Management of a Fractured Implant Abutment Screw: A Clinical Report
Ceyhun Canpolat, DDS, PhD,¹ Zeynep Özkurt-Kayahan, DDS, PhD,² & Ender Kazazoğlu, DDS, PhD³

¹Assistant Professor, Department of Prosthodontics, Yeditepe University, Faculty of Dentistry, Istanbul, Turkey
²Associate Professor, Department of Prosthodontics, Yeditepe University, Faculty of Dentistry, Istanbul, Turkey
³Professor, Department of Prosthodontics, Yeditepe University, Faculty of Dentistry, Istanbul, Turkey

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Correspondence
Zeynep Özkurt-Kayahan, Department of Prosthodontics, Yeditepe University, Faculty of Dentistry, Bağdat cad. No: 238, 34728 Gозtepe, Istanbul, Turkey.
E-mail: zeynepozkurt@hotmail.com

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Abstract
In an abutment screw fracture, it is generally a challenge for the clinician to remove fractured fragments. In some cases, the screw cannot be removed, and alternative solutions should be considered. This clinical report describes the replacement of a ball attachment with a fractured screw, which was impossible to retrieve, with a cast dowel with ball attachment. The patient who presented to the Department of Prosthodontics, Yeditepe University, Faculty of Dentistry was a 65-year-old woman, wearing a mandibular complete denture supported by two implants for 4 years. She complained about the loss of retention of the denture because of the fractured abutment screw, and it was found that another dentist had previously tried to retrieve the fractured screw with no success. It was decided to construct a cast dowel with ball attachment to improve retention without sacrificing the implant. The interior of the implant and the fractured screw were machined with a rotating instrument. An impression was taken with a metal strip and silicone-based materials. In the laboratory, a stone die was generated from the impression, and a custom-made cast dowel with ball attachment was constructed. It was then cemented with glass ionomer cement and connected to the denture with the direct method. The alternative procedure described in this clinical report was successful for the removal of the fractured abutment screw and use of the existing denture.

Dental implants are an effective, reliable, and predictable prosthodontic treatment option for partially and completely edentulous patients.¹,² Despite a high success rate of 97% to 99%,³,⁴ technical and biological problems may be encountered. Biological complications include peri-implant radiolucencies, peri-implantitis, and radiographic signs of loss of osseointegration. Technical complications include loss of retention, screw loosening, and fractures of porcelain/framework/screws.⁵ Abutment screw fracture is an uncommon (range from 0.5% to 8%)⁶ but challenging technical complication in implant-retained restorations and may occur due to bruxism, unfavorable superstructure, overloading, malfunction, premature occlusal contacts, metal fatigue after screw loosening, and component misfit.⁷,⁸,⁹

A fractured abutment screw must be removed without damage to the implant body to be replaced by a new abutment, so the implant will still be able to retain the prosthesis.¹⁰ The success of removal depends on the location of the screws. If fracture occurs above the head of the implant, the screw can be removed successfully with hemostats; however, if fracture occurs below the head of the implant, other special removal systems, such as Retrieval Instruments (Nobel Biocare, Zurich, Switzerland), Neo Screw Remover Kit (Neobiotech, Seoul, Korea), and Implant Repair Kit (ITI, Waldenburg, Switzerland), should be used.¹¹,¹² If these systems are not available, other methods for retrieving fractured abutment screws may be tried.¹³-¹⁸ Although in the authors’ opinion, removing the fractured part successfully without any damage to the internal threads of the implant and screwing a new abutment is the best solution, the attempts may be unsuccessful in some cases. The aim of this report was to describe an alternative method to remove a fractured screw without sacrificing the implant and to maintain the use of an existing mandibular overdenture using conventional techniques.

Clinical report
A 65-year-old female patient presented to the Department of Prosthodontics, Yeditepe University, Faculty of Dentistry. She had been wearing a maxillary complete denture and a mandibular overdenture supported by two implants for 4 years. She complained about the loss of retention of the overdenture because of the fractured abutment screw whose apical part remained threaded into the implant. Upon clinical examination, it was
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Figure 1 Fractured abutment screw.

Figure 2 (A) Dowel space, (B) metal strip, (C) impression.

Figure 3 Final impression.

Figure 4 (A) Impression of the existing ball attachment, (B) cold-curing acrylic replica.

Figure 5 Cast dowel with ball attachment.

Figure 6 (A) Dowel in place, (B) radiographic image of the dowel.

Figure 7 (A) Cast dowel and ball housing, (B, C) ball housing try-in.

found that another dentist had tried to retrieve the fractured screw but was not successful (Fig 1). The remaining part of the fractured screw was very small, far from the implant neck, and almost impossible to remove. Since the fractured screw and the inner walls of the implant had been machined and damaged during previous removal attempts, it was impossible to retrieve the fractured screw. Therefore, the only solution seemed to be placement of a new implant. Both implants were osseointegrated without any sign of peri-implantitis. The patient and the clinician were not willing to sacrifice the implant and to
Although a fractured abutment screw is a challenging complication of implant-supported restorations,18 although a fractured screw should be retrieved and replaced by a new one without any damage to the internal threads of the implant, in some cases, it cannot be removed.17 In the literature, various techniques have been described to decrease the risk of implant damage.11-17 Retrieving the fractured screw is the best solution; however, an alternative method was used for this patient, who required placement of a custom-made metallic dowel into the implant. In situations in which the fractured screw cannot be removed, and the inner surface of the implant is damaged, the implant would be sacrificed, the treatment plan would be changed, and new implants would be inserted with additional cost. This conservative management is easy to perform, cost-effective, and time-efficient and does not require additional equipment. On the other hand, the aim of this technique should be to avoid any further complications such as loosening of the dowel. Retrieving the fractured parts is important, but so is defining the reason for failure and eliminating those factors, including checking the occlusion, eliminating premature contacts, and equilibrating the chewing force.15 It is highly recommended that a detailed clinical examination be performed to identify parafunctional activities, such as bruxism, which may cause component fractures.13

The results are satisfactory both for the patient and for the clinician. After a 15-month follow-up, continued stabilization of the dowel, implant, and dentures was observed (Fig 9).

**Discussion**

There is only one article in the literature presenting a technique of converting the screw chamber into a dowel space and constructing a dowel-core and crown restoration.18 However, the presented case describes a similar solution to abutment screw fracture complication of an implant-retained overdenture. One possible explanation for the fracture was assumed to be the unrecognized loosening of the screw caused by nonaxial or excessive prosthetic loading, poor denture support, poor balance, or occlusal rocking. The case was complicated because another dentist attempted to remove the fractured part with an unsuccessful outcome, decreasing the possibility of removing the screw with special removal systems. Therefore, a cast metallic dowel with ball attachment reproduction was constructed to use the existing implant and overdenture, saving the patient’s time and the cost of a new implant and a new overdenture.

The implant interior and the remaining fractured screw were machined with a high-speed handpiece (320,000 rpm) under water cooling and a diamond bur (Super Coarse, 180 to 200 μm, No:544; Acurata GmbH, Thurmansbang, Germany). The running handpiece was removed from the implant every few seconds so there was adequate water cooling inside the implant. After radiographs of the dowel space were taken (Fig 2A), an impression was taken with a metal strip (Fig 2B) and poly(vinyl siloxane) (PVS) impression material (Fig 2C; Express XT Light Body Quick and Express XT Penta Putty, 3M ESPE, Neuss, Germany). After polymerization (Fig 3), another impression was taken with PVS material to construct a similar attachment above the dowel that would be a reproduction of the ball attachment of the sound implant (Fig 4A). After the negative space of the existing ball attachment was filled with cold-curing acrylic material (Meliodent; Heraeus Kulzer GmbH, Hanau, Germany) to determine the height, a stone die was generated from the impression (Fig 4B). A custom-made cast dowel with ball attachment (Vario-Kugel Snap vks 1.7; Bredent, Senden, Germany) was fabricated in the laboratory, using chrome-cobalt alloy (MESA, Brescia, Italy; Fig 5). In the next appointment, a cast dowel with ball attachment was tried in the site for proper fit. The dowel was then luted with glass ionomer cement (Meron; VOCO GmbH, Cuxhaven, Germany; Fig 6). The ball housing (Fig 7) was fixed in the existing mandibular overdenture with the direct method using self-curing acrylic resin material (Meliodent; Heraeus Kulzer GmbH, Hanau, Germany). Excess acrylic came out through the previously opened hole in the denture (Fig 8). After polymerization of the acrylic, the overdenture was removed, trimmed, and polished. The overdenture was checked for retention, and proper occlusal relationship with the existing maxillary complete denture was obtained.

The patient was satisfied with the final result.

**Figure 8** A hole was opened for excess acrylic in the existing mandibular overdenture.

**Figure 9** Patient with restored ball attachment after 15 months follow-up.
Conclusion

This report suggests that a conventional technique used for natural teeth such as cast dowel with ball attachment may be a useful compromise option for replacing failed implant abutment screws in such cases.

References
