

Dental Photography: Need of the Hour – A Perspective

Dr Preet Patel¹, Dr Nikhil Verma², Dr Jyoti Kundu³,
Dr Hani Solanki⁴, Dr Abhishek Pal⁵

¹PG Student, Department of Prosthodontics, Geetanjali Dental and Research Institute, Geetanjali University, India

²Principal/Head of the Department of Prosthodontics, Geetanjali Dental and Research Institute, Geetanjali University, India

³Professor, Department of Prosthodontics, Geetanjali Dental and Research Institute, Geetanjali University, India

⁴PG Student, Department of Prosthodontics, Geetanjali Dental and Research Institute, Geetanjali University, India

⁵PG Student, Department of Prosthodontics, Geetanjali Dental and Research Institute, Geetanjali University, India

Abstract:

In today's era of digital dentistry, dental photography plays a major role as an "informative tool" in diagnosis and treatment planning, documentation of cases, to communicate with lab technician and other specialist for a multidisciplinary approach. These all can be achieved only by an ideal photograph which have proper amount of exposure, sharpness and color-contrast. The lack of knowledge on the equipment, technique and advancements has restricted its appropriate usage. This article stresses on dental photography and different practical aspects which are required to understand photography in the field of dentistry.

Key Word: Digital dental photography, Innovative technique, clinical photography, documentation

Date of Submission: 03-07-2022

Date of Acceptance: 17-07-2022

I. Introduction

Digital photography has currently penetrated into all segments of life, providing new realities and perceptions in the field of science, medicine, industry, fashion designing, communications and arts. The digital photograph is a positive replica of an object of which it is taken. Photography has an extensive role of implication in teaching, research, clinical recording and has become an important part of standard dental practice.

When evidence-based practice in dentistry is gaining importance worldwide, the dental photography plays a significant role in providing the evidence. In addition to conventional patient records and radiographs, dental photography offers the dental professional additional possibility of visual reconstruction of the various stages of treatment.

Dental photography was pioneered by Dr. R. Thompson and W. Elde of Columbus (1948).¹ Digital photography is described as the images that are stored in a computerized file format referred to as a digital image file. It signifies a file format that is composed of a graphical image instead of text or program data. These images can be recorded in the form of bitmapped image (JPEG, PNG, GIF, TIFF and BMP) and vector-based images used in paint or illustration programs.² More recently, use of dental photography for documentation of cases, presentation of the case, and patient education has increased, and it became an essential part of modern digital dentistry.

II. Requirement of dental photography in daily practice

Diagnosis and treatment planning

A series of photographs before starting any treatment is the ideal method to evaluate the case and to make a baseline for an oral health condition for the patient. Based on that, a treatment plan can be made easily. It is advised to click a series of different views of extraoral and intraoral photographs. Extraoral photographs include full face (frontal & lateral, with different expression), full natural smile (frontal & lateral), lips at rest position while intraoral photographs include occlusal photograph (maxillary and mandibular arch), full dentition retracted view (teeth slightly apart and closed), any special view (photograph of any particular tooth).³

Case documentation

Digital photographs in their raw format (nonedited) can be used as a legal document proof. This can help a mistreated patient or defend a colleague who has provided appropriate treatment or can be helpful in malpractice lawsuits.^{4,5}

Enhanced patient education and communication

Till now, there were audio and visual aids such as videos, models, and brochures, for patient education purpose, but none of these modalities thoroughly covered the information. Utilizing a tablet display and presentation software, tailored presentation on dental procedures could be created with photographed cases. These detailed pictures showing anatomy, surgical steps, materials, and completed cases can help in educating the patients on diagnosis and proposed treatment and thereby improving their understanding and case acceptance.^{4,5}

Laboratory communication

Most often, a shade guide is required to convey information on tooth or gingival character, shade, or color. This procedure is mostly accompanied by demerits like falling short in describing the complexity of depth and shadowing a tooth exhibit. Hence, here, a color-corrected photograph can provide the much-needed information to create a final restoration with more accurate hue, value, and chroma.^{4,5}

Insurance verification

Periodontal charting, radiographs, or a narrative is required by insurance companies before disbursement of benefits to the consumer. Therefore, a digital photograph can be used to support a narrative.^{4,5}

Specialist consultation

Charted radiographs and written reports were the only means to present our patients to other doctors. Now, with photographs, an entirely new dimension has been introduced. A complete case history with high-resolution photographs may be sufficient enough for an over-the-phone consultation with a specialist. Similarly, photographs from referring dentist of mutual patients and their recent accomplishments could be transferred or received so that the operator may assess the condition without being physically present in the office.^{4,5}

Professional advertising and marketing

Before and after photos are powerful aids to motivate the patients for accepting the treatment plan or for showcasing any particular skill.^{4,5}

Professional instruction

Only texts and bullets are often inadequate in describing dental concepts or specific surgical procedures. A photo is worth more than a thousand words and sparks more interest and discussion than written matter.^{4,5}

Self-education/improvement

As professionals, we continuously learn throughout our careers. Courses and other forms of continuing education are important educational vehicles. Digital photography in such occasion is a boon.^{4,5}

Treatment philosophy and work ethic

Taking efforts and time to clean surgical sites for photographs requires patience and painstaking attention to detail. This attitude propels us to execute our work at the high levels of accuracy. Hence, preparing the patient for photographs in return helps improve our own skills.^{4,5}

How should be the Ideal Dental Photograph?

Intraoral photography is one kind of macro-photography which allows you to take a photograph of an object in magnified view. The main problem with this type of photography is to get proper exposure for better illumination and depth of field for better clarity.⁶

Illumination

All photographs require a proper light source while capturing. Best light source to click a photograph is natural daylight. There are different light sources available for photography like an electronic flash, quartz lighting, ultraviolet illumination. Selection of light source should be in such a way that it should not hamper the quality of the image.⁷

Sharpness and clarity

Quality of the image can be measured by clarity and sharpness of the image. In dental photography, clarity of the image can be modified by changing the focusing plane or area. When we talk about dental photography, to click the image with better clarity, certain areas are determined for different views (Table 1).⁸

Table 1: Where to focus to obtain maximum depth of field for intra-oral photography?	
Views	Focusing Area
Entire Arch	Maxillary Canine
Occlusal View	Premolar
Maxillary anterior	Lateral Incisor

Color

An image with natural color is the best image one can capture. Different sources of light have different color content. It is described and measured as color temperature (degrees Kelvin) by the color scientist. For example, the color temperature of daylight is 5500-6500 K while for the cloudy sky, it is around 6500-8000 K. If the color is different in an image, then the natural color of an object; it can lead to a miscommunication between a dentist and dental technician. Color of an image can be modified by white balance.⁸

Consistency

For any case documentation, pre-operative, intra-operative, and post-operative photographs of each view are recommended. To evaluate the outcome of the treatment, consistency of each photograph should be maintained. To maintain the consistency, magnification ratio, and working distance should be maintained throughout the photography session.⁸

How we can achieve it

Exposure control When we pressed the “picture-taking button, “the light will pass through the aperture (small opening of the camera), and the sensor will get exposed to create an image. Exposure is the control of the amount of light falling on the sensor when a photograph is clicked. If the amount of light is unnecessarily high, the resultant image will be overexposed and if it is too low, the resultant image will be underexposed.⁸

Exposure can be controlled by mainly three factors, they are ...

a. Sensitivity of sensor

ISO sensitivity is the designated as number (given by International Organization for Standardization) which is defined as the sensitivity of the sensor to light. If the ISO number is higher (for example, a camera with ISO 400), the sensitivity of the sensor to the light is higher (will require lesser light to produce an image). The lower ISO number is recommended to get a high quality, clear picture and to avoid grainy pictures.⁸

b. Size of aperture

Size of lens opening through which light passes is known as aperture. Size of the aperture is calibrated as f-Stop (f-Ratio) which is a ratio of focal length to size of aperture. f-32 is interpreted as the diameter of aperture is 1/32th of the focal length of the lens. f-stop is directly related to the depth of field.¹³ Hence a camera with smallest aperture size (available smallest size is: f=32) can click a photograph with the highest depth of field. But practically this opening is too small to allow light to pass through. Therefore, f 22 is recommended for dental photography.⁹

c. Time of exposure

Time of exposure can be controlled by shutter speed and amount of flash burst. Shutter speed is determined by the speed at which curtain slides off the sensor and after a given time sensor will be covered by another curtain and image exposure will stop. Shutter speed should not be either too slow to avoid blurring of the image due to the patient’s movement or too fast to avoid the darkness of image due to less exposure.¹⁵ For dental photography, shutter speed ranges from 1/60 s to 1/120 s.⁹

Depth of field

Depth of field is defined as the zone of sharpness within a photo for which focus was made. Depth of field (clarity) is distributed in the image as follows (based on focused area):

1. 1/3rd in front of focused area
2. 2/3rd behind the focused area

Depth of field is affected by the size of aperture and photography distance. With the decreased size of aperture, depth of field increases while photography distance is indirectly proportional to the depth of field.⁹

White balance

White balance is one of the essential functions of the camera; by modifying this function, one can capture an image with natural color. We can easily differentiate an image with natural color and an image which may not reflect natural color. The different setting of white balance tries to modify the light and capture the image as natural as possible. Hence, it results in an image with more natural color reproduction. From all the different setting, flash white balance is recommended for dental photography. Hence, an auto mode for white balance is not suitable for dental photography.⁹

Magnification ratio

The magnification ratio is a ratio of image size to object size. This ratio can be affected by the size of the sensor. But nowadays, all cameras have 35 mm size film, so modification is not needed. The magnification ratio is affected by working distance. Working distance is the distance between the lens and an object. In recent

lenses, for a given magnification ratio working distance is advised in the camera setting itself. Therefore, one can capture a consistent series of images. For different views, the different magnification ratio is advised (Table 2).⁸

Table 2 Recommended magnification ratio for different views	
Views	Magnification Ratio
Portrait	01:10
Full dental arch- in occlusion (frontal view)	01:02
Full dental arch- in occlusion (lateral view)	01:01.5
Anterior teeth (canine-canine; frontal view)	01:01.2
Occlusal view of arch (maxillary/mandibular)	01:02
Maxillary central incisors	1.5:1

Basic Armamentarium

Camera

Basic classification of the camera includes two types- still and action. Still, cameras are for photography while the other one is for videography. Initially, the film was used in cameras which must be chemically processed to get a print of the photograph. But now it is replaced by a digital sensor (charge coupled device- CCD or a complementary metal oxide semiconductor- CMOS). Modern cameras are divided into two categories- Rangefinder and Digital Single Lens Reflex camera (DSLRs). The primary difference between these two categories is the presence of parallax effect in Rangefinder cameras.¹⁰

Camera Accessories

Lenses

There are different types of lenses available and each one for different uses. The lens that mostly concerns us for documentation and record purposes are mainly the macro lenses. These lens systems allow a sharper focus in the close-up pictures as they have larger diaphragm and we get a higher magnification than with other armature lenses. In medical and technical documentation, the objects and the images are dealt in close ranges. Using a macro lens will help the user to focus better and obtain sharper images.^{11,12}

However, these macro lenses are further distinguished from one another by the focal length, which varies from one lens to another. Focal lengths are normally 16 mm, 28 mm, 35 mm, 50 mm, 85 mm, 100 mm, 135 mm, 200 mm, 300 mm, 400 mm, etc. The lenses that are of our interest for medical and technician offices are mainly those with a focal length of about 100 mm.^{11,12}

These lenses have mechanisms that are defined by the term “Diaphragm;” it consists of sheets that let more or less light in it, similar to the function of iris in human eye. With poor light, the diaphragm expands to let more light pass through; on the other hand, if there is plenty of light, the diaphragm closes to the minimum to be able to see without being blinded. The aperture size or diaphragm width directly affects the sharpness of the image. As smaller the diaphragm size, sharper would be the image.¹³

Hence, with true macro lenses, the operator can take advantage of the depth of field and obtain sharper and focused images at their original magnification.

Light and Different Flash Systems

With a lack of light and presence of shadow, it is difficult to capture a high-quality photograph in dentistry. Especially for intraoral photography, flashes are the integral part of a camera. Three types of flashes are available- single point, twin flash, and ring flash. These all flashes have their advantages and disadvantages, are recommended for different situations.^{14,15}(Table 3)

Table 3 All flashes have their advantages and disadvantages, are recommended for different situations		
Flash type	Use	Advantage & Disadvantage
Single Point	- To capture anterior teeth (a small segment)	- It creates a shadow so the contour of anterior teeth can be readily appreciated in the photographs. But it is not recommended for the entire arch.
Twin Flash	- To capture the entire arch - For the attachment to camera, adjustable arm attachment is available. - Can be used at different angulation. (45 degrees; one on each side is recommended)	- The second flash is used to cover the shadow which is created by using a single point flash

Ring Flash	- To capture the entire arch - It is attached to the front end of the lens	- It emits too much light. Therefore, the captured image is flat and bland (due to the absence of shadow) - Not recommended to capture an image for anterior teeth
------------	---	--

This light can be modified by blocking, diffusing, and using reflectors. In twin flash, if twin flash is not required, one flash can be blocked, and just a single flash can be used to capture an image. Light can be diffused by using a material (for example, a cloth of different opacities or tissue paper) in front of light to decrease the intensity and amount of falling light on to the object. Various types of reflectors are available in the market which is placed in the opposite direction of the primary light source. Deflected light can be used in the diagnosis of enamel cracks and dentin characteristics.

Equipment essential for Intra-oral photography

Apart from camera, lens, and flash, there are few accessories which are needed to take a high-resolution image. These accessories include photographic mirrors, contrastors, and retractors.⁶

Photographic mirror

These are available in different sizes and have different coatings like rhodium and aluminum. Rhodium mirrors are recommended for dental photography (Figure1). They are used to click a photograph of occlusal view, the palatal surface of maxillary anterior teeth, lateral view of the entire arch, etc. Placement of mirror to include the desired area should be in such a way that it should be comfortable for the patient and, unnecessary area (retractors or nose) should not be captured in the image. To avoid fogging of these mirrors while using, one should pass a mirror through a hot water tap or blow an air through three-way syringe or ask the patient to breathe through nose only and to clean these mirrors, we can use paper towels without causing damage.^{16,17}



Fig. 1 Different Size and Shape of Photographic Mirror

Retractors

Retractors are available in different sizes and materials (plastic and metal). Plastic retractors are recommended due to more flexibility than metal retractors (Figure 2). These retractors are autoclavable, but due to repeated autoclaving, it becomes cloudy over a period. It is an accessory which is used to retract the cheeks for taking an image of a full arch (frontal and lateral view) and occlusal view. For easy placement and comfort for the patient, retractors should be moistened before use.^{16,17}



Fig 2 : Different Size and Type of Cheek Retractor

Contrastors

The contrastor is used to create a black background to capture the images of anterior teeth. It enhances the transparency of incisal edges and blocks the structures of the oral cavity behind the teeth (Figure 3). These contrastors are made up of black anodized aluminum or bendable copper sheet covered with silicone rubber and are available in different shapes.¹⁸



Fig. 3 Different Types of Contrastor

III. Conclusion

The process of dental digital photography is a kind of macrophotography and with the advent of digital cameras; photography has become an easy and accessible way of educating and documenting our patients. Knowledge of camera and specific protocols while taking a photograph enhances the quality of clinical photography. Good photography requires a skill of the operator, and it is time-consuming to set a camera in every case according to the surrounding condition. Familiarity with equipment and adherence to simple protocols can make all the difference between success and failure in clinical photography. Considerable attention should also be paid to legal and ethical issues before undertaking any clinical photography.

References

- [1]. Galante DL. History and current use of clinical photography in orthodontics. *J Calif Dent Assoc.* 2009;37(3):173–174.
- [2]. Curtin, DP. A short course books. The textbook of digital photography. 3rd ed. Massachusetts: Short Courses Com; 2011. 44 p
- [3]. American Academy of Cosmetic Dentistry. Photographic documentation and evaluation in cosmetic dentistry: a guide to accreditation photography. Madison, USA. 2009:16.
- [4]. Bengel W. Mastering Digital Dental Photography. 1st ed. New Maiden, Surry (UK): Quintessence Publishers; 2006.
- [5]. Yoo A. 10 reasons why dental photography should be an essential part of your practice. *Dent Econ* 2014; 104:1-7
- [6]. Hegde MN, Sodvadiya UB. Photography in dentistry: A perspective. *J Otolaryngol ENT Res.* 2020;12(5):161–165. DOI: 10.15406/joentr.2020.12.00476
- [7]. Fahim R, Thakur R. Digital dental photography: The guidelines for a practical approach. *TMU J Dent.* 2014;1(3):106–112.
- [8]. Sreevatsan R, Philip K, Peter E, et al. Digital photography in general and clinical dentistry–technical aspects and accessories. *International Dental Journal of Students Research.* 2015;3(1):17–24.
- [9]. Ahmad I. Digital dental photography. Part 6: Camera setting. *Br Dent J.* 2009;207(2):63–69.
- [10]. Laws R. The author’s guide to controlling the photograph. *Journal of Prosthetic Dentistry.* 2001;85(3):213–218.

- [11]. Manjunath SG, Raju Ragavendra T, Setty SK, Jayalakshmi K. Photography in clinical dentistry – A review. *Int J Dent Clin* 2011; 3:40-3.
- [12]. Chandni P, Anupam S, Nitin S, Shikha G. An overview on dental photography. *Int J Dent Health Sci* 2016; 3:581-9.
- [13]. Alberto C. Digital photography and documentation techniques in dentistry and dental technology. *Zerodonto* 2013; 1:1-103.
- [14]. Terry DA, Snow SR, McLaren EA. CE 1–Contemporary Dental Photography: Selection and Application. *Compend Contin Educ Dent*. 2008;29(8):432–436.
- [15]. Bengel WM. Digital photography and the assessment of therapeutic results after bleaching procedures. *J Esthet Restor Dent*. 2003;15(Suppl 1):S21–S32.
- [16]. Vargas MA. Maxillary and mandibular occlusal photographs. *J Prosthodont*. 2003;12(2):149–151.
- [17]. Vargas MA, Lloyd PM. Maxillary and mandibular lateral view photographs. *J Prosthodont*. 2003;12(3):227–229.
- [18]. Vargas MA. Photographing a view of the maxillary anterior teeth with a black background. *J Prosthodont*. 2002;11(3):208–210

Dr Preet Patel, et. al. “Dental Photography: Need of the Hour – A Perspective.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(07), 2022, pp. 12-18.