

Review Article

Orthodontic Photography –A Clinical Aspect**Dr. Uday Nandkishorji Soni¹, Dr. Shyama Dash¹, Dr. Sagar Kausal², Dr. Mayuresh Baheti³, Dr. Nilesh Mote⁴, Dr. Shubhangi Mani⁵**¹PG Student, Dept. of Orthodontics and Dentofacial orthopaedics, Rural Dental College, Pravara Institute Of Medical Sciences, Loni – 413736, Maharashtra, India²Private practitioner, Akola, Maharashtra, India³Private practitioner, Nanded, Maharashtra, India⁴Reader, Dept. of Orthodontics and Dentofacial orthopaedics, Rural Dental College, Pravara Institute Of Medical Sciences, Loni – 413736, Maharashtra, India⁵Professor, Dept. of Orthodontics and Dentofacial orthopaedics, Rural Dental College, Pravara Institute Of Medical Sciences, Loni – 413736, Maharashtra, India***Corresponding author**

Dr. Uday Nandkishorji Soni

Email: udaysoni88@rediffmail.com

Abstract: Photography today has entered almost every aspect of human life. It has wide spread uses and almost used in every day to day life. Clinical photography is an important aspect of clinical orthodontics or dentistry. Digital photography has completely changed the routine clinical practice. A clinician today needs to master the art and science of photography. In the following review we over look the history of photography, its uses, the basic principles and Standardization.

Keywords: Photography, Orthodontics, Standardization

INTRODUCTION

Photography in today's routine clinical practice has reached its maximum level of impact. For some in everyday life it has become a hobby, for some professionally it is an art and science. Photography today has been used in every field like medicine dentistry, fashion, communication and very much in every aspect of life. In dentistry photography has a diverse use [1-2]. History dates back to 1845, when GURDON BUCK used for the first time pre-operative photographs in his medical paper [3]. He was the first person to use photographs in medical field. Since then the world of photography as seen numerous developments. Digital cameras have revolutionized today's photographic world. The image capturing and its visual effect and storage has changed a lot.

Photographs in orthodontics have a prime importance in diagnosis and treatment planning. In dentistry photography has its different platform, there a numerous uses of this science some of which are –

1. To store records,
2. To compare pre-operative and post-operative,
3. Useful in diagnosis,
4. Documentation and patient management,
5. Patient education.

6. In dental curriculum
7. Tele- dentistry.
8. Medico-legal purpose

- 1) To store records –the technological advancement from conventional photography to digital photography has greatly enhanced the capacity to store a large amount of data in a very small place. During dental treatment photographs of each and every step serve as a record of the treatment for the clinician and also for the patient. As so called soft copy of the photographs can be stored and a large amount of data can be stored in a very small place and can be reproduced or can be communicated to other clinician very easily. This is one of the advantages of digital photography over conventional photography [4-5].
- 2) To compare pre-operative and post operative-photographs should be taken before starting any invasive procedure and after completion of the procedure . They serve as pre-operative and post-operative records of the patient . These records are very important as patients operative record and documentation, during case presentation, for

medico-legal purpose, for patient education program and proof finding procedures [4-6].

- 3) Useful in Diagnosis- many a times photographs can be used for diagnosis of malocclusion in orthodontics or for many other procedures like smile designing . Photographic analysis is used in orthodontic to diagnose the underlying malocclusion. Study of photographs of a patient is more for obtaining confirmatory evidence for deductions already reached and to establish added proof in borderline cases, than to obtain positive symptoms of the class of malocclusion with which one is dealing. Facial photographs assume a greater importance as a diagnostic tool even when the dentist does not have equipment permitting him to take cephalometric radiographs. Also, both frontal and profile facial analysis can be carried out utilizing these photographs [7].
- 4) Documentation and patient management-in dental office patient documentation is very important from point of view patient and practice management . Documentation of patients include detailed case history, x-rays and photographs and informed consent signed by the patient [8].
- 5) Patient education – photographs acts as an important visual aid in patient education. Photographs helps to encourage patients to take up dental treatment and photographs also act as an positive reinforcement for the patient.
- 6) In dental curriculum- Photographs are used as illustrations in lectures , paper presentation , poster-presentation during dental teaching . Photographs helps dental students to understand the subject well [9].
- 7) Tele- dentistry – In 1994 the United states of American army started a project - U.S. Army’s Total Dental Access Project. The aim of this project to improve patient protection, offer dental education and realize the communication of dentist-dental technician laboratory. That is by teledentistry, dental professionals can mutually be consulted at remote locations [5]. Teledentistry enabled the clinician to share complete patient information by two methods, first is real time conference video and second is more common store and forward method. Teledentistry allows clinician to share photographs, x ray images, video information, drawing etc. via multiple service providers [10].
- 8) Medico-legal purpose- As there is increasing awareness in the patient regarding the laws, it is important to keep records of all patients for medico-legal purpose. Photographs and also plaster models serve as best proof For medico-legal

purposes the Consumer Protection Act 1987 states that it is necessary to retain all patient records for not less than 11 years and the British Association of Orthodontists⁴ recommends that study models should be kept for 11 years or until the patient is 26 years old [11].

PRINCIPLES OF PHOTOSTATICS

Paul W. Simon in 1924, introduced principle of gnathostatic models which were applicable to photography and were called as Photostatics [12] These principles are -

- a) The median plane of the head is always the same distance from the object lens
- b) The median plane of the head and the photographic plate or film should be parallel to each other and
- c) The line of the lens axis passes through both orbital points.

HISTORY OF PHOTOGRAPHY IN DETISTRY

Andreson in 1926, formed a system of photography called as gnathophysiological photographs. The photographs made by this technique were composite of facial photograph with photograph of study models [13].

B. E. Lischer in 1933,in his review of requirements of diagnostic aids has placed Facial Photography next in importance to written records [14].

Tauro M. Graber in 1946,divided the use of orthodontic photography into two types 1) for diagnostic criteria and 2) record purpose [15].

Robert E. Binder in 1974,described the uses of lip retractor developed by Dr. Brainerd Swain, which was specifically designed for occlusal intra-oral photographs [16].

William F. Stutts in 1978,described method taking extra-oral as well as intra-oral photographs in orthodontic practice. He also described method of duplicating the color slides as well as obtaining black & white negatives from color slides [17].

Wolfgang Bengel in 1985,developed a method of Standardization of dental photography which is widely used till date. He proposed fixed distance, center of frame, center of focus, edge of frame, and orientation of occlusal plane for each photographic view [18].

Lewis Claman, Daniel Patton, Robert Rashid in 1990,described method of Standardization of portrait photography for dental patients [19].

Marc B. Ackerman and James L. Ackerman in 2002, presented smile analysis and smile design using digital imaging and computer programs. They concluded that esthetic smile design is a multifactorial decision making process that allows the clinician to

treat patients with an individualized and interdisciplinary approach [20].

Jonathan Sandler and Alison Murray in 2002, carried out a clinical survey regarding use of clinical photography. They concluded that the need for intraoral and extraoral photographs was important and a minimum data set of 18 photographs (pre treatment and post treatment) for each and every orthodontic patient [21].

Standardization of Photographs

1. Method of Standardization as suggested by Wolfgang Bengel [12] –

Photographic apparatus

- 35 mm Single Lens Reflex Camera
- 100 – 135 mm Lens
- Lateral Flash for Extra oral Photographs
- Ring Flash for Intra oral Photographs

Intra oral Photography

- **Frontal view**
 - **Centre of Frame** – at the point of contact between upper central incisors
 - **Centre of Focus** – between canine and first premolars
 - **Edge of Frame** – the lateral edges besides the last molars
 - **Occlusal plane** – parallel to upper or lower edge of frame
- **Lateral Views**
 - **Centre of Frame** – at the tip of the second premolar
 - **Centre of Focus** – at the tip of the second premolar
 - **Edge of Frame** – beside the last molar or at the side of the central incisor
 - **Occlusal plane** – parallel to upper or lower edge of frame
- **Occlusal View of Mandible**
 - **Centre of Frame** – at the intersection of the sagittal plane with the line joining the second premolars
 - **Centre of Focus** – in the lingual sulcus or on the gingival margin of second premolars
 - **Edge of Frame** – upper or lower edges of the frame should be distal to the last molars and in front of the incisors.
- **Occlusal View of Maxilla**
 - **Centre of Frame** – at the intersection of the sagittal plane with the line joining the second premolars
 - **Centre of Focus** – in the Palate or on the gingival margin of second premolars

- **Edge of Frame** – upper or lower edges of the frame should be distal to the last molars and in front of the incisors.

Extra Oral Photography

- **Background** – it should be harmonious. Generally grey or white background is suitable
- **Illumination** – photofloods or electronic flash units
- **Position of Mandible** – in rest position with lip in resting state and normal relation.

Profile View

- Top edge of the frame should be just above the head and bottom edge in the region of larynx
- Back of the head need not be included
- There should be an empty area in front of the profile
- Focus should be on the patient's eye
- FH plane should be parallel to the top or bottom edge of the frame
- Ear should not be covered by hair

Frontal View

- Top edge of the frame should be just above the head and bottom edge in the region of larynx
- Focus should be on the patient's eye
- Inter pupillary line should be parallel to the top or bottom edge of the frame.

2. Method of Standardization of Intra oral Photographs as suggested by Hielke Brouwer and A. Jan Van Hillemonds-Berg [22]–

Routine intraoral photography

For standard front and lateral intraoral views the following settings are used:

Exposure time — 1/60 second.

Focal distance — infinity.

Lens aperture — f22.

3. Standardization of Intra oral Photography by Ross G. Kaplan [23]

- Use of Point source of illumination
- Use of Buccal or Occlusal mirrors oriented 45⁰ to occlusion or occlusal surface of teeth and camera oriented 45⁰ to mirror so that resultant image would be at 90⁰ to the occlusion
- Area being photographed should occupy same position in frame each time
- The orientation of camera to the teeth being photographed should be consistently reproducible

4. Standardized Extra oral photography by Lewis Claman *et. al.* [19]

- **Head position**
 - Photograph should encompass – Crown of head to clavicle

- Camera to subject distance should be kept constant
- Inter pupillary line should be parallel to horizontal plane
- Distance from outer canthus to hairline should be equal on each side
- Line from outer canthus to superior attachment of ear should be parallel to horizontal plane
- For Profile photograph – inner and outer aspect of eye which is on photographic side should be visible
- **Camera Lens and position**
 - Focal length of lens should be kept constant (100mm or 105mm)
 - Line from middle of lens to eye should be parallel to horizontal plane and lens should be centered between two eyes.
- **Mandibular position**
 - Photograph must be taken in postural rest position

Various Extra-oral and Intra-oral views [24]

Extra oral Views

- Frontal view
 - Camera should be positioned in front of patient's head – on the same level as the patient
 - There should not be any tilt in the camera position
 - Distance of patient from camera about 180cm
 - Mandible of the patient must be in resting position
 - Two photographs must be taken in frontal view
 - Lips in relaxed state [Fig-1]
 - Smiling [Fig-2]



Fig-1: Frontal view – lips in relaxed position (Extra-oral)



Fig-2: Frontal view- smiling (Extra-oral)

- Profile view [Fig-3]
 - Camera and head orientation are same as for frontal view
 - Eyebrow on the side of photograph should be visible only and not the opposite side eyebrow
 - Focus should be at patient's eye
 - Lips should be in resting state



Fig-3: Profile view (Extra-oral)

Intra-oral views

- Frontal intra oral view [Fig-4]
 - It is taken in centric occlusion
 - Lip retractors are used for retraction of lips. Lips should be retracted as well as pulled away in front from teeth.
 - Occlusal plane should be parallel to top or bottom edge of frame



Fig-4: Frontal view (Intra-oral)

- Buccal view [Fig-5 and Fig-6]
 - It is also taken in centric occlusion
 - Occlusal plane should be parallel to top or bottom edge of frame
 - If possible last erupted molars should be included in the frame



Fig-5: Buccal view (intra-oral-Right side)



Fig-6: Buccal view (Intra-oral-Left side)

- Occlusal views [Fig-7 and Fig-8]
 - Maxilla and mandibular occlusal views are taken using mirrors
 - Mirrors should be pre-warmed to avoid fogging
 - Inter molar line should be parallel to top or bottom edge of the frame
 -



Fig-7: Occlusal view (Intra-oral Maxillary)



Fig-8: Occlusal view (Intra-oral Mandibular)

CONCLUSION

Photographs provides considerable data for diagnosis and treatment planning of the patients and also digitalization has achieved a new level for photography. Storage and communication of data today is quite simple process. Photographs can be qualitative evaluation of postoperative results, and the patient is can see his own changes before to and after the procedure, this can help in patient education. A good understanding of can help a clinician to a far greater extent than he can imagine.

REFERENCES

1. McLaren EA, Terry DA; Photography in dentistry. J Cal Dent Assoc., 2001; 29:735-42.
2. Nathanson O; Dental imaging by computer: A look at the future. JADA, 1991; 122:45-6.
3. Zyman P, Etienne JM; Recording and communicating shade with digital photography: concepts and considerations. Pract Porced Aesthet Dent., 2002; 14(1):188-92.
4. Mladenović D, Stanković D, Mladenović L, sarad I; Dentalna fotografija kao propratni element pacijentove dokumentacije i komunikacija, XLVH Kongres antropološkog društva Srbije sa međunarodnim učešćem, Program i izvodi saopštenja, Kruševac, maj., 2008; 52.
5. Mihailović B, Miladinović M, Mladenović D, Lazić Z, Janković A, Živković D, Vujičić B; Computerized Dentistry. Obeležja, Beograd 2009; 211-49 (in Serbian).
6. Digital foto, avgust-septembar, 2009; 06:6-9.
7. Diagnostic Procedures, Aids and Their Interpretation. In: Sridhar Premkumar. Graber's Textbook Of Orthodontics: Basic Principles and Practice, 4/e: Elsevier, 2009; 320.
8. Reynolds P, Mason R; On-line video media for continuing professional development in dentistry. Computers & Education, 2002; 39: 65-98.
9. Digital foto, oktobar-novembar, 2008; 01:70-9.
10. Chen JW, Cobdell MN, Dunn K, Johnson KA, Zhang J; Teledentistry and its use in dental education. J Am Dent Assoc., 2003; 134 (3):342-6.
11. Bel A, Ayoub AF, Siebert P; Assessment of the accuracy of a three dimensional imaging system for archiving dental study models. Jr. of Ortho., 2003; 30:219-23.
12. Bengel W; Standardization in dental photography, Int Dent. Jr., 1985; 35:210-17.
13. Anderson V; Three Contributions to Orthodontological Diagnosis. Int J. Ortho 1926; 12:235-51.
14. Lischer BE; Photography for Orthodontics. Int J. Ortho 1933; 377-85.
15. Graber TM; Patient Photography in Orthodontics, Angle Orthod., 1946; 16:17-43.
16. Binder RE; A lip retractor for intraoral photography, 1974; 8:465-67.

17. Stutts WF; Clinical Photography in orthodontic practice. AJO, 1978; 74:1-31.
18. Bengel W; Standardization in dental photography. Int Dent. Jr., 1985; 35:210-17.
19. Claman L, Patton D, Rashid R; Standardized portrait photography for dental patients, AJO-DO, 1990; 98:197-205.
20. Ackerman MB, Ackerman JL; Smile analysis and design in digital era, JCO, 2002; 36:221-33.
21. Sandler PJ, Murray A; Current products and practice - Clinical photographs – The Gold Standards, Jr of Ortho., 2002; 29:158-67.
22. Brouwer H, Jan van Hillegondsberg A; Standardized Intraoral photography, 1969; 3:239-46.
23. Kaplan RG; Standardization for serial intraoral photography. AJO, 1979; 75:431-37.
24. Wang CH; Standardized digital photographs for the orthodontic practice. JIOS, 2005; 38:176-83.