

Image Distortion of the Roots of Maxillary Deciduous Molars on IOPA's Recorded with Bisecting Angle or a Modified Paralleling Technique

Shilpi Sanghvi¹, Ashwin Rao^{2*}, Y.M. Karuna²,
Karthik Shetty³ and Anupama Nayak²

¹Manipal College of Dental Sciences, Mangalore, Manipal Academy of Higher Education, Manipal, India.

²Department of Paedodontics and Preventive Dentistry, Manipal College of dental sciences, Mangalore. Manipal Academy of Higher Education, Manipal, India.

³Department of Conservative Dentistry and Endodontics, Manipal college of dental sciences, Mangalore, Manipal Academy of Higher Education, Manipal, India.

*Corresponding author E-mail: ashwin.rao@manipal.edu

<http://dx.doi.org/10.13005/bpj/1464>

(Received: 14 May 2018; accepted: 20 June 2018)

The maxillary deciduous molar periapical radiograph often presents a diagnostic challenge for the clinician due to the overlapping of their roots with the developing premolar tooth bud. Clear and distortion free images are necessary for decision making while planning the treatment. However, the practical anatomical difficulties discourage the clinician from using the paralleling technique in children. While looking for an alternative technique, it was hypothesized in the literature that the 20 degree paralleling compromise technique suggested by Van Aken (1969), could override the anatomic challenges in children and provide images that are superior compared to those recorded with the bisecting angle technique. To compare the image quality of maxillary deciduous molar IOPAR taken using the "20 degree paralleling compromise technique" with that taken using the "bisecting angle technique". Parallel double blinded randomized clinical trial. Sixty children who fulfilled the inclusion criteria were randomly split into two groups. In group A, the bisecting angle technique was used and in Group B the 20 degree paralleling compromise technique was used. The radiographs were categorized into three groups according to the quality of the image (1: Foreshortened image of the roots, 2: Elongated Image of the roots, 3: Undistorted well-defined image) by two independent observers who were blinded to the study and then compared. The obtained data was analysed for inter and intra observer agreements using Kappa statistics and analyzed for significance using the Chi square test. The p values obtained for category 1 and 2 were 0.21 and 0.99 for observer 1 and 0.16 and 0.33 for observer 2 respectively. Under the conditions of the study, there was no difference in the image quality of maxillary deciduous molar roots on IOPAR recorded using either the "bisecting angle" or the "20 degree paralleling compromise" techniques.

Keywords: Dental; Pedodontics; Radiography.

One of the important criteria which leads the clinician to make a decision on to retain the deciduous molar through pulp therapy or to extract

it is the remaining length of the deciduous molar root. Hence, accurate radiographic information is very essential. It is a well-established fact that the

periapical radiography using paralleling technique is the choice because the obtained images are more accurate and produce less distortion than those recorded using the bisecting angle principle^{1,2}.

However in young children, the paralleling technique is not recommended because of the high muscle attachments in the mandible and the shallow depth of the palate in the maxilla which prevent the proper placement of the film parallel to the long axis of the tooth³. Thus image distortion is one of the factor that makes the task of interpretation of the intra oral periapical radiograph (IOPAR) a difficult one in children. The task becomes even more difficult on the maxillary deciduous molar IOPAR due to the overlap of the developing premolar on the palatal root.

It was demonstrated that even if the film cannot be placed precisely parallel to the long axis of the tooth, radiographs superior to those recorded using bisecting angle technique can be obtained by placing the film within 20 degree of the parallel to the long axis of the tooth with the beam directed perpendicular to the film³. However, no study so far has evaluated this “20 degree paralleling compromise radiographic technique” for its image quality in children. Thus the aim of this study was to evaluate and compare the image quality of maxillary deciduous molar roots on IOPAR recorded using “20 degree paralleling compromise technique” with that of bisecting angle technique in children. The Null hypothesis was set as there will be no difference in the image quality of maxillary deciduous molar roots recorded with either of the two techniques.

MATERIAL AND METHODS

This was a double blinded randomized intergroup comparative study, which was initiated after obtaining the ethical clearance from the Institutional ethics committee (Protocol No. **14063**).

Sixty children below nine years of age who reported to the department of Paedodontics and Preventive Dentistry in whom an IOPAR of maxillary deciduous molars was indicated for diagnostic purposes were included in the study. Informed consent was obtained from the parents/guardian of included children. Children having physical/medical/emotional disability, gagging reflex and Frankle’s negative and definitely negative children were excluded from the study.

Using a simple randomization procedure with the flip of a coin, selected children were divided into two groups: Group A- IOPAR recorded using the bisecting angle technique (33 children) and Group B- IOPAR recorded using the 20 degree paralleling compromise technique (27 children). Size 0 or size 2 films were selected based on the age, palate depth and comfort of the child. Standard protocol was followed for radiation protection of the child and the operator. All the radiographs were recorded by a single operator.

For the bisecting angle technique, the central ray of the X-Ray beam was directed perpendicularly to a plane that bisects the angle created by the long axis of the tooth and the radiographic film packet. For the 20 degree paralleling compromise technique, the film was placed with a XCP (extension cone paralleling) instrument and positioner (Dentsply Rinn), within 20 degree of the parallel to the long axis of the tooth or as parallel as the depth of the palate in the child would permit with the beam directed perpendicular to the film. The radiographs were processed in an automated processor.

All the radiographs were analyzed by two Paedodontists (observers) who were not aware of the study design or purpose. The radiographs were observed in a well illuminated radiograph viewer. Depending upon the quality of maxillary molar roots, the IOPARs were divided into three categories- 1) foreshortened images of the roots,

Table 1. Inter observer agreement

Group	K
A	0.63
B	0.58

Table 2. Group A vs Group B ,results of chi square test

Observer	P value
1	0.219
2	0.161

2) elongated images of the roots and 3) undistorted and well defined images of the roots.

The inter agreements were calculated using Kappa statistics. The obtained qualitative values were statistically analyzed using the Chi Square test. While the level of significance was set at a P value <0.05.

RESULTS

The inter observer agreement was calculated as Cohen's Kappa. (K) shown in table 1. Results of Chi square test to analyze significance between Group A and Group B (Significance $P < 0.05$) is shown in table 2. At the significance level of $p < 0.05$, the values between Group A and Group B are interpreted as *not statistically significant*.

DISCUSSION

The paralleling technique has been considered the standard in intra oral periapical radiography. Many authors and studies have recommended the paralleling over the bisecting angle technique citing better image accuracy (1, 2, 4) But, the difficulties posed by the anatomic considerations discourage the clinician from recording high quality radiographs using paralleling technique in young children (3). This partially explains the paucity of studies in literature on paralleling techniques in children. This study compared a 20 degree paralleling compromise technique with the bisecting angle technique for image quality of maxillary deciduous molar roots in children.

Various options of film holders for recording IOPAR using paralleling technique include XCP film holder, hemostat with bite block, endoray This study used the XCP film holder with the positioner ring because it is said to produce very accurate radiographs (1, 5) Two observers were used to analyze the radiographs to increase the validity and accuracy of the results (6).

However, the results of this study showed no statistical significance in the image quality of maxillary deciduous molar roots on radiographs recorded with the bisecting or the 20 degree paralleling compromise technique. Though, paralleling technique is considered the standard

and has shown to be superior to the bisecting angle technique (7), it has to be emphasized that these studies were done on adults and children have other challenging considerations. Dale et al (8), suggested that, for the smaller child, the film holder may need to be reduced in size to accommodate the film and the child's mouth when using the paralleling technique. However since no pedo sized film holder was available in the market, in the present study adult size XCP film holder was used.

Also, there are studies in the literature which found no difference in image qualities of radiographs recorded with bisecting or paralleling techniques (9, 10), thus supporting the results of our study. However, these studies do not mention on the use of film holders for paralleling technique. Film holder plays an important role while taking IOPAR using paralleling technique. Bhakdinaronk A et al (5) reported that, for the buccal roots of maxillary molars, the bisecting-the-angle technique using the Rinn XCP film holder produced the least mean difference between radiographic image and tooth length.

Further studies are recommended to standardize intra oral radiographic techniques, either bisecting angle or paralleling techniques in children especially in maxillary deciduous molars to enable the clinician to see the three roots accurately there by enabling him/her to arrive at a proper diagnosis.

CONCLUSION

Under the conditions of this study, there was no difference in the image quality of maxillary deciduous molar roots on IOPARs recorded with the bisecting or the 20 degree paralleling compromise technique.

ACKNOWLEDGEMENT

The study has been funded by the Indian council of medical research.

REFERENCES

1. Kazzi D, Horner K, Qualtrough AC, Martinez-Beneyto Y, Rushton VE. A comparative study of three periapical radiographic techniques for endodontic working length estimation. *Int Endod*

- J.* **40**(7):526-31 (2007).
2. Stuart C. White, Michael J. Pharoah. Projection Geometry. In, Stuart C. White, Michael J. Pharoah (ed). *Oral Radiology: Principles and Interpretation*, 6th edition. St. Louis, *Missouri, Mosby*, 48-50 (2009).
 3. John W Preece. Dental Radiology. In, Stephen H.Y.Wei (ed). *Pediatric Dentistry: Total Patient Care*, 1st edition. Philadelphia, *Iea and Febiger*; 129-130 (1988).
 4. Forsberg J. Radiographic reproduction of endodontic “working length” comparing the paralleling and the bisecting-angle techniques. *Oral Surg Oral Med Oral Pathol.* **64**(3):353-60 (1987).
 5. Bhakdinaronk A, Manson-Hing LR. Effect of radiographic technique upon prediction of tooth length in intraoral radiography. *Oral Surg Oral Med Oral Pathol.* **51**(1):100-7 (1981).
 6. Saunders MB, Gulabivala K, Holt R, Kahan RS. Reliability of radiographic observations recorded on a proforma measured using inter- and intra-observer variation: a preliminary study. *Int Endod J.* **33**(3):272-8 (2000).
 7. Molven O, Halse A, Fristad I. Long-term reliability and observer comparisons in the radiographic diagnosis of periapical disease. *Int Endod J.* ; **35**(2):142-7 (2002).
 8. Forsberg J, Halse A. Periapical radiolucencies as evaluated by bisecting-angle and paralleling radiographic techniques. *Int Endod J.* **30**(2):115-23 (1997).
 9. Forsberg J, Halse A. Radiographic simulation of a periapical lesion comparing the paralleling and the bisecting-angle techniques. *Int Endod J.* **27**(3):133-8 (1994).
 10. Dale A Miles, Edwin T Parks. Radiographic Techniques. In, McDonald and Avery (ed). *Dentistry for the Child and Adolescent*, 9th edition. Missouri, Elsevier, 54-55 (2011).