity for dentists and patients

alike. With digital photography, dentists can share clinical images with patients at the same time as their initial examination.

Recently, a consumer publication dedicated to the science of photography presented an historic overview of the top 20 film cameras of all time. The magazine ranked the 1888 Kodak film camera the No. 1 camera, stipulating that, "What makes this humble-looking box camera so pivotal and consequential is not its ingenious construction or technical brilliance, both of which are noteworthy, but the idea it embodies — creating a camera capable of producing satisfying photographs in the hands of an ordinary person having no particular technical skill."¹¹

This commentary about a film camera that is more than 120 years old parallels what can be said about advances in the most recent generation of digital SLR cameras. When the first consumer digital SLR cameras were introduced, like the Nikon D1 developed in 1998, questions were raised about whether satisfactory results could be achieved equal to film and whether the average person or dentist could easily master digital technology.^{12,13} The D1 was a 3 megapixel camera with questionable color accuracy, relatively low resolution compared to film, technical complexity, and a high price tag.

Now, 10 years later, these initial significant flaws have been overcome. Digital is considerably more afford-

able, can produce useful clinical images on par with consumer film cameras, and can be operated by the average individual without advanced technical expertise. While film photography still offers the ability to produce images with a higher resolution than digital, this is of questionable benefit since most clinical images are not viewed or printed in such high resolution.

Mastering this technology has many rewards. Dentists can communicate better with patients before, during, and after treatment concerning the current state of their oral health; concisely chronicle any irreversible procedure; and share information with other members of the dental-medical team (dental lab and specialists).¹⁴ Doctors and staff can more easily master this technology because they receive instant feedback concerning the results of their image capture and can make adjustments immediately.

Because dentists are committed to quality and excellence, clinical digital photography can prove a useful tool providing opportunities for self-assessment of treatment outcomes. Photographic images can reveal insights into areas of needed improvement. It has been noted that one of the best defenses against malpractice suits is informed consent and good clinical documentation. Digital photography is a powerful and efficient documentation tool.¹⁵⁻¹⁷

Several medical specialties like dermatology, plastic surgery, and ophthalmology have embraced digital photography as an important diagnostic tool.^{18,19} Dental specialties, such as orthodontics, have adopted clinical photography as a regular part of their suggested diagnostic protocol. It has been suggested that diagnostic clinical images include five standard intraoral photographs: right, center, and left views with teeth in maximum intercuspation, as well as maxillary and mandibular occlusal views.^{16,20}

The intraoral photographic images provide a clear, well-illuminated view of hard and soft tissues, teeth alignment, bite relations, and the condition of existing restorations. In its publication, *A Guide to Accreditation Photography*, the American Academy of Cosmetic Dentistry suggested 12 views for case documentation. Most clinical photographic series include extraoral portrait images along with intraoral images. It is generally believed that greater skill is needed to capture standardized, consistent intraoral clinical images than extraoral portrait images.²¹ However, proper composition, subject posture, magnification, and lighting are all important factors in useful clinical documentation including clinical portrait photography.²²⁻²⁴

Standardization requires planning, a systematic approach, observance of protocols, and attention to detail. The regimentation and skill sets required for taking quality clinical photographs are very similar to those necessary for taking good dental radiographs (FIGURES 2 AND 3). After capturing a clinical photographic series, the images can be loaded into a computer and viewed without any additional software beyond the computer's operating systems like Windows XP, Windows Vista, or MacOSX.

Occlusal views allow patients to tour their mouth and see both hard and soft tis-

sue and the relationship of adjacent teeth, condition of restorations and structures. Lateral side views can show bite relations and malocclusions. Front views can expose issues relative to wear, symmetry, tissue inflammation, and the relative beauty of the smile, as well as more subtle issues such as midline discrepancies and occlusal cants, which may be less apparent when only plaster study models are available.²¹ Patients can usually relate to the discussion of photographs of their own mouth more than dental radiographs and study models.

In 2001, the October issue of the *Journal of the California Dental Association* was dedicated to the newly emerging technology of digital clinical photography. Seven years later, this technology is ripe to be a regular part of the standard of care for the entire dental profession. Current trends in this emerging area are toward lowering camera costs and improving features. Limiting factors of digital photography recognized in 2001 have mostly been eliminated; the remaining obstacles may simply be recognition of the benefits and acceptance of this technology by clinicians and their staff as a useful part of their daily practice. ■■■■

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