Retrieval of a Separated Implant Screwdriver Fragment

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Introduction

The use of dental implants for replacement of a single missing tooth is a well-established treatment modality.[1,2] The procedure of implant placement and restoration has been conventionally divided into surgical and prosthetic phases. Each phase requires specialized instrumentation and trained operators. The main prosthetic procedures for a straightforward, single-implant rehabilitation are abutment connection, impression, abutment modifications if needed, followed by trial and delivery of the prosthesis. Even with precautionary measures, some complications may occur during implant therapy. Various classifications have been proposed to categorize these complications.[3–5] Although prosthetic complications are given some consideration, detailed intraoperative and procedural complications during the prosthetic phase have not been considered in most classifications.

Although instrument breakage or separation has been mentioned under the classification of surgical complications,[6] there is no classification that considers such a complication during the prosthetic phase. Numerous instruments are used during the prosthetic phase of implant therapy. One such instrument is the screwdriver used to tighten the screw that holds the abutment and implant together. It is mandatory to use the implant screwdriver in conjunction with a calibrated torque wrench, as it has been shown that even experienced operators tighten the screws to only 30%–50% of the prescribed torque when using handheld screwdrivers and that a torque wrench application also reduces microbial leakage.[7,8]

This case report describes an intraoperative complication that arose due to the separation of the tip of a screwdriver in the screw access channel of the abutment. This features a lesser-reported complication due to instrumentation failure and operator error. It also describes the technique that was used to retrieve it so that the procedure of rehabilitation could be completed successfully.

Description of the Case

A 39-year-old man reported to the Department of Prosthodonics, Goa Dental College and Hospital, with a request for the replacement of a missing lower molar No. 31. After a detailed clinical and radiographic examination, a single implant-supported crown was decided upon as the ideal treatment plan for the replacement of the tooth No. 31.

A 2-stage protocol was selected for the implant treatment. At the next appointment, implant (GS II, Osstem, Seoul, South Korea) placement was done under antibiotic cover. The fixture measured 5.5 mm in diameter and 11.5 mm in length. The surgical procedures were carried out according to the manufacturer's instructions. The surgical site was closed with sutures, and the patient was dismissed with postoperative home care instructions. A week later, the sutures were removed, and the surgical site demonstrated good healing. The patient was asked to report back to the department after 3 months.

After the completion of 3 months, following a radiologic evaluation, second-stage surgery was performed and a healing abutment was placed. The healing abutment was left for a period of 3 weeks, after which the abutment connection was planned. During the abutment connection and tightening using the torque wrench, the tip of the screwdriver (1.2 S, Osstem) separated and remained wedged inside the screw access hole in the abutment (Figure 1). The reason for the separation was overtightening.

A radiograph revealed that approximately 2.5 mm of the tip had separated from the instrument and had remained embedded in the screw access channel (Figure 2a). The fragment had to be

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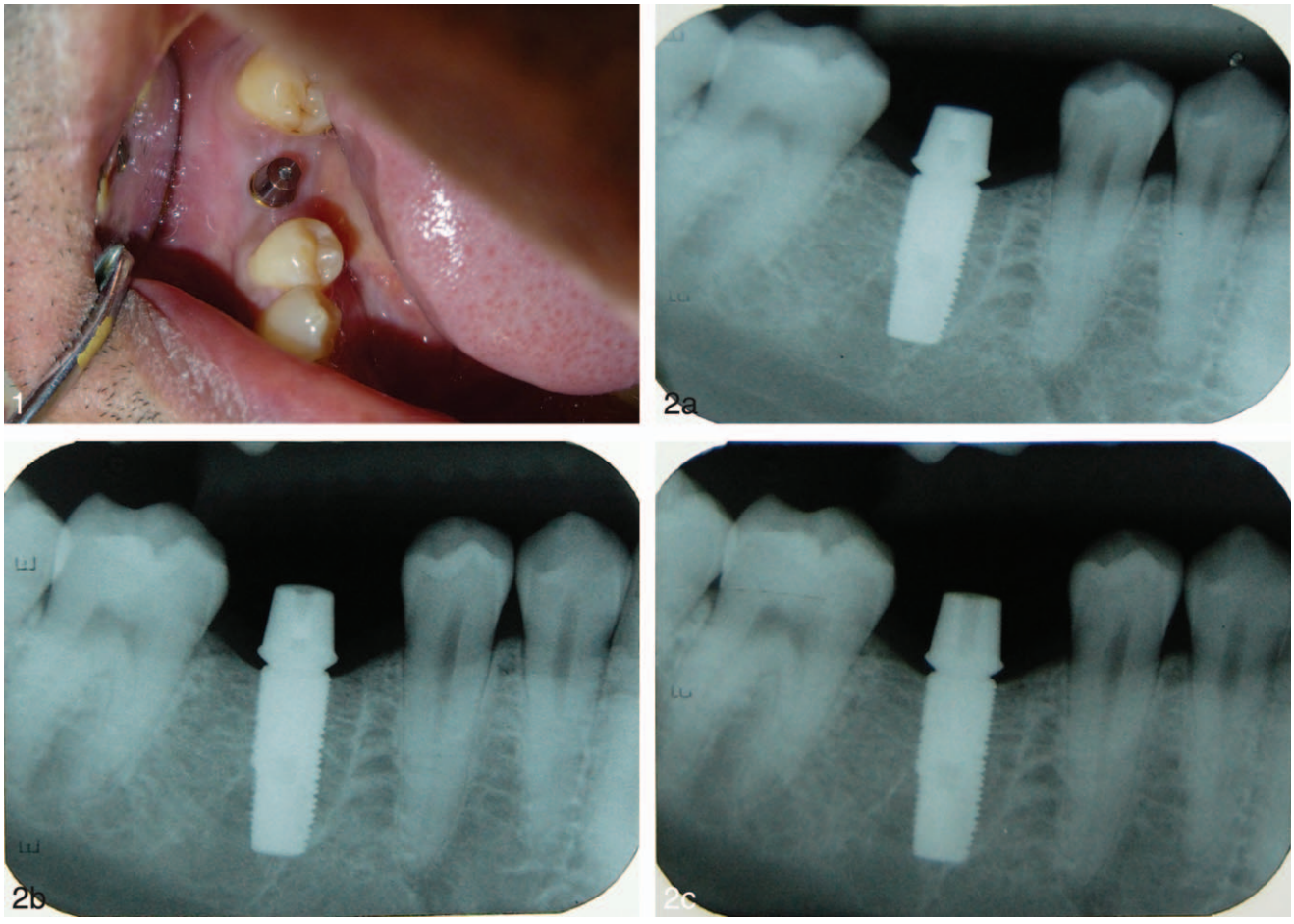
DOI: 10.1563/AAID-JOI-D-12-00128

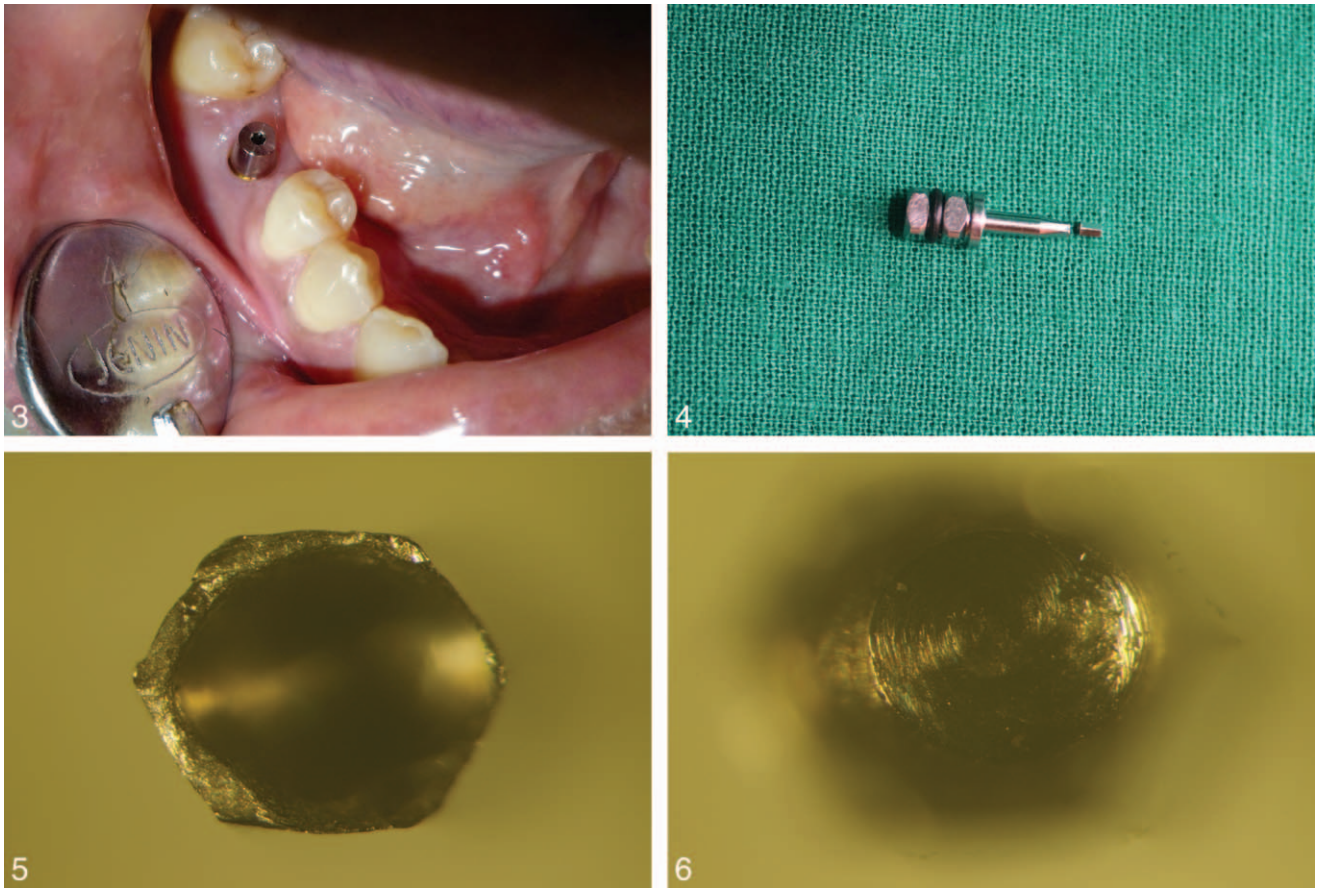


FIGURES 1–2. FIGURE 1. Intraoral, occlusal view of the abutment showing the separated screwdriver fragment embedded in the screw access channel. **FIGURE 2.** Intraoral radiograph showing the separated fragment. (a) Preoperative. (b) Intraoperative. (c) Postoperative.

removed so that access could be kept patent if the abutment required retightening or replacement. The fragment was friction locked into the screw access channel. The broken fragment was hexagonal in cross section and measured 1.2 mm in width.

The available options for the retrieval of the fragment were assessed, and the following plan was selected. The fragment was locked in due to friction, and its sides were in very close approximation with the walls of the channel. One possible way was to tease the fragment out of the access channel by creating a purchase point to gain a mechanical advantage. The plan involved drilling a purchase point using a needle-point diamond into the broken fragment.

A high-speed handpiece with a fine needle-point diamond (TC-11, Mani Inc, Japan) was centered on the hexagonal separated fragment and checked. Because of the limited margin for error, the position and angulation of the head of the handpiece were practiced until the exact spot for the drill was engaged repeatedly. The purchase point was then created, keeping the handpiece stable and the diamond point rotating at a high speed with abundant cooling with jets of distilled water. The handpiece was moved only vertically while its buccolingual and mesiodistal positions were kept steady. Once the indentation was deemed deep enough to engage with a dental explorer, a radiograph was taken to assess the position of the drill point (Figure 2b). Then, a sharp explorer tip was firmly engaged into the purchase point created by the diamond point and teased out using vertical/occlusal strokes. When the fragment showed over the rim of the abutment occlusally, it was held with a pair of tweezers and removed. Another radiograph was taken to confirm that the whole fragment was successfully retrieved (Figures 2c



Figures 3–6. Figure 3. Intraoral, occlusal view showing the abutment after the retrieval of the separated screwdriver fragment. **Figure 4.** The screwdriver and the separated fragment after its retrieval. **Figure 5.** The separated fragment seen under ×10 magnification, showing the hexagonal outer rim. **Figure 6.** The separated fragment seen under ×10 magnification, showing the purchase point drilled into it.

and 3). The retrieved fragment was approximated with the rest of the screwdriver from which it had separated and checked for complete retrieval (Figure 4). The impression procedure, trial, and delivery of the finished crown were carried out at subsequent appointments. The retrieved fragment was examined under a stereomicroscope (Olympus SZX 16, Tokyo, Japan) to evaluate the positioning of the purchase point (Figures 5 and 6).

Discussion

Many authors have classified the complications that arise during and after the prosthetic phase of implant therapy.[3–5] Complications due to instrument or operator error are rarely (if at all) included. Reports regarding prosthetic complications of implant restorations are largely dominated by fractures of prosthetic, threaded components and the use of manufacturer-provided kits and/or routine dental instruments for retrieval of such fragments.[9–15]

In the current case, the separated fragment was lodged into the screw access channel and was held there by friction and not by a thread mechanism. This report describes the use of routine dental instruments for its retrieval. The technique demanded precision and stability as only minimum damage to the screw access hole could be accepted.

When assessed postoperatively, the cause of the separation was determined to be due to the failure in calibrating the torque wrench to a manufacturer-prescribed 30 Ncm. It was found to be set at infinity and would thus directly transmit all of the applied force to the tip of the driver without giving way at the elbow, where it is designed to cut the torque if it exceeds a preset limit. Also, as the implant screwdrivers used for prosthetic procedures are subjected to sterilization procedures, fatigue of the instrument may also have been a contributing

factor for the intraoperative separation of the screwdriver.[6]

Another aspect to this is also the fact that this complication may have risen as the operator was still learning and fairly inexperienced. The Dental Implant Clinical Research Group pointed out that inexperienced dentists have twice as many complications as experienced ones during implant treatment.[16] However, every operator has to go through a training and learning phase where mistakes and complications are bound to happen. It is far more important to learn the nature of the complication, avoid it in the future, and, in case it occurs, tackle it with confidence so as to not cause any kind of permanent and irreversible damage to the implant or the patient.

The examination of the separated segment below a ×10 magnification showed that the drilling had not violated the sides of the fragment. The precise drilling procedure had ensured correct angulation and depth of the purchase point.

In light of the observations made in this case, the prevention of such an occurrence is of utmost importance. To ensure this, the instruments used during the prosthetic procedures should be routinely checked for signs of wear. A track must be kept of the sterilization cycles the instruments have gone through so that appropriate replacements can be made when necessary. The operating personnel and assistants must always be aware that they are handling precision instruments and they should follow strict adherence to manufacturer specifications. The operation of the instruments should be learned and practiced methodically.

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