

Case Report

Veiling The Exposed – A Case Report On Repair Of Porcelain Fused To Metal Restoration

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ABSTRACT

Dental ceramic is frequently used for restoring damaged teeth, replacing missing teeth, and improving the esthetics of the natural dentition due to mainly its superior cosmetic properties. It is frequently used in conjunction with metal to enhance its strength which thereby gets its name as metal-ceramic restorations. This is a case report on repair of porcelain fused to metal restoration.

INTRODUCTION

Dental ceramic is frequently used for restoring damaged teeth, replacing missing teeth, and improving the esthetics of the natural dentition due to mainly its superior cosmetic properties. It is frequently used in conjunction with metal to enhance its strength which thereby gets its name as metal-ceramic restorations. Thus, these metal-ceramic restorations give us the best of both materials i.e. ceramic's inherent esthetics and metal's superior strength. However, they still have 5% failure rate after 10 years, the leading cause of which being the fracture of ceramic.^{1,2} Fractures of ceramics are a consequence of their brittle nature and differences in the moduli of metal and ceramic. Clinically, such failures often begin as porcelain fracture that may be caused by inappropriate coping design, poor abutment preparation,

technical errors, contamination, physical trauma or occlusal prematurity.³

In such cases, repair of the metal-ceramic restoration is a reliable, low-cost and efficient treatment option.

The techniques for repair of fractured metal-ceramic restorations can be grouped into intra-oral, extra-oral and a combination of both these methods. The purpose of this article is to review those techniques and present a novel and efficient technique for the same.

I. The intraoral techniques⁴

These types of techniques are made completely in the patient's mouth and finished at the same visit.

The advantages of those techniques are⁵:

1) It is an applicable approach that can restore esthetic and function to the patient in an easy, inexpensive and rapid way.

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- 2) Achieving of an adequate bond by using silane coupling agent with an adhesive bond and the ability of silane to improve the wettability of the ceramic surface for the composite,
- 3) Reduced the clinical time and sessions for the patient.

The disadvantages of these techniques are⁵:

- 1) Composite is not color stable results in staining of repaired areas,
- 2) Wearing of composite after time elapsed,
- 3) Formation of weak bond strength in load-bearing, deterioration and solubility of the bond areas.

Techniques:

1. Re-bonding of the fractured ceramic fragment to the fixed restoration using micro-hybrid composite.⁴

This technique can be employed when dislodgment of the ceramic portion from the metallic structure occurs probably due to fatigue of the ceramic structure and overloaded during the excursive movement. This is accomplished by using a dentin micro-hybrid composite to help bond the chipped ceramic fragment to the existing restoration intra-orally.

2. Use of composite resin to repair fractured ceramic restorations.⁴

This technique uses composite resin in incremental layers to repair the fractured restoration. The use of intra-oral roughening techniques such as sand-blasting (with purified aluminum oxide particles (30-250 μ m) delivered by air pressure (2-3 bars or 30-42 psi) may or may not be used prior to application of composite resin.

II. Extra-oral techniques⁶:

These types of techniques need some modification of the fractured area and impression of the fractured area in the patient's mouth. It constructed in both patients' mouth and in the dental laboratories and need many visits.

The advantages of those techniques are⁵:

- 1) Long lasting repair
- 2) The color of the repaired part is stable
- 3) Increase the clinical survival of the existing prosthesis without replacing the whole prosthesis
- 4) Patient can practice proper oral hygiene at the repaired area

The disadvantages of these techniques are⁵:

- 1) It is expensive
- 2) Need many visits since it is constructed in both clinic and laboratory
- 3) Care during preparing a room for the overcasting or the fractured part
- 4) It is not a simple technique

Techniques:

1. Overcasting technique⁶:

This involves the removal of the remaining ceramic and leaving a feather edge margin over the metal substructure and making an intra-oral impression. Then a metal coping is fabricated, onto which ceramic layering is done to produce an overcasting that is fitted over the original restoration with adhesive cement.

2. Pin-retained casting technique⁶:

It used in long-span FPD with porcelain veneered only on the labial surfaces, with no overlapping onto the occlusal or inciso-lingual surface. The technique is

accomplished by placement of pin-holes in the existing restoration after the removal of the ceramic and making of impression. Following which a pin-retained metal-ceramic restoration is fabricated and fitted onto the preparation.

CASE REPORT:

A 40-year old male patient with a 4-unit metal-ceramic fixed partial denture presented with a fracture on the mesio-buccal surface of the maxillary left central incisor and on the joint between the maxillary left central incisor and maxillary right central incisor (Fig.1). Localized ceramic restoration repair was selected as the treatment of choice to repair otherwise sound, clinically and radiographically acceptable porcelain-fused-to-metal restorations using an overlay casting technique.



Fig.1: Ceramic fracture on the mesio-buccal surface of the maxillary left central incisor and on the joint between the maxillary left central incisor and maxillary right central incisor

PROCEDURE:

1. Removal of the remaining fractured porcelain from the pontic was done using carbide burs and/or a diamond cutting instrument. Reduction was done incisally, facially and lingually to provide room for both metal and porcelain and

the connector of the restoration was left without separation. The form of the preparation in the existing framework was similar to that described by Weinberg⁷ (Fig.2)



Fig 2: Removal of existing ceramic and preparation of central incisor to receive an overcasting

2. An impression of the prepared framework was made and a working cast was poured.
3. The next step was to fabricate an over-casting which must have sufficient thickness to ensure adequate strength and rigidity. A thin but rigid over-casting is desired. This over-casting was sand-blasted using 50 micron aluminum oxide to aid in adhesion to the luting cement.
4. Then a try-in of the overcasting was done intra-orally to confirm the fit and evaluate the thickness of porcelain layering required. (Fig.3)



Fig 3: Intra-oral try-in of the overcasting

5. Subsequently, porcelain layering was done onto the overcasting.
6. The existing metal restoration was then isolated and its conditioning was done using MKZ

Primer (Bredent, GmbH & Co., Germany) to improve the bonding of metal to the luting cement.

7. The over-casting was then luted onto the existing restoration using resin cement (Relyx U200, 3M ESPE, Dubai, UAE) after ascertaining the fit and occlusion. (Fig.4)



Fig 4: Cementation of the over-casting.

DISCUSSION

Ceramic fractures may result from trauma, inadequate occlusal adjustment parafunctional habits, flexural fatigue of the metal substructure, incompatibility of the coefficient of thermal expansion between the ceramic and the metal structure, failures in the adhesive bonding, inadequate tooth reduction during dental preparation, porosities in the ceramic, and inappropriate coping design.⁸

Complete removal and remake of a long standing FPD is a tedious and risky procedure. Damage resulting from attempted removal of the cemented retainer included minor porcelain fracture (9%), minor core chipping (14%), minor incisal edge chipping of tooth preparations (27%), and major damage to the abutment tooth (4%).⁹

Hence repair of these restorations rather than removal and remake seems like a viable option.

Intraoral ceramic repairs present a variety of difficulties and possible failures. The most important issue is to explain to the patient the cause of the initial restoration failure, to proceed in possible changes and include the challenge of anticipating longevity of the repair. The problem anticipated with this technique is the weak bonding between the metal of the over-casting and the metallic substructure of the FPD. This problem is overcome with the help of a good primer that enhances the bonding of the metal to the resin and thereby ensures the longevity of the over-casting.¹⁰

Failures occur most frequently in regions that are quite visible, compromising esthetics. The goal of this clinical report was to demonstrate the potential of repairing ceramics with over-casting. An over-casting restoration is usually applied to repair a multi-unit FPD which is otherwise clinically and radiographically healthy. Minor loss of porcelain following years of use of FPD, where the patient is not willing for removal and replacement of the entire prosthesis, warrants this kind of repair. This is, by no means, a modality to repair short-term fracture of porcelain due to occlusal pre-maturities and failure of bond between porcelain and metal substructure. In such cases, removal and remake of the entire prosthesis would be the treatment of choice.

CONCLUSION

Fracture of the PFM restoration creates an esthetic and functional dilemma for the patient and dentist. Determining the cause of porcelain fracture and evaluating the existing restoration is essential to determine if repair or to remake is the treatment of choice. Proper case selection and the use of good

adhesives are of prime importance in determining the prognosis of this treatment. The patient has to be informed for the possible risks and alternative solutions.

Repairing ceramic restoration fractures with over casting has some advantages, as it preserves the main body of the restoration and avoids extra unnecessary cut of the tooth, making the treatment inexpensive and easy when no replacement or fabrication of new prosthesis is possible.

The repair performed with over casting is an esthetic and functional alternative when extensive fixed partial dentures cannot be replaced.

REFERENCES:

1. Darban JG, Goharian RK & Kardan ZA: In-Vivo Evaluation of Durability of Intraoral Porcelain Repair. J Dent Res (2003);76:454.(abstract).
2. Galiatsatos A.: An Indirect Repair Technique for Fractured Metal-Ceramic Restorations: A Clinical Report. J Prosthet Dent (2005); 93; 321-333.
3. Chung KH & Hwang YC: Bonding Strengths of Porcelain Repair Systems with Various Surface Treatments. J Prosthet Dent (1997);78: 267-74.
4. Reston EG et al. Repairing Ceramic Restorations: Final Solution or Alternative Procedure? Operative Dentistry 2008;33(4); 461-466.
5. Mohammed M. Al-Moaleem et al. Repairing of Fractured Metal Ceramic Restorations: Techniques Review. Int. Journal of Contemporary Dentistry 2013;3(1);21-30.
6. Dent RJ. Repair of porcelain-fused-to-metal restorations. J.Pros.Dent. 1979;41(6); 661-664.
7. Weinberg LA. New design for anterior unit-built porcelain prostheses. J.Pros.Dent. 1969: 21(1);61-78.
8. Raposo LHA et al. Ceramic restoration repair: report of two cases. J Appl Oral Sci. 2009;17(2):140-4.
9. Curtis DA. Complications associated with fixed partial dentures with a loose retainer. J.Pros.Dent. 2006;96(4); 245–251
10. Kosmas Tolidis et al. Intraoral Ceramic Restoration Repair Techniques: Report of 3 Cases. Balk J Stom. 2012; 16:103-108.