Immediate Core Reconstruction With A Vacuum Formed Matrix: A Case Report

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Citation

H Esteves, A Correia. *Immediate Core Reconstruction With A Vacuum Formed Matrix: A Case Report*. The Internet Journal of Dental Science. 2007 Volume 6 Number 1.

Abstract

Reconstruction of endodontically treated teeth with major destruction is a difficult process in dental practice. When destruction is more extended and strength is critical, silver amalgam still is the choice. Due to the difficulty of creating a core in posterior teeth with major destruction, the main purpose of this paper is to present a technique that, in our opinion, improves the buildup core process, especially in an isolated tooth.

INTRODUCTION

Reconstruction of endodontically treated teeth with major destruction is a difficult process in dental practice. The remaining dental structure doesn't give sufficient retention and resistance to the restoration to stand up with masticatory forces [1]. In a review article, Peroz [2] describes five levels classification of tooth destruction, depending on the number of axial cavity walls present: class I-III, two to four cavity walls; class IV, one wall; class V, no wall. If we have at least two axial walls, an adhesive restoration may be the best choice. However, if we have less than two axial walls we must follow a different reconstruction method, consisting of auxiliary methods of retention like posts, and the build-up of a core. It must be considered that the construction of a core is always necessary as the amount of the tooth remaining structure decreases, specially bellow a two axial walls cavity. This same reason is applied for the use of a post, which major function is to provide resistance and retention for the core material. In addition, Sorensen and Martinoff [3] report a high failure rate for posterior pulpless teeth without cusps protection by the restoration. Aquilino and Caplan [4] found a significantly improved success rate when the pulpless teeth were crowned.

In order to reconstruct a tooth of class IV or V, we can apply two major types of systems to enhance retention and resistance of crown: indirectly called custom-made and directly using different restorative materials helped when needed through a prefabricated post.

The amount of remaining dental structures is the main responsible for long term success of the restoration [5,6,7,8]. For anterior teeth and premolars custom-made posts are recommended, because tooth preparation is more conservative than prefabricated post and the core is generally too fragile (some parts of direct material are less than 1 mm of thickness after tooth/core preparation) [9,10,11]. But in teeth with fewer millimeters of remaining coronal dental tissue, physical properties of core reconstruction profoundly influence the long-term prognosis of restored pulpless tooth [12]. In molars direct materials are used more often (core with more than 2mm of thickness and pulpar walls are retentive inclination). Direct materials should present mechanical, biological properties and easy manipulation.

The materials used in this kind of reconstructions must present features like biocompatibility, easy manipulation, sufficient compressive and flexural strength to the oral forces, dimensional stability and thermal coefficient of expansion and contraction similar to the tooth structure and mainly a good pattern of stress distribution that depends on the elasticity modulus of the material [13].

Some of the most commonly used direct materials are: silver amalgam, resin-based composites and glass ionomers [14]:

Glass ionomers should not be used as a core material as they present a low compressive, flexural and fracture resistance, low Young's modulus, poor condensability, poor bonding features and high solubility [15,16,17,18,19].

When more than half of the coronal structure tooth remains, the resin-based composites can also be used [20]. Recently,

resins have been reinforced with titanium and some studies show an increased in resistance to intra-oral compressive and flexural forces [21,22,23,24,25], but long-term studies are needed in order to see the success rate, mainly due the polymerization shrinkage, hygroscopic expansion and the presence of voids as a result of deficiencies in condensation [26,27].

When destruction is more extended and strength is critical, silver amalgam still is the choice [28,29,30,31,32,33,34,35,36,37],. The amalgam has been used for many decades. This material present an high strength and low solubility and a coefficient of thermal expansion similar to the tooth substance, which makes it adequate as a core material [38,39,40,41,42,43].

Amalgam build up of dental cores in teeth with major destruction, especially in posterior regions of the mouth, it is only possible with the use of a matrix to help condensation amalgam process. Some dental materials manufactures present a plastic matrix with different sizes depending on the teeth (Ex. Accor® Accor Inc.), and some authors, like Livaditis [44], present techniques that may facilitate the build up of multiple cores, with the fabrication of a polyether semi rigid matrix over a waxed up cast.

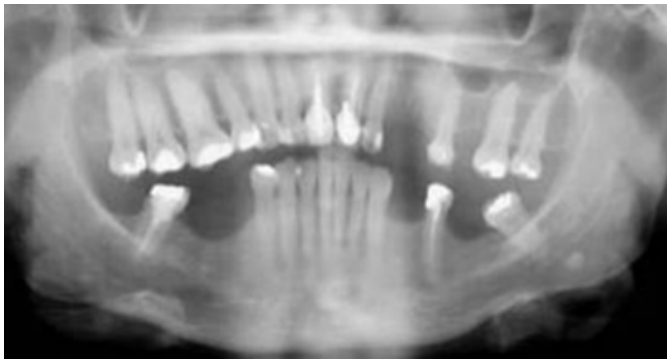
Due to the difficulty of creating a core in posterior teeth with major destruction [45,46], the main purpose of this paper is to present a technique that, in our opinion, improves the buildup core process, especially in an isolated tooth.

CLINICAL CASE

A 25 years woman went to University Clinics for prosthetic rehabilitation. Tooth 47 had an unsatisfactory occluso-distal amalgam restoration (40%), a fracture of buccal wall including dentine and enamel, and an endodontic treatment (Fig. 1).

Figure 1

Figure 1: The ortopantomography show no evidence of periapical lesion.



No more tooth signs and symptoms were reported. Time and economics were determinant to establish the following treatment plan: removable partial denture and metallic crown on 47, after core reconstruction with silver amalgam retained by prefabricated post.

Case procedure step-by-step

Preparation of tooth 47: amalgam and caries tissue were removed from the teeth, and an evaluation of the reminiscent tooth was made.

Production of three plaster models, from full-arch alginate impressions: two from the mandible and one from maxilla (Fig. 2 and Fig. 3).

Figure 2

Figure 2: Inferior gypsum study model.

Figure 3

Figure 3: Articulating cast study models.

Wax up of tooth 47 reproducing tooth anatomy.

Construction of vacuum formed matrix (Pro-Form®).

Drawing of the outline of the cavity with a pencil (Fig. 4) on plaster model.

Elimination of matrix occlusal surface in tooth 47.

Figure 4

Figure 4: Evaluation of matrix adaptation on second plaster model

Application of Technosil separating fluid®Protechno, up 3-4mm down from outline.

Closing the hiatus between internal surface of matrix and cavity pencil outline, with acrylic resin Bosworth Trim II® (Fig. 5).

Figure 5

Figure 5: Application of acrylic resin inside the matrix.

Excesses elimination was helped by the impression of model pencil outline after acrylic setting.

Check intraoral matrix stabilization.

Post cementation with a glass ionomer cement (Ketac Cem Aplicap®3M).

Amalgam (Tytin fast set®Kerr) application.

Horizontal removal of the matrix. (Note: remove of the matrix is a delicate process since there is a risk of amalgam break. The matrix should be cut and removed horizontally. Cooperation of patient is determinant. He should be quiet and calm during several minutes while amalgam's setting.)

Check amalgam core adaptation (Fig. 7).

Figure 6

Figure 7: Final aspect if the amalgam core.

Prosthetic rehabilitation with a metallic crown (Fig. 8).

Figure 8: Metallic crown cemented.

Figure 7

CONCLUSIONS

According to literature, amalgam still is one of the best dental materials to be used as a restoration [33] or as a core to support a prosthetic crown in the posterior region of the mouth [47,48] . The personalized matrix has a good stabilization in the mouth, is comfortable for the patient and strong enough to support condensation lateral forces of the amalgam. This material presents high strength, low solubility and thermal expansion coefficient similar to tooth substance, which makes it adequate as a core material [49,50,51,52,53] . The major disadvantages of this technique is the extended laboratory time, the high setting time and difficulty manipulation of amalgam in teeth with major destruction [54] . A personalized matrix can, in our opinion, resolve these disadvantages.

SUMMARY

Amalgam still is one of the best dental materials to be used as a core to support a prosthetic crown in the posterior region of the mouth A personalized matrix can, in our opinion, help in an effectively core build-up.

References

1. Morgano SM, Rodrigues AH, Sabrosa CE. Restoration of endodontically treated teeth. Dent Clin North Am 2004 Apr;48(2):vi, 397-vi, 416.
2. Peroz I, Blankenstein F, Lange KP, Naumann M. Restoring endodontically treated teeth with posts and cores--a review. Quintessence International 2005 Oct;36(9):737-46.
3. Sorensen JA, Martinoff JT. Clinically significant factors in dowel design. J Prosthet Dent 1984 Jul;52(1):28-35.
4. Aquilino SA, Caplan DJ. Relationship between crown placement and the survival of endodontically treated teeth. J Prosthet Dent 2002 Mar;87(3):256-63.
5. Karlsson S. A clinical evaluation of fixed bridges, 10 years following insertion. J Oral Rehabil 1986 Sep;13(5):423-32.
6. Landolt A, Lang NP. [Results and failures in extension bridges. A clinical and roentgenological follow-up study of free-end bridges]. Schweiz Monatsschr Zahnmed 1988;98(3):239-44.
7. Morgano SM, Rodrigues AH, Sabrosa CE. Restoration of endodontically treated teeth. Dent Clin North Am 2004 Apr;48(2):vi, 397-vi, 416.
8. Sorensen JA, Martinoff JT. Intracoronal reinforcement and coronal coverage: a study of endodontically treated teeth. J Prosthet Dent 1984 Jun;51(6):780-4.
9. Morgano SM, Rodrigues AH, Sabrosa CE. Restoration of endodontically treated teeth. Dent Clin North Am 2004 Apr;48(2):vi, 397-vi, 416.
10. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.
11. Peroz I, Blankenstein F, Lange KP, Naumann M. Restoring endodontically treated teeth with posts and cores--a review. Quintessence International 2005 Oct;36(9):737-46.
12. Kovarik RE, Breeding LC, Caughman WF. Fatigue life of three core materials under simulated chewing conditions. J Prosthet Dent 1992 Oct;68(4):584-90.
13. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.
14. Cho GC, Kaneko LM, Donovan TE, White SN. Diametral and compressive strength of dental core materials. J Prosthet Dent 1999 Sep;82(3):272-6.
15. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.
16. Kovarik RE, Breeding LC, Caughman WF. Fatigue life of three core materials under simulated chewing conditions. Journal of Prosthetic Dentistry 1992 Oct;68(4):584-90.
17. Peroz I, Blankenstein F, Lange KP, Naumann M. Restoring endodontically treated teeth with posts and cores--a review. Quintessence International 2005 Oct;36(9):737-46.
18. Cohen BI, Pagnillo MK, Condos S, Deutsch AS. Four different core materials measured for fracture strength in combination with five different designs of endodontic posts. Journal of Prosthetic Dentistry 1996 Nov;76(5):487-95.
19. Cohen BI, Pagnillo MK, Newman I, Musikant BL, Deutsch AS. Pilot study of the cyclic fatigue characteristics of five endodontic posts with four core materials. Journal of Oral Rehabilitation 2000 Jan;27(1):83-92.
20. Morgano SM, Brackett SE. Foundation restorations in fixed prosthodontics: current knowledge and future needs. J Prosthet Dent 1999 Dec;82(6):643-57.
21. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.
22. Cohen BI, Pagnillo MK, Condos S, Deutsch AS. Four different core materials measured for fracture strength in combination with five different designs of endodontic posts. Journal of Prosthetic Dentistry 1996 Nov;76(5):487-95.
23. Cohen BI, Pagnillo MK, Newman I, Musikant BL, Deutsch AS. Pilot study of the cyclic fatigue characteristics

of five endodontic posts with four core materials. Journal of Oral Rehabilitation 2000 Jan;27(1):83-92.
24. Kovarik RE, Breeding LC, Caughman WF. Fatigue life of three core materials under simulated chewing conditions. Journal of Prosthetic Dentistry 1992 Oct;68(4):584-90.
25. Peroz I, Blankenstein F, Lange KP, Naumann M. Restoring endodontically treated teeth with posts and cores--a review. Quintessence International 2005 Oct;36(9):737-46.
26. Pilo R, Cardash HS, Levin E, Assif D. Effect of core stiffness on the in vitro fracture of crowned, endodontically treated teeth. J Prosthet Dent 2002 Sep;88(3):302-6.
27. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.
28. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.
29. Cohen BI, Pagnillo MK, Condos S, Deutsch AS. Four different core materials measured for fracture strength in combination with five different designs of endodontic posts. Journal of Prosthetic Dentistry 1996 Nov;76(5):487-95.
30. Cohen BI, Pagnillo MK, Newman I, Musikant BL, Deutsch AS. Pilot study of the cyclic fatigue characteristics of five endodontic posts with four core materials. Journal of Oral Rehabilitation 2000 Jan;27(1):83-92.
31. Kovarik RE, Breeding LC, Caughman WF. Fatigue life of three core materials under simulated chewing conditions. Journal of Prosthetic Dentistry 1992 Oct;68(4):584-90.
32. Peroz I, Blankenstein F, Lange KP, Naumann M. Restoring endodontically treated teeth with posts and cores--a review. Quintessence International 2005 Oct;36(9):737-46.
33. Bernardo M, Luis H, Martin MD, Leroux BG, Rue T, Leitão J, et al. Survival and reasons for failure of amalgam versus composite posterior restorations placed in a randomized clinical trial. Journal of the American Dental Association 2007;138(6):775-83.
34. Cho GC, Kaneko LM, Donovan TE, White SN. Diametral and compressive strength of dental core materials. J Prosthet Dent 1999 Sep;82(3):272-6.
35. Gateau P, Sabek M, Dailey B. Fatigue testing and microscopic evaluation of post and core restorations under artificial crowns. J Prosthet Dent 1999 Sep;82(3):341-7.
36. Cho GC, Kaneko LM, Donovan TE, White SN. Diametral and compressive strength of dental core materials. J Prosthet Dent 1999 Sep;82(3):272-6.
37. Gateau P, Sabek M, Dailey B. Fatigue testing and microscopic evaluation of post and core restorations under artificial crowns. J Prosthet Dent 1999 Sep;82(3):341-7.
38. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.
39. Cohen BI, Pagnillo MK, Condos S, Deutsch AS. Four different core materials measured for fracture strength in combination with five different designs of endodontic posts. Journal of Prosthetic Dentistry 1996 Nov;76(5):487-95.
40. Cohen BI, Pagnillo MK, Newman I, Musikant BL, Deutsch AS. Cyclic fatigue testing of five endodontic post designs supported by four core materials. Journal of Prosthetic Dentistry 1997 Nov;78(5):458-64.
41. Kovarik RE, Breeding LC, Caughman WF. Fatigue life of three core materials under simulated chewing conditions. Journal of Prosthetic Dentistry 1992 Oct;68(4):584-90.
42. Peroz I, Blankenstein F, Lange KP, Naumann M. Restoring endodontically treated teeth with posts and cores--a review. Quintessence International 2005 Oct;36(9):737-46.
43. Cohen BI, Pagnillo MK, Newman I, Musikant BL, Deutsch AS. Pilot study of the cyclic fatigue characteristics of five endodontic posts with four core materials. Journal of Oral Rehabilitation 2000 Jan;27(1):83-92.
44. Livaditis G.J. Indirectly formed matrix for multiple composite core restorations: Two clinical treatments illustrating an expanded technique. J Prosthet Dent 2002;88(3):245-51.
45. Peroz I, Blankenstein F, Lange KP, Naumann M. Restoring endodontically treated teeth with posts and cores--a review. Quintessence Int 2005 Oct;36(9):737-46.
46. Morgano SM, Rodrigues AH, Sabrosa CE. Restoration of endodontically treated teeth. Dent Clin North Am 2004 Apr;48(2):vi, 397-vi, 416.
47. Cho GC, Kaneko LM, Donovan TE, White SN. Diametral and compressive strength of dental core materials. J Prosthet Dent 1999 Sep;82(3):272-6.
48. Gateau P, Sabek M, Dailey B. Fatigue testing and microscopic evaluation of post and core restorations under artificial crowns. J Prosthet Dent 1999 Sep;82(3):341-7.
49. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.
50. Cohen BI, Pagnillo MK, Condos S, Deutsch AS. Four different core materials measured for fracture strength in combination with five different designs of endodontic posts. Journal of Prosthetic Dentistry 1996 Nov;76(5):487-95.
51. Cohen BI, Pagnillo MK, Newman I, Musikant BL, Deutsch AS. Cyclic fatigue testing of five endodontic post designs supported by four core materials. Journal of Prosthetic Dentistry 1997 Nov;78(5):458-64.
52. Kovarik RE, Breeding LC, Caughman WF. Fatigue life of three core materials under simulated chewing conditions. Journal of Prosthetic Dentistry 1992 Oct;68(4):584-90.
53. Cohen BI, Pagnillo MK, Newman I, Musikant BL, Deutsch AS. Pilot study of the cyclic fatigue characteristics of five endodontic posts with four core materials. Journal of Oral Rehabilitation 2000 Jan;27(1):83-92.
54. Cheung W. A review of the management of endodontically treated teeth. Post, core and the final restoration. Journal of the American Dental Association 2005 May;136(5):611-9.

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