

**INCIDENCE OF USE OF ELECTRONIC APEX LOCATOR IN PRIMARY DENTITION  
AMONG SPECIALIST PRACTITIONERS OF WEST BENGAL**

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**ABSTRACT**

Proper maintenance of the integrity of the primary dentition until physiologic exfoliation is of prime importance as far as treating young patients are concerned. The deportation of the microorganisms, pulp tissue and necrotic material is requisite for endodontic success. This can only be accomplished if the length of the tooth and the root canal working length is determined with accuracy. Failure in determination of a working length can compromise the result, thus numerous techniques including tactile sensation, radiographs and Electronic apex locator are used routinely. The present study. Aim-to find out the use of Electronic apex locator in primary dentition among the specialist practitioners of West Bengal based on a questionnaire based survey. Result-The survey results concludes that 71.9% dental practitioners finds usage of Electronic apex locator in primary dentitions effective. Hence root canal procedures should remain limited within the confine of the canal with logical endpoint for preparation with obturation being the narrowest part of the canal, Conclusion- Hence It is necessary to combine radiographic and electronic techniques in order to arrive at the desired apical terminus of endodontic preparation in order to achieve the highest degree of accuracy in working length determination.

**KEYWORDS:** Electronic apex locator, primary dentition, dental practitioners, working length determination.

**INTRODUCTION**

Lifelong preservation of tooth in a healthy state is the ultimate goal of dentistry. Premature loss of primary teeth is common due to caries, dental trauma or other causes. The triad of endodontics is incomplete without the vital step of obturation. The success of an endodontically treated tooth vastly relies upon achieving a "fluid tight seal" carrying out an obturation adequately and accurately as the primary teeth are the best space maintainers, teeth with infected pulps should be retained until exfoliation, whenever possible. Preservation of an intact primary tooth until eruption of the permanent successors is very important in maintaining the integrity of the arch form. Pulp therapy (pulpotomy and pulpectomy) is widely used in the treatment of pediatric patients, while attempting to prevent premature exfoliation of the primary teeth. The main objective of endodontic treatment is total elimination of microorganisms from the root canal and the prevention

of subsequent re-infection.<sup>[1]</sup> The removal of infected pulp tissue, necrotic material, and microorganisms from the root canal system is essential for endodontic treatment success. This can be achieved only if the length of the root canal is determined accurately.<sup>[2]</sup> Most of the root canals requiring pulpectomy are contaminated with bacteria, and the working length determination is a necessary step in the pulp treatment to decrease the bacterial charge and avoid periapical lesions and damage to the permanent tooth bud.

Working length is defined as the distance from a coronal reference point to the point at which canal preparation and filling should terminate.<sup>[3]</sup> A correct working length is a critical factor for the endodontic success. Failure to determine the proper root canal working length during root canal treatment may compromise the treatment result. To determine the working length, a number of

techniques, including tactile sensation, radiographs, and electronic apex locators are routinely used in clinics.<sup>[4]</sup>

Conventionally, conventional radiographs used to determine the working length which provides information about the canal anatomy and surrounding tissues. Radiographs are advantageous as the information they furnish, thus cannot be obtained from any other source and its value is not diminished by a critical appraisal of its limitations. However, the accurate determination of root canal length radiographically is hindered due to anatomical variations, interference of anatomical structures, or errors in projection. Super imposition, anatomy interferences, distortion, shortening and elongation, interpretation variability, and lack of three-dimensional representation affect the correct interpretation of the images.

These findings clearly indicate that serious consideration should be given to the use of electronic measurement. Thus it has stimulated the development of electronic root length measuring devices (apex locators), which accurately report the foramen or more precisely an area between the minor and major foramen diameter.<sup>[5]</sup> According to previous studies, conventional radiography yields an 82% precision, whereas in a study done by Olson et al, electronic measurement is closer to 95%. Comparison between the two techniques shows apex locators to be more accurate and more reliable than radiography for determining working length.<sup>[6]</sup> This is primarily due to the fact that electronic measurement is an objective technique, whereas radiography is a subjective technique. This was proven as early as 1983 in the study by Gelfand et al in which almost 22% of operators disagreed with themselves while examining a set of X-rays for the second time.<sup>[7]</sup>

Electronic apex locating devices have been introduced since the 1960s. In 1962, Sunada demonstrated that the electrical resistance between the periodontal ligament

and oral mucosa has a constant value that can be measured. However in case of primary teeth the accuracy of electronic apex locators in primary teeth has been evaluated in vitro in several studies, but only one study evaluated in vivo accuracy of electronic apex locator in primary dentition.<sup>[8]</sup> Kielbassa et al recommended using Root ZX in primary teeth that have undergone little or no resorption.<sup>[9]</sup>

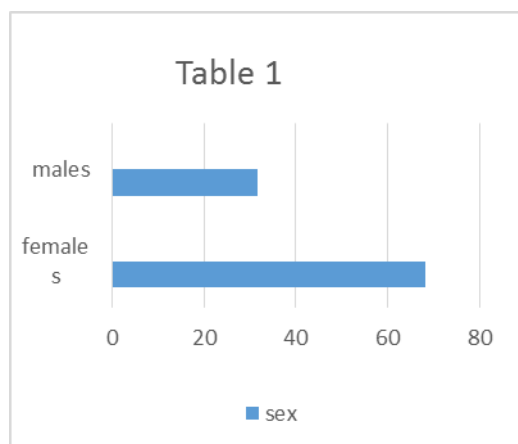
However much in-vivo studies have not been done on use of electronic apex locator in primary teeth, thereby not providing about its accuracy in primary dentition. But considering the fact that it can be easily used in uncooperative child and along with its other positive qualities we have conducted a survey study to assess the awareness among the practitioners about apex locator in primary dentition.

## MATERIALS AND METHODS

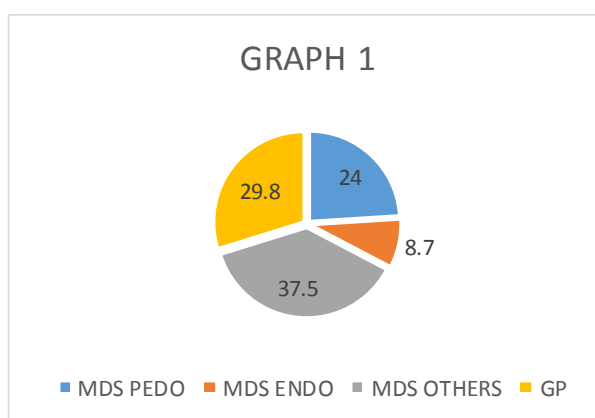
A cross-sectional, questionnaire survey was conducted among the specialist practitioners of West Bengal over a time period of 6 months. A closed-ended, structured 15 multiple-choice questionnaire was formulated in English for evaluating the awareness about using Electronic Apex Locator in primary dentition among specialist practitioners of West Bengal. Then the questionnaires were mailed to the practitioners. The identity of the dental practitioners were kept tightly confidential, and participation was voluntary. The responses were collected and computed on Microsoft Excel (Microsoft, Redmond, WA, USA). Descriptive statistics were performed among the questionnaire items.

## RESULT

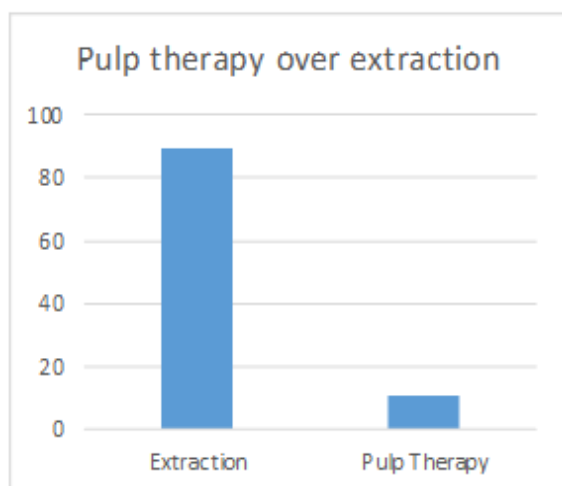
A total of 1600 survey questionnaires were distributed. Among them 1500 were filled and returned. Among them 68.3% were female and 31.8% were male (Table 1). Most of them were general practitioners, followed by specialist practitioners of other branches then pediatrics and orthodontics, the result was shown in (Graph 1).



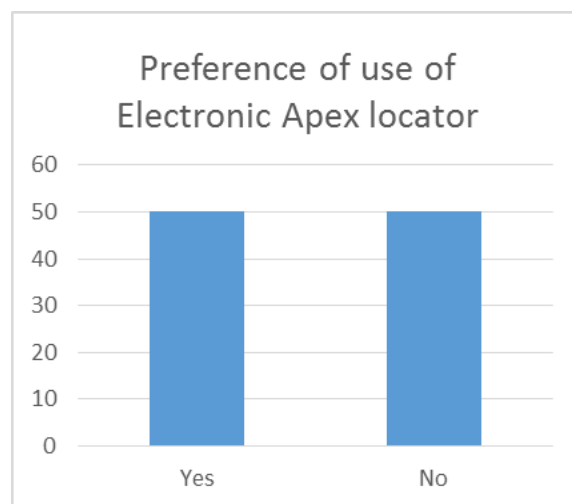
Among the practitioners a percentage of 89.4% preferred pulp therapy over extraction in primary teeth with only



10.6% not preferring it (Graph 2). The graph 3 showed it 50% preferred using Electronic apex locator.



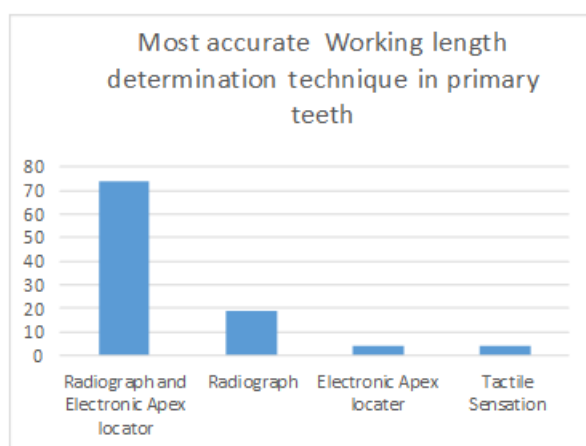
Graph 2



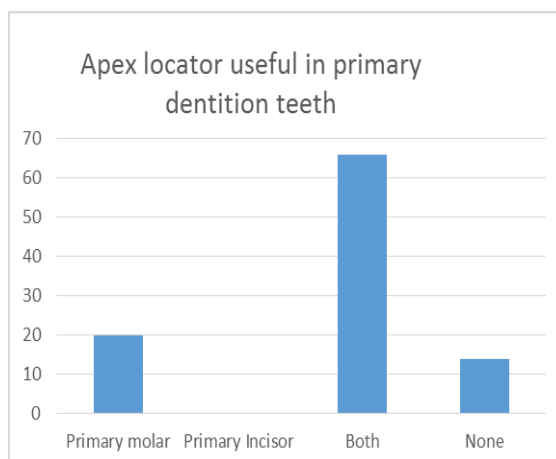
Graph 3

However 73.3% had preferred a combination of both Electronic apex locator and radiograph for accuracy and only 18 % had chosen only radiographs (graph 4).Graph

(5) showed that among the practitioners a majority of 66% preferred using apex locator in both anterior and posterior teeth.



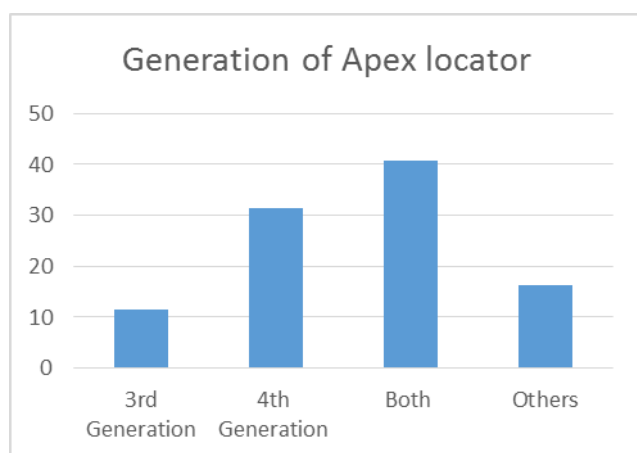
Graph 4



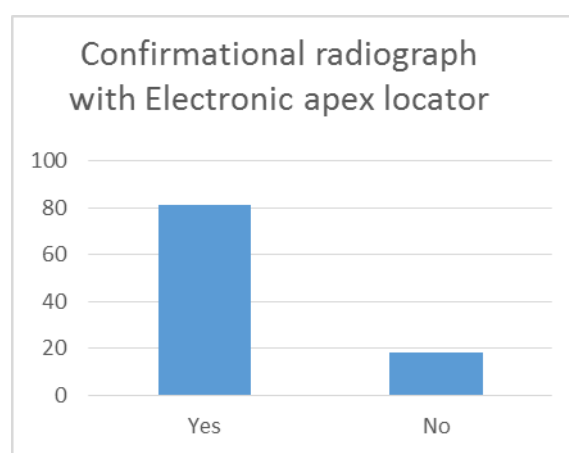
Graph 5

The 5<sup>th</sup> generation of apex locator was used more followed by the 4<sup>th</sup> generation shown in graph (6).Graph (7) showed that 81.5% people preferred using a conformational radiograph in primary dentition after

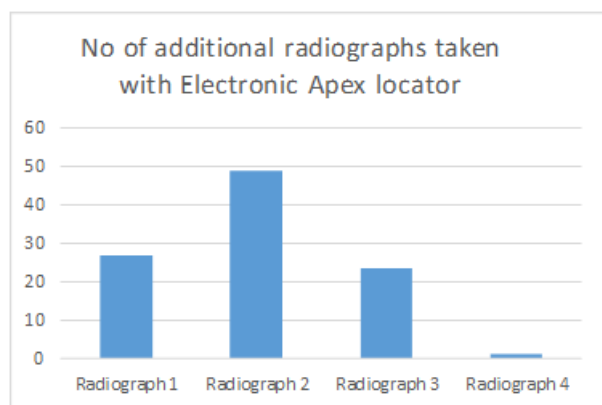
usage of an electronic apex locator while it was shown in (graph 8) that 48.8% practitioners preferred using at least 2 confirmational radiographs and 26.8% preferred using more than 2.



Graph 6

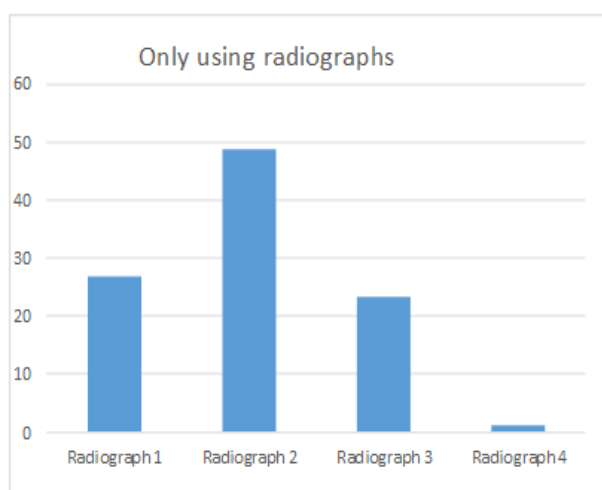


Graph 7



Graph 8.

The graph (9) showed that it was around 42.9% people prefer using 3 radiographs and not use electronic apex locator while 37.8% people preferred using less than 2 radiographs.



Graph 9.

## DISCUSSION

The determination of working length is the most crucial step in the endodontic treatment. It is particularly important in primary teeth in order to minimize periapical injury and possible damage to the succedaneous teeth. The endodontic anatomy of primary molars is difficult to predict because of the balance of resorption and hard tissue deposition. Root resorption is a physiological process in the life span of primary teeth. Moreover, there is also a pathological root resorption of primary teeth because of apical periodontitis. Shape, position, and dimension of the root apex continuously altered. For this reason, resorption and hard tissue deposition make difficult to determine exact location of the apical foramen.<sup>[10]</sup> This present survey study was mainly done to find the awareness and application of Electronic apex locator in primary dentition among the dental practitioners.

The result of this study showed that 50% of the dental surgeons preferred using electronic apex locator, which

was in accordance to the study done by Mesut Enes Odabaş et al where electronic apex locator was largely used.<sup>[11]</sup>

Although it was seen that in earlier times that extraction was a preferred choice of treatment for primary dentition now days aesthetics playing an important rule has enhanced the chances of preservation of tooth thus favoring pulp therapies in deciduous dentition. The present study showed that 89.4% preferred using pulp therapy over extraction in primary dentition. This has been supported by a study done by Togoo RA, Nasim VS<sup>[12]</sup> where it was shown increment of pulp therapy over extraction. Another study done by C McKnight-Hanes also supported this.<sup>[13]</sup> This survey showed that around 73.3% preferred a combination of Electronic apex locator and radiograph as the most accurate method for working length determination. In contrast to this study conducted by R. J. G. de Moor, a majority of the dental practitioners were using radiographs and tactile sensation to determine the working length and only 7% of them were using electron apex locators to determine the working length however this was not preferred now as because the instrument may bind against the canal wall at any position plus it requires a lot of technical skill and anatomic knowledge to perform a pulp therapy on the basis of tactile sensation.<sup>[14]</sup> A study conducted by Ahmed et al concluded that apex locator was useful in both primary anterior and posterior teeth, this was in accordance with this current study where 66% practitioners found it useful in both anterior and posterior teeth.<sup>[15]</sup> As time has advanced there has been progressive changes in the generation of apex locators. Currently 5th generation that is Root zx is the most popular one, this has also been in accordance with the current study where 40.7% practitioners preferred it. A study done by Mesut Enes Odabaş et al concluded that the Root ZX (J. Morita Corp. Tokyo, Japan), electronic apex locator, could able to detect narrowest diameter of the root canal under both wet and dry conditions.<sup>[11]</sup> It uses the impedance ratio instead of the impedance difference. Kielbassa et al recommended using Root ZX in primary teeth that have undergone little or no resorption thus proving it to be effective in primary teeth.<sup>[9]</sup> Another study on favour of this tells that Ghaemmaghami et al 28 reported that Root ZX accurately determined crown to apex length in the presence of gingival fistula or parulis in primary teeth.<sup>[16]</sup>

This study also tell us that only 41.7% dental practitioners were not at ease with the application of electronic apex locator in children, teeth as they fear in managing the children. However a study done by Krithi Nellamakkada et al showed 'Definitely positive' in Frankel rating scale with use of electronic apex locator and negative and definitely negative in the scale when conventional radiography were used.<sup>[17]</sup> This could possibly be because of the placement of the film positioner was problematic in children with small mouth

openings which could attribute to them finding the procedure uncomfortable and to elicit a certain degree of negative behavior, also in reducing the chances of gag reflex.

Around 81.5% dental practitioners had voted to use a confirmation additional radiograph after the use of electronic apex locator and 48.% of the practitioners preferred at least 2 radiographs. Thus this clearly highlights that not just an electronic apex locator but a combination of the trio of tactile sensation, radiographs and electronic apex locator seems to be the perfect solution.

## CONCLUSION

Although there have been many studies regarding the use of electronic apex locator in permanent dentition there have been not much studies done on primary dentition. This present survey study has pointed out that practitioners are now considering electronic apex locator as an option in pediatric patients because of its advantages. Pediatric dentistry may therefore benefit from using these apex locators which are not only easy to use, but also there is significant reduction in the radiation dosage as there is less exposure. It has also been proven to elicit better cooperation from children. Thus it can fairly be concluded that a combination of all the three methods can provide for a successful root canal therapy in children.

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