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Assessment of retention of different luting agents to implant abutments

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ABSTRACT: Introduction-The retention of cemented prosthesis has been shown to be influenced by various parameters such as abutment size (height and width), abutment texture, the convergence angle between the walls of the abutment and the cements. Factors that may affect the retention of cast restorations include geometry of abutment preparation, abutment taper, surface area, abutment height, surface roughness, retentive grooves, and the luting agent used.
Material and method-20 straight shoulder type titanium abutments with abutment screws as well as prefabricated plastic copings and corresponding 12 mm-long stainless steel laboratory implant analogs were used. The abutments were divided into two subgroups of 10 abutments each. The implant abutment screws with the abutments were tightened to the analogs with a screwdriver to a torque of 20 Ncm. The access screw hole was blocked with composite resin. The analog with its abutment was placed in the hole while the cast coping was cemented.
Result- The mean retentive forces of standard machined abutments cemented with non-eugenol cement showed 49.93N and with zinc phosphate cement showed 212.80N.
Conclusion- The retention of cast copings cemented on plain abutments with zinc phosphate cement was more than 4 times greater than those cemented with zinc oxide provisional cement.

Key words: luting agents, retention, implant abutment

INTRODUCTION

Implant restorations can be screw retained, cement retained or combination of both[1].The retention of cemented prosthesis has been shown to be influenced by various parameters such as abutment size (height and width), abutment texture, the convergence angle between the walls of the abutment and the cements. Factors that may affect the retention of cast restorations include geometry of abutment preparation, abutment taper, surface area, abutment height, surface

roughness, retentive grooves, and the luting agent used[2]. Surface roughness, grooves, and luting agents are factors that can be controlled by the clinician[3]. Implant dentistry requires a blend of diagnostic, treatment planning, prosthetic and maintenance skills in order to achieve maximum success. If there is reduced interocclusal space then abutment height is shortened and the crowns cemented on short implant abutments may have insufficient retention. The surface modifications such as sand blasting, creating grooves on implant abutment and etc. may increase the retentive strength of cemented castings on them by providing micro and macroretentive ridge and groove patterns[4]. Restoring the dental implants with cement retained prosthesis has its own advantages and disadvantages which are all well documented[5]. Cement selection, classified as definitive or provisional, is of primary importance for cement-retained implant-supported crowns. For cement-retained implant-supported restorations, the choice of cement is one of the most important factors controlling the amount of retention attained[6,7].

Material and Method

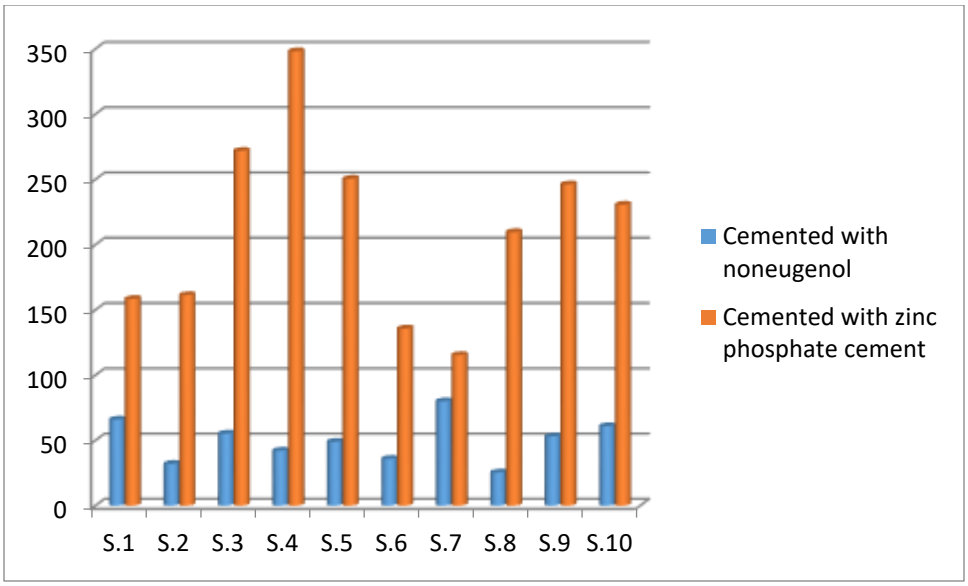
20 straight shoulder type titanium abutments with abutment screws as well as prefabricated plastic copings and corresponding 12 mm-long stainless steel laboratory implant analogs were used. The abutments were divided into two subgroups of 10 abutments each.

Laboratory analogs were paired with numbered abutments (and cast crown copings) and connected to the encased abutment screw. The implant abutment screws with the abutments were tightened to the analogs with a screwdriver to a torque of 20 Ncm. The access screw hole was blocked with composite resin. To cement the copings onto the abutments in a repeatable manner, a base was fabricated with acrylic resin with a vertical hole prepared in the center. The analog with its abutment was placed in the hole while the cast coping was cemented.

After thermocycling and storing the cemented abutments in water at 37°C water for 6 days they were assembled in the Universal testing machine (computerized ,software based, Model No. STS 248) and subjected to a pullout test (retention) at a crosshead speed of 5.0mm/min. The forces required to remove the copings were recorded in Newton.

RESULTS

The mean tensile force required to separate the castings from the abutments is seen in Graph 1.



Graph 1-Effect of different cements on retention

One sample t-test for intergroup comparison between different cements on retention

					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
			Lower	Upper			
162.83500	76.47959	24.18497	-217.54521	-108.12479	-6.733	9	.020*

DISCUSSION

Cement-retained implant prosthesis have become a method of choice for implant-supported restorations. To increase the retention of these cement retained implant prosthesis, specially in short abutments surface modifications are done by many methods and incorporating circumferential grooves is one of the modification used in this study. Along with this, the selection of appropriate cement is equally important.The purpose of this study was to evaluate and compare retentive property of provisional and permanent luting agents. Metal copings were fabricated to cement on abutments, after cementation they were thermocycled between 5°C-55°C 500times with dwell time of 10 seconds and stored in water. The retention test/pullout test was performed and retention values were recorded in Newton. The further scope of present study

is that, this protocol did not simulate long-term oral conditions. Therefore, additional studies are needed to quantify the effect of grooves on the retention of other cements under long-term simulation, which may assist clinicians in cement selection.The mean retentive forces of standard machined abutments cemented with non-eugenol cement showed 49.93N and with zinc phosphate cement showed 212.80N.

The study done by Lewinstein et al[8] compared the effect of increasing the number of circumferential grooves on the retention of cemented cast copings on implant abutments. They concluded that, for ZnPO4 cement 1 groove was as effective as several grooves, whereas for ZO non eugenol the retention increased gradually with additional grooves. Another study done by Nejatidanesh et al[9] compared the retention values of implant supported metal copings using different luting agents and concluded that the Resin Modified Glass Ionomer, Zinc Phosphate, Zinc Polycarboxylate, and Panavia F2.0 had statistically the same retentive quality and are recommended for definitive cementation of single implant-supported restorations. Walfart et al[10] investigated the retention of various cements without thermocycling, and found that retentive forces for ZP (Harvard Cement; Harvard Dental International GmbH) was 400N and for ZO (Freegenol; GC Europe NV, Leuven, Belgium) 180N, which are not similar to the current findings as thermocycling reduced the retention values. Squire et al[11] examined the retention of cemented specimens with 5 types of cements subjected to 24 hours of thermocycling (approximately 1000 cycles). The authors found approximately 300N for ZP (Fleck's Cement; Mizzy/Keystone Industries, Cherry Hill, NJ) and 30N for ZO (ZONE; Cadco Dental Products, Inc, Oxnard, Calif). The low retention values for the non-eugenol provisional cement can be attributed to the different thermocycling conditions. In the dental literature, there is no consensus on the thermocycling protocol needed for testing provisional cements. The cement failure mode was generally adhesive in nature, although some cohesive and mixed failure was observed.

CONCLUSION

Within the limitations of this study, the following conclusions were drawn:

The retention of cast copings cemented on plain abutments with zinc phosphate cement was more than 4 times greater than those cemented with zinc oxide provisional cement.

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