Case Report

Covering the Screw-Access Holes of Implant Restorations in the Esthetic Zone: A Clinical Report

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Abstract

Screw-retained implant restorations have an advantage of predictable retention as well as retrievability, and obviate the risk of excessive sub-gingival cement commonly associated with cement retained implant restorations. Screw-retained restorations generally have screw access holes, which can compromise esthetics and weaken the porcelain around the holes. The purpose of this study is to describe the use of a separate overcasting crown design to cover the screw access hole of implant screw-retained prosthesis for improved esthetics.

Key words: Implant; Esthetic; Fixed Prosthesis

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Received: 6 March 2014
Accepted: 28 July 2014

Journal of Dentistry, Tehran University of Medical Sciences, Tehran, Iran (2014; Vol. 11, No. 6)

INTRODUCTION

Esthetics can influence the selection of the prosthesis. In screw-retained implant restorations, the screw- access hole is unesthetic; because the gray color of screw hole cannot be eliminated by opaque composite materials. This problem does not exist with cemented restorations. All prostheses have inherent advantages and disadvantages; clinicians should assess them and choose the appropriate one [1].

The porcelain veneer in porcelain fused to metal (PFM) restorations is susceptible to chipping due to different factors such as inappropriate porcelain -metal bonding, incompatible thermal expansion coefficients of the porcelain and the metal substructure, use of a metal alloy with low modulus of elasticity and trauma from occlusion [2]. Four different modes of fracture have been reported in the surfaces: (1) adhesive failure between the metal and the oxide layer; (2) cohesive failure within the oxide layer; (3) adhesive failure between the oxide and ceramic layers; (4) and cohesive failure within the ceramic layer. Faulty design of the metal substructure, excessive porcelain thickness with inadequate metal support and technical flaws in the porcelain application are among the suggested causes of failure [3].

Tooth-supported restorations have shown lower five-year risk of ceramic fracture in comparison with implant supported fixed partial dentures (FPD) (2.9% versus 8.8%)[4, 5].

Fig 1. Porcelain chipping around the screw access holes.

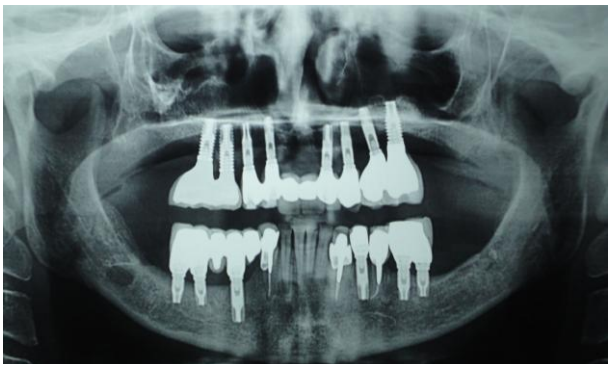

Fig 2. Panoramic view of the patient's mouth.

Fig 3. Buccally located screw access holes.

Possible somatic causes that may account for the differences in ceramic failure rates between restorations include the lack of neurologic feedback and the periodontal reflex mechanism that are not present as a protective mechanism resulting in generation of high masticatory loads [6].

Two main techniques have been recommended to repair a fractured porcelain: The direct method and the indirect method [7]. For screw-retained implant restorations, the repair procedure can be performed extra-orally (indirect method). In direct methods, repair of the fractured porcelain is done intraorally using a composite resin. The direct method has the advantage of easy application and being less time consuming. The disadvantages of this technique include poor wear qualities, low strength and poor esthetics due to the lack of color stability and shade-matching to the remaining porcelain.

Fabrication of a pin-retained casting with a fused porcelain veneer or fabrication of an "overlay" restoration comprise the indirect technique [7].

The purpose of this study is to describe the use of a separate over casting crown design to cover the screw access hole of implant screw-retained prosthesis in the esthetic zone.

CASE REPORT

A 51 year-old woman was referred to the Prosthodontics Department of Shahid Beheshti University, School of Dentistry to assess teeth 12 and 13 (FDI two digit tooth numbering system) screw-retained fixed implant restorations (Figure 1).

Four years ago, she received dental implants to restore edentulous spaces in both jaws with implant -supported fixed prosthesis (Figure 2); 6 months after delivery of

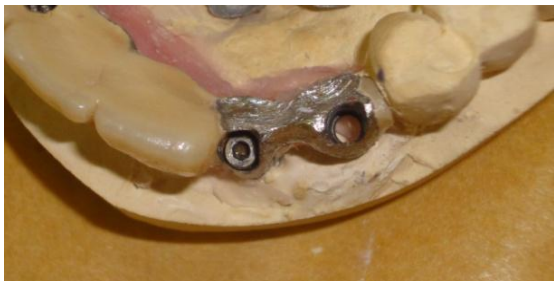

Fig 4-1. Prepared metal substructure: occlusal view.

Fig 4-2. Prepared metal substructure: labial view.

Fig 5-1. Splinted over casting crowns: palatal view.

Fig 5-2. Splinted over casting crowns: labial view.

the prosthesis, porcelain chipping occurred in teeth 12 and 13, which was repaired with composite resin. But, the composite detached from the porcelain once every 5-6 months and she was forced to go to dental office for repair.

Clinical examination revealed that the anterior segment of the maxilla had a six-unit screw-retained FPD (Figure 1). Four implants in the maxillary right and left lateral and canine areas supported this FPD (Figure 2).

The extreme buccal angulation of the implant replacing teeth 12 and 13 resulted in a buccally- located screw access hole, which compromised esthetics and potentially weakened the porcelain around the screw holes in the six-unit screw-retained FPD. In lateral excursions canine guidance distributed forces to the canines.

It was decided to overcome this esthetic and structural obstacle by using a separate over casting crown design to cover the metal substructure of the screw-retained prosthesis.

Procedure

After choosing a suitable stock tray, alginate (Tropicalgin, Zhermack, Italy) impression was made from the upper jaw. Then, two implant analogs ((Biomet 3i implants, UK) were connected to the abutment connections of both laterals. After using a separator (Gingifast Separator, Zhermack, Italy), gingival mask (Gingifast, Zhermack, Italy) was injected around the implant analogs and abutment connections. Also, both canine abutment connections and tissue surface of pontics were covered with gingival mask to protect and facilitate the

Fig 6. Intraoral view of six-unit screw-retained FPD without splinted over casting crowns.

Fig 7. Intraoral view of screw-retained six-unit FPD with splinted over casting crowns in place.

separation of FPD from the cast and then the impression was poured with type 4 dental stone (Vel-Mix, Ernst Hinrichs GmbH, Germany). Buccally located screw access holes are shown in Figure 3.

All the porcelain on the labial and palatal one-third of the lateral and canine teeth was removed with green stone and then metal was removed in the same places to gain space for metal and porcelain of the over casting crowns (Figures 4-1 and 4-2).

Finally deep chamfer finish line was designed in the palatal surface with chamfer diamond bur. In the labial surface because of the limitation in metal volume, light chamfer finish line was designed. Die spacer (EURO CLASSIC DIE SPACER, Kerr, Orange, CA) was applied to the prepared frame but not in the screw access holes. For adequate marginal adaptation, a band of about 1 mm, not painted, adjacent to the preparation margin immediately.

Vaseline was applied to the prepared frame to lubricate it and then full contour resin pattern (GC resin pattern, Tokyo, Japan) was fabricated on it. This pattern penetrated the screw access holes until 1mm from the head of screws remained. Once the final contour of the resin pattern was completed, the pattern was cut back over a uniform thickness of about 1 mm to provide room for the porcelain fused to the cast metal substructure. Finally, thickness of metal framework was 0.2 mm in the cervical area to 0.5 mm in the incisal area. Investing and casting procedures were done and porcelain was applied to the metal framework (Figures 5-1 and 5-2).

Six-unit screw-retained FPD was placed into the patient's mouth and was secured by tightening the screws (Figure 6). Splinted over-casting crown was tried in the mouth and color coordination was done by applying stain (Figure 7).

Fig 8. Delivered Prosthesis.

Then, a small amount of gutta-percha was placed over the head of screws. The splinted over casting crown was glazed and cemented with temporary cement (Temp Bond NE, Kerr, Orange, CA, USA) (Figure 8).

DISCUSSION

It is very common to use a resin-based composite for intraoral repair of the fractured porcelain of PFM crowns or FPD [7].

Micromechanical retention is an important factor for resin-metal bonding and this method fails in many cases. Thus, the problem worsens when porcelain fracture results in metal exposure. The results of repaired fractured porcelain are not permanent [9]. Shade matching of composite resin to the remaining porcelain is also difficult [10]. Using composite materials for repairing screw access holes is very difficult since implementing color to match with the surrounding porcelain in cases with large screw access holes is hard and problematic. Also, by increasing the forces on the prosthesis in lateral excursions, composite separation is likely as in this case. Another problem which arises is high wear of composite material [11]. A novel "overlay casting" restoration [12-16] explained here is useful when a huge part of the porcelain is missing and metal is exposed or where metal support for composite is missing. The reliability of this technique is higher in comparison to resin used in the direct method.

Support and reinforcement of porcelain are provided by the metal substructure that uses a separate over casting crown design. Moreover, oven heat evaporates the water, which has been absorbed by the old porcelain in the oral environment during its service and increases the likelihood of its cracking [17]. Thus, repairing fractured porcelain with new porcelain is unreasonable. One reason which causes increase in generation of masticatory force in the implant supported FPD is lack of periodontal ligament [18]. Therefore, porcelain not supported by a metal substructure renders it prone to chipping and removing the previous porcelain and rebaking is unreasonable. Our method has many advantages namely predictable results, lower cost, easiness and time saving at chair side [12, 13]. The simplicity of our method makes it suitable for repair of fractured porcelain surrounding screw access holes of metal-ceramic restorations in screw retained implant restorations.

CONCLUSION

Screw-retained FPDs generally have screw access holes, which can compromise esthetics and weaken the porcelain around the holes. This study described the use of a separate over - casting crown design to cover the screw access hole of implant screw-retained prosthesis in the esthetic zone with notable advantages.

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