Excess Dental Cement and Peri-implantitis: A Systematic Review

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Received 15/10/2020; revised 22/11/2020; accepted 16/12/2020

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Abstract

Introduction: Cemented crowns are usually used on implant abutments instead of screw retained crowns. The remnants of cements are frequently disseminated to the surrounding tissues despite of clinician efforts to control the cementation. This review aimed to explore the evidence regarding the impact of cement excess and cement types on the development of peri-implantitis.

Methods: Many electronic databases were searched include MEDLINE and EMBASE. Moreover, the databases of systematic review and clinical trials such as Cochrane libraries and Center for Reviews and dissemination were screened for eligible studies. The full texts of the eligible studies were retrieved to conduct in depth reading. The eligibility criteria were applied on the eligible studies which lead to exclusion of further studies. The data from included studies were collected in tables with highlighted similarities and differences between studies and the findings of the review were discussed to reach conclusive recommendations.

Results: The electronic search in PubMed, Embase, Cochrane Library, Open Grey resulted in 119 articles, 262, 39, and 70 respectively, with total number of 490 articles. The titles and abstracts were reviewed by the researcher to identify relevant articles. This step led to exclusion of 438 irrelevant articles, then the full text articles were retrieved for remaining articles. In depth reading was conducted which resulted in exclusion of 427 articles and inclusion of 11 articles in this review.

Conclusions: The evidence showed a higher prevalence of peri-implantitis in cement retained group versus screw retained group which was mostly related to the presence of cement remnants. However, bone loss was lower or similar in cement retained implants than that in screw-retained implants.

Keywords: Dental implant, Periimplantitis, Cement-retained, Screw-retained, Prevalence
Introduction

Inflammation of tissues surrounding dental implants is a major risk factor that may compromise implant survival [1]. Bone loss around the implant can be caused by other technique-related factors such as deep insertion of the implant, very close placement of adjacent implants, or using of two-piece implants [2]. However, Peri-implantitis is a destructive inflammation that causes peri-implant pocket and bone loss around the osseointegrated implants [1]. Diagnosis of peri-implantitis should be based on longitudinal monitoring from time of insertion till the establishment of tissue homeostasis around the implant [3]. In the literature, the prevalence of peri-implantitis varied widely from 1.4% to 53.5% due to several factors such as differences in the diagnostic criteria, using of non-probability samples, and the availability of post-placement care [4, 5]. A study reviewed 29 articles found an estimated proportion of 10% implants and 20% patients developed peri-implantitis in 5-10 years following implant insertion [1]. Similar prevalence reported by a meta-analysis included 1497 patients with 9.6% implants and 18.8% patients have developed peri-implantitis [6].

Poor oral hygiene is an important risk factor of peri-implantitis, since accumulation of plaque around dental implants was associated with occurrence of peri-implant mucositis [7]. This inflammation may lead to the bone resorption with consequent loss of the implant stability and subsequent failure [8]. When several studies compared the microbiota of periodontitis with this of peri-implantitis, the authors found more divers microbiota in plaque surrounding periodontitis than that from plaque samples taken from peri-implantitis [9-11]. The mechanical overload of implant on the supported bone can result in bone loss and many studies linked the overload to the peri-implantitis in animal models [12].

Cemented crowns are usually used on implant abutments instead of screw retained crowns. The remnants of cements are frequently disseminated to the surrounding tissues despite of clinician efforts to control the cementation [13]. The amount of cement excess that is left in the peri-implant tissues depended on depth of crown margins [14]. The radiographic examination failed to detect excess cement in most cases already had excess cement which limited the use of x-rays in detection of this problem [14]. The remnants of cement in peri-implant tissues can trigger inflammatory response because it is considered as foreign body. Moreover, the cement excess can form a colonization sites for bacteria leading to peri-implantitis. The opportunistic pathogenic bacteria found to invade the methacrylate-made cement which resulted in development of peri-implantitis [15]. A study found that cement excess was associated with peri-implant diseases in 81% of patients. When excess of cement was removed, the endoscopic signs of peri-implantitis subsided in the majority of cases [16]. The bleeding on probing and suppuration were more likely associated with implants had cement excess than that which had not [14]. This review aimed to explore the evidence regarding the impact of cement excess and cement types on the development of peri-implantitis.

Methods

This systematic review included clinical trials, cohort and case control studies aiming at estimation of the effect of cement on the development of peri-implantitis. No language limits were used, but only in-vivo studies were included in this review. The comparison was restricted to studies assessed screw-retained dental implants. The outcomes measured were occurrence of peri-implantitis, magnitude of bone loss, depth of pocket and amount of bleeding during probing. Simulation studies or studies with short-term follow up period (less than 3 months) were excluded. Many electronic databases were searched include MEDLINE and EMBASE. Moreover, the databases of systematic review and clinical trials such as Cochrane libraries and Center for Reviews and dissemination were screened for eligible studies. The keywords, that will be used in electronic search, are demonstrated in summary of search results (Table 1). They search strategy in PubMed and Cochrane library is built as following (implant OR “Dental implant” OR “Implantitis” OR “Peri-implantitis” OR “periimplantitis”) AND (cement OR “cement-retained” OR “cement excess” OR “residual cement” OR “cement-associated” OR...
“foreign body”) AND (screw* OR “screw-retained” OR “screw-fixed”) AND (prevalence OR incidence OR occurrence OR “bone loss” OR “bleeding on probing” OR “pocket depth”). The full texts of the eligible studies were retrieved to conduct in depth reading. The eligibility criteria were applied on the eligible studies which lead to exclusion of further studies.

The data from included studies were collected in tables with highlighted similarities and differences between studies and the findings of the review were discussed to reach conclusive recommendations.

Results and Discussion

The electronic search in PubMed, Embase, Cochrane Library, Open Grey resulted in 119 articles, 262, 39, and 70 respectively, with total number of 490 articles. The titles and abstracts were reviewed by the researcher to identify relevant articles. This step led to exclusion of 438 irrelevant articles, then the full text articles were retrieved for remaining articles. In depth reading was conducted which resulted in exclusion of 427 articles and inclusion of 11 articles in this review (table 1).

Most of the included studies were conducted by the retrospective analysis of the patients records, only two studies were randomized clinical trials [17, 18] and one was cross sectional study [19]. The largest sample size was used in this cross-sectional study with 394 implants supported either single crown of FPDs. The randomized clinical trials recruited smaller samples than those recruited in other studies, where only 33 patients with single implants [18] or 38 patients with multiple implants [17]. All included studies compared the cement retained implants to the implants with screw retention except Jemt et al. who compared them to porcelain veneers baked directly on custom-made titanium abutments [20].

The mean age of patients varied across included studies from 33.5 (±15.6) years old reported by Jemt et al. [20] to 64.2 (±12.60) years old reported by Woelber et al. [21].

The older mean age of patients was associated with implant supported FPDs, while younger age was associated with using single implants. Five of included studies evaluated only implants supported single crown [18, 20, 22-24] and five studies assessed different types of implants supported single crowns or FPDs [13, 19, 21, 25, 26]. Only one study, randomized clinical trial, focused on implants supported FPDs using split mouth design [17]. The site of implant placement were different, however commonly anterior teeth, bicuspid teeth, and first molars.

In regards to the type of cement used to retain crowns, zinc oxide cements were reported in some studies [19, 21, 22], other studies used glass ionomer cement [13], resin cement [18], zinc phosphate cement [19], and temporary cements [17, 24]. Only two studies reported the detection of cement remnant [13, 24], while other studies reported use of procedures to reduce or remove the excess cement. Jemt et al. cemented the crown to the abutment outside the mouth [20], while Al Amri only cemented the occlusal half of the crown to decrease the extra-coronal cement [22]. Some investigators used probes, dental scalers and dental floss to remove the excess cement [18, 19, 21].

The follow-up period greatly differed across the included studies; however, the majority of these studies followed the patients for more than 5 years period [13, 17, 19-22]. Some studies have a mean follow up period between 1-5 years [23-25], while two studies have early assessment of outcomes in less than one year [18, 26]. The longest period of follow-up was 13.2(3.2) years reported by Woelber et al. [21], while the shortest one was 6-months period reported by Thoma et al. [18].

The prevalence of periimplantitis was estimated in tow included studies [13, 21], while other studies assessed different clinical signs which could be related to periimplantitis such as bone loss, bleeding on probing, pocket depth, gingivitis, gingival recession and plaque indices. The most common clinical signs assessed by the included studies was bone loss which used by almost all included studies. Beside bone lose, other indices were used by the included studies. Bleeding on probing was used in conjunction with assessment of pocket depth in four included studies [18, 19, 21, 22, 24]. Gingival indices were evaluated with other clinical indices in four included studies [17, 18, 20, 25] and plaque records were used by Kotsakis et al. [19]. The presence of pus as a sign of periimplantitis was detected by only two included studies [20, 24].
The comparison between cemented and non-cemented type of retention were conducted using all or some of the previously mentioned clinical indices. The evidence showed a higher prevalence of periimplantitis in cemented and non-cemented groups of implants. Woelber et al. found no case of periimplantitis in any group. However, they found a higher prevalence of bleeding on probing in cement retained group (31.6%) than that in screw retained group (25%) [21]. Linkevicius et al. evaluated the prevalence of periimplantitis among the failure or complicated cases of cemented and screw retained implants. They found 85% prevalence of periimplantitis among cement retained implants with detected cement remnant and 30% prevalence of periimplantitis among cement retained implants without cement remnant. In screw retained group, only 2/283 cases (1.1%) developed periimplantitis [13]. Ferreiraoa et al. found a higher prevalence and complication rates in cement retained group versus screw retained group [24]. Besides, Kotsakis et al. found an odds ratio of 1.43 (0.45, 4.60) for cement retained group versus screw retained group, however this odds ratio was not statistically significant [19].

A study found a significantly higher marginal bone loss in cement retention group than that in group with non-cemented type of retention [23], while two studies found non-significant higher bone loss in cement retention group [20, 22]. In contrast, the bone loss was found significantly lower among cement retained implants than that of screw retained implants by tow included studies [17, 26], while non-significant lower bone loss in cement retention group reported by Thoma et al. [18]. The mean bone loss was found similar by Al Amri et al. [22].

The survival rate of dental implants was reported as 100% in 5 included studies [17, 18, 20-22], other studies did not report clearly the survival rate.

Conclusions

The evidence showed a higher prevalence of periimplantitis in cement retained group versus screw retained group which was mostly related to the presence of cement remnants. However, bone loss was lower or similar in cement retained implants than that in screw-retained implants.
Conflict of interests:

The authors declared no conflict of interests

References


