

Osteomyelitis

A Rare Complication After Subpectoral Biceps Tenodesis

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The long head of the biceps tendon can be a source of persistent pain and dysfunction. After failure of nonoperative management, two surgical techniques, tenotomy or tenodesis, can be used to treat this condition. Tenodesis is preferred when the patient is young, is highly active, or seeks an improved cosmetic appearance.^{4,6,9,17,19} Tenodesis can be performed either open or arthroscopically with the biceps tendon placed proximally on the humerus or underneath the pectoralis major tendon insertion.^{13,18} Multiple fixation techniques are available for the tenodesis, such as interference screw, suture anchor, tunnel, and keyhole techniques, and these methods have similar complications. These complications include biceps tendon rerupture, hematoma, infection, persistent pain, nerve injury, cosmetic deformity, and humeral fracture.^{4,6,9,12,13,20-22} Current data are scarce regarding the clinical complications of open subpectoral biceps tenodesis with interference screw fixation. In this case study, we present what we believe is the first documented case report of osteomyelitis with this technique.

CASE REPORT

A 29-year-old, right-hand-dominant man, who was a former military servicemember, injured his right shoulder on active duty while lifting weights in 2007. A physician

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Figure 1. Initial clinical presentation: 2 draining wounds are shown near the anterior (right arrow) and posterior (left arrow) aspect of patient's arm near his axilla.

outside of our institution diagnosed the patient with a type 2 superior labrum anterior and posterior (SLAP) tear, and he attempted a trial of physical therapy. In November 2012, the patient underwent an arthroscopic SLAP repair, which was converted to an open subpectoral biceps tenodesis with interference screw fixation. Postoperatively, the patient had no immediate issues other than minor pain.

Six months after the procedure, the patient presented to our department with increasing right shoulder pain. He reported no specific history of recent trauma, fever, chills, or prior infection elsewhere; however, he had increased swelling and purulent drainage from the posterior aspect of his arm near his axilla (Figure 1). Initial cultures of the drainage were negative, but repeat cultures grew *Proteus mirabilis*. Computed tomography scans revealed a lytic defect and bony sequestrum of the humerus suggestive of osteomyelitis (Figure 2). Furthermore, magnetic resonance imaging revealed a visible fluid collection at the tenodesis site as well as a partially displaced bioabsorbable screw

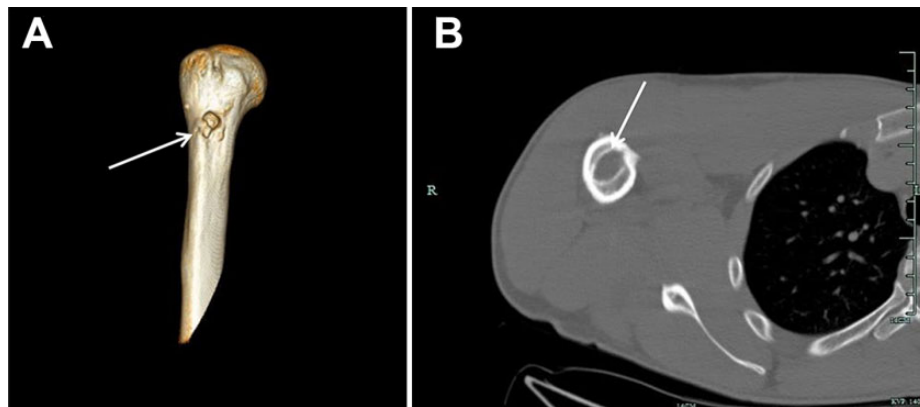


Figure 2. Computed tomography images of the patient's humerus: (A) 3-dimensional reconstructed image shows a lytic defect (arrow); (B) axial image shows bony sequestrum (arrow).

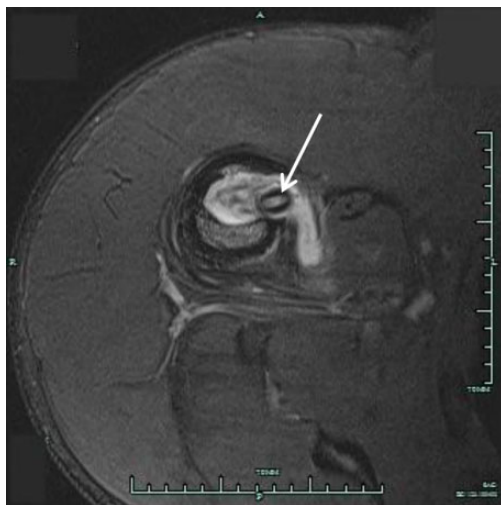


Figure 3. A proton density-weighted, fat-suppressed image of the tenodesis site shows a fluid collection with increased signal and a protruding screw (arrow).

that was protruding several millimeters out of the humeral cortex (Figure 3).

Subsequently, the patient underwent formal irrigation and debridement of the wound, removal of the bioabsorbable screw and suture material, and debridement of the bony cortex. The wound was packed with calcium sulfate impregnated with antibiotics. Bone cultures were positive for *P mirabilis*. The patient received a 6-week course of intravenous antibiotics. After his treatment course, he followed up with our department for a year. He had complete resolution of his drainage and pain, and he made a full functional recovery with no limitation to his military training or sporting activities.

DISCUSSION

Biceps tenodesis has had favorable clinical outcomes in the treatment of injuries of the long head of the biceps tendon

after failure of conservative measures.^{9,12,25,27} Mazzocca et al¹⁷ reported that tenodesis retained the natural length-tension relationship of the biceps muscle. Slenker et al²⁵ reported a significantly lower incidence of cosmetic deformity with tenodesis compared with tenotomy (8% vs 43%, respectively). Other studies have reported a lower incidence of biceps cramping and soreness with tenodesis.²⁷ Provencher et al²³ found that subpectoral biceps tenodesis is an efficient and reproducible technique that requires minimal dissection without any violation of muscle tendon units. Because complications can occur with subpectoral tenodesis, further investigation of this approach is warranted.

We could find no reported cases of osteomyelitis in patients who had undergone an open subpectoral tenodesis with interference screw fixation. In the largest clinical series, entailing 353 patients, Nho et al²¹ reported a total of 7 complications of the following types: a deep postoperative wound infection requiring irrigation and debridement with 2 weeks of intravenous antibiotics, musculocutaneous neuropathy, persistent pain, reflex sympathetic dystrophy, and fixation failure. Other reported complications have included musculocutaneous nerve entrapment, brachial artery injury, failure of screw fixation, and fractures.^{7,14,16,25,26}

Our case demonstrates that osteomyelitis can occur after subpectoral tenodesis with interference screw fixation, and this complication warrants further investigation. Several factors may contribute to this complication. The subpectoral location can be an area of concern given its proximity to the axilla, which harbors a high density of sebaceous glands and hair follicles that predispose to bacteria flora.^{6,10,24} Also, the deep location of the biceps tenodesis underneath the pectoralis major insertion may give rise to underlying hematoma or seroma, which can become infected.¹ The indolent nature of organisms such as *Proteus* and *Propionibacterium acnes* around the shoulder gives rise to the potential for occult infection at the tenodesis site.¹⁵ Furthermore, surgical technique may predispose to infection.^{2,24} The likelihood of shoulder infection is increased in open techniques compared with arthroscopic techniques.² Because of this correlation, the bacterial contamination may increase as the operation time and size of

the incision increase.²⁴ Additionally, interference screw fixation increases the suture and implant burden for fixation, which may be an independent variable contributing to development of deep infection.¹¹

Our patient had several risk factors that contributed to his development of osteomyelitis—axilla location, indolent infection, open technique, and delay in diagnosis. Early treatment could have prevented this complication, and his delay in care could be attributed to the indolent nature of the *P mirabilis* infection, his military deployment, or his lack of symptoms of infection, such as fever or chills. His deployment entailed a constant change of treating physicians, which could have led to a delay in workup or treatment of his shoulder pain. This constant change in providers could have contributed to a lack of insight or appreciation of the potential consequence of an indolent infection. Also, the patient did not take long-term pain medication or have any risk factors for infection, such as diabetes, immunocompromised illnesses, or smoking.^{4,22}

In his initial surgery by the outside physician, the patient underwent a conversion of his SLAP repair to an open subpectoral biceps tenodesis with interference screw fixation. The reason for this conversion is unknown, but the literature has shown favorable clinical outcomes for isolated type 2 SLAP lesions treated with a biceps tenodesis.^{5,8} Patients who received such treatment were able to return to their presurgical level of activity and participate in sports.⁵ Further, our patient's initial surgery entailed the use of a bioabsorbable screw; in a previous study, patients who underwent anterior cruciate ligament reconstruction with bioabsorbable screws experienced a local inflammatory reaction that mimicked an occult infection because of the prolonged degradation of the implant.¹⁹ These patients reported similar symptoms of an indolent infection with vague pain and possible drainage. However, a literature search did not show this phenomenon in the shoulder, and any infection is more likely caused by bacterial contamination. That being said, clinical suspicion must be high in any situation with persistent pain after shoulder surgery.

Regarding our surgical technique, we prefer to perform biceps tenodesis in an open fashion with an anchor in the bicipital groove. Fortunately, our patients have not experienced any early infection that leads to a deep infection. However, we recommend removal of the implant in the setting of deep infection given the risk of osteomyelitis or tendon failure. Even though deep infection can theoretically lead to osteomyelitis, reports of this complication after shoulder surgery are relatively rare. There have been 2 case reports of osteomyelitis after rotator cuff repair: a *Pseudomonas* infection³ and a nonabsorbable suture infection with *Propionibacterium*.²⁸ However, our case study is the first to report osteomyelitis after a subpectoral biceps tenodesis with interference screw fixation.

Although subpectoral biceps tenodesis with interference screw fixation has gained a great deal of popularity, morbidities are associated with this technique. To our knowledge, our case of osteomyelitis is the first one

reported, and no formal investigations have been published in the literature. This case report raises awareness of this complication associated with subpectoral biceps tenodesis.

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