Arthroscopic Removal of a Broken Bone Staple Occurring 24 Years After Insertion That Presented as Lateral Joint Line Pain and Joint Locking

Case Report

J. Winslow Alford, MD
Michael L. Caravelli, BA
Brian J. Cole, MD, MBA

INTRODUCTION

Bone staples are commonly used as a method of fixation in orthopedics, often at or near the joint line of the knee. Specific uses in sports medicine include ligament reconstruction fixation. Like all orthopedic hardware, these staples may break or loosen years after a successful ligament reconstruction and cause local, intra-articular' or remote symptoms. This article presents an unusual case in which a bone staple used to reconstruct a torn medial collateral ligament (MCL) remained quiescent for 24 years before migrating intra-articularly and presenting clinically as a displaced lateral meniscus bucket handle tear.

CASE REPORT

A 42-year old man presented with a medical history of an isolated complete MCL tear of his right knee while playing collegiate level football in 1979. The ligament was reconstructed with an open augmentation with autologous hamstrings and fixed on the tibia and femur with bone staples. The patient returned to competitive football and had maintained an asymptomatic athletic life for 24 years until 2 weeks prior to presentation.

He reported no traumatic or excessive exertional event, but a gradual onset of generalized knee pain and effusions for 4 days, followed by one week of painless true locking of the knee joint with continued effusions. Finally, he experienced localized lateral joint line pain with any activity and tenderness specifically at the posterolateral joint line, at which time the mechanical joint locking stopped. He was referred to our office by his primary care physician without radiographs with the clinical diagnosis of a torn lateral meniscus.

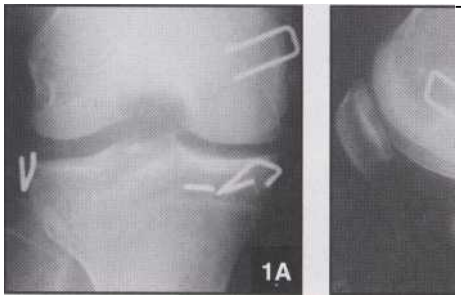

Figure 1. Preoperative AP radiograph, demonstrating staple fragments within 15 mm of medial joint line and loose fragment laterally (A). Preoperative lateral radiograph demonstrating loose fragment in posterior knee (B).

On physical examination, he was a thin, athletic, healthy-appearing male. Examination of the knee demonstrated a medial-sided longitudinal incision centered over the joint line that was well-healed and mature in appearance. His examination demonstrated tenderness to palpation of the lateral joint line with the greatest intensity at the posterior margin. He had a mild effusion of his right knee, and range of motion was 0°-140°, without locking or crepitus, but with posterolateral joint line pain at extreme of flexion. This pain was more dramatic with valgus meniscal compression maneuvers (ie, McMurray's). Despite the patient's thin habitus, no palpable mass or prominence was identified throughout the knee. Ligament examination demonstrated a negative Lachman and <3 mm of medial opening with valgus stress at 30° of flexion. Ligament examination of the uninvolved left knee was identical. His strength and sensation were normal throughout his leg and the popliteal, posterior tibialis, and dorsalis pedis pulses were palpable.

Dr Alford is from West Bay Orthopedics, Warwick, RI and Mr Caravelli and Dr Cole are from the Division of Sports Medicine, Rush University, Chicago, Ill.

Reprint requests: Brian J. Cole MD, MBA, Division of Sports Medicine, Rush University, 1725 W Harrison St, Ste 1063, Chicago, IL 60612.

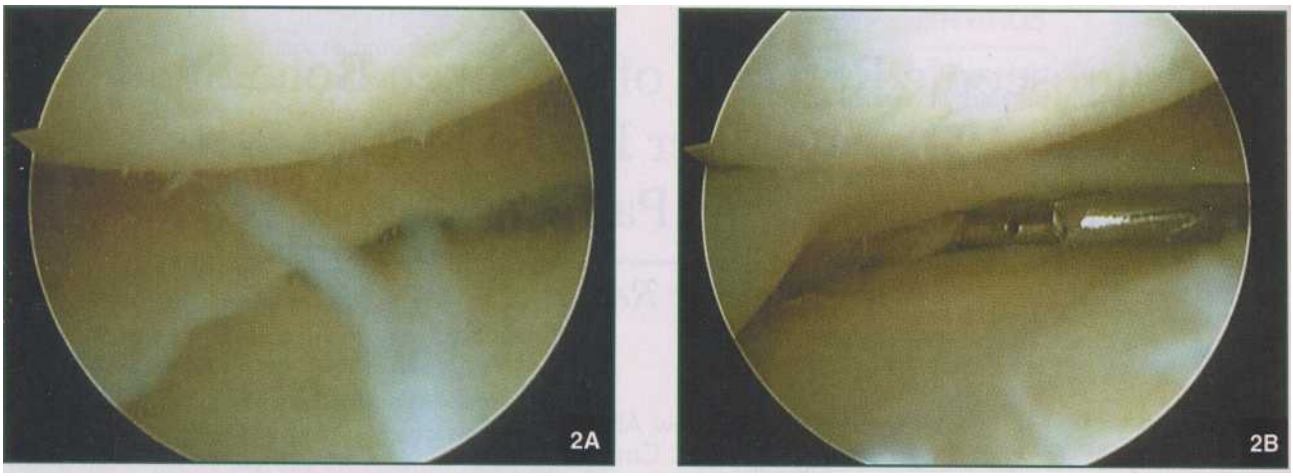

Figure 2. Arthroscopic photographs of lateral compartment demonstrating normal appearing meniscus (A) and after submeniscal debridement with staple in posterolateral compartment (B).

Figure 3. Photograph of removed staple. One arm broken, the other intact, implicating pullout and fatigue failure.

Routine radiographic examination revealed staple tips well seated in the medial tibia metaphysis approximately 1.5 cm inferior to the joint line and evidence of a staple fragment in the posterior lateral portion of the knee, at the level of the joint line, suggesting an intra-articular location (Figure 1).

With the diagnosis of a migrating intra-articular metal bone staple fragment, the patient underwent surgery within 24 hours for foreign body removal after informed consent was obtained. Preferably the procedure would be done arthroscopically, but alternate plans for fluoroscopic-assisted open hardware removal were made, and these were discussed with the patient.

At arthroscopy, the only chondral injuries found were chronic-appearing Outberbridge grade II changes of the medial femoral condyle. A thorough arthroscopic survey of the articular cartilage revealed no focal traumatic chondral defects. Medial and lateral menisci were normal and a thorough arthroscopic examination of the posterolateral corner revealed no evidence of the staple. Even with the knee at the extreme of a figure four position, examination of the lateral meniscus and popliteal hiatus revealed a normal lateral meniscus and initially no evidence of the staple (Figure 2A). Further exploration under the lateral meniscus with a probe and light shaving through a synovial layer revealed one of the two arms of the staple loop (Figure 2B). A grasper was introduced via the lateral portal, and with gentle rotation, the staple was freed from beneath the lateral meniscus and atraumatically removed, facilitated by placing a firm varus load to the knee to avoid damaging the articular surface. The patient's postoperative course was unremarkable. He resumed an unrestricted athletic lifestyle without symptoms within a few weeks.

DISCUSSION

Previous reports of freely mobile foreign bodies in the knee cover both iatrogenic and other exogenous particles including bullets, arthroscopic knife blades, orthopedic fixation screw tips, metallic stone fragments and glass.* Typically, if orthopedic hardware or other foreign body is well-fixed and not causing symptoms or threatening vital structures, it is recommended that these objects remain in place as the process of removing them will violate tissue and expose the patient to surgical risks. However, this case demonstrates the importance of surveillance of hardware near articular surfaces, particularly metallic implants with smooth shafts such as staples and k-wires that may loosen and back out. In addition, it emphasizes the importance of the orthopedic surgeon to remain cognizant of the possibility of migrating hardware or foreign body to cause symptoms that may mimic other common pathology even decades after the original successful implantation. [19]

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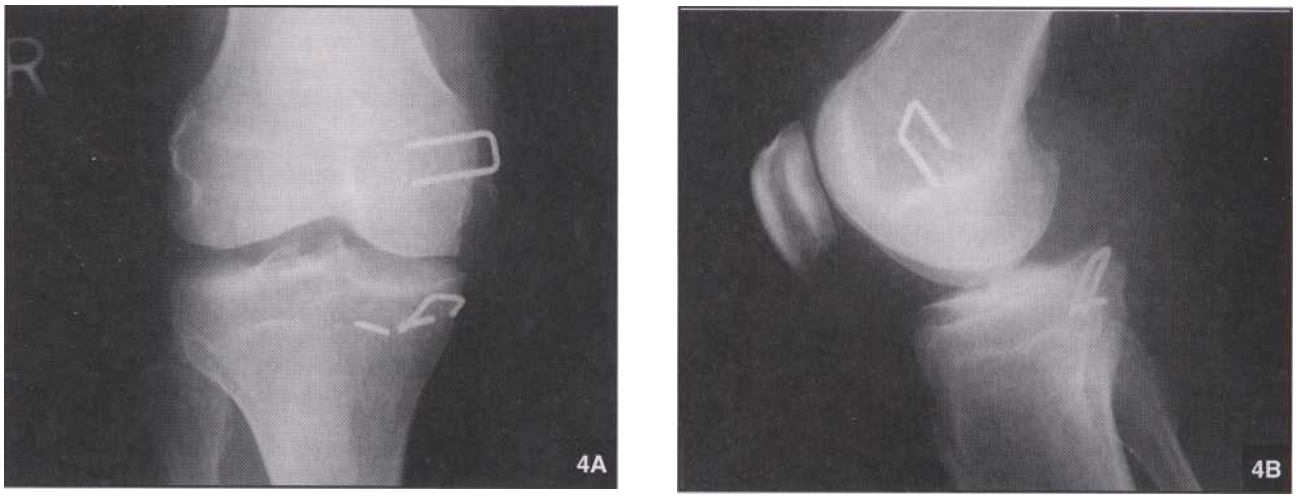

Figure 4. Postoperative AP (A) and lateral (B) radiographs demonstrating absence of removed loose hardware.

This case also highlights the need for caution when using metallic fixation devices specifically near the proximal tibia. The implantation of orthopedics hardware near the joint surface in the proximal tibia has been associated with inadvertent penetration of the joint capsule that may extend up to 15 mm below the articular surface." While using staples, external fixation frames, or other minimally invasive orthopedic instruments, this relationship of the joint capsule to the proximal tibia must be appreciated. Anecdotal information from various recent sports medicine and arthroscopy meetings has revealed that staple use in augmenting tibial fixation of anterior cruciate ligament reconstruction is gaining popularity. Caution is warranted when using these implants near joint surfaces. In this case, the process of hardware failure and migration must have begun with the staple loosening, fatiguing, and backing out of the then extraosseous portion of the staple. This assumption is supported by the fact that the removed staple had one arm intact and the other broken (Figure 3). When the superior limb of the staple broke, at least a portion of it was within the critical 15 mm of the joint line (Figure 4), and presumably normal joint motion worked the staple into the knee joint space.

Of particular interest in this case is that despite a normal arthroscopic appearing lateral meniscus, the staple was hidden well below the lateral meniscus and covered with a thin layer of synovium. Therefore, it was not visible even after excellent access to the posterolateral corner was obtained. The arthroscopic removal of metallic foreign bodies requires that the surgeon commit to a careful and accurate interpretation of radiographic data and persist until the object is located. Thorough access to all parts of the knee and a familiarity with accessory portals is often essential to locate and remove foreign or loose bodies. Although the staple was removed via the standard lateral portal in this case, additional portals may be necessary at times to locate, control, and remove foreign bodies that are freely mobile.

Complications of staple fixation including loosening, breakage, and migration are not unusual, but these usually result only in local irritation. Rare intracorporeal migration of foreign bodies, including staples and various other internal fixation devices have also been reported.[1-7,15-17,23] Complications including injury to neurovascular structures,[3,4,15] internal joint derangement,[4,5,16,21] synovitis,[21] and even arterial embolization with resultant death[21] have been reported. With these severe consequences, often the diagnosis is obvious.

In this case the staple migrated into the knee joint resulting in symptoms mimicking a meniscal tear and this stoic athletic individual did not seek treatment for several weeks, but instead continued vigorous exercise and athletic participation risking further damage to the articular surface of his knee. The radiographs obtained following the onset of symptoms demonstrated presumed migration of the broken staple fragment. In retrospect, the staple must have been mobile within the joint for at least two weeks prior to presentation, potentially grinding against articular cartilage during his daily workouts. Fortunately, arthroscopic examination of the articular surface demonstrated no acute focal articular defects. The staple was removed before focal chondral defects were created with minimal risk or morbidity and the patient has returned to an asymptomatic athletic lifestyle.

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