

## Enhancing Retrievability of Cement Retained Implant Supported Restorations

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**Received:** January 30, 2019; **Published:** February 26, 2019

### Abstract

Despite the high success rate and the wide use of dental implants in restoring partially and fully edentulous patients, the retrievability of the restorations could be needed in case of control, debridements, changing the restorations or any other reasons. With all the advantages of the cemented retained implant supported restorations over the screw retained ones, but there is insufficient information concerning the proper cement and technique which be used to enhance the retrievability of cement retained implant supported restorations. For this goal, in- vitro studies which tested the retention strength for dental cements has been reviewed and summarized in this article.

**Keywords:** *Dental Implants; Dental Cements; Adhesiveness; Tensile Strength*

### Introduction

The success of oral rehabilitation in patients undergoing implant therapy depends not only on the osseointegration of implant but also on maintaining the integrity of connection between the prosthetic superstructure and fixture [1]. The original implant supported prosthesis retained by screw [2]. These type of treatment got wide success to restore complete edentulous cases [3]. This encourage the dentists to establish a new design of restorations and different methods to retain restorations over implant. Cement-retained prosthesis are widely used these days to retain implant supported prosthesis. This method has become very popular and provide advantages over the original method [3,4].

Alveolar bone shape and thickness [5], the surgical technique during implant placement [6], implant angulation and position [7], inter-occlusal distance [8] and esthetic demand, all of these criteria determining the prosthodontic retaining methods.

Cement retention has clear advantages in terms of ease of fabrication and cost [9], the passivity of the framework [10], occlusion and aesthetics [11]. Besides that, fabrication procedure of cement retained restoration is much easier than the screw retained restoration which needs special component and laboratory techniques [12]. Dental cements enhance the adaptation of restoration which lead to more equitable stress distribution than screw retained restorations [13]. Beside that the continuing structure of cemented restoration - without any missing part which could be present in screw retained type as screw access hole over the occlusal or lingual wall- enhance the material durability and prevent ceramic chipping in cemented restorations.

In spite of these advantages of cement-retained prostheses, screw retention is still beneficial in terms of retrievability. In many clinical conditions - Fracture of the prosthesis, loosening or fracture of the abutment screw, and the need to modify the prosthesis after loss of an implant or neighboring teeth- retrievability of restoration could be needed [11,14]. The supporters of the screw retained methods insist that easily reachability of this restoration without any trauma to the implant system including the abutment, implant body or even the bone supporting implant is a great advantage over the cement retained restorations [14].

### Aim of the Study

The aim of this article was reviewing and summarizing the in vitro studies, concerning the retentive strength of dental cements to find the proper dental cement and technique which enhance the retrievability of cement retained implant supported restorations.

### Factors that influence the retrievability of implant supported restorations

#### Type of dental cement

The choice of cement for implant-supported restoration should be based on the need or desire for retrievability. The anticipated amount of retention needed, the ease of cement removal and cost [15]. According to another research, provisional luting agent may be used as a final luting agent when the superstructure is entirely implant supported [16]. Clinically during normal function, the restoration will be subject to thermal changes and chewing forces reducing the retention of dental cements [17]. Many *in-vitro* studies has been discussing the retaining ability of the dental cements which use for implant supported restorations. Variety of aging process has been used to simulate the oral conditions. Using different aging methods in each study result in different result which could be consider as limitation of these type of studies. This systematic review depends on studies which apply different type of aging methods: 37 degree water bath [17-20], thermal cycling [21] and chewing simulator [22]. As a result, these studies shows that zinc phosphate cement, zinc polycarboxylate cement, resin base cement, and resin modified glass ionomer cement show high retention values to consider them as permanent luting agent for implant supported restorations whereas provisional cements (zinc oxide eugenol, free eugenol temporary cement, and resin base temporary cement) and glass ionomer cement showed statistically the same retentive strength which is lower than other permanent cements.

In the same time, cement failure considered as important factor in the retrievability of the restoration [17]. Using the cement which has cement failure occurs in the cement abutment interference will be indicated to leave a clean abutment for recementing procedure [17]. According to Nejatidanesh, *et al.* [20] study Zinc phosphate cement, resin base cement, and resin modified glass ionomer cement samples showing adhesive failure at cement abutment interference.

According to another study [23] mixing the luting agents with petroleum solution will reduce the retention of cemented suprastructure, an remarkable increasing has been noticed in the adhesive failure of zinc oxide eugenol cement when it mixed with 15% of vaseline before cementation.

#### Type of abutment

Abutment surface preparation, and the abutment tapering, width, and height also affect the retentive strength of cement-retained implant supported prosthesis. Cylindrical abutment and any type of abutment roughness should be avoided to enhance retrievability of restorations, tapered smooth abutment is suitable for these cases. The height of the abutment also was analyzed, increasing the abutment height from 4 to 6 mm resulted in a statistically significant increase in the bond strength for dental cements [23]. Farzin, *et al.* [17] used the same temporary cements which has been used in the previous study, remarkable increase in the retention mean value for the same cements after elimination one of the abutment wall. That has been explained by increasing the surface area of the modified abutment and because that the internal walls were not coated with smooth titanium nitride [24].

### Alternative methods to enhance retrievability of cement retained implant supported restoration

#### Occlusally access method

Removing the restoration and abutment as one part by reaching the abutment screw throw access channel on the occlusal surface could be effective way to retrieve cement retained restoration without damaging the implant body [25,26]. Determining the screw channel angulation is a challenge in these cases. A special technique for recording the abutment screw angulation of cemented implant prosthesis by using the 2 dimensional radiographs has been explained [25]. This technique could be summarized as taking a photograph for the dental model and dental abutment, then another radiograph taken from the same distance for the same positioned model with a definitive restoration seated over the dental abutment. Using the computer technology to superimpose these two radiographs and saving this superimposed radiograph in patient archive. This photo will give enough idea about the location and angulation of screw channel.

Another method to expect the screw channel angulation by using different shade ceramic over the screw channel access during ceramic fabrication. This different colored ceramic spot could be considered as indicator to determine the access hole location without needs to review patient archive [27].

#### Lingual retrieval slot mechanism

Palatal or lingual slot (1 mm height, 3 mm width) over the finish line of abutment design during max build-up of the restoration. This slot is designed to be reached by excavator or straight elevator and apply friction forces to break the cement seal at margins of the restoration and retrieving the crown without any traumatic forces over dental implant. This slot should be closed by composite restoration to prevent food accumulation [27].

#### Combination implant crown

In this technique, provision is made to unscrew abutment together with a crown. abutment screw driver placed in the abutment and over which wax up is done for metal coping. Ceramic also has been done while the abutment screw driver in place. Cementation could be done over the dental model. Then delivering the abutment and restoration as one part, later the access hole will be closed by composite resin. For future retrievability, the crown-abutment complex can be unscrewed by removing the resin composite and inserting the seating tool through the access cavity [27].

### Conclusion

- The retrievability of cement retained implant supported restoration could be enhanced by using low retention strength dental cement like provisional cement and glass ionomer cement.
- Choosing tapered and smooth short abutment will reduce contact surface area with dental cement which play role in reducing retention strength of the cement retained implant supported restoration.
- Mild modification during designing of restoration provide easier approach for the retrieving cement retained implant supported restoration with minimal trauma to implant system.

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**Volume 18 Issue 3 March 2019**

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