

Screw Versus Cement Retained Restoration: A Decision Making Analysis

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Abstract

Dental implant is one of the treatment options to replace the missing teeth. Screw retention and cement type of retention are the two methods of retaining a fixed implant supported restoration. Both have their own advantages and disadvantages. Prosthesis can be screw or cement retained depending on various factors like surface area of abutment, height of abutment, taper or parallelism of abutment, etc. Cement retained prosthesis can be retrieved easily, has better esthetics, passivity, good occlusion, reduced cost, reduced chair side time, less complex and better loading than screw retained. Screw retained prosthesis can be used when interarch distance is less or when implants are not placed in proper alignment. 86000 patient records were reviewed and a total of 342 patients who had undergone treatment for implant prosthesis were selected and their treatment details such as Implant brand, type of implant prosthesis, amount of interact space available were reviewed and analysed. Details were tabulated using excel and imported into SPSS for statistical analysis. 69.3% of prosthesis given was cement retained restoration and 30.7% of prosthesis were screw retained restoration. When interarch distance was adequate cement retained prosthesis was preferred and while interarch distance was inadequate screw retained prosthesis were preferred. This study concluded that cement retained crowns were more preferred than screw retained when the interarch distance was adequate and the commonly used implant brand as Nobel biocare.

Keywords: Cement retained; Implant; Maxillary arch; Mandibular arch; Screw retained

Introduction

Loss of teeth affects the quality of life. Several treatment modalities are available for replacing the missing teeth Dentists suggest treatment options depending on the space available, condition of the remaining teeth, bone support, cost and patient requirement. [1,2] Recently fixed prosthesis is more popular due to comfort, function and aesthetics. Missing teeth can be replaced by two types of prosthesis: Tooth supported-Fixed partial denture and Implant supported. An implant has been widely accepted as a treatment modality for replacing single or multiple missing teeth. [3] The most commonly used implant systems include Nobel biocare, Straumann, Astra Tech, Bicon, Biohorizon, BioMet 3I, interlock and Zimmer. In general, implants may be classified as one or two piece implant. [4]

Depending on how crowns or bridges are connected to implants, they are classified as screw retained and cement retained. The major advantage of screw retained fixed implant prosthesis is retrievability, it can be used in less interarch space, it can be used when implants are not aligned in proper line. [5] Whereas in cement retained prosthesis, retrievability is possible with the use of access cement as a luting agent,. Axial loading of implant is very much important for load distribution. It is not possible with screw retained because of screws and occlusal retained prosthesis has the ability to transmit axial is directly on the implant. [6] Screw retained prosthesis compromise esthetics, whereas it is not an issue with cement retained prosthesis. [7] Porcelain fracture is also more common in screw retained

prosthesis as compared to cement retained prosthesis. Cement retained prosthesis has various other advantages such as passivity, good occlusion, reduced cost, reduced chair side time, less complex and better loading than screw retained. The only disadvantage of cement retained prosthesis is peri implantitis, this can occur due to residual cement, this might lead to peri implant bone loss. This can be prevented by keeping the margin supra gingival or equi-gingival, removing the excess cement properly, using floss, applying lubricant obturation material which is overlying which are not capable of taking the axial loading. Whereas cement to the crown before cementing, curettage, etc. This problem is not seen in screw retained prosthesis and the soft tissue response is better in screw retained prosthesis compared to cement retained prosthesis. But fluid and bacterial penetration is more common in screw retained prosthesis than cement retained because microgap is present in screw retained prosthesis. Hence, gingival inflammation can be seen even in screw retained prosthesis. Another disadvantage of screw retained prosthesis is screw loosening or screw fracture. Incidence of screw loosening and screw fracture can range from 10% to 65%. This is mainly seen in single restorations, prosthesis having long cantilever length, prosthesis having

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more occlusal forces, etc. Branemark’s original external hex connection design reported screw joint complications and screw loosening ranging from 6% to 48%. [8] Hence, to reduce chances of screw loosening new systems developed internal hex, anti-rotational features, changes in screw design, etc.

There are many systematic reviews clinical trial. [9-11] *In vitro* study questionnaire study. [12-16] Case reports review on this topic in the last five years. Previously our team has a rich experience in working on various research projects across multiple disciplines. [17-21] Now the growing trend in this area motivated us to pursue this project.

Since both screw and cement retained prosthesis have their advantages and disadvantages, hence this study aimed to evaluate the type of prosthesis based on retention given for a dental implant restoration. [22-36]

Methodology

The present study was a cross sectional retrospective study done in a university setting. Ethical approval for this study was obtained from the Institutional Scientific Review Board. 86000 patient records from June 2019 to March 2020 were reviewed and a total of 342 patients who had undergone treatment for implant prosthesis were selected and their treatment details such as Implant brand, type of implant prosthesis, amount of interarch space were reviewed and analysed. Samples were cross verified by another examiner to avoid any missing data. Sampling bias was minimised by excluding incomplete data. Data was cross verified by photographs and RVGs. All the data was collected and tabulated using excel and were imported to statistical software SPSS for windows (version 20.0) for statistical analysis [Table 1]. Chi square test was performed to determine association between interarch space available and the mode of retention used.

Results and Discussion

In this study, the Nobel biocare brand was the commonly used brand. Shah et al also reported the Nobel biocare brand (22.4%) as the most commonly used brand which was similar to the present study [37].

In this study, 237(69.3%) implants were cement retained and 105(30.75%) implants were screw retained prosthesis [Figure 1] 36(10.5) were placed in sextant 1, 37(10.8%) implants were placed in sextant 2, 40(11.7%) were placed in sextant 3, 99(28.9%) implants were placed in sextant 4, 30(8.8%) implants were placed in sextant 5, 100(29.2%) implants were placed in sextant 6. In adequate interarch space, 228(66.67%) implants were cement retained mode of retention, 9(2.63%) implants were screw retained mode of retention. In inadequate interarch space, 9(2.63%) implants were cement retained mode of retention, 96(28.07%) implants were screw retained mode of

retention [Figure 2]. Association between the mode of retention used in dental implant prosthesis and the amount of interarch

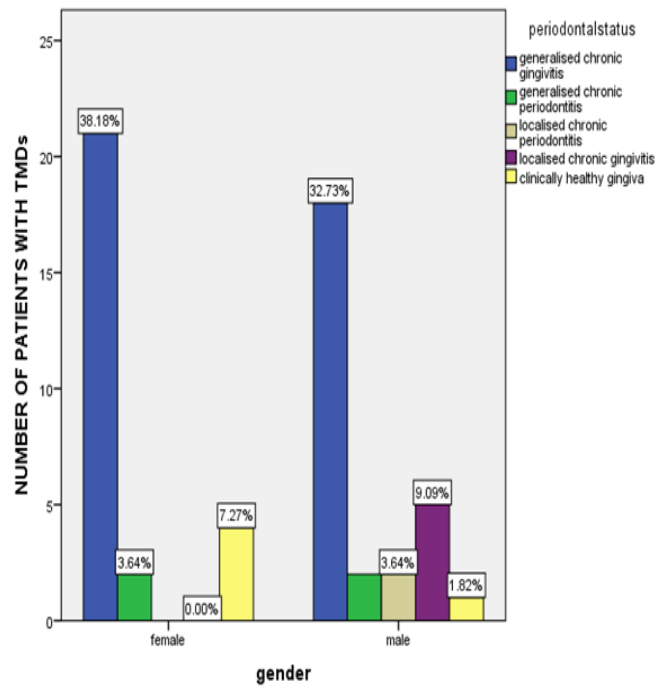


Figure 1: Bar chart represents the association of age and periodontal status in patients with TMD. X axis represents different age groups and Y axis represents the number of patients with TMDs Majority of patients in the age group of 26-40 years were diagnosed with generalised chronic gingivitis than other age groups. (Chi square test). Pearson chi square value: 20.303; p value-0.009 (p<0.05) which is statistically significant.

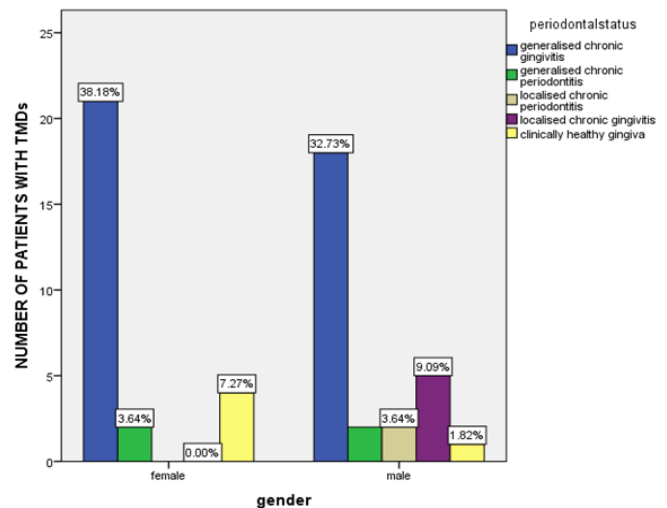


Figure 2: Bar chart represents the association of gender and periodontal status in patients with TMD. X axis represents the gender and Y axis represents periodontal status of the number of patients with TMDs. Majority of female patients were diagnosed with generalised chronic gingivitis than male patients. (Chi square test) Pearson chi square value 9.016; p value-0.061 (p>0.05) which is not statically.

Table 1: Frequency distribution of periodontal status in patients with TMDs based on gender.

	Generalized chronic gingivitis	Generalized chronic periodontitis	Localised chronic gingivitis	Localised chronic periodontitis	Clinically healthy gingiva	Total
Males	18	2	5	2	1	28
Females	21	2	0	0	4	29
Total	39	4	5	2	5	55

space available were done using Chi square test. p value was found to be 0.000(< 0.05), statistically significant, proving that mode of retention used for dental implant prosthesis is dependent on the interarch space available.

From [Figure 1] the most commonly used type of prosthesis was cement retained prosthesis in this study. Chowdhary et al. in his survey on the use of techniques, materials in dental implantology practice reported that most of the dentists preferred cement retained prosthesis as the restoration of choice which was similar to this study.^[38] Makke et al. 2017 in his study on survey of screw retained versus cement retained implant restorations also reported that (86%) cement retained was more in practice than screw retained which was also similar to this study. He also added that 78% of respondents answered cement retained as the most frequent prosthesis resulted in implant failure.^[39] Hajiwara et al. indicated a distribution of 61.4% cement retained prosthesis and 38.6% screw retained prosthesis which was also suggestive of cement retained prosthesis was used more frequently in Japan too.^[40] Wittneben et al. revealed statistical significance between screw and cement retained prosthesis in loss of retention and no significance in survival or failure rates between cement retained and screw retained prosthesis.^[41] Implant survival rate or success is similar for both screw retained or cement retained prosthesis. A study showed that after 72 months the implant survival rate for screw retained prosthesis was 83.4% and for cement retained prosthesis was 93.2%. Hence, there was no statistically significant difference in implant survival rate.

While patients prefer esthetics outcome, many dentists choose cement retained implant restoration would be esthetic than screw retained. This may be due to lack of visible screw access holes. Several aesthetics techniques available to blend the screw access holes. Hence, esthetics can be achieved by both screw and cement retained restoration. In case of minimal interocclusal space, adequate retention is not possible to achieve to retain the restoration with cement in case of cement retained implant restorations. But screw retained restoration can be restored with little as 4 mm space from implant surface to the occlusal surface of the opposing dentition. There were no statistical differences in technical complications between screw and cement retained implant prosthesis. Biologic complications in a screw-retained restoration were fewer compared to cement-retained prostheses. Excess cement in cement retained restorations would cause peri implant diseases. Even though several techniques are available for the removal of cement-retained implant crowns, removing a cement-retained crown is still more difficult and less predictable than a screw-retained restoration.^[42] In case of cost, screw retained prosthesis would be 1.5-2 times than that of the cement retained prosthesis.^[6] Limitations of the study were small sample size and specific population. Future studies can be done with a larger population, understanding the depth in knowledge regarding implant prosthetic failure. Our institution is passionate about high quality evidence based research and has excelled in various fields.^[43-49] We hope this study adds to this rich legacy.

Conclusion

Within the limitation of the study, cement retained prosthesis was more commonly used than screw retained when interarch space was adequate. However, it is totally up to the clinician to make a proper evidence based decision as to which retention method will be more effective.

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References

1. Shenoy VK, Rodrigue SJ, Prashanti E, Saldanha SJR. Tooth implant supported prosthesis: A literature review. *J Interdiscip Dent.* 2013;3(3):143.
2. Adell R. Clinical results of osseointegrated implants supporting fixed prostheses in edentulous jaws. *J Prosthet Dent.* 1983;5;50(2):251-4.
3. Kannan A, Venugopalan S, Ganapathy DM. Effect of Coated surfaces influencing screw loosening in implants: A systematic review and meta-analysis. *World J Dent.* 2017;8(6):496-502.
4. Warreth A, Ibiyou N, O'Leary RB, Cremonese M, Abdulrahim M. Dental implants: An overview. *Dental Update.* 2017;44(7):596-620.
5. Chiche GJ, Pinault A. Considerations for fabrication of implant-supported posterior restorations. *Int J Prosthodont.* 1991;4(1):37-44.
6. Shetty S, Garg A, Shenoy K. Principles of screw-retained and cement-retained fixed implant prosthesis: A critical review. *J Interdiscip Dent.* 2004;6:78-81.
7. Michalakakis KX, Hirayama H, Garefis PD. Cement-retained versus screw-retained implant restorations: a critical review. *Int J Oral Maxillofac Implants.* 2003;18(5):719-28.
8. Duraisamy R, Krishnan CS, Ramasubramanian H, Sampathkumar J, Mariappan S, Navarasampatti Sivaprakasam A. Compatibility of non original abutments with implants. *Implant Dent.* 2019;28(3):289-295.
9. Ariga P, Nallaswamy D, Jain AR, Ganapathy DM. Determination of correlation of width of maxillary anterior teeth using extraoral and intraoral factors in indian population: A systematic review. *World J Dent.* 2018;68-75.
10. Kannan A, Venugopalan S. A systematic review on the effect of use of impregnated retraction cords on gingiva. *Res J Pharm Technol.* 2018;11(5):2121-6.
11. Jyothi S, Robin PK, Ganapathy D, Others. Periodontal health status of three different groups wearing temporary partial denture. *Res J Pharm Technol.* 2017;10(12):4339-42.
12. Ajay R, Suma K, Ali SA, Kumar Sivakumar JS, Rakshagan V, Devaki V, et al. Effect of surface modifications on the retention of cement-retained implant crowns under fatigue loads: An *in vitro* Study. *J Pharm Bioallied Sci.* 2017;9(Suppl 1):S154-60.
13. Ganapathy D, Sathyamoorthy A, Ranganathan H, Murthykumar K. Effect of resin bonded luting agents influencing marginal discrepancy in all ceramic complete veneer crowns. *J Clin Diagn Res.* 2016;10(12):ZC67-70.
14. Ranganathan H, Ganapathy DM, Jain AR. cervical and incisal

- marginal discrepancy in ceramic laminate veneering materials: A SEM analysis. *Contemp Clin Dent*. 2017;8(2):272–8.
15. Ashok V, Suvitha S. Awareness of all ceramic restoration in rural population. *Res J Pharm Technol*. 2016;9(10):1691–3.
 16. Basha FYS, Ganapathy D, Venugopalan S. Oral hygiene status among pregnant women. *Res J Pharm Technol*. 2018;11(7): 3099–102.
 17. Ashok V, Nallaswamy D, Benazir Begum S, Nesappan T. Lip bumper prosthesis for an acromegaly patient: A clinical report. *J Indian Prosthodont Soc*. 2014;14:279–82.
 18. Venugopalan S, Ariga P, Aggarwal P, Viswanath A. Case report: Magnetically retained silicone facial prosthesis. *Niger J Clin Pract*. 2014;27:17260–4.
 19. Selvan SR, Ganapathy D. Efficacy of fifth generation cephalosporins against methicillin-resistant *Staphylococcus aureus*-A review. *Res J Pharm Technol*. 2016;9(10):1815–8.
 20. Subasree S, Murthykumar K, Others. Effect of aloe vera in oral health: A review. *Res J Pharm Technol*. 2016;9(5):609–12.
 21. Vijayalakshmi B, Ganapathy D. Medical management of cellulitis. *Res J Pharm Technol*. 2016;9:2067–70.
 22. Ponnulakshmi R, Shyamaladevi B, Vijayalakshmi P, Selvaraj J. In silico and *in vivo* analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats. *Toxicol Mech Methods*. 2019;29(4):276–90.
 23. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. *Clin Oral Investig*. 2020;24(9):3275–80.
 24. Subramaniam N, Muthukrishnan A. Oral mucositis and microbial colonization in oral cancer patients undergoing radiotherapy and chemotherapy: *J Investig Clin Dent*. 2019;10(4):e12454.
 25. Giriya ASS, Shankar EM, Larsson M. Could SARS-CoV-2-Induced hyperinflammation magnify the severity of Coronavirus Disease (CoViD-19). *Front Immunol*. 2020;27(11):1206.
 26. Dinesh S, Kumaran P, Mohanamurugan S, Vijay R, Singaravelu DL, Vinod A, et al. Influence of wood dust fillers on the mechanical, thermal, water absorption and biodegradation characteristics of jute fiber epoxy composites. *J Polym Res*. 2020;27:e12458
 27. Thanikodi S, Singaravelu DK, Devarajan C, Venkatraman V, Rathinavelu V. Teaching learning optimization and neural network for the effective prediction of heat transfer rates in tube heat exchangers. *Therm Sci*. 2020;24:575–81.
 28. Murugan MA, Jayaseelan V, Jayabalakrishnan D, Maridurai T, Kumar SS, Ramesh G, et al. Low velocity impact and mechanical behaviour of shot blasted SiC wire-mesh and silane-treated aloe vera/hemp/flax-reinforced SiC whisker modified epoxy resin composites. *Silicon Chem*. 2020;(8):1847–56.
 29. Vadivel JK, Govindarajan M, Somasundaram E, Muthukrishnan A. Mast cell expression in oral lichen planus: A systematic review. *J Investig Clin Dent*. 2019;10(4):e12457.
 30. Chen F, Tang Y, Sun Y, Veeraraghavan VP, Mohan SK, Cui C. 6-shogaol, a active constituents of ginger prevents UVB radiation mediated inflammation and oxidative stress through modulating NrF2 signaling in human epidermal keratinocytes (HaCaT cells). *J Photochem Photobiol B*. 2019;197:111518.
 31. Manickam A, Devarasan E, Manogaran G, Priyan MK, Varatharajan R, Hsu C-H, et al. Score level based latent fingerprint enhancement and matching using SIFT feature. *Multimed Tools Appl*. 2019; 8(3):3065–85
 32. Wu F, Zhu J, Li G, Wang J, Veeraraghavan VP, Krishna Mohan S, et al. Biologically synthesized green gold nanoparticles from induce growth-inhibitory effect on melanoma cells (B16). *Artif Cells Nanomed Biotechnol*. 2019;47(1):3297–305.
 33. Ma Y, Karunakaran T, Veeraraghavan VP, Mohan SK, Li S. Sesame inhibits cell proliferation and induces apoptosis through inhibition of STAT-3 translocation in thyroid cancer cell lines (FTC-133). *Biotechnol Bioprocess Eng*. 2019;24(4):646–52.
 34. Ponnaniakajamideen M, Rajeshkumar S, Vanaja M, Annadurai G. *In vivo* type 2 diabetes and wound-healing effects of antioxidant gold nanoparticles synthesized using the insulin plant *Chamaecostus cuspidatus* in albino rats. *Can J Diabetes*. 2019;43
 35. Vairavel M, Devaraj E, Shanmugam R. An eco-friendly synthesis of *Enterococcus* sp.-mediated gold nanoparticle induces cytotoxicity in human colorectal cancer cells. *Environ Sci Pollut Res Int*. 2020; 27(8):8166–75.
 36. Paramasivam A, Priyadharsini VJ, kumar RS. N6-adenosine methylation (m6A): a promising new molecular target in hypertension and cardiovascular diseases. *Hypertens Res*. 2020;43(2):153–4.
 37. Shah RJ, Shah SG, Patel GC, Others. Trends in implant dentistry among private dental practitioners of Gujarat: A survey. *Int J Oral Maxillofac Implants*. 2014;4(1):48.
 38. Chowdhary R, Hosadettu SR, Chandrakar N. A survey on the use of techniques, materials in dental implantology practice. *Indian J Dent Res*. 2012;23(2):297.
 39. Makke A, Homsy A, Guzaiz M, Almalki A. Survey of screw-retained versus cement-retained implant restorations in Saudi Arabia. *Int J Dent*. 2017;4:17-20.
 40. Hagiwara Y, Narita T, Shioda Y, Iwasaki K, Ikeda T, Namaki S, et al. Current status of implant prosthetics in Japan: a survey among certified dental lab technicians. *Int J Implant Dent*. 2015;1.
 41. Wittneben JG, Joda T, Weber HP, Brägger U. Screw retained vs. cement retained implant-supported fixed dental prosthesis. *J Periodontol*. 2000; 20(17):73.
 42. Jivraj S. Screw versus cemented implant restorations: The decision-making process. *Int J Implant Dent*. 2018;8(1):9.
 43. Vijayashree PJ. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol*. 2019;90(12):1441–8.
 44. Ezhilarasan D, Apoorva VS, Ashok VN. *Syzygium cumini* extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells. *J Oral Pathol Med*. 2019;48(2)
 45. Ramesh A, Varghese S, Jayakumar ND, Malaiappan S. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients: A case-control study. *J Periodontol*. 2018;89(10):1241–8.
 46. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. *Clin Oral Investig*. 2020;24(9):3275–3280.

47. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. *J Oral Pathol Med.* 2019;48(4):299–306.
48. Pc J, Marimuthu T, Devadoss P. Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study. *Clin Implant Dent Relat Res.* 2018;20(4):531-534.
49. Ramadurai N, Gurunathan D, Samuel AV, Subramanian E, Rodrigues SJL. Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. *Clin Oral Investig.* 2019;23(9):3543–50.