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Case Report

Synovial cutaneous fistula complicating a reverse total shoulder arthroplasty

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ABSTRACT

Reverse total shoulder arthroplasty is becoming a common form of shoulder arthroplasty that is often performed in the setting of rotator cuff pathology. Infection is a rare complication but is more common in reverse total shoulder arthroplasty than in hemiarthroplasty or anatomic total shoulder arthroplasty. We present the case of a 69-year-old patient with a reverse total shoulder arthroplasty who presented with purulent drainage from the skin of his anterior shoulder. Computed tomography arthrogram confirmed the presence of a synovial cutaneous fistula. Synovial cutaneous fistula is a rare variant of periprosthetic infection that, to our knowledge, has not been described previously in the setting of a reverse total shoulder arthroplasty. Computed tomography arthrogram proved to be a reliable method for confirming the diagnosis and was used for operative planning to remove the hardware.

Introduction

Reverse total shoulder arthroplasty is becoming an increasingly common orthopedic procedure. It is most often performed in the setting of rotator cuff arthropathy and rotator cuff deficient shoulders [1]. The most common complications of reverse total shoulder arthroplasty include scapular notching, postoperative hematoma, and glenosphere dissociation [1]. Infection is a less common complication, occurring in approximately 1-10% of reverse shoulder arthroplasties [1]. A synovial cutaneous fistula is a very rare form of periprosthetic infection that has not been previously described in the setting of reverse total shoulder arthroplasty. Physical examination, laboratory data, and imaging findings all play an important role in detecting periprosthetic infection.

Case history

A 69-year-old man with history of obesity, atrial fibrillation, and diabetes mellitus, initially presented to an orthopedic surgeon after a motor vehicle accident in which he sustained a comminuted fracture of the proximal left humerus. At that time, he underwent an open reduction internal fixation of the

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proximal left humerus. After surgery, he continued to have severe shoulder pain and limited mobility of the left shoulder. Therefore, 2 years later, he underwent reverse total shoulder arthroplasty of the left shoulder. A few weeks after that surgery, he began to have redness and swelling of the skin overlying the left shoulder. He was treated conservatively with antibiotics as well as incision and drainage of an abscess that developed subsequently. A Technetium (99mTc) exametazime (Ceretec, GE Healthcare, Medi-Physics Inc, Melbourne, FL, USA) scan (Fig. 1) was performed and did not reveal evidence of osteomyelitis. The patient was monitored by an infectious disease physician and was treated with the long-term oral antibiotics.

His symptoms continued to worsen over the next 2 years, and he developed purulent drainage from a soft-tissue wound on the skin overlying the left shoulder (Fig. 2). He presented to our institution to be evaluated by an orthopedic surgeon. His C-reative protein level was 73 mg/L (normal range is <5 mg/L), and his white blood cell count was 11.6 $\times$ $10^3/\mu L$ (normal range is <10.5 $\times$ $10^3/\mu L$). Of note, his hemoglobin A1c was elevated at 8.7% (normal is <5.5%). The orthopedic surgeon wanted to know if the purulent drainage was in continuity with the reverse total shoulder arthroplasty device.

A preoperative computed tomography (CT) arthrogram was ordered. During the fluoroscopic portion of the examination, the contrast agent (a cocktail of equal parts 1% lidocaine and Ominpaque 300) that was injected into the joint rapidly decompressed superiorly through a fistula into the subcutaneous tissues and into an open wound (Fig. 3). The subsequent CT images also demonstrated the fistulous tract between the glenohumeral joint and the skin surface (Fig. 4). The chronic infection had also led to multiple complications of the hardware. For example, the metagalene was no longer positioned flush with the glenoid (Fig. 5A). Three of the anchoring screws were not coursing appropriately through the glenoid, including the central metaglene anchoring screw (Figs. 5B and C). The polyethylene insert was intact, as were

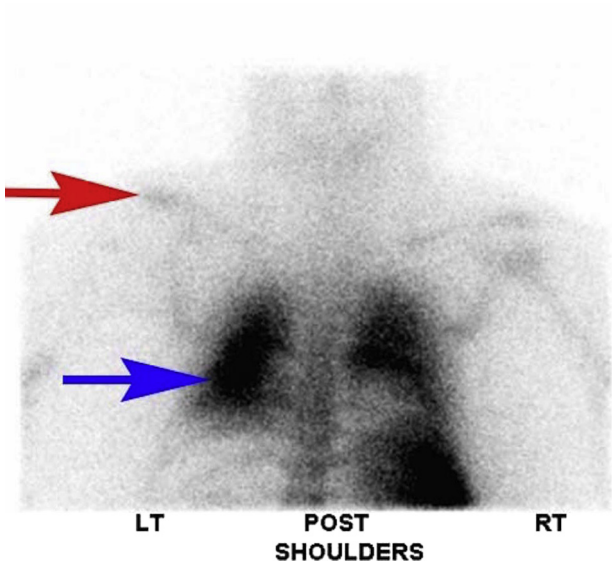

Fig. 1 – Normal Technetium (99mTc) exametazime study. Posterior image of the thorax and shoulders after administration of 27.2 mCi of Technetium (99mTc) exametazime demonstrates no significant uptake of radioisotope in the left shoulder (red arrow) when compared with the right. Incidental note is made of diffuse uptake in the lungs bilaterally (blue arrow) consistent with inflammation.

Fig. 2 – Gross image of the left shoulder. There is an exposed soft-tissue wound on the superior aspect of the patient's left shoulder.

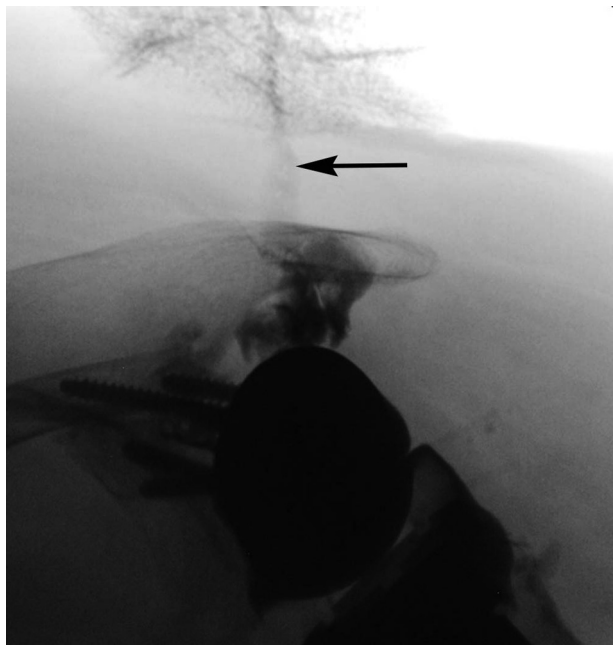

Fig. 3 – Intraprocedural fluoroscopic image of the left shoulder. A linear streak of contrast (black arrow) extends superiorly from the joint and through the soft tissues, exiting through the skin. A rotator interval approach was used for the procedure.

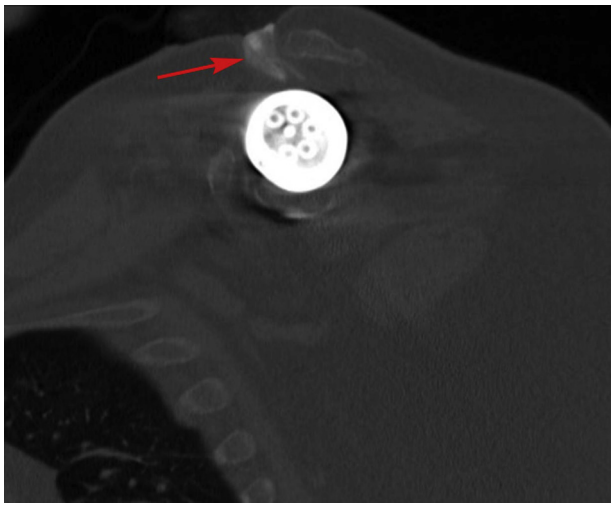

Fig. 4 – Sagittal CT arthrogram image of the left shoulder. Contrast agent is seen tracking superiorly from the joint and through the defect in the skin (red arrow).

the glenosphere and metagalene prosthetic components. There was also a minor degree of scapular notching, suggesting inferior glenoid impingement.

The patient underwent removal of the total shoulder arthroplasty device via a deltopectoral approach. The sinus tract was debrided, and the wound was excised. A frozen section of tissue from the humeral canal was taken and revealed over 20 white blood cells per high-power field, suggesting infection. Therefore, the humeral and glenoid components of the arthroplasty were removed. A Prostalac spacer (ExacTech, Gainesville, FL, USA) was assembled and loosely held into place in the humeral canal by cement (Fig. 6). Propionibacterium was isolated from the humeral specimen. After surgery, standard postoperative care was initiated with nonsteroidal anti-inflammatories and physical therapy, and the patient has made significant progress in regard to his shoulder mobility and pain.

Discussion

Periprosthetic infection is a rare but serious complication of joint replacement and is most commonly seen with hip and knee arthroplasties [2]. Risk factors associated with periprosthetic infection include diabetes mellitus, atrial fibrillation, obesity, chronic immunosuppression, and tobacco use [2]. Physical examination findings and laboratory data are essential in making the diagnosis. A C-reactive protein level greater than 10 mg/L is very indicative of infection, and when used in conjunction with erythrocyte sedimentation rate, has a specificity of 1.00 for diagnosing infection [2]. According to the Clinical Orthopedics and Related Research guidelines published in 2011, the diagnosis of a periprosthetic joint infection requires several criteria be met. Our patient met the criteria of a sinus tract communicating with the prosthesis and a pathogen (Propionibacterium) being isolated from the tissue sample, with other criteria in our case including elevated erythrocyte sedimentation rate, C-reactive protein, white blood cell count, and greater than 5 neutrophils per high-power field [3].

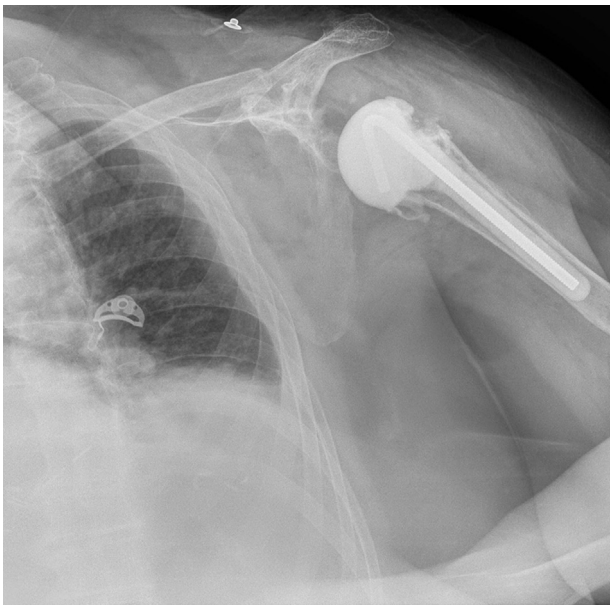

Fig. 6 – Anterior–posterior radiograph of the left shoulder acquired in the postanesthesia care unit. The patient has undergone removal of the reverse total shoulder arthroplasty, and an antibiotic-impregnated cemented device has been placed.

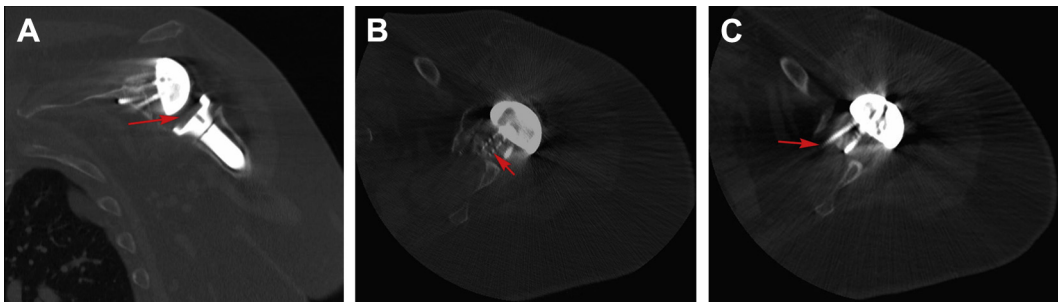

Fig. 5 – Axial CT arthrogram images. In Figure A, the metagalene component (red arrow) is not flush with the glenoid. In Figure B, the central metalgene screw (red arrow) is not anchored appropriately in the glenoid. In Figure C, one of the anterior anchoring screws in not anchored to the glenoid.

Periprosthetic infection can be subdivided into categories based on the chronicity of the infection. "Early" infections occur within 3 months of prosthesis placement, "delayed" occur within 3-12 months, and "late" occur more than 12 months after surgery [1]. This information is helpful in predicting the route of infection because most late infections are hematogenously acquired [2]. One study reviewed 35 cases of shoulder arthroplasty infection and demonstrated the 2 most common organisms are *Staphylococcus epidermidis* and *Propionibacterium acnes* [4]. Rates of infection are reportedly higher with reverse total shoulder arthroplasty than with hemiarthroplasty and anatomic total shoulder arthroplasty and range from 1 to 10% [1]. Rates of infection have been shown to be lower in patients with an antibiotic-impregnated cemented reverse total shoulder arthroplasty when compared with those patients without antibiotic-impregnated cement [1].

Imaging can facilitate the diagnosis of a suspected infected prosthetic joint. Findings that suggest infection include radiolucency around the humeral component of >0.5 mm, periostitis, and soft-tissue swelling [5]. Bone resorption around the prosthesis is also an indicator of infection on plain radiograph [6]. Magnetic resonance imaging is often limited in the setting of metallic hardware. CT arthrogram has been shown to be safe and effective alternative to magnetic resonance imaging in these patients [7]. Arthrography, however, is controversial in the setting of a suspected joint infection. In the case of our patient, the referring surgeon wanted to confirm the presence of a fistulous tract and had already planned to take the patient to surgery. In addition, the route of needle entry into the skin for the procedure did not overlap with the well-defined skin wound. Nonetheless, it was discussed with the patient and his wife, and he was elected to undergo the examination.

There are only a few case reports of patients who developed infected synovial cutaneous fistulas secondary to an arthroplasty, and most of these are reported in knees and hips [8–12]. The 2 case reports of synovial cutaneous fistulas of the shoulder [11,12] discussed sterile fistula formation after massive rotator cuff repair. Our case is, therefore, unique in that we discuss an infected fistulous tract complicating a reverse total shoulder arthroplasty. To our knowledge, this has not been reported previously in the literature.

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