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Knowledge, Attitude and Awareness of Intraoral Radiographic Imaging Techniques among Dental Students Across Chennai: A Questionnaire Study

Dr.K. Pazhanivel[1], Dr. Priya Ramani[2]Dhivya Dharshini.K[3], Aswathy.M[4], D. Bhavani[5]
Senior Lecturer, Head[1]and Professor[2]Junior Resident[3,4,5]
Department of Oral Medicine & Radiology
Thaimoogambigai Dental College and Hospital, Chennai,
India

Abstract:
Aim and Objectives: To assess the Knowledge, Attitude and Awarenessof intraoral radiographic imaging techniques and its clinical application in dental practice among undergraduate dental students across Chennai, Tamil Nadu.

Materials and methods:An online-based cross-sectional self-administered questionnaire survey comprisingof 15 relevant questions were used for assessment among 103undergraduate dental students (3rd year, 4th year, Interns)using Google forms distributed through various social media platforms across Chennai, Tamilnadu. The obtained data was analyzed using SPSS version 24.0 with the significance level set at $P \leq 0.05$.

Results: Analysis of the given data,43.08% were familiar with rule of isometry principlewhile 20.77% agreed paralleling technique as safe. Only one-third were aware on application of paralleling angle technique in endodontics (39.23%), edentulousness (26.15%), and impaction (19.23%) though 23.08% advocated both techniques can be modified as per clinical scenario. A very low response rate was observed towards paralleling technique and image accuracy parameters while majority were unaware (36.92%) of appropriate procedure and prefer bisecting angle despite paralleling technique being most accurate one with reduce image distortion.

Conclusion: The present study clearly shows sufficient knowledge about the intraoral techniques but lack practice awarenesstowards use of different intraoral imaging techniques despite positive attitude towards its safe and clinical application, thus demanding the need for organizing hands-on courses, workshops and continuing dental education training programs with effective modifications in dental curriculum at the Undergraduate level for efficient implementation in their routine practice.

Keywords:-*Awareness, Bisecting angle technique, Bone density, Image quality, Magnification, SLOB rule.*

I. INTRODUCTION

Dental Radiography is a photographic imaging procedure employed to obtain images of the oral and para-oral structures that includes teeth, bone and associated soft tissues to aid in identification, diagnosis, treatment plan and monitor the integrity of oral and para-oral tissues. Dental or oral radiography often remains the gold standard investigatory tool in identification of pulp and periapical pathologies, detect anomalies, injuries at the maxillofacial region, determine presence or absence of teeth, evaluate bony structures, skeletal tissues and assess post-operative effectiveness following surgical procedures [1, 2]. Oral radiography can be broadly categorized as intraoral (the X-ray film is inside the mouth) and extraoral (The X-ray film is outside the mouth) radiographs. Intraoral radiography is the most common procedure performed in routine practice for identification of oral diseases that includesperiapical, bitewing and occlusal radiographic projections. On the other hand, extraoral radiographs with aid of Panoramic, oblique lateral, cephalometric radiography is recommended when inconclusive intraoral and extensive identification is required to obtain definite diagnosis [3, 4, 5].

Intra oral Periapical radiography (IOPAR) is a lateral projection of intraoral structures displaying both the crown and the root of the tooth and surrounding bone which illustrates 3-4 teeth and the tissues around them. Two projecting techniques of IOPAR were employed to obtain optimal image geometry that includes: a) Paralleling technique (Long-cone technique) where the periapical film is placed parallel to the long axis of the teeth and the central X-ray beam is aimed at the right angles of the teeth and the film and B) Bisecting-angle technique at which the periapical film is stood as close as possible to the palatal/lingual surface of the teeth. The film and the teeth form an angle with its apex at the point where the film is in contact with the teeth with central ray directed at apex of the teeth (Geometric theorem of Isometry) [6, 7, 8].

Radiolucent or radiopaque image structures obtained with periapical radiography may not only depict pathological conditions which require treatment but also normal anatomic variations to ensure integrity of oral structures. In order to obtainhigh-quality radiographic image, knowledge and practice awareness towards image parameters, technical and exposure parameters, guiding

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image principles, patient comfort and image accuracy are essential among dental students and professionals to aid in diagnostic process. Several studies carried in the past focused predominantly on radiographic protection, radiation exposure, hazards and safety precautions [9, 10]. Very few studies have shown the significance of knowledge and practice awareness towards radiographic procedure among dental students in achieving a good differential diagnosis of appropriate treatment outcome [11-14].

II. MATERIALS AND METHODS

A cross-sectional online-based questionnaire survey was conducted amongst the undergraduate dental students (3rd year, 4th year, Interns) across Chennai, Tamil Nadu, India to assess their knowledge awareness on various intraoral radiographic imaging techniques and its indications, contraindications, and specific clinical applications based on their individual experience. After obtaining the Ethical clearance, 15 relevant self-administered questionnairescomprised of few selected responses to specific questions along with multiple selection answer-based questions were prepared using online Google forms and circulated through various social media platforms. Responses recorded were evaluated using SPSS (Statistical Package for the Social Sciences V22.0 Illinois, Chicago) software Version 22.0. All the study participants were instructed about the purpose of the study and pre-filled online consent was obtained before the survey through Google forms and guaranteed that their participation was purely voluntary.

III. RESULTS

Of all the 103 dental students (39% of Interns, 35%of 4th years, 26% of 3rd years)enrolled in the study,43.08% of the dental students considered bisecting angle technique is based on the rule of isometry, Others were unaware about the principle of bisecting angle technique **(Fig 1).** Majority of dental students 35.38% preferred tube shift technique for localization of object and the others were unaware of which technique is used for the localization of object **(Fig 2)**. It was observed 29.23% of dental students preferred tube shift technique for detecting the object present lingual to reference point, and 28.46% of dental students considered paralleling technique for detecting object lingual to reference point. Majority of dental students 30%were aware of placement of film in bisecting angle technique as close as possible to the tooth, Others were unaware about the film placement in bisecting angle technique**(Fig 3)**. It was observed 33.08% of dental students were aware of increased target film distance to avoid image magnification and distortion. Others were unaware about the increased target film distance**(Fig 4)**. Less percentage of dental students (20%) were aware of use of long cone (paralleling technique) is used to prevent image elongation or distortion. Majority of them (24.62%) were unaware of the long cone technique is used to prevent image elongation and distortion**(Fig 5)**. Less percentage of dental students(20%) were awareof paralleling technique with less radiation exposure.Majority of them(28.46%) were unaware about the technique with less radiation exposure. Majority of dental students (26.92) were aware about the paralleling technique is feasible in mentally challenged individuals and the endodontic purpose(39.23%) and also feasible in assessing edentulous conditions(26.15%). Majority of them preferred both bisecting & paralleling technique, better in young children(33.8%) and also easily modify according to clinical conditions(23.08%)**(Fig 6)**

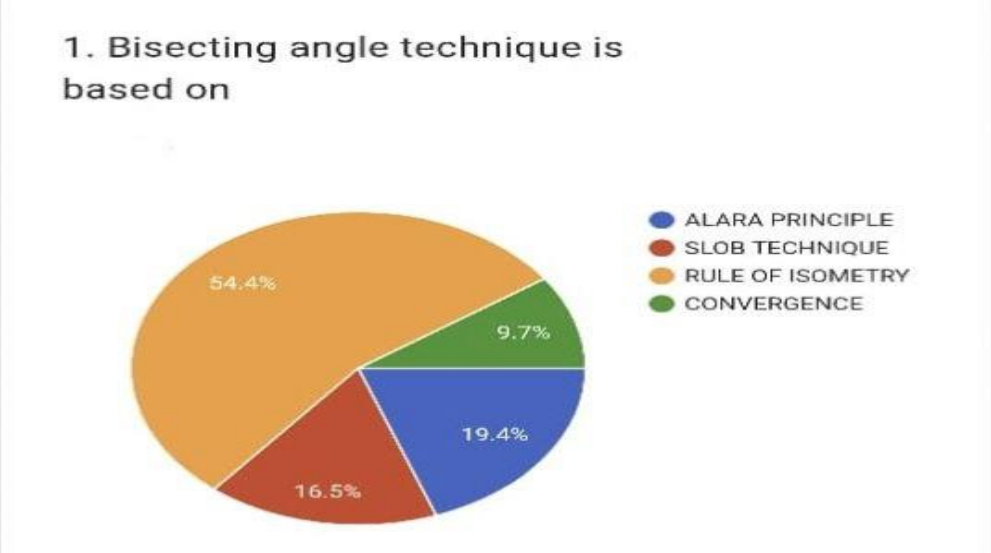

Fig. 1: Figure Showing Pie Diagram Representing Bisecting Angle Technique Is Based On

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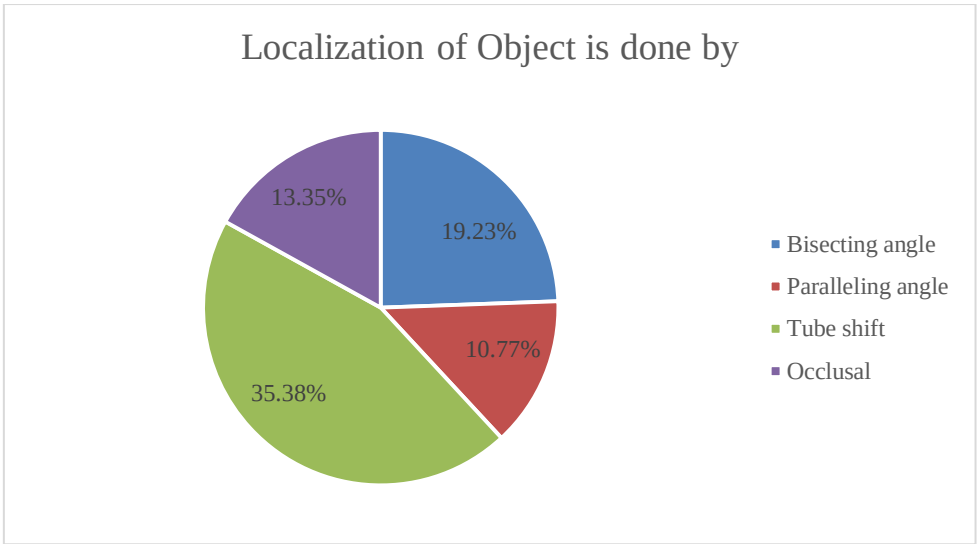

Fig. 2: Figure Showing Pie Diagram Representing Localization Of Object Is Done By

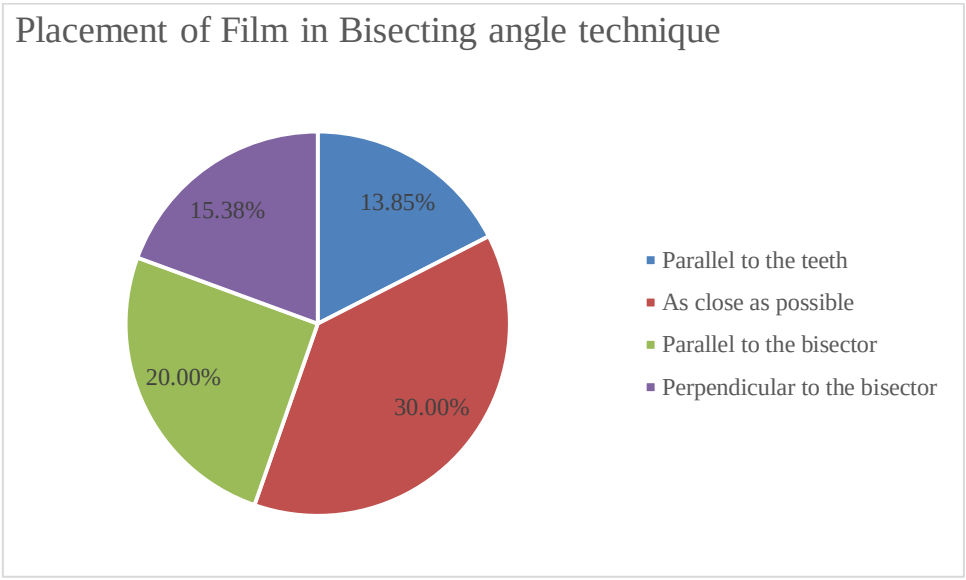

Fig. 3: Figure Showing Pie Diagram Representing Placement Of Bisecting Angle Technique

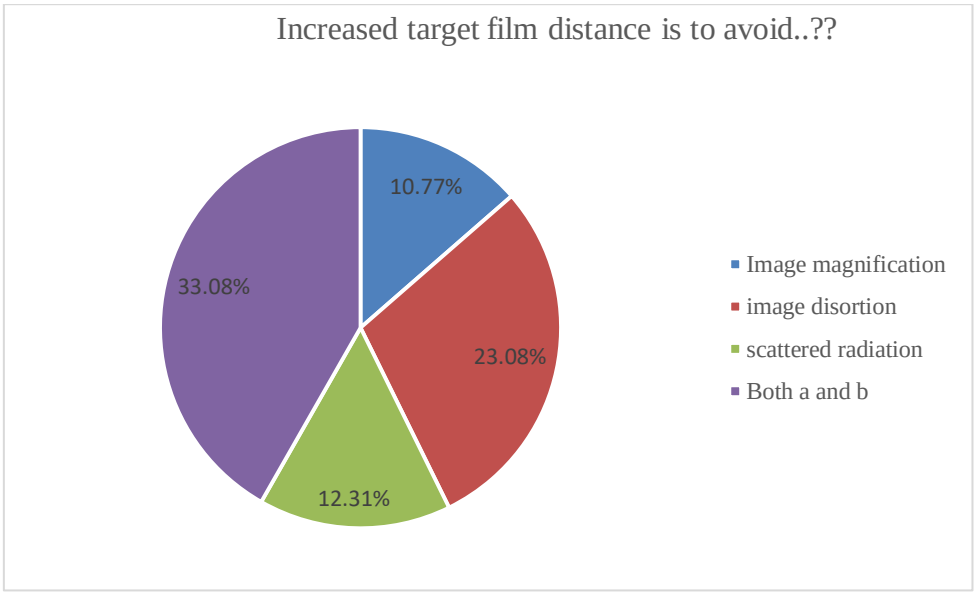

Fig. 4: Figure Showing Pie Diagram Representing Reason To Increase Target Film Distance

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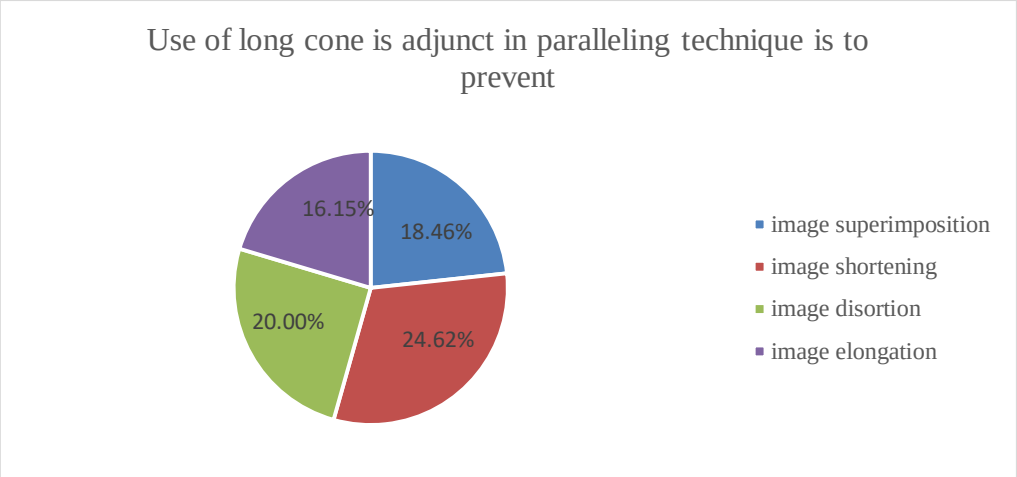

Fig. 5: Figure Showing Pie Diagram Representing Use Of Long Cone In Paralleling Technique

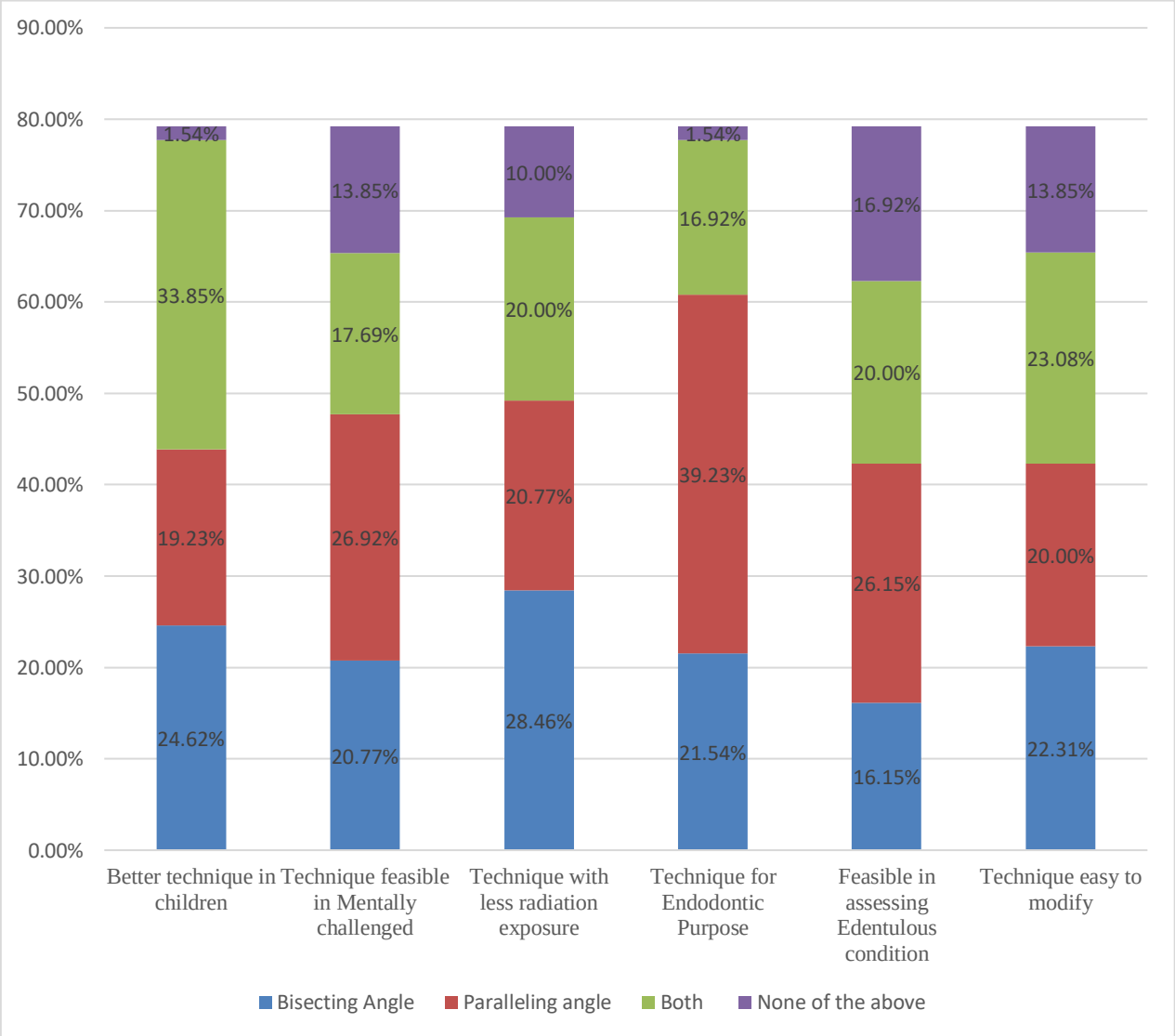

Fig. 6: Figure Shows Bar Diagram Representing Responses For Knowledge Based Questions

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IV. DISCUSSION

Intraoral periapical radiographs (IOPAR) provide an image of the teeth, surrounding periodontal tissues and alveolar bone for preoperative and postoperative assessment, trauma, pulp and periapical pathologies, localization of teeth and various oral disease of diagnostic importance.Several studies have shown that the paralleling technique produces images that are more accurate than the bisecting angle technique. The intraoral periapical film may not always be able to be maintained without bending due to oral anatomy or the intolerance of the patient, making it hard to use the paralleling technique in any circumstance. Contrarily, bisecting angle technique which is frequently used in dentistry is reasonably to use, gives result rapidly and is comfortable for patients but it has the inherent flaw of distorting images.

In the present study only 43.08% considered bisecting angle techniqueworks on the principle of isometry while 15.38% and 13.08% answered with SLOB technique and ALARA principle respectively which was contrast to studies by Jailance L [1], Parvez K [2] and Tamijeselvan S et al [7]. Studies by Tugnait A [15], Salti L [16], Alcaraz M et al [17] revealed lack of knowledge on radiographic principles impact largely on the dental practice by producing poor picture quality, image distortion, reduced or altered specialized figures, incorrect technical and exposure parameters and inappropriate handling of filmswith low diagnostic importance. Nearly one-third of the dental students suggested both bisecting angle (24.62%) and paralleling angle techniques (19.23%) can be used in children and 23.08% advocated both bisecting angle and paralleling angle technique can be easily modified according to the existing clinical condition for adults similar to studies by Tatapudi R et al [11], Anthea BD et al [13] and Ibrahim [14] but contrast to observations by Jailance L [1], Jamdade AS [18] where bisecting angle techniques were predominant and popular in dental practice despite paralleling technique being more accurate uniform method with reduced image distortion, image accuracy and reproducibility.

Studies by Tatapudi R et al [11], Anthea BD et al [13], Ibrahim MF[14] and Chandler NP [19] showed superiority of paralleling technique and practice in western countries while bisecting angle was most preferred in Indian subcontinent. Similar observations were also revealed in the present study where 26.92% recommended paralleling technique as predominantly feasible in mentally challenged individuals nonetheless only 20.77% agreed that paralleling angle technique is safer and causes less total body exposure to patientcompared to bisecting angle technique (28.46%) attributed to technical difficulty, patient and dentist comfort and lack of practice awareness towards both techniques.

More than two-thirds of the dental students were not aware on specific application of radiographic techniques in dental practice among which only one-third of the students were aware on application of paralleling angle technique in endodontics (39.23%), edentulousness (26.15%), and impaction (19.23%) though 23.08% advocated both techniques can be modified as per clinical scenario. Similar results were also observed by Rai S [8], Raoof M et al [20] and Kazzi et al [21] indicating sufficient knowledge towards paralleling technique that provides less discomfort for operator, patient, prevents multiple repeats and decreases unnecessary exposure were seen despite majority of dental students prefer bisecting angle technique due to lack of application and awareness towards other techniques.

In the present study, 30% selected film to be placed as close as possible, 33.08% preferred to increased target- film distance, 24.62% use long cone and 36.92% practice long cone in adjunct and/or increased focal spot film distance to reduce magnification, image distortion and image quality. Our observations were in agreement with studies by Tatapudi R et al [11], Ibrahim MF [14] and Anand A et al [22] where majority of these authors considered paralleling technique as gold standard that produces spatial accuracy, reproducibility with decreased errors despite patient's intolerance, and difficulty in film placement. From the above observations it can be perceived that paralleling technique being the most precise in image accuracy should be emphasized and needed to be modified and practiced in conditions where it is not feasible to ensure accurate diagnosis and treatment planning.

V. CONCLUSION

The present study clearly demonstrates lack of practice awareness despite sufficient knowledge towards paralleling technique in compared to bisecting angle technique despite positive attitude towards its safe and clinical application. This demands the need for organizing hands-on courses, workshops and continuing dental education training programs with effective modifications in dental curriculum on basics of radiological practices, radiographic principles and clinical parameters at the Undergraduate level to guide the future dental practitioners and apply these gold standard imaging technologies for efficient diagnosis and effective treatment planning.

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