Cemented vs. screw-retained restorations on dental implants

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Abstract

Aim and objectives: Implants represent a growing business all over the world. As more and more dentists tend to treat patients using this kind of treatments, the complications are also much more common as time goes by. The prosthetic solutions are various, they include single/multi-unit restorations, cemented or screw-retained on a variety of abutments and ti-bases. The aim of this study is to compare the two choices - cemented vs screw-retained and follow up the tissue response after replacing an old cemented restoration with a screw-retained one.

Materials and methods: A patient with cement-related peri-implantitis was treated and followed over a period of time. Tissue response was analysed as healing and bio-integration of the new restoration occurred.

Results: Tissue healing and maturation progressed very well after the irritation caused by the cement was removed.

Conclusions: Cemented implant restoration pose a higher threat of peri-implantitis compared to the screw-retained ones due to the risk of cement overpass into the peri-implant space.

Keywords: Implants, Peri-implantitis, Screw-retained restorations

INTRODUCTION

The history of the modern implant has seen countless changes, beginning in 1913 when Dr EJ Greenfield implanted an artificial root made from a "hollow 24 mm diameter hollow latticed cylinder of multi-unit iridbond, which compensates for the angulation of implants and allows precise screwing through a circular incision. In the 1940s, Formiggini, considered the "father of modern implantology", and Zepponi developed an endosseous implant with a stainless steel spiral design that allowed bone to grow into the metal [1].

An endosseous dental implant is designed for placement in the alveolar bone of the mandible or maxilla, with the body of the implant embedded in the bone [2]. Two basic types of endosseous implants are described in the literature, blade and root form. Regardless of shape, modern implants undergo a series of surface treatments: After processing a titanium or titanium alloy implant, contact with air causes immediate development of a titanium oxide on the implant surface. Until the late 1980s, additional procedures to surface treat the implant were rarely performed. Since then, numerous implant surface modifications have been developed to adjust the texture of the implant surface to encourage the osseointegration process, especially in cases of low bone density. Modifications can be classified into additive and subtractive procedures, if the substance is removed or added to the implant surface during implant surface treatment. Subtractive procedures include the following: acid etching; blasting with an abrasive material such as silica or HA; blasting with HA, is particularly advantageous because unlike sand, any or laser treatment [3]. Additive procedures have the same purpose of modifying the implant surface to a moderate degree and include: coating with HA, anodizing to thicken the titanium oxide surface [4], [5], [6].

The prosthetic connections of implants can be divided into internal and external (older). External hex connections have the disadvantage of screw loosening, as they bear more horizontal forces on the connecting screw [7]. There are numerous studies in the literature on marginal bone loss comparing the two types of connections, most of them showing that implants with internal connection resulted in a more favourable response from the alveolar bone with respect to marginal bone loss in the posterior areas without periodontal or peri-implant damage, unlike implants with external connection [8].

Cemented restorations feature a conventional design to connect a restoration (crown, bridge) to an implant-supported bridge. This process is similar to cementing a crown onto a natural tooth. Conventional casting techniques have a relatively low fidelity, this has been one of the drawbacks to achieving the passive fit required for multi-unit restorations on implants. CAD/CAM scanning and milling of the restoration provides high accuracy and passive fit.

These restorations are mainly used in the esthetic area, in cases where a significant angle is present between the implant and the axis of the prosthetic restoration, because the screw hole that secures the restoration will appear on the visible surfaces of the restoration (buccal), which makes cemented restorations the preferred choice, because the screw hole that secures the restoration will not affect the appearance of the restoration, as the restoration is cemented to the abutment [9], [10].

Although cemented restorations have many advantages, they also have many disadvantages, which should be taken into account when deciding on a cemented restoration. The main complication of this type of restoration is the residual cement left in the sulcus, which can lead to peri-implant disease.

Screw-retained restorations are designed to be screwed either directly onto the implant or onto a screw-retained abutment positioned on the implant (multi-unit abutments). Screw-retained restorations are a safe and easy way to maintain a prosthetic restoration

because the restoration can be unscrewed at any time by the clinician, both for sanitation of the restoration and for maintenance of the implant [10].

Screw-retained restorations can also be used for angled implants, as these restorations can also be screwed onto multi-unit abutments, which compensate for the angulation of the implants and allow the restorations to be screwed straight.

Aim and objectives

The aim of the present study is to evaluate peri-implant tissue responses after modification of the prosthetic restoration aggregation method and to follow their stability over time.

MATERIAL AND METHODS

The evolution of a patient with peri-implantitis caused by excess peri-implant cement resulting from the cementing of the prosthetic restoration was followed.

The patient's implant was explanted, a bone augmentation was performed with different bio-materials, and then the lost implant was replaced. Afterwards, a new screw-retained restoration was set in place, and the follow-up of the tissue healing begun.

Clinical protocol and stages:

After the patient presented to the clinic and following the clinical examination, in conjunction with complementary examinations (radiological examination), a fistula was observed in the implant at the 3.6 position (Figure 1).

Figure 1. Initial appearance of peri-implant restoration and mucosa

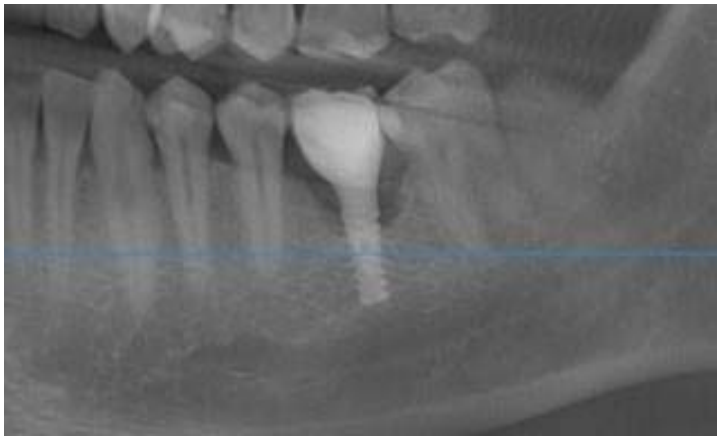

Figure 2. Initial radiological appearance (section from OPG) of the implant

Following radiographic analysis, vertical defects were observed mesial and distal to the implant (Figure 2), and the patient was referred for a CBCT radiographic examination to observe the status of the buccal and lingual cortical bone.

After performing and analyzing the CBCT examination, it was observed that the implant also shows vertical defects in the lingual and buccal cortices (Figure 3).

Figure 3. Sagittal section from CBCT

After the diagnosis was established, the fistula at the implant was inspected and this fistulous path was curettage (Figure 4). During the curettage of the fistula, a hard mass was detected and removed with the curettage, this hard mass, which turned out to be residual cement remaining at the implant sulcus, which led to the formation of the fistula, but also to the formation of peri-implant vertical bone defects.

Figure 4. Intraoperative appearance during curettage - removal of a residual cement mass

After curettage of the fistulous tract and removal of residual cement, the affected implant was uncovered and explanted by unthreading it (Figure 5).

Figure 5. Appearance of the explanted implant

After the explantation was performed, the implant socket (Figure 6) remained and was cleared to provide the necessary support for a future bone graft, with which the bone augmentation will be performed.

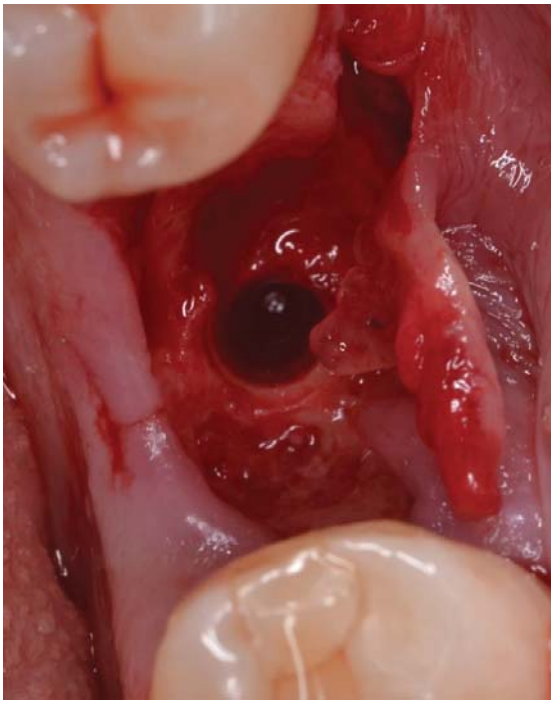

Figure 6. Appearance of the implant socket - after explantation

Once the alveolar curettage was completed and all residual cement was removed, bone augmentation was performed with a xenograft made of bovine bone combined with autologous bone harvested from the patient. This bone graft, was protected with a PRF membrane, obtained after centrifugation of blood collected from the patient, to allow osteosynthesis and subsequent wound healing (Figure 7).

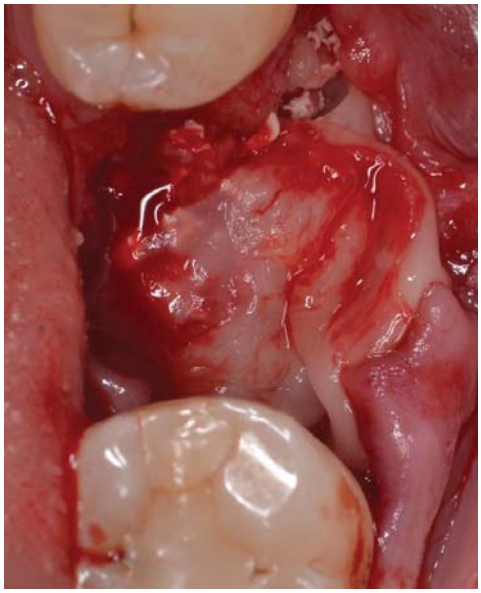

Figure 7. Appearance of xenograft protected with PRF membrane

After a period of 6 months a new implant was inserted (Figure 8), in the same position as the old implant, this time a screw-retained restoration was chosen to avoid the risk of peri-implantitis due to residual cement.

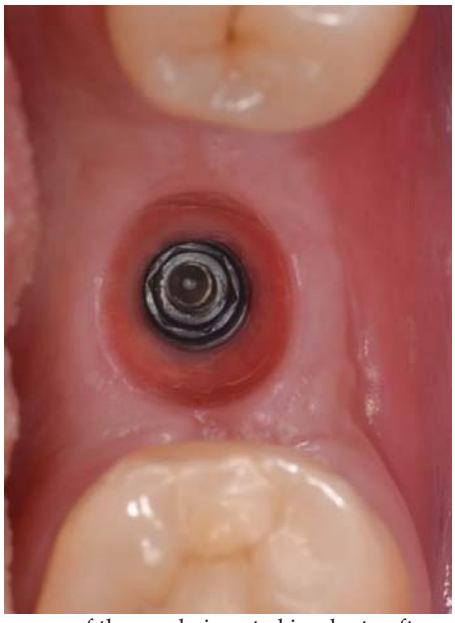

Figure 8. Appearance of the newly inserted implant - after osseointegration

The emergence profile of the new restoration can be seen (Figure 9) which ensures optimal closure of the peri-implant soft tissues and implant sulcus. The mucosal face of the restoration has been finished and polished to block the possibility of bacteria adhering to it.

Figure 9. The appearance of the screw-retained restoration - emergence profile and mucosal face

RESULTS

After the application of the restoration, the peri-implant soft tissues conformed to the contour and emergence profile of the restoration, with complete healing of the soft tissues (Figure 10) (Figure 11). The tissues remained healthy with no signs of inflamation over the next 6 months.

Figure 10. Occlusal aspect

Figure 11. Buccal aspect

Excess cement is a real risk factor when it comes to implant restorations. Screw-retained restorations are more predictable to fix than cemented restorations, as there is no risk of residual cement remaining in the peri-implant space and thus the risk of peri-implantitis is lower than with cemented restorations. The only major problem with screw-retained restorations is achieving complete passivity when they are fixed into the implant.

DISCUSSIONS

As can be seen in this case, cleaning the cement around an implant restoration is often a problem. The only major problem related to screw-retained restorations is achieving complete passivity, when it is established that the main cause of peri-implantitis in implants with cemented restorations is the residual cement left unremoved by the clinician during the cementing of the restoration [11], [12]. Even in implants with a smooth surface, it has been shown that complete removal of a resin cement was not possible. In newer implant surfaces, which are intentionally rougher to ensure better healing, the cement is expected to have even greater adhesion and cleaning becomes significantly more difficult [13] [14], [15].

CONCLUSIONS

There are different philosophies about the ideal type of restoration. The truth is that most decisions are based on the personal preference of the clinician and the actual clinical situation. The literature shows advantages and disadvantages for both implant-screwed and cement-retained restorations.

An understanding of how each type of prosthesis influences the aesthetics, occlusion and longevity of the restoration is essential in selecting the best case for a screw-retained or cement-retained restoration.

None of the fixation methods is clearly perfect, but cemented restorations have biological complications more often (bone loss >2 mm).

Excess residual cement remaining in the peri-implant space is one of the main causes of peri-implant soft tissue inflammation and peri-implant vertical bone resorption in implant cemented restorations.

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