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An update on Techniquesto Improve clinical photography while controlling errors in orthodontics.

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ABSTRACT

In current years, clinical photography has grown to become a very important diagnostic aid and proper permanent time-linked clinical record which are not only used for diagnosis and treatment planning but also for communicating with the patients about the existing problems, available treatment options and visualization of end results by using various software meant for showing predictable changes with the treatment. Moreover, the treatment progress can also be visualized with sequential photographs during various stages of treatment. Digital photography can have numerous impacts on our dental practice. Photographs can teach patients and improve case acknowledgment, impart shade to the dental lab, and improve patients' certainty following treatment. Though, there are numerous possible causes of errors while getting these records. Photographs of insufficient quality may distort the initial illness of the patient, may record dental anomalies and defects incorrectly, or may inaccurately replicate the progress. This paper is an attempt to feature anupdate on techniques to improve clinical photography of the causes of error in every-day clinical tasks and best-practices for getting proper high-quality photographic records in a clinical setup.

KEYWORDS: Clinical record, digital photography, sources of errors, photography in Orthodontics

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INTRODUCTION

Clinical digital photographs acquired pre, mid and post orthodontic treatment form an important portion of the patients' records.[1]When captured correctly, dental photographs will provide more correct evidence about malocclusion and possible treatment options than any other clinical record.[2]The errors most often encountered in clinical photographs can be distributed hooked on double groups. The first group comprises of errors that result from an inappropriate selection of photographic equipment-the camera, lens, flash, backdrop, and auxiliary equipment such as mirrors and retractors.[1] The second group of errors comprises incorrect patient-operator positioning. Why we shot orthodontic photographic records? Case records (photo documentation), Complement additional orthodontic records, Significant clinical and lawful role, From a diagnostic opinion of examination, Case demonstrations to study clubs and former groups, Academic investigate, Guidance of staff and students, Journals, Patient instruction, Pre-surgical planning, and post-operative analysis.[3]Hence, this paper provides an overview of the causes of error in clinical digital photography in every-day clinical practice and best-practices for achieving proper high quality photographic records in a clinical setup.

NEED FOR STANDARDIZATION

Shaffer stated in 1936[4,5], "A review of the orthodontic illustrations in our orthodontic and dental journals disclosed that they need a surprisingly small share of standardized images of orthodontic patients. One has to study the before-and-after images used as illustrations in our textbooks and journals to comprehend the requirement of additional standardization''

LINEAR SCALE

The clinical pictures must constantly be magnified in well-ordered and standardized manner. This principle was definitely recognized in what is called the **'Westminster scales'**, summarized in Table:1 for recording the assessments of various body elements. The scales check with main magnification on the film itself, and employ to taking pictures using a 35mm camera.[5]

Table: 1 The Westminster Scale Percentages

Normal adult magnification ratios	View ratio
Full length	1:50
Head & neck	1:10
Face	1: 8
Both hands	1: 10
Single hand	1: 5
Single eye	1: 2

The best thanks to standardize measure is to usage a lens that's marked with copy percentages on the barrel. The lens is arranged to a precise magnification percentage and focusing is achieved by moving the whole camera back and frontward.[5]

COMMON CAUSES OF ERRORS/ MISTAKES IN CLINICAL DIGITAL PHOTOGRAPHY

A. Apparatus and technical faults due to incorrect choice or utilization of device involving the camera, lens, flash, retractors, mirrors. [1,6]

B. The Error re-counts to some recording and includes incorrect positioning of the subjects.

1) Camera

Orthodontics photography may be a role procedure of macro photography. Macro photography is wherever you are taking careful pictures of small things. so you may want a specialized camera capable of taking sensible macro photography i.e DSLR (digital single-lens reflex) which is extremely modifiable and may be created to be excellent for orthodontics photography. Correct camera emphasis is very essential, with extra-oral images taken in portrait mode andintra-oral images taken in landscape method. To let direct evaluation of images acquired at totally different time's reliable magnification of pictures is needed.

Figure 1: Portrait   **Figure2:Landscape**

1) Lens

The standard lens of a camera provides a field of view just like that of the naked eye. A macro lens permits you to require sharp, detailed, close-up images of small subject. However, a dedicated Macro lens attached to a DSLR camera provides even better close-up pictures mainly through higher definition and accurate focus, and is by far the superior choice.[3,6,7]The lens required for dental taking pictures may be a Macro lens by a focal length of 85-105mm.

Point flash once used for clinical image, often manufacture distracting shadows, which can hinder necessary details (Fig 3). These is avoided by employing a ring flash (Fig 5:) that removes shadows by permitting an additional uniform distribution of light during extra and intra –oral photographs consequently   improving the quality of the pictures.

2) Flash

Figure3:Problem with point flash even with diffuser   **Figure 4: Point flash**

Figure 5: Distracting shadow is avoided   **Figure 6: Ring flashby employing a ring flash**

4.Retractors

Cheek retractors such like plastic ones are suitable for retracting the cheeks while taking intraoral images. The single ones help more in retraction than the double ones. Lip retractors are helpful to keep the lip away once the front teeth have to be snapped or for snapping mirror photos of the occlusal surfaces.[6,8]

Cheek retractors

- Wider end of the cheek retractors is used
- Assistant ought to hold each retractors propulsion them both from the sides, and frontward.

- By propulsion the lips forwards, towards the creative person it makes it simpler for the patient to bite along in occlusion and retract the soft tissue away from the teeth.
- Use the smaller end of the larger retractor.
- The photographer must hold it & pull it 4-5mm distally and away from the teeth so that the distal of first molar is taken.[9]
- The assistant holds the wide end of the cheek retractor on the opposite side

5.Mirrors

- Glass mirrors with front-silvered are best suited
- Long-handled, front-silvered mirrors, rhodium glass mirrors- perfect apparatus for dental photography.

Figure 7: The top one includes a ghost image from stainless steel mirror and image from rear silver (Bottom) shows sharp image

PROBLEMS RELATED TO DIGITAL PHOTOGRAPHY

1. Depth of field.
2. ISO speed
3. Shutter speed
4. CCD and CMOS problem.

1) Depth of field

- A camera's aperture setting determines the depth of field and variance over which objects looks in sharp focus.[10]
- When taking an intraoral frontal shot (Figure 8 &9) that needs a large depth of field since as when you want all the teeth from incisors to molars in focus-use a narrow aperture, like f-25.

Figure 8: Wide Aperturef/2.8 - low f-stop number Figure 9 : Narrow Aperture f/25 - high f-stop number large depth of field

2) *ISO SPEED*

- The ISO speed regulates in what way sensitivity of the camera is toward received light. A lesser ISO speed is practically always suitable; subsequently higher ISO speeds intensely increase picture noise.

3) *Shutter speed*

- .Shutter speed suggests to the length of your time throughout that the shutter is open given as a fraction of a second. (1/60,1/120 etc)
- Faster shutter speeds freeze the act as there is less chance for the camera to move.
- Good photography involves an equilibrium amongst shutter speed and aperture that controls the quantity of light coming into the lens.

4) *CCD and CMOS problem*

- CCD (charge-coupled device) and CMOS (complementary metal-oxide semiconductor) image devices
- Even when the lenses on the digital cameras are never changed dust can still eventually acquire on the CCD of the cameras.
- This may get as tiny black spots, at an exact promotion on intra- and extra-oral images

Figure10: Hairs and dirtparticles eventually get on the CCD

Suggested camera settings in clinical photography[10,11,12]

- It is recommended to use manual settings to take perfect photographs

  - Shutter speed   –   1/125
  - ISO   –   100-200
  - Mode   –   M
  - Aperture for Extra-oral   –   f-8 to f-11
  - Aperture for intra oral   –   f 25- f-32
  - Aperture for mirror view   –   f-19 to f-16

B) POSITIONING MISTAKES/ERRORS–

Together the patient & also the doctor are required to be arranged in a correct manner, in a standardized way, to produce good photographs.

Extra-Oral Photographs

Frequently seen features of a lowly extra-oral shooting comprise –

Figure11: The photograph acquired in landscape

Figure12:   Wrong magnificationorientation

Figure13:Excessively showing of the patient's body in the image

Figure 14: Formation of a dark shadow in background

Figure15: Errors caused by failure to adjust Frankfort plane

Figure 16: Forget to removes glasses

Errors with profile shots include-

Figure 17: Patient posing with extremeleaning of the head forwards or backwards

Figure 18: Patients with long hair coming on face

Figure19:Region of interest is not fully included.

Figure 21:Disruptions in the form of jewelry

Figure 20 :Background noise

In what way to minimizethis errors-

A. The head must be in the natural rest position, alongside their eyes stable horizontally[13](Fig 22).

B. The right aspect of the face must be distinctly visible with no hindrances like caps, hair, jewelry or scarfs.[5,8,12]

C. The aperture value for extra oral photographs should be set to a least e.g. F8 is frequently a suitable setting.[3]

Figure 22: Extra oral portrait photographs

Intra-oral photographs Common errors include –

Figure 23: Canted occlusal planes

Figure 24:Incorrect choice and usage of retractors

Figure 25: Saliva is not suctioned

Figure26: The tongue has not been retracted before the photograph is taken

A suction will be accustomed eliminate saliva before taking every photograph

Figure 27: Dark buccal passages

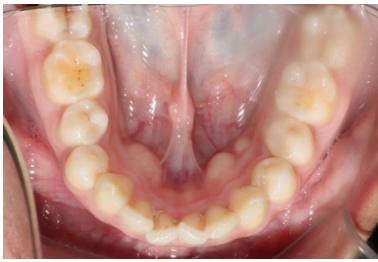**Figure28: Failure to visualize distal side of first molar teeth**

Figure29: Fogging up of the mirror

Figure: 30 Stainless steel mirror with scratch

When taking occlusal "mirror" photographs, heating the mirror earlier to insertion prevents "fogging" of the mirrors.[9]

(a)

(b)

Figure 31 (a &b): Camera is not positioned correctly in center

Figure 32: Incorrect choice and use of retractor

Figure 33: First molar not visible

POSITIONING ERRORS

Problems is also encountered wherever there's a height distinction between the patient and also the practitioner. This drawback will be resolved by obtaining the patient or the practitioner, that ever is suitable, to square on a platform to lift them to the identical height.[1,6]

CONCLUSION.

Clinical photography has remained an important and integral part of every field of dental specialties and has become a very valuable resource. pictures are often simply obtained using the right instrumentation, correct settings and also the simplest techniques, thereby increasing the possibilities of getting high-quality pictures. Knowledge of entirely doable mistakes in extra- and intra-oral clinical photography can increase the probabilities of exploit high quality picturesThis

article provides with the basics that a medical practitioner desires or rather should grasp before he indulging into the attention-grabbing world of digital clinical photography.

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