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ORIGINAL ARTICLE

Evaluation of canal curvature on accuracy of apex locator- An invitro study

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ABSTRACT:

Background: Accurate working length determination helps to decide the extent to which the instruments are placed. The present study was conducted to evaluate the effect of canal curvature on accuracy of apex locator. **Materials & Methods:** The present study was conducted on 54 mandibular molar teeth. The file clip of apex locator was attached to the file and the file inserted until the “Apex” reading was reached in Root ZX. This was the electronic working length (EWL). Differences between EWL and actual working length (AWL) were calculated. **Results:** Group I teeth were with root curvature < 20°, group II with 20-36° and group III with >36°. Each group had 17 teeth. Maximum difference was observed in group III, followed by group II and group I. **Conclusion:** Authors found that mild curvature group revealed better reading with apex locator than moderate and severe groups.

Key words: Apex locator, Canal curvature, electronic working length

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INTRODUCTION

The removal of all pulp tissue, necrotic material and microorganisms from the root canal is essential for endodontic success. This can only be achieved if the length of the tooth and the root canal is determined with accuracy. The outcome of treatment of roots with necrotic pulps and periapical lesions is influenced significantly by the apical level of the root filling. Traditionally, the point of termination for endodontic instrumentation and obturation has been determined by taking radiographs.¹

Electronic apex locators have been used clinically for over 30 years as an aid in deciding where canal preparation and obturation should terminate.² Accurate working length determination helps to decide the extent to which the instruments are placed and worked in the root canal system and this will determine how effectively the unwanted items are removed from it. This will also limit the depth to which the canal filling may be placed.³ Correct working length determination will also affect the degree of pain and discomfort that the patient would feel following the appointment. Thus it plays an important role in determining the success of the treatment. Accepted techniques for the determination of the

working length include tactile, radiographic and electronic method.⁴ The present study was conducted to evaluate the effect of canal curvature on accuracy of apex locator.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It comprised of 54 mandibular molar teeth. The study protocol was approved from institutional ethical committee. In all teeth working length was assessed with 10 K file. The degree of root canal curvature was determined by Schneider’s method. Samples were divided into three groups. Group I were with mild canal curvature (< 20°), group II were moderate canal curvature (20-36°) and group III were severe canal curvature (>36°). The file clip of apex locator was attached to the file and the file inserted until the “Apex” reading was reached in Root ZX. This was the electronic working length (EWL). Differences between EWL and actual working length (AWL) were calculated. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of teeth

Groups	Group I (17)	Group II (17)	Group III (17)
Root curvature	< 20°	20-36°	>36°

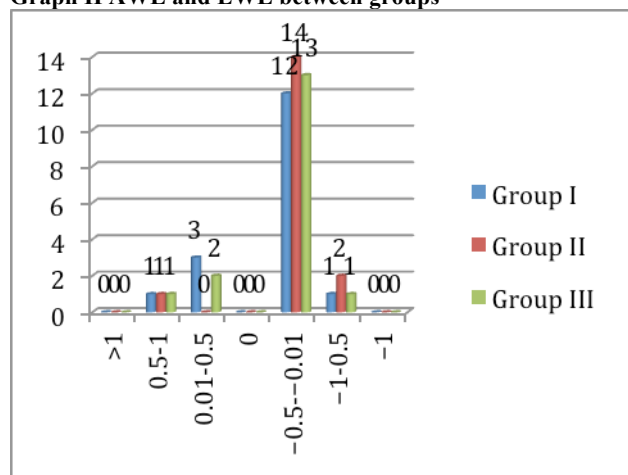
Table I shows that group I teeth were with root curvature < 20°, group II with 20-36° and group III with >36°. Each group had 17 teeth.

Table II AWL and EWL between groups

Difference	Group I	Group II	Group III	P value
>1	0	0	0	0.02
0.5-1	1	1	1	
0.01-0.5	3	0	2	
0	0	0	0	
-0.5--0.01	12	14	13	
-1-0.5	1	2	1	
-1	0	0	0	

Table II shows that maximum difference was observed in group III, followed by group II and group I.

Graph II AWL and EWL between groups



DISCUSSION

Failure to accurately determine and maintain working length (WL) may result in length being too long leading to apical perforation, overfilling or overextension and increased post-operative pain with prolonged healing period and a lower success rate.⁵ A WL too short of the apical constriction can lead to incomplete cleaning and under filling causing persistent discomfort, and continued periradicular infection. The apical

constriction (AC) is suggested as the end-point of root canal treatment.⁶ This anatomical landmark is a point where pulpal and periodontal tissues reach together and is identified as minor apical foramen. It is generally accepted to be located at 0.5-1 mm coronal to the radiographic apex. AC might be located on one side of root at a distance up to 3 mm from the anatomical apex. Moreover, the position and topography of minor foramen varies between teeth, making it difficult to determine clinically.⁷ The present study was conducted to evaluate the effect of canal curvature on accuracy of apex locator.

In present study, we included 54 mandibular molars. Group I teeth were with root curvature < 20°, group II with 20-36° and group III with >36°. Each group had 17 teeth. Santosh et al⁸ conducted a study on sixty mandibular posterior teeth were decoronated. A number (No.) 10 file was inserted into the mesiobuccal canal and radiographs were taken to determine the degree of curvature by Schneider’s method. Samples were divided into three groups of mild (<20°), moderate (20-36°) and severe curvature (>36°). After enlarging the orifice, the actual canal length was determined by introducing a file until the tip emerged through the major foramen when observed under 20X magnification. The teeth were embedded in an alginate model and the Root ZX was used to determine the electronic length. The difference in measurement of Actual and Electronic working length was statistically significant between group 1 and 2 (P< 0.05) as well as between group 1 and group 3 (P < 0.05) with group 1 showing the lowest difference. Ravanchad et al⁹ in their study a total of 84 patients with 188 canals were randomized into two groups; in group 1, the working length was determined by working length radiograph, whereas in group 2, it was determined by the Raypex5 electronic apex locator (VDW, Munich, Germany). Length adequacy was assessed in each group for master cone and final obturation radiography and categorized into short, acceptable, and over cases. There was no statistically significant difference between the rates of acceptable (master cone radiography: group 1 = 82.1% and group 2 = 90.4%; final radiography: group 1 = 85.7% and group 2 = 90.4%) and short cases (master cone radiography: group 1 = 7.1% and group 2 = 8.7%; final radiography: group 1 = 1.2% and group 2 = 1%) between the two groups. Over cases in master cone radiography were significantly more in group 1 (10.7%) than group 2 (1%) (χ^2 , p = 0.00). However, this category did not show a significant difference for final obturation between group 1 (13.1%) and group 2 (8.7%).

We found that maximum difference was observed in group III, followed by group II and group I. Mello et al¹⁰ included twenty-one studies, five RCTs and 16 in vivo diagnostic test studies. There was considerable heterogeneity between the EALs used and the study designs and a narrative summary of the findings were presented. Working length measurement was compared using three different methods: distance to the radiographic apex in teeth undergoing root canal treatment, (11 studies); concordance between the comparative measurements with EAL and radiography, (two studies); distance to specific anatomic apical reference points evaluated after tooth extraction (four studies). The body of evidence was once again assessed as of low quality. It is suggested that working length determination by using EAL may perform better than radiography alone.

CONCLUSION

Authors found that mild curvature group revealed better reading with apex locator than moderate and severe groups.

REFERENCES

1. Sunanada, Ebrahim AK, Wadachi R, Suda H. *Ex vivo* evaluation of the ability of four different electronic apex locators to determine the working length in teeth with various foramen diameters. *Aust Dent J* 2006;51:258-62.
2. Brunton PA, Abdeen D, MacFarlaneTV. The effect of an apex locator on exposure to radiation during endodontic therapy. *J Endod* 2002; 28: 524-526.
3. Pagavino G, Pace R, Bacetti T. A SEM study of *in vivo* accuracy of the Root ZX electronic apex locator. *J Endod* 1998;24:438-41.
4. Ibarrola JL, Chapman BL, Howard JH, Knowles KI, Ludlow MO. Effect of preflaring on Root ZX apex locators. *J Endod* 1999;25:625-6.
5. Suzuki, Venturi M, Breschi L. A comparison between two electronic apex locators: An *in vivo* investigation. *Int Endod J* 2005;38:36-45.
6. Guitierrez G, Aguayo P. Apical foraminal opening in human teeth. Number and location. *Oral Surg Oral Med Oral Pathol Endod* 1995; 79: 769-773.
7. Kim E, Lee SJ. Electronic Apex Locator. *Dent Clin North Am* 2004; 48: 35-54.
8. Santhosh L, Raiththa P, Aswathanarayana S, Panchajanya S, Reddy JT, Susheela SR. Influence of root canal curvature on the accuracy of an electronic apex locator: An *in vitro* study. *J Conserv Dent* 2014;17:583-6.
9. Ravanshad S, Adl A, Anvar J. Effect of working length measurement by electronic apex locator or radiography on the adequacy of final working length: a randomized clinical trial. *Journal of endodontics*. 2010 Nov 1;36(11):1753-6.
10. Mello I. Use of electronic apex locators may improve determination of working length. *Evidence-based dentistry*. 2014 Dec;15(4):120.