Case Report

# Management of Broken Dental Implant Abutment in a Patient with Bruxism: A Rare Case Report and Review of Literature


## Abstract

This rare case report describes prosthodontic complications resulting from a dental implant was placed surgically more distally in the area of the missing mandibular first molar with a cantilever effect and a crest width of >12 mm in a 59-year-old patient who had a history of bruxism. Fracture of abutment is a common complication in implant was placed in area with high occlusal forces. Inability to remove the broken abutment may most often end up in discarding the implant. Adding one more dental implant mesially to the previously placed implant, improvisation of technique to remove the broken abutment without sacrificing the osseointegrated dental implant, fabrication with cemented custom-made abutment to replace the broken abutment for the first implant, and the use of the two implants to replace a single molar restoration proved reliable and logical treatment solutions to avoid these prosthodontic complications.


**Keywords:** *Bruxism, cantilever effect, crest width, custom fabricated titanium abutment, prosthodontics complication*

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## Introduction

Occlusal forces are greatest in the molar region, leading to possible increased stress on the implant components as well as on the surrounding bone.[1] The screw joint for a single implant is susceptible to loosening because the torque relative to the implant axis must be counteracted by the screw joint itself.[2] The clinical feasibility of using two implants to support a molar restoration has been previously reported.[3]

Failures of implant-supported restorations result from technical problems and can be divided into two groups: those relating to implant components, and those relating to the prosthesis.[4-6] Technical problems related to implant components include abutment screw fracture.[7] Jung *et al*., 2008, reported that prosthetic screw fracture has an incidence rate of 3.9% and the rate for prosthetic screw loosening is 6.7%.[8] Fracture of the implant abutment in a patient with bruxism was reported as a rare case with prosthodontic complication due to the low incidence rate of 3.9%; this can be a serious problem as the fragment remaining inside the implant prevents the implant from efficiently functioning. The primary reason for screw fracture is undetected screw loosening, which can be due to bruxism, an unfavorable superstructure, overloading, or malfunction.[9]

In the presence of bruxism, most authors recommend the placement of more implants than would have been necessary in the absence of the movement disorder. These authors suggested that bruxism remains a potential risk factor; therefore, clinicians should adopt a cautious approach when planning for implant-assisted prostheses in bruxers and authors also argue that the overloading influence of bruxism on implants and their superstructures yields a higher risk of biological and biomechanical complications than would be the case during physiological masticatory activities.[7,10,11] In addition, mechanically connecting the implants leads to better force distribution and a reduced stress on bone around the implants.[12]

Once an abutment fracture has occurred, the fractured screw segment inside of the implant must be removed. Otherwise, the implant will remain osseointegrated but lose its ability to retain the prosthesis; thus, the existing prosthodontic restoration can no longer be used.[6] Methods for retrieving screw fragments within implants *in situ* have been reported.[6,9,10,13-15] This rare



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clinical report presents the management of prosthodontic complication in a patient with bruxism, with reliable and logical treatment solutions.

## Case Report

A 45-year-old male reported to the clinic with the chief complaint of a dislodged crown in relation to an implant placed in the lower posterior region 4 years prior [Figure 1]. The dental history for the surgical and prosthetic treatments for that area was situated outside the town. The clinical and radiographic findings of the patient had a history of bruxing habits and a standard neck, nonsubmerged, screw-type implants of 12 mm height (4.8 mm diameter) (ITI, Straumann, Basel, Switzerland manufacturer) that was inserted more distally in the area of the missing mandibular first molar with a cantilever effect and a crest width of >12 mm [Figure 2]. This clinical report describes a situation, in which a fractured implant abutment screw was not successfully retrieved using the erbium-doped yttrium aluminum garnet laser as an auxiliary tool, which was moved by an explorer or using an ultrasonic scaler tip. Other methods of screw fragment retrieval were employed, which also failed.[15] The apical part of the screw remained threaded into the implant but was fractured at the level of the hexagonal lock. The patient was unwilling to undergo an extensive implant removal procedure; thus, it was decided that the screw hole would be used as a prepared channel for custom fabricated titanium abutment with a passive fit and antirotational device post inside that channel. A recommendation was made to surgically add a narrow neck, nonsubmerged, screw-type, sandblasted, large grit, acid-etched implants of 12 mm height (3.3 mm diameter) (ITI, Straumann, Basel, Switzerland manufacturer) mesial to the previously placed implant [Figure 3]. Informed consent was obtained from the patient after all options for retreatment were explained and before any surgical procedure was conducted. Six weeks after implant placement, it was decided that the fractured portion would be drill out of the abutment screw to make room for fabrication, a custom-fabricated titanium abutment, and the internal threads of the implant were eliminated using a tungsten carbide bur (170 L) in a high-speed air rotor handpiece under copious saline irrigation. The coronal fragment of the fractured segment was removed using an 8 mm round-ended tapered diamond and carbide bur to provide a room for a sufficient length of a passive fit and antirotational device for a post inside that channel capable of resisting the torsional forces. A radiograph was taken to reconfirm the complete room inside the 4.8 mm diameter implant [Figure 3]. The internal threads for the implant were lost. The following steps were followed to fabricate a custom fabricated titanium abutment:

- The implant body was thoroughly cleaned using the air/ water spray from the three-way syringe and then dried with air

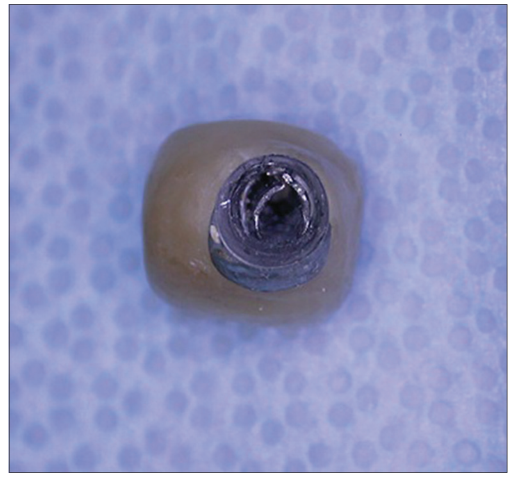

Figure 1: The broken abutment inside the crown

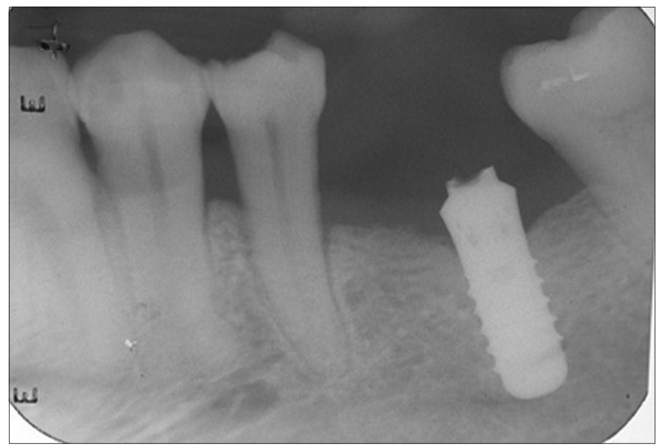

Figure 2: Implant position with fractured implant abutment screw

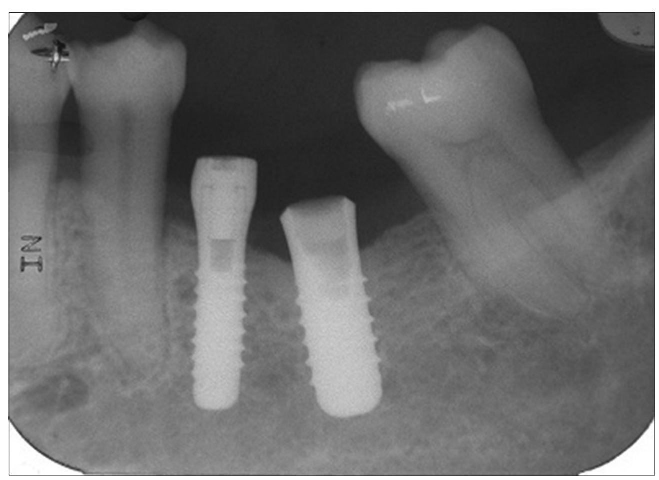

Figure 3: Implant was added mesially and internal implant preparation

- A regular neck stainless steel solid abutment with a diameter of 4.8 mm, and a height of 5.5 mm (ITI, Straumann, Basel, Switzerland manufacturer) was selected to be sure that it is passively fit into the prepared implant room, otherwise more preparation into that room

- GC pattern resin low shrinkage (GC Pattern Resin LS, Europe N.V, Interleuvenlaan 33, B-3001, Leuven) was applied on the internal threads of the RN stainless steel solid Abutment to provide a sufficient length of a passive fit and antirotational device for a post inside that channel capable of resisting the torsional forces
- Impression coping for the solid stainless steel abutment with the GS pattern resin post was taken and sent to the laboratory for fabrication of the titanium abutment
- A trial fitting of the fabricated abutment in the patient's mouth was conducted.

The impression post for the open tray and the fabricated abutment for the 3.3 and 4.8 mm diameter implants, respectively, were inserted in parallel direction [Figure 4]. A pick-up impression was taken, an Narrow Neck CrossFit (NNC) cementable titanium abutment, with a height of 5.9 mm was selected for 3.3 mm diameter implant, and the fabricated abutment was inserted into the cast and to be sure in a parallel direction. Laboratory procedures as well as fabrication of a single metal framework for porcelain-fused-to-metal cemented crown were conducted [Figure 5]. The NNC cementable titanium abutment screw was tightened into 3.3 mm diameter implant, and the fabricated custom-made abutment was cemented into the 4.8 mm diameter implant using resin cement. Delivery of the final restoration included confirmation that proximal contact allowed the patient to perform normal oral hygiene procedures using dental floss and the occlusal scheme for all molars was evaluated to ensure a firm-centric contact [Figure 6]. A postoperative photograph and radiograph were taken after cementation to confirm the seating of the two-implant supported molar restoration at the time of delivery. Oral hygiene instructions were reinforced, and the importance of periodic recall visits was emphasized. A maxillary acrylic resin occlusal guide was provided for long-term stability in this case due to the patient's history of bruxism. Radiographic evaluation has indicated a stable periodontal condition with little or no bone loss associated with the osseointegrated implants. The patient was followed up after 4 years and showed no signs of failure nor peri-implant radiolucency [Figure 7].

## Discussion

Previous studies have shown that prosthesis mobility and screw loosening are the most frequent complications associated with single-implant molar restorations.[16] A high incidence of screw loosening may be a warning sign of potentially more serious complications, including fracture of the implant fixture, which may arise over time with these restorations, as observed by Rangert and others.[17] Zhou *et al*. were performed the meta-analysis to evaluate the relationship between bruxism and dental implant failure. In contrast to nonbruxers, prostheses in bruxers had a higher failure rate. It suggests that bruxism is a contributing factor of causing the occurrence of dental implant technical/biological complications and plays a role in dental implant failure.[18]

At the onset of treatment, the patient was trying to reduce costs by opting for a single fixture, but in the long term, this was not cost effective for the patient or the treating dentist. Abutment screw fracture, although uncommon, does occur in clinical practice, and its removal can be quite challenging for the clinician.[9,13,19] If an abutment screw fracture occurs above the head of the implant, hemostats or artery forceps may be used to grasp the broken screw and remove it successfully. Other methods or systems can be employed to remove the fragment. Most of these systems involve drilling a hole into the center of the broken screw followed by engaging a removal wedge into the broken screw. Reverse torque is then applied with the removal instrument. However, if the methods fail to retrieve the fractured segment or there is damage to the internal threads of the implant screw hole, the implant may be rendered useless. In such a scenario, a fabricated, custom-made, abutment-supported prosthesis can retrieve the near useless implant. Fabrication of custom-made abutment by means of titanium elements for the advantage of titanium's

Figure 4: Impression post and fabricated abutment were inserted

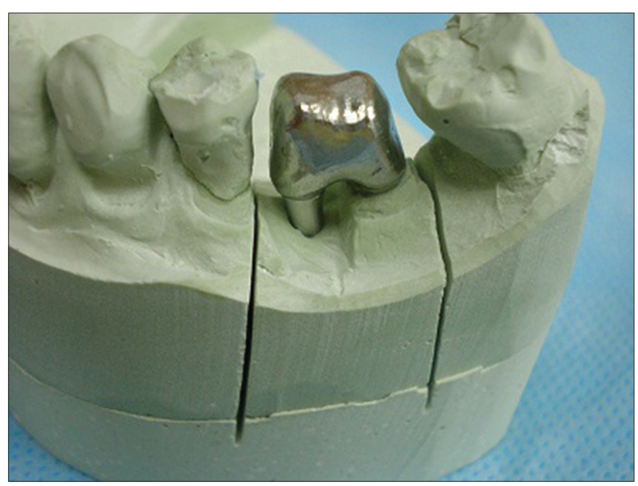

Figure 5: The metal substructure for the porcelain-fused-to-metal crown

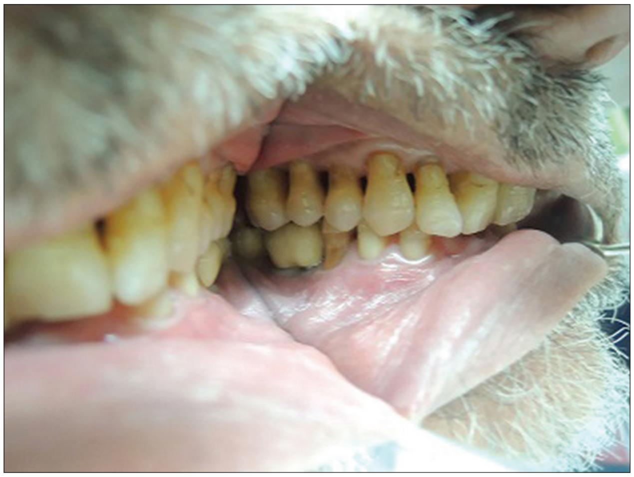

Figure 6: Delivery for the final restoration

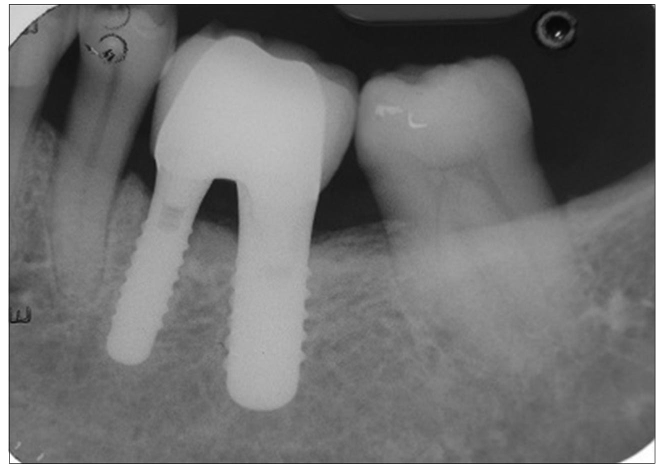

Figure 7: Four-year postoperative for the implants with good bone pattern

melting point (1670°C) higher than stainless steels melting point (1510°C). Nevertheless, the use of two implants is especially indicated in patients who have been identified as pronounced bruxers or clenchers to overcome the masticatory overload. For a molar, the use of two implants provides more surface area for osseointegration and spreads the occlusal loading forces over a wider area while reducing the potential bending forces that would exist in a single-implant molar restoration.[3,20-22] A logical solution to implant overload is the use of two implants to replace the roots of a missing molar.[20]

The postulated advantages of using two implants to support a molar restoration instead of a wide diameter implant are several. First, there is wider support of the restoration in both the mesial-distal and the buccolingual dimensions. In addition, the dentist has greater flexibility to maximize placement in compromised bone receptor sites without perforation of the cortical plates; thus, there is better subsequent retention of the crestal bone levels. The use of two implants also diminishes the potential of the restoration to loosen under normal or parafunctional forces. Furthermore, the double implant may lessen the possibility of occlusal overload. It also allows for greater flexibility in the restorative style used: cement or screw retained. The possibility of increased cost may be outweighed by the reduced likelihood of failure of the implant or the restoration based on the reported complications described earlier. Finally, the double implant does not require special components or procedures that are not normally used in other restorative applications.

## Conclusion

The procedures described in this paper to manage prosthodontic complications resulting from a dental implant was placed surgically more distally with a cantilever effect and a crest width of >12 mm in a patient who had a history of bruxism. Adding one more dental implant mesially to the previously placed implant, improvisation of technique to remove the broken abutment without sacrificing the osseointegrated dental implant, fabrication with cemented custom-made abutment to replace the broken abutment for the first implant, and the use of the two implants to replace a single molar restoration proved reliable and logical treatment solutions to avoid these prosthodontic complications.

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### Conflicts of interest

There are no conflicts of interest.

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