



DIGITAL DENTAL PHOTOGRAPHY – THE TOOL OF NECESSITY

Dental Science

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ABSTRACT

Photography in dentistry has revolutionized diagnosis, treatment planning, marketing and communication between the patient, dentist and the dental lab technicians. With the advancements digital photography has implied on dentistry, the craftsmanship of the practitioners are touching new grounds for education, self-improvement and documentation. Through this article, we intend to broaden the knowledge on technicality behind digital photography and how the same can be used in dentistry. We have attempted to solve the enigma of choosing the camera and its lens and other accessories that are necessary to achieve professional results and have also highlighted about the next big leap in accessible photography, the smartphone camera.

KEYWORDS

Dental, Esthetics, Intraoral Photography, Photography, smartphone

INTRODUCTION

Photography is defined in Greek as 'the creation with light'¹. Light rays are captured on a light sensitive medium and a visual image is recorded. From the cameras obscure and daguerreotypes to the DSLRs and mirrorless cameras today, this process has advanced to perfection and become more user friendly.

While early dentistry included drawings and visual representations to describe dental conditions and treatment procedures, today dental photography has created a portal of possibilities. The first pre-operative and post-operative photographs got published by Ide and Thompson² in The American Journal of Dental Sciences.

BASICS OF PHOTOGRAPHY

A photograph is a delicate balance of *shutter speed, aperture and ISO* that creates the style and aesthetics funded by creativity.²

Shutter speed: - The measured time between the opening and closing of the camera shutter. A fast shutter speed is needed to freeze an action. A low or slow shutter speed will give motion blur.

Aperture: - The size of the hole that lets light into the camera is the aperture. Denoted by 'f number'. Smaller the f number wider will be the hole and vice versa. The smaller the aperture, the more overall focusing in the image.

Exposure / ISO: - It is the amount of light allowed to pass through the lens to reach the sensor. If the subject is well lit then a brief exposure will give crisp result. Longer exposure is necessary in low light conditions. Modern cameras have a built-in meter to calibrate the correct exposure.

Composition: This is the object to be photographed. Composition can be improved by eliminating the background and foreground. As per the *rule of thirds*, if one divides the frame into 9 grids forming 4 intersections, and the subject is placed at any of these intersections¹. The negative/ empty space if present in an image can be used wisely to obtain amazing results.

WHY DIGITAL DENTAL PHOTOGRAPHY (DDP)?

Though legal documentation, education, publication and marketing shares the need of DDP, accurate recording of the oral details holds the primary requirement. Recording the stages and steps of the treatment helps in follow-up and avoiding misunderstandings with the patient. It can be used as an educational tool for students and patients. It also facilitates communication specialists and dental technician³. Projecting and enlarging these images help a dentist in self-evaluation and training.

ADVANTAGES OF DIGITAL DENTAL PHOTOGRAPHY

- Images are immediately available and easy share.
- No expense of film processing.
- No chemical development required.
- Higher reproducibility.
- Metadata of the images can be produced.
- Image lighting can be adjusted real-time.

DISADVANTAGES OF DIGITAL DENTAL PHOTOGRAPHY

- Steep learning curve.
- Planning and pro-active management of the files for accessibility.
- Possibility of fakery.

ARMAMENTARIUM

Camera: - A perfect camera does not exist! Camera is an aid. One must first decide the subject and composition. A Single Lens Reflex (SLR) and mirror less system are recommended^{4,5}. Investing on the lenses and lighting is advocated rather than on the camera body.

Camera accessories: These are used for supporting the camera and adjusting the lighting. These include eyecup, tripod, copy stand, remote release cables etc.⁵

Lens: - This is the image quality negotiator! Dentistry is about macro photography, hence use of a macro lens is recommended². Some of the suggested lenses are Canon* 60mm f2.8 and 100mm f2.8, Nikon* 60mm f2.8 and 105mm f2.8, Tamron* 90mm f2.8 and Tokina* 100mm f2.8.

Lens accessories: They are utilized to mount the lenses to focus closely on an image. Close up lenses, reverse rings are some of the accessories used.

Light Source: - A ring flash and twin flashes are ideal as it provides even illumination⁵. They are attached in front of the lens.

Background: - Light neutral color background like grey, blue and beige are recommended for standardizing portrait photographs. Background usually depends on the subject color and the purpose of the photograph. A uniform color helps in post editing processes. Each color is designated for a particular reason⁷.

- **White:** - Used for dark subjects. Easy to reproduce in printing.
- **Black:** - Black eliminates shadows and produce a pseudo 3-dimensional reproduction giving the object a floating appearance.
- **Grey:** - Universal background color. Grey does not hamper the exposure or the color of the subject.
- **Colored backgrounds:** - Background and object color should be harmonious. Red is the least recommended; blue is near ideal.

Dental armamentarium: Along with the correct camera setup, dental photography also requires some specific dental armamentarium.⁸

- Cheek retractors
- Intra oral mirror
- Contraster
- Pensler shield
- Cotton rolls, saliva ejector and rubber dams

CAMERA SETUP FOR DENTAL PHOTOGRAPHY

For a DSLR camera, the following settings as given in Table 1, will be optimum for dental photography.

Table 1. Optimum camera settings for dental photography

ISO	Shutter speed	Aperture	White Balance	Focus
100-200 (>200 causes grainy image)	1/125seconds	For intra oral: f22 For portraits :f5.6 or less	5500K flash	Single point autofocus (S-AF)

LIGHT SETUP FOR DIGITAL DENTAL PHOTOGRAPHY

- Two light sources are to be used on both sides of the camera.
- Light sources should be at 45° angulation in the horizontal plane.
- A ring flash to be used for uniform illumination.
- Use of flags and opaque objects to block unnecessary light.
- Use diffusers for smoother lighting.

PHOTOGRAPHING SMALL OBJECTS IN DENTISTRY

The aim is to attain maximum details, filling the frame with highly perceptible image for documentation. A macro lens with 50mm or 60mm are used with a circular polarizing filter on a camera with a lens hood, operated with a wireless device or self-timer.

For better perception, object should be shot from a top oblique view. Camera must be stabilized with tripod, while the object has to be stabilized with an adhesives or alligator clips and rod sets (Novoflex). A shooting table like Novoflex macroscopy stand or Top-table (Kaiser) helps in isolating and shooting the object.

For isolating an object in a horizontal level shoot, the object should be placed far from the background and illuminated in such a way that the shadows of the object are outside the viewing field. For, over the top' shots, place the object on a glass. One can also place the object on black glass plate or tile.⁵

PHOTOGRAPHING A RADIOGRAPH

For a diagnostic quality photograph, we need a 100mm macro lens on smaller aperture mounted on a camera with a tripod.

The x-ray film should be taped on four corners onto an x-ray viewer. The orientation of the viewer should be perpendicular to the floor. Shoot after switching off all lights except that of the x-ray viewer at larger f number like, f/11 or f/16⁷.

SMARTPHONE DENTAL PHOTOGRAPHY

With accessibility turning the cards, smartphone photography is picking up pace. With technology the latest smartphones are capable of producing professional standard photographs but it might need color correction using a spectrophotometry device to attain the exact value¹⁰.

The problem with smartphone lens is the difference in focal point, leading to distortion at the edges of the lens and hence may not be appreciated in macro photography¹⁰. The use of attachable lenses in front of the smartphone camera can easily help us overcome this problem.

The other issue with smartphone photography is the flash. It can washout the surface textures of the enamel or ceramic prosthesis. This can be avoided by lighting the subject using USB ring flashes and point flashes¹¹. Smile MDP frame is an affordable luxury in smartphone lighting^{11,12}.

Intra-oral smartphone photography:

1. Retract the lips and cheek.
2. Disinfect the smartphone. Place it at 45° to the horizontal plane.
3. Use the chair light to illuminate the scene. For diffused lighting loosely cover the light using a white cloth or tracing paper.
4. To get more texture in the image, use a ring flash with the mobile.

5. Focus the area of interest. 'Lock-focus' if there is an option.
6. Shoot!

Extra oral smartphone photography:

1. Ask the patient to smile naturally. Judiciously use the facial asymmetries.
2. Eliminate plaque and excess material before the shoot.
3. Centre the nose to the image.
4. Use white or black background.
5. Place the patient about 50-60 cm in front of the fundus to reduce the shadow.
6. Place the phone camera in level with the patient's eyes.¹²
7. Shoot!

CONCLUSION

Photography in dentistry is revolutionizing the diagnosis, treatment planning and patient-dental team communication. Constant integration of knowledge and technology in digital dental photography can help an average dental practitioner, mutate his practice to stand ahead of the market. It also helps in self-evaluation, learning, training and publications. If channeled well, the dentist can develop an exciting hobby as well!!

REFERENCES:

1. Ahmad I. Digital dental photography. Part 1: an overview. British dental journal. 2009 Apr;206(8):403-7.
2. Matishva vyas, B. Clinical Photography in Dentistry. : Jaypee brothers; 2008..
3. Ahmad I. Digital dental photography. Part 2: Purposes and uses. British dental journal. 2009 May;206(9):459-64.
4. Ahmad I. Digital dental photography. Part 4: choosing a camera. British dental journal. 2009 Jun;206(11):575-81.
5. Wolfgang bengal. Mastering digital dental photography. (2nd ed.). New Malden, Surrey: Quintessence Publishing; 2006.
6. Desai V, Bumb D. Digital dental photography: a contemporary revolution. International journal of clinical pediatric dentistry. 2013 Sep;6(3):193.
7. Pasquale loiacono, Luca pascoletti. Photography in Dentistry: Theory and Techniques in Modern Documentation. (2nd ed.). Italy: Quintessence Publishing; 2012.
8. Ahmad I. Digital dental photography. Part 5: lighting. British dental journal. 2009 Jul;207(1):13-8.
9. Ahmad I. Digital dental photography. Part 7: extra-oral set-ups. British dental journal. 2009 Aug;207(3):103-10.
10. Godlevsky L, Bidnyuk E, Bayazitov N, Kresyun N, Kovalenko A, Lyashenko A, Balyko V. Application of mobile photography with smartphone cameras for monitoring of early caries appearance in the course of orthodontic correction with dental brackets.
11. Antar F, Zebouni E. Comparative review of DSLR cameras and smartphones in dental photography: indications and limitations. International Arab Journal of Dentistry. 2018 Nov 9;9(3).
12. Payne KF, Tahim A, Goodson AM, Delaney M, Fan K. A review of current clinical photography guidelines in relation to smartphone publishing of medical images. Journal of visual communication in medicine. 2012 Dec 1;35(4):188-92.
13. Feng liu, Luca pascoletti. Dental Digital Photography: From Dental Clinical Photography to Digital Smile. Singapore: Springer; 2019.