A Simple yet Effective Way to Prevent Loose Metal Debris When Removing Cold-Welded Titanium Locking Plates: A Case Report

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CASE REPORT

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ABSTRACT

Introduction: Titanium screws sometimes become cold-welded to locking compression plates (LCP). Most methods describing removal of cold-welded screws generate considerable metal debris that induce and maintain chronic inflammation and fibrous encapsulation. We present a combined technique to diminish contamination of the wound. Operative technique: This technique was used in a single case in October 2017. Removal of a titanium LCP distal femur plate was indicated in a 15 year old male because of persistent complaints of pain. During removal, 3 screws were found to be cold-welded. After several unsuccessful attempts to remove the screws, the screw heads were stripped. A carbide drill was used to obliterate the screw heads. Before drilling, a plastic syringe was cut in half, and a hole was drilled in the top. The distal end of the syringe was placed over the carbide drill-bit as a collection basket. Surgical lubricant was then applied in the wound around the screw to intercept any excess metallic debris. While using the carbide drill, the metal debris was intercepted in the collection basket and its contents emptied in gauze. Afterwards, the wound was wiped with gauze and flushed with saline. No fragments remained after checking the wound area under fluoroscopy.

Conclusion: While obliterating the screw heads, contamination is limited by a plastic syringe that is placed over the carbide drill. It is an inexpensive and effective way to intercept and remove metal debris generated by obliterating titanium screws that can be used in different kinds of locking systems.

INTRODUCTION

Some 20 years ago, the Locking Compression Plate (LCP) made its way into orthopaedics and trauma surgery.[1] When taking into account the large incidence of long-bone fractures world-wide, Locking compression plates (LCP) are an effective and popular and also effective way to fixate long-bone fractures.[2] However, problems can occur due to the locking features of the plate, secondary to a poor screwing technique that causes cross threading (without adequate placement of the targeting device) or use of excessive force that causes overtightening.3 Titanium screws have the propensity to sometimes become cold-welded to the plate due to being a relatively soft metal,[2–5] and subsequent removal of implants risks additional invasive surgery that can be more time-consuming than the initial surgery.[4–7] Most methods describing removal of cold-welded screws generate considerable metal debris that induce and maintain chronic inflammation and fibrous encapsulation,[6] prevention should therefore be of paramount importance.8 To avoid additional and potentially damaging maneuvers, the following precautions can be taken to reduce slippage of the screwdriver. 1) Usage of a manufacturer-prescribed, torque-limiting screwdriver to insert screws. 2) Avoid worn screwdrivers and use a new one when removing screws. 3) Clean the screw head of metal debris. 4) Place the screwdriver in the recess of the screw head at the right angle and maintain high pressure evenly during the first few turns of the removal. [3, 5, 9, 10] If this fails, the screw head is likely to become stripped of the recess' hexagonal or star drive shape. Multiple techniques are described to remove jammed or cold-welded screws, however no technique seems uniformly successful. [3–6, 10] The current case shows a combined technique to diminish contamination of the wound that is inexpensive and simple to perform.

Operative technique

This technique was used in a single case in October 2017. A 15 year old male successfully healed a right distal femur fracture three months after being treated with a titanium LCP distal femur plate. Removal of the implants was indicated because of persistent complaints of pain. Removal of 4 proximal screws was unproblematic, but 1 unicortical and 2 bicortical distal screws were found to be cold-welded. Multiple attempts were made to remove them in the manner described in the introduction, however unsuccessfully, after which the screw heads were stripped. To make removal of the screws and plate possible, a carbide drill from the Synthes screw removal set was used to obliterate the screw heads. Before drilling, a 10cc plastic syringe was cut in half, and a hole was drilled in the top (Figure 1). The distal end of the syringe was placed over the carbide drill-bit as a collection basket to limit the area of contamination. The closed end of the collection basket was on the patient's side, the open end on the surgeon's side (Figure 2). Surgical lubricant was then applied generously in the wound around the screw to intercept any excess metallic debris. [11] While using the carbide drill, the metal debris was intercepted in the collection basket as they fell from the notches of the drill bit (Figure 3). After each screw head was obliterated, the contents of the collection basket were emptied in gauze (Figure 4). Surgical lubricant was re-applied for each individual screw. After all screw heads were obliterated and the screws and plates were removed, the wound was wiped with sterile gauze and afterwards flushed with saline. The wound area was checked under fluoroscopy for any remaining metallic debris. No fragments remained, the wound was then closed in the usual fashion. There was no wound healing problems during the last outpatient clinical check-up, two months postoperatively.

Conclusion

Difficulties due to cold welding are sometimes encountered in removal of titanium LCP plates.[3] Removal may be more time consuming than the initial procedure and generally produces significant amounts of metallic debris that stall wound healing. [8] We describe a technique in which the area of contamination is limited by a plastic syringe that is placed over the drill used to obliterate the screw heads. It is an inexpensive, simple and effective way to intercept and remove metal debris generated by obliterating titanium screws that can be used in different kinds of locking systems. As this is a case report, our findings will have to be replicated in larger studies for more conclusive results and we see this as an area for future study.

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Figures:

Figure 1. A hole is drilled in the top of a 10 cc plastic syringe that was cut in half.

Figure 2. The open end of the syringe is on the surgeon's side, and serves as a collection basket.

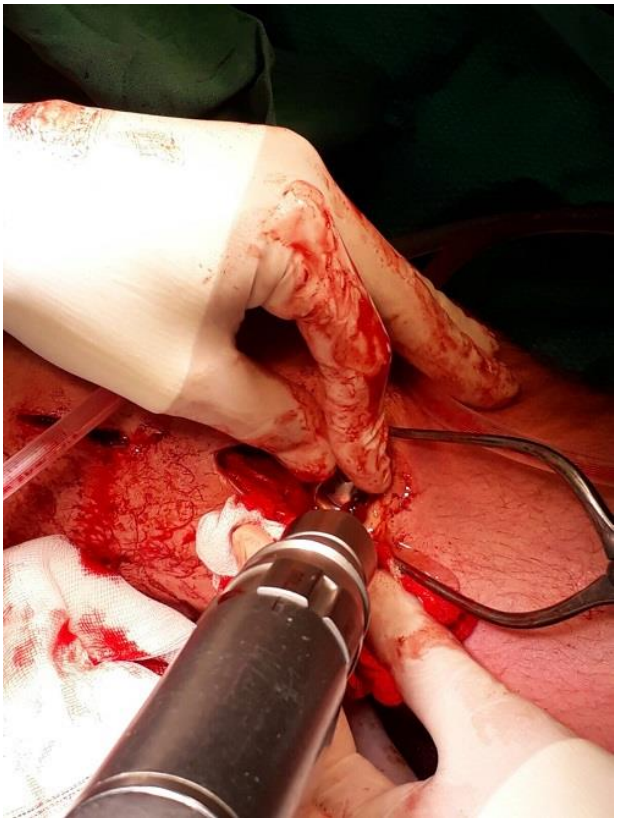

Figure 3. Metal debris is intercepted in the collection basket as they fall from the notches of the drillbit.

Figure 4. The collection basket is emptied in a gauze.

PEER REVIEW

Not commissioned. Externally peer reviewed.