Determination of the working length in root canal treatment using bisecting angle technique

Laury Naf'a Kaka*

Abstract:

Bisecting angel technique is used for viewing (30) selected vital teeth from patients who attended a dental clinic for extracting those teeth mostly because of pain. The selected teeth are upper and lower central incisors, canines, and premolars.

A size 20 file is inserted in each tooth, with different length as follows: 19mm in premolars, 21mm in central incisors and 23mm in canines. All radiographs were examined by five examiners (dentists) to estimate the working length from these radiographs and then compare their estimation with the real length of the teeth which are calibrated after they had extracted using a ruler. It is found that when the difference between file end and the apex of the tooth is not exceed (0.5 mm), the bisecting angle technique give an accurate estimation for working length of the tooth, otherwise this technique is not recommended to be used in root canal treatment because of the incorrect estimation that is gained when the difference is more than (0.5 mm).

Keywords:

Bisecting angle technique, root canal treatment, radiographs.

Introduction:

Radiography is an essential aid in endodontic treatment and without its use, treatment cannot be considered satisfactory. However, radiographs can be misleading, particularly, if badly taken, poorly processed and examined in a cursory manner under poor viewing conditions[1]. Knowledge of endodontic radiography is essential for proper diagnosis, instrumentation and obturation. Although parallel technique is recommended over the bisecting angle technique because they show less distortion and minimal enlargement and review approximately the same length of the tooth which make it indicated for root canal treatment [2], and the parallel technique eliminate the foreshortening or elongation of tooth image [3], most dentists use the bisecting angle technique for the determination of the working length because it is easier but it may give false information about the accurate working length due to the distortion which may occur because of unequal distance between the film and the tooth along the total length of the tooth, but there are special situation in which the parallel technique is not feasible such as low palatal vault, maxillary tori, exceptionally long roots, or an uncooperative or gagging patients. This may necessitate an alternative technique, a second choice is the modified parallel technique and least accurate is the bisecting angle technique. So this study is done to show the benefit of using the bisecting angle technique in determination the working length during root canal treatment and if it give us approximately the same length of the tooth being examined.

*Lecturer in Dental Radiology, Department of Oral Medicine, College of Dentistry, Al-Mustansiria University.

Materials and method:

Thirty patients were included in this study, who were attended a dental clinic for teeth extraction mostly because of pain (pulpitis) or periodontal diseases. All the teeth are vital and are chosen as follows: (5) upper central incissors, (5) lower central incissors, (5) upper canines (5) lower canines, (5) upper premolars and (5) lower premolars. Access opening are done for each tooth and then size (20) file is inserted, the length of the files that are inserted are as follows:

(19mm) for upper and lower premolars, (21mm) for upper and lower incissors, and (23 mm) for upper and lower canines.

All the radiographs are taken by the same radiologist who follow the exact principle of the bisecting angle technique , the films are processed by the same procedure and then examined by (5) dentists who asked to estimate the working length for each film as he suspected to be used if it is his own case, and all the estimations are arranged into tables.

The real length of all the teeth have been measured using a ruler after they had been extracted. The resulted measures have been compared with the estimated values by the five dentists. Statistical analysis using ANOVA test is measured so as to determine the differences in the readings of the five dentists and to confirm the study.

Results and discussion:

Table (1-6) show the real and the estimated working length of all the selected teeth. The accurate working length that is used in root canal treatment should be (0.5-1 mm) less than the real length of the tooth when it is vital because the apical construction ends to occur about (0.5-1mm) from the apical foramen [4], and ideally the apical constriction should be used as a natural stop in root canal treatment, and the integrity of the constriction should be maintained during treatment if complications are to be avoided [5] This study demonstrated that it is unlikely for a clinician to estimate accurately the added or subtracted length needed to correct a provisional file length to proper working length (based on a radiograph) if the amount of correction is greater than (1mm) , this was in agreement with theof [Gox et al] [6] , table(3) show that the upper canines that had a length of (27.1) and (26.4), are approximately (4-3.5 mm) respectively longer than the inserted length of the file, and only 20% of the estimated length is correct , and the same percentage occur with the lower canine whose length was (19) table(4). The above result is also in agreement with other study [7] who stated that if the distance between the root apex and file tip is greater than (1mm), another film is strongly recommended to obtain the proper working length.

All the readings from the tables reveals that when the difference between real length and estimated length is not exceed (2 mm) [more or less] , 80% of the estimated length is acceptable in root canal treatment, and when there is no difference or not more than (0.5 mm), 100% of the estimated length is correct.

The tables show that the incorrect readings in the upper teeth is more than the lower teeth, this may be due to the increase difference in the distance between the tooth and film along the whole length of the tooth because of the curvature of the palate which give more distortion, so parallel technique is recommended to decrease this distortion and this is in agreement with other studies [8,9] who stated that radiographs must be as clear and

undistorted as possible and this is best achieved using the parallel technique.

It was shown from the variance analysis for tables 1, 2, 3, 4, 5, and 6 (given below) that there is no significant difference in the reading submitted by the five dentists (examiners) including all the teeth.

Readings' tables:

Table (1): The real and estimated length of the upper five incisors.

Real length of upper central incisors	23.5	22.1	19.5	21	20.5
Examiner (1)	24	**21.5**	20	**20.5**	**20**
Examiner (2)	24	22.5	**18.5**	**20.5**	**20**
Examiner (3)	24	**21.5**	18	**20**	**19.5**
Examiner (4)	**23**	**21.5**	**19**	**20**	**20**
Examiner (5)	**23**	**21**	**18.5**	**20**	**19.5**
Percentage of accuracy	40%	80%	60%	100%	100%

Estimated Length

The bold lined number is the true estimation and the light number is the false estimation. (File length is 21 mm).

Table (2): The real and estimated length of the lower five central incisors.

Real length of Lower central incisors	19.3	21.1	18.5	20.4	22.4
Examiner (1)	**18.5**	**20.5**	17	**20**	23
Examiner (2)	**18.5**	**20.5**	**18**	19	22.5
Examiner (3)	**18.5**	**20.5**	19	**19.5**	**22**
Examiner (4)	**18.5**	**20**	**18**	**19.5**	23.5
Examiner (5)	18	**20**	**18**	**19.5**	**22**
Percentage of accuracy	80%	100%	60%	80%	40%

Estimated Length

The bold lined value is the true estimation and the light value is the false estimation. (File length is 21 mm).

Table(3): The real and estimated length of the upper canines.

Real length of upper canines	23.5	27.1	24.2	26.4	25.3
Examiner (1)	**23**	27.5	**23.5**	28	25.5
Examiner (2)	**23**	**26.5**	**23.5**	27	26.5
Examiner (3)	**22.5**	27.5	**23.5**	27	**24.5**
Examiner (4)	**22.5**	27.5	**23.5**	26.5	**25**
Examiner (5)	**22.5**	28	23	**26**	**25.5**
Percentage of accuracy	100%	20%	80%	20%	40%

Estimated Length

The bold lined value is the true estimation and the light value is the false estimation. (File length 23 mm).

Table (4): The real and estimated length of the lower canines.

Real length of lower canines	22.3	24.5	21.6	23.4	19
Examiner (1)	22.5	**24**	**21**	**22.5**	**18**
Examiner (2)	**21.5**	25	**21**	**22.5**	17.5
Examiner (3)	**21.5**	**23.5**	**21**	**22.5**	17
Examiner (4)	**21.5**	**23.5**	20	**23**	20
Examiner (5)	**21.5**	**24**	**21**	**22.5**	19.5
Percentage of accuracy	80%	80%	80%	100%	20%

Estimated Length

The bold lined value is the true estimation and the light value is the false estimation. (File length is 23 mm)

Table (5): The real and estimated length of the upper premolars.

Real length of upper premolars	19	20.4	22.2	21.1	21.5
Examiner (1)	**18.5**	20.5	22.5	21.5	**21**
Examiner (2)	**18.5**	**20**	22.5	**20.5**	**20.5**
Examiner (3)	**18**	**20**	22.5	21.5	22
Examiner (4)	**18.5**	**19.5**	**21.5**	**20.5**	22
Examiner (5)	**18**	**19.5**	**21.5**	**20.5**	**20.5**
Percentage of accuracy	100%	80%	40%	60%	60%

Estimated Length

The bold lined value is the real estimation and the light value is the false estimation. (File length is 19 mm)

Table (6): The real and estimated length of the lower premolars.

Real length of lower premolars	19.5	21	20.4	21.5	22.3
Examiner (1)	**19**	21.5	20.5	**21**	22.5
Examiner (2)	**19**	**20.5**	**20**	**21**	23
Examiner (3)	**18.5**	**20.5**	**19.5**	22	23
Examiner (4)	**19**	**20**	**19.5**	22	**21.5**
Examiner (5)	**18.5**	**20.5**	**20**	**21**	**21.5**
Percentage of accuracy	100%	80%	80%	60%	40%

Estimated Length

The bold lined value is the real estimation and the light value is the false estimation (File length is 19 mm)

Conclusions:

1. In bisecting angle technique, the degree of accuracy of this technique in estimation the working length is 100% if the difference between the file end and apical end of the tooth is (0-0.5mm).
2. Bisecting angle technique give more accurate result for estimation the working length of lower teeth than the upper teeth.
3. A second radiograph should be taken in case the difference between the file end and the apex of the tooth is more than (1 mm), if bisecting angle technique is used.

4. It is preferable to the dentist to use the parallel technique during root canal a treatment specially in the maxillary teeth.

References:

1.Pittford T R :Harty's Endodontic in Clinical Practice. Fourth Edition,1977; 220-244,1977.

2.Edward B, Andrew E Miclanowicz, John P michanowicz: Practical Endodontics. 1994 pp 41-56 .

3.Forsberg J: A comparison of the parallel and bisecting-angle radiographic techniques in endodontics. International endodontic journal, 1987; 177-182 .

4.Chapman CE: A microscopic study of the apical region of human anterior teeth. Journal of the British Endodontic Society, 1969; 3,52-58.

5.PittFord T R: Hatry's Endodontic in clinical practice, Fourth edition 1997.

6.Gox V S, Brown C E, Bricker SL,et al: Radiographic interpretation of endodontic file length , oral surg oral Med oral pathol,1991; 72, 340-344 .

7.Gutmann JL, Leonard JE: Problem solving in endodontic working length determination. Comp contin educ dent, 1995; 16: 288-304.

8.Smith NJD: Dental radiography. 2nd ed Oxford, UK:Blavk well scientific publications ,1988.

9.WHAITES EJ: Essentials of dental radiography and radiology. Edinburgh,UK :Churchill living stone, 1992.