Research Article

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Modified Post Space Impression Technique to Edge on Prevailing Best Technique: In Vitro Study

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ABSTRACT

Background: **Aim**: The aim of the present study was to determine a technique which produces a most complete post space impression that is accurate in all dimensions.

Materials and Methods: 10 freshly extracted maxillary central incisors were collected followed by root canal treatment and post space was prepared leaving 4 mm of gutta-percha at the apex. Impression of post space was recorded by poly vinyl siloxane and the three techniques were employed that made use of different combinations of 24 gauge anaesthetic needle vent, 26 gauge reinforcement wire and lentulo spiral. Hence in total 150 samples of impression were recorded and then evaluated for presence of void and completeness using magnifying glass of power 3x. Observations were recorded and statistically analyzed.

Results: Maximum number of void free impressions were obtained using anesthetic needle to vent air. Impressions made using lentulo spiral and needle did capture complete impressions but were flexible. However maximum number of complete, firm and void free impressions was produced using anesthetic needle, lentulo spiral and reinforcing wire.

Conclusions: Use of anaesthetic needle vent produced void free impressions and lentulo spiral assures extension of material till full length but renders an unsupported impression to be flexible. Hence incorporating reinforcing wire is recommended to achieve firm, void free and complete impressions which were accurate in all dimensions.

Keywords: Impression technique, Prosthodontics, Dentistry.

INTRODUCTION

Extensive loss of tooth structure, due to any reason either may it be because of caries or fractured tooth, requires treatment to strengthen the remaining tooth structure which might necessitate root canal treatment of the tooth followed by post and core and crown. [1] Post and core system has been broadly classified as: (1) Prefabricated post, further divided into: (a) Metal post –serrated, non serrated, tapered, parallel or combination. (b) Fibre glass posts – E sintered glass fibre post, S sintered glass fibres post and fibre reinforced composite posts. (2) Custom Posts: which employs different alloys for casting.eg High noble, noble and base metal alloys, all have been used for the construction of posts. [2]

Prefabricated posts though reduce chair side time but require more reduction of remaining tooth structure as well as does not adapt according to the root canal morphology.[3] Advantages of cast posts like increased strength, being more tarnish and

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Fig 1: Material and Armamentarium.

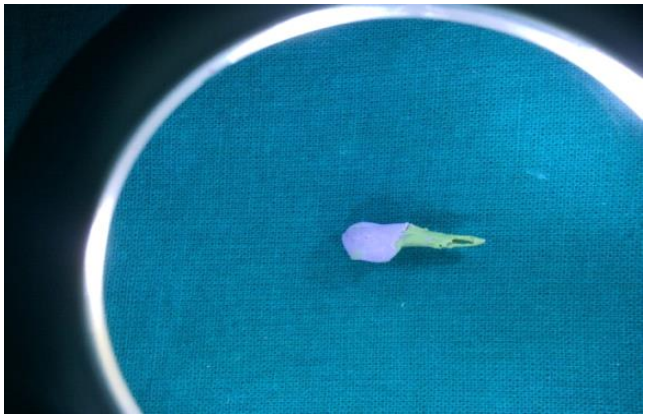


Fig 2: Impression taken by technique 1.

Fig 3: Impression taken by technique 2.

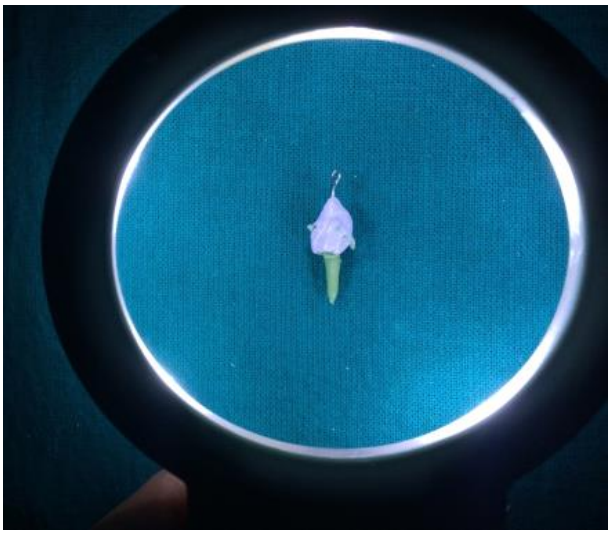
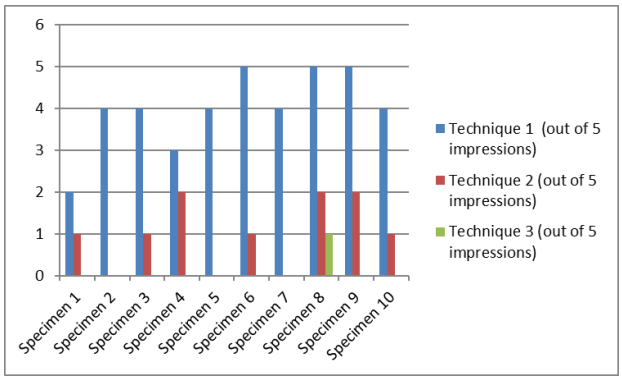


Fig 4: Impression taken by tech. 3.

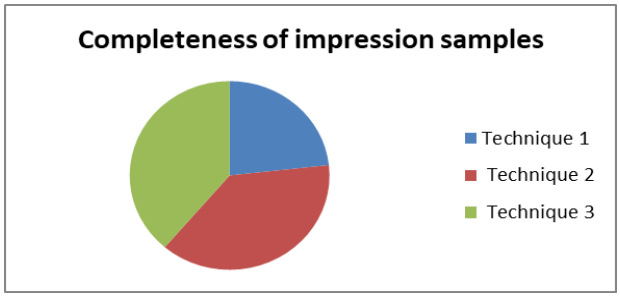
Fig 5: Flexible post impression due to lack of reinforcement.

Fig 6: Presence of void at apex resulting in incomplete impression.

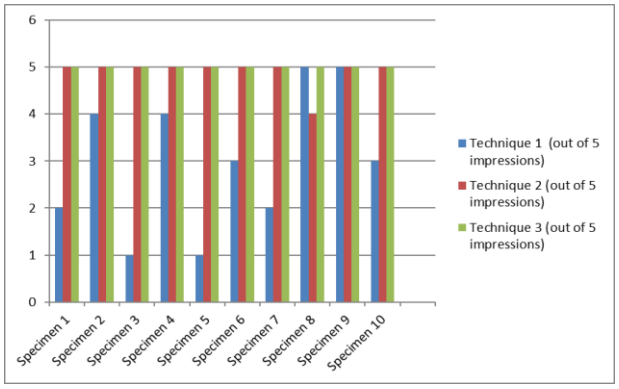
Fig 7: Complete impression recorded using tech. 3.



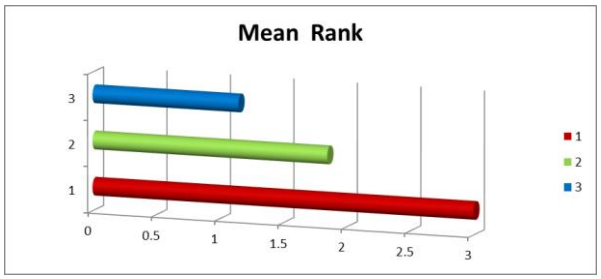
Graph 1: Shows data analysis for Table I.



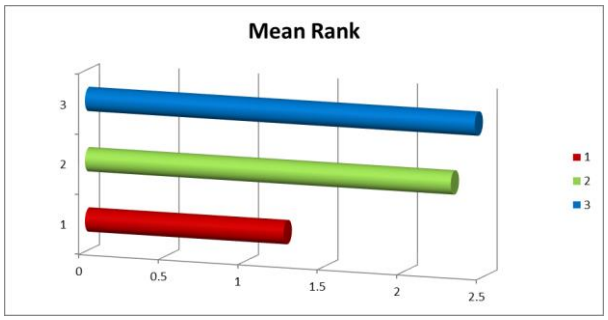
Graph 2: Completeness of impression samples.



Geaph 3: Shows data analysis for Table II.



Graph 4: Mean rank for statistics of Presences of voids For Table III.



Graph 5: According to mean rank for statistics of completeness for Table IV.

corrosion resistance due to use of noble metal alloys and customized fit, sound junction between post and core as the casting is a single unit, radio opacity of material thus facilitating ease of detection are the pronounced features documented supporting their popularity over prefabricated posts.

Custom made post offers better fit to prepared canals within the flat and irregular shaped canals requiring less canal preparation while offering higher strength as compared to prefabricated post.[3] This necessitates the post space impression to be most accurate in all forms. Post space impressions can be recorded using different materials namely, polyvinylsiloxane, vinylpolyether siloxane, pattern resin, blue inlay wax etc. depending on the either of the two different techniques, being employed, classified as: Direct technique and Indirect technique.[4] Here in the conducted in-vitro study we have employed indirect method for recording post space impression, considering its advantage of reduced chair side time.

Objective of this study is to evaluate and compare two modified post space impression techniques with the prevailing best technique. Hence different alterations have been made in combinations, with

Table 1: Shows data for samples with presence of voids.

Specimens	Technique 1 (out of 5 impressions)	Technique 2 (out of 5 impressions)	Technique 3 (out of 5 impressions)
Specimen 1	2	1	0
Specimen 2	4	0	0
Specimen 3	4	1	0
Specimen 4	3	2	0
Specimen 5	4	0	0
Specimen 6	5	1	0
Specimen 7	4	0	0
Specimen 8	5	2	1
Specimen 9	5	2	0
Specimen 10	4	1	0
Total (out of 50)	40	10	1

Table 2: Shows data for samples with completeness of impressions.

Specimens	Technique 1 (out of 5 impressions)	Technique 2 (out of 5 impressions)	Technique 3 (out of 5 impressions)
Specimen 1	2	5	5
Specimen 2	4	5	5
Specimen 3	1	5	5
Specimen 4	4	5	5
Specimen 5	1	5	5
Specimen 6	3	5	5
Specimen 7	2	5	5
Specimen 8	5	4	5
Specimen 9	5	5	5
Specimen 10	3	5	5
Total (out of 50)	30	49	50

Table 3: Shows Biostatistical analysis for Presences of voids in impression samples.

Descriptive Statistics for Voids					Friedman's ANOVA test			Bonferroni post-hoc test
	N	Mean	Std. Deviation	Mean Rank	Chi-Square	df	P Value	
TECH1	10	4.00	.943	3.00	18.865	2	0.001 (HS)	3 < 2 < 1
TECH2	10	1.00	.816	1.85				
TECH3	10	.10	.316	1.15				

Table 4: Shows Biostatistical analysis for completeness of the impression samples.

Descriptive Statistics for Completeness					Friedman's ANOVA test			Bonferroni post-hoc test
	N	Mean	Std. Deviation	Mean Rank	Chi-Square	df	P Value	
TECH1	10	3.00	1.491	1.25	12.667	2	0.002 (HS)	2 = 3 > 1
TECH2	10	4.90	.316	2.30				
TECH3	10	5.00	.000	2.45				

the same basic instruments, to propose a technique which is maximum effective in producing post space impression that is accurate in all dimensions.

MATERIALS AND METHODS

This study has been conducted on 10 freshly extracted and root canal treated maxillary central incisors, with the help of materials and armamentarium as displayed (Fig.1).

Ten freshly extracted central incisors were collected and disinfected using gluteraldehyde solution and were mounted in wax blocks as per dimension of tooth for proper stabilization. Root canal was accessed using safe end cutting bur and was flared for proper visibility and access. Pulp was expirated and biomechanical preparation was done with the help of hand filing using K file upto #80. Preparation was standardized for all in order to gain equal post space. Obturation was done with lateral condensation technique using gutta percha cones (Dentsply).[5] The post space preparation was done in all 10 teeth using gates drill followed by peeso- reamer upto #5. To standardize the method, the post space preparation was kept 8mm in length, which was confirmed using endo file.

100 pieces of 26 gauge wire measuring 3 cm were cut and curved tags were made at one end. Grooves and serrations were made on wire using airotor with thin diamond bur. PVS Adhesive [3M ESPE VPS Tray adhesive (liquid)] was applied with the thickness of single coat on each wire piece. It was allowed to dry for 15 minutes for proper bond strength. [6]

Three different techniques have been employed to obtain the impression of the post space using polyvinylsiloxane (light body consistency) impression material (3M ESPE,Express).[7] Three techniques were employed on each of the 10 teeth with each technique being performed on same tooth for 5 times thus recording total 150 impression samples. Techniques employed were:

Technique 1[8]:

Tooth sample was selected and 24 gauge anaesthetic needle was inserted in post space, with the aim to act as a vent for air. Light body polyvinylsiloxane Impression material (Express, 3M ESPE) was then injected into post space using a disposable tip. Anaesthetic needle was removed and 26 gauge wire was inserted into the post space filled with light body impression material, supported by high viscosity putty consistency siloxane impression material (Aquasil,Dentsply), in order to reinforce the material and prevent the distortion of the impression at the time of retrieval.

Technique 2:

Tooth sample was selected and 24 gauge anaesthetic needle was inserted in the post space, with the aim to act as a vent for air. Lentulo spiral was operated with micro motor at low speed in pulling motion while injecting the impression material in post space to push the material most apically. Impression is then retrieved in similar manner to that of technique 1, after the impression material has set. (Fig. 5)

Technique 3:

Tooth sample is selected and 24 gauge anaesthetic needle was placed in post space, with the aim to act as a vent to evacuate air. Impression material was injected into the post space and pushed apically using lentulo spiral as in technique 2. 26 gauge serrated wire was then inserted into the post space filled with impression material in order to reinforce the impression to prevent its distortion and simultaneously needle was removed. Material was allowed to set and was then removed carefully, as in technique 1. (Fig. 4 and Fig. 7)

Evaluation: Each impression sample was then individually evaluated under magnifying lens with the power of 3x. And the readings were recorded under the two criteria of evaluation, as follows: (1) According to Presence of voids [Table I], (2) According to extent of completeness of impression. [Table II]

RESULT

Evaluation of total 150 samples, made using three techniques, studied using the two criteria revealed that :

Criteria 1: Presence of voids: Presence of voids was maximum in samples taken using technique 1 (Fig.2), voids were mostly found in middle half and at apex. Minimum voids or no voids were seen in the impressions taken using technique 2 and 3 respectively (Fig. 3, Fig.4). According to presence of voids in the impressions, which were made using above mentioned techniques, decreasing order (of voids in samples) would be as follows: Tech. 1 > Tech. 2 > Tech. 3. Hence **Maximum** samples **without voids** were obtained by technique 3 and **with voids** were obtained by technique 1. P value obtained in Friedman's ANOVA test is highly significant (0.001) accounting to the marked difference, confirmed by Bonferroni's test which graded technique 3 as a method presenting with least number of samples with presence of voids.[Table III and Graph 1,4]

Criteria 2: Completeness of impression: No voids were detected and maximum length of the post space was covered by the impressions taken using technique 3 (Fig. 7). In impressions made using technique 1, material did not reach till apex showing incomplete post space coverage. Sample of complete impressions derived from post space using all three techniques in decreasing order is as follows: Tech. 3 > Tech. 2 > Tech. 1. Maximum length of post space and completeness of impression in all aspects was covered by the impressions which were obtained by technique 3.Through the tabulated figures noted after evaluating 150 samples, results obtained shows that technique 3 proves to be most promising of all three techniques. It gives least number of voids as well as maximum extent of completeness of post space impression in terms of length along with all other dimensions. P value obtained in Friedman's ANOVA test is highly significant (0.002) accounting to the marked difference. Though according to Bonferroni's post hoc test technique 2 is equivalent to technique 3, but on evaluating other data like mean rank values, technique 3 can be considered to be the one superior in all three, generating a higher number of complete impressions. [Table IV and Graph 3, 5]. Hence Tech. 3 > Tech. 2 > Tech. 1

This statistical analysis was performed using the statistical software package SPSS (Chicago, IL, USA) version 22.0 for MS Windows & $P \leq 0.05$ was considered statistically significant.

$P \leq 0.01$ = Highly Significant (HS)
$P \leq 0.05$ = Significant (S)
$P > 0.05$ = Not Significant (NS)

DISCUSSION

The post space impression plays a major role in determining the shape and form of customized post to be fabricated and hence needs to be most accurate to ensure a proper fit. Only few studies have been done to compare the techniques employed to evaluate post space impression. Regardless of the technique used, impression must be highly accurate and must record all the surface details along the entire length of post space. This study was conducted to compare the post space impressions which were recorded using polyvinylsiloxane light body as impression material and lentulo spiral, anaesthetic needle and reinforcing wire with different combinations as instruments, to that with prevailing best technique which made use of polyvinylsiloxane as impression material, since it records minute surface details upto 0.02 mm has better wettability and recovers

the deformation during removal easily [10]. Marzola et al in 2000, suggested the use of anesthetic needle to provide vent in order to achieve void free impression. [9]. Rosensteil et al in 2001, concluded all the elastomeric impression material in one form or another requires reinforcement preventing distortion giving an accurate fit. [5]

This study makes use of 24 gauge anaesthetic needle to vent air and 26 gauge wire which was serrated to reinforce the material. This can be attributed to the fact that anaesthetic needle allowed air to escape while injecting the material into post space leading to a void free impression. [8]

Using a lentulo spiral, material is introduced into post space and pushed as apically as possible in order to gain maximum length of complete impressions. The spiral body of the instrument produces bubbles, which were removed using the vent of the needle and the impression was reinforced with 26 gauge wire to prevent the distortion of impression.

On comparison of two tables [Table I and Table II], it was found that the technique 3 produced impression which were complete and accurate in all dimensions with maximum number of samples with no voids and hence fulfils both the criteria of the study.

Prevailing best method which was selected as the base method does not seem to be as competent to that of its modifications. In the impression made by this method (tech1) material seems not to be reaching till the apex leaving a void at apex, and hence not replicating the apex of post space giving incomplete details in impression.

In this study technique 3 gave most apically extending (attributed to the use of lentulo spiral), void free (attributed to the use of vent provided by anaesthetic needle) and firm impression (due to reinforcement done by serrated 26 gauge wire). Though technique 2 (Fig. 5) also gave complete impression but flexibility due to lack of reinforcement seems to be a setback of this technique, and can be considered as a limitation. Hence according to the data tabulated and on comparison between tables, accuracy of the impressions can be summarized as: (in decreasing order): Technique 3 > Technique 2 > Technique 1

CONCLUSION

Impression of post space is usually detected to have voids due to insufficient vent hole for air to escape, but introduction of anaesthetic need to vent air and lentulo spiral to push the material most apically leads to complete coverage of the post space. This has resulted in more accurate post space impressions which promote accurate fit of the custom posts, helping to strengthen the destructed tooth in best possible way. Impression technique which uses lentulo spiral to express impression material into the post space produces greatest number of complete impression, and that of maximum number of void free impressions were produced by technique which uses vent hole for air to escape. In addition, reinforcement with serrated wire adds to the better retrieval of the complete impression without distorting it .Combination of these three (as seen in technique 3) proves to be a promising technique, confirmed after evaluation of 150 impression samples.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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