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Evaluate clinical outcome of residual subgingival cement in prosthetic dentures reliant on dental implants: A systematic review and meta-analysis

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Abstract---Aim: the aim of present study was Evaluate clinical outcome of residual subgingival cement in Prosthetic Dentures Reliant on Dental Implants. Method: Databases of PubMed, Scopus, Web of Science, EBSCO and Embase were searched for systematic literature until March 2022. 95% confidence interval for effect size with fixed effect model and Inverse-variance method were calculated. Meta-analysis was performed using Stata/MP v.16 software (The fastest version of Stata). Result: Bleeding on Probing was observed in 60% of implants with excess cement and the Survival rates of implants was 91% (ES, 91% 95% CI; 75%-100%). Conclusion: present meta-analysis showed that survival rates are 91% and residual subgingival cement can be considered a risk factor for probing depths crestal bone loss and peri-implantitis.

Keywords---residual subgingival cement, probing depths, dental implants.

Introduction

The use of implant prostheses, fixed or removable, provides a better treatment outcome, with a significant improvement of oral function(1). Implant-supported restorations can be secured to implants with screws (screw-retained), or they can be cemented to abutments(2). Cement-retained implant-supported prostheses are widely used for restoring missing teeth; however, they show some complications in comparison to screw-retained restorations, such as difficulty in retrieving the restoration and biocompatibility of cement (3). According to Weber et al., observed higher plaque index and more bleeding were seen around cement retaining prostheses (4). Another study reported that screw retaining crowns have statistically smaller margin gaps than cement retaining crowns(5). There are different methods to identify the excess cement around the implant, one of the most common methods is radiography(6); Endoscopy is also one of the more reliable methods that can show the excess cement attached to the implant or its surface with white reflection(7). According to the mentioned cases, the remaining subgingival cement can increase the biological effects of dental implants, so its investigation is very important; the aim of present study was Evaluate clinical outcome of residual subgingival cement in Prosthetic Dentures Reliant on Dental Implants.

Methods

Search strategy

Databases of PubMed, Scopus, Web of Science, EBSCO and Embase were searched for systematic literature until March 2022. Use the MeSH Database, to build searches in PubMed: ((("Dental Implant-Abutment Design"[Mesh]) OR ("Immediate Dental Implant Loading"[Mesh] OR "Dental Prosthesis, Implant-Supported"[Mesh])) AND "Dental Cements"[Mesh]) AND ("Survival"[Mesh] OR "Survival Analysis"[Mesh] OR "Survival Rate"[Mesh]). Key considerations PRISMA was the basis of the present study(8) and PECO strategy to answer the research questions showed in Table1.

Inclusion and Exclusion criteria

Randomized controlled trials studies, controlled clinical trials, prospective and retrospective cohort studies and in vitro studies, cement-retained fixed dentures, articles published with English language. Case studies, case reports, reviews were excluded from the study.

Table 1
PECO strategy

PECO strategy	Description
P	Population: Patients with dental implants
E	Exposition: biological complications
C	Comparison: cement-retained vs screw-retained restorations
O	Outcome: implant failure and bone loss

Study selection, Data Extraction and method of analysis

Studies data were reported by study, years, and study design, number of population, Type of Restoration, Follow-up, Cement, Biological Complications, and Excess Cement. 95% confidence interval for effect size with fixed effect model and Inverse-variance method were calculated. To deal with potential heterogeneity, random effects were used and I^2 showed heterogeneity. I^2 values less than 50% indicate low heterogeneity and above 50% indicate moderate to high heterogeneity. Meta-analysis was performed using Stata/MP v.16 software (The fastest version of Stata).

Result

The review of the existing literature using the studied keywords, 218 studies were found. In the initial review, duplicate studies were eliminated and abstracts of 184 studies were reviewed. At this stage, 152 studies did not meet the inclusion criteria, so they were excluded, and in the second stage, the full text of 32 studies was reviewed by two authors. At this stage, 26 studies were excluded from the study; finally, six studies were selected (Figure1).

Characteristics

Five retrospective studies and two in-vitro studies have been included in present article. A total of 324 patients with 640 implants were examined. The mean of Excess Cement was 57.91%, the mean of follow up was 3.8 years.

Survival rates

The Survival rates of implants was 91% (ES, 91% 95% CI; 75%-100%).

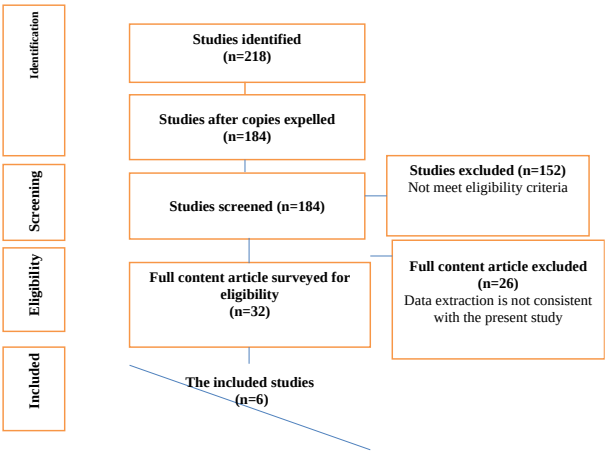

Figure 1. Study Attrition

Table 2
Studies selected for systematic review and meta-analysis

Study. Years	Study design	Number of patients	Number of implant	Type of Restoration	Cement	Excess Cement (%)	Follow-up
Jagathpal et al.,2021 (9)	In-vitro	-	20	NR	alcium aluminate glass ionomer cement	52	NR
Hidalgo et al.,2021 (10)	In-vitro	-	44	NR	alcium aluminate glass ionomer cement and zinc phosphate cement	58	NR
Korsch et al.,2015 (11)	retrospective	71	126	Single crowns, multiple unit bridges	Methacrylate cement	59.5	4 years
Korsch et al.,2015 (12)	retrospective	105	198	NR	Methacrylate cement	62	4 years
Korsch et al.,2014 (13)	retrospective	71	126	Single crowns, multiple unit bridges	Methacrylate cement Zinc oxide euegenol cemen	59.5	261 days
Linkevicius et al.,2013 (14)	retrospective	77	126	Single crowns, fixed partial dentures, splinted crowns	Resin modified glass ionomer cement	56.6	NR

Bleeding on Probing

Bleeding on Probing was observed in 60% of implants with excess cement (ES, 60% 95% CI ;45%-76%).

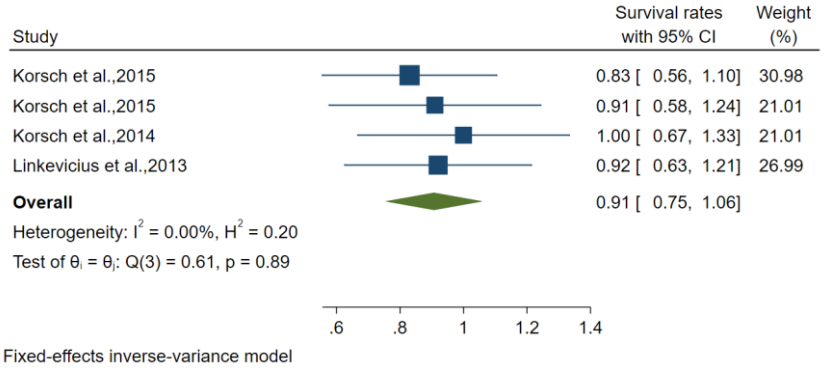

Figure 2. Forest plot showed Survival rates

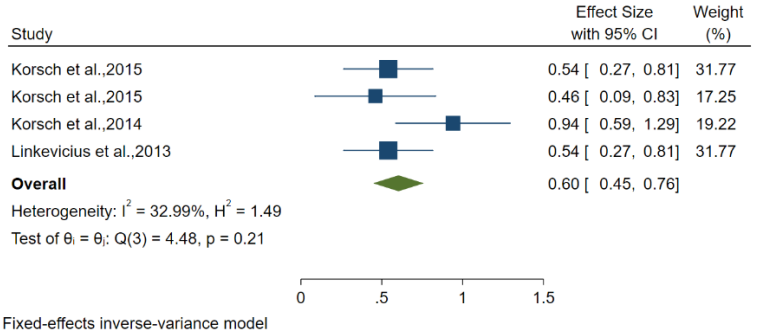

Figure 3. Forest plot showed Bleeding on Probing

Suppuration was detected in 15% cement (ES, 15% 95% CI; 4%-34%) (Figure4).

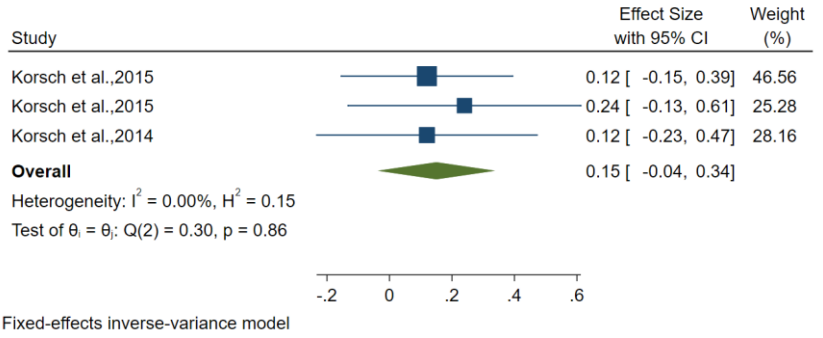

Figure 4. Forest plot showed Suppuration

Discussion

The present study was conducted with the aim of evaluating clinical outcome of residual subgingival cement in Prosthetic Dentures Reliant on Dental Implants; in present study, an attempt was made to investigate the residual effect of cement, however, many studies were found, two of which were in-vitro studies. Alcium aluminate glass ionomer cement, zinc phosphate cement, methacrylate cement, zinc oxide euegenol cement and resin modified glass ionomer cement were used.

There are several methods that can be used to identify Residual cement(15). The evaluated clinical parameters were bleeding on probing and bone loss, suppuration. In almost all studies, bleeding on probing and suppuration was present in most of the remaining cemented implants. The results are consistent with studies by Pauletto et al., Shapoff et al., and Stancari et al. of the remaining cemented implants (16-18).

The present study had limitations, including the methods of data collection and analysis performed in different studies, although the heterogeneity between the results of the studies was low and this shows that these results can be cited, more studies with the same working method and the same analysis method required in the future. The same clinical parameters were not reported in all studies, especially in laboratory studies, the improvement of biological effects related to cement left after implantation was not evaluated in any of the studies. Further studies are needed to achieve better results and provide strong and sufficient evidence. All the included studies agreed with other reports that show a correlation between residual of cement and peri-implant mucositis. Recently, peri-implant mucositis was reported as a risk factor at patient level for the onset of peri-implantitis. That was mainly observed in subjects who were not enrolled or compliant with a regular supportive therapy.

The present study had many limitations, including the number of studies is very small and no RCT study was found; also, high heterogeneity between studies was observed, which could be related to differences in cognitive methodology. The clinical parameters collected in the included studies were also incomplete, and moderate to high risk of bias was observed in most studies. More studies with higher sample size and higher quality studies are needed to provide stronger evidence.

Conclusion

present meta-analysis showed that survival rates are 91% and residual subgingival cement can be considered a risk factor for probing depths crestal bone loss and peri-implantitis. Further studies in this field and with the aim of the present study are needed to find solid results and evidence.

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