Effect of two temporary cements on the retention of two implant supported all ceramic crowns

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Dedicated to ………

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LIST OF ABBREVIATION

Abbreviation	Abbreviation for
3D	Three dimensions
ASTM	American Society for Testing and Materials
CAD-CAM	Computer aided design, computer aided manufacturing
CNC	Computer numerically controlled machining
CpTi	Commercially pure Titanium
DNH	Double network hybrid
FPDs	Fixed partial dentures
GPa	Gigapascal
KIC	Stress Intense factor
mm	Millimetre
mol	Mole
N	Average maximum load
ns	Non-significant
o	Angle degree
p	Significance level
RP	Rapid prototype
SD	Standard deviation
STL	Standard Tessellation Language
Ti	Titanium
Ti-6AL-4V	Alpha Beta Titanium alloy
Ti-6AL-4V-ELi	Alpha Beta Titanium alloy with extra low interstitials
Y_2O_3	Yttria
Y-TZP	Yttria-stabilized, tetragonal zirconia polycrystal ceramics
ZrO_2	Zirconium Oxide
Δ E	Difference between two colors in metric of interest in color science

LIST OF ABBREVIATION (Cont.....)

Abbreviation	Abbreviation for
%	Percent
wt%	Weight percent
vol%	Volume percent
UDMA	Urethane dimethacrylate
TEGMA	Triethylene glycol dimethacrylate
g/cm^3	Gram per centimeter cube
HV10	Vicker pyramid number
MPa	Megapascal
BIS-GMA	Bisphenol A – glycidyl methacrylate
PMMA	Poly methyl methacrylate
cm	centimeter
^{o}c	Celsius degree
Ncm	Newton centimeter
Kg	kilogram

Dental implants are an effective and popular option for replacing the single missing tooth and form an important part of mainstream dental practice today. Their use often represents a better alternative over traditional options of tooth replacement. The selection of the method of crown retention presents the clinician with a treatment planning challenge that involves recognition of the drivers of the desired treatment outcome. Among other factors, aspects of retrievability versus aesthetics have largely been considered in deciding whether crowns should be screw-retained or cement-retained.[1]

Zirconia is one of the most commonly used all ceramic materials due to its high strength, fracture toughness, biocompatibility, and excellent esthetics, especially with the introduction of the new translucent CAD-CAM zirconia blanks, and with the introduction of the new polymer infiltrated hybrid glass ceramics as CAD-CAM blocks for fabricating implant supported restorations, many studies have been done to test its properties in vivo and in vitro because of their excellent esthetics, sufficient strength, high resilience and good shock absorbing capacity.

With implant supported restorations, it may be required to retrieve the implant supported prostheses in the event of a biologic or technical complication. These complications are relatively common even in the hands of experienced clinician. Therefore, retrievability of implant prosthetic component is a significant safety factor.[2]

The choice between cement and screw retained methods for implant-supported fixed prostheses has long been discussed, and there is still no consensus on the best method among practitioners.[3]

Both methods have advantages and disadvantages. Although the choice of either method seems to depend more on the preferences of the clinician rather than on the available scientific evidence, screw-retained is preferred in some clinical situations and cement-retained in other situations.[4]

Although most studies showed that screw-retained prostheses were associated with more technical complications,[5] dentists might prefer screw-retained restorations for its predictable retrievability. Esthetics and good biomechanical properties are among the advantages of the implant-supported cement-retained prosthesis, but they are not great enough benefits for dentists to choose this type of restoration. For the dentists' preference, the cement should have retrievability with sufficient retention strength to keep the restoration in place.[6]

The option to cement crowns to implant abutments may be elected, or contrastingly forced upon the clinician due to implant positioning. The choice of cement must subsequently be considered. The majority of cements used in implant dentistry at present have been designed for use with crowns luted to natural teeth. In cementing crowns to implant abutments, luting agents are required to act in a different manner to oppose the abutment.[7]

Urethane-based resin cement (temporary cement) and resin-modified glass ionomer and resin composite cements (permanent cements) are the examples of available luting agents that are used clinically to cement crowns to implant abutments.[8]

The cement used for a cement-retained implant needs to provide sufficient retention of the superstructure to the abutment and also to allow for retrieval of the superstructure from the abutment if necessary. In order to satisfy these requirements, temporary cements can be favorably used for this type of implant prosthesis.[9]

Dental implants have a centuries-long history; indeed there is evidence that prehistoric peoples sought this technology. As dentistry progressed in the past century, experimental implant designs focused on materials and techniques that might serve as quality anchorages for conventional dental prostheses. [10]

By the mid-20th century, a number of sophisticated techniques had been developed, including subperiosteal, transosteal and blade implants. However none of these techniques were widely adopted because of high costs and unpredictability. Furthermore, although some of these implants functioned reasonably well for years, some began to show signs of failure shortly after insertion. Patients often faced complex retrieval surgeries once these types of implants became intolerable.[10]

In recent decades predictable dental implants were introduced and have revolutionized dentistry. Now, after thousands of years of trying, we have dental implants that in some circumstances (e.g., individuals with limited salivary flow who are especially prone to caries) may even be an improvement over natural teeth. This article provides an overview of contemporary concepts regarding the maintenance of modern dental implants.[10]

Compared to all other dental disciplines, implant dentistry has enjoyed far more innovation and progressive development in recent years. Indeed in this regard are the developments of new implant systems, the propagation of new and improved diagnostic procedures and the introduction of novel surgical techniques. Technical procedures have also advanced from the introduction of state of the art CADCAM technology to improve prosthodontic precision of fit and allow restoration of implants in non-ideal positions. [11]

The goal of modern implant dentistry is no longer represented solely by successful osseointegration. Today clinicians can prescribe the use of implants with the knowledge and confidence that they will predictably integrate into the jaw bone. In order to claim success the definitive restorations must restore the patient to normal contour, function, aesthetics, speech and health.[11]

An ideal implant material should be biocompatible, with adequate toughness, strength, corrosion, wear and fracture resistance. The design principles of the implant should be compatible with the physical properties of the material. Materials used for the fabrication of dental implants can be categorized according to their chemical composition or the biological responses they elicit when implanted. [12]

From a chemical point of view, dental implants may be made from metals, ceramics or polymers. The favourable long-term clinical survival rates reported for titanium and its biomedical alloys have made titanium the “gold standard” material for the fabrication of endosseous dental implants. [12]

According to the American Society for Testing and Materials (ASTM), there are six distinct types of titanium available as implant biomaterials. Amongst these six materials, there are four grades of commercially pure titanium (CpTi) and two titanium (Ti) alloys. [12]

The mechanical and physical properties of CpTi are different and are related chiefly to the oxygen residuals in the metal. The two alloys are Ti-6Al-4V and Ti-6Al-4V-ELI (extra low interstitial alloys). The commercially