

Endosseous Implant Failure Influenced by Crown Cementation: A Clinical Case Report

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Implant dentistry has developed predictable treatment outcomes. Nevertheless, there are multiple reasons for implant failure. This case report documents a previously unreported type of implant failure that occurred 1 month after crown cementation. The implant failure is believed to be associated with retained excess subgingival cement. INT J ORAL MAXILLOFAC IMPLANTS 2008;23:943–946

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Titanium endosseous dental implants have been increasingly utilized over the past few decades.¹ Successful outcomes can be expected when implants are placed in bone of good quality and quantity and when proper surgical protocol is followed.² Although dental implants are considered a very successful mode of therapy, many factors have been associated with the failure of dental implants.³ Complicating factors can be divided into the following categories: surgery-related implant loss; bone loss; peri-implant soft tissue disease; mechanical problems; and esthetic/phonetic results.⁴

In terms of biological implant failure, contributing factors reported in the literature include implant length and diameter,⁵ body design,⁶ smoking,^{1,5} implant location,⁷ bone quality,⁸ peri-implantitis,⁹ and others. In terms of mechanical implant failure, several investigations have evaluated the most common prosthetic complications associated with dental implants. Overall, the majority of these studies focus on problems associated with the suprastructural components and the function/esthetics of the prosthesis. Examples of such complications are abutment fractures and loosening,¹⁰ prosthesis fracture,^{11,12} prosthesis retention and comfort,¹³ and patient satisfaction.¹³ The literature on early implant failure due

to prosthetic reasons is scarce. This case report relates to a prosthetic-related implant complication that resulted in early implant failure.

CASE PRESENTATION

A 31-year-old Hispanic woman presented to the authors' periodontal office reporting mobility of the maxillary right lateral incisor. The medical history of the patient was noncontributory. The patient reported previous orthodontic therapy for 3 years. A periapical radiograph revealed severe root resorption (Fig 1). The treatment plan was to extract the maxillary right lateral incisor with immediate placement of an endosseous dental implant. After local anesthesia was obtained, the maxillary right lateral incisor was atraumatically extracted. The surgical site revealed an adequate amount of alveolar bone for immediate implant placement. The buccal alveolar bone was intact, and no signs of pathology or bone resorption beyond the socket of the remaining tooth fragment were noted.

Subsequently, a narrow, internal platform, parallel-walled endosseous implant was inserted (3.25×11.5 mm; Biomet 3i, Palm Beach Gardens, FL) using a surgical template (Fig 2). At the same visit, the healing abutment was inserted (3.4×4 mm) and a provisional removable partial denture was delivered. Postoperative medication included amoxicillin 500 mg every 8 hours for 10 days, chlorhexidine 0.12% every 12 hours for 7 days, and an acetaminophen/hydrocodone-based analgesic as needed for pain. The implant was allowed to heal for 4 months (Fig 3). Then, a reverse torque of 20

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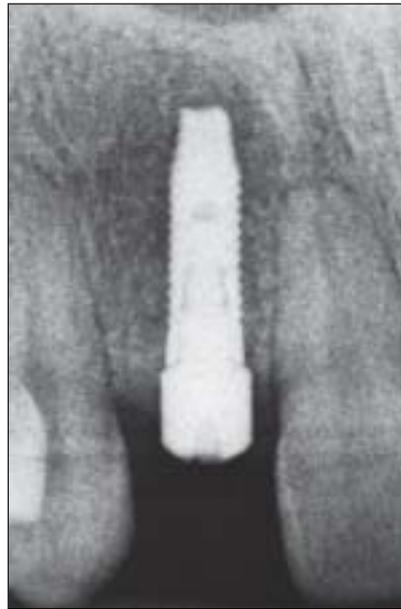


Fig 1 (Left) Baseline periapical radiograph. Note severe resorption of tooth in the maxillary right lateral incisor.

Fig 2 (Center) Implant placement at baseline (the day of the surgery).

Fig 3 (Right) Clinical photograph demonstrating uneventful healing 4 months after implant placement.

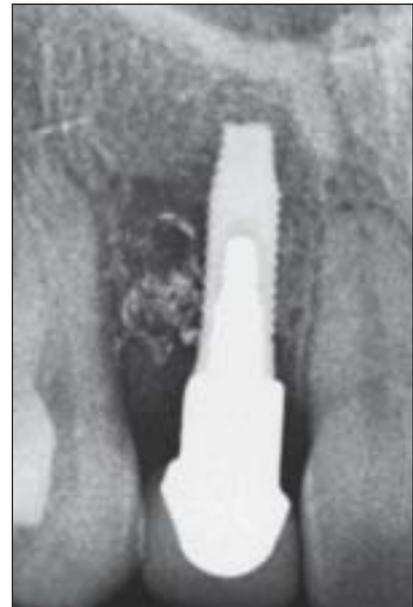


Fig 4 (Left) Four-month postoperative radiograph.

Fig 5 (Center) Clinical photograph approximately 1 month after crown cementation was performed. Note the erythematous and cyanotic tissues around the implant. A 9-mm peri-implant pocket with suppuration was detected on the distal aspect of the implant.

Fig 6 (Right) Radiograph taken approximately 1 month after crown cementation. Note the radiopaque material at the distal aspect of the implant in combination with extensive bone loss.

Ncm was utilized to ensure the implant was osseointegrated and a follow-up radiograph was obtained (Fig 4). The peri-implant sulcus was within normal range.

The patient returned to the periodontal office 1 month after final cementation of the implant prosthesis reporting soreness and swelling in the area (Fig 5). Clinically, a 9-mm pocket with suppuration was present on the distal aspect of the implant, while a shallow sulcus was present on the mesial aspect of the maxillary right canine. A radiograph at the same appointment revealed radiopaque material at the distal aspect of the implant in combination with

extensive bone loss (Fig 6). It was decided to remove the crown and prosthetic abutment and re-insert the healing abutment and provisional partial denture prior to exploration of the site. After local anesthesia was obtained, the area was surgically explored, revealing extensive bone loss distal and buccal to the implant (Figs 7a and 7b). There was a mixture resembling granulation material and temporary cement involving up to 70% of the implant length. The implant was surgically removed, and guided bone regeneration was performed at the site for a future dental implant.



Figs 7a and 7b (a) Exploration of the defect revealed extensive bone loss at the distal and buccal aspects of the implant and material resembling temporary cement at the thread of the implant. (b) A mixture of granulation tissue with large amount of material resembling temporary cement was removed from the defect.

DISCUSSION

Numerous studies show that abutment loosening constitutes one of the known implant postsurgery complications requiring clinical intervention.⁴ A review of the literature demonstrated that abutment loosening is the most common prosthetic complication in implant dentistry (2% to 45% depending on the study and type of prosthesis).⁴ In a prospective preclinical study, 27% of loosened screws were present with use of screwed abutments, in comparison to no abutment loosening with cemented restorations.¹⁴ The authors speculated that screwed abutments are often submitted to nonaxial loads that determine screw and abutment loosening.¹⁴ Screw loosening not only becomes an inconvenience to clinicians and patients due to the increase in maintenance, but also there are biological detrimental effects in the surrounding tissues when this condition occurs. An *in vivo* study has demonstrated an increase in expression of vascular endothelial growth factor and microvessel density (markers of inflammation) in loosely screwed abutments compared to screw-tight and cement-retained restorations.¹⁵ In addition, microbial leakage through the gap between the suprastructure and the abutment plays an important role in the bacterial colonization of the internal part of screw-retained crowns and partial prostheses.¹⁶

Despite all the advantages related to cement-retained implant restorations, some disadvantages can be clearly seen. For instance, difficult prosthesis

retrieval and excess cement removal can be experienced with cemented restorations.¹⁷ When properly restored, the intracrevicular position of the restoration margin does not appear to adversely affect peri-implant health and stability.¹⁸ However, it can be speculated that excess cement is more difficult to remove or identify when implants are restored with deep subgingival margins. These situations are more commonly seen in anterior restorations, where esthetic demands are higher. In such cases, the margins are usually placed further subgingivally, leading to an increased risk of leaving additional cement in the peri-implant tissues. In a recent 8-year private practice study, the authors did not notice different complication rates for cemented and screw-retained prostheses.¹⁰ However, the authors recommended screw-retained prostheses in the esthetic zone to avoid problems associated with excess cement irritating the soft tissues.¹⁰

One of the reasons for such a complication possibly relates to the supracrestal soft tissue microanatomy around dental implants. In contrast to natural teeth, implants do not develop perpendicular fiber attachment.^{19,20} Instead, the gingival connective tissue fibers are closely adapted to the titanium layer but in an orientation approximately parallel to the implant surface.²⁰ This anatomic condition may not provide enough protection if excess cement is pushed into the peri-implant sulcus. In fact, probing measurements around healthy osseointegrated oral implants and teeth differ.²¹ Histologic studies have demonstrated that a probe has a tendency to pene-

trate deeper into the peri-implant tissues compared to the counterpart teeth.^{21–23} In addition, it has been demonstrated that peri-implant probing depth measurements are more sensitive to force variation than periodontal pocket probing.²² Hence, it could be further speculated that implants may be more sensitive to excess cement pressed into the peri-implant tissue than tissue around natural teeth.

This is the first case report demonstrating that excess cement can lead to severe clinical consequences, including implant failure. However, it is difficult to be certain of the cause-effect cited in this report; other factors should be considered. First, there were no apparent signs of peri-implant pathology prior to the insertion of the crown. Second, the crown was not in occlusal trauma, which could justify the severe bone loss. Finally, there was a large amount of temporary cement in the vertical defect around the implant. It is imperative to note that it is difficult to speculate whether local factors such as an undermining bone fenestration influenced the severity of the infection. Further controlled studies are necessary to unravel all possible variables associated with excess cement and implant failure.

CONCLUSIONS

Cementation of implant-supported crowns is common in the esthetic zone. It is recommended that the restorative dentist be especially vigilant to remove excess subgingival cement following cementation of the crowns to avoid the potential for implant failure. The biologic process by which the cement is found within the intraosseous defect requires further study.

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