ORIGINAL ARTICLE

Effect of Working Length Measurement by Electronic Apex Locater and Digital Radiography on Post-Operative Pain Dissipation

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ABSTRACT

Objective: The aim of this study is to compare the mean time of postoperative pain dissipation between working length measurement methods by using an electronic apex locator and digital radiography

Study Design: Randomized clinical trial

Place and Duration of Study: Study was conducted at Punjab Dental Hospital, Lahore for duration of one year, from 1st June 2019 to 30th May 2020.

Patients and Methods: Eighty patients fulfilling the selection criteria were selected. Patient's detailed demographics age, gender and tooth being treated was recorded. Patients were divided into two groups. Thorough medical and dental history of each patient was recorded and pulpal and periapical status of the tooth to be treated was evaluated with the help of periapical radiograph, periodontal probing, palpation, percussion, electric pulp tester and thermal tests.

Results: Among 80 patients, those having age 14–37 years, mean time (hours) of postoperative pain dissipation between working length measurement methods by using an electronic apex locator and digital radiography was 18.97±19.63 and 21.02±5.53 respectively which was statistically not significant. In male patients, mean time (hours) of postoperative pain dissipation between working length measurement methods by using an electronic apex locator and digital radiography was 27.11±08.14 and 26.34±6.55 respectively which was statistically not significant (p-value 0.431).

Conclusion: There was no difference among mean post-operative pain dissipation time by taking working length from electronic apex locater and digital radiography

Keywords: Effect, Working length, Post-operative pain

INTRODUCTION

During endodontic treatment it is important to establish and maintain a precise working length. The working length is specified as the distance between the coronal reference point on the tooth and the end of the channel preparation and the seal[1]. The apical restriction is accepted as the physiological apical limit for the termination and sequestration of endodontic instruments [2]. The apical constriction, which is also known as a smaller diameter, constitutes the histological point of transition between the cementodentinal cords and the periodontal tissue[3]. Periapical radiographs and electronic apex locators are conventional measurement methods for determining working lengths. Recently, endodontic measuring of working length [4] cone-beam computed tomography scans have been promoted, but this is not a popular technique. Periapical X-rays are the most common technique for determining working length and have both advantages and disadvantages. The benefits include details about the peripheral condition of the teeth, anatomy of the root canal and the proximity of the neighboring anatomical structures. However, radiography restriction is due to superposition, since a three-dimensional object is represented in two dimensions. [5] [5] [5].

In 1918, Custer first explored an electronic system for determining the working length. Suzuki reviewed the concept in 1942, on the basis of a constant value of 6.5 kU electrical resistance between parodontal ligament and oral mucosa (3). In the presence of fluids or pulp tissue in the root canal, this first-generation process did not work properly. In order to provide reliable readings regardless of the fluid electrolytes in the root canal, new apex locators have been created because of these limitations. Postoperative pain is a common complication of endodontic care, an occurrence of between 3% and 58% (6). Many factors may lead to post-operative pain, including pulp or periradicular mechanical, chemical and/or microbial damage. The root canal therapy triggers an active inflammatory reaction to periradicular tissue irritation that leads to release of chemical mediators and local adaptation and periapical tissue pressures (7). Precise working time determination was shown to affect postoperative pain (8). A working length set beyond the small diameter may cause apical perforation and root canal system overfilling. This can increase discomfort and delay after surgery or prevent healing. A working length short of the minor diameter may cause the channel to become poorly debridged and underfilled. The pulp tissue retained can cause lengthy pain (3).

However, the use of optical radiography for the measurement of working lengths has many drawbacks. Expanding the image, x-rays, apical foramen position, root curvature and the two-dimensional scene are primarily affected by the accuracy, which are often masked by anatomical structures around. [9] The following: [9]

Custer first reported the use of electrical current to assess workload.

8 According to Suzuki et al's electrical resistance, 6.5 kilos of ohm is constant between oral mucosa and periodontal ligament and this could be used to establish the exact location of the apical constriction at the end of a

periodontal ligament. [10] The report of the Council of Europe.

PATIENTS AND METHODS

A randomized clinical trial was designed and conducted at Punjab Dental Hospital, Lahore for duration of one year, from 1st June 2019 to 30th May 2020. 80 subjects were fulfilling the following inclusion criteria were selected. Single rooted teseth with vital pulp, asymptomatic irreversible pulpitis or being treated for prosthodontic reasons, in both genders, aged between 14 to 55 years, with good oral hygiene and teeth that could be restored after completion of procedure. Patients were excluded if they had taken analgesic 12 hours before treatment, had teeth with chronic apical periodontitis, necrotic pulp, or if during working length determination file went beyond the apex, patients with complicating systemic disease, severe pain, acute apical abscess or those using antibiotics or steroids.

All endodontic treatments were carried out in a single visit by the principal investigator. Anesthetized with local anaesthetic agent containing 2 per cent lignocaine with 1:1,000 epinephrine after application of topical anaesthetic agent teeth. After removal of the caries with sterile high-speed and low-speed burs, initial access cavity was fitted. The patency of the canal was calculated with K-file scale # 10 stainless steel. Coronal flaring was performed with SX ProTaper, 2.5 per cent NaOCl solution was irrigated with disc and channels. After that, patients were randomly assigned by lottery method to two groups for determining working lengths: the radiographic group and the electronic apex locator group.

In the radiographic group, K-file size # 15 was put in the root canal up to 1 mm less than the average working duration obtained from the pre-operative radiograph. Digital radiography then took periapical x-rays. On radiograph, the interval between file end and apex was measured. If the file end was shorter than the top, the number has been applied to the initial estimated volume. Repeated radiograph to check that the end of the disc was 1 mm shy of the x-ray peak.

In the electronic apex locator group the working time was determined by the Root ZX apex locator as directed by the maker. The film was first inserted onto the receiver's ear, and the electrode was connected to K-file size # 15.As shown on the liquid crystal monitor by the blinking "APEX" symbol, the file was advanced in the root channel to the point just outside the main foramen. With Protaper instruments in crown-down mode, the chemo-mechanical preparation was performed with gentle in and out motion. Coronal flaring was done with SX ProTaper file and each channel was irrigated with a 2.5 percent NaOCl solution and then either optical radiography (Group A) or electronic apex locator (Group B) calculated the operational duration. For the operating period minus 1 mm, the instruments ProTaper S1 and S2 were used, then F1-, F2- and F3 were used for full instrumentation. For each instrument change, 1 per cent NaOCl was used as irrigant. anals were dried with paper points, then master cone radiograph was taken and canal was filled with proTaper universal gutta percha and sealer using lateral compaction technique and sealed with Composite restoration.

A questionnaire was given to participant patients to postoperatively consider pain severity and the level of analgesic use at 48 hours after completion of the endodontic procedure. — A 100 mg flurbiprofen prescription was given to the patient, with instructions for taking only when pain is necessary. For measuring postoperative pain a Tactile Analog Scale was used. One week after formulations were obturated patients were asked to come to the clinic to report their postoperative pain. Data was analysed using SPSS-24. They used separate t-test tests to measure pain 24 hours after surgery. The statistically relevant P<0.05 was found.

RESULTS

In the sample it was 43.42±9.21 (Table 1). Mean age (years) There were 46 (57.5) male and 34 (42.5) female patients (Table 2). The mean VAS score for medium and standard deviation has been assessed in the study. Both of these groups have a mean score of 4.35±0.39 and 4.27±0.48.

The mean time (hours) for dissipating after surgery between calculating methods of working longitude using a digital radiograph and an optical apex locator was 25.83±11.05 and 24.25±7.40, which were not statistically relevant (p-value 0.138).

The age was stratified by means of an electronic apex locator and digital radiography and compared to average time (hours) for postoperative pain dissipation between working time measurement methods. Patients between 14 and 37 years of age received mean postoperative dissipation time (hours) between the measurement of working lengths and the digital radiography using an electronic apex locator, which were not statistically significant respectively 19.86±11.36 and 20.27±8.35 (p-value 0.783) [table 5].

The genders were stratified and contrasted by an automated apex locator with digital radiography to average postoperative pain dissipation period (hours) between work duration calculation methods. In male patients there was mean duration (heours), respectively, of a postoperative dissipation, of 27.11±08.14 and 26.34±6.55 between operating duration measuring techniques for the use of an optical apex-locator and a visual x-ray. (p-value 0.431) [Table 6].

Table 1: Descriptive statistics of age (years) of patients

Age (years)	Group 1	Group 2
	42.68±6.94	41.26±8.88

Table 2: Distribution of Gender

Gender	Group 1	Group 2
Male	23 (57.5%)	23 (57.5%
Female	17 (42.5%)	17 (42.5%)

Table 3: Descriptive statistics of VAS score of patients

VAS score	Group 1	Group 2
	4.35±0.39	4.27±0.48

Table 4: Comparison of mean time of Postoperative Pain Dissipation

Mean time (hrs) of postoperative pain dissipation	Group 1	Group 2	P value
	25.83±11.05	24.25±7.40	0.138

Table 5: Comparison of age with mean time (hrs) of postoperative pain dissipation

Age (years)	Group I	Group 2	P value
15 – 35	19.86±11.36	20.27±8.35	0.783
36 – 50	25.98±12.14	25.25±8.25	0.564

Table 6: Comparison of gender with mean time (hrs) of postoperative pain dissipation

Gender	Group I	Group 2	P value
Male	27.11±08.14	26.34±6.55	0.431
Female	23.26±5.20	23.14±7.20	0.492

DISCUSSION

During endodontic care an exact working period must be measured and maintained. The working time is the distance between a coronal point on the tooth and the end of planning and canal shutdown. Apical limitation is recognized because of the apical physiological limitation of endodontic instrumentation and the shutdown. The apical limitation is the histological convergence of the pulsal, which is considered a minor limit of the perodontal tissue. Histological convergence is the apical restriction.

Periodic X-rays and automatic locators are typical methods of working time calculations. However, with endodontic work length estimation a new analysis was created of the cone-beam computed tomography. Periapical X-rays are the most common instrument with benefits and disadvantages to measure working day. The benefits include knowledge of the periapical position of the teeth, anatomy of the root canal and incorporation of anatomical surroundings. Thus, the radiographic constraint is induced by a three-dimensional object superposition. For the first time, in 1918 Custer used an automated method to evaluate working time.

In 1942, Suzuki revisited the hypothesis with a focus on on the ongoing 6.5 kU electrical resistance between periodontal and oral silk ligaments. It did not work well for fluids or pulp tissue on the radiation canal in the first edition. These limitations have led to the need for modern apex locators to reliably estimate the root channel, regardless of fluid electrolytes. Postoperative suffering is natural and common in 3% to 58% in endodontic surgery. [11-12] Most cases of chemical and/or microbial damage, such as mechanical, pulp or periradicular tissue, may lead to postoperative pain. Periradicular tissue inflammation causes serious inflammatory responses during root channel operation and leads to release of chemical mediators and local alterations and pressure of the periapical tissue. Approximate work time assessment has shown that it affects postoperative pain. A job length greater than its small diameter may be used to drill and overfill the root canal structure apically. This can create postoperative pain, prolong it and hinder it. The working distance short of a smaller diameter will help to make the channel unsatisfactory. Conserved pulp can cause long-term discomfort2.

Several studies have assessed the association between preoperative pulp symptoms, hospitalization, instrumentation, irrigation, intra-channel drug and the reduction in postoperative occlusal pain. We are, however, aware that no data are available to decide whether the evaluation of the working time with an apex locator causes more or less postoperative pain than the periapical radiation treatment. The aim of this study was to balance postoperative pain levels with two distinct work time assessment approaches.

The mean age in our survey was 43.42±9.21 years, we had 46 (57.5) male and 34 (42.5) female patients.Working duration calculation approaches using an electronic apex locator and visual radiographics in our research, mean period (heures) for postoperative dissipations was 25.83±11.05 and 24.25±7.40, respectively. These results were comparable to the previous studies. [13-15] In previous research, the severity of postoperative pain following endodontic treatment has been assessed using various scales and methods.[16] The severity of pain usually fell to half on one day over the course of a few days and to less than ten percent on 7 days in another study[17]

CONCLUSION

No difference was observed between the mean postoperative dissipation period when the electronic apex reporter and the optical x-ray were working long.

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