A Modified Technique for Removing a Failed Abutment Screw From an Implant With a Custom Guide Tube

Yohsuke Taira, DDS, PhD*
Takashi Sawase, DDS, PhD

Fracture of abutment screw is a serious prosthodontic complication. When the abutment screw is fractured at the junction of the screw shank and screw thread, removal of the fractured screw fragment from the screw hole can be difficult. This article describes a modified technique for removing the failed abutment screw with a custom guide tube and tungsten carbide bur. The failed screw can be removed speedily without damaging the screw hole of the implant body or the screw threads.

Key Words: implant, prosthodontic complication, abutment screw, removal

INTRODUCTION

A modified implant-supported prosthesis is a useful treatment option for replacement of a missing tooth. However, clinicians occasionally encounter complications, such as abutment screw loosening and fracture.1–4 The incidence of abutment screw fracture was reported to range from 0.5% to 8%.2 Abutment screw fractures are related to the design of the implant-abutment connection, poorly fitting framework, bone remodeling and release of pretension in the screw joint, reduced clamping force and screw joint movement, heavy occlusal forces, and metal fatigue after screw loosening.2,3,5

The screw shank is defined as the cylindrical length of the screw that extends from the underside of the head to the first thread (Figure 1). Fractures mostly occur at the junction of the screw head and screw shank or at the junction of the screw shank and screw thread.6 Once a tightened screw fails at the junction of the screw shank and screw thread, it is difficult to remove the remaining screw from the screw hole. Furthermore, the threads of the screw hole should not be damaged during the removal of the fragment so that the superstructure can be replaced. Although some manufacturers supply instruments, for example, Retrieval Instruments (Nobel Biocare, Zurich, Switzerland) and Neo Screw Remover kit (Neobiotech Co Ltd, Seoul, Korea), to remove failed abutment screws with a low-speed micro-motor hand piece or with a hand driver, the procedure is often time consuming. The purpose of this article was to describe a simple and accurate clinical technique for removing a fractured abutment screw fragment from the implant body using a custom guide tube.
A 68-year-old female patient was referred to our hospital for management of a prosthodontic complication associated with an implant (Branemark System RP, Nobel Biocare) that had been placed 13 years earlier. The patient reported mobility of the superstructure in the maxillary central incisors region. A 30° angled abutment and a superstructure were retained with screws. The splinted crowns were veneered with a resin composite. A dental radiograph revealed that the abutment screw of the maxillary right central incisor had fractured at the junction of the screw shank and screw thread (Figures 2 through 4). The failed abutment screw was removed and a new abutment was connected in the following manner.

1. Stainless steel tubes (Sprue Pin Tube, Daiei Dental Product Co Ltd, Osaka, Japan) of 2 sizes were prepared to fabricate a guide tube. The narrow tube (1.5 mm external diameter, 4 mm length) was attached inside the thick tube (1.8 mm external diameter, 4 mm length) with cyanoacrylate bonding agent (Dental Cyanone, Koatsu Gas Kogyo Co Ltd, Osaka, Japan), to form a single tube, 6 mm long. A curved acrylic beam (4–5 mm width, 19 mm length) was prepared with self-curing resin (Pattern Resin, GC Corp, Tokyo, Japan) to form a handle on the plaster study.
model. A primer (Alloy Primer, Kuraray Medical Co Ltd, Tokyo, Japan) was applied on the tube, and the resin handle was affixed with Pattern Resin (Figure 5). The tube extended to a length of 4 mm under the handle in order to reach the fractured abutment screw fragment.

2. Holding on to the handle (Figure 6), the guide tube and tungsten carbide bur (Mani Carbide Burs No. 330, J. Morita Corp, Osaka, Japan) were inserted into the screw hole successively until these touched the failed abutment screw (Figure 7). The head and shank of the tungsten carbide bur were 0.7 mm and 1.5 mm in diameter, respectively.

3. A hole was drilled in the center of the failed abutment screw with a high-speed air-turbine (J. Morita Corp) and the tungsten carbide bur through the guide tube, protecting the surface of the screw hole with the guide tube (Figure 8).

4. The threads of the screw hole were restored with a series of instruments (Retrieval Instruments, Nobel Biocare) (Figure 9) according to the manufacturer’s instructions. An impression was taken to fabricate a custom abutment (Procera, Nobel Biocare), which was tightened with a new abutment screw (Figures 10 and 11), and then a porcelain fused metal prosthesis was constructed (Figure 12).

**Discussion**

The custom guide tube enables the use of a high-speed air turbine or a high-speed micro-motor hand piece and provides reliable protection of the screw hole against drilling. As shown in Figure 7, two tubes of different diameters were connected so that the tapered shank of the tungsten carbide bur could be inserted in the guide tube. The resin handle also functioned as a stopper of the hand piece.
head. When compared to the commercially available instruments (Retrieval Instruments and Neo Screw Remover kit), the custom guide tube is inexpensive and disposable.

The procedure described here was used to remove a Branemark abutment screw. This method may be applied to other types of abutment screws, and other implant systems, by adjusting the size of the guide tube, and can be used for removing fractured prosthesis screws as well. Suitable burs or diamond points may be selected according to the screw size.

In this case, the drilling was performed intermittently, and the instruments were always cooled with water spray from the air-turbine. The drilling was performed for about 1 second with an interval of several seconds. Some microscopic studies revealed that the blood flow in bone became sluggish at 53°C, and that bone necrosis occurred at scalding temperatures greater than or equal to 70°C. In order to prevent bone damage, care must be taken not to raise the local temperature of the implant-bone interface while drilling the failed abutment screw.

The tungsten carbide bur penetrated the failed abutment screw easily and safely. Once a hole was prepared in the center of the failed abutment screw, it became easy to turn the fragment out and restore the screw threads with the conventional instruments (Retrieval Instruments). When the proprietary kits are not available, narrow screwdrivers may be used to rotate the fractured screw fragment counterclockwise and pick it out of the screw hole.

**Figures 9–12.** Figure 9. Retrieval Instruments for Branemark System (Nobel Biocare). Figure 10. The failed abutment screw and abutment were successfully replaced with a custom abutment. Figure 11. Radiograph showed that the connection of the implant body, the replaced abutment, and the new abutment screw were fine. Figure 12. The fabricated porcelain fused metal prosthesis was tried on the custom abutment.
After removing the fractured screw fragment, there was no interference in the connection between the impression coping and the screw hole. Therefore, an impression was taken according to the manufacturer’s instructions, and the Procera abutment was tightened successfully. It is suggested that the described guide tube and technical procedure can be applied for removing failed abutment screws from the screw hole and for replacing failed abutments and superstructures in other cases.

One of the possible explanations as to why the abutment screw was fractured in this case is that high bending moment was generated on the abutment screw when using 30° angled abutment. It may be the reason why some manufacturers do not make such severely angled abutments.

**CONCLUSION**

When the tightened abutment screw fails at the junction of the screw shank and screw thread, the fractured abutment screw fragment can be speedily removed from the implant body by means of a custom guide tube without damaging the screw hole. This technique would be a useful option for replacing failed abutment screws.

**REFERENCES**