

Evaluation of tactile sensation for apical root canal obturation

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ABSTRACT

An accurate working length is absolutely necessary for successful root canal treatment. Obturation of the root canal system forms the final stage of root canal therapy and its success depends on obtaining perfect apical seal. The aim of this study is to evaluate the effect of tactile sensation in obtaining an optimum obturation.

Three hundred and fifty radiograph of root filled teeth taken after obturation of clinical cases evaluated in this study. The root canal prepared and the length was determined by the tactile sensation. After the obturation final radiograph to evaluate the obturation in the apical area was recorded. The films (284 radiographs included in the study) were divided according to the sex, position in the jaws and the type of tooth. Two observers evaluate the radiograph for apical obturation separately. Three categories were used: The first category, which is given a score of zero for optimal obturation (1 mm from the anatomical apex. The second category, which is given a score of one, is regarded as an underfilled root canal filling which is more than (1) mm from the anatomical apex. And finally the third category which is given a score of two which is regarded as an overfilled filling when there is extension of the filling material beyond the anatomical apex. The data were tabulated and a non-parametric chi square analysis was used for statistical test.

The percentage of optimum apical obturation was found in (66.55%) of cases, while those scored (1) was (28.9%) and those scored (2) was (4.6%). The analysis showed that there was no effect of the sex of the patient or between both jaws or with regard tooth type. The result of the study showed that, under the circumstances of this work, the tactile sensation produce results as effective as other methods of working length determination and could be justified, under the circumstances that limit the availability of other methods for working length determination and in particular the X-ray machine for the general dentist in Iraq upon which a harsh sanction is imposed which include scientific and health sanction.

Key Words: Root canal therapy, tactile sensation, obturation.

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الخلاصة

القياس الدقيق لطول قناة الجذر مهم جداً في المعالجة الصحيحة لحشوات قنوات الأسنان. إن غلق قناة الجذر بحشوة القناة الجذرية تعتبر الخطوة الأخيرة في هكذا نوع حشوات ونجاحها يعتمد على الحصول على الغلق التام لذروة الجذر. الغرض من هذه الدراسة هو تقييم التحسس اللمسي في الحصول على الغلق الأمثل عند قياس أطوال القنوات الجذرية. تم جمع (٣٥) صورة شعاعية أُخذت لأسنان تم إجراء الحشوات الجذرية لها. هيئت القناة الجذرية وُحِدَت أطوال القنوات بواسطة التحسس اللمسي. من هذه الأفلام تم اعتماد (٢٨٤) صورة شعاعية في الدراسة وقد قُسمت تبعاً للجنس، وموقع السن في الفكين ونوع السن. تم تقييم الصور الشعاعية بواسطة مقيمين لغرض تقييم الغلق الأمثل لذروة الجذر، واستُخدمت ثلاثة معايير لذلك: أعطى الصفر للغلق المثالي والذي يمثل (١) ملم من القمة الشعاعية لذروة الجذر، وأعطى الرقم واحد للحشوات التي اعتُبرت غير كاملة الحشوة أكثر من (١) ملم من ذروة الجذر. كما أعطى الرقم اثنان للحشوات التي كانت أطول من ذروة الجذر بواقع (١) ملم أو أكثر (أي أن الحشوة قد اجتازت ذروة الجذر نحو الخارج)، استعمل تحليل "مربع كاي" في الاختبار الإحصائي وكانت النتائج كما يلي: إن نسبة الغلق المثالية لذروة الجذر كانت (٦٦,٥٥%)، بينما الحشوات غير الكاملة كانت بنسبة (٢٨,٩%)، والتي كانت بالمعايير رقم اثنان (الحشوات التي ظهرت خارج الذروة) كانت بنسبة (٤,٦%). أظهر التحليل الإحصائي أن ليس هناك تأثير لجنس المريض أو بين الفكين أو نوع السن على هذه النتائج. نتيجة الدراسة بينت بأنه تحت الظروف التي أُجريت فيها الدراسة أبرز التحسس اللمسي نتائج فعالة في الحصول على الحشوة المثالية وخصوصاً إذا علمنا أن الطرق الإلكترونية وحتى الأجهزة الشعاعية المُستعملة عادةً في مثل هذه الحشوات غير متوفرة لطبيب الأسنان على العموم، حيث يزرع العراق تحت ظروف الحصر الجائر والذي شمل العلم والبحوث ووسائلها.

INTRODUCTON

Ideally the apical extent of the pulp should end short of the radiographic apex. This is an elusive point that varies from author to author to be between (0.5) to (2) mm⁽¹⁻⁴⁾. It can be determined or established by many methods, among these methods are tactile sensation, radiographic

assessment, electronic device ^(4,5) and recently digital radiograph is utilized for the estimation of the working lengths ⁽⁶⁾.

An accurate working length is absolutely necessary for successful root canal treatment. Normally an estimated working length is initially obtained from the pre-operative radiograph. Then the largest instrument that can be gently worked to this length is placed in the canal. If this is accurate as verified by radiograph, the preparation can be continued ⁽¹⁾. X-ray are required at various stages of root canal treatment this allow immediate visual observation which help the tactile sensation of the operator to determine the working length ⁽⁷⁾. Many authors suggested that many radiograph to be taken during working length determination of root canal treatment ^(5,8,9), which are; radiographs for the initial working determination. One or two radiograph taken during canal preparation for possible shortening of the working length as curvature in the body of the canal are reduced and finally a film of the last instrument is the desired apical depth. In addition to the pre-operative, final radiograph and follow up films ^(7,8), but due to the unavailability of x-ray machine in every practice; this will make taking the x-ray during root canal treatment difficult, in addition to increasing the cost of such treatment.

Apical foramina are usually found slightly short and to the side of radiograph apex ⁽⁷⁾. Canals may exit on the root surface at a variable distance and position from the root tip and it is impossible to judge the position of the apical foramina satisfactorily from radiograph ⁽⁴⁾. X-ray machines are available for practicing dentist at any stage of root canal restoration this allow immediate visual observation which help the tactile sensation of the operator to determine the working length ⁽⁷⁾.

Electronic equipment introduced to replace or supplement radiograph and tactile sensation in determining the end of the root canals was thought to be of limited value in endodontic practice ⁽⁷⁾, but this author suggested that their use should be considered only under conditions where routine dental radiography is not available. While other authors suggest that a diagnostic file is placed to the length indicated by the apex locator and a radiograph taken, then working length is decided on the bases of electrical, radiographic and tactile guidelines collectively ⁽⁴⁾. It is obvious that there is no general agreement upon which working length determination is performed.

The so-called apical foramen rarely ends at the geometric apex of the root. Nor, on the other hand it is routinely located far from the root apex. In clinical description instrumentation to the apex signifies the placement of the reamer and/or files to the radiographic apex. At this position it will be understood that the instruments are in most cases, slightly beyond the

confine of the root canal in the adjacent periodontal ligament space, continuous instrumentation in this area will ensure a complete debridement of tissue debris and to maintain the pathway of the canal. Deliberate instrumentation short of this point predisposes to dentin accumulation at the apex thereby increasing the risk of inadvertent blockage of the primary canal. These two points that might affect the final root canal length. The main objectives of determining the working length is to enable the canal to be prepared as close to the cementum dentin junction as possible⁽⁸⁾.

Obturation of the root canal system forms the final stage of root canal therapy and its success depends on obtaining perfect apical seal. The aim of this study is to evaluate the effect of tactile sensation in obtaining an optimum obturation.

MATERIALS AND METHODS

Three hundred and fifty radiograph of root filled teeth taken after obturation of clinical cases evaluated in this study. The author treated all teeth involved over a period of three year. The root canal prepared and the length was determined by the tactile sensation after measuring the initial length on the pre-operative radiograph. No radiograph was taken to determine the working length, but they were solely determined by the tactile sensation. All canals were obturated by gutta percha using the cold lateral condensation technique recommended by Grossman⁽¹⁰⁾. After the obturation a temporary stop was placed in the coronal part of the tooth and the patients were sent to a local radiologist for final radiograph to evaluate the obturation in the apical area. Among the (350) radiograph included in the study, (66) radiograph were excluded from the evaluation because of improper x-ray exposure which maybe either dark film, very faint film, distorted films or it is multicanal cases. The remaining films (284 radiograph) were divided according to the sex of the patient, position in the jaws and the type of tooth. The evaluation was carried as follows: two observer evaluate the radiograph for apical obturation separately, and when there was a difference between them a third evaluator checked the radiograph and final decision was recorded. The radiographs were placed on the X-ray viewer and all extraneous light was excluded and a magnifying lens was used. The view was restricted to the area of interest, which is the apical area.

The following categories were used:

The first category which is given a score of zero in which there is a dense three dimensional obturation of visible canal space within the confines of root canal space extending to cementum dentin junction approximately 1mm from the anatomical apex.

The second category which is given a score of one is regarded as an underfilled root canal in which there is a visible canal space in the apical area or when the root canal filling is more than 1mm from the anatomical apex.

And finally the third category which is given a score of two which is regarded as an overfilled filling when there is extension of the filling material beyond the anatomical apex.

The data were tabulated and a non-parametric chi square analysis was used for statistical test.

RESULT AND DISCUSSION

Teeth ranked zero score which is the optimum apical obturation was (189) cases (66.55%) in both jaws while those scored (1) which is under filled obturation was (82) cases (28.9%) and those scored (3) or overfilled cases was (13) cases (4.6%) as shown in table (1). Chi square analysis showed that there was significant difference between groups at $\alpha=0.01$.

Table (1): The quality of obturation according to the tooth type

Quality	Central	Lateral	Canine	First Premolar	Second Premolar	Total
0*	51	31	18	33	26	189 66.5 %
1**	17	14	10	11	30	82 28.9 %
2***	4	4	0	3	2	13 4.6 %
Total	72 25.3 %	49 17.3 %	28 9.9 %	47 16.5 %	58 30.9 %	284 100 %

* 0: optimum obturation extending to cementum dentin junction approximately 1mm from the anatomical apex.

** 1: underfilled root canal which is more than 1mm from the anatomical apex.

***2: overfilled root canal which is beyond the anatomical apex.

Tables (2) shows the distribution of cases evaluated according to tooth type, jaw and sex. It was shown that (82.04%) of the cases were in the upper jaw and (17.96%) were in the lower jaw. Among the cases the male constitutes (25.7%) in the upper jaw and (4.6%) in the lower jaw, while female constitute (56.34%) in the upper jaw and (13.03%) in the lower jaw.

Table (2): Distribution of cases evaluated according to tooth type, jaw and sex

Quality	Male						Female						Overall Total	
	Central	Lateral	Canine	First Premolar	Second Premolar	Total	Central	Lateral	Canine	First Premolar	Second Premolar	Total		
Upper Jaw	0*	20	8	2	7	14	51	28	20	10	18	23	99	150
	1**	4	3	4	1	6	18	13	10	6	6	18	53	71
	2***	2	2	0	0	0	4	2	2	0	2	2	8	12
	Total	26	13	6	8	20	73	43	32	16	26	43	160	233
Lower Jaw	0*	1	0	3	3	4	11	2	3	3	5	15	28	39
	1**	0	0	0	0	2	2	0	1	0	4	4	9	11
	2***	0	0	0	0	0	0	0	0	1	0	1	1	1
	Total	1	0	3	3	6	13	2	4	3	10	19	38	51
Overall Total	27	13	9	11	26	86	45	36	19	35	52	197	284	

*0: optimum obturation extending to cementum dentin junction approximately (1) mm from the radiographic apex.

**1: underfilled root canal which is more than (1) mm from the radiographic apex.

*** 2: overfilled root canal which is beyond the radiographic apex.

The analysis showed that there was no effect of the sex of the patient on the result of this study. Analysis showed that there was no significant difference between both jaws.

There was no significant difference in the result of this study with regard individual teeth meaning that the tooth type has no effect on the outcome of the quality of the obturation.

It was obvious from the result that the quality of the apical obturation is the main source of the differences in the results of this study.

The result of the study showed that, under the circumstances of this work, the tactile sensation produce results as effective as other methods of working length determination advocated by many authors⁽⁴⁻⁶⁾ by having a reasonable apical obturation. Where it was found in this study that about (67%) of cases evaluated produced an acceptable apical obturation. Where as very few cases were unacceptable apical obturation and that constitute only (4.6%) of the evaluated cases. Those cases which regarded as having an under filled obturation constitute about (28%) of over all cases. These cases might be regarded by some authors^(2,3,5) as an acceptable cases when they consider a (2) mm from an anatomical apex as an acceptable root filling cases but in this study it was considered and obturation which is more than 1mm as an unacceptable.

In conclusion this evaluation showed that tactile sensation for root canal length determination could be justified, under the circumstances that limit the availability of other methods for working length determination and in particular the x-ray machine for the general dentist in Iraq upon which a harsh sanction is imposed which include scientific and health sanction.

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