A Newly Designed Screw- and Cement-Retained Prosthesis and Its Abutments

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The degree of misfit between a prosthesis and its supporting implants is a major concern in screw-retained prostheses because it can lead to screw loosening or mechanical failure of implant components. On the other hand, the difficulty of removing subgingival excess cement and the irretrievability of the superstructure are major drawbacks to cement-retained prostheses. A newly designed screw- and cement-retained prosthesis (SCRP) may solve these problems with its passivity, retrievability, and ease in the complete removal of excess cement, giving it the advantages of both screw-retained and cement-retained prostheses. This prosthetic system is mainly composed of a cement-retained framework with screw holes on the occlusal surface and specially designed cementable abutments for multiunit prostheses. The principle and structure of the SCRP system is described in this article. *Int J Prosthodont 2015;28:612–614. doi: 10.11607/ijp.4236*

One of the key factors for the long-term success of implant treatment is the passivity of fit between the superstructure and the implants.[1] However, in a clinical situation, it is almost impossible to achieve a completely passive fit of the prosthetic framework to the implant abutments, especially in multiple splinted implant restorations.[2] For retention, implant-supported fixed prostheses can be either screw- or cement-retained. One advantage of the cement-retained approach is the ability to compensate for minor discrepancies between the superstructure and the abutment by filling the space with cement.[3] While the screw-retained approach requires a high degree of precision, a cement-retained prosthesis can obtain a passive fit with relatively simple clinical and laboratory procedures. Despite these benefits of cement-retained implant prostheses, their disadvantages include irretrievability, the difficulty of removing the cement surplus in the subgingival sulcus, and a lack of retention with a short abutment in areas with insufficient interocclusal space.[3]

Previous studies have attempted to overcome these problems with single- and multiunit fixed implant restorations. The KAL technique by Voitik[4] and a technique for multiunit implant-supported prostheses by Jiménez and Torroba[5] compensate for the misfit of the superstructure by using cements for fixation of the framework to obtain a passive fit of the prosthesis. In addition, Rajan and Gunaseelan[6] introduced a retrievable cement- and screw-retained implant-supported crown, but this approach is limited to single-tooth replacement.

The present article introduces a new method for fabricating a screw- and cement-retained multiunit implant-supported prosthesis to overcome the disadvantages of both types of prostheses.

The Principle and Structure of Screw- and Cement-Retained Prostheses

A screw- and cement-retained multiunit implant-supported prosthesis (SCRP) is a new concept for an implant restorative system and incorporates the advantages of both the screw- and cement-retained

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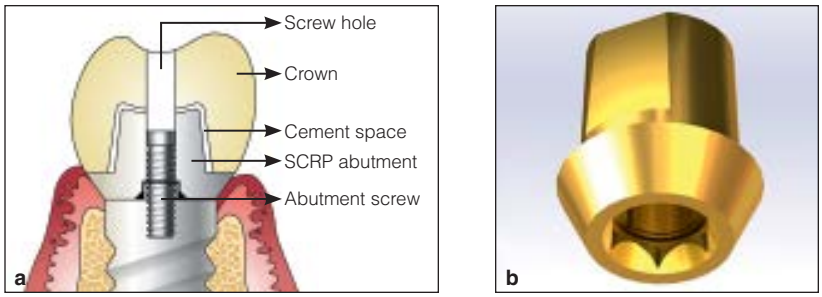

Fig 1 The components of the SCRP system. **(a)** SCRP is composed of specially designed abutments (SCRP abutments) and a cement-retained prosthesis with the screw holes on the occlusal surfaces. **(b)** This abutment has both hex and nonhex configurations, which satisfies two functions, repositioning of abutment and retrievability of SCRP.

Fig 2 Retrieved SCRP prosthesis. The abutment-superstructure unit can be removed from the mouth after cementation by unscrewing the abutment screws through the holes. The excess cement around the abutments and any ill-fitting crown margins can also be removed and polished extraorally.

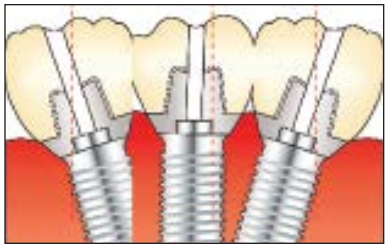

Fig 3 Conventional cementable abutments with hex connections: For conventional cementable abutments that possess a totally hex-type engagement, the prosthesis-abutment unit cannot be retrieved from the implants because of undercuts created from the hex parts of the nonparallel implants.

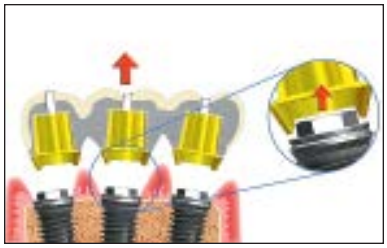

Fig 4 Schematic image of retrievable multiunit SCRP. Even for the angled implants, any multiunit SCRP can be retrieved due to the nonhex part of the abutments, which are designed to compensate for most of undercuts created from the path of insertion.

approaches. The prostheses of the SCRP system have achieved not only a passive fit through using a cement, but also retrievability, if needed, through the screw holes on the occlusal surfaces. The SCRP system is composed of specially designed abutments and a cement-retained prosthesis with the screw holes on the occlusal surfaces (Fig 1). After the prepared abutments are repositioned individually by their hex part and attached to the implants, the prosthesis is cemented over the abutments with a definitive cement. The abutment-superstructure unit is removed from the mouth by unscrewing the abutment screws through the holes (Fig 2). A clinician can then remove the excess cement around the abutments and polish any ill-fitting crown margins extraorally. The finished one-piece prosthesis is a passively fitting screw-retained prosthesis.

SCRP Abutment

Conventional cementable abutments with external hex connections can be used for both single- and multiunit implant restorations when implants are placed in parallel. However, hex abutments on nonparallel implants are not retrievable because of the undercuts created between the angled implants. Nonhex abutments should be used in such cases, but they cannot be repositioned after preparation without a repositioning jig. Nonhex abutments, however, sometimes cannot be repositioned if the jig is not fit precisely or if the seating is disturbed by the surrounding gingiva.

A specially designed prepared abutment called an SCRP abutment (Fig 1) is unique in having both hex and nonhex components in one cementable abutment. The lower half of the hex portion has a nonhex figure. The upper hex (engaging) portion of the abutment is designed to allow for each prepared abutment to be reconnected to its corresponding implant without a repositioning jig in the mouth. The lower nonhex portion is designed for retrievability of the SCRP after cementing the multiunit superstructure to the abutments intraorally. Unlike conventional hex abutments, the SCRP abutments allow the entire superstructure to be retrieved even if the implants are not parallel (Figs 3 and 4). This is possible because of the special structural design of the SCRP abutment, which provides spaces to compensate for the undercuts created between the hex parts of the nonparallel implants.

The Clinical Pros and Cons of SCRP

With the SCRP system, the prosthetic superstructure is retained with any definitive resin cement, which can compensate for minor discrepancies created during fabrication processes. As a result, it is possible to achieve a passive fit even in long-span prostheses

without cutting and soldering. The prosthesis of the SCRP system is retrievable after permanent cementation, so a clinician can unscrew and retighten the entire superstructure as needed for repair, maintenance, or the removal of excess cement extraorally. Furthermore, this retrievability makes it possible to use a definitive cement instead of a temporary cement. Lastly, in cases with a limited interarch distance, a longer abutment with a deep subgingival margin can be used because it can be retrieved for extraoral cleaning and repair.

As with conventional screw-retained prostheses, the presence of screw holes on the occlusal surface can affect the stable occlusion and esthetic component of the SCRP prosthesis. Since the SCRP is cement-retained, cement washout is inevitable in the long term even if a definitive cement is used. Therefore, it is critical for the success of the SCRP system to establish the maximum retention form of the abutment and select a definitive cement with a high strength.

Conclusions

The SCRP system is a new concept for an implant restorative system that can easily obtain a passive fit and retrievability. The SCRP abutment with both hex and nonhex components in one allows repositioning of the abutment and retrievability of the prosthesis. The SCRP system simplifies implant treatment procedures and eliminates the difficulty of removing excess cement.

Acknowledgments

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Literature Abstract

Does Ridge Preservation Following Tooth Extraction Improve Implant Treatment Outcomes: A Systematic Review. Group 4: Therapeutic Concepts and Methods

This systematic review and meta-analysis *(1)* investigated the additional effect of alveolar ridge preservation (ARP) on implant-related outcomes in comparison with unassisted socket healing and *(2)* estimated the size effects according to the type of intervention for ARP. General inclusion and exclusion criteria were explained in detail. Ten randomized controlled trials (RCTs) and controlled clinical trials (CCTs) and 30 RCTs and CCTs and prospective case series were included in the study for each respective aspect of the proposed aim. The authors found that ARP procedures may decrease the need for further ridge augmentation during implant placement (pooled relative risk for further ridge augmentation was 0.150) but did not increase the feasibility of implant placement. The survival and success rates and marginal bone levels of implants placed in alveolar ridges following ARP are comparable to those of implants placed in untreated sockets. Different types of ARP intervention (GBR, socket filler, and socket seal) did not show superior impact on implant outcomes. The authors mentioned that the majority of included studies were qualified for high risk of bias.

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