Glenoid Erosion Leading to Contact with Retained Metallic Suture Anchors: Bilateral Metallosis After Bilateral Shoulder Hemiarthroplasty

A Case Report

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Abstract

Case: Hemiarthroplasty of the shoulder is commonly indicated for younger patients with osteoarthritis who desire to continue recreational and employment activities. In patients who have undergone prior shoulder surgery, metallic suture anchors may be present in the glenoid. We present a case of bilateral shoulder metallosis following bilateral resurfacing hemiarthroplasty for arthropathy in the setting of previous shoulder instability; the prostheses caused eventual glenoid erosion, leading to contact with the retained metal anchors.

Conclusion: Because glenoid erosion is a common complication after shoulder hemiarthroplasty, patients with retained metal anchors are at risk for secondary metallosis due to medial protrusion of the prosthesis in the glenoid, with subsequent erosion of the metal anchors.

Metallosis occurs following the accumulation of metallic debris within the joint space and soft tissues surrounding a prosthesis. This deposition of foreign material results in a macrophagic cellular reaction, leading to the formation of giant cells and periprosthetic fibrosis, which can cause pain and dysfunction of the affected joint[1]. Extensive metallosis after arthroplasty predominantly has been described following hip replacement. It is a rare complication following shoulder arthroplasty; to our knowledge, only a small number of cases have been reported[1-3].

Despite the rarity of this complication after shoulder arthroplasty, there have been reports of metallosis following both total shoulder arthroplasty (TSA) and hemiarthroplasty when metal-on-metal contact occurs[1,2,4]. One such instance is when a shoulder hemiarthroplasty prosthesis comes in contact with previously placed metal suture anchors within the glenoid[2]. This can be caused by intra-articular protrusion of the metal anchor that has gone unrecognized, or following glenoid erosion, leading to contact of the humeral prosthesis with the retained glenoid implant.

We present an unusual case of bilateral shoulder metallosis after bilateral resurfacing shoulder hemiarthroplasty. Both humeral prostheses caused slow and progressive medial glenoid erosion, leading to contact with the metallic suture anchors that had remained from previous stabilization surgery.

The patient was informed that data concerning the case would be submitted for publication, and he provided consent.

Case Report

A 52-year-old man presented to our clinic with substantial dysfunction and limited range of motion of both shoulders. He had undergone previous open and arthroscopic anterior stabilization procedures for glenohumeral instability at outside institutions approximately 6 years prior to presentation. These symptoms were associated with pain that limited activities of daily living and recreational activity, and caused difficulty with job-related activities. The most recent arthroscopic stabilization procedures had been performed utilizing titanium metal glenoid suture anchors (GII Anchor; Mitek Sports Medicine), which were placed from approximately the 2:00 to 5:00 position on the anterior aspect of the glenoid for labral repair, and anterior capsulorrhaphy. The patient reported no noteworthy symptomatology or dislocation events for the intervening 6-year time frame following the stabilization procedures, but presented to us with symptoms of bilateral shoulder pain.

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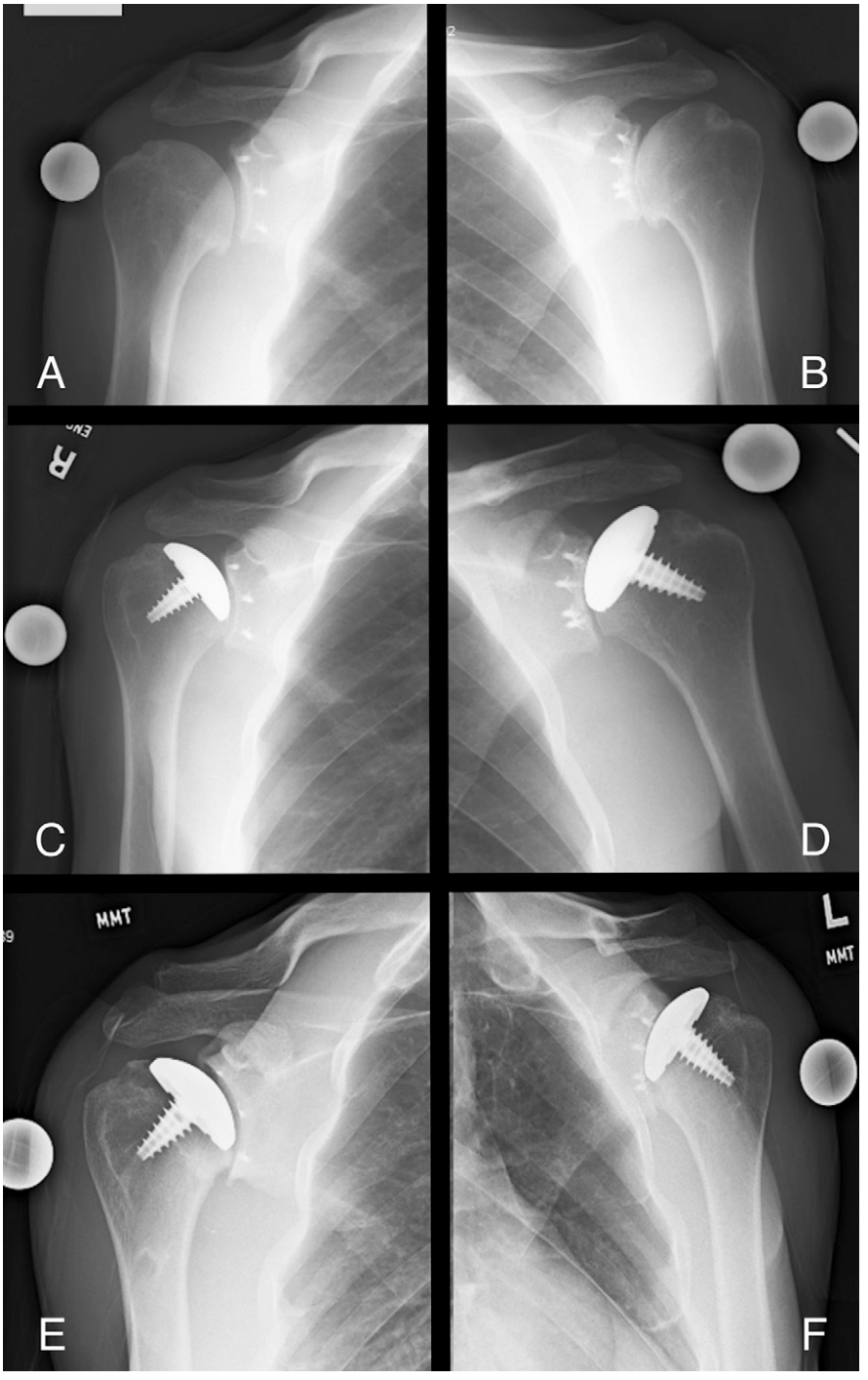

Fig. 1

Figures 1-A through 1-F Anteroposterior radiographs of the right (**Fig. 1-A**) and left (**Fig. 1-B**) shoulders showing bilateral glenohumeral arthropathy (Samilson and Prieto grade-3 osteoarthritis) following multiple open and arthroscopic stabilization procedures. Note the metal suture anchors in the glenoid rim. Anteroposterior radiographs of the right (**Fig. 1-C**) and left (**Fig. 1-D**) shoulders after staged, bilateral humeral resurfacing shoulder hemiarthroplasty. Bilateral anteroposterior radiographs of the right (**Fig. 1-E**) and left (**Fig. 1-F**) shoulders showing substantial glenoid erosion, with contact of the prosthesis with the metal anchors on the right shoulder as well as loosening of the hemiprosthesis and surrounding osteolysis. Similar but less-severe findings were evident in the left shoulder.

Physical examination and radiographic images at the time of presentation to our institution were consistent with end-stage, posttraumatic, Samilson and Prieto grade-3 osteoarthritis of both shoulders (Figs. 1-A, 1-B, 2-A, and 2-B)[5]. An extended course of conservative treatment consisting of physiotherapy, injections, and activity modification was attempted for approximately 6 months.

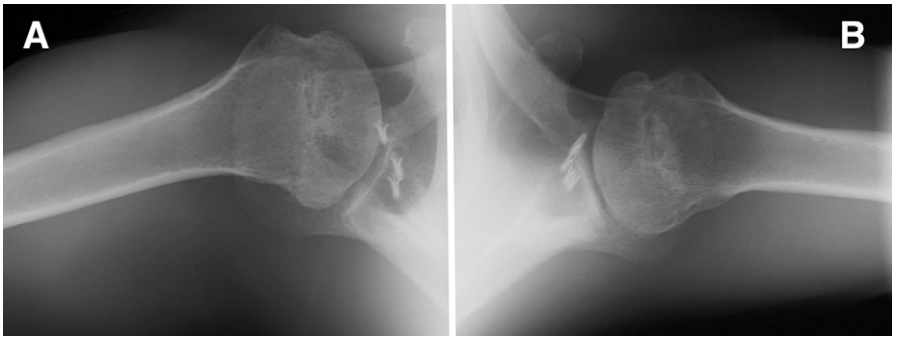

Fig. 2

Axillary radiographs of the right (**Fig. 2-A**) and left (**Fig. 2-B**) shoulders after multiple previous stabilization procedures, demonstrating retained metallic suture anchors in both shoulders.

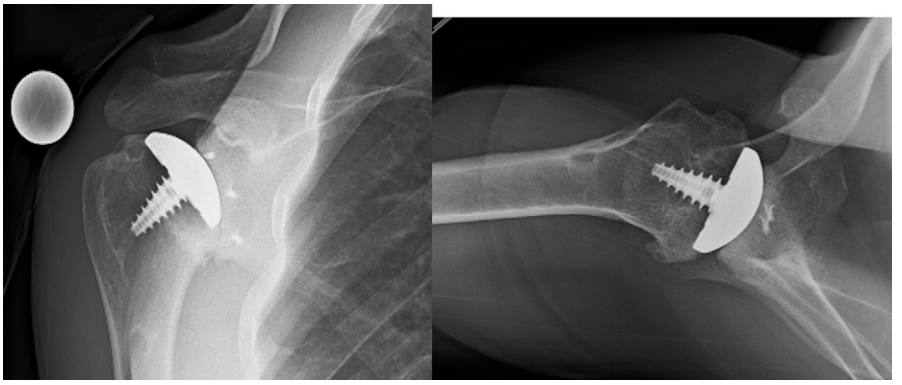

Fig. 3

Anteroposterior (left) and axillary (right) radiographs of the right shoulder approximately 3.5 years after humeral head resurfacing in the setting of the retained metallic suture anchors. There is medial glenoid erosion, but no contact between the prosthesis and the metal anchors.

However, the patient demonstrated little subjective or objective improvement. Given the relatively young age of the patient at the time of presentation, and his desire to continue recreational and employment activities, bilateral shoulder hemiarthroplasty was recommended.

The patient underwent bilateral shoulder hemiarthroplasty with cobalt-chromium alloy (Co-Cr-Mo) humeral resurfacing (HemiCAP; Arthrosurface), first on the right shoulder and 2 months later on the left shoulder, without complication. At the time of both arthroplasty procedures, the metallic anchors were not grossly visible on the face of the glenoid or at the anterior edge, and it was felt that attempts at removal would likely cause more damage to the glenoid than could be tolerated during a hemiarthroplasty procedure without glenoid resurfacing.

The patient progressed well and was symptom-free for several years (Figs. 1-C and 1-D). However, approximately 3.5 years after the right shoulder hemiarthroplasty, he presented with increasing pain and a subjective grinding sensation in the right shoulder. Radiographs obtained at that time revealed medial glenoid erosion, but without compromise of the metal anchors (Fig. 3). The patient was given the option of close follow-up and serial radiographs or conversion to TSA. Given the extensive surgical history, he had a strong desire to avoid revision if possible, and it was agreed that he would undergo serial radiographic evaluation of both shoulders.

Radiographs of both shoulders approximately 3 months later revealed mild progression of the glenoid erosion, and it was felt that the rate of progression would place the humeral prosthesis at risk for contact with the metal anchors bilaterally.

Fig. 4

Intraoperative view of the left shoulder with retained metallic suture anchors and an intact hemiarthroplasty component. Metallic soft-tissue staining and loose intra-articular metallic debris were seen at the time of conversion to TSA.

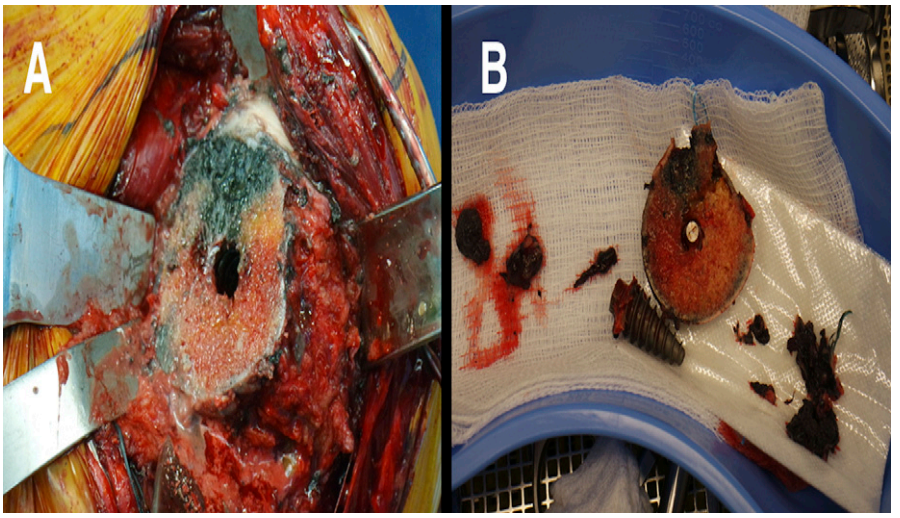

Fig. 5

Intraoperative view of the proximal aspect of the humerus (**Fig. 5-A**), demonstrating metallic staining following removal of a hemiarthroplasty prosthesis; the removed humeral prosthesis (**Fig. 5-B**) has retained bone with metallic staining and associated metallic debris.

Bilateral revision surgery with removal of the anchors and conversion to TSA was recommended.

The patient elected to forgo this option and seek other nonsurgical options and opinions from other providers; he was lost to follow-up for approximately 12 months. He then returned to our clinic with persistent and progressive bilateral shoulder pain. Radiographs revealed substantial glenoid erosion in the right shoulder, with loosening of the hemiprosthesis and surrounding osteolysis. The metallic suture anchors, which previously had been placed in the glenoid, had been nearly completely eroded by the humeral prosthesis, and there had been substantial progression of glenoid wear. The left shoulder demonstrated similar findings (Figs. 1-E and 1-F). The patient again was counseled to consider bilateral TSA.

Approximately 6 years following the right shoulder hemiarthroplasty, the patient underwent a right TSA, followed by a left TSA 7 months later to allow for recovery of each side. At the time of revision arthroplasty, substantial metallic soft-tissue staining was noted around the prosthesis on either side, and superficial abrasions were noted on the humeral prosthesis, consistent with contact wear. Furthermore, loose intra-articular metallic debris was noted (Fig. 4), and the humeral prosthesis was slightly loose and was able to be removed by hand (Figs. 5-A and 5-B). There was also visible erosion of the glenoid with compromise, and wearing of each remaining metallic suture anchor. Culture specimens of the soft tissue and debris were collected and maintained for microbial and pathologic evaluation. Final results revealed no evidence of infection, and the gross specimen was consistent with metallosis without evidence of acute inflammation.

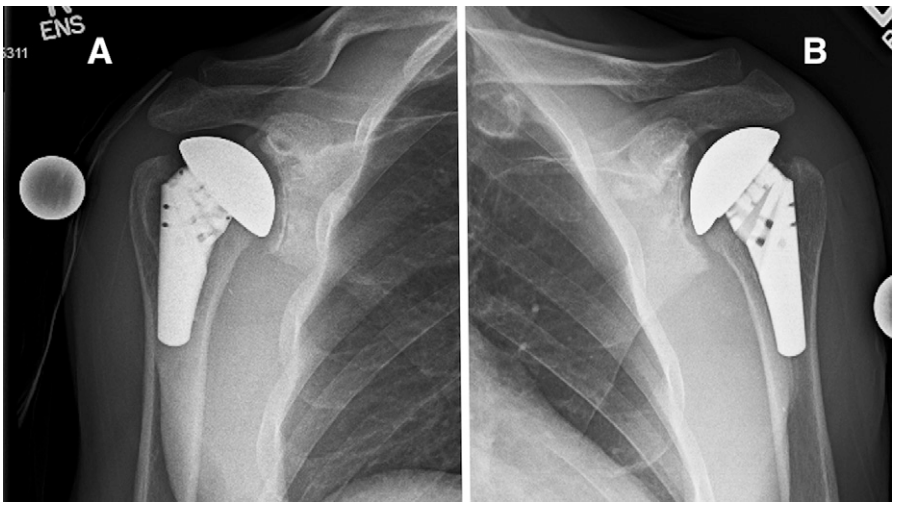

Fig. 6

Radiographs of the right (**Fig. 6-A**) and left (**Fig. 6-B**) shoulders following TSA in the setting of previous metallosis.

The patient recovered well following the bilateral TSA procedures (Figs. 6-A and 6-B), and had no recurrent symptoms at the follow-up 18 months after the right shoulder surgery and 10 months after the left shoulder surgery. He reported a subjective shoulder value of 90% on the left side and 100% on the right side, and had regained full strength bilaterally. He demonstrated return of full and symmetric motion bilaterally, and had returned to his desired work and recreational activities, including using free weights and cardiovascular workouts.

Discussion

To our knowledge, this is the first reported case of bilateral shoulder metallosis. The patient presented with right shoulder pain with mechanical symptoms 3.5 years following bilateral resurfacing hemiarthroplasty, which then progressed to bilateral shoulder pain. Approximately 1 year after radiographs had demonstrated glenoid erosion, he returned with progressively worsening bilateral pain, with near-complete erosion of the metal anchors in both shoulders, resulting in bilateral metallosis. This case highlights the progression of glenoid and anchor erosion over time from wear of titanium anchors on the stiffer cobalt-chromium alloy implant. These types of cases are infrequent, but highlight the need to advise patients about possible complications and long-term outcomes of similar surgical procedures in order to avoid this rare complication.

Hemiarthroplasty of the shoulder is commonly indicated for younger patients with osteoarthritis that does not involve the glenoid[6]. It can also be used to treat nonreconstructable proximal humeral fractures as well as osteonecrosis with flattening or collapse of the humeral head without secondary arthritis of the glenoid. It is less invasive than TSA and avoids glenoid-component loosening, a common complication of TSA[7]. Other than the complications common to all prostheses, such as periprosthetic fracture and infection, the primary complication unique to hemiarthroplasty is glenoid erosion and progressive osteoarthritis[8]. As described herein, hemiarthroplasty was used for a relatively young patient who wanted to remain active after developing bilateral osteoarthritis following prior surgery for shoulder instability. He experienced the complications of substantial glenoid wear and slow erosion of the prosthesis into the previously placed metal anchors.

Glenoid anchors are commonly used in shoulder surgery, including rotator cuff tear and instability procedures. Metal anchors now have largely been replaced by bioabsorbable and plastic (polyetheretherketone [PEEK]) anchors; however, these anchors may cause similar complications. Common complications include incorrect placement of anchors, anchor migration, and anchor loosening or breakage, which are largely related to surgical technique and bone quality, and can result in pain, mechanical symptoms, cartilage damage, and arthritis[9,10]. Additionally, the complication of metallosis is possible in patients who have undergone prior shoulder surgery with metal anchors who then have more invasive surgeries, such as shoulder hemiarthroplasty. In these patients, it is common practice to leave glenoid anchors in place during the arthroplasty if they are not problematic. However, in some cases, as with our patient, glenoid erosion causes metal-on-metal contact with retained anchors and can cause serious problems. In the specific constellation of a planned shoulder hemiarthroplasty in a patient with previously placed metal suture anchors in the glenoid, it may be a better option to remove the metal anchors during implantation of the prosthesis, or even opt for a primary TSA, in order to avoid secondary metallosis.

Metallosis has been described in the literature with a similar metal-on-metal contact mechanism after shoulder hemiarthroplasty, after a Nottingham shoulder replacement, and from wear of a hydroxyapatite-coated hemiarthroplasty implant[1,2,4]. Based solely on these reports, the metal humeral head of the hemiarthroplasty implant contributed to the erosion of the metal glenoid anchors; this seems to be the most common cause of shoulder metallosis. Our patient presented with findings similar to prior reports, including mechanical symptoms and pain; there were no signs of infection. During revision surgery, intra-articular metallic debris and metallic soft-tissue staining were found. After flushing the joint and performing TSA on both shoulders, the patient had excellent results.

In this case, the patient was cautioned about the impending possibility that the glenoid erosion would continue, and he was advised to undergo revision surgery. Understandably, he was reluctant to have additional surgery on both shoulders, but found it to be necessary when the symptoms had become unbearable. In cases similar to this, our recommendation is close monitoring of at-risk patients with serial radiographs in addition to open communication for implementing a shared decision-making model. Given the concavity of the glenoid, radiographs are likely limited in their reliability to demonstrate the true position of metallic anchors relative to the prosthesis. However, radiographic evaluation of the metallic anchors, the remaining joint space, and medial migration of the humeral head can act as surrogate markers of possible complication when combined with physical examination and patient symptomatology.

Metallosis due to glenoid erosion after shoulder hemiarthroplasty in patients with retained metal suture anchors in the glenoid is an important potential complication. To minimize the risk for later wear and the need for future revision surgery, removal of retained metal suture anchors during hemiarthroplasty implantation or primary TSA may be prudent in cases in which removal would not compromise the planned surgical procedure or when the anchors are clearly visible. If removal of the anchors is not possible, or if anchor fragments persist, patient counseling regarding the possibility of delayed complications is warranted. ■

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