

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

H Esteves, A Correia

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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 forces¹. In a review article, Peroz² 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 Martinoff³ report a high failure rate for posterior pulpless teeth without cusps protection by the restoration. Aquilino and Caplan⁴ 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 tooth¹². 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 material¹³.

Some of the most commonly used direct materials are: silver amalgam, resin-based composites and glass ionomers¹⁴:

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 used²⁰. 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.

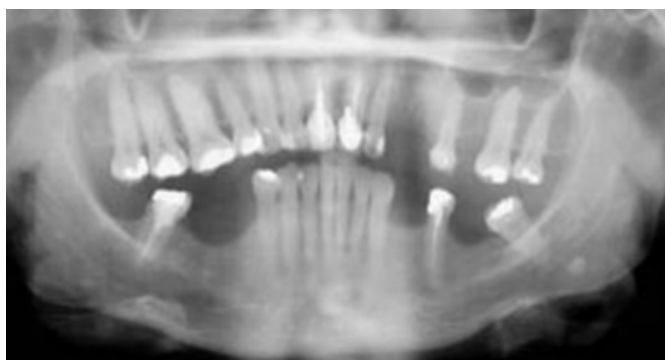
Due to the difficulty of creating a core in posterior teeth with major destruction ^{45,46}, the main purpose of this paper is to present a technique that, in our opinion, improves the buildup core process, especially in an isolated tooth.

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 restoration³³ 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 destruction⁵⁴. 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.

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Author Information

Helder Esteves, DMD

Coordinator of Fixed Prosthodontics, Dental Medicine Graduation, Health Science Department, Portuguese Catholic University

André Correia, DMD

Lecturer of Fixed Prosthodontics, Dental Medicine Graduation, Health Science Department, Portuguese Catholic University