Review Article

# Cement Versus Screw-retained Implant-supported Prosthesis: A Review

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## ABSTRACT

The majority of dentists make decisions about implant restorationafter they are already osseointegrated.The purpose of this article compares cement-retained and screw-retained implant restorations in terms of esthetics, occlusion, retrievability, framework passivity, immediate loading, ease of fabrication, and cost, improved skills, techniques, materials, housing choices, and designs have proven their worth.These prostheses were integrated with Cement or screw implants. There is so much controversy in the literature regarding retention selection. This review article provides an overview of various clinical aspects, abutment designs, and materials on cement versusscrew-retainedimplant-supported prostheses.

**Keywords:** Cement-retained implant, Prosthesis, Restoration, Screw-retained implant.

## Introduction

Improved techniques, materials, case selection, and tried-and-true designs are key factors in the greater success rate of dental implants and the persistence of osteointegration with dental implants.[1] The field of implant dentistry has advanced remarkably quickly in recent years. For patients with partial or total tooth loss, fixed implant-supported prostheses have evolved into the gold standard of care, improving both their mastication and appearance.[2,3] The optimal kind of implant prosthesis is still up for debate among practitioners, as is the option between the screw and cement-retained prosthesis, which has long been addressed.[3] After implants have osseointegrated, most dental professionals choose how to restore them. However, there have been frequent reports of prosthesis failure, particularly mechanical kind. These prosthetic devices are fixed either with cement or a screw to the integrated implant.

## Esthetics

Once the implant is perfectly positioned, esthetics can be achieved with either screw-retained or cement-retained restorations.[3] It is well-documented that clinicians believe that cement[4,5,6] restorations are more esthetic.[7,8,9,10] A cemented restoration abutment can be prepared in the same way as a natural tooth and then the crown can be cemented.[11] Screw-retained restorations have been criticized for screw access channels that can be placed in esthetic areas when the implant is awkwardly positioned. To solve this problem, pre-angled/angled/custom abutments were used so that the screw access holes were relocated to the cingulum or occlusal plane.[1] For posterior restorations, there are various esthetic techniques to fuse the screw access holes into the restoration using silicone plugs and resin opaque[7] or pressed ceramic plugs.[12]

### Clinical significance

Esthetic success does not depend on the use of screw-retained or cement-retained restorations. Both can be used to achieve the same esthetic result.[13]

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## Occlusion

The absence of occlusal screw access holes allows for ideal and stable occlusal contact with cemented restorations.[14,15,16] These screw access holes may also impede anterior and lateral movement, thus compromising anterior guidance.[14] These restorative materials are prone to wear when functional forces are applied, so less occlusal contact is preserved than when cement restorations with intact occlusal surfaces are used. Furthermore, the presence of restorative material affects the direction of occlusal loading as it is difficult to achieve stable occlusal contact when using screw-retained restorations.[15] It has been suggested that occlusal screw access holes can disrupt occlusal contact at maximal cusp occlusion, creating offset loading forces.[2] The access tube occupies a significant portion of the occlusal table. This accident can only have a significant impact if the implant system uses larger screws for larger-diameter implants. When used on small premolars, the screw access holes can occupy a large portion of the occlusal surface, which can lead to both esthetic and occlusal formation difficulties. Stable occlusal contact can be established with cemented restorations as the occlusal surface is not interrupted.[17,18] Screw-retained restorations require a minimum interproximal spacing of 4 mm from the implant platform to the occlusal surface of the antagonist. Cement-retained crowns require more interocclusal space to accommodate the many components used in their manufacture. A minimum height of 4 mm is required in the posterior region of the abutment for proper retention of the cemented crown on the abutment. Anterior abutments have more tapered axial walls than posterior abutments, thus requiring a higher height and less holding power. In addition, the crown should have enough space for the restorative material to be used, which typically requires about 2 mm. Therefore, a minimum of 6 mm is required for the posterior region, resulting in a fairly flattened occlusal anatomy, requiring additional space to develop lifelike anatomy.[2]

### Clinical significance

For optimal and stable occlusion with contralateral dentition, screw-retained restoration can achieve the same predictable results as cement restoration when occlusion is a superior crown, not screw channel filler.[13]

## Porcelain Fractures

Porcelain fractures are a common complication observed with implant-supported restorations. This is most common in screw-retained restorations because the screw access hole breaks the structural continuity of the porcelain, leaving unsupported porcelain in the screw access hole.[19,20,21,22]

### Clinical significance

Occlusal schemes should be carefully evaluated to ensure that static and dynamic occlusion are properly controlled to reduce the incidence of screw-retained porcelain fractures, comparable to reported cement crowns.[13]

## Retrievability

A major advantage of screw-retained restorations is their easy delivery and retrieval without damaging the attachment or the restoration.[14,17] In the past, it was routine to remove the implant-supported prosthesis and clean the prosthesis each year. This concept was abandoned due to a lack of clinical evidence that it positively impacts long-term success compared to not removing the prosthesis at follow-up appointments.[2] Screw-retained implant support. In restorations, screw loosening has historically been a problem. However, better-designed implants, improved screw mechanical properties, improved internal connections, and a tighter interface with the abutment that works with conical seals and is virtually free of tremors lead to the optimal prosthesis. Criteria for connectivity are set.[21] The lack of micromotion of the abutment during function prevents bacteria from entering and exiting the interface between the implant and the abutment, which, in addition to other factors such as the platform-switching design, helps maintain bone at the highest possible level.[22,23] Cement-retained restorations are suitable for short-span, single-unit, and solid-definition teeth where removal is unlikely to be necessary. Implant survival rates were similar for individual screw-retained and cement-retained units.[24] The retrievability advantage appears to improve implant survival in screw-retained restorations of fixed full-arch dentures. Low implant survival has been reported when large-span restorations are fabricated with cemented components.[25] If the cement component is not properly removed, it causes peri-implant bone loss and this complication increases with the prosthesis span.[25] The fact that a screw-retained crown allows direct access to an abutment screw or implant is an advantage over cement restorations. When comparing both techniques, treatment time and costs are comparable to screw-retained and cement-retained restorations.

### Clinical significance

Clinicians need to plan prostheses for the future. In the event of complications requiring the removal of the prosthesis, screw-retained prostheses simplify the treatment process.[13]

## Interocclusal Space

If the interocclusal distance is <4 mm, screw-retained restorations can be used.

### Clinical significance

Limited interocclusal space or poor implant alignment are contraindications for cement implant restoration. Instead, a screw-retained prosthesis should be chosen.[13]

## Retention

Retention is considered one of the most important factors affecting the longevity of implant prostheses.

Factors affecting the retention of cement restorations:

1. Abutment taper
2. Surface and height

3. Surface roughness
4. Type of cement
5. Screw design

### Abutment taper

Taper has a significant impact on the retention of cement restorations. Machined abutments most often have a taper of 6°, according to Jorgensen's proposed ideal taper concept for natural teeth. In clinical situations where the implants are not parallel to each other, abutment preparation and tapering may be required to allow an ideal path for the insertion of the bridge prosthesis. Overtapered abutments may not adequately retain cemented bridge prostheses, requiring screw-retained prostheses.[14,26]

### Surface and height

Placing the implant under the gingival margin lengthens the abutment wall of the implant, which usually has a larger surface area than a prepared natural tooth. The minimum documented abutment height for the use of cemented restorations with predictable retention is 5 mm. Therefore, screw-retained restorations can be used when the interocclusal distance is only 4 mm.[3]

### Surface roughness

Increased surface roughness improves the mechanical retention of cement. Therefore, roughening the implant abutment with a diamond bur or sandblasting improves retention. However, due to the ideal He of an implant abutment with a 6° taper and long surface, there is usually no need to roughen the abutment surface to increase retention.[3]

### Type of cement

Cement selection is one of the most important factors controlling the retention achieved in cement restorations. Cement used for implant restoration can be permanent or temporary, and the physician decides to choose a particular cement type based on the clinical situation. The concept of using temporary cementation is believed to achieve restoration recoverability in the event of loose restorations or abutment screw loosening without compromising the implant restoration components.[13]

#### *Clinical significance*

Cement application should be minimal and localized only around the crown margin. A pre-extrusion procedure should be performed before the crown is gently seated onto the abutment to remove excess cement from outside the oral cavity. A strict follow-up protocol should be followed to reduce the risk of complications.[11]

### Abutment design

Since the design of the screw affects the holding power of the screw, a hexagon socket screw head has been shown to retain higher strength than a slotted screw head.[13]

#### *Clinical significance*

Customized abutments that follow the gingival contour are preferred over standard abutments but are not guaranteed to be free of residual cement. Vent holes can reduce the amount of cement that is extruded.[11]

## The Passivity of Framework

Passivity refers to the state of existence without resistance, meaning that no mismatch forces are generated within the prosthetic system when applied to an implant prosthesis. Achieving a completely passive framework with a screw-retained prosthesis is technically very challenging.

### Clinical significance

Cemented prostheses are inherently more passive due to the cemented intermediate buffer. Passivity is technically more difficult to achieve with screw-retained prostheses. This is because dimensional variations lead to static stresses and screw mismatch stresses, which can lead to screw-related complication.[11]

## Provisionalization and Gingival Remolding

Gingival contouring is a critical step in the healing phase to achieve satisfactory esthetics with a natural-looking tissue profile around the implant crown. This process requires a temporary restoration as the healing abutment is not the correct size or emergence profile required for restoration. The advantages of screw-retained provisional restorations can be used as pick-up impression copings, creating a soft tissue impression identical to the intraoral soft tissue impression. This provides the lab with a model of the emergence profile that will be transferred to the final restoration. A major drawback of cemented provisional restorations is the difficulty of removing excess cement while controlling bleeding. Cement residue can also cause gingivitis.[13]

### Clinical significance

Screw-retained provisionals have several advantages over cement-retained provisionals for achieving ideal tissue contours, maintaining tissue health, and translating soft-tissue profiles into impressions for communication in the laboratory.[11]

## Ease of Manufacture and Cost

Fabrication of cement-retained restorations is easier than fabrication of screw-retained restorations. This is because conventional laboratory and clinical prosthetic techniques are used to fabricate cement-retained restorations.[2] Screw-retained restorations are usually more expensive because they require additional components such as plastic sleeves, laboratory fixation screws, and the fixation screw itself. Nevertheless, the increased cost of screw-retained restorations that allow for predictable retrieval should be weighed against the potential costs of damaging cement restorations should biological or technical complications occur.[2]

### Technical complication (screw related)

Implant screw connections are prone to technical complications due to intraoral forces and strength limitations of the

components themselves. For full-arch restorations, abutment screw loosening was more common with screw-fixed teeth. No screw fractures were observed in cemented full-arch prostheses. Screw-retained restorations are prone to implant-abutment misfits, reducing the clamping force the screw can generate. Lower than normal buccolingual off-axis loading forces can cause screw loosening. Screw fractures have been observed to occur primarily at the first occlusal screw thread. He reported that the screws needed to be re-tightened, especially within a year of functional load. Most of the technical errors in the past have been due to imprecise assembly of the components that enable micromotion. Clinical relevance screw loosening and screw breakage are the most common technical complications encountered with both screw- and cement-retained restorations. Current evidence indicates no statistical difference in the frequency of technical complications between groups. Loose screws must be replaced before retightening the abutment.[13]

### Biological complications

The biology of implants in oral tissue is very different from that of natural teeth.

#### *Clinical significance*

Screw-retained restorations have fewer biological complications than cement-retained prostheses. Cement extrusion and retention in the peri-implant tissue can lead to microbial colonization and soft/hard-tissue damage.[13]

## Cement-retained Prosthesis

Cemented implant-supported prostheses were initially introduced for esthetic reasons and to address the problem of loosening that occurs with screw-retained restorations.[13]

### Cementation technique

#### *Clinical significance*

Cement application should be minimal and localized only around the crown margin. A pre-extrusion procedure should be performed before the crown is gently seated onto the abutment to remove excess cement from outside the oral cavity. A strict follow-up protocol should be followed to reduce the risk of complications.[13]

### Residual excess cement

Excessive cement residue is one of the most common problems with cement implants, found in up to 81% of subgingival gaps in one study.[13]

#### *Clinical significance*

Excessive cement residue in the peri-implant tissue is a risk factor for the development of early (months later) or late (years later) symptomatic peri-implant disease. Diagnosis is most accurate when the crown and abutment are removed. The use of radiographs is a poor diagnostic tool. Non-surgical debridement using a titanium scaler should be attempted first to remove cement debris and assess healing before surgical treatment is considered. Healing can be expected after 3–4 weeks.[13]

### Retrieval of cemented restorations

Cemented implant restorations are often more difficult to remove than natural teeth.

#### *Clinical significance*

There are several techniques to help remove cemented implant crowns. Despite their use, the removal of cemented crowns is arguably more difficult and less predictable than screw-retained restorations.[13]

## Screw-retained Prosthesis New Developments

Ideally, the implants should be placed parallel to each other and vertically with axial force. Several prosthesis components have been introduced that can correct the angle of the prosthesis and return it to a more recoverable position. This section describes pre-angled abutments, dynamic abutments, and angulated screw channels (ASCs) as alternatives to cemented restorations for poorly angled implants.[13]

### Pre-angled abutment

Pre-angled abutments can redirect screws get admission to openings to the occlusal or cingulum regions of implant restorations thru the usage of off-axis screws: one screw to steady the abutment into the implant and the second one screw at an attitude to steady the crown into the majority of the abutment shape. However, to offer enough abutment shape to residence a retention screw for the restoration, the lengthy axis of the implant and direction of the retention screw has to diverge significantly. At a minimum, Nobel Biocare affords a screw-retained pre-angled abutment with a divergence of 17°. A 30° thing is likewise to be had for extra seriously angled implants. Clinical importance there is a widespread consensus that pre-angled screw-retained abutments produce no extraclinically obtrusive physiological risks over conventional abutments. From a biomechanical factor of view, the pre-angled abutment can be an appropriate restorative alternative for implants with non-ideal angulation.[13]

### Dynamic abutment

In 2004, a biomechanically novel provision design was introduced.

Dynamic Abutment (Palladium International Implantology) is a biomechanically novel provision design that allows it to change the angle of the abutment up to 28° away from the axis by 360°. Unlike pre-angled abutments, which have a thicker labial margin and need to be placed more distally to hide the component, the advantage here is that the labial dimension is very thin so it can be placed more distally. There is no need to place implants. The abutment consists of a base with an occlusal hemisphere, on which he has a combustible chimney with 28° degrees of freedom of rotation. The angle is selected and set before casting the abutment. After fabrication, the abutment is secured using a screw with a specially serrated screw head and a ballpoint driver with a 1.3 mm hexagonal facet.[13]

### *Clinical significance*

Dynamic abutments are preferred due to thinner components and less disruption to peri-implant tissue, with a custom angle between 0° and 28°.[13]

## ANGULATED SCREW CHANNEL

Recently, Nobel Biocare launched a variant of Dynamic Abutment.

Angulated screw channel. This system offers a much simpler alternative to cemented prostheses when restoring tilted implants. The technician can "bend" the screw access channel up to 25°., he can be 360° variable to a more favorable position. The abutment is secured using an Omnigrip screwdriver with rounded facets to engage the screw head. The head itself has several grooved reliefs cut into the wall to allow maximum rider angle. This design allows torque to be applied at any angle between 0° and 25°.[13]

### *Clinical significance*

The use of ASC abutments appears very promising, but further investigation is needed to estimate the incidence of complications.[13]

## Conclusion

Single-crown restorations had more technical complications with screw-retained prostheses, but more biological complications with cement-retained prostheses. Clinicians should decide what they wish to keep during follow-up visits. Restorations with full-arch implants should be screw-retained. They are easier to find for the management of technical complications and seem to be preferable from a biological point of view.

Both types of screw-retained and cement-retained restorations have certain advantages and disadvantages, so the authors do not favor one type of restoration over the other. However, based on a review of the relevant literature, some types of repair are more appropriate than others in some clinical situations.

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