

## Dental Photography

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### Abstract

*Science and technology are by default dynamic. One falls behind if not with the race. Technology has helped in our communication skills through photography in a way to patients to educate and indirectly helping by instilling confidence in them towards our practice. Record keeping is the evidence of our work; dental photography with the right skills helps in maintaining them. This article emphasizes on types of cameras, accessories, essentials required and also tips for intraoral photography which enables the clinician to make standardized photographic documentation of cases.*

**Key Words:** dental photography, cameras, accessories

### 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]

### Background

In a survey that was conducted to determine the extent of the use of photography by dentists for the needs of

everyday practice, revealed 82 (32.28%) people use photography for dental practice and 172 (67.72%) dentists do not to apply this method in their daily work. It was found that the reasons for not using the photography by dentists are: fear of cross-infection- 4 persons (1.57%); lack of need to use photography- 14 persons (5.51%); lack of interest - 18 persons (7.09%); cost of clinical time - 24 persons (9.45%); additional training - 58 (22.83%); expensive investment - 98 persons (38.58%).[2]

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 from New York, designed and patented the first camera from the Daguerre concept. This camera used a concave mirror to form an image on a photographic plate. These early photographs were called "daguerreotype" after their inventor and were a one-of-a-kind image on a silver-coated copper plate. The "photographic phenomena" introduced a new era of objectively reproducing and recording visual dental images. This new era observed the inception of the world's first dental journal, the American Journal of Dental Science and, for the first time in literature,

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preoperative and postoperative photographs were published by Thompson and Ide. [3]

There are numerous applications for digital photography in dentistry which are enlisted in **Table 1**. [3]

**TABLE 1: Applications of photography in dentistry**

<b>Diagnosis and treatment planning</b>	During the pretreatment it provides the clinician, specialist, and technician with an instant visualization of the clinical setting without the need for the presence of the patient. Also, preoperative digital photography can be utilized as a significant co-diagnostic tool that often influences the patient to accept treatment
<b>Legal documentation</b>	Photographic images document pretreatment conditions as well as esthetic changes that were achieved through delivery of dental care. Potentially legally threatening clinical situations should be photographed, dated, and filed for easy retrieval
<b>Forensic documentation</b>	Identification of human remains and the analysis of dental-related trauma (ie, human bite marks) through digital photographs can provide accuracy and reproducibility of detail
<b>Patient education and communication</b>	A series of photographic images of previous treatment accomplished with other patients can provide a detailed explanation of a specific dental procedure and treatment alternatives. Furthermore, this visualization process stimulates patient awareness and involvement, which can advance the clinician/patient relationship.
<b>Laboratory communication</b>	Color photographs can illustrate shade comparisons to surrounding dentition and underlying substrates. Black and white photographic images can provide a visual description of surface texture in addition to a value comparison. Incisal edge position, as well as the relationship of the provisionals and final restorations to the contours of the lower lip and to the horizontal plane, can be evaluated.
<b>Professional instruction</b>	Instructional photographs illustrating the armamentarium and protocol for specific clinical procedures can be utilized by auxiliaries to improve organization and efficiency. In addition, photographic series can be used to describe a clinical condition or to communicate ideas and concepts with colleagues in lecture presentations, publications, and professional certification.
<b>Insurance verification</b>	Digital images of pre-existing clinical conditions can indicate and reinforce treatment requirements and expedite authorization for an insurance claim
<b>Patient education and motivation</b>	Periodic digital photographs of a patient's clinical condition can provide immediate visual illustration of improvement or progression of a disease process (ie, caries, gingivitis, periodontitis)

**Accessories required for dental photography are:**

- a) Camera
- b) Mirrors
- c) Retractors

d) Contractors

**a) Cameras :** are broadly divided into three main types[1],[4],[5],[6] :

- 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).

**Single Lens Reflex (SLR) camera system:** SLR camera used in dental photography has two main parts, its body and lens. The camera body can influence the ease in which good results of photography can be obtained; by offering the photographer additional features such as auto-exposure and auto advance. Cameras that are manual will function perfectly adequate, however cameras with auto exposure allow for more concentration on the patient and not photography. The use of a SLR is valuable for several reasons i.e. there are a variety of films to choose.

#### **Digital Camera system:**

The heart of any digital camera is the CCD (charge-coupled device). The individual areas on the CCD, which register the light falling onto them, are photodiodes, known as pixels. Megapixels are therefore millions of such pixels. So the resolution of the camera is a measure of how many pixels or tiny bits of information the camera's image sensor uses to split up and then reassemble the picture. The higher the MP (Mega Pixel) number, the smaller the pixels, the better the resolution.

A digital zoom is not a true zoom lens, it merely crops the image throwing away the information at the edges and increasing the apparent magnification of the lens.

Optical zoom implies the actual change in focal length. It functions by using a system of lenses to refract light and magnify the image on the CCD. Optical zoom magnifies the image quality along with the resulting details and clarity unlike digital zoom.

Digital cameras have a LCD screen so that the pictures can be reviewed. Digital cameras are more computer-centric than conventional cameras. Digital cameras use charge-coupled device (CCD) or complementary metal oxide semiconductor (CMOS), instead of the conventional film. It is this chip that converts the light entering the camera into an electrical signal, which eventually ends up as the digital image. The recorded image can be viewed on a LCD screen on the rear of

the camera. Subsequently, it can be downloaded to a computer to edit, print, send as e-mail, or post in albums to share with others on the Internet.

**Intraoral camera:** 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 can be stored, and later enlarged and printed.

Patients can see each of his/her teeth and dentists can indicate problems such as fractured tooth, plaque, decay, gingival disease, defective fillings, and so on. Since the intraoral camera generates images that are stored, enlarged and analyzed, often dental problems are caught in the early stages and sometimes even problems that dentists might otherwise miss with a visual examination are seen. Once treatment options are discussed and agreed upon, intraoral cameras can be used to effectively track treatment progress.

**Digital SLR camera:** These cameras combine the features of the SLR system with the digital camera. These include: i) an interchangeable lens which gives the option of taking extreme telephoto images that would be difficult or impossible with a compact digital camera. A macrolens with focal length 100mm is ideal for dental photography [4] ii) Digital SLRs with large sensors will have much less noise than compact cameras. A shot from a digital SLR at full size, it will look smooth and have pure colors. iii) Digital SLRs use the faster and more accurate phase detection autofocus method and generally have shorter shutter lag times, making it easier to capture the action.

Refer **Table 2** to check the brief difference between Digital and Compact cameras. [5]

#### **b) Mirrors:**

Mirrors can be front or back surface coated. Back surface coated mirrors have the disadvantage of getting scratched easily and also the quality of glass is thick and poor. Front surface coated mirrors such as chrome coated mirrors are preferred for dental photography followed by rhodium and titanium coated. Moreover, full stainless steel mirrors can be used both sides; nevertheless, any mirror used carelessly could develop scratches. [6]

Occlusal, lateral/ sectional or dual viewing mirrors are available. It is advisable to use sectional mirrors for buccal

**TABLE 2: Comparison between SLR and Compact Cameras**

SLR	Point-and-Shoot/ Compact Camera
Actual image viewed is what is captured	Image captured is computer generated
Large CCD or CMOS chip resulting in true-to- life-size image	Smaller CCD or CMOS chip, therefore image is computer extrapolated
Interchangeable lenses	Fixed lens
Automatic and manual control	Limited manual control
More expensive	Less expensive
Depth of field easily controlled	Limited depth of field
Dental photography requires ring/point flash	Dental photography requires special modifications like lens adaptors and flash diffusers

aspects otherwise the entire focus will be on canine and premolar and shown in **Figure 1** , also could be used for quadrant wise images.



Dual viewing mirrors help to check out buccal as well as lingual aspects simultaneously.

#### c) Retractors:

Retractors selected for dental photography shouldn't cause distraction to viewer's eyes hence transparent retractors are preferred over colored retractors such as green, red.

Though "Self-retaining" or C-shaped retainers, do not put adequate pressure on the labial and cheek mucosa, best option is Y-type cheek retractors (non-self retaining) with "tabs" or handles. [6]

#### d) Contrastors:

They help in isolating the field of interest from the background. They improve the image by creating a black background; useful for close-up to highlight incisal edges and to "black out" areas of potential distraction thereby making the image stand out.

#### Essentials for Intraoral photography: [4], [5], [6], [7]

- 1) Histogram: Simple bar chart can be seen on the rear of digital camera. Tells us whether the image is too dark, too bright or neutral.
- 2) Focal length: This describes the magnifying power of a lens; the longer the focal length, the greater the magnification.
- 3) F-stop: the f-number is the ratio of the aperture (opening) of the lens to its focal length. If more the lens is opened, more the amount of light that is allowed into the camera and lighter the exposure. Hence use small apertures (f22 and above) for close-ups.
- 4) Depth of field: When you focus on a subject, some detail behind and in front will also be in focus. This is known as the depth of field. The smaller the aperture of the lens, the greater the depth of field.
- 5) ISO: Stands for International Organisation for Standardisation rating. Lower ISO to reduce noise/ graininess in the final image.
- 6) Magnification Ratio: This function is only available with macro lens. Set the magnification ratio, to 1:1 or 1:2 gives a good overall view.

#### Tips for intra-oral views [2], [6], [7]

- 1) Look through the viewfinder and visualize the end result.
- 2) Look round the edges of the viewfinder frame for distractions, such as the edges of mirrors, retractors,

hairs, impression material, bubbles of saliva, blood, food debris.

- 3) Dry the tissues, use suction and gentle streams of air from the three-in-one syringe, latest technology of fog free mirrors are also available with Micro fan in base that prevents fogging and 3 LED lights provide direct lightening. Fogging of mirrors can also be prevented by pre warming the mirrors in warm water.
- 4) Focus accurately and always be prepared so that the patient is not kept posed for too long.
- 5) It is best to focus on a point lying 1/3 behind and 2/3 in front of the area to be photographed; for instance, if photographing an anterior view with lips retracted, focus on the distal aspect of the lateral incisor.
- 6) Hold the camera firmly and securely.
- 7) Have the patient sit comfortably, semi-upright or supine (some prefer to take upper occlusal shots from behind the patient), with the head turned towards the photographer – keep camera perpendicular to the occlusal plane, as tilting will cause the teeth to appear distorted, elongated or foreshortened.
- 8) When using retractors, apply Vaseline to the patient's lips. Place the retractor at an angle in the corner of the mouth and rotate it into position. Retract the lips/cheek gently outwards and forwards on anterior views to see the "buccal corridor". Decide if you want the teeth in occlusion or apart.
- 9) For occlusal views the posterior border of the mirror should be placed on the tuberosities, and not in contact with the last molar teeth. For lower arch views ask the patient to rest their tongue or retract it behind the mirror if possible. **Figure 2 and 3**



- 10) For occlusal views, focus on the image you see in the mirror in the premolar region. Keep the camera perpendicular to the mirror.
- 11) When all set, be ready to CLICK.... Check the result in the monitor viewing screen at the back of the camera.

### Conclusion

Observing the simple rules to ensure standardized images will allow on to obtain good quality images by all of the dental team. It is important to be aware that dental photography is an essential part of dentistry used not only to document but to illustrate and educate.

Technological developments in the photographic process have continued to change and improve the practice of dentistry. Clinicians must now integrate existing photographic principles with today's contemporary camera systems and computer software technology.

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