An alternative treatment for hopeless implants: Coronal resection

H. Burak Kutlu^a, Samir Goyushov^{b,**}, Tolga F. Tözüm^c

^a Department of Periodontology, Faculty of Dentistry, Hacettepe University, Ankara, Turkey

^b Department of Periodontology, Faculty of Dentistry, Istanbul Aydin University, Istanbul, Turkey

^c Department of Periodontics, College of Dentistry, University of Illinois at Chicago, Chicago, IL, USA

ARTICLE INFO

Keywords:

Resection
Explantation
Surgery
Inflammation
Bone
Gingiva

ABSTRACT

Dental implant surgery is a highly reliable therapy with widespread use all over the world. However, various accidental symptoms and complications such as peri-implantitis have been reported, and occasionally necessitate implant removal. This alternative technique was performed to minimize the harmful effect of conventional resective explantation procedures. The present case concerns a 55-year-old woman who had two dental implants in the mandibular incisor regions who apparently developed severe marginal peri-implantitis. Presence of lesion was confirmed by two and three-dimensional radiographic images. Explantation was indicated because of the excessive ongoing bone loss around implants. Due to avoid serious complications such as jaw fracture, coronal resection technique (partial explantation) was suggested. After the full thickness flap was elevated, affected part of both implants were resected, and osseointegrated healthy apical parts were left in the basal bone. Wound healing was uneventful at one week follow-up. Proper locator abutments were tightened after 5 months of the partial explantation procedure, and final denture was applied in the oral cavity. The radiologic and clinical examinations showed successful outcome at 12-months follow-up. Minimally resective peri-implantitis therapy may be achieved using this non-traumatic coronal implant resection approach.

1. Introduction

The use of dental implants in the treatment of fully and partially edentulous jaws has become a standard clinical method in the past few decades.¹ A dental implant is an innovative surgical structure inserted into edentulous regions of the jaws to support prosthetic restorations.^{2,3} Prosthodontic treatment planning paradigm has expanded because of the success rates of dental implants.⁴ Despite the evidence of outstanding results of implant therapy, diseases and failing implants do occur due to a peri-implant infection.⁵ Peri-implantitis is defined as an inflammatory process, taking place in surrounding tissue of dental implants that result with the loss of implant supporting bone.^{6,7} Development of peri-implantitis with excessive bone loss can lead to the removal of the implant.⁸ In the literature, different implant removal techniques have been suggested, such as the burs or a trephine drill with saline-cooling system, laser-assisted explantation as well as a reverse torque method.⁹ Because of the lack of reported unique method for the least traumatic implant removal, existing explantation techniques are incoherent.⁹

Implant removal procedure is similar to tooth extraction surgery in some situations, where the reverse-torque technique is ineffective with well-integrated or fractured implants.¹⁰ Therefore, types and

frequencies of complications are similar as well: surrounding soft tissue trauma, nerve damage, paresthesia, and dislocation of implants or fractured parts into adjacent maxillofacial anatomical structures.¹¹ Aside from wound-healing problems after explantation, potential root damage of the adjacent teeth, injured neurovascular unit with permanent impairment may be facing complications of the procedure, especially in the mental region.¹⁰ Different techniques have been reported to partial explantation of the osseointegrated implant, which allow preserving the maximum peri-implant bone. One of them is resective surgery in the apical part of the implant which is affected by existed periapical lesion (IPL).^{12,13}

The purpose of this clinical report was to describe an alternative explantation technique based on the concept that preserves adjacent soft and hard tissue in hopeless marginal peri-implantitis cases.

2. Materials and methods

A 55-year-old female patient referred to the Department of Periodontology for the evaluation of implants #22 and #27 (ADA's Current Dental Terminology teeth, 2011–2012). The patient was non-smoker, without any systemic disease. Implants were inserted in a private clinic two years before the patient came to the attention of the

* Corresponding author. Department of Periodontology, Faculty of Dentistry, Istanbul Aydin University, Inonu ave. No 38., Istanbul, Turkey.

E-mail address: samir.goyush@gmail.com (S. Goyushov).

<https://doi.org/10.1016/j.jobcr.2020.03.005>

Received 6 January 2020; Received in revised form 19 February 2020; Accepted 9 March 2020

Available online 13 March 2020

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Fig. 1. a: Pre-operative panoramic radiograph revealed vertical bone loss around both implants.
b: Pre-operative cone-beam computerized tomography image of #27 implant site.
c: Pre-operative cone-beam computerized tomography image of #22 implant site.

authors. Her main complaint was the moderate to severe pain and swelling in the implanted regions, associated with moderate halitosis.

Implant sites were characterized by circumferential pocket probing depths of 7mm–9mm. Suppuration and visible loss of alveolar bone around the implants were evident. None of the implants were mobile. After 2-dimensional (panoramic image) and 3-dimensional (cone-beam computed tomography images) detailed radiographic assessments were done, a concave marginal bone loss was detected of about 7mm mesial and distal to both implants (Fig. 1).

In this case, apices of the implants, especially implant #27 was in close relation to the inferior border of the mandible, and it was intact (Fig. 1b and c). The distances between inferior border of the mandible and implants were 1.5mm and 4.2mm (right and left, respectively). Through conventional surgical explantation methods, inferior border of the mandible was at risk of damage, and may end up with jaw fracture. The patient was informed about her critical clinical condition because of the very thin basal bone thickness and was presented with three different treatment modalities:

- (1) Explantation of implants regarding possible complications such as jaw fracture, augmentation of the sockets and application of a removable prosthesis, or
- (2) Explantation implants regarding possible complications such as jaw fracture, augmentation of the sockets and placement of two new implants to the new grafted region, or
- (3) Application of two new implants for the overdenture prosthesis after coronal implant resection technique.

The patient was informed about advantages and disadvantages of all offered treatments including financial costs. The patient chose the third treatment option instead of conventional explantation surgery and signed written consent form that includes the possible risks and complications of the treatment. All preoperative and postoperative oral hygiene instructions were given to the patient.

Anterior mandibular region was given local anesthesia (Articaine 4% with Epinephrine 1:100,000). After the anesthesia, a horizontal crestal incision and sulcular incisions around the implants were made. Reflection of mucoperiosteal flap from the bone and implant surfaces was performed by blunt dissection. After the full thickness flap elevation, both peri-implantitis sites were classified as Class 4 according to

the status of surrounding bone (Fig. 2).^{14–16}

Affected coronal part of the implants, which were not surrounded by the intact bone, were resected accurately with carbide burs under cold sterile saline irrigation, and osseointegrated parts were left in the bone. Due to avoid the possible damaging effects, the use of high speed burs should be intermittently with abundant irrigation. The granulation tissues surrounding the implants were removed by periodontal curettes, and large bone defects were vigorously washed with sterile saline solution (Fig. 3a and b). New dental implants (4.1 × 12mm and 4.8 × 10mm, Institute Straumann AG, CH-4437, Waldenburg, Switzerland) were placed anteriorly into the intact bone. Hard tissue augmentation of the defects were completed by mineralized plasmatic matrix (MPM) and platelet rich fibrin (PRF) after the implant placements (Fig. 3c). The flap was sutured by using 4.0 polypropylene monofilament sutures, replacing it to its initial position without tension. Postsurgical instructions were explained to control postoperative pain and to prevent possible post-surgical wound infection. Antibiotics (Amoxicillin 500 mg 3 times daily), analgesics (Ibuprofen 600 mg times daily) and a 0.12% chlorhexidine gluconate rinse (twice daily) were prescribed for 7 days.

3. Results

One week later, the wound healing was uneventful and all sutures were removed. The healing was evaluated clinically 4 and 6 weeks after the baseline as well. The patient was recalled 4 months after the surgery for the prosthetic procedures, and the healing abutments were connected by performing a second minimally invasive surgery. Two weeks after the uncover surgery, healing abutments were removed and depth measurements of the surrounding gingival levels were taken with the aid of plastic periodontal probe to make an accurate prosthesis abutment selection. Proper locator implant abutment heights were calculated and the abutments were tightened to 25–30 Ncm with a torque wrench as suggested by the company (Fig. 4a).

Prosthetic restoration was presented to the patient after mock-up procedure accordingly to the wax-up. The final denture was applied in the oral cavity. The stability, retention, and lip support of the denture were shown to be appropriately secured (Fig. 4b). After the delivery of her denture, the patient was pleased with the appearance and comfort achieved by the new mandibular prosthesis over two implants and the

Fig. 2. a: Clinical view of the gingival inflammation with suppuration around the implants.
 b: Bone defect around implant #27 after debridement of the granulation tissues.
 c: Bone defect around implant #22 after debridement of the granulation tissues.

locator systems (4mm, Institute Straumann AG, CH-4437, Waldenburg, Switzerland). The clinical examination and panoramic radiography at 12-months follow-up were evaluated; successful hard and soft tissue healings were achieved without any signs of pathologies or disorders (Fig. 5). The patient was very satisfied with both the function and the esthetics of the restoration. She was monitored without an additional treatment and was scheduled for further follow-up appointments.

4. Discussion

In the last decades, implant dentistry has achieved high success rates as the choice to replace lost dentition of patients being treated with implant-supported prosthesis.¹⁷ Despite high success rates, there are still implants that may be lost due to severe marginal peri-implantitis or IPL. Therefore, different techniques including dental implant removal and implant resection have been proposed in the

literature.^{9,12} It is critical to provide predictable explantation methods with minimum damage for the patients, which may directly influence the subsequent re-treatment, healing time and the final prosthetic restoration. In such cases, where the reverse-torque explantation technique with counter-torque ratchets may be problematic due to damaging the adjacent anatomic landmarks.¹⁰

The choice of the implant explantation technique mainly depends on two aspects: the neighboring tooth/implant proximity and the cortical bone thickness around failing implant. Taking these crucial factors into consideration, the explantation protocols were reviewed by Stajcic et al., in 2015.⁹ To best of the authors' knowledge, the present technique has not been reported in the literature. The employment of less traumatic techniques such as partial resection seems to be required to cause minimal residual hard tissue defects, especially in well-integrated implant cases.^{9,16,18}

The decision to use partial explantation technique was based

Fig. 3. a: Bone defect after the coronal resection of #27 implant.
 b: Bone defect after the coronal resection of #22 implant.
 c: After the placement new implants and augmentation previous implant sockets.

primarily on the fact that complete removal of the well-osseointegrated implant portions would cause abovementioned severe complications. However, this implant resection technique is only appropriate when the peri-implant bone is very thin or well-osseointegrated part of the implant is very close to the crucial anatomical landmarks. Furthermore, by reducing the amount of damaged bone with partial implant removal, the range of surgical complications during explantation surgery might be reduced. The possible disadvantage of the technique is that, surrounding tissues might be damaged during the resection of the titanium implants. Therefore, due to avoid the any damage, compared with other conventional explantation techniques, this one requires more clinical sensitivity from practitioners.

The technique presented in this report could establish an actual alternative to other reported techniques for the explantation of failed implants. Through the partial explantation, the preservation of existing hard tissues is possible in terms of avoiding serious complications during explantation surgery such as jaw fracture.¹⁶ Further long-term clinical trials are necessary to document the advantages of the present removal procedure compared to total explantation by using different techniques.

5. Conclusions

Peri-implantitis is one of the main causes for implant explantation. The partial explantation technique seems to preserve the surrounding alveolar bone tissue, and may decrease the need for advanced tissue regeneration surgeries. Minimally resective peri-implantitis therapy can be achieved by using this less traumatic coronal implant resection approach. Further investigations are needed to evaluate the healing tissue, and to histologically understand the regenerated/repared tissue at the socket of implant.

Declaration of competing interest

Dr.Goyushov has nothing to disclose.

List of abbreviations

IPL	implant periapical lesion
MPM	mineralized plasmatic matrix
PRF	platelet rich fibrin

Fig. 4. a: Locator abutments at #23 and #26.
b: Denture in place.

Fig. 5. Panoramic radiograph, at 1-year control appointment.

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