ORIGINAL RESEARCH PAPER

Volume-8 | Issue-7 | July - 2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

USE OF G-CUFF IN THE RETRIVAL OF EXCESS CEMENT IN IMPLANT PROSTHESIS

Prosthodontics

Dr. Nivedan KS Senior lecturer at Department Of Prosthodontics, The Oxford Dental College, Bangalore

Dr. Malathi Dayalan Head Of the Department at Department Of Prosthodontics, The Oxford Dental College, Bangalore

Dr. Lipi Bardia* Senior lecturer at Department Of Prosthodontics ,The Oxford Dental College, Bangalore
*Corresponding Author

ABSTRACT

BACKGROUND AND OBJECTIVE: Cement extrusion into the sulcular area may result in soreness, bleeding and exudation on probing. Various techniques to remove excess cement such as removal with plastic and metal scalers, cementation techniques such as venting, escape channel and half filling of the crown has been documented to reduce the amount of excess cement around the implant. The purpose was to propose an appropriate technique to reduce the excess retained cement with an objective of reducing residual cement induced peri-implantitis.

METHOD: Thirty implant analog's measuring 3.5 mm X 11mm were mounted in self cure acrylic resin block. Each abutment of 5.5mm long were tightened to the implant analog by applying 35Ncm of torque to each implant. The groups were divided into Group IM, Group OH and Group AA .All the 30 samples belonging to all group Type I Glass Ionomer cement was applied only to the internal margins . Excess cement was retrieved using stainless steel straight probe, putty index technique and G-CUFFTM. A constant load of 80 N was applied to all the three groups. The excess cement was measured for all the three groups. The values were collected and statistically analysed.

RESULT: There was a significant difference in all cementation techniques. Multiple comparison test between the groups showed that there was a statistically significant difference in the technique used to retrieve excess cement among the groups that the Internal Margin technique, Occlusal Half and Axial Wall technique. The technique which involved in the application of cement on the axial wall had less amount of excess cement. Similarly the use of G-CUFFTM also resulted in the complete retrieval of excess cement.

CONCLUSION : Within the limitations of the study, It was concluded that application of cement on the axial walls and retrieved through G-cuff reduces the excess cement. Cement application on the axial walls and retrieval of cement using the G-Cuff was most appropriate method for reducing excess cement to decrease peri-implantitis.

KEYWORDS

Cementation, cement retained crowns, Excess cement, G-Cuff.

INTRODUCTION

Implant dentistry has seen a rapid and remarkable progress in recent years. The quest for predictable long term results have raised several questions concerning the materials used as well as the technique followed in clinical practice. Implant restorations may be cemented or screw retained,each method having its inherent advantages and disadvantages. Cemented restorations have the advantage of simplicity, hermetic sealing, passive fit and more favourable aesthetics and crown contour. Clinician's decision are not limited to the selection and type of implant and the abutment: There is also the need to choose the type of cement. A dental cement must act as a sealing interface between the two components and holding them together through some form of the surface attachment. The tensile strength of the luting agent should allow retrieval when required yet be sufficient to retain the prosthesis during function.

Crestal bone loss, around dental implants, has been a subject of discussion in implant dentistry since its inception. While there are a variety of causes for crestal bone loss around dental implants, retained dental cement plays a major crucial role.. Excess dental cement was associated with signs of peri-implant disease in the majority of the cases. Peri-implant inflammation is associated with swelling, soreness, deeper probing depths, bleeding or exudation on probing and radiographic loss of peri-implant bone. The removal of residual excess cement may be difficult and can only be confirmed and evaluated with the exploratory flap surgery or with a dental endoscope. Removal of excess cement with hand instruments may damage the implant surfaces. Roughened implant surfaces may lead to increased plaque accumulation, impaired plaque removal and compromised soft tissue compatibility.

There are several methods of preventing the accumulation of excess cement around implant crown junction, such as probing,screw retained with ceramic vented crowns, rubber dam technique and Teflon Tape technique.

G-Cuff™ is a non-invasive implant accessory. G-Cuff™ aids clinicians in non-invasive tissue retraction, supports tissue from collapsing, creates a barrier to stop cement and adhesive from invading the tissue , it has a unique size that makes it universal and compatible with almost any implant. G-Cuff™ is a complete tissue management solution for dental implants that retracts, supports tissues, supports and carries the abutment. The advantage of this G-Cuff™ is to prevent cement flow.

In cement retained implant restorations, extruded excess cement may retard wound healing and lead to peri-implantitis. Thus, the purpose of this study was to compare different cementation and cement retrieval techniques thereby reducing cement induced peri-implantitis.

AIM OF THE STUDY

The aim of this study is to evaluate and compare different cementation and cement retrieval technique and to propose an appropriate technique for cement retained implant restoration there by reducing cement induced peri-implantitis.

MATERIALS AND METHOD

Specimen Preparation:

A polyvinyl chloride pipe was cut to obtain a cylinder of 1" x 1". Autopolymerising acrylic resin was mixed in a ratio of (3:1) by volume and poured in the cylindrical polyvinyl chloride pipe mould. Thirty such acrylic blocks were obtained measuring 1" x 1".Implant analog measuring 3.5 X 11mm was embedded in an acrylic block. Each abutments of 5.5mm long were tightened to the implant analogues by applying 35Ncm of torque to each implant.

Inlay casting wax (Hindustan Dental Product) was used to fabricate 30 wax patterns of thickness 0.8mm for each abutment analog sample, the wax patterns were divided into three parts occlusal third, middle third and cervical third and wax patterns were measured using wax gauge.

All wax patterns were sprued and invested in a phosphate bonded investment material (BEGO) and cast in metal ceramic alloy (BELLABOND BEGO) according to the manufacturers laboratory protocol. After divesting and ultrasonic cleaning the internal aspect of the castings were inspected using a magnifying glass and surface irregularities were removed using a small round tungsten carbide bur. Residual Investment materials were removed using an ultrasonic cleaner with sand blasting and thirty crowns obtained were measured with metallic gauge to obtain crowns of 1.5 mm thickness. Putty index

fabrication: Vinyl polysiloxane putty impression material i,e Base and catalyst paste was mixed in 1:1 ratio and inserted on the intaglio surface of the crown to form the replica. All the thirty specimens were divided into three groups of 10 samples each according to the cementation technique: The measured cement was pre-weighed on a digital weighing machine and the weight was noted. Glass-Ionomer cement type I(Fuji,GC) was mixed according to the manufacturer's instructions in the luting consistency and all the thirty crowns were cemented.

Group IM: Cement applied on the internal margins of the crown and retrieved using stainless steel straight probe.

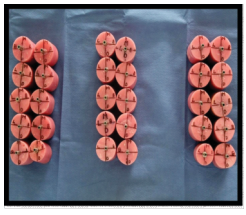
Group OH: Cement applied on the occlusal half of the crown and retrieved using putty index

Group AA: Cement applied on the axial walls of the crown and retrieved using G-cuff.

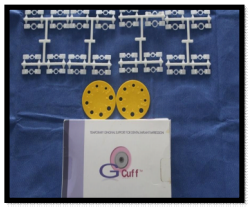
Excess Cement measurement:
The retained excess cement around the crown margins were retrieved and measured using a digital weighing machine. The weighed cement was then compared with the pre- weighed cement and checked for difference. This provided the net weight of the retained excess cement.

DIAGRAMS AND IMAGES

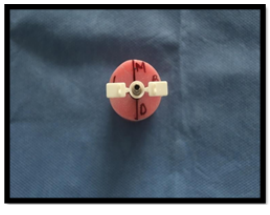
1. Specimen with implant analog and abutment

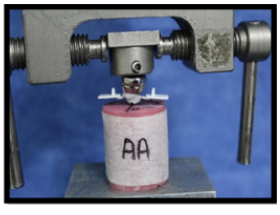


2.G-Cuff Kit



3. Application of G-Cuff and Retrieval Of Excess cement using G-Cuff





RESULTS

Table I: Retrieval Of Excess Cement(group IM)

Sl.No	Pre-weighed cement(g)	Retrieved excess Cement(g)
Sample 1	0.50	0.03
Sample 2	0.50	0.02
Sample 3	0.50	0.04
Sample 4	0.50	0.02
Sample 5	0.50	0.01
Sample 6	0.50	0.03
Sample 7	0.50	0.02
Sample 8	0.50	0.01
Sample 9	0.50	0.01
Sample 10	0.50	0.02

Table II: Retrieval Of Excess Cement (Group OH)

SL.NO	Pre-weighed cement(g)	Retrieved excess cement.(g)
Sample 1	0.50	0.07
Sample 2	0.50	0.05
Sample 3	0.50	0.04
Sample 4	0.50	0.05
Sample 5	0.50	0.06
Sample 6	0.50	0.07
Sample 7	0.50	0.06
Sample 8	0.50	0.05
Sample 9	0.50	0.07
Sample 10	0.50	0.05

Table III: Retrieval Of Excess Cement (Group AA)

Sl.no	Pre-weighed cement(g)	Retrieved excess cement(g)
Sample 1	0.50	0.01
Sample 2	0.50	0.02
Sample 3	0.50	0.02
Sample 4	0.50	0.02
Sample 5	0.50	0.01
Sample 6	0.50	0.01
Sample 7	0.50	0.02
Sample 8	0.50	0.00
Sample 9	0.50	0.01
Sample 10	0.50	0.01

Table IV: Mean And Standard Deviation (sd) Of All The Three Groups

Descriptives

Retrieved excess Cement

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	10	.0210	.00994	.00314	.0139	.0281	.01	.04
2	10	.0570	.01059	.00335	.0494	.0646	.04	.07
3	10	.0130	.00675	.00213	.0082	.0178	.00	.02
Total	30	.0303	.02141	.00391	.0223	.0383	.00	.07

TEST OF HOMOGENEITY OF VARIANCES

Retrieved excess Cement

Levene Statistic	df1	df2	Sig.
1.223	2	27	.310

The p-value is 0.310 greater than 0.05, so the groups have equal variances.

Retrieved Excess Cement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.011	2	.005	64.208	.000*
Within Groups	.002	27	.000		
Total	.013	29			

*significant at 5% level of significance

There was a statistically significant difference between groups as determined by one-way ANOVA ($F(2,27) = 64.208$, $p = .000$)The significance value is 0.000 (i.e., $p = .000$), which is below 0.05 and, therefore, there is a statistically highly significant difference in the retrieved excess of cement between different techniques.

Table VI :multiple Comparisons Between Groups
Dependent Variable :Retrieved excess Cement

			Mean Difference (A-B)	Std. Error	Sig.	95% Confidence Interval	
	(A) Group_cat	(B) Group_cat				Lower Bound	Upper Bound
Tukey HSD	IM	OH	-.03600*	.00414	.000	-.0463	-.0257
		AA	.00800	.00414	.149	-.0023	.0183
	OH	IM	.03600*	.00414	.000	.0257	.0463
		AA		.00414	.000	.0337	.0543
			.04400*				
	AA	IM	-.00800	.00414	.149	-.0183	.0023
		OH		.00414	.000	-.0543	-.0337
			-.04400*				

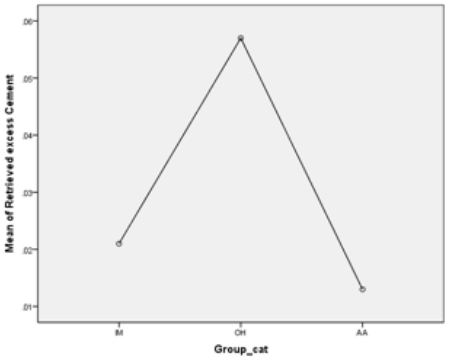
From the results of the above table Analysis Of Variance table, there is statistically highly significant differences between the groups were found.

Multiple Comparisons, shows groups differed from each other.The Tukey post hoc shows that statistically significant difference is found in the technique used to retrieve excess cement between the groups that is Internal Margin technique and Occlusal Half technique (p = 0.000), as well as Occlusal Half and Axial Wall technique (p = 0.000),

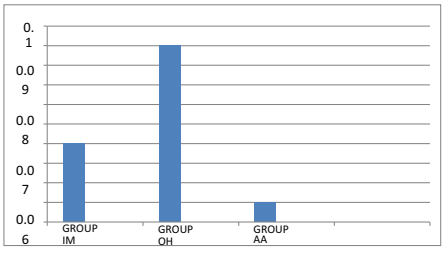
and the Axial wall and Internal Margin technique (p = 0.000).

However, there were differences between the groups IM (Internal margin) and AA (Axial wall) techniques (p = 0.149).

Graph 1 : Mean Plot Of Three Different Groups



Graph II : The Mean And Standard Deviation Of Retained Excess Cement Values For The Three Different Cementation Techniques.



DISCUSSION

Implant supported crown restorations may be either screw retained or cement retained.

Cement retained prosthesis is the restoration of choice for the treatment of implant patients because they are better than screw retained in respect to margin adaptation, occlusion, esthetics, passivity and cost factor. It has also been suggested that the intervening cement layer can act as a shock absorber and enhance the transfer of load throughout the prosthesis implant-bone system[1]. Screw retained restorations thus are associated with more complications such as unaesthetic appearance, access hole exiting through the central fossa, compromised occlusion due to presence of the screw access holes and high cost.

Agar et al reported that the use of instruments such as scalers and curettes (Gold coated scaler, rigid plastic scaler and stainless steel explorer) to retrieve the residual excess cement on the titanium implant components harmed periodontal attachment. The purpose of this study was to investigate and compare the surface of the abutments after the removal of cement using these instruments. Cementation of implant abutments proved to be a technique sensitive procedure and excess cement was left with resin cement around peri-implant region[23].

The choice of cement for an implant-retained restoration should also be based on the need for the retrievability of the prostheses and ease of excess cement removal. There is little evidence regarding which cement is most suitable for the retrievabilty of implant supported prostheses.

Many clinicians prefer the use of provisional cement or the least retentive cement for the final cementation to ensure retrievability of implant supported prostheses[10]. However such cements often have low tensile strength and are soluble.

Studies have shown that reducing the amount of permanent cement applied to the restoration does not reduce strength of the restoration. The use of a cementation technique such as half coating of the restorations with cements did not result in the retentive strength values compared to complete luting technique. These studies proved that using less cement results in better marginal fit of cemented implant restorations.[5]

Steven et al described an increased incidence of peri-mucositis and peri-implantitis in cement retained implant restorations because of the difficulty to remove excess cement by using a metal scalers. Biologically, the junctional epithelium and connective tissue attachment around the natural teeth insert perpendicularly and this tends to limit compartmentalize the flow of excess cement. According to the authors there are several techniques to eliminate or control the flow of excess cement such as screw retained with ceramic inserts, rubber dam technique, Teflon tape technique and putty index technique. However, by implementing the above described technique, the potential adverse effects of cements are still present and a better technique should be found to possibly eliminate the excess cement[27].

The aim of the present study was to evaluate and compare different cementation techniques in cement retrieval and to propose an appropriate technique for cemented implant restoration there by reducing cement induced peri-implantitis.

All the 30 samples were divided in 3 groups with 10 samples in each group. Glass ionomer cement (Type 1) was used to cement the crowns to the implant analog. In first group Group(IM) Glass ionomer cement was applied only on the internal margin of the crown and cemented onto the implant analog and excess cement was retrieved with a stainless steel straight probe.

In the second group (GroupOH), Glass ionomer cement was applied only to the occlusal half of the crown and cemented onto the implant analog. Excess cement was retrieved using a putty index technique.

In the third group (Group AA) Glass ionomer cement was applied on the axial walls of the crown and cemented onto the implant analog. Excess cement was retrieved using a G-CUFF .Glass ionomer cement was pre-weighed and compared with retrieved cement for all the 30 samples. All the 30 samples were mounted on the JIG and placed on a universal testing machine (Mecmesin). A controlled load of 80 N was applied. All the three groups were statistically analysed using ANOVA and Multiple comparison tests.

The results showed that the cementation technique wherein the luting cement is applied on the axial walls (Group AA) and Internal margins (Group IM) lesser excess cement was retrieved. When all the three groups were compared application of luting cement on the axial walls (Group AA) resulted in the least amount of excess cement. G-CUFF is a collar like implant accessory, which fits according to the size of the abutment compatible with almost any implant systems.

The G- CUFF kit is available with 10 disposable cuffs with a ring like measuring scale for various sizes suitable for implant abutments. The size of the cuff is selected appropriately using the measuring scale and the cuff is placed.

CONCLUSION

Within the limitations of the study, following conclusion can be drawn

1) A technique where in the cement applied on the axial walls and internal margins of crown resulted in lesser excess cement.
2) Comparison of the three cementation techniques showed that application of cement on the axial walls of the crown resulted in the least amount of excess cement.
3) G-CUFF™ is the most appropriate technique and is a non-invasive easy method in the retrieval of excess cement.

REFERENCES

1. Michalakis K X, Hirayama H and Garefis P D. Cement retained versus screw retained implant restorations: A critical Review. Int J Oral Maxillofac Implants 2003: 18:719-728
2. Martin T Clark, et al. Seating accuracy and fracture strength of vented and non-vented ceramic crowns luted with three cements. J Prosthet Dent !995: 74: 18-24.
3. Matthias Kernal al. Clinical comparison of postoperative sensitivity for ionomer and a zinc phosphate luting cement. J Prosthet Dent 1996: 75: 159-62.
4. Rosensteil S F, Land M F, Crispin B J. Dental luting agents: a review of current literature. J Prosthet Dent 1998: 80: 280-301.
5. MorakotTuntiprawon, et al. Effect of tooth surface roughness on marginal seating and retention of complete metal crowns. J Prosthet Dent 1999: 81 : 142-7.
6. Steven O, Hondrum, Fort Gordon. Storage stability of dental luting agents. J Prosthet Dent 1999: 81:464-8.
7. Keith S E, Miller B H, Woody R D, Higginbottom F L. Marginal discrepancy of screw retained and cemented metal-ceramic crowns on implant abutments. Int J Oral Maxillofac Implants 1999; 14: 369-378.
8. Covey D A, Kent D K, Henry A. Effects of abutment size and luting cement type on the uniaxial retention force of implant supported crowns. J Prosthet Dent 2000: 83: 344-8.
9. Randi A P, Hsu A T, Verga A, Kim J J. Dimensional accuracy and retentive strength of a retrievable cement -retained implant supported prosthesis. Int J Oral Maxillofac Implants 2001: 16 : 547-556.
10. Dumbrigue H B, Abanomi AA, Cheng L L. Techniques to minimize excess luting agent in cement retained implant restorations. J Prosthet Dent 2002: 87: 112-114.
11. Lai T, Lee Y. The effect of cement and venting design on the retentive strength and

marginal adaptation of CeraOne implant prosthesis.
12. Pan Y H, Ramp L C, Lin C K, Liu P R. Comparison of 7 luting protocols and their effect on the retention and marginal leakage of a cement retained dental implant restoration. The Int J Oral and Maxillofac Implants. 2005: 21(4): 587-592.
13. Michalakis K, Pissiotis et al. The effect of thermal cycling and air abrasion on cement failure loads of 4 provisional luting agents used for the cementation of implant supported fixed partial dentures. Int J Oral Maxillofac Implants 2007; 22(4): 569-74.
14. Wilson T G. The positive relationship between excess cement and periimplant diseases: A prospective clinical endoscopic study. J Periodontal 2009:80:1388-1392.
15. Dr. Rajeev Gupta. A simple technique for removing cement retained implant prosthesis in case of abutment screw loosening. A case report. Indian Journal of Dental sciences 2009: 1(1).
16. Wadhwani C, Pineyro A. Technique for controllong the cement for an implant crown. J Prosthet Dent 2009; 102:57-58.
17. Tarica D Y, et al. Survey of United states dental schools on cementation protocols for implant crown restorations. J Prosthet Dent2010 Feb: 103(2):68-79.
18. AbdulmohsinAlhashim et al. Four year follow –up of the rehabilitation of a mandibular arch with a cementable zirconia-reinforced fixed dental prosthesis. A clinical report. J Prosthet Dent 2012; 108: 138-142.
19. Tomas L, Puisys A et al. The influence of cementation margin position on the amount of undetected cement : A prospective clinical study. Clin Oral Impl Rest 2012; 1-6.
20. Timothy A S. A technique to eliminate sub gingival cement adhesion to implant abutments by using polytetrafluoroethylene tape. J Prosthet Dent 2013: 112(2); 365- 8.
21. Wadhwani C, Chung K H. Effect of modifying the screw access channels of zirconia implant abutment on the cement flow pattern and retention of zirconia restorations. J Prosthet Dent 2014: 112(1); 45-50.
22. Hebel K S, Gajjar R C. Cement retained versus screw retained implant restorations: Achieving optimal occlusion and esthetics in implant dentistry. J Prosthet Dent 1997: 77: 28-35.
23. Agar J G,Cameron S M, Hughbanks J C, Parker H. Cement removal from restorations luted to titanium abutments with simulated subgingival margins. J Prosthet Dent 1997: 78:43-47.
24. Powers J M, Sakaguchi R L. Cements : In Craig's Restorative Dental Materials 12thn Ed. 2006; 480-511.
25. Caudry S, Chvartszaid D, Kemp N. A simple cementation method to prevent material extrusion into the peri-implant tissues. J Prosthet Dent 2009:08, 102; 130-1.
26. Wadhwani C, Rapopart D, Rosa S L, Hess T et al. Radiographic detection and characterscitic patterns of residual excess cement associated with cement retained implant restorations: A clinical report. J Prosthet Dent 2011: 107(3); 151-7.
27. Present S, Levine R A. Techniques to control or avoid cement around implant retained restorations. Compendium :2013, 6; 34(6): 432-7.
28. Wadhawani C, Hess T, Pineryo A. Cement application techniques in luting implant supported crowns : A quantitative and qualitative survey. Int J Oral Maxillofac Implant 2011;26(6):1241-6.
29. Gapski R, Neugeboren N, Pomeranz A Z, Reissner M W. Endosseous implant failure influenced by crown cementation: A clinical case report. Int J Oral Maxillofac Implant, 2008: 22(8); 943-6.
30 Pauletto N, Perio D, Lahiffe B J, Walton J N, Pros C. Complications associated with excess cement around crowns on osseointegrated implants: A clinical report. J Oral Maxillofac Implant, 2008: 14(6); 865-8.
31. Wadhani C, Pineryo A, Hess T, Zhang H, Chung K H. Effect of implant abutment modification on the extrusion of excess cement at the crown-abutment margin for cement retained implant restorations. J Oral Maxillofac Implant, 2011: 26(6); 1241-6