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# Review Article

## Review Article on Screw Retained Versus Cement Retained Implant Restoration

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***ABSTRACT:***
One of the debates is the choice between screw- and cement-retained implant prosthesis. It has been discussed for a long time, but the best type of implant prosthesis remains controversial among practitioners and there have been a few publications that comprehensively compare these 2 types of retention. The aim of this literature review was to provide an overview of the advantages and disadvantages of the cement and screw retained restorations, & also to suggest some clinical situations that advocate for one method of retention over the other.
**Key words-** screw, retention, cement, restorations

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### INTRODUCTION

With the high rate of implant success for edentulous, partially edentulous and single tooth restorations, the concept of implant therapy is now a highly predictable treatment modality.

Implant dentistry has seen rapid and remarkable progress in recent years. Several questions have been raised concerning materials as well as designs of both implants and implant abutments to achieve maximum clinical success rates.

The factors that are affected by different methods of retention of the prosthesis to the implants are[1,2]

ease of fabrication and cost, esthetics, access, occlusion, retention, incidence of loss of retention, retrievability, passivity of fit, restriction of implant position, effect on peri-implant tissue health, provisionalization, immediate loading, impression procedures, porcelain fracture, and clinical performance.

### EASE OF FABRICATION AND COST

The fabrication of cement-retained restorations is easier than that of screw-retained restorations because conventional laboratory and clinical prosthodontic techniques are used for making cemented restorations. The screw-retained restorations are usually more expensive because of the extra components needed, such as plastic sleeves, laboratory fixation screws, and the fixation screws themselves. Nevertheless, the increased cost of the screw-retained restoration allows for predictable retrievability of the prosthesis.[1,3]

**ESTHETICS** When the implant is placed in the ideal position, predictable esthetics can be achieved with either screw- or cement-retained restorations, but the problem in regards to screw-retained restorations is that of the screw access channel that may be located in an esthetic area. In cases where there is difficulty in placing the implant in an ideal

position for any anatomic limitation, the pre-angled or custom abutments can be used so that the screw access channel is relocated away from an esthetic area. The use of an opaquer in combination with a resilient composite, offered a significant esthetic improvement of implant restoration.

**ACCESS** Cement-retained restorations offer easier access to the posterior region of the mouth, especially in patients with limited jaw opening. It is often difficult to use screw retained restorations in such situations, as screwdriver (or implant wrench/hex) is required to be placed far posteriorly causing difficulty of access. The use of screw-retained restorations in the posterior part of the mouth may carry a risk of swallowing or aspirating the screw or screwdriver.[2,3,4]

**OCCLUSION**

Ideal and stable occlusal contacts can be established with cement-retained restorations because there are no occlusal screw access holes. In screw-retained, access holes will interfere with protrusive and lateral excursions and, therefore, anterior guidance may be compromised. Moreover, there is difficulty in achieving stable occlusal contacts when using screw-retained restorations because of the presence of restoration material which will affect the direction of occlusal loads that would be distributed as lateral forces to the implant instead of being axially directed.[1]

Thus, occlusal adjustments are made on the occlusal composite obturation placed over the screw to create axial load on these restorations. These restorations require additional chair time and wear more rapidly than porcelain or metal, which is the occlusal contact material of choice for a cement-retained restoration. An added advantage is that cemented-retained restorations permit the design of narrow occlusal tables because no minimum dimensions are required for screw holes and surrounding metal. This in turn proves a valuable advantage to prevent over-contouring and promote the design of an emergence profile favourable to peri-implant tissue health.

**RETENTION**

The security of retention is considered one of the most important factors affecting implant prosthesis longevity.

For screw-retained prosthesis, the screw that connects the implant with the abutment and the abutment with the prosthesis is the main factor aiding in retention, as validated by the studies of the Branemark system. Literature exhibits that screw loosening and screw-breakage are major technical complications with these restorations. Since screw is an inclined plane, any discrepancy such as in passivity or accuracy of super structures, occlusal scheme, or existing parafunctional habits, result in emergence of fulcrum points at the junction of abutment and implant. The consequential offset loads at the interface are of sufficient magnitude to overcome the clamping forces of the screw, as a result, screw gets stretched, broken or loosened. To overcome this, various biomechanical considerations such as preload to be 75% of the yield strength, torque ranging from 20 to 35 N/cm, optimum screw head design incorporating flat head, long stem length, result in axial loading of the implant and avoids screw loosening.[1,4,5]

**FACTORS THAT AFFECT THE RETENTION OF CEMENT RETAINED RESTORATIONS[1]**

**1.TAPER OF THE ABUTMENT**

Taper greatly affects the amount of retention in cement-retained restorations. Machined abutments have mostly 6° of taper depending on the concept of ideal tapering proposed by Jorgensen for natural teeth.

**2. SURFACE AREA AND HEIGHT**

Regarding surface area and height, the subgingival placement of the implants provides longer implant abutment walls and usually more surface area than prepared natural teeth. The minimum abutment height to use cement-retained restorations with predictable retention, was documented to be 5 mm. Therefore, when the interocclusal space is as little as 4 mm, screw-retained restorations may be used, since these restorations can be attached directly to implants without intermediate abutment.[1,5,6]

Also,

Kaufman et al proved that an additional 4–7 mm of abutment height, increases retention by 67%.

due to increase in available surface

increased resistance of abutment to lateral forces

Under lateral forces, prosthesis tends to rotate upwards on one side of the implant along the arc of rotation. The height of the abutment should be greater than the arc of rotation. A wider implant requires a greater height than a smaller diameter implant to resist lateral forces. Placement of vertical

directional grooves (mesial and distal) in low profile abutments increases the retention, by decreasing the arc of ROTATION.

**3.SURFACE TREATMENTS**

Increased surface roughness will offer increased mechanical retention for cements.

Surface texture of the abutment and **e**nhanced retention for cemented prosthesis is acquired by creating micro-retentive irregularities on the abutment surface, into which the luting agents bond. Also, the internal aspect of the casting as well as the abutment surface is air abraded with 50 μm of alumina to enhance its retention for cementation.

**4. SELECTION OF THE CEMENT**

Cement selection is one of the most important factors controlling the amount of retention attained for cement-retained restorations. The cement used with implant restorations can be either permanent or provisional, and it is the clinician's decision to choose a certain type of cement, based on the clinical situation.

**FACTORS AFFECTING THE AMOUNT OF RETENTION OF SCREW-RETAINED RESTORATIONS INCLUDE:**

**1. INSUFFICENT FORCES**

Insufficient clamping force, screw settling, biomechanical overload, off-axis centric forces (forces that are not directed along the long axis of the implant), implant components -Prosthesis misfit, differences in screw material & design, and finally hex height and implant diameter. To achieve sufficient clamping force, the amount of torque suggested by most implant manufacturers on abutment screws ranges from 20 to 35 N-cm. It should be noted that because this torque value used, is less than the permanent deformation of the screw material, the screw rebounds slightly and reduces the clamping force.

**2. TORQUE**

It is suggested that the screw is torqued to 75% of its permanent deformation (i.e., 30 N-cm) and then loosened and torqued again. After 10 minutes, the screw is again tightened. This delayed torque method reduces the amount of relapse in the strain of the screw.

The use of a counter-torque procedure is advocated, especially in soft bone. A simple counter-torque method is to use a modified haemostat to hold the abutment while the torque wrench tightens the screw. The counter-torque technique helps to reduce shear loads to the crestal bone.

To use this counter-torque technique the abutment must engage the hex or anti-rotational design of the implant. To ensure that the abutment seats completely on the implant body and fully engages the hexagon or anti-rotational feature of the implant body, a radiograph is often necessary, before using the torque wrench when the implant platform is placed below the soft tissue.

**3. PROSTHETIC COMPONENTS**

Screw loosening is also affected by implant component and prosthesis misfit. Poor fit between implant and components could increase stress in the screw, leading to screw loosening. The same is applied to non-passive prosthesis that will apply additional load to the system, leading to bending moments constantly loading the implant components and surrounding bone tissue.

**RETRIEVABILITY**

The main advantage of screw-retained restorations is the predictable retrievability that can be achieved without damaging the restoration or fixture. Therefore, the prosthodontic components can be adjusted, the screws can be refastened, and the fractured components can be repaired with less time and at lower cost than would be the case with cement-retained restorations.

Other techniques that have been suggested depend mainly on locating the screw access opening of the abutment screw in cement-retained restoration, in turn, to allow access to the abutment screw with least damage in the future. These techniques are achieved by using abutment screw access guide or placement of a well-defined small ceramic stain on the occlusal surface of restoration where the screw access opening is located.[7]

**FIT OF THE RESTORATION**

The passive fit of implant prosthesis has been stressed because of the ankylotic character of implant abutments and because poor fit is correlated with biologic and mechanical complications. Cement-retained restoration is more likely to achieve passive fit than a screw-retained one. Reasons include increased passivity of cement-retained restorations rests on the assumption that the cement could act as a shock absorber and reduce stress to bone and implant-abutment structure. Also, die spacers on the stone dies help create approximately a 40-micron cement space that compensates for some of the dimensional variation of laboratory materials and permits the fabrication of a more passive casting with cement-retained restorations.

Passive fit of screw-retained restoration can be improved by laser welding of the prosthesis framework, Most recent approaches to improve passivity of fit is using the laser scanned computer numeric controlled–milled titanium (computer aided design/computer aided manufacturer).

**HEALTH OF PERIODONTIUM**

There are chances of gingival inflammation when using cement-retained prosthesis because of difficulty in removing excess cement, especially when the restoration margin is greater than 3 mm sub-gingivally. This is particularly common in the anterior region when it is recommended to place the implant 3 to 4 mm apical to the cementoenamel junction or the facial gingival margin of adjacent teeth to develop proper emergence profile.[7,8]

It has been shown that incomplete removal of cement may result in peri-implant inflammation, soft tissue swelling, soreness, bleeding or exudation on probing, and resorption of peri-implant bone. The solution for these clinical situations is using either screw-retained restorations or custom abutments for cement restoration with margin following the anterior gingival contours.

**IMPLANT POSITION**

Screw-retained implant-supported restorations require precise placement of the implant to achieve predictable esthetics. However, the use of cement-retained restorations allows for greater freedom in implant placement. Good treatment planning and precision surgery using surgical guides, the implant can be placed in its ideal position.

**PROVISIONAL RESTORATION**

Provisional restorations are frequently used for immediate or early implant loading to achieve better esthetics and to mould soft tissue for proper emergence profile for definitive restorations.

**LAB PROCEDURES**

Using screw-retained provisional restoration is preferred over cement-retained restoration because the screw can be used to seat the provisional restoration and to expand peri-implant mucosa. Also, screw-retained provisional restoration can be screwed into the master impression to translate additional information to the technician about the contours.

The major disadvantage of cement-retained provisional restoration is the difficulty associated with removing excess cement and managing bleeding at the same time. Moreover, cement residues may cause gingival inflammation.

**FRACTURE OF OCCLUSAL MATERIAL**

Occlusal material fracture is more common with implants than natural teeth because of the lack of periodontal stress relief with implants and a resultant higher impact force to the occlusal material.[1,8]

A decreased incidence of porcelain fracture of the prosthesis has been observed with cement-retained restorations compared to screw-retained prosthesis because the screw access hole disrupts the structure continuity of porcelain leaving some unsupported porcelain at the screw access hole. Screw-retained provisional restorations can be screwed in the master impression so as to transfer soft tissue contours to master cast. As a result the definitive restorations will be easily seated without soft tissue impingement.

**CLINICAL PERFORMANCE**

The success rate of cement- and screw-retained implant-supported restorations were evaluated in several studies. Most of these studies showed that screw-retained restorations have more complications during follow-up periods than their cemented counterparts. However, the percentage of these complications was generally small and most of them were controllable.[9,10]

**SUMMARY**

**SITUATIONS THAT PREFER SCREW RETENTION**

1. LARGE, FULL ARCH IMPLANT reconstructions are preferred to be screw retained, because complications are more common than those of short span ones.
2. Cantilevered prosthesis is preferred to be screw retained because some maintenance of restorative structures or implants would probably be needed during lifetime of such prosthesis.
3. With patients who are at risk of developing gingival recession.
4. In situations where minimal interocclusal space exists. It may not be possible to achieve adequate retention for cement retained restorations because these restorations require a vertical component of at least 5 mm.
5. Patient who are expected to lose more teeth in the future, screw retained restorations are preferred.
6. Situations in which removal of excess cement is difficult or impossible.
7. Cases in which technical or biological complications are anticipated, screw retained are preferred to allow for easy removal of the restorations, thereby managing the problems.

**SITUATIONS THAT PREFER CEMENT RETENTION**

1. Single unit and short implant restorations assuming that implant table size, implant numbers and abutment screw torque can be optimized, are preferred to be cement retained.
2. Cases involving **narrow diameter crowns** in which the screw access may compromise the crowns integrity are preferred to be cement retained.
3. Situations in which **occlusal surface will be compromised** with regard to esthetics or occlusal stability due to the presence of a restorative material sealing the screw access are preferred to be cement retained.
4. In situations of restoring misaligned implants, if the divergence of the implant axis and the retaining screw of the angled abutment which is to receive the restoration is less than 17, conventional screw retention of the restoration using pre machined abutments is not possible.

**CONCLUSION**

Thus both types of restorations, screw-retained and cement-retained, have certain advantages and disadvantages. However, it is important that the dentist first evaluates the clinical status with proper diagnosis, plan treatment accordingly and then conclude the type of restorations to be used in that particular situation.

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