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Original research article

Comparative assessment of the opinion regarding usage of bisecting-angle technique and the paralleling techniques among dental professionals- A questionnaire based study

Dr. Abhishek Anand[1], Dr. Swati Sharma[2], Dr. Ajay Kumar Shahi[3]

[1]Senior Resident, Department of Dentistry, Narayan Medical College and Hospital, Sasaram, Bihar, India

[2]Assistant Professor, Department of Pedodontics, Dental Institute, Rims, Ranchi, Jharkhand, India.

[3]Associate Professor, Department of oral and Maxillofacial Surgery, Dental Institute, Rims, Ranchi, Jharkhand, India.

Corresponding Author: Dr. Abhishek Anand

Abstract

Aim: To compare the opinion regarding usage of bisecting-angle technique and the paralleling techniques among dental professionals.

Material and methods: The present comparative, observational study was conducted in the Department of Pedodontics, Buddha Institute of Dental Sciences & Hospital, Patna, Bihar, India. The research instrument was close ended questionnaire with 20 simple and straight-forward questions. These questions were broadly categorized under four factors like image accuracy factors, technical factors, operator and exposure factors and other factors. Questions included in the study sample was divided into five groups based upon their academic levels and time frames of usage of techniques such as Group, I (Third-year year undergraduate students), Group II (Fourth-year year under-graduate students), Group III (Students, who are pursuing internship), Group IV (Post graduates students), and Group V (General dental practitioners). Total 250 undergraduate, interns, postgraduate students and private practitioners were involved in the present study, with 50 individuals in each group. Every participant was explained through the study and those who were willing to participate were included in a present study. Each question had three options 1- Bisecting angle technique 2- Paralleling technique and 3-Other techniques preferred for that particular question.

Results: Out of 250 participated in this study, 50 were third year students; 50 were fourth year students; 50 were students perusing their internship; 50 were post-graduate students, and 50 were general dental practitioners from the city. Most of the participants opted for bisecting angle technique with p value$\leq$ 0.05 and found as significant. In aspect of exposure parameters, results are in favour of paralleling technique and p value is $\leq$ 0.05. In aspect of the operator and patient comfort there is an equal opinion most of them opted for bisecting angle technique and paralleling technique p-value is significant. In aspect of image accuracy p-value is significant for paralleling technique.

Conclusion: There is sufficient knowledge about the techniques, but lack of application decreases their ability to get more accurate diagnostic radiograph. Paralleling technique being the most accurate in image accuracy should be emphasized to practice and needed to be modified in conditions where it is not feasible to deal with.

Keywords: opinion, bisecting-angle technique, paralleling techniques

Introduction

Intraoral periapical (IOPA) radiographs form the backbone of imaging of teeth and its associated structures. The IOPA radiograph is an essential aid in determining the working length (WL) during endodontic procedures, the root canal treatment assessment, and postoperative appraisal of endodontic therapy. One of the most critical steps during endodontic therapy is determination of an accurate working root length.[1] Therefore, accurate tooth length measurements are extremely important to ensure that the file does not pass beyond the apical foramen and causes injuries to the periapical tissues.[2] Inaccuracy in determining the WL of tooth can lead to various complications such as ledge formation, apical perforation, and overextension of irritant's through the apical constriction leading to periradicular inflammation, pain, and ultimately lowering the overall outcome of treatment.[1] Periapical radiographs due to its high image resolution and excellent image contrast have always been considered for radiographic diagnosis technique by diagnostician to determine the nature and characteristics of bone, dental structures, and lesion. In recent times, digital dental radiography has preceded imaging dentistry as a new standard.[3] Image manipulation that enhances the perceived image quality, patient education, lower radiation exposure to patients, and instant imaging are the advantages of the digital system over the conventional radiographs.[4–6] Certain conditions and anatomical difficulties such as large tongue; shallow palate and/or floor of mouth; impacted third mandibular molar; maxillary and mandibular tori; restricted mouth opening; neurological difficulties; exaggerated gag reflex; children; dental phobic patients with low pain threshold; painful mucosal conditions such as ulcers, infections, and intraoral abscesses differently abled patients who are unable to follow the clinician's instructions; residual ridge resorption in edentulous patients; and any lingual interference make the placement of IOPA radiographs challenging. Thus, intraoral film/sensor placement in a large group of patients becomes challenging.[7] In such cases, extraoral periapical (EOPA) radiographic technique can be used as an alternative. Extraoral technique is relatively a novel approach for periapical imaging and was introduced by Michael Newmann and Seymour Friedman in 2003 for maxillary and mandibular teeth.[8] The technique involves placement of the radiographic film sensor extraorally parallel to the teeth to be imaged, such that the tooth of interest comes in the center and the beam is directed through the opposite side buccal soft tissue without exposing the crowns of opposite side teeth.[9] Extraoral radiographic technique can be as an alternative in pediatric patients who are generally anxious and unwilling to intraoral film placement. Intraoral radiograph with placement of rubber dam along with the WL files during endodontic procedures is both time-consuming and uncomfortable for patients.[10] Since the introduction of extraoral radiographic technique, clinical usage has not been validated and is still used as a supplementary aid in dental radiography.[11]The reasons anticipated were due to lack of practice or usage, because of technical difficulty or may be because of any other reason. Thus present study was intended with an aim to compare the opinion regarding usage of bisecting-angle technique and the paralleling techniques among under graduate dental students. Post graduates from dental students and general dental practitioners.

Material and methods

The present comparative, observational study was conducted in the Department of Pedodontics, Buddha Institute of Dental Sciences & Hospital, Patna, Bihar, India, for 3 months, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

The research instrument was close ended questionnaire with 20 simple and straight-forward questions. These questions were broadly categorized under four factors like image accuracy factors, technical factors, operator and exposure factors and other factors. Questions included in the study sample was divided into five groups based upon their academic levels and time frames of usage of techniques such as Group, I (Third-year undergraduate students), Group II (Fourth-year year under-graduate students), Group III (Students, who are pursuing internship), Group IV (Post graduates students), and Group V (General dental practitioners from the city). Total 250 individuals were participated in the present study, with 50 individuals in each group. Every participant was explained through the study and those who were willing to participate were included in a present study.

Each question had three options 1-Bisecting angle technique 2-Paralleling technique and 3-Other techniques preferred for that particular question. Participants were asked to tick the option preferred. Questionnaire validity and reliability were carried out on a representative sample of dental students who were excluded from the main study. Test Retest was used to check the reliability and internal consistency.

Results:

Out of 250 participated in this study, 50 were third year students; 50 were fourth year dental students; 50 were students perusing their internship; 50 were post-graduate students, and 50 were general dental practitioners.

Most of the people opted for bisecting angle technique with p value$\leq$ 0.05 and found as significant. In aspect of exposure parameters, results are in favour of paralleling technique and p value is $\leq$ 0.05. In aspect of the operator and patient comfort there is an equal opinion most of them opted for bisecting angle technique and paralleling technique p-value is significant. In aspect of image accuracy p-value is significant for paralleling technique.

Table1: Questions Included in the Questionnaire

Factors	Questions involved
Image accuracy	Which technique has less chances of image distortion Which technique is better in appreciating inter-dental and Periapical bony changes Which technique is better in appreciating dental caries Which technique is better in assessment of implants Which technique is better in appreciating pathologies of jaws Which technique is useful in assessing edentulous condition Which technique is better to asses proximity the usually impacted Mandibular third molars with inferior alveolar canal Which technique is better to asses working length determination And post-operative assessment of Root canal treatment Which technique is useful in misaligned teeth
Technical	Which technique has less chances of error while recording radiographs? Which technique causes less total body exposure to patient? Which technique is easy to modify according to existing condition? Which procedure is more technique sensitive?
Operator and exposure parameters	Which technique is more comfortable for the operator? Which technique is more comfortable for the patient? Which technique do you prefer in your working area?

Any others	Which technique is better in children? Which technique is feasible in mentally challenged individuals? Which technique have more chances of infection spread? Which technique in to would you prefer or advise?

Table 2: Responses of Each Group towards Each Question

A – Denotes option bisecting angle technique. B– Denotes option paralleling technique. C- Denotes option other techniques

Question no.	Group1			Group2			Group3			Group4			Group5			P-value
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	
1	9	38	3	21	27	2	40	8	2	6	42	2	20	80	0	.000
2	15	33	2	25	30	5	23	25	2	1	43	6	20	27	3	.000
3	17	30	3	32	18	0	25	25	0	33	15	2	48	2	0	.000
4	22	26	2	26	22	2	30	20	0	13	35	2	15	35	0	.000
5	15	35	0	17	32	1	10	40	0	9	40	1	5	45	0	.000
6	16	34	0	17	32	1	10	40	0	8	41	1	6	44	0	.000
7	14	33	3	27	22	5	27	19	4	18	30	2	6	40	4	.000
8	15	32	3	21	23	6	24	19	7	12	28	10	8	32	10	.000
9	22	23	5	14	10	26	12	8	30	12	15	23	6	6	38	.000
10	4	21	25	20	10	20	23	8	19	20	10	20	5	20	25	.000
11	15	30	5	27	20	3	32	15	3	17	25	8	3	47	0	.000
12	18	30	2	25	15	10	31	8	11	16	22	12	20	25	5	.000
13	20	25	5	12	20	18	22	15	13	15	20	15	5	35	10	.000
14	12	28	10	30	20	0	43	7	0	22	26	2	35	15	0	.000
15	15	32	3	27	22	1	12	36	2	30	18	2	13	33	4	.000
16	31	15	4	25	21	4	12	32	6	32	15	3	30	20	0	.000
17	11	34	5	10	23	17	20	15	15	58	28	14	15	35	0	.012
18	16	30	4	14	32	4	20	30	0	17	23	10	15	35	0	.000
19	24	26	0	26	22	2	26	21	3	20	26	4	20	30	0	.000
20	13	34	3	30	15	5	30	20	0	14	34	2	18	32	0	.000

Table 2 shows each group response towards each question and their p values. P values for each question were statistically significant.

In all the groups most of the individuals in all the groups opted in favour of paralleling technique

Discussion

Periapical radiography describes intra oral techniques designed to show individual teeth and the bony structures around the teeth in their apices. Each film usually shows two to four teeth and provides detailed information about the teeth and the surrounding alveolar bone.[12] At routine clinical use; the two intraoral radiographic techniques used were the bisectingangletechniqueandtheparallelingtechniques.[13] Periapical radiography in practice is not as easy as it appears in theory. A thorough theoretical knowledge helps clinicians in modifying techniques to suit individual patient criteria, since the anatomy of the mouth does not allow rules of geometric projections to be satisfied.

Several studies revealed paralleling technique provides more accurate images than bisecting angle technique. Although paralleling technique is being considered as the technique of choice, practically it may not be always possible to keep the intraoral Periapical film without

bending may be due to oral anatomy and patient's intolerance, which renders this technique impossible to implement in every situation.[14]

On the other hand, bisecting angle technique, which is routinely used in dental practice, was, relatively simple, quickly produces and comfortable to the patient, but it has an inherent drawback of image distortion. Even though having inherent image distortion, bisecting angle technique is still preferred in dental practice because of its resilience. Paralleling technique is a standardized method and should always be preferred when spatial accuracy and reproducibility were desired.

In paralleling technique, the film packet is kept in a film holder and positioned in the oral cavity parallel to the long axis of the tooth for investigation. The anatomy of the palate and shape of arches mean that the tooth and film packet cannot be in parallel and in contact. The film packet is positioned at some distance from the tooth. The X-ray tube head is aimed at right angles both vertically and horizontally to both the tooth and film packet. With the help of the film holder with film packet and X-ray tube head positions, the technique is reproducible.

In bisecting angle technique, the film packet is positioned close to the tooth without bending the packet. The angle formed between the long axis of the tooth and the film packet is assessed and bisected medially. The X-ray tube head is positioned at right angle to the bisecting line with the central ray of the X-ray beam aimed through the tooth apex. Vertical angulation of the X-ray tube head is the angle formed by continuing the line of the central ray until it meets the occlusal plane. Horizontal angulation of the X-ray tube head depicts that the central ray should be aimed through the interproximal contact areas, to avoid overlapping the teeth. The horizontal angulation is therefore, determined by the shape of the arch and the position of the teeth. This technique can be performed either by using a film holder who helps in supporting the film packet in the patient's mouth or by asking the patient to support the film packet gently using either an index finger orthumb or by using a film holder to avoid irradiating the patient'sfingers.[15] Focusing the x ray beam to the imaginary bisector in bisecting angle technique may not be accurate from individual to individual, where as in paralleling technique it is easy to practice and maintain accuracy to even reproduce if film is without bending film and placing the film parallel to the long axis of the tooth.

Undergraduate students had reported to make more technical errors when they used bisecting-angle radiographic technique than the paralleling technique. The purpose of the study is to know the opinion regarding usage to intra oral Periapical radiographic techniques.[16]

According to Ibrahim et al in a cross-sectional study performed to compare the efficacies and errors of Paralleling technique and Bisecting angle technique when used for endodontic working length determination the results of the study revealed that significantly higher proportion of retake due to errors was found with bisecting angle technique (24.16%), as compared to Paralleling technique (10.83%). Thus, concluded that the paralleling technique produces less distortion and is less variable, which is similartopresentstudy.[17]

Forsbergand Rushton V.E reported that radiographs taken with holders who had a positioning arm to guide alignment, which were designed to allow patients to bite together, while the film was exposed, had a lower intolerance rate than the holders.[18,19] (There were a limited number of studies[20] in which the use of the paralleling technique has been compared with the bisecting angle technique for technical accuracy of endodontic working length films[20,21] and present study being one among them.

Literature reveals that, use of film holders in endodontic practice ranges from 26.3%,[22] (to 41.7% of dentists [23] Moreover, the routine use of film holders ranges from 21.6% .23 Thus expanding use of film holders has been shown to have a relationship to those practitioners who use a rubber dam[22],those clinicians who are specialization in Endodontics[22] and also has a significant relationship to younger clinicians (Saunders et al.1999) to 26%.[22]Each of these

studies, however, has confirmed the superiority of the paralleling technique.[22,23] This result is similar to present study.

Owing to image accuracy aspects, there is mixed opinion regarding a type of technique to be preferred, but most of them preferred paralleling technique followed by bisecting angle technique and other techniques. Other techniques preferred under these aspects were for Orthopantomograph (OPG), Computed tomography (CT) and Cone beam computed tomography (CBCT) reason may be due to the limitations of the IOPA in delineating the extent of the underlying pathology.

Owing to operator and exposure parameters, individuals in a present study favored bisecting angle technique more than paralleling technique. Study conducted by kazzi et al a comparative study of three radiographic techniques used for endodontic working length estimation reveal expertise in either of technique maintains less discomfort for operator, patient and also prevents retakes thus decreasing unnecessary exposure.[24] Owing to other aspects the technique which is commonly advised for children and mentally challenged individuals were paralleling technique. Aps J K M conducted a study to determine general dental practitioner's awareness of dental radiography, the results of this study showed that the awareness of dental radiography in Flanders regarding dentomaxillo-facial radiology ispoor.[25] However, the results of present study revealed that though there is knowledge regarding the different types of techniques among general practitioners, but lack of application in regular practice, decreases their ability to get more accurate diagnostic radiograph. In the present study, paralleling technique showed better results in appreciation of details than the bisecting angle technique. It is important to develop the dental curriculum to ensure that both undergraduate and post-graduate students have the necessary competency when using these devices in clinical practice. There is still a great deal of work to be done to ameliorate the quality of radiographs and the knowledge and attitude of dental graduates regarding dento-maxillofacial radiology. Paralleling technique being the most accurate in image accuracy should be emphasized to practice and needed to be modified in conditions where it is not feasible to deal with.

Conclusion

We concluded that there is knowledge about the techniques, but lack of application decreases their ability to get more accurate diagnostic radiograph. Paralleling technique being the most accurate in image accuracy should be emphasized to practice and needed to be modified in conditions where it is not feasible to deal with.

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