Original Article

An In-Vitro Comparison Of Post Space Impression Using Two Different Technique With Polyvinylsiloxane And Vinyl Siloxane Ether Impression Material

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Abstract

Purpose: To identify the best impression material and technique for completeness and voids free post space impression.
Materials and method: 5 extracted maxillary central incisors mounted on acrylic block used and modified by biomechanical preparation of root canal and filled with gutta purcha. Post space was prepared and impression were made using Polyvinylsiloxane and Vinyl Siloxane Ether using two different technique. Technique 1 performed only with anesthetic needle and 23 gauge orthodontic wire, whereas technique 2 performed with additional use of lenturospiral. Data were collected and statistical analysis were done to identify best technique and material for completeness and voids free post space impression.
Results : There was statistical difference between technique 1 and 2 with Polyvinylsiloxane material [Group A = 68%, Group B = 88%] and no difference in both techniques while making impression with Vinyl Siloxane Ether material[Group B,D= 96%]. Maximum voids in post space impression were found in polyvinyl siloxane impression material using technique 1 [mean: 2.424] and least voids found in technique of impression making using Vinyl Siloxane Ether material [mean: 0.52]
Conclusion : Impression made with Vinyl Siloxane Ether impression material, with anesthetic needle, lenturospiral and 23 gauge orthodontic wire, is considered to be the better of Polyvinylsiloxane impression material.

keywords: Polyvinylsiloxane, Vinyl Siloxane Ether, post space impression.

Introduction

Restoring and reinforcing endodontically treated teeth is a practical concern.[1] Most teeth required endodontic therapy have already endured ravages of advanced dental diseases like gross caries, ultimately weakened the coronal tooth structure. Further removal of coronal structure for endodontic access cavity predispose to inopportune crown/root fracture.[2] The use of post and core circumvents these problems. The post, core and crown acts as one unit. Post provides retention for the core, core replaces lost coronal tooth structure and crown restores the function and esthetics of the tooth.[3]

Post are of two types-prefabricated or custom made. Selection of post type based on clinician's preference and clinical situation.[4] The main advantages of custom made post are that they have proper fit to the root design and

less removal of tooth required. These can be used with irregularly shaped and extremely tapered canals, multi-rooted teeth, small teeth like mandibular incisors.[5,6]

Various techniques have been described for post and core fabrication. Fabrication of Custom made post can be done by direct and indirect technique.[5] In direct technique it fabricated directly intraorally in prepared tooth, can be made with auto or light polymerising resin. In indirect technique final impression of prepared tooth and post space made and final pattern and custom post fabricated on a die from impression.[7]

Various impression materials and techniques are introduced to record the post space correctly. Any kind of impression material with selected technique be able to record completeness of post space without voids. Currently most dental practitioners uses polyether and silicone in single step impression technique. With the advent of newer material Vinly Polyether Siloxane combining the advantages of Polyvinylsiloxane and Polyether impression material, can be used with indirect technique for custom made post. [8,9,10] Vinyl Siloxane Ether offers excellent flowability with remarkable hydrophilicity, ensures excellent inflow in even in narrow space. Due to high elastic properties, material shows better dimensional accuracy and easy retrieval.[11,12]

Very few studies carried out comparing post space impression technique. So, the purpose of this study was to compare the two different impression technique using Polyvinylsiloxane and Vinyl Siloxane Ether impression material to record voids free and accurate post space.

Materials and Method

In the present study, evaluation of post space impression was carried out with Polyvinylsiloxane and Vinyl Siloxane Ether impression material using two different impression technique. The completeness of impression and voids in impression were evaluated. the evaluation of accuracy of impressions of was done by 2 different operators using 3.0X magnifying lens.

Total 5 freshly extracted and sterilized maxillary central incisors were mounted on acrylic block to carry out the procedure[figure- 1]. Teeth were first modified to remove pulp and gutta purcha was filled after biomechanical preparation of root canal. Post space was prepared with No.1 to No.4 GG drill followed by No 1 peesoremaer keeping around 4 mm of gutta purcha at the root apex and root canal was enlarged to number 5 peesoreamers. post space was then analysed with radiograph. Preparation was standardised for all in order to gain equal post space. Teeth prepared for porcelain fused to metal restoration. Materials used to perform this study are shown in figure 2.

23 gauge orthodontic wire with length of 3 cm were cut and curved tag at the cervical portion of tooth. grooves and serration made on wire with thin diamond bur. Tray adhesives applied on wire and allowed to dry for 15 minutes for proper bond strength.

Impression technique 1

Anaesthetic needle of 24 gauge diameter used as vent and inserted in prepared post space and stabilised with help of tweezer and flowable light body impression material injected using disposable tip into post space. Anesthetic needle then retrieved and orthodontic wire of length 3 cm and diameter of 23 gauge for reinforcement of light body impression material inserted to prevent distortion. Then final impression made with custom tray with putty over light body material and whole impression was obtained .

Impression technique 2

Anaesthetic needle of 24 gauge diameter used as vent and inserted in prepared post space and stabilised with help of tweezer and flowable light body impression material injected using disposable tip into post space. Anesthetic needle removed and after that with the help of lenturospiral with slow speed contra angled hand piece light body impression material were spread in post space. Then, orthodontic wire of length 3 cm and diameter of 23 gauge for reinforcement of light body impression material inserted and then final impression made with custom tray with putty over light body material.

Group A: Polyvinylsiloxane impression material with technique 1[figure 3]

Group B: Vinyl Siloxane Ether impression material with technique 1[figure 4]

Group c: Polyvinylsiloxane impression material with technique 2[figure 5]

Group d: Vinyl Siloxane Ether impression material with technique 2[figure 6]

Total 25 samples were obtained from each group. Two techniques using two different impression materials were employed on each of the 5 teeth, with which technique being performed on same tooth for 5 times thus recording total 100 samples.

Figure 1: 5 prepared maxillary central incisor mounted in acrylic block

Figure 2: armamentarium and materials used to perform the study

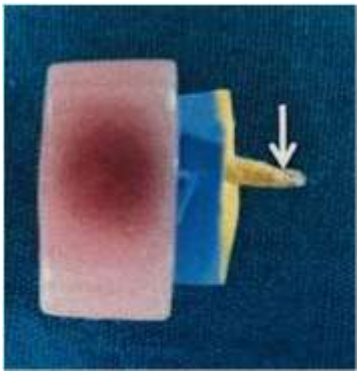


Figure 3: group A's impression showing voids at apex and incomplete impression

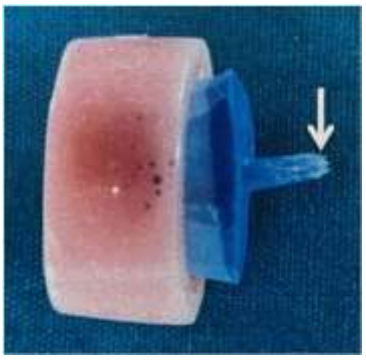


Figure 4: group B's impression showing voids at apex and complete impression

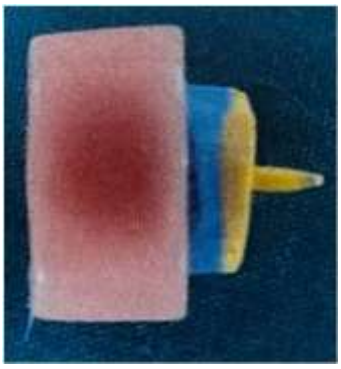


Figure 5: group C's impression showing complete impression

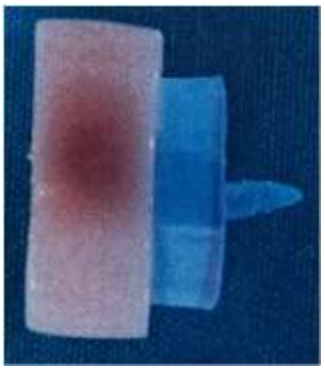


Figure 6: group D's impression showing voids free complete impression

Results:

In the present study, two techniques with two different impression materials are compared for completeness of impression and number of voids in impression. The completeness of the impression was evaluated by magnifying lens of 3.0X. According to the results obtained, for the completeness of impression, using the Polyvinylsiloxaneimpression material, in Technique 1, had 68% of complete impression (Table 1) and in Technique 2, it had 88% of Complete impression (Table 2). The mean difference of completeness of Impression was 0.20 (Table 1,2) and it was found to be statistically Significant ($p<0.018$) between the two techniques. This implies that, using the Polyvinyl siloxane impression material, The technique 2 had better recording of completeness of impression.

Completeness of Impression, using the Vinyl Siloxane Ether impression material, in Technique 1, had 96% of Complete impression (Table 1) and in Technique 2, it had 96% of complete Impression (Table 2). The mean value of difference in completeness of Impression was not found to be statistically significant. This implies that, Using the Vinyl Siloxane Ether impression material, the any of the two Techniques used, can give us good recording of completeness of Impression[Group B=D]. This result can be attributed to the properties of the impression Material- Vinyl Siloxane Ether like better flowability, hydrophilicity, less distortion and good accuracy. while using Polyvinylsiloxane material with technique 2 shows more completeness of impression rather than technique 1. and Vinyl Siloxane Ether is superior than Polyvinylsiloxane in terms of completeness of impression. so sequence of group in decreasing order can be given as: Group D= Group B> Group C> Group A.

The number of voids, recorded in impression, using two different Materials and both the techniques, were evaluated by magnifying lens Of 3.0 X.

According to the results obtained, for the number of voids in Impression, using the Polyvinylsiloxaneimpression material, in Technique 1, the mean Number of voids were 2.44 +0.71 (Table 3) and in Technique 2, the mean number of Voids were 1.00 +0.91 (Table 4). The mean difference of number of voids Was 1.44 and it was found to be statistically significant ($p<0.001$) between the two techniques.

This implies that, using the Polyvinyl siloxane impression material, The technique 2 had lesser number of voids in comparison to Technique 1. According to the results obtained, for the number of voids in Impression, using the Vinyl Siloxane Ether impression material, in Technique 1, the mean Number of voids were 1.56 ± 0.71 (Table 3) and in Technique 2, the mean number of Voids were 0.52 +0.58 (Table 4). The mean difference of number of

voids Was 1.040 and it was found to be statistically significant ($p<0.001$) between the two techniques. This implies that, using the Vinyl Siloxane Ether impression material, the technique 2 had lesser number of Voids in comparison to Technique 1. The sequence of the groups in Decreasing Order Given Can Be As: Group D> Group B> Group C> Group A.

The maximum number of void free impressions were obtained in Group D (Vinyl Siloxane Ether impression material with needle and Lentulospiral with 23-gauge orthodontic wire for reinforcement was used) As seen in TABLE 4 followed by Group B (Vinyl Siloxane Ether impression Material with needle with 23-gauge orthodontic wire for reinforcement was Used), given in TABLE 3, then Group C (Polyvinyl siloxane impression Material with needle and lentulospiral with 23-gauge orthodontic wire for Reinforcement was used) seen in TABLE 4 and lastly Group D (Polyvinyl Siloxane impression material with needle with 23-gauge orthodontic wire For reinforcement was used), as shown in TABLE 3.

Materials	Complete Impression		Partial Impression		Total		Mean value	Sd
Group A	17	68.0%	8	32.0%	25	100%	0.68	.476
Group B	24	96.0%	1	4.0%	25	100%	0.96	.200

Table 1: distribution of complteness of impression by technique 1.

Materials	Complete Impression		Partial Impression		Total		Mean value	Sd
Group C	22	88.0%	3	12.0%	25	100%	0.88	.332
Group D	24	96.0%	1	4.0%	25	100%	0.96	.200

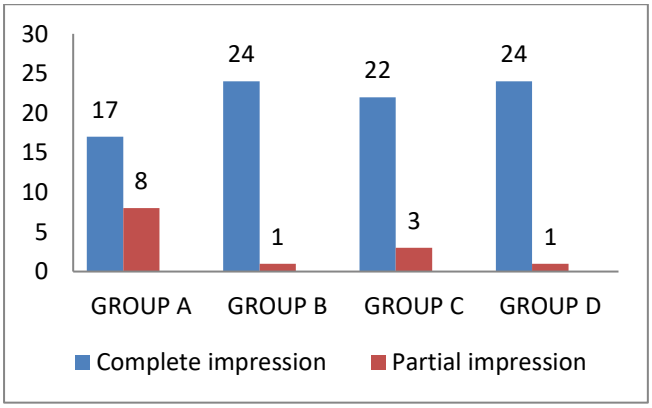
Table 2: distribution of complteness of impression by technique 2.

Type	N	Mean	SD	SE	Min	Max
Group a	25	2.440	0.7118	.1424	1	4
Group b	25	1.56	0.712	.142	0	3

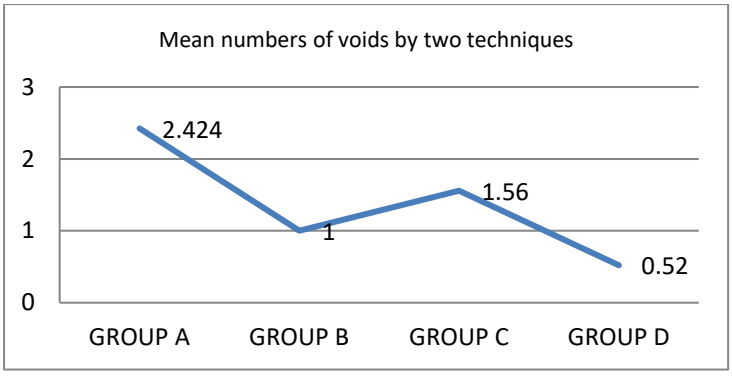
Table 3: shows mean value of voids by technique 1.

Type	N	Mean	SD	SE	Min	Max
Group C	25	1.000	0.9129	.1826	0	3
Group D	25	0.52	0.586	.117	0	2

Table 4: shows mean value of voids by technique 2.



Graph 1: distribution of completeness of impression



Graph 2: distribution of mean number of voids by technique 1 and 2 and two impression materials.

Discussion

Due to removal of extensive caries/trauma, endodontically treated teeth becomes anatomically and structurally weak.[13] Restorative problem occured due to brittleness of dentin caused by loss of water, collagen cross linking and tooth structure.[6] Today patient themselves prefer, to preserve their teeth rather than getting extracted. So, after root canal treatment if needed they go for post and core treatment. Post and core provides advantages of better proprioception and feeling of naturalness. Amount of tooth structure retaining and amount of tooth structure damaged, will decides the restoration type of endodontic treated teeth.[14,15]

Preprosthetic treatment of root canal treated teeth involves reconstruction of lost tooth structure using suitable alloplastic material to provide a sufficient amount of structure for crown and bridge. Root post must be used when remaining tooth structure is insufficient for permanent retention of direct core build up.[16,17]

Previously cast dowel pins were used. But due to multiple disadvantages such as minute fracture line and crazing of dentin, as a result of friction locked and self thredding pins, use of dowel pins are restricted.[18] To overcome the disadvantage of dowel pins, a prefabricated root post or custom fabricated post can be used. Prefabricated post are round so requires more tooth reduction and incapable of resisting the rotational forces. Custom cast post and core considered best as it provides better geometric adaptation to irregular and excessively flared or elliptical canal, and requires minimum tooth structure removal.[5,18,19]

Complete impression making of post space is an important requisite. If not recorded properly it leads to inaccuracy of fit of cast post and deficiencies of impression, lead to nodules on the cast post, which again affects passive fit of post. Hence, accurate recording of post space is must. Custom cast post can be formed either directly in mouth or indirectly in the laboratory.[20]

Direct technique of custom made post usually indicated for single rooted teeth with good access. And it is made directly in mouth with auto or light polymerising acrylic resin or inlay wax and then invested and cast.[5,21] In indirect technique, one makes an impression of endodontically treated root from which a working die is made. On this die, a suitable pattern is carved, invested and cast.[22,23]

Thermoplastic or elastomeric impression material mostly used for indirect technique. Indirect technique provides some advantages such as reduce chair side time and allows parallelism and design to be optimized, particularly when multiple abutments are used. So in this study indirect technique was chosen.

According to Chee et al[4] and Niraj Mishra et al[24], they compared Five techniques for the preparation of post space, and concluded that Anaesthetic needle used as vent with wire reinforcement, was considered to Be the best of all five techniques. Marzola et al[4], also suggested the use of anaesthetic needle to Provide vent in order to achieve void free impression So, this was one of the techniques used in this study. The second technique, used in this study, used lentulospiral For pushing the material apically in the post space along with anaesthetic Needle acting as a vent and using wire for reinforcement. The second technique, was considered to be the Promoting technique for post space impression making using Polyvinylsiloxaneimpression material according to Dipti et al.[25] In the Present study, the comparison of two techniques using newer impression Material Vinyl Siloxane Ether has been carried out. Furthermore, Poly vinyl siloxane (light body consistency) Elastomeric impression material makes an accurate impression of the post Space if wire reinforcement is placed to prevent distortion"

Based on the availability of new impression material Vinyl Siloxane Ether, which offers excellent flowability that, in combination with a remarkable hydrophilicity (lowest achievable contact angle of less than 10° after 1 second) ensures an optimal inflow in a humid environment, even in The narrowest sulcus crevices. Due to its high elastic

properties, this material retains its dimension accuracy, is very easy to remove (from the patient's mouth and plaster model] and is odorless and tasteless. [26,27]

Vinyl Siloxane Ether, has advantages of Polyvinylsiloxane and Polyether impression Materials, can be used for the indirect technique of post fabrication. Since, this material has not been used in any previous studies for the post space Impression, it is used in this study, for recording the prepared post space and comparing it to Polyvinylsiloxane impression Material, which has been used till date for recording the post space Impression.

Rosensteil et al in 2001,[28] concluded all the elastomeric impression material in one form or another requires reinforcement preventing distortion, leading to an accurate fit of cast post. In this study, an orthodontic wire of 23-gauge was used for the purpose of reinforcement of the impression to record accurate and complete impression of post space.

From this study, it can be deduced, that the newer impression Material – Vinyl Siloxane Ether has more completeness of impression and Void-free impressions, because of the properties of material like stiffness Of material (due to the combination of two impression material- Polyvinylsiloxaneand polyether), better flowability, hydrophilicity, more Accuracy and can be removed from post space with lesser distortion in Comparison to Polyvinyl siloxane impression material, which is being used Till date for indirect technique of making the post space impressions.

So, from this study, it can be concluded that, Vinyl Siloxane Ether With needle, lentulospiral and 23-gauge orthodontic wire is considered to Be the better of both techniques and both materials in obtaining complete Void free impression. The lentulospiral helped in pushing the material apically, and the Needle acted as vent, getting us more complete impression.

Thus, being a Prosthodontist, for post space impression, using Indirect technique, one can prefer Vinyl Siloxane Ether impression material Being used along with needle, lentulospiral and orthodontic wire, to make Complete, accurate and void- free impression of the prepared post space.

From this study, it can be inferred that attention should not only be Given to material of post space impression making but also to the technique That is being used for the same.

Conclusion:

For polyvinyl siloxane impression material, the combined technique of needle, lentulospiral and 23-gauge orthodontic wire gave us more complete and void-free impressions, in comparison to needle and orthodontic wire technique. For Vinyl Siloxane Ether impression material, either of the two techniques gave us the similar results for completeness of impression, but the technique 2 was superior to technique 1, in giving void-free impressions. When both the impression materials are considered and compared, newer material, Vinyl Siloxane Ether, is considered more superior in recording post space impressions, due to its enhanced properties than polyvinylsiloxane.

From this study, it can be concluded that Vinyl Siloxane Ether impression material, with anaesthetic needle, lentulospiral and gauge orthodontic wire, is considered to be the better of both techniques and both materials, in obtaining complete, void free impressions.

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