

Dental Photography

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Abstract: *Dental photography is important in teaching, research and clinical recording. The correct use of clinical camera is an invaluable way for the practitioner not only to document what is being done in terms of pre-treatment and post-treatment photographs of cases, thereby maintaining excellent clinical records, but also improve patient education and enhance his or her self-education. Without photography, the Patient easily forget what they looked like before they started the treatment. This article covers the bare minimum that a dentist needs or rather ought to know before he ventures into the interesting world of digital clinical photography.*

Keywords: Dental photography, digital camera, esthetic dentistry

1. Introduction

Photography has a wide role of significance in teaching, research and clinical recording. Clinical photography has become an important part of standard dental practice. Clinicians in both general practice and specialty areas have found the pictorial representation of a patient's condition to be of a valuable part of the patient's record. When evidence-based dentistry is gaining roots worldwide, dental photography finds an important place in providing the evidence. In addition to conventional patient records and radiographs, dental photography offers the dental professional another possibility of visual reconstruction of the various stages of treatment [1].

2. Relevance of photography to esthetic dentistry

Good photography lies at the heart of absolutely every area of esthetic dentistry. The correct use of clinical camera is an invaluable way for the practitioner not only to document what is being done in terms of pre-treatment and post-treatment photographs of cases, thereby maintaining excellent clinical records, but also improve patient education and enhance his or her self-education [1].

3. Digital Cameras

Digital dental cameras can be divided into 3 categories.

Compact point-and-shoot cameras without interchangeable lenses: This type of camera allows varying amounts of exposure control and mixed results in the unique setting of the oral cavity. Full-face photos can be acceptable, but intraoral and close-up views remain variable. The amount of noise in the images is also quite significant. A slightly higher variant is available called Prosumer cameras in which, the size and form of the Prosumer camera is smaller than a Digital SLR camera. Prosumer camera is light and equipped with a super zoom lens. It is cheaper than entry level Digital SLR camera [2].

DSLR (Digital single lens reflex) camera: DSLR cameras are designed for semi-professionals to professionals. DSLR cameras have the advantage of interchangeable lenses,

including macro (or Micro in a Nikon System), telephoto and metered lenses. They also have ports for accessories such as a ring flash or a dual flash system. All controls can be set manually. An 85mm- to 105mm telephoto macro lens is used ideally- the reason is quite simple to maintain natural height-width ratio when reproduced in a photograph. A ring flash is placed around the lens to distribute the light evenly with intraoral exposures. Some cameras are also fitted with point flashes to reduce red-eye with full-face views. A drawback is that these cameras can be expensive and bulky [2].

Intraoral cameras: An intraoral camera is a tiny device with a video camera that moves around inside the mouth and generates a surface video examination of the teeth. The images or videos can be stored, and later enlarged and showcased. Patients can see their teeth and any issues such as a fractured tooth, plaque, decay, and gingival disease, among others. This allows for better education of the patients and also allows dentists to catch problems in the early stages for analysis or to record patient progress [2].

4. Advantages of digital camera

- 1) Ability to view the image as soon as it has been taken both in the camera screen or in the PC, allowing the doctor or operator to rectify it, repeat it or show it to the patients in order to motivate them.
- 2) The absence of film, slides or processing cost is very well welcome for everybody.
- 3) The ability to store records electronically is useful since after a number of years working, the space needed to store a large number of pictures records is significant.
- 4) Image copies can be made automatically and easily with no cost.
- 5) Digital photos are suited for immediate data transmission automatically everywhere to a colleague with the advantage of keeping original ones.
- 6) There is not dust, scratch or damage of slides with time, even though it is necessary to make security copies very often.
- 7) Digital records allow complete more confidentiality as the number of people involved in the processing and storage procedure is reduced.

- 8) Digital records are easily and automatically introduced in main lectures, oral communications or PC presentations for teaching purposes.
- 9) Any competent assistant can be trained to take digital photos, thus saving time for the orthodontist [3].

5. Disadvantages of digital camera

- 1) Tend to be expensive.
- 2) Requires extra equipment, flash, light, lenses, and other attachments.
- 3) Have a heavy body; attached accessories, make these cameras even heavier.
- 4) Need resetting of basic features (aperture, shutter, speed, ISO, F-stops, etc.) and retooling of auxiliary equipment before different tasks.
- 5) Navigating customizable settings require extensive photography training/knowledge.
- 6) Are usually operated by the doctor, thus consuming clinical chair time on tasks that could be delegated to other team members.
- 7) Cannot be navigated with a gloved hand; one-handed operation is difficult due to heavy weight
- 8) Difficult to disinfect; not resistant to chemicals, water, or abrasion
- 9) Stressful to work with; involve a long learning curve [3].

6. Camera Accessories

Flash for dental photography

All digital cameras come with an “on board” flash. This is the flash located either on the top of the camera, or on the left side. For digital SLR cameras, the flash is usually a “pop up” style, and a button must be pushed to open it. Point and Shoot style cameras usually have a visible flash, which is located on the top or left side of the camera. While flash systems that come with a camera may be sufficient for recreational use, they are not always adequate for dental photography [4].

For a digital camera to focus efficiently on a subject, it must be able to read the contrast found in the image. The better the image is illuminated, the faster the camera will focus. This is especially true for Point and Shoot style cameras. If you have ever tried to take an arch shot with a Point and Shoot style camera - and the camera just keeps hunting for the focus - then you know to what I am referring. The computer chips found in the most recently released cameras are more sensitive, and require less light to focus. But additional light is still needed for intraoral photography. For digital cameras, the most common flash system used in dentistry is a ring flash [4].

A ring flash emits light 360 degrees around the lens. This provides illumination to the subject from all directions. It is designed for up-close photography. This is different from the on board flash found on digital cameras. The on board flash gives additional light from only one direction, usually from the top of the lens or from the left side. This causes problems in two areas. As previously mentioned, it makes it difficult to take intraoral pictures. The light from the flash bounces off the cheek and lips while very little light actually enters the mouth. When a photo of a smile or a photo taken

with retractors is used, the left buccal corridor will be fine but the right buccal corridor will be dark [4].

The ring flash eliminates these problems. The ring flash emits light from all sides so sufficient light enters the mouth for intraoral photos. It also lights up both sides of the mouth evenly. But, as with everything, bad comes along with the good. The ring flash can do the job almost too well. While its job is to illuminate the entire field from all directions, the ring flash also will eliminate all shadows. This means the slight texture and anatomy, found particularly on anterior teeth, will not be seen. So teeth and veneers may appear to look “flat” [4].

A twin flash solves this problem. A twin flash has a ring that attaches to the end of the lens like a ring flash. But it only has two flashes located on opposite sides. These flashes can usually be rotated around the ring and on their own axis, so they can be located in almost any position. I keep mine at the 9 and 12 o'clock positions, and pointed straight ahead. This provides light to both sides of a patient's smile, and provides sufficient light to illuminate an arch. But it does not remove all shadows [4].

A photo of a smile taken with a twin flash will look much more natural than a smile taken with a ring flash. The color quality will be the same, but even the slightest texture will be visible. The down side to a twin flash is its cost. Depending on the model, a ring flash will cost between \$200 and \$400. Meanwhile, a twin flash will cost from \$700 to \$1,100. I have both Canon flash system models that I use with my Canon 20D digital SLR camera. I suggest the twin flash if it fits your budget. Both the Canon ring flash and twin flash also will fit on Canon G series Point and Shoot cameras. For compatibility of Fuji and Nikon ring-twin flashes with their respective Point and Shoot cameras, you will need to consult a camera dealer [4].

Lens

A lens selected for dental purposes must be able to capture diagnostic and accurate views of teeth, gingiva and surrounding structures

Specially fixed focal length macro lenses are able to capture an image of a subject while focusing at a very close range. Macro lenses with a fixed focal length designation of 85 to 105 mm provide the ideal combination of magnification ability and working distance convenience for dental purposes. The quality of the lens has a significant influence on the sharpness, clarity, and ultimate quality of the final image.

The magnification ratio is the ratio of the size of the image projected on the sensor compared to the actual size of the object. A magnification ratio of 1:10 means the image on the sensor is one-tenth life-size, while a 1:1 magnification ratio signifies a life-size image on the sensor. The 1:1 setting is ideal for close-up imaging of teeth while the 1:10 setting is useful for full-face views [4].

Memory card

Memory cards are available in different formats such as CF (CompactFlash), Micro SDHC (Secure Digital High

Capacity), Micro SD (Secure Digital) and SDHC. They can reach up to 512 GB in size and store thousands of images. Blue/Standard for Point and Shoot cameras and Ultra for DSLRs should suffice the needs of the dental setup [4].

Filter

It serves the dual purpose of lens protection and if required changing the lightening conditions [4].

Batteries

It is required to get an extra battery pack with a quick charger, to ensure you never run out of battery during a shoot [4].

Camera Bags

This is useful to protect the camera and to be able to carry your camera, lenses and accessories in an organized fashion [4].

7. Clinical Dentistry Photographic Accessories

Cheek Retractors

They are used to retract the lips, labial and buccal mucosa out of the area to be photographed so that the maximum amount of light enters oral cavity which improves the visibility. Cheek retractors are available in clear plastic or metal. Metal retractors are less attractive but can be autoclaved. The transparent plastic retractors are aesthetically more acceptable and natural tissue color shows through them, limiting the potential for distraction.

Retractors are either single or double-ended. Double-ended retractors provide both a small and large curvature. This allows adaptability to a variety of mouth sizes. The end of the retractors acts as a handle to aid retraction. Single-ended plastic retractors have longer, tapered handles. The curved end is larger for excellent lip retraction. Strict aseptic measures are important during intraoral photography as in any other dental procedures in which infectious pathogens can be transmitted to the dental personnel or between patients. Because plastic retractors cannot be autoclaved, chemical sterilization is necessary. After sterilization, the retractors should be rinsed well to remove all traces of the chemical, which could be irritating to the patient [5].

Intraoral mirrors

Intraoral mirrors are used to provide a reflected image when areas of difficult access are photographed. Glass mirrors that have been rhodium plated on both sides create an excellent reflective surface. Intraoral mirrors are available in several sizes. The mirrors allow flexibility with minimal equipment for general adult photography. For photography of the pediatric patient smaller mirrors are recommended especially a child-size occlusal mirror [5]. The large end of the mirror provides an excellent surface for capturing occlusal views, and the smaller end can be placed for palatal and lingual views. The mirror is easy to hold and keeps fingers from being too close to the scene. Mirrors can be washed with detergent and water. Care must be taken when using mirror as they are easily scratched or broken. They should be wiped with a soft paper napkin or cloth and wrapped in cloth or felt for safekeeping [5].

8. Available Camera Systems

Cameras are broadly divided into three main types:

- a) Those based on the single lens reflex (SLR camera) design with interchangeable lenses.
- b) Those based on a compact design where the lenses are not interchangeable - Digital camera and intraoral camera.
- c) Digital SLR camera (combination of Digital and SLR camera).

Because of the need for photography to be done on-site, most camera systems are kept chair side or in close proximity within the clinic.

The camera system could include (in most instances), a 35mm single lens reflex system (SLR) camera, a lens capable of close-up photography, an electronic flash, mirrors and retractors. The specific brand of camera is not important, but rather the camera system capable of doing the required functions and being simple to operate is most important. Most dental photography is done with 35mm SLR camera systems, and of course digital cameras [6].

9. Guidelines for Clinical Photography

To achieve a good digital dental photograph, standardization is very important, i.e. consistent lighting, exposure, patient positioning, perspective, depth of field and background. Photographs should be stored and presented appropriately for their use in publications. Three types of intraoral cameras are used like 35 mm film camera with macro lens and ring flash, intraoral video camera (Orthoscan camera) or 5 and 6 megapixel extraoral digital cameras. Several views should be taken for all the patients like frontal view that incorporates full facial profile and entire dentition.

Other views like lateral and oblique lateral, occlusal mandibularmaxillary and a three-quarters profile view for esthetic purposes. Photography can be divided into three broad areas namely:

- Preparation of the patient.
- Background and intraoral sites.
- Preparation of camera [7].

10. Conclusions

The rapid rate of innovation in the field of photography often confounds dental professionals regarding the same. Digital photography has been gradually adopted, accepted and standardized by all dental specialties and has become an important resource. Photographs can be easily obtained using the correct equipment, proper settings and the most effective techniques, thereby increasing the chances of obtaining high-quality images.

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