



## **Influence of the method for determining working length on the quality of obturation level of primary molars**

**Type of Research:** Original study

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### **Abstract**

**Introduction:** Presently, various methodologies are being employed to ascertain the precise working length, encompassing conventional or digital radiography, tactile menthol, and moisture with paper points. Among these, radiography and electronic methods are the prevailing choices, renowned for their accuracy in determining the working length.

**Aim:** The objective of this study is to evaluate how the method chosen for working length determination influences the quality of obturation in primary molars.

**Materials and methods:** Radiographic data were procured from DIAS (Dental Information Archiving Software) at Saveetha Dental College. Coll and Sadrian's criteria were used to assess the quality of obturation. Statistical analysis was performed using SPSS software, supplemented by Pearson's chi-square test to ascertain any correlation between the method of working length determination and the quality of obturation.

**Results and Discussion:** The study unveiled that primary molars exhibited optimal obturation levels when hand files were employed for working length determination, whereas electronic apex locators yielded a lesser rate of optimal obturation.

**Conclusion:** This investigation underscores the superior accuracy of hand files over electronic devices in pinpointing precise measurements in primary dentitions and improved quality of obturation. The scarcity of studies elucidating the accuracy and challenges posed by electronic apex locators necessitates the undertaking of larger-scale studies to address these gaps for future applications.

**Keywords:** Influence; Working length; Obturation level; Primary molars

### **Introduction:**

The predominant techniques for working length determination are radiography and electronic methods, renowned for their precision (1). Accurately determining the working length is crucial in endodontics, as it forms the cornerstone for ensuring the success of root canal treatments (2). It involves identifying the precise endpoint of a tooth's root canal system, crucial for cleaning, shaping, and filling (3). Accurate determination of working length significantly impacts the effectiveness of endodontic therapy and helps prevent post-treatment complications (4). Historically, conventional radiography was relied upon for working length determination (5). However, advancements in digital imaging, electronic apex locators, and diagnostic tools have enhanced accuracy and efficiency (6).

This exploration will delve into the methods, tools, and influencing factors in working length determination, a foundational aspect of modern dentistry with direct implications for patient outcomes and oral health (7).

Electronic apex locators ascertain the working length by analyzing impedances and frequencies between the file and canal fluids. Although their effectiveness in permanent teeth is widely recognized, their validation in primary teeth is still pending (8)(9). The success of root canal procedures depends on multiple factors, including complete mechanical debridement, quality of obturation, type of obturation material, technique used, and factors influencing canal preparation (10). Research into early caries, root canal treatments, orthodontic bacterial landscapes, and root resorption patterns illuminates the vital role of biological factors in disease progression.(11,12,13). This study aims to evaluate the influence of working length determination methods on obturation quality in primary molars.

### **Materials and methods:**

#### Data collection

The clinical and radiographic data was collected from the records of the institution from 2021 to 2024.

#### Inclusion and exclusion criteria

Primary molars eligible for the study exhibited clinical and radiographic signs warranting pulpectomy. Exclusions comprised molars with prior root canal treatment, calcified canals, furcation involvement, teeth displaying bone resorption, and internal or external root resorption. Additionally, molars presenting with coronal defects were not included. All the data chosen were selected properly due to the major risk of bias which are reliable like patient selection (30).

#### Training and calibration process

To ensure study impartiality and mitigate bias, two operators underwent thorough training and calibration for both data collection and analysis. Additionally, to assess obturation levels, an extra twenty radiographs of filled primary molars were scrutinized. Notably, all radiographs utilized were sourced from university software, ensuring no unnecessary exposure of children to radiation.

#### Analysis of obturation level

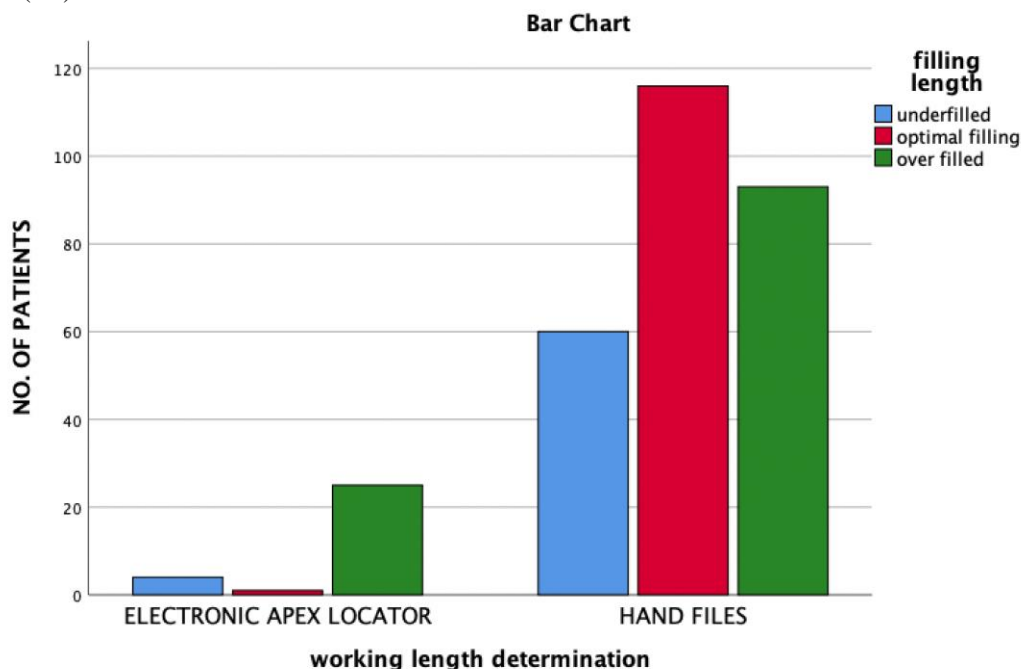
Around 250 cases were selected from the past 3 years. The obturation level was analyzed using Croll and Sadrian's criteria with the index from the previous article (1) and was tabulated in Excel. Statistical analysis: The data was collected and statistically analyzed using SPSS software and the Pearson Chi-square test was also done to evaluate the association between working length determination and obturation level.

### **Results:**

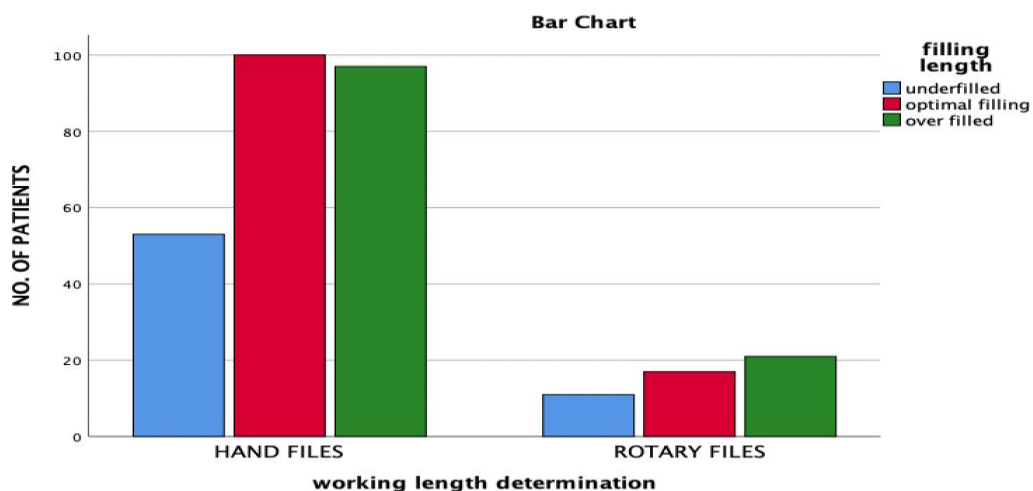
From the study, it was observed that the optimal level of obturation was present in primary molars when hand files were used for working length determination whereas a lower ratio of optimal level of obturation was observed with electronic apex locators. It was also inferred that electronic apex

locators were used rarely for working length determination in pulpectomy procedures; it may mislead the obturation level.

From Figure-1, it is inferred that working length determination using hand files led to maximum optimal filling (110) whereas it was minimal through electronic apex locators. From Figure 2, the obturation level with hand files was determined where (100) were optimal filling, (97) were over-filled and (53) were under-filled.



**Figure-1: Bar graph representing the association between the method of working length determination and obturation level**



**Figure-2: Bar graph representing the association between the method of BMP and obturation level**

**Discussion:**

Traditional radiography has long been a standard method for working length determination (2). While useful, it may not provide the same level of accuracy in primary molars due to their variable root shapes and sizes. The risk of over- or under-instrumentation can compromise obturation quality (6). Electronic Apex Locators have gained popularity for their ability to directly measure the electrical resistance within the canal (14). This method offers enhanced precision in determining working length, reducing the chances of instrumentation-related complications. Cone-beam computed tomography (CBCT) provides three-dimensional views of root canals, offering valuable insights into their morphology. Although less commonly used in primary molars due to radiation concerns, it can be a powerful tool for accurate working length determination in complex cases (15). Investigations into early dental caries, root canal procedures, bacterial profiles within orthodontics, and root resorption trends underscore the significant impact of biological factors on the pathogenesis of diseases (16,17,18).

Factors Influencing method selection include tooth anatomy, patient age, and cooperation level. Primary molars exhibit a wide range of root shapes and sizes. The choice of method should be tailored to the specific anatomical characteristics of each tooth. Pediatric patients often require a method that minimizes discomfort and reduces chairside time (18). Techniques that are less invasive and quicker, such as EALs, can be advantageous. Efficiency in working length determination is crucial, especially in a clinical setting where time constraints are common (19). Methods that streamline the process can contribute to overall treatment efficiency. Ultimately, the selected method should ensure that the root canal space is adequately cleaned, shaped, and sealed. The quality of obturation directly correlates with the method's accuracy (20). Prevalence of lesion was more in and right mandibular teeth (21). Future studies should explore additional variables, such as the operator's skill and the technique used for obturation, which were not assessed in this evaluation (24).

The changes were observed in the teeth within the first 3 months after the obturation of primary molars (25). Prevalence of lesion was more in and right mandibular teeth (26). Strip crowns prevented secondary caries and lesions (27).

The choice of method for determining working length in primary molars is a critical decision that influences various aspects of endodontic treatment. Some teeth led to lesion formation and subsequent cavitation and destruction if seen in the follow up (28). Knowledge on Post care also played a major role (29). While traditional radiography remains a valuable tool, modern advancements like EALs offer enhanced accuracy, preservation of tooth structure, patient comfort, and clinical efficiency. However, the selection should be based on a case-by-case assessment, considering tooth anatomy, patient age, and clinical objectives.

**Conclusion:** In this study, working length determination using different methods was analyzed, where hand files proved to have better accuracy than electronic devices in locating precise measurements in primary dentitions. The method used for working length determination in primary molars plays a pivotal role in achieving optimal obturation levels and, consequently, successful endodontic outcomes. There are not many studies explaining the accuracy and complications,

difficulties faced by electronic apex locators, hence the much larger sample size that focuses on these objectives to be done for future applications.

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### **Conflicts of Interest**

The authors declare that there are no conflicts of interest in the present study.

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