

# Massive Subacromial-Subdeltoid Bursitis With Rice Bodies Secondary to an Orthopedic Implant

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## Abstract

Both early and late complications following open reduction and internal fixation of proximal humerus fractures have been reported extensively in the literature. Although orthopedic implants are known to cause irritation and inflammation, to our knowledge, this is the first case report to describe a patient with massive subacromial-subdeltoid bursitis with rice bodies secondary to an orthopedic implant.

Although the etiology of rice bodies is unclear, histological studies reveal that they are composed of an inner amorphous core surrounded by collagen and fibrin. The differential diagnosis in this case included synovial chondromatosis, infection, and the formation of a malignant tumor. Additional imaging studies, such as magnetic resonance imaging, and more specific tests were necessary to differentiate the rice bodies due to bursitis versus neoplasm, prior to excision.

The patient presented 5 years following open reduction and internal fixation of a displaced proximal humerus fracture, with swelling in the area of the previous surgical site. Examination revealed a large, painless tumor-like mass on the anterior aspect of the shoulder. The patient's chief concern was the unpleasant aesthetic of the mass; no pain was reported. Upon excision of the mass, the patient's full, painless range of motion returned.

Early complications following repair of a proximal humerus fracture with a locked plate and screw construct have been reported often in the literature and include infection, hardware failure, and screw penetration of the articular surface.<sup>1-6</sup> Late complications following open reduction and internal fixation (ORIF) of proximal humerus fractures include shoulder stiffness, painful hardware, osteonecrosis, and subacromial bursitis.<sup>1,7,8</sup> While subacromial bursitis is not uncommon following trauma to the shoulder, it is usually marked by inflammation of

the rotator cuff musculature and pain with overhead activities. In very rare cases, bursitis about the shoulder may involve the subdeltoid bursa that possesses no communication with the subacromial bursa. Even more unusual in the inflammatory cascade is the development of rice bodies.

Although the formation of numerous small white nodules, or rice bodies, is more commonly encountered in rheumatoid synovitis,<sup>9</sup> it has also known to be a rare complication of chronic bursitis.<sup>10,11</sup> These rice bodies, thought to be a nonspecific response to synovial inflammation, are either composed of a core of collagen with a fibrinous border, or fibrin only.<sup>12</sup> Their etiology remain unclear, but some authors suggest that rice bodies arise from microinfarcted synovium, which leads to synovial shedding and the subsequent encasement of fibrin.<sup>13</sup> Others have proposed their formation to be de novo in synovial fluid and their progressive enlargement to be the aggregation of fibronectin or fibrin.<sup>9</sup> Clinically and macroscopically, rice body formation due to chronic bursitis may resemble synovial chondromatosis, and magnetic resonance imaging (MRI) is necessary to distinguish the diagnoses.<sup>14</sup>

While orthopedic trauma implants are known to cause irritation and inflammation to surrounding muscles and tendons, to our knowledge, there have not been any reports of massive subacromial-subdeltoid bursitis with rice bodies secondary to an orthopedic implant. We report an unusual case of a 66-year-old female presenting with rice body formation due to chronic subacromial-subdeltoid bursitis 5 years post-proximal humerus fracture treated with a locked plate and screws. The patient provided written informed consent for print and electronic publication of this case report. After consulting with the Institutional Review Board (IRB), it was determined that IRB approval was not necessary for this case report.

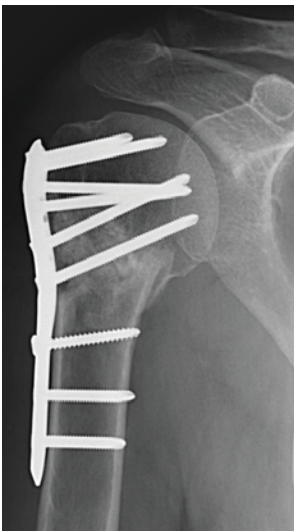
## CASE REPORT

A 66-year-old female presented with an atraumatic swelling about the operative shoulder, 5 years following an ORIF of a displaced 2-part proximal humerus fracture. A review of the surgical details revealed an uncomplicated surgical intervention where the fracture was reduced open through a deltopectoral approach. Following reduction, 20 mL of crushed cancellous allograft bone was placed within the metaphyseal

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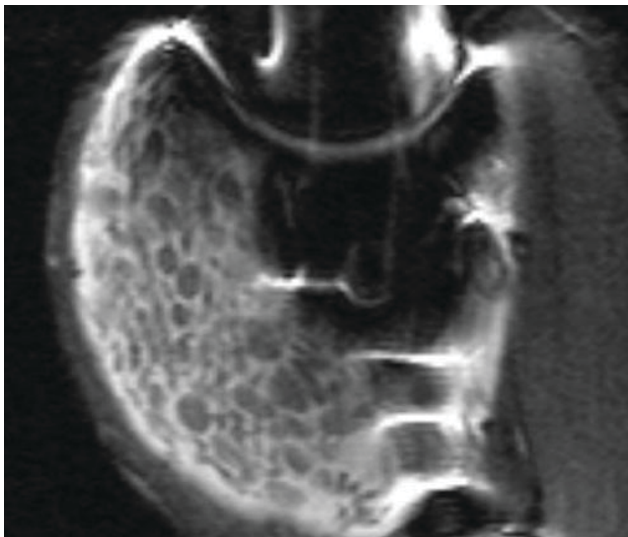
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**Figure 1.** Anteroposterior radiograph taken 12 months after injury shows a united fracture.



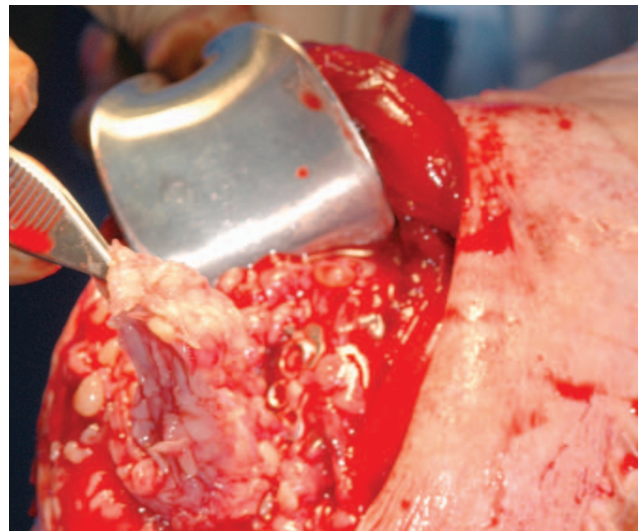
**Figure 2.** Clinical appearance of the shoulder with a large mass, causing visible distortion of the anterior aspect of the shoulder.



**Figure 3.** MRI of the affected shoulder revealed a fluid filled sac with numerous isotense bodies.

void. Two Ethibond (Ethicon, Somerville, New Jersey) nonabsorbable sutures were placed, 1 through the supraspinatus and 1 through the teres minor. Fixation was achieved with a proximal humeral locking plate affixed to the lateral aspect of the humerus with a total of 9 screws, 6 placed within the head and 3 in the shaft. Postoperative radiographs revealed anatomic restoration of the humeral head-neck relationship and reduction of the glenohumeral joint.

The patient was followed at regular intervals until 1-year after surgery. The fracture was radiographically united at 2-months postoperatively, and at 4 months, she had an excellent clinical and functional result with a full painless range of motion. One-year after surgery, the patient continued to have full range of motion,



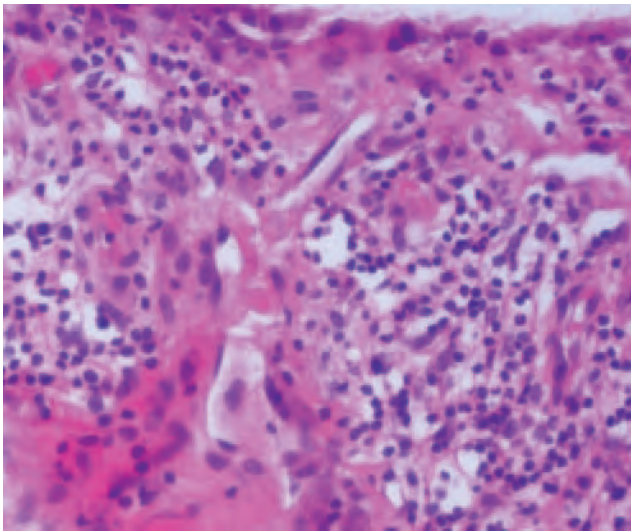
**Figure 4.** A large encapsulated mass was found through a deltopectoral approach. Incision into the capsule revealed several hundred rice bodies, both free floating, and attached to the synovial lining.

excellent strength, was neurovascularly intact, and had no evidence of healing complication (Figure 1).

At 5-years post-repair of the proximal humerus fracture, the patient presented with a large soft tissue mass about the previous surgical site. She was not certain of its onset, but had become aware of the bulge 1 month prior. Examination revealed a large mass causing distortion of the anterior aspect of the shoulder (Figure 2). The patient had a full painless range of motion.

Radiographic findings on standard anteroposterior, axillary, and internal and external rotation views did not reveal any indications of rotator cuff disease or degenerative arthritis. A multiplanar MRI of the shoulder without intravenous contrast was obtained to evaluate the soft tissue mass. This study revealed a large heterogeneous fluid collection located deep in the deltoid muscle, which communicated with the subacromial and subdeltoid bursa. Furthermore, the mass, which measured  $10.6 \times 8.5 \times 2.6$  cm, was found to have innumerable isotense bodies within it (Figure 3). Baseline laboratory values including complete blood count, erythrocyte sedimentation rate, C-reactive protein, and complete metabolic panels were within normal parameters. The patient's white blood cell count was also normal.

The patient underwent an excisional biopsy 3 weeks later. At surgery, a large mass of encapsulated fluid was found in the subacromial-subdeltoid bursa, which contained several hundred small 0.5 cm rice bodies (Figure 4). Some of the rice bodies were loose while others were attached to the synovial lining of the bursa. The entire bursa was excised; there was neither communication with the glenohumeral joint nor compromise of the rotator cuff. Upon resection, the patient continued to have a full, painless range of motion, and returned to her active lifestyle.



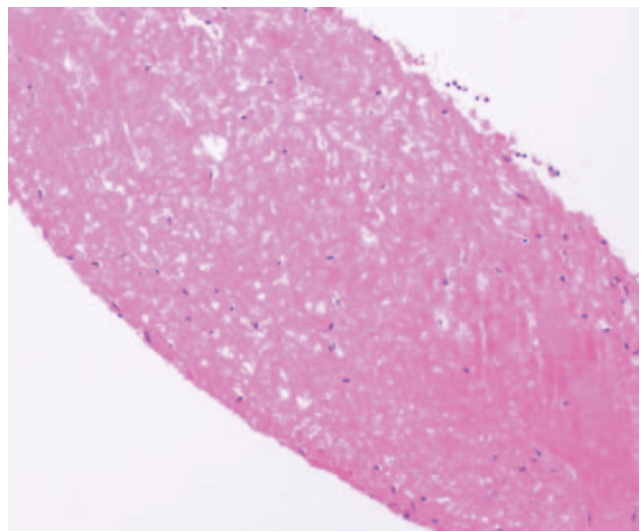
**Figure 5.** Histologic specimen of synovial lining revealed abundant neutrophils and lymphocytes characteristic of nonspecific inflammation (Hematoxylin and Eosin [H&E] stain, 20x).

Pathological examination of the synovial lining of the bursa revealed the presence of neutrophils and lymphocytes; findings were consistent with acute and chronic inflammation (Figure 5). The rice bodies were found to be composed of dense fibrinous material (Figure 6). These histological findings confirmed that the mass was benign and that the rice bodies were the result of subacromial subdeltoid bursitis.

The patient's postoperative course was unremarkable. Twelve months after mass excision, the patient was examined by her treating orthopedic surgeon, and radiographs and a thorough clinical examination revealed an excellent result. She returned to full activities with acceptable cosmesis.

## DISCUSSION

Complications following operative fixation of proximal humerus fractures range between 9.4% to 50%.<sup>5,13</sup> Early complications include screw perforation into the glenohumeral joint, infection, and malalignment, while late complications include shoulder stiffness, osteonecrosis, and painful hardware.<sup>1-4,6-8</sup> Egol and colleagues<sup>2</sup> reported 16 complications among 12 patients in a series of 51 patients (23.5%); 8 patients (16%) had screws that penetrated the humeral head, 2 patients (4%) had early implant failure, and 2 (4%) developed osteonecrosis. Agudelo and colleagues<sup>1</sup> reported complications in 29 of 153 patients (19%). Among the 29 patients with complications, 7 patients (4.5%) developed osteonecrosis, 7 patients (4.5%) deep infection, and 3 (2%) went on to develop a frozen shoulder. Most complications that result from the ORIF of proximal humerus fractures are treated by revision surgery, and most frequently, hardware removal. Although both early and late complications following repair of a proximal humerus fracture are common in the literature, to our knowledge, there



**Figure 6.** Histologic specimen shows a rice body filled with dense fibrinous material (H&E, x10).

have not been any reports of massive subacromial-subdeltoid bursitis with rice bodies secondary to an orthopedic fracture implant in this or any other area of the body.

Rice bodies, which are thought to be a nonspecific response to synovial inflammation, macroscopically resemble white, shiny grains of rice. Histologically, they consist of an inner amorphous core of acidophilic material surrounded by collagen and fibrin.<sup>11</sup> The pathogenesis of rice bodies is unknown. Some authors have proposed that they arise from microinfarcted synovium leading to synovial shedding,<sup>15</sup> while others suggest that they form spontaneously in synovial fluid and progressively enlarge with the aggregation of fibrin.<sup>9</sup> The differential diagnosis in this case included synovial chondromatosis. However, the rice bodies were determined to be the product of chronic and acute inflammation due to the lack of evidence of chondroid tissue in the rice bodies. Infection was also ruled out when the white blood cell count was within the normal physiological range.

The formation of a local malignant tumor is another rare, yet known, complication of metal orthopedic implants. In 1989, Sunderman<sup>16</sup> presented a compilation of 13 case reports of patients that developed malignant tumors, predominantly sarcomas, at the site of an orthopedic implant. Many of the prosthesis implanted in the patients that went on to develop tumors were made of FeCrNi (stainless steel) or CoCrMo (Vitallium) alloys. Similarly, a review published in 1995 described 20 cases in which a tumor was identified in close proximity to a metallic implant.<sup>17</sup> Vahey and colleagues<sup>17</sup> suggested that the carcinogenicity of metallic implants may be caused by either the direct toxicity of the compounds, corrosion of the implants, or the electromotive forces that result from the use of different metals for the plate and the screws. The orthopedic implant used in this case was a stainless steel proximal humerus locking plate and



9 stainless steel screws. Although there was a massive tumor-like growth overlying the implant, histological assessment of the tissue revealed no evidence of carcinogenesis, and the potential of a sarcoma was removed from the differential.

Plastic-coated polyester sutures, like the Ethibond (Ethicon) used on this patient, have also been reported to cause a foreign-body response several years postoperatively.<sup>18,19</sup> A study on rabbits indicated that the inflammatory reaction that results from the non-absorbable sutures is likely specific to the polyester component. Mozaffar and colleagues<sup>20</sup> reported that Ethibond (Ethicon) ranked second only to Tevdek (Genzyme, Cambridge, Massachusetts) in terms of the average number of giant cells found around each suture. In another rabbit model that investigated the histologic response to 8 commonly used orthopedic sutures, Ethibond (Ethicon) stimulated minimal tissue reactivity, compared with other high-strength sutures.<sup>21</sup> Although foreign-body responses have been reported in humans in response to nonabsorbable sutures, the development of rice bodies has not been described. It is unclear what caused the inflammatory reaction in this case.

Significant isolated shoulder swelling indicative of an underlying mass has been reported as the primary manifestation of rheumatoid arthritis.<sup>22</sup> The presence of rice bodies has also commonly been reported in various arthritides including rheumatoid and septic arthritis.<sup>9</sup> Steinfeld and colleagues<sup>12</sup> described 3 cases of massive subacromial bursitis with multiple rice bodies and discovered that 2 of 3 patients had an underlying arthropathy. Because the patient in our case report did not have a history of rheumatoid arthritis, an inflammatory arthritis panel was not taken. Although less common, there have been reports in the literature of chronic bursitis with rice body formation without an underlying systemic disorder. Chen and colleagues<sup>23</sup> reported a case of rice body formation in chronic subacromial-subdeltoid bursitis in a patient that did not have arthritic symptoms; the cause of the chronic bursitis and formation of the rice bodies was unknown. Sahlstrand and colleagues<sup>10</sup> described a case of painful-arc syndrome caused by subacromial bursitis with loose bodies. This patient had a history of pain in the shoulder, both with motion and at rest, and had a restricted range of shoulder motion. There was no indication of trauma in either of the cases. We note that since we report only 12-month follow-up and the mass was detected 5 years post-ORIF, a recurrence is possible, although the risk of recurrence is unknown. In this case, no laboratory panel was obtained to definitively rule out inflammatory arthritis as a potential etiology; there was no evidence of this condition and the arthritis panel was deemed unnecessary.

## CONCLUSION

To the best of our knowledge, this is the first case of chronic bursitis with rice bodies presenting as a compli-

cation following the insertion of an orthopedic fracture implant in a patient with no history of an underlying systemic condition. Prior to the resection, the patient had a full painless range of shoulder motion and her chief concern was the size and unpleasant aesthetic of the obvious deformity of the shoulder. Once the entire bursa was excised, the patient's full, painless range of motion returned.

## AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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