



Removal of a Fractured Locator Abutment Screw Fragment

Ilser Turkyilmaz, Matthew Joseph Vierra, Neset Volkan Asar

ABSTRACT

Background: Although, dental implants have been a predictable option to support several types of restorations, mechanical problems are not uncommon. Retaining and abutment screw loosening/fractures are one of the most common technical problems.

Aim: To present a step-by-step technique in order to remove a broken locator abutment screw fragment.

Materials and methods: A 56-year-old, edentulous man with a fractured locator abutment screw in an implant was referred to our clinic from a private practice. His dentist placed a narrow platform locator abutment onto a regular platform implant and the fracture occurred. Attempts to remove the fractured fragment using a periodontal probe and a manual screw removal driver were unsuccessful.

Results: This clinical report presents a situation in which a fractured locator abutment screw fragment was successfully removed using an implant repair kit.

Conclusion: A fractured locator abutment screw fragment was successfully removed using an implant repair kit including drills, drill guides and tapping instruments. To avoid similar complications, it is recommended to use appropriate manufacturer specified torque values in conjunction with compatible restorative components.

Clinical significance: Retaining and abutment screw loosening/fractures are one of the most common mechanical problems associated with the implant components. This clinical report showed how to remove a broken screw fragment using proper armamentarium and technique, which might help clinicians eliminate similar problems.

Keywords: Implant, Locator, Screw, Fracture, Torque.

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INTRODUCTION

Ever since dental implants were first successfully employed in restoring completely edentulous mandibles, implant supported

dental rehabilitations of various designs and complexity have been shown to be a reliable and predictable treatment option for both partially and fully edentulous patients.¹⁻³ Dental implants can provide high success rates with meticulous treatment planning, appropriate implant placement, adequate prosthetic design, and proper maintenance.¹⁻³

Although implant success rates are high, mechanical problems are not uncommon.⁴⁻⁶ Common mechanical complications are associated with the implant components or the restorations.⁴⁻⁶ Retaining and abutment screw loosening/fractures are one of the most common mechanical problems.⁵⁻⁷ Screw loosening, which may result from bruxism, nonpassive fit of superstructure, or overloading is a considerable reason for screw fracture.⁸⁻¹⁰ In addition, abutment screw fractures are related to the design of the implant-abutment connection, bone remodeling and release of pretension in the screw joint, reduced clamping force and screw joint movement, metal fatigue, and defects, such as porosity, during fabrication.^{6,11,12} Fractures usually occur at the junction of the screw head and screw shank or at the junction of the screw shank and screw thread.^{12,13} The screw shank is the cylindrical section of the screw that extends from the bottom of the head to the first thread (Fig. 1). If a torqued screw fractures at the junction



Fig. 1: Patient with fractured locator abutment covered with temporary restorative material

of the screw shank and screw thread, it is often difficult to retrieve the remaining screw fragment from the screw hole.¹² Furthermore, the threads of the screw hole should not be damaged during the removal of the fragment so that the superstructure/restoration can be replaced.

It is generally easier to remove fractured screw fragments if the screw emerges from the implant. The broken fragment can be held with a hemostat and taken out by turning counterclockwise. If the screws are fractured in the deep part of the implant screw hole, it might not be possible to remove the fragments.^{14,15} Then, these implants may have to be covered over with soft tissue due to the nonretrievable fragments, and the existing restoration may no longer be utilized.⁷ Therefore, the removal of failed screw fragments is an important and often time consuming task for the clinician, which requires significant experience and extra-armormentarium.

Only few methods of addressing a fractured abutment screws have been described in the literature.^{7,14,15} The use

of an implant repair kit (screw removal kit) available for the specific implant system is more predictable to remove a fractured abutment/screw. An implant repair kit may include drills with different diameters, drill guides, and manual tapping instruments.¹⁶ A comprehensive understanding of implant systems (i.e. types of implant-abutment connection, design of abutment screws, torque values recommended by the company) and an exact diagnosis are key elements to eliminate these problems.

This clinical report presents a situation in which a fractured locater abutment screw fragment was successfully removed using an implant repair kit.

CLINICAL REPORT

A 56-year-old, edentulous man with a fractured locater abutment screw in an implant in the area of the mandibular right canine was referred to our clinic from a private practice. Her dentist told us that he placed a narrow platform locater abutment onto a regular platform implant and the fracture



Fig. 2: Fractured locater abutment screw fragment in the implant screw hole

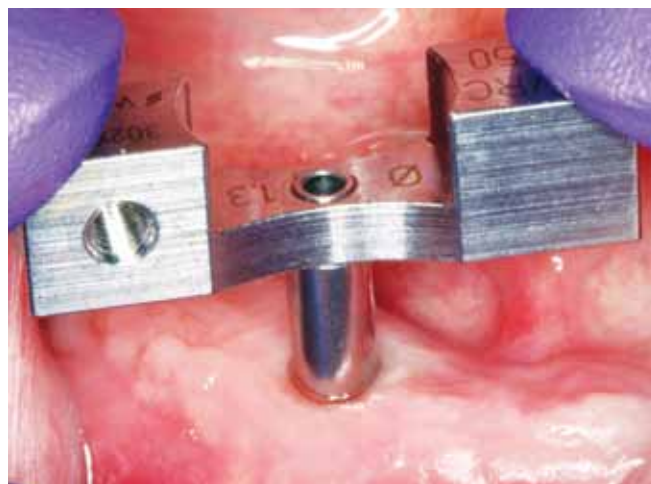


Fig. 4: Drill guide seated on the implant



Fig. 3: Manual screw removal driver



Fig. 5: Drill used to perforate fractured locater abutment screw fragment



Fig. 6: Drill guide and tapping instruments



Fig. 8: Remaining fractured locator abutment screw fragment removed

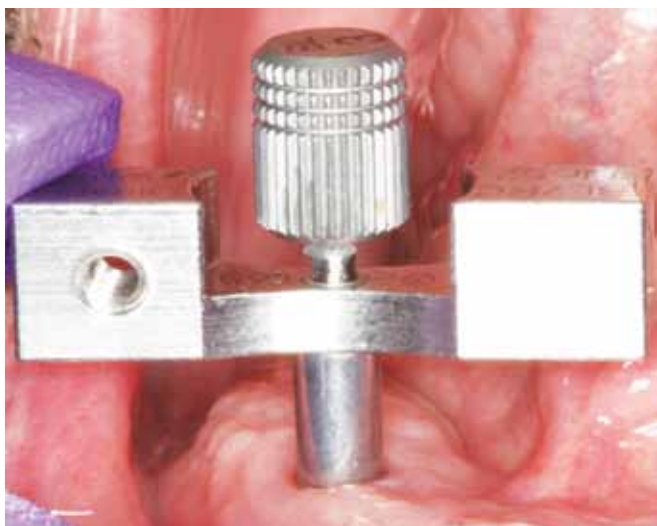


Fig. 7: Tapping instrument used with drill guide



Fig. 9: Implant screw hole after fractured locator abutment screw fragment removed

occurred when he torqued it with 50 Ncm. The locator abutments should not be torqued with more than 30 Ncm. Clinical and radiographic examination revealed a fractured locator abutment screw associated with a bone-level implant (4.1 × 10 mm, ITI Dental Implant System; Institute Straumann AG, Waldenburg, Switzerland)) (Figs 1 and 2). Clinical access and visibility were compromised as only about 2 to 3 mm of apical part of the screw was in the implant. Temporary restoration material placed by his dentist to cover the implant was removed. The implant screw hole was flushed with an air/water spray, and dried with air for better access and visibility. The area was isolated with cotton rolls and implant threads were evaluated for damage. Attempts to remove the fractured fragment using a periodontal probe and a manual screw removal driver were unsuccessful (Fig. 3).

An implant repair kit (ITI Dental Implant System; Institute Straumann AG, Waldenburg, Switzerland) including an initial drill, 2 instrument guides, and 3 manual tapping

instruments was used according to the manufacturer's instructions.⁵

After the first drill guide was inserted on the implant, the corresponding initial twist drill with diameter of 1.3 mm was used to perforate the screw fragment centrally, rotating clockwise at a maximum speed of 800 rpm under copious irrigation with standard saline solution (Figs 4 and 5). The drill guide was stabilized in position directly on the top of the implant to allow strong axial preparation, which helped to not damage the internal aspect of the implant body during drilling. The manual tapping instruments to retrieve the fragment were coated with vaseline and inserted into the hole drilled into the fragment through an additional larger diameter guide (Figs 6 and 7). The fragment was taken out under gradual manual rotation (Figs 8 and 9). If the threads inside the implants are damaged, they are recut with the successive manual tapping instruments. The inner wall of the implant body was rinsed with saline solution and evaluated thoroughly. The implant screw hole was flushed with an air/water spray, and dried



Fig. 10: Intraoral view after new locater abutments inserted

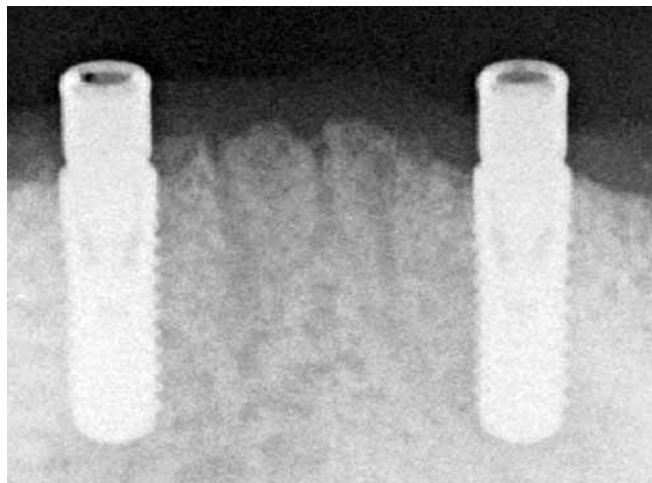


Fig. 11: Periapical radiograph taken after new locater abutments screwed

with air. A new locater abutment was inserted on the implant and tightened with 30 Ncm of torque (Figs 10 and 11). The implant has been salvaged and the patient returned to her dentist for a mandibular overdenture treatment.

DISCUSSION

Dental implants have been a reliable option to support several types of restorations. However, various types of mechanical problems have been faced by the clinicians over time. Abutment screw loosening/fracture is one of the most common prosthetic problems.^{5,7} This clinical report presents a situation in which a fractured locater abutment screw fragment was successfully removed from an implant screw hole using an implant repair kit.

Torquing an abutment screw has a clamping effect, the preload, which holds the abutment to the implant.¹⁷ The integrity of the implant-abutment joint substantially depend on this clamping force.¹⁷ Causes of screw loosening or fracture were identified as inadequate tightening, adverse occlusal forces, and fatigue character and yielding strength of the screw material.^{11,12} Other possible reasons of screw loosening can be a defect in the screw itself, or the abutment may not have been fully seated when the torque was applied to the screw, which generates higher stress.

Depending on the manufacturer and the system, recommended abutment screw torque varies from 15 to 45 Ncm.¹⁸ Some studies indicated that even experienced clinicians may under-tighten abutment screws by 30 to 50%.¹⁸ However, if a screw is tightened until plastic deformation takes place, loss of preload may occur, which may cause screw loosening or fracture. Therefore, torque wrenches should be used to reduce the possibility of suboptimal torque. On the other hand, if the abutment

screw is tightened beyond its yield strength, then the screw will fracture as well. Therefore, clinicians should use the recommended torque values for each component determined by manufacturers.

CONCLUSION

A fractured locater abutment screw fragment was successfully removed using an implant repair kit including drills, drill guides and tapping instruments. To avoid similar complications, the use of appropriate torque values recommended by the manufacturer for each component, such as abutments and abutment/retaining screws, is crucial. Also, the clinicians need to know their limits before dealing similar complications as insufficient training, experience and armamentarium often make the existing situation worse.

CLINICAL SIGNIFICANCE

Although implant success rates are high, mechanical problems are not uncommon. Retaining and abutment screw loosening/fractures are one of the most common mechanical problems associated with the implant components. The removal of broken screw fragments is an important and often time consuming task for the clinician. In this report, removal of a broken screw fragment using proper armamentarium and technique was presented.

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