



Knowledge Attitude and Practice for Use of Apexlocator among Endodontist in Tamilnadu

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ABSTRACT: Background: Determining the working length accurately is critical for the success of root canal treatment (RCT). Apex locators are widely recognized as essential tools for improving precision during RCT by accurately measuring the root canal length. Despite their benefits, barriers such as cost, lack of knowledge, and technical issues hinder their consistent use. This study aims to evaluate the knowledge, attitude, and practice (KAP) of endodontists in Tamil Nadu regarding the use of apex locators.

Methods: A cross-sectional survey was conducted among 127 endodontists in Tamil Nadu. A structured questionnaire comprising 12 questions was distributed via online platforms. The questionnaire focused on demographic details, knowledge, attitudes, and practices related to apex locator use. Data analysis was performed to assess associations between demographic factors and KAP responses.

Results: The study revealed that 81.5% of participants regularly use apex locators during RCT, while 18.5% do not. About 51.9% strongly agreed that apex locators are essential, with 33.3% agreeing. Lack of knowledge (18.5%) and high cost (11.1%) were identified as the primary barriers to apex locator use. False readings (37%) and calibration issues (18.5%) were reported as common challenges. No significant association was found between years of experience and apex locator usage, but there was a notable correlation between practice type and challenges encountered.

KEYWORDS: Apex Locator, Root Canal Treatment, Working Length Determination, Endodontics, Electronic Measurement, Dental Technology, KAP Study, Tamil Nadu Endodontists

I. INTRODUCTION

Establishing the working length is one of the most vital steps connected to the successful results of root canal treatment (RCT). Successful

cleaning, shaping, and obturation can only occur after accurately determining the working length, since an incorrect length undermines biomechanical preparation (BMP) and obturation, resulting in the continued presence of microbes¹. Apex locators are electronic instruments utilized for measuring the length of the root canal space². The advancement of electronic apex locators has enhanced the accuracy and predictability of determining working length³.

Many research works have shown the precision and dependability of apex locators, leading to the creation of various device generations aimed at enhancing functionality⁴. The use of apex locators alongside radiographic techniques enhances accuracy in measuring the length of the root canal, reducing the likelihood of procedural mistakes⁵. Nonetheless, elements like the price of apex locators, limited awareness, and operator expertise can affect their utilization⁶.

This research assesses the knowledge, attitudes, and practices (KAP) of endodontic specialists concerning the utilization of electronic apex locators in RCTs within Tamil Nadu. The objective is to evaluate knowledge about the care standards related to working length measurement with apex locators, while also examining the impact of demographic elements and professional background⁷.

II. MATERIAL AND METHODS

This study utilized a questionnaire-based survey to evaluate the knowledge, attitude, and practice (KAP) of endodontists regarding the use of apex locators for working length determination. The survey was conducted online using a Google Form, which was shared through various social media platforms to reach the target audience.

A study was initially conducted with a sample of 127 randomly selected participants from different universities to prevalidate and refine the



questionnaire questionnaires consist of 12 questions

DEMOGRAPHIC DATA

Age

- 20 - 30
- 31 - 40
- 41 - 50
- 51 above

Gender

- Male
- Female

Year of experience in endodontics

- Less than 5 years
- 5 - 10 years
- More than 10 years

Type of practice

- Clinician
- Academic institution
- Both

KNOWLEDGE

1. Do you regularly use an apex locator in your endodontic practice?

- Yes
- No

2. Do you believe that apex locators are essential in modern endodontic practice?

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

3. How often do you update your knowledge about apex locators ?

- Once a year
- 6 month once
- Never

ATTITUDE

4. How confident are you in using apex locators during endodontic treatment?

- Very confident
- Confident
- Neutral
- Not confident

5. Do you believe apex locators improve the accuracy of working length determination?

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

6. What are the barriers to the use of Apex locators in your practice?

- High cost
- Lack of knowledge
- Time constraints
- No barriers
- Other

PRACTICE

7. Do you combine apex locator reading with a radiographic method ?

- Always
- Sometimes
- Never

8. Specify the type of difficulty encountered while using apex locators?

- Calibration issue
- False reading
- Poor visibility in canal
- Other

9. In which condition do apex locators show incorrect reading?

- Open apex
- Weeping canal
- Apical resorption / lesion
- All the above
- Other:

10. Do you believe that the reading of an Apex locator differs between endodontic retreatment and conventional RCT ?

- Yes
- No

11. Do you use apex locators in which tooth?

- Anterior
- Posterior
- Both

12. Which generation of Apex locators are you using?

- First generation of Apex locators
- Second generation of Apex locators
- Third generation of Apex locators
- Fourth generation of Apex locators
- Not aware

The questionnaire consisted of sections focusing on demographic details, knowledge, attitudes, and clinical practices related to apex locator usage. Responses were collected anonymously to maintain confidentiality and encourage honest feedback.



III. STATISTICAL ANALYSIS:

The survey's findings were examined to assess correlations between endodontists' knowledge, attitudes, and practices (KAP) about apex locators and demographic characteristics like

age, years of experience, and kind of practice. Chi-square tests were used to determine statistical significance; a p-value of less than 0.05 was deemed significant.

IV. RESULT :

TABLE 1 REPRESENTS THE DESCRIPTIVE STATISTICS BASED ON AGE GENDER AND YEAR OF STUDY AMONG THE STUDY PARTICIPANTS

PARAMETER	OPTION	FREQUENCY	PERCENTAGE
AGE	20-30	80	63.0
	31-40	43	33.3
	41-50	4	3.7
GENDER	Female	66	51.9
	Male	61	48.9
YEARS OF EXPERIENCE	5-10 years	23	18.5
	Less than 5 years	90	70.4
	More than 10 years	14	11.1
TYPE OF WORK	Academic institution	37	29.6
	Both	52	40.7
	Clinician	38	29.6

TABLE 1 represents the descriptive statistics based on age, gender and year of study among the study participants which is based on age 63% where 20 - 30 years 33.3% where 31- 40 years 3.7 % where 41 - 50 years . When the year of experience is considered there were 18.5%

belonging to 5 - 10 years 70.4 % where less than 5 years 11.1% were more than 10 years . Based on type of work of study participants it was denoted by 29.6% belonging to academic institution 40.7% where both academic and clinician 29.6 % where clinician only



TABLE 2 REPRESENTS THE DISTRIBUTION OF RESPONSES GIVEN BY THE STUDY POPULATION TO THE QUESTIONNAIRE USED IN THE STUDY

QUESTIONS	OPTION	FREQUENCY	PERCENTAGE
Do you regularly use an apex locator in your endodontic practice?	No	24	18.5
	Yes	103	81.5
Do you believe that apex locators are essential in modern endodontic practice?	Agree	43	33.3
	Neutral	18	14.8
	Strongly agree	66	51.9
How often do you update your knowledge about apex locators ?	6 month once	57	44.4
	6 month once; never	5	3.7
	Never	18	14.8
	Once a year	47	37.0
How confident are you in using apex locators during endodontic treatment?	Confident	42	33.3
	Neutral	38	29.6
	Very confident	47	37.0
Do you believe apex locators improve the	Agree	66	51.9



	Neutral	19	14.8
	Strongly agree	42	33.3
What are the barriers to the use of Apex locators in your practice?	High cost	14	11.1
	High cost;lack of knowledge	5	3.7
	High cost;no barrier	5	3.7
	High cost;time constraints	5	3.7
	Lack of knowledge	23	18.5
	Lack of knowledge;no barrier	5	3.7
	No barrier	56	44.4
	Other	9	7.4
	Time constraints	5	3.7
Do you combine apex locator reading with a radiographic method	Always	18	14.8
	Never	19	14.8
	Sometimes	90	70.4
Specify the type of difficulty encountered while using apex locators?	Calibration issue	23	18.5
	Calibration issue;false reading	5	3.7
	Calibration issue;false reading;poor visibility in canal	9	7.4
	False reading	47	37.0
	Other	38	29.6
	Poor visibility in canal;other	5	3.7



In which condition do apex locators show incorrect reading?	All the above	94	73.7
	Coronal leakage	5	3.7
	Open apex	9	7.4
	Open apex; weeping canal	5	3.7
	Weeping canal	9	7.4
	Weeping canal; apical resorption/lesion	5	3.7
Do you believe that the reading of an Apex locator differs between endodontic retreatment and conventional RCT ?	No	43	33.3
	Yes	80	63.0
	Yes;no	4	3.7
Do you use apex locators in which tooth?	Anterior	5	3.7
	Both	94	74.1
	Posterior	28	22.2
Which generation of Apex locators are you using?	Fourth generation of apex locators	43	33.3
	Not aware	36	29.6
	Second generation of apex locators	5	3.7
	Third generation of apex locators	43	33.3

TABLE 2 : Represent the distribution of response given by the study population to the questionnaire used in the study population that 81.5% of practitioners regularly use apex locators in their endodontic practice, while 18.5% do not. When asked whether apex locators are essential in modern endodontic practice, 51.9% strongly agreed, and 33.3% agreed. A smaller portion (14.8%) remained neutral. The main barriers to using apex locators in endodontic practice were lack of knowledge (18.5%) and high cost (11.1%). A smaller percentage (3.7%) reported facing both

high cost and time constraints, while some practitioners experienced no barriers. The combination of apex locator readings with radiographic methods was assessed, with 70.4% of practitioners sometimes combining both methods. However, 14.8% reported always using both methods, while another 14.8% never combined the two. The widespread use, practitioners faced several challenges when using apex locators 37% reported false readings as a primary issue 18.5% experienced calibration issues A smaller percentage (7.4%) faced multiple difficulties, including



calibration issues, false readings, and poor canal visibility. 29.6% cited "other" issues, suggesting a

range of less common but noteworthy problems.

TABLE 3 REPRESENTS THE ASSOCIATION BETWEEN THE YEAR OF EXPERIENCE AND TYPE OF WORK PRACTICED BY ENDODONTIST IN RELATIONSHIP WITH THE KNOWLEDGE BASED QUESTIONS

PARAMETER	QUESTION	CHI SQUARE	SIG
TYPE OF WORK			
Academic institution Both Clinician	Do you regularly use an apex locator in your endodontic practice?	0.943	0.63
	Do you believe that apex locators are essential in modern endodontic practice?	4.552	0.33
	How often do you update your knowledge about apex locators ?	9.112	0.01
YEAR OF EXPERIENCE			
5 - 10 years Less than 5 years More than 10 years	Do you regularly use an apex locator in your endodontic practice?	5.421	0.05
	Do you believe that apex locators are essential in modern endodontic practice?	1.623	0.12
	How often do you update your knowledge about apex locators ?	8.081	0.23

TABLE 3 represents the association between the year of experience and type of work practiced by an endodontist in relationship with the knowledge based questions in which chi square that was applied with P value ≤ 0.62 consider statistics significant difference. The association between type of work and knowledge based questions, knowledge on updating apex locators was statistics significant P value 0.01 there exist the difference between clinician and academician with respect to knowledge on regular use of apex locator and

knowledge on importance of apex locator in modern Endodontics most statistics significant difference which inference in all the three categories there was no significant between based on knowledge and based on year of experience the association. It shows no statistics. A significant difference represents years of experience and knowledge on apex locator, in which inference there was no significant associations found between year of experience and knowledge on apex locator .

TABLE 4 REPRESENTS THE ASSOCIATION BETWEEN THE YEAR OF EXPERIENCE AND TYPE OF WORK PRACTICED BY ENDODONTIST IN RELATIONSHIP WITH THE ATTITUDE BASED QUESTIONS



PARAMETER	QUESTION	CHI SQUARE	SIG
TYPE OF WORK			
Academic institution Both Clinician	How confident are you in using apex locators during endodontic treatment?	3.923	0.42
	Do you believe apex locators improve the accuracy of working length determination?	3.835	0.42
	What are the barriers to the use of Apex locators in your practice?	14.124	0.58
YEARS OF EXPERIENCE			
5 - 10 years Less than 5 years More than 10 years	How confident are you in using apex locators during endodontic treatment?	4.197	0.32
	Do you believe apex locators improve the accuracy of working length determination?	2.362	0.66
	What are the barriers to the use of Apex locators in your practice?	13.516	0.64

TABLE 4: represents the association between the year of experience and type of work practiced by endodontist in relationship with the attitude based questions In which chi square that was applied with P value $< \text{or} = 0.62$ consider statistics significant difference. Based on type of work and attitude and study population no statistics significant difference for confident using apex locator during treatment,

believe that apex locator improve accuracy of working length determination and barrier using apex locator since attitude of study population no significant associations with the nature of work likewise the years of experience also shows no statistics significant differences with respect to attitude of the practicing endodontist .



TABLE 5 REPRESENTS THE ASSOCIATION BETWEEN THE YEAR OF EXPERIENCE AND TYPE OF WORK PRACTICED BY ENDODONTIST IN RELATIONSHIP WITH THE PRACTICE BASED QUESTIONS

PARAMETER	QUESTION	CHI SQUARE	SIG
TYPE OF WORK			
Academic institution Both Clinician	Do you combine apex locator reading with a radiographic method ?	2.010	0.73
	Specify the type of difficulty encountered while using apex locators?	7.975	0.05
	In which condition do apex locators show incorrect reading?	14.590	0.06
	Do you believe that the reading of an Apex locator differs between endodontic retreatment and conventional RCT	5.045	0.03
	Do you use apex locators in which tooth?	2.746	0.56
	Which generation of Apex locators are you using?	5.847	0.44
YEARS OF EXPERIENCE			
5 - 10 years Less than 5 years More than 10 years	Do you combine apex locator reading with a radiographic method ?	2.787	0.594
	Specify the type of difficulty encountered while using apex locators?	12.699	0.21
	In which condition do apex locators show incorrect reading?	4.531	0.33
	Do you believe that the reading of an Apex locator differs between endodontic retreatment and conventional RCT?	1.620	0.80
	Do you use apex locators in which tooth?	4.432	0.67
	Which generation of Apex locators are you using?	3.231	0.43

Table 5 . Represents the association between the year of experience and type of work practiced by endodontist in relationship with the practice based questions in which association type of work practiced shows the significant difference on type of difficulty encounter by using apex locator (P - 0.05) , believe the reading of apex locator

difference between Endodontic retreatment and conventional RCT (0.03) Among the academic , clinic and both type of practice, apart from which question based on comparing apex locator reading with radiograph methods and in which apex locator shows incorrect reading utilisation of apex locator and generation of apex locator used.shows no



statistics significant difference based on year of experience there was statistics significant with respect to practice based questions irrespective of the year of experience (less than 5 years , 5 - 10 years , more than 10 years) between the study population

V. DISCUSSION

The findings of this study underscore the extensive use of apex locators by endodontists in Tamil Nadu, demonstrating their crucial function in enhancing the precision of working length measurement during root canal treatment (RCT). The research indicated that 81.5% of practitioners frequently utilize apex locators, highlighting their significance in improving procedural accuracy and minimizing the likelihood of iatrogenic mistakes[8].

Apex locators enhance the precision of cleaning, shaping, and obturation by reducing dependence on radiographs solely, resulting in improved treatment results[9].

Although they are commonly utilized, obstacles to the adoption of apex locators remain. A notable percentage (18.5%) of participants mentioned insufficient knowledge, whereas 11.1% pointed to high expenses as barriers to consistent usage. This aligns with earlier research indicating that insufficient training and financial limitations are significant barriers to incorporating advanced dental technologies into everyday practice[10]. Organized educational programs, workshops, and advanced training have been recognized as successful methods to close this knowledge gap and enhance confidence in utilizing apex locators[11].

Curiously, the research did not reveal a notable connection between experience years and the utilization or comprehension of apex locators. This contradicts previous research indicating that seasoned practitioners tend to depend more on tactile feedback, whereas younger practitioners prefer technological assistance[12]. The absence of a connection might indicate the growing incorporation of apex locator training in contemporary endodontic programs, guaranteeing that even novice practitioners are skilled in their application[13].

Technical issues like inaccurate readings (37%) and calibration problems (18.5%) surfaced as prevalent obstacles. This discovery aligns with current literature suggesting that apex locators may yield imprecise measurements when open apices, apical resorption, or excessive fluid are present in the canal[14].

Ricucci et al. showed that apex locator inaccuracies frequently arise in the presence of significant periapical lesions, highlighting the need for precise calibration and skilled operators[15]. To enhance the reliability of apex locators, it is essential to tackle these technical problems by implementing regular device calibration and providing advanced training for operators[16].

The research further evaluated the use of apex locator measurements alongside radiographs, with 70.4% of practitioners sometimes using this combined method. While apex locators improve accuracy, research suggests that using radiographs alongside them helps confirm measurements and minimizes the chance of errors, especially in difficult scenarios[17].

An important discovery was the strong correlation between the type of practice (academic, clinical, or both) and the use of apex locators. Professionals engaged in both educational and clinical environments noted an increased occurrence of calibration problems and incorrect readings, probably stemming from the variety of cases faced[18]. On the other hand, academic professionals gained advantages from consistent training and access to modern equipment, enhancing their skills in utilizing apex locators[19].

The results of this research highlight the significance of ongoing training, frequent device calibration, and financial availability to promote the wider use of apex locators.

In summary, although apex locators are crucial in contemporary endodontic procedures, it is important to tackle knowledge deficiencies and technical challenges to optimize their efficiency. Future studies ought to investigate the effects of new apex locator technologies across various clinical environments and evaluate their lasting effect on treatment outcomes[20].

VI. CONCLUSION:

Apex locators are integral to modern endodontic practice, enhancing accuracy and minimizing procedural errors. However, barriers such as insufficient knowledge, high costs, and technical difficulties need to be addressed through ongoing education and financial support. Future advancements in apex locator technology hold promise for further improving endodontic outcomes.

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