



WORKING LENGTH DETERMINATION OF ROOT CANALS WITH AN INNOVATIVE HEROJIT'S METHOD: AN IN VITRO STUDY

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Abstract

Aim: To assess the accuracy of Herojit's method in determining working length of root canals. **Materials and Methods:** A sample of 20 extracted teeth of 5 different permanent teeth were collected and divided into 5 groups of 4 teeth each. The root canals of the teeth were filed and mounted on 20 plastic test tubes with modelling wax. Conventional physical methods and Herojit's method were used to determine the working length of each root canal. **Results:** The readings of the two methods were statistically analyzed by using Student's t test. There was no significant difference between the readings of the two methods ($p > 0.05$). **Conclusion:** Herojit's method can be used clinically to determine the working length of root canals during endodontic therapy.

Keywords: endodontic therapy, Herojit's method, root canal

Introduction

Incomplete obturation is an important factor of root canal treatment failure. This can be due to inaccurate measurement of root canal length. Improper utilization of methods of root canal measurements result in inaccurate measurement of root canal length. However, different methods are available at present, the radiographic method is the most common method; however, it is harmful to both patient and dentist because of its harmful radiation. Another most common method is by using apex locators which also give false reading in the presence of necrosed pulp tissue.

Herojit's method of root canal length measurement is an innovative physical method of working length measurement developed by the author himself. This method uses non-absorbent paper points coated with red litmus solution and a pre-determined length chart. This method was based on the "Theory of Optimum pH for pulp vitality"¹ postulated by the author while studying the pH value of vital pulp and necrosed pulp tissue. This method is advantageous over other methods in terms of cost and procedure and its accuracy is comparable to both apex locator and radiographic method.

Materials and methods

To measure the accuracy in determining working length of root canals, an invitro study was carried out in a sample of 20 extracted teeth of 05 different permanent teeth groups having 4 teeth each namely maxillary central incisor (GROUP I), maxillary lateral incisor (GROUP II), maxillary canine (GROUP III), mandibular central incisor (GROUP IV) and mandibular lateral incisor (GROUP V). All permanent teeth having single root canal and complete root without resorption are included for the study. The teeth were soaked in 2% hydrogen peroxide for 15 days to remove the attached necrosed tissue. The roots of all the teeth were cleaned with an ultrasonic scaler (EMS, Mectron) and dried. An access opening was prepared with a sterile round bur (Mani Inc.) and an airtorator handpiece (NSK) under continuous water spray. The root canal length of all the teeth was filed and enlarged till NiTi 30# K-file (Waldent) with alternate irrigation of normal saline and 2.5% NaOCl solution. Each root canal was rinsed with distilled water and dried with absorbent paper points.

Measurement of working length using conventional physical method

A NiTi 15# K-file (Waldent) was introduced inside each root canal until it became visible at the apical foramen. The rubber stop was adjusted, the file was removed and the distance between the base of rubber stop and file tip was measured using Endo gauge. To obtain the actual working length, 0.5 mm was subtracted from the measured length.

Table 1. Pre-determined length of permanent dentition

SL No.	PERMANENT TEETH	TOTAL LENGTH (in mm.)
1.	Maxillary Central Incisor	23.5
2.	Maxillary Lateral Incisor	22
3.	Maxillary Canine	27
4.	Maxillary First Premolar	22.5
5.	Maxillary Second Premolar	22.5
6.	Maxillary First Molar	Buccal=19.5 & Palatal=20.5
7.	Maxillary Second Molar	Buccal=18 & Palatal=19
8.	Maxillary Third Molar	17.5
9.	Mandibular Central Incisor	22
10.	Mandibular Lateral Incisor	23.5
11.	Mandibular Canine	27
12.	Mandibular First Premolar	22.5
13.	Mandibular Second Premolar	22.5
14.	Mandibular First Molar	21.5
15.	Mandibular Second Molar	20
16.	Mandibular Third Molar	18

Measurement of working length using Herojit's method

All the 20 teeth were mounted on 20 small plastic test tube containing slaked lime paste using modelling wax. A non-absorbent paper point coated with red litmus solution and having rubber stop adjusted at pre-determined length (**Table 1**) prepared for each tooth² is introduced inside each root canals. Each paper point is then withdrawn and check for change of colour from red to blue at each tip. If there is no change in colour then re-adjusted the rubber stop with at least 2mm more than the pre-determined length and re-introduced inside each root canals. The length of the change in colour from red to blue at the tip of each paper point is measured with Endo gauge and subtracted from the pre-determined length (i.e. distance between the base of the rubber stop and paper point tip). To obtain the actual working length, 0.5 mm was subtracted from each measured length.

Results

The recorded readings were statistically analyzed using Student's t test for nonparametric evaluation of the groups (**Table 2**). Statistical readings were considered significant when $p \leq 0.05$. There was no significant difference between readings of the two methods.

Table 2. Statistical analysis using student's t test

GROUPS	CONVENTIONAL PHYSICAL METHOD READINGS (MEAN \pm SD) in MM	HEROJIT'S METHOD READINGS (MEAN \pm SD) in MM	p Value
I	23.62 \pm 0.95	23.59 \pm 0.87	0.91
II	21.37 \pm 1.47	21.00 \pm 0.95	0.35
III	26.62 \pm 0.20	26.59 \pm 0.67	0.84
IV	21.50 \pm 0.61	21.50 \pm 0.85	1.00
V	22.75 \pm 0.74	23.00 \pm 0.25	0.16

Discussion

Different methods are available for determination of working length of root canals. With the advancement of technology methods using radiographs and electronic apex locators are considered today the best methods of determining working length in endodontic practices. However these methods have certain disadvantages such as harmful radiations to both patient and dentist, expensive and false readings in presence of necrosed pulp tissue.

The present method utilizes the contrast in colour perception between acidic and alkaline medium. Vital pulp tissue and periapical tissue are alkaline in nature whereas the necrosed pulp tissues are acidic in nature. By utilizing the phenomenon of change

of colour from red to blue with a red litmus paper and change of colour from blue to red with a blue litmus paper to identify acid and alkali, the present method was employed to determine the working length on a sample of 20 extracted permanent teeth.

The result of the present study confirms that there were no significant difference between the readings of conventional physical method and Herojit's method.

Conclusion

Herojit's method is an easy and simple method to determine working length of root canals during endodontic treatment. This method utilizes easily available dental materials which does not have the fear of irradiation or false readings. This method can also be introduced in clinical practices.

Acknowledgement

I would like to thank my Head of Department, Dr. Manohar Bhat for his indispensable inspiration and exceptional support. I would also like to thank my wife, my daughter, my parents and friends for their support.

References

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