

## Fabrication of a Hybrid Screw-Retained and Cement-Retained Implant Prosthesis: A Case Report

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### Abstract

**Objective:** Various prosthodontic techniques are used for treatment of implant patients. Fabrication of a cement-retained prosthesis on a screw-retained framework is among these techniques. This type of prosthesis is usually indicated for implants that have been inserted obliquely or in an improper position. Easy retrieval, repair and maintenance are the main advantages of this type of prosthesis. The present article describes a method for fabrication of implant supported prosthesis. In this prosthesis, separate crowns are cemented on a screw-retained framework. The metal framework is coated with gingival-colored porcelain in order to support soft tissue.

**Case:** Our patient was a completely edentulous 56 year-old female suffering from severe bone loss as the result of long term use of dentures. The bone resorption was so severe that the normal ridge contour could not be restored even after extensive ridge augmentation using iliac crest bone graft. Thus, a combination of cement-retained and screw-retained prostheses was selected as the treatment of choice for this patient.

**Conclusion:** This technique combines the advantages of both screw-retained and cement-retained prostheses in terms of function and esthetics. Also, despite the hardly-accessible location of the screw access channel in the framework, assessment of implants is always feasible by unscrewing the metal framework. Additionally, the fabricated crowns can be easily repaired or replaced without the need for unscrewing the framework.

**Key words:** Implant, Cement-retained prosthesis, Screw-retained prosthesis, Titanium, Hybrid prosthesis

**Please cite this article as follows:**

Neshandar Asli H, Saboury A. Fabrication of a hybrid screw-retained and cement-retained implant prosthesis: a case report. *J Dent Sch* 2012;30(2):198-202.

**Received: 20.12.2011**

**Final Revision: 21.04.2012**

**Accepted: 27.05.2012**

### Introduction:

As the result of high success rate of implants, implant-supported prostheses have gained fame among edentulous patients (1). This type of prosthesis can be used for treatment of completely or partially edentulous patients and is approved by international scientific organizations (2). Dental reconstruction and rehabilitation in edentulous patients can be performed by using screw-retained hybrid prosthesis, screw-retained metal ceramic prosthesis and cement-retained metal ceramic prosthesis. Use of screw-retained prosthesis is recommended for patients suffering

from weak denture retention because this type of prosthesis can be easily placed and retrieved (3-5). Apart from the abovementioned advantages, hybrid prostheses can also replace soft tissue defects. However, lack of passive fit in the framework and distortion (which is possible to occur anytime during the fabrication) are major obstacles in the process of prosthesis fabrication (3).

On the other hand, low volume of bone in edentulous patients is another problem for an ideal treatment. Such patients have to undergo bone augmentation before implantation (3,4,6). Generally, hybrid prosthesis is the recommended

treatment for patients suffering from severe alveolar ridge resorption (3,6-8).

In screw-retained prostheses, sometimes the screw access channel has to be placed in buccal, lingual or occlusal aspect of the prosthesis due to the position of the implant which may interfere with the esthetics and morphology of occlusal surface (3, 9). On the other hand, the cement-retained prostheses can compensate for the improper position of implant through customized preparation of the abutments or use of oblique abutments (10-12). Passive fit of the framework and esthetics of the prosthesis are among other superiorities of the cement-retained prostheses over the screw-retained restorations. Use of customized abutments in such cases can correct the path of insertion for implants placed obliquely and restore the esthetics of prosthesis (10, 11). The disadvantages of cement-retained restorations include their difficult retrieval, repair and maintenance. Excess cement in the gingival sulcus is another drawback that should be considered (12, 13). In order to overcome the aforementioned problems in both screw-retained and cement-retained systems, the present technique was suggested which combines the advantages of both techniques and is a combination of a screw-retained framework and cement-retained crowns. In this restoration, the soft tissue is replaced using the gingival-colored porcelain.

In previous studies, this method was used for fabrication of partially edentulous prostheses with casting (14,15), zirconia (16) and titanium (17) frameworks. Hagiwara in 2007 (14) used this technique for a partially edentulous patient while Rajan in 2004 (15) used a cement and screw-retained prosthesis for a single tooth patient. Baig in 2009 used a CAD/CAM screw-retained framework for full mouth reconstruction (17).

The present article describes a combination of metal ceramic crowns and screw-retained framework in a completely edentulous patient who had received extensive bone graft. In this technique, the screw-retained framework is fabricated with a core for each tooth. In the next step, a cement-retained single crown is fabricated for each core.

### Case:

Our patient was a 56 year-old completely edentulous patient who presented to the Implant Fellowship Department of Dental School, Shahid Beheshti University of Medical Sciences for dental reconstruction.

The patient had lost all her teeth due to periodontal disease and had acrylic dentures. Considering the severe bone loss, oral reconstruction with implant-supported prosthesis was suggested for her. Bone grafting was performed in the Oral and Maxillofacial Department of Taleghani Hospital and included maxillary on lay graft, alveolar ridge augmentation using bone grafts from the iliac crest and sinus lift for height reconstruction of the posterior maxilla. After surgery, a 6-month recovery period was maintained for the patient.

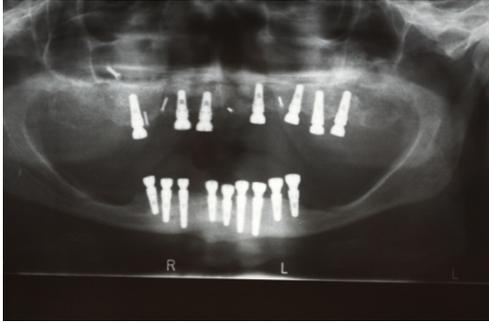
After 6 months, a diagnostic complete denture was fabricated for maxilla and mandible and a surgical guide was prepared through duplication. A total of 7 implants were placed in the maxilla and 9 in the mandible (Euroteknika, Sallanches, France)(Figures 1-3).



**Figure 1- A total of 7 implants were placed in the maxilla**



**Figure 2- A total of 9 implants were placed in the mandible**



**Figure 3- OPG of the patient**

After a 6-month recovery, impressions were taken from maxilla and mandible using open tray technique.

First, the plural abutment (Euroteknika, Sallanches, France) was attached to the implants and the impression coping was connected to them. Using cold cure acrylic resin (pattern resin, GC, Tokyo, Japan), the copings were attached to each other and the final impression was made with addition silicone impression material (Monopren transfer, Kettenbach GmbH & Co., KG, Germany) and direct method.

Impressions were poured with type IV stone (Elite Master Sandy brown, Zermack, BadiaPolesine, Italy). A screw-retained acrylic resin record base was fabricated on the master cast with the use of copings.

After taking records, the acrylic teeth were mounted on the record base. Following try-in, a putty index was taken (Spidex, ApadanaTak Co., Iran). Then plastic abutments (burn-out sleeve) were attached to the implant analog on the cast with 10 N/cm force and use of acrylic resin (GC Pattern Resin, Tokyo, Japan). A diagnostic wax-up was performed afterwards.

The wax pattern of metal framework was then cut back using the putty index and cores in the form of prepared teeth were created on the framework and sufficient room was allowed for the crowns. In the gingival part of the metal framework, wax was formed to reconstruct the hard tissue contour after applying porcelain and provide adequate lip and cheek support. Casting framework was tried in and its passive fit was evaluated intra orally (Figure 4).

After ensuring the passive fit, gingival-colored porcelain was coated on the gingival part of the framework. Putty index was used when forming the porcelain. Gingival adaptation of the

framework was evaluated in patient's mouth and eventually 27 crowns were fabricated on the framework cores. The margins of crowns were extended to the interface of core and gingival-colored porcelain (Figure 5).



**Figure 4- Try-in of the metal framework**



**Figure 5- Gingival-colored porcelain and cement-retained mandibular crowns**

At the time of delivery, first the framework was screwed with 35 N/cm force according to the manufacturer's instructions. The framework was 3-piece in the maxilla and 2-piece in the mandible. Gutta-percha was placed at the orifice of screw channels and they were eventually closed with composite resin. Crowns were cemented with Temp-Bond temporary cement (Kerr, Italy) (Figure 6). The patient was provided with hybrid prosthesis hygiene instructions.



**Figure 6- Delivery of prostheses with temporary cement**

## Discussion:

As mentioned earlier, crowns were separately cemented and optimal esthetics and morphology were achieved for the patient. The crowns can be removed at any time and the abutments can be unscrewed enjoying the benefits of screw-retained prosthesis. Thus, we can conclude that the explained method combines the advantages of both screw-retained and cement-retained restorations. Also, in this method the dentist is able to maintain gingival health. However, it still possesses the downside of screw-retained system which is to achieve passive fit.

It should be kept in mind that passive fit is the prerequisite for survival of implants in bone (18, 19) and not achieving it leads to mechanical and biological failures (20, 21). Passive fit can usually be achieved through precise laboratory work and special attention during framework try-in. However, if the framework does not have an adequate fit despite all the precise work, the framework should be cut, joint with acrylic resin and soldered which imposes additional costs to both the patient and the dentist (22, 23). In the present study a casting framework was fabricated which is different than the one fabricated by Baig et al, in their study in 2009. They used a titanium framework fabricated with the CAD-CAM method for edentulous arch

treatment (17). Hagiwara in his study in 2007 (14) used composite resin to coat the gingival part of framework; whereas, we used gingival-colored porcelain for this purpose.

Crown dislodgement as the result of using temporary cement is among the disadvantages of this technique. However, use of temporary cement is necessary for retrievability of the framework and its benefits (24-26). This dislodgement results in frequent patient visits to the clinic. Another disadvantage is the higher cost of this technique compared to the cement-retained and screw-retained restorations; but considering patient satisfaction of the obtained esthetics and function, this technique can be successfully used for complete oral reconstruction.

## Conclusion:

This technique combines the advantages of both cement-retained and screw-retained systems and is indicated for complete dental reconstruction especially in patients with severe bone loss. Implants can be easily accessed through unscrewing the metal framework. Additionally, the fabricated crowns can be replaced or repaired without the need for unscrewing the framework.

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