

Clinical Case Report of Misused Implant Componentry: Part 1 – Clarification of Definitions regarding Screw-Retained and Cement-Retained Prostheses

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Introduction

The use of cement-retained or screw-retained implant prostheses has long been debated in the literature. Articles have been published from more than 20 years ago¹ till very recently² discussing the advantages and disadvantages of either approach.

Despite the numerous articles published, many fail to clearly define the terms screw-retained or cement-retained. The exact definition of either of these terms is missing from the articles^{3,4,5,6,7,8,9,10}, or at best, is vague¹.

The aim of the first of this three part article is to clarify the meaning of these terms used in the literature, and then use this knowledge in the final part of this article to describe the solution to a clinical case involving a patient's restorative complication when implant components are used incorrectly. The second part will discuss the concept of abutment indexing, when they are required, and how it relates to the solutions of the clinical case report.

Lack of Definition Clarity for Cement-Retained and Screw-Retained Prostheses

Implant abutments act as the connector between the fixture and the prosthesis. It is important to understand that all abutments, regardless of their intended connection to the prosthesis are always screwed down to the fixture through a screw channel, whether it be with a separate screw or, very infrequently, as a one piece abutment where the screw is "built in" to the abutment (Figure 2). Therefore, even prostheses that are cemented and have the intention of covering the screw channel, will still have an abutment with a screw fixation mechanism to the fixture. The presence of this abutment screw does not determine what is referred to as cement-retained or screw-retained.

To make definitions even more vague, prostheses can be cemented to the abutment not by the clinician in the patient's mouth, but rather done so in the laboratory before being connected to the fixture. In these cases, there is a "hole" or channel cut into the prosthesis so that the pre-cemented prosthesis and abutment can be screwed down to the fixture in one piece. These are known as direct-to-fixture prostheses, and despite still using cement to fixate the prosthesis to the abutment, they are not considered "cement retained" by the literature.

Definition and Examples of Cement-Retained Implant Supported Prostheses

The few articles that do provide some degree of clarification of definitions essentially infer that cement retention is any

implant restoration that is not only fixated to the abutment using dental cements, but also covers the screw channel in order to achieve better occlusion and better aesthetics. The improved occlusion is due to the fact that load can be applied directly through the axis of the fixture. This is because the prosthesis covers the screw channel, and the screw channel will always be in line with the axis of the fixture. If this screw channel is not covered by the prosthesis, occlusal forces cannot be applied to the prosthesis through the axis, and this creates a cantilevering force which is considered to be destructive to the fixture, abutment and prosthesis complex.¹¹ The improved aesthetics is a result of the absence of a visible screw channel, which even if covered in opaque composite, rarely matches the colour of the prosthesis exactly.¹² In these cement-retained prosthesis situations, it is important to understand that the abutment is still invariably screwed down to the fixture.

Given the description above, cement-retained implant prostheses should be defined in the literature as prostheses that are cemented clinically in the patient's mouth, after which there is no other means of accessing the prosthetic or abutment screw without cutting the crown. Examples of cement-retained restorations as defined above, and inferred by the literature, will be described below with illustrations.

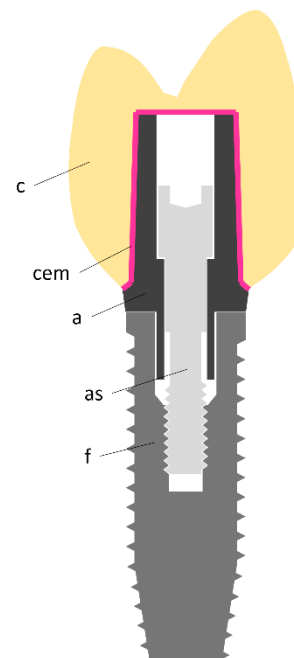


Figure 1

Figure 1 shows a stock (or pre-fabricated) titanium abutment (a) which is screwed via an abutment screw (as) to the fixture (f). There is a full zirconia crown (c) covering the screw channel cemented with a layer of cement (cem) to the abutment.

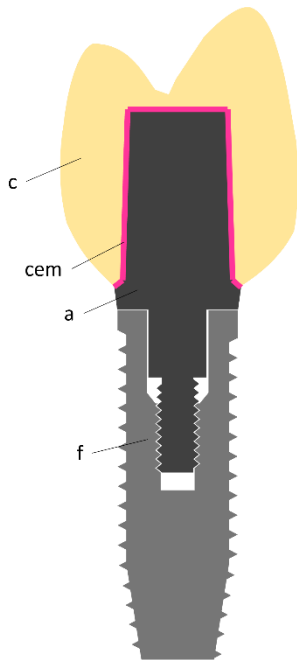


Figure 2

Figure 2 shows a stock one piece titanium abutment which has conjoined screw (a). The abutment itself is screwed into the fixture (f) with a full zirconia crown (c) cemented with a layer of cement (cem) to the abutment. There is no screw channel to cover since the abutment is a one piece abutment.

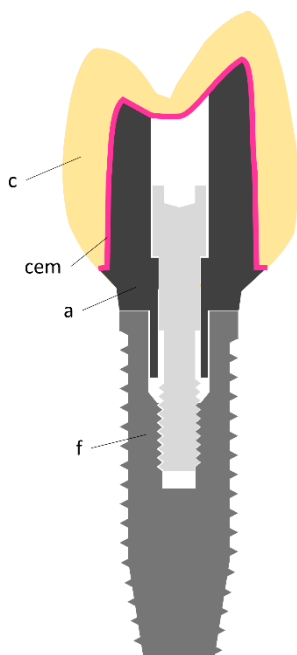


Figure 3

Figure 3 shows a customised titanium abutment (a) which is screwed via an abutment screw (as) to the fixture (f). There is a full zirconia crown (c) covering the screw channel cemented with a layer of cement (cem) to the abutment.

Definition and Examples of Screw-Retained Implant Supported Prostheses

The literature infers that screw retention is any prosthesis “attachment mechanism that sacrifices occlusion and

esthetics for retrievability”. This means that there is a screw channel present through the prosthesis, for the purposes of access to an internal screw. This internal screw may be an abutment screw, in the case of a direct-to-fixture prosthesis; or a prosthetic screw, in the case of a prosthesis that connected to the abutment via a second screw. The screw channel needs to be filled with a restorative material, and the occlusal contacts on the prosthesis must then be shifted away from this channel, meaning all occlusal forces become non-axial relative to the implant. These non-axial or cantilevering forces are considered to be destructive, and can result in screw loosening or fracture, and increased micro leakage.¹¹ The loss of integrity due to the screw channel also increases risk of prosthetic fracture.⁷ It is interesting to note that cross-pin restorations do not have a screw channel, and do not sacrifice occlusion or aesthetics, but are still considered to be screw retained restorations.

Given the description above, screw-retained implant prostheses should be defined as prostheses where there is direct access to the prosthetic or abutment screw when inserted into the patient’s mouth. The screw channel, if present, may then be covered in any other restorative material. Examples of screw-retained restorations as defined above, and inferred by the literature, will be described below with illustrations.

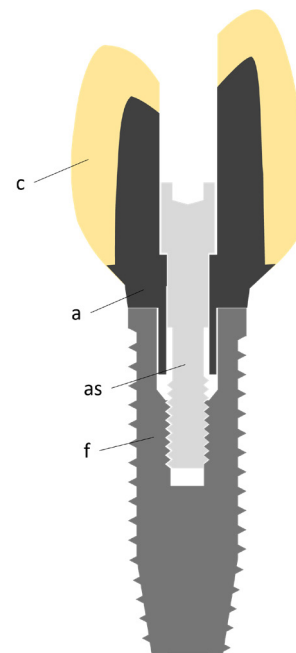


Figure 4

Figure 4 shows a customised base metal abutment (a) which is screwed via an abutment screw (as) to the fixture (f). There is a feldspathic ceramic layer (c) fired directly to the surface of the abutment, obviating the need for cement. There is a screw channel present to gain access to the abutment screw. Since the prosthesis and abutment are already joined before insertion to the fixture, this is also known as a direct-to-fixture restoration.

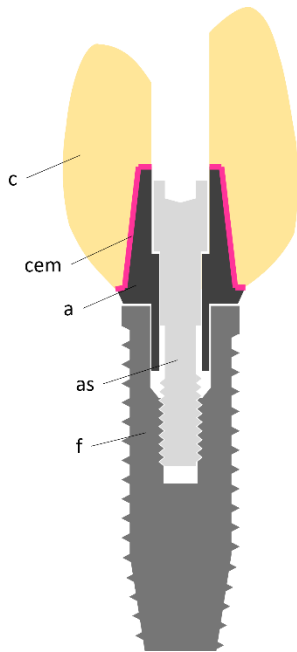


Figure 5

Figure 5 shows a stock titanium abutment (a) often referred to as a “Ti-base” which is screwed via an abutment screw (as) to the fixture (f). There is a full zirconia crown (c) pre-cemented with a layer of cement (cem) to the abutment, but there is a hole present to gain access to the screw channel. Despite the use of cement, this is still regarded as a screw-retained prosthesis. This is also a direct-to-implant restoration.

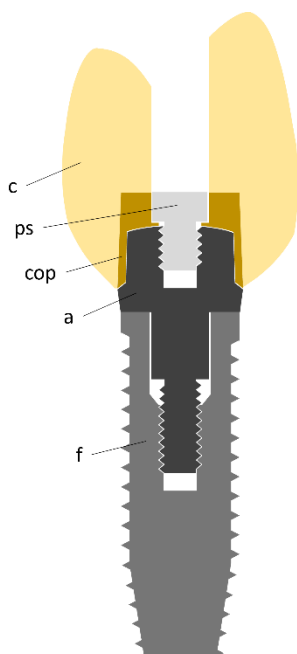


Figure 6

Figure 6 shows a stock one-piece titanium abutment (a) which has a conjoined screw. The abutment itself is screwed to the fixture (f). There is a porcelain-fused-to-metal crown (c) cast onto a metal coping (cop), and there is a screw channel present in the crown to gain access to a 2nd screw,

the prosthetic screw (ps), that holds the crown and coping to the abutment.

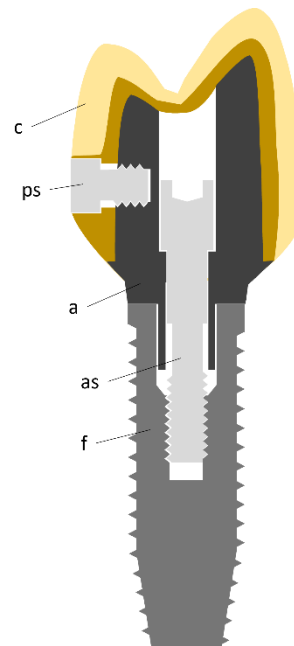


Figure 7

Figure 7 shows a customised titanium abutment (a) which is screwed via an abutment screw (as) to the fixture (f). There is a porcelain-fused-to-metal crown (c) that is screwed to the abutment from the palatal surface using a cross-pin prosthetic screw (ps). The crown covers the screw access channel allowing occlusal forces to be directed through the axis of the fixture and improves aesthetics, but this is not regarded as a cement-retained prosthesis.

Clinical Identification and Retrieval of Cement-Retained vs Screw-Retained Prostheses

From a clinical standpoint, cement-retained implant prostheses can be distinguished by the absence of either a screw access channel covered in restorative material, or the absence of a cross pin screw. If the internal abutment screw becomes loosened or disengages completely from the fixture, retrieval techniques include attempted removal of crown (crown removers or completely cutting the crown off) or by cutting a hole through the crown, essentially converting it into a direct-to-implant restoration.

Screw-retained restorations can be clinically identified by the presence of a screw-access channel or a cross-pin screw. Retrieval or re-tightening a loose screw is much simpler and involves removal of the restorative material covering the internal screw; or in the case of a cross-pin, direct access to the cross-pin screw is immediately obtainable from the palatal/lingual surface.

Conclusions

Cement-retained implant prostheses should be defined in the literature as prostheses that are cemented clinically in the patient’s mouth, after which there is no other means of

accessing the prosthetic or abutment screw without cutting the crown.

Screw-retained implant prostheses should be defined as prostheses where there is direct access to the prosthetic or abutment screw when inserted into the patient's mouth. The screw channel, if present, may then be covered in any other restorative material.

About the Author

Dr. Alex Loh graduated with a Bachelor of Dental Science with Honours in 2003. He has a Graduate Diploma in Clinical Dentistry in Dental Implantology, and has a Master of Clinical Dentistry in Orthodontics. He is a Fellow of the Royal Australasian College of Dental Surgeons, a Fellow of the International College of Continuing Dental Education, a Fellow of the International Academy for Dental Facial Esthetics, a Fellow of the International Association for Orthodontics, a Fellow of the World Academy of Ultrasonic Piezosurgery.

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