



## Dentist's Perception towards using Radiography and Apex Locators in Endodontics.

<sup>1</sup>Dr. Renuka Nagarale, <sup>2</sup>Dr. Neetu Kadu, <sup>3</sup>Ulfat Zehra Sayyed, <sup>4</sup>Aqduş Shaikh, <sup>5</sup>Pooja Mane, <sup>6</sup>Naushad Khan.

<sup>1</sup>HOD & Professor, <sup>2</sup>Associate Professor, <sup>3,4,5,6</sup> Undergraduate students  
Department of Public Health Dentistry.

M.A.Rangoonwala College of Dental Science and Research Centre Pune.

Date of Submission: 10-01-2024

Date of Acceptance: 20-01-2024

**ABSTRACT:** Introduction-Despite being the gold standard as well as a routine fashion in endodontics, radiographic working length( WL) determination owns numerous downsides. Electronic apex- locators( EALs) are recommended to round radiographies. Several styles have been used to determine the working length( WL) of root canals. Radiographic system is traditionally the most common fashion in working length( WL) determination. The end of this study is to assess the dentist's perception towards using Radiography and Apex Locators in Endodontics.

Methodology- This cross-sectional study was performed with a sample of 210 male and female dentist's in Pune. A questionnaire with 21 questions was formed and was distributed among dentists using radiographic system and Electronic apex locator in conventions and dental sodalities in Pune. The Cronbach's nascence was 0.738 which was set up to be satisfactory. The study was conducted during the morning of the 2022- 2023.

Results-46.3%( n = 95) believed that they always calculate on radiography to determine the working length of a tooth as a standard procedure. When asked about the primary purpose of using radiography in endodontics the maximum responses were to detect the apex of the root and to estimate the extent of journal pathology.

Conclusion- This study delved the perception of dentists towards using Radiography and Apex Locators in Endodontics. The maximum responses attained for the use of radiography and apex locator was to detect the apex of the root and to estimate the extent of journal pathology. The perception of the Dentist's towards the use of apex locator was to determine the working length directly but utmost of them believed that they always calculate on radiography to determine the working length of a tooth as a standard procedure.

### I. INTRODUCTION :

An interdisciplinary area of dentistry called endodontics is concerned with the identification, operation, and avoidance of conditions that damage the inner of teeth. When decay or infection has entered your teeth's pulp chamber and root canals, endodontic treatments are needed.

Although root canal treatment(RCT) is regarded as a pivotal aspect of dental care, general dentists(GDPs) still find it to be a delicate process.[2] exploration indicates that over 50% of teeth suffer unacceptable endodontic care, and between 30 and 50 percent of teeth with root canal treatment parade radiographic pointers of apical periodontitis [3]. Determining and conserving the natural length of the root canal treatment is one of the primary challenges of endodontic treatment.

One important element that affects how well an RCT(root canal treatment) turns out is the precise computation of the working length( WL).[4,5] The working length( WL) of root canals has been determined using a variety of ways. The most extensively habituated system for determining working length( WL) is the radiographic system.[6] likewise, it's a pivotal part of every step of root canal treatment(RCT), from individual and planning to the mechanical phases of the procedure and evaluation of the endodontic issues.[ 7] But this system has certain downsides that mean it's not applicable in every circumstance. A two-dimensional image of the roots is produced via radiography.[ 8]

Likewise, superimposition of other structures generally makes working length( WL) determination delicate. Tooth inclination and angulation of the x-ray tube also have an influence on the results. Other disadvantages include fashion perceptivity, subjectivity[ 6] and the peril of ionizing radiation[ 9]. The development and product of electronic apex locators( EALs) for locating the canal boundary, has been one of the



most remarkable inventions in endodontics that has simplified and docked the treatment procedure and accordingly has bettered its outgrowth.[ 10] nonetheless, a number of experimenters have stressed the benefits of combining both radiographic and electronic styles to optimize dimension delicacy.[ 11] In this regard, some examinations have shown disinclination among clinicians to use Electronic Apex Locators( EALs).[12, 13, 14] The end of this study is to assess the dentist's perception towards using Radiography and Apex Locators in Endodontics.

### II. METHODOLOGY :

This cross-sectional study was performed with a sample of 210 male and female dentist's in Pune. The sample size is determined using the following formula  $n = z^2 \cdot p(1-p) / d^2$  where,  $p =$  former anticipated values = 0.95,  $d =$  wanted periphery of error = 0.5,  $Z_{1-\alpha/2}$  confidence interval of 95,  $z = 1.96$ . The advised Sample size

was 182 and Considering 10 of non-responsiveness, sample size is calculated as  $N = n/0.9 = 264/0.9 = 293$ . A questionnaire with 21 questions was formed and was distributed among dentists using radiographic system and Electronic apex locator in conventions and dental sodalities in Pune. The Cronbach's nascence was 0.738 which was set up to be satisfactory. The study was conducted during the morning of the 2022- 2023. The questionnaire was designed on Google forms( Google LLC, Mountain View, California, United States) and the link was distributed among the dentist's through email, whatsapp number and other social media platforms( Instagram, Telegram,etc.) points of the study were explained upon distribution. All participant's took part in the study freely and no incentives were given to the respondent

### III. RESULT :

The total number of respondents for this survey were 205, out of which 49.3% were male and 50.7% were female. (Table 1)

	(N)	Percentage
<b>interns</b>	<b>98</b>	<b>47.8</b>
<b>post graduates</b>	<b>41</b>	<b>20.0</b>
<b>dental practioners</b>	<b>66</b>	<b>32.2</b>
<b>Total</b>	<b>205</b>	<b>100.0</b>

Maximum number of participants were interns, n=98; followed by dental practitioners, n=66; and post graduates, n=41. (Table 2)

	(N)	Percentage	P value
<b>To locate the apex of the root</b>	<b>101</b>	<b>49.3</b>	<b>0.001</b>
<b>To evaluate the extent of periapical pathology</b>	<b>101</b>	<b>49.3</b>	
<b>To measure the length of the crown</b>	<b>3</b>	<b>1.5</b>	
<b>Total</b>	<b>205</b>	<b>100.0</b>	



When asked about the primary purpose of using radiography in endodontics the maximum responses were to locate the apex of the root and to

evaluate the extent of periodical pathology, n=101, with an observed p value = 0,001. (Table 3)

**Table 4 :Which imaging technique is commonly used in endodontics for periapical assessment**

	(N)	Percentage
<b>Cone beam computer tomography (CBCT)</b>	<b>159</b>	<b>77.6</b>
<b>Magnetic resonance imaging (MRI)</b>	<b>8</b>	<b>3.9</b>
<b>Panoramic radiography</b>	<b>35</b>	<b>17.1</b>
<b>Ultrasonography</b>	<b>3</b>	<b>1.5</b>
<b>Total</b>	<b>205</b>	<b>100.0</b>

77.6 % (n=159) respondents opted CBCT as the most commonly used imaging method to assess periapical status in endodontics. (Table 4)

**Table 5 :What is the main advantage of using an Apex locator during root canal treatment**

	(N)	Percentage
<b>It provides information on root canal anatomy</b>	<b>12</b>	<b>5.9</b>
<b>It helps in canal disinfection</b>	<b>10</b>	<b>4.9</b>
<b>It determines the working length accurately</b>	<b>180</b>	<b>87.8</b>
<b>It sterilized the root canal</b>	<b>3</b>	<b>1.5</b>
<b>Total</b>	<b>205</b>	<b>100.0</b>

According to 87.8% of the participating population the advantage of using apex locator during root canal treatment was to determine the working length accurately. (Table 5)

Around 75.1 % (n=154) were of the opinion that periapical radiography is most effective in detecting root fractures and 66.8 %

(n=137) opted the role of identifying root canal anatomy is to evaluate the number and curvatures of the canals.

77.1 % respondents main concern with excessive radiation exposure in dental radiography was potential damage to the thyroid gland.



**Table 6 :Which factor affects the accuracy of an Apex locator in determining the working length of a root canal**

	(N)	Percentage
<b>Patients age</b>	<b>20</b>	<b>9.8</b>
<b>Tooth anatomy</b>	<b>45</b>	<b>22.0</b>
<b>Saliva flow</b>	<b>123</b>	<b>60.0</b>
<b>Operator's experience</b>	<b>17</b>	<b>8.3</b>
<b>Total</b>	<b>205</b>	<b>100.0</b>

Saliva flow is the factor that affects the accuracy of an Apex locator in determining the working length of a root canal according to 60 % (n=123) of the individuals. (Table 6)

67.3 % are excited and eager to adopt advanced radiographic technique in your endodontic practice.

**Table 7 :What is your attitude towards the use of an Apex locator for root canal procedures**

	(N)	Percentage
<b>Highly supportive, believing it improves precision</b>	<b>166</b>	<b>81.0</b>
<b>Willing to use it if it doesn't complicate the procedure</b>	<b>32</b>	<b>15.6</b>
<b>Indifferent,as you reply on traditional methods</b>	<b>7</b>	<b>3.4</b>
<b>Total</b>	<b>205</b>	<b>100.0</b>

81 % (n=166) of the respondents believed that apex locator Highly supportive, believing it improves precision whereas 15.6 % (n=32) opted that they are willing to use it if it doesn't complicate the procedure. (Table 7)

64.9 % believed that advancements in radiography and apex locator technology Significantly improves patient comfort.



**Table 8 :When considering root canal treatment, how often do you rely on radiography to determine the working length of a tooth**

	(N)	Percentage	P value
Always, it's a standard practice	95	46.3	0.001
Frequently, but not always	36	17.6	
Occasionally, only when necessary	68	33.2	
Rarely, preferring clinical judgment	6	2.9	
Total	205	100.0	

46.3 % (n=95) believed that they always rely on radiography to determine the working length of a tooth as a standard procedure. This is statistically significant with a p value + 0.001. (Table 8)

**Table 9 :In your clinical experience, how accurate do you find Apex locators in determining the working length of root canals**

	(N)	Percentage
Very accurate and reliable	51	24.9
Fairly Accurate, with occasional discrepancies	140	68.3
Somewhat accurate but often challenging	10	4.9
Not accurate enough for routine use	4	2.0
Total	205	100.0

68.3 % (n=140) have found Apex locators in determining the working length of root canals fairly accurate while 24.9 % (n=51) have found it Very accurate and reliable. (Table 9)

#### IV. DISCUSSION :

This present study is unique in its own way as it establishes the perception of dentists towards the use of radiographs and electronic apex locators in endodontics. In the present study a mixed group of individualities including interns, general dental practitioners and post graduates were



estimated for their perception towards the use of radiographs and electronic apex locators in endodontics. The primary purpose of using radiography was to detect the apex of the tooth, to estimate the extent of journal pathology. Traditionally, radiography was widely conceded as the stylish and most common fashion in this regard. still, the limitations of this system are well known, including two-dimensional images, superimposition of structures and geometric deformation. As the electronic system for WL dimension eliminates some of the problems associated with traditional radiographic styles, it's delicacy and ease of use has progressed significantly during recent times.

In our study, when the question was asked ' Which imaging technique is commonly used in Endodontics for periapical assessment ' , 77.6% responses were Cone beam computed tomography (CBCT).

In a similar study done by evaluating 6 studies carried out for Periapical Radiograph (PR) and CBCT( Cone beam computed tomography ) (Barthel et al., 2004[26]; Brynolf, 1967[27]; Green et al., 1997[28]; Kanagasigam, Hussaini, et al., 2017[29], Kanagasigam, Lim, et al., 2017[29]; Kruse et al., 2019[30]). The diagnostic accuracy was reported to be significantly higher in case of CBCT (cone beam computed Tomography) [22]

In a study done by McDonald and Hovland[23] the accuracy of apex locator device was 93.3%. According to this study Apex locator was an appropriate substitute for radiography[23].

Similarly in our study, accuracy for apex locator is believed to be 'fairly accurate with occasional discrepancies' by 68.3% and very accurate by 24.9%. Only 7% believe that apex locator is not accurate for Working length determination.

A study shows that 90.85% Endodontists and 88.5% Other Specialists used Electronic Apex locator for both single and multirouted teeth for root canal procedures[24]. And According to our study 81.0% (n=166) believe that Apex locator for root canal procedures is highly supportive and it improves precision.

In a study the practitioners who participated used the following methods for detecting working length: 18% radiography, 32% electronic apex locator, 7% hand sensitivity, and 43% radiography and electronic apex locator[25]. While in our study 33.2% (n=68) use radiography for working length determination occasionally and 46.3% (n=95) always.

In a study by Maryam Raoof et al[1], a noticeable 23.5% of General Dental Practitioners (GDPs) recorded no use of radiography to determine the master cone position in the canal maybe due to ethical importance for reducing x-ray exposures due to multiple x-rays.[1]

Similarly in our study 79.5% practitioner support that there should be reduction in radiographic exposures.

Because of the hazards of radiation, the technical problems associated with radiographic techniques and to avoid over-instrumentation beyond the canal terminus, electronic working length determination has gained popularity amongst both general dentists and endodontists .[21]

Electronic apex locators reduce the number of radiographs required and assist where radiographic methods create difficulty. The development of the electronic apex locator has helped make the assessment of working length more accurate and predictable. [21]

In summary, Electronic apex locators are increasingly embraced for determining working length, with high perceived accuracy and support from practitioners. The survey also reveals a growing ethical concern about radiographic exposures, prompting a trend towards reduction. Overall, technological advancements, particularly in electronic apex locators and CBCT, are reshaping endodontic approaches by improving precision, reducing radiation exposure, and enhancing diagnostic capabilities.

## V. CONCLUSION :

This study investigated the perception of dentists towards using Radiography and Apex Locators in Endodontics. In this study the participants majorly belonged to interns posted in the department of endodontics, followed by general dental practitioners and then post graduates. The maximum responses obtained for the use of radiography and apex locator was to locate the apex of the root and to evaluate the extent of periodical pathology. The perception of the participants towards the use of apex locator was to determine the working length accurately but most of them believed that they always rely on radiography to determine the working length of a tooth as a standard procedure. The participants were eager to use different advancements in terms of radiography and apex locator but wished to focus majorly on the use of radiographic method to determine the working length of the tooth. Majority of the practitioners and interns have found the use of apex locator to be fairly accurate with occasional



discrepancy proving the use of radiographic method to be more precise and accurate.

#### REFERENCE :

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4224766/>
2. Ravanshad S, Sahraei S, Khayat A. Survey of Endodontic Practice amongst Iranian Dentists Participating Restorative Dentistry Congress in Shiraz, November 2007. Iran Endod J. 2008;2(4):135–42.
3. Peng L, Ye L, Tan H, Zhou X. Outcome of root canal obturation by warm gutta-percha versus cold lateral condensation: a meta-analysis. J Endod. 2007;33(2):106–9.
4. Ng YL, Mann V, Rahbaran S, Lewsey J, Gulabivala K. Outcome of primary root canal treatment: systematic review of the literature Part 2 Influence of clinical factors. Int Endod J. 2008;41(1):6–31.
5. Kojima K, Inamoto K, Nagamatsu K, Hara A, Nakata K, Morita I, Nakagaki H, Nakamura H. Success rate of endodontic treatment of teeth with vital and nonvital pulps. A meta-analysis. Oral Surg Oral Med Oral Pathol Oral RadiolEndod. 2004;97(1):95–9.
6. 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. 2007;40(7):526–31.
7. Faculty of general dental practitioners. Selection criteria for dental radiography. London: FGDP(UK); 2004.
8. ElAyouti A, Weiger R, Lost C. The ability of root ZX apex locator to reduce the frequency of overestimated radiographic working length. J Endod. 2002;28(2):116–9.
9. Pendlebury ME, Horner K, Eaton KA. Selection Criteria for Dental Radiography, 1st Edition. London, UK: 2004. pp. 6–17.
10. Farokh Gisour E, Zarmehi S. The use of instruments by Iranian endodontics and general practioners. The Open Dentistry J. 2012;6:105–10.
11. Kim E, Marmo M, Lee CY, Oh NS, Kim IK. An in vivo comparison of working length determination by only root-ZX apex locator versus combining root-ZX apex locator with radiographs using a new impression technique. Oral Surg Oral Med Oral Pathol Oral RadiolEndod. 2008;105(4):e79–e83.
12. Orafi I, Rushton VE. The use of radiography and the apex locator in endodontic treatment within the UK: a comparison between endodontic specialists and general dental practitioners. Int Endod J. 2013;46(4):355–64.
13. Bjorndal L, Reit C. The adoption of new endodontic technology amongst Danish general dental practitioners. Int Endod J. 2005;38(1):52–8.
14. Hommezm GM, Braem M, De Moor RJ. Root canal treatment performed by Flemish dentists. Part 1. Cleaning and shaping. Int Endod J. 2003;36(3):166–73.
15. Leonardo MR, Silva LAB, Nelson-Filho P, Silva RAB, Raffaini MSGG. Ex vivo evaluation of the Ex vivo evaluation of the accuracy of two electronic apex locators during root canal length determination in primary teeth. IntEndod J 2008;41(4):317-21
16. Kim E, Lee SJ. Electronic apex locator. Dent Clin N Am 2004;48(1):35-54. 14.
17. Griffiths BM, Brown JE, Hyatt AT, Linney AD. Comparison of three imaging techniques for assessing endodontic working length. IntEndod J 1992;25:279-287.
18. Kim E, Marmo M, Lee CY, Oh NS, Kim IK. An in vivo comparison of working length determination by only root-ZX apex locator versus combining root-ZX apex locator with radiographs using a new impression technique. Oral Surg Oral Med Oral Pathol Oral RadiolEndod 2008;105(4):79-83.
19. Lamus F, Katz JO, Glaros AG. Evaluation of a digital measurement tool to estimate working length in endodontics. JContemp Dent Pract 2001;2:24-30.
20. Neena IE, Ananthraj A, Praveen P, Karthik V, Rani P. Comparison of digital radiography and apex locator with the conventional method in root length determination of primary teeth. J Indian Soc Pedod Prev Dent 2011;29(4):300-4.
21. Radiographic Practices & The Use of Apex Locators In Endodontic Treatment In Mumbai – A Comparison of Perceptions Between Endodontists & Other Dental Practitioners. Bhagwat Sumita A. Mds1, Chalkar Aaditya Mds2, Padhye Leena V. Mds3
22. <https://onlinelibrary.wiley.com/doi/10.1111/iej.13921>
23. MC Donald N. An Evaluation of the Apex Locator Endocator. JOE 1990;16:5-8.



24. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 15, Issue 8 Ver. XI (August. 2016).
25. [https://www.researchgate.net/deref/https%3A%2F%2Fdoi.org%2F10.5577%2Fjomdi.e230324?\\_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InNpZ251cCIslInBhZ2UiOiJwdWJsaWNhdGlvbiJ9fQ](https://www.researchgate.net/deref/https%3A%2F%2Fdoi.org%2F10.5577%2Fjomdi.e230324?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InNpZ251cCIslInBhZ2UiOiJwdWJsaWNhdGlvbiJ9fQ)
26. <https://www.sciencedirect.com/science/article/abs/pii/S0099239905602907>
27. Rechenberg DK, Munir A, Zehnder M. Correlation between the clinically diagnosed inflammatory process and periapical index scores in severely painful endodontically involved teeth. *Int Endod J.* 2021 Feb;54(2):172-180. doi: 10.1111/iej.13407. Epub 2020 Oct 13. PMID: 32918280; PMCID: PMC7894281.
28. Green TL, Walton RE, Taylor JK, Merrell P. Radiographic and histologic periapical findings of root canal treated teeth in cadaver. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1997 Jun;83(6):707-11. doi: 10.1016/s1079-2104(97)90324-3. PMID: 9195628.
29. Kanagasingam S, Hussaini HM, Soo I, Baharin S, Ashar A, Patel S. Accuracy of single and parallax film and digital periapical radiographs in diagnosing apical periodontitis - a cadaver study. *Int Endod J.* 2017 May;50(5):427-436. doi: 10.1111/iej.12651. Epub 2016 May 14. PMID: 27063356.
30. Kruse C, Spin-Neto R, Evar Kraft DC, Vaeth M, Kirkevang LL. Diagnostic accuracy of cone beam computed tomography used for assessment of apical periodontitis: an ex vivo histopathological study on human cadavers. *Int Endod J.* 2019 Apr;52(4):439-450. doi: 10.1111/iej.13020. Epub 2018 Oct 25. PMID: 30267421.