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CLINICAL REPORT

Alternative approach to salvaging an implant with a fractured screw fragment: A clinical report

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ABSTRACT

Managing fractures of implant abutment screws is challenging because of the uncertainty associated with the removal of the fractured screw fragments. In case of unsuccessful retrieval of the fractured fragment with known techniques, removal and replacement of the implant becomes traumatic and financially burdensome to the patient. This clinical report describes a conservative solution for the management of nonretrievable fractured screws by reconnecting the prostheses to the existing implants by using cut screws. This alternative, cost-effective method obviates the need for surgery and has proved successful and satisfactory for patients. (J Prosthet Dent 2021;125:18-21)

Implant abutment screw fracture is not common, ranging from 0.5% to 8%[1]; however, its clinical management is challenging because of the difficulty in removing the fractured screw fragments.[2-4] Once the fractured screw fragment is removed without damaging the implant, the screw can be replaced effectively to solve problems. A loosely engaged fractured screw fragment, which is not locked in the implant, can be successfully retrieved by unscrewing it counterclockwise by using a sharp instrument, such as an explorer or a straight probe.[2,3] However, if the fractured fragment is tightly engaged with the internal threads of the implant, removing the screw may not be possible.[4,5] In such situations, various commercially available removal kits with low-speed rotary instruments can be used to remove the fractured screw fragment; however, the results of such approaches are uncertain, and the implants may become irreversibly damaged.[5-7] When removal of the screw fragment is impossible or when the internal thread is damaged during the removal, many clinicians choose to remove the implant and replace it with a new one or leave it buried in the soft tissue and unconnected to the superstructure.[5-9] An alternative approach using a dowel system has been described with the screw fragment remaining in the implant, which is prepared for a cast post similar to that during the cast dowel core fabrication of natural teeth.[3,6,7] However, this method has the risk of additional problems, including cement wash-out, reduction in the strength of the remaining walls, and increased risk of implant fracture from a wedging effect depending on the amount of preparation. Therefore, this report describes an alternative way to salvage implants with irretrievable fractured screw fragments. In vitro studies have reported no significant relationship between the length of the abutment screw and screw loosening or fracture strength, provided that the screw is at least 1.4-mm long or 3.5 screw threads.[10-13] No significant decrease in retention has been reported with external hexagon implants with screw threads of up to 2.5; moreover, abutment screws with a minimum screw thread of 3.5 showed no significant difference in removal torque loss after cyclic loading with both internal and external hexagon implants.[14] This clinical report aims to provide a novel solution for the management of fractured implant abutment screws with irretrievable fragments by using shorter abutment screws cut to the remaining internal threads.

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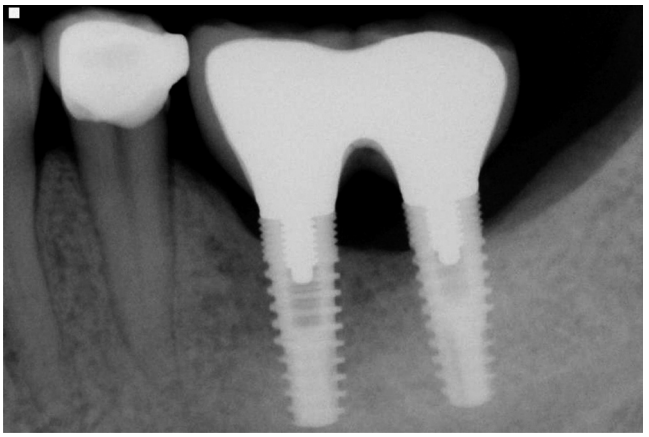

Figure 1. Before abutment screw fracture. Mandibular left second molar implant (patient 1).

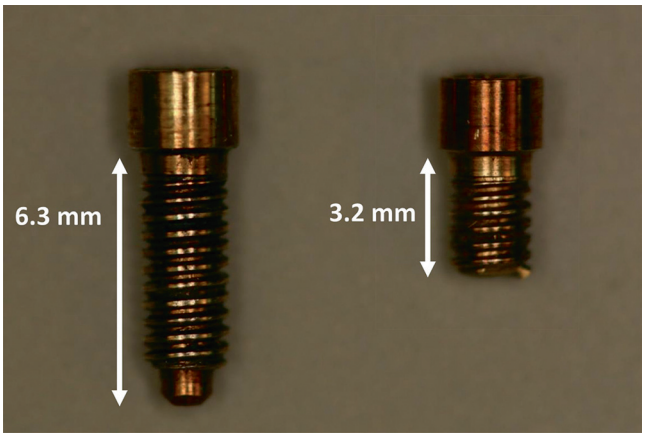

Figure 2. Intact screw (left) and cut screw (right) (patient 1).

CLINICAL REPORT

Patient 1

A 45-year-old woman presented to the Department of Prosthodontics, Seoul National University Dental Hospital (SNUDH) with complaints about the mobility of the prosthesis supported by 2 implants in the left mandibular posterior area, which had been placed 3 years ago (Hexplant 4.0×11.5 mm; Warantec) (Fig. 1). Clinical examination revealed that both the abutment screws were fractured and remained within the implants. One of the fractured screws was removed by rotating it counterclockwise by using a sharp explorer. However, despite the use of other clinical techniques—the use of an ultrasonic scaler and a removal kit with low-speed rotary instruments—the other screw could not be retrieved. The patient was reluctant to consent to implant removal and replacement; therefore, an alternative option was attempted. She was informed about the procedure she would receive and consented to undergo this new method. She was also informed of the inevitable need for surgery should the method fail.

The fractured screw fragment was pushed down gently by using a no. 330 tungsten carbide bur with a high-speed clockwise rotating handpiece with a pushing action to avoid damaging the internal threads of the implant. A new abutment screw was prepared by cutting it to the length of the remaining upper part of the internal threads (3.2 mm; 6.5 threads) (Fig. 2). During the cutting of the screw, cooling with a spray syringe and drilling with minimal pressure eliminated the potential for structural damage. Initially, a passive fit of the existing prosthesis was identified. Thereafter, the prosthesis was connected by hand-tightening the cut screw only to the implant in which the fractured fragment remained. If the prosthesis was not secured properly and the screw was not fully tightened, it would mean the screw was not short enough; therefore, the cut screw had to be slightly shortened again. After confirming that the prosthesis was secured on the implants, all the screws, including the intact one, were engaged into both implants and tightened with a manufacturer-recommended torque of 30 Ncm (Fig. 3). The occlusal relationship was examined and adjusted to obtain stable occlusion. Screw access holes were sealed with cotton and interim filling material (Fermit; Ivoclar Vivadent AG). A month later, the abutment screws were retightened with 30-Ncm torque, and the access holes were sealed with cotton and composite resin (Filtek Z250; 3M ESPE). At the 3-year follow-up visit, it was confirmed that the screws were tightened sufficiently and that there were no biological or technical problems (Fig. 4). After replacing the screws, the patient was followed up for 11 years. The abutment screws and the prosthesis remained stable without any sign of screw loosening or fracture. The patient was satisfied with the result and reported no discomfort.

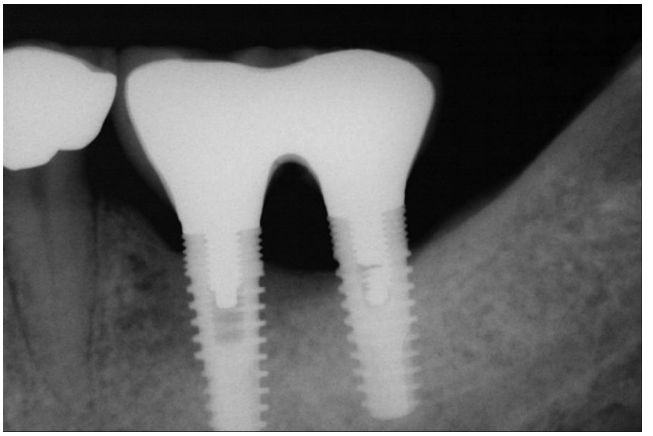

Figure 3. After reconnection of existing prosthesis with cut screw (patient 1).

Patient 2

An 83-year-old woman was treated with implants in the left canine and premolar area at SNUDH (Hexplant

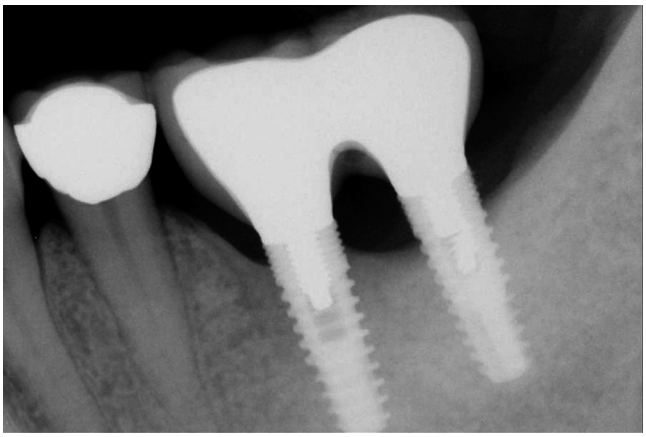

Figure 4. Three years after reconnection of prosthesis with cut screw (patient 1).

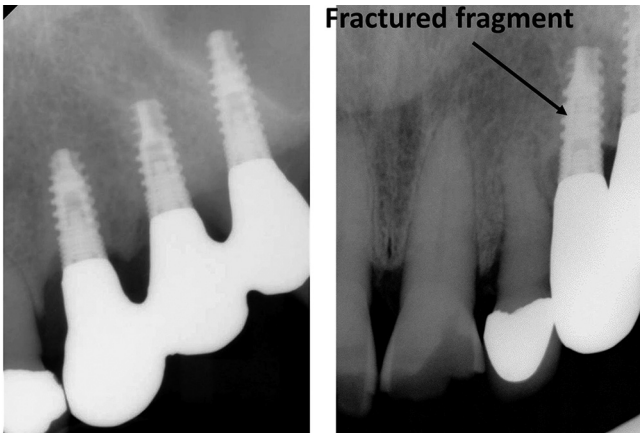

Figure 5. Before screw fracture in maxillary left canine implant (left); after treatment with cut screw (right) (patient 2).

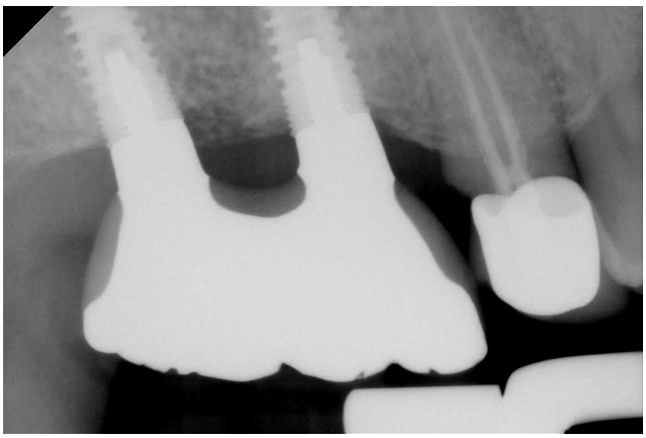

Figure 6. Before screw fracture in maxillary right second molar implant (patient 3).

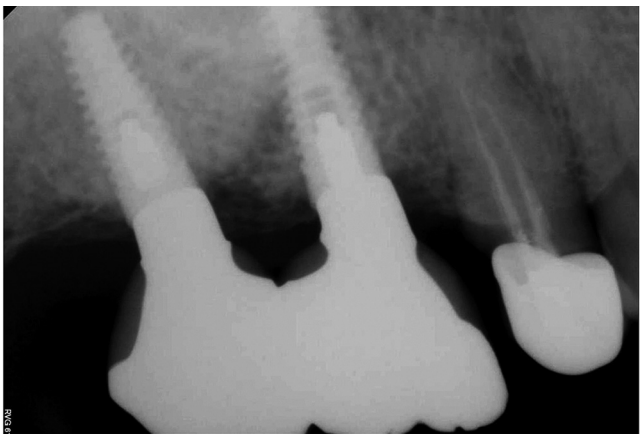

Figure 7. After treatment with cut screw in maxillary right second molar implant (patient 3).

3.3×8.5 mm for the canine and the first premolar area; Hexplant 3.3×10 mm for the second premolar area; Warantec) (Fig. 1). Four years later, she visited the hospital with the chief complaint of movement of the implant-supported prosthesis. On clinical examination, the implants were found to be osseointegrated; however, the prosthesis was mobile because of the fractured abutment screws. Of the 3 fractured screws, 2 screw fragments in the premolar area were removed by counterclockwise rotation with an explorer and an ultrasonic scaler. However, the screw fragment in the canine implant was locked in the internal threads and could not be retrieved. As the patient declined replacement of this implant, the alternative method was attempted. For the implant with the irretrievable screw fragment, a new screw was prepared, which was cut to the length of the internal threads on the upper part of the fragment (2.15 mm, 3.5 threads). After confirming the passive fit of the prosthesis, it was connected to the canine implant by using the cut screw, along with the 2 new screws that were connected to the premolar implants. The occlusal relationship was examined and adjusted to obtain stable occlusion. After confirming that the prosthesis was secured on the implants, the abutment screws were tightened with a manufacturer-recommended torque of 20 Ncm and subsequently retightened with the same torque a month later. At the 3-year follow-up visit, the implants and prosthesis were stable, and the patient was satisfied and reported no discomfort (Fig. 5).

Patient 3

A 71-year-old man visited SNUDH with a dislodged prosthesis from the implants in the right maxillary posterior area (Hexplant 4.3×13 mm for the first molar area; Hexplant 4.3×11.5 for the second molar area; Warantec) (Fig. 6). He had previously experienced screw loosening 4 times (at 1, 3, 9, and 10 years previously). The screw loosening that occurred the year before was accompanied by a fracture of the second molar implant. Clinical examination revealed abutment screw fracture in the

second molar implant and screw loosening of the adjacent implant, the same as that which occurred the year before. Retrieval of the screw fragment was attempted with various techniques, including counterclockwise rotation with an explorer, use of an ultrasonic scaler, and a removal kit with a low-speed drilling instrument. However, they were unsuccessful, and the fragment went deeper during drilling with the low-speed rotary instrument. Options included removal and replacement of the implant or securing the existing prosthesis with a short screw cut to the length of the remaining internal threads. The patient was unwilling to undergo surgical intervention and, therefore, chose the short screw. After preparing the cut screw for an implant with an irretrievable fragment (2.60 mm, 4.5 threads), the prosthesis was connected. The passive fit of the prosthesis was confirmed, and the occlusal relationship was examined. Occlusal interference was eliminated to obtain stable occlusion. The abutment screws were tightened with 20-Ncm torque and retightened a month later. At the 1-year follow-up visit, the implants and prosthesis were stable, and the patient was satisfied and reported no discomfort (Fig. 7).

DISCUSSION

Implant screw fracture is a challenging situation that may occur due to fatigue from overload, nonpassive fit of the prostheses, improper occlusion, or manufacturing errors.[2] Removal of the fractured screw fragment from the implant and replacement with a new one is recommended; however, in some situations, the fractured screw fragment cannot be retrieved successfully.[4,5] When all attempts at retrieval are unsuccessful, the novel approach described may prove to be the best alternative. It is a conservative solution that eliminates the need for surgical intervention. In addition, it is cost-effective and consumes less time because the existing prosthesis can be salvaged. However, to prevent further complications such as screw loosening, this method should be used cautiously. Moreover, cut screws with at least 3.5 threads (1.4 mm) are recommended.[10-13] This requires adequate length of the internal threads to remain above the fractured fragment inside the implant. If the length of the fractured fragment above the implant is not secured, careful reduction of the fractured fragment is required without damaging the internal threads.

Fracture of the abutment screws may indicate overloading of the implants. It is important to identify the etiology of the fracture and eliminate the risk factors. In parallel with problem resolution, it is recommended that various efforts be made to eliminate the cause of screw fracture, such as inadequate occlusion, premature contacts, parafunction, and nonpassive fit or misfit of the prosthesis.[3-5]

SUMMARY

This clinical report describes a novel solution for the management of implants with irretrievable fractured implant abutment screws. The screw is prepared by cutting it to the length of the remaining upper part of the internal threads of the implant and, thereafter, connecting the existing prosthesis with the cut screw to the implant.

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