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Case Report

Open reduction internal fixation with bone grafting for scapular body nonunion: A case report

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ABSTRACT

Scapular body fractures are rare fractures that represent less than 1 % of all fractures and are typically associated with a high energy mechanism of injury. Traditionally these fractures have been treated non-operatively, resulting in union of the fracture and acceptable patient outcomes. We present a case of symptomatic scapular body fracture nonunion following non-operative management that was treated with open reduction and internal fixation with local autologous bone grafting. Our patient went on to successful union of his fracture as well as drastic improvement in shoulder function, range of motion, strength, and patient reported outcome measures assessed throughout his treatment course. The authors believe that scapular body fracture nonunion should be of clinical suspicion in forming the differential diagnosis for a patient who had previously sustained a scapular body fracture with persistent pain and failure to improve following non-operative management. We believe that open reduction and internal fixation with bone grafting can help promote fracture union in these patients and may result in improved shoulder function post-operatively.

Introduction

Scapular body fractures represent less than 1 % of all fractures [1]. Fractures of the scapular body account for about 50 % of all scapular fractures [2]. These injuries typically occur secondary to high energy, direct trauma to the shoulder sustained during motor vehicle or sporting injuries [1,3,4]. Traditionally, fractures of the scapular body have been treated non-operatively. A growing number of scapula fractures are being treated operatively, using well established criteria for scapula fracture instability [2,5–8]. Non-union of these fractures is rarely reported. To our knowledge only 2 prior case reports of symptomatic non-union of the scapular body exist [9,10]. The authors report that treatment with open reduction and internal fixation (ORIF) with local bone graft resulted in union of the fracture and improved outcome for their patients. Due to the paucity of information on this topic, we present a case of a 41-year-old male who suffered a scapula body fracture following a fall off a ladder and went on to develop a symptomatic nonunion that failed conservative non-operative treatment. He subsequently was treated with ORIF with iliac crest bone grafting and went on to successfully heal his fracture with symptomatic improvement.

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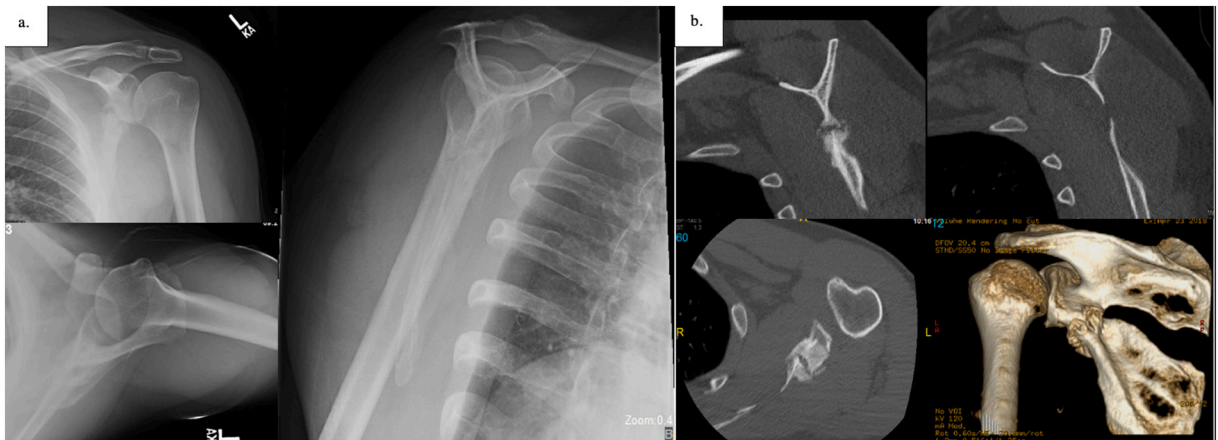


Fig. 1. a: AP (top left), Axillary (bottom left), and Scapular-Y (right) radiographs of the left shoulder from initial presentation, 4/30/18. b: Sagittal CT cuts (top left, top right), Axial CT cuts (bottom left) and 3-dimensional reconstruction (bottom right) of the left scapula from initial presentation, 4/30/18.

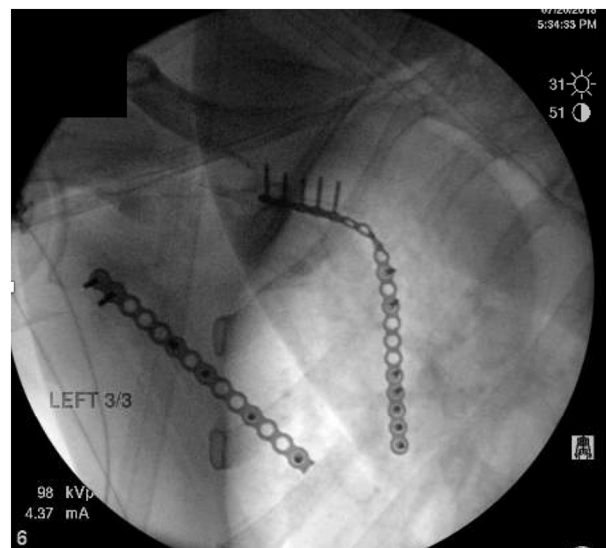


Fig. 2. Intraoperative fluoroscopic imaging demonstrating fracture nonunion reduction and fixation.

Clinical summary

A 41-year-old right hand dominant male was referred to the senior author for left scapular body nonunion. The patient initially sustained a left shoulder injury in November of 2017 after falling roughly 6 ft off a ladder onto his left shoulder. He did not seek immediate medical attention. Two weeks following the primary injury he presented to his primary care physician's office for evaluation and was subsequently diagnosed with a displaced, transverse infraglenoid fracture of the left scapular body. He was initially managed nonoperatively in a sling.

After six months of persistent pain and weakness in his left shoulder it was recommended he see a sports medicine physician for further evaluation. Presenting radiographs are shown in Fig. 1a. His main complaints were persistent pain and weakness in the left shoulder. CT and MRI of the left shoulder at that time demonstrated an atrophic nonunion of the left scapular body as well as a partial-thickness articular sided supraspinatus tear (Fig. 1b). The patient was referred to the senior author who is fellowship trained in orthopaedic traumatology for management of scapular fractures.

The patient presented to the office on 5/3/18. He made a decision to proceed with surgery due to worsening left shoulder pain and disability.

On 7/20/2018 the patient underwent reconstruction of the left scapular body nonunion with ORIF and local autologous bone grafting. An extensile Judet approach to the left scapular body was used. Separation of the two pieces of the fractured scapular body of

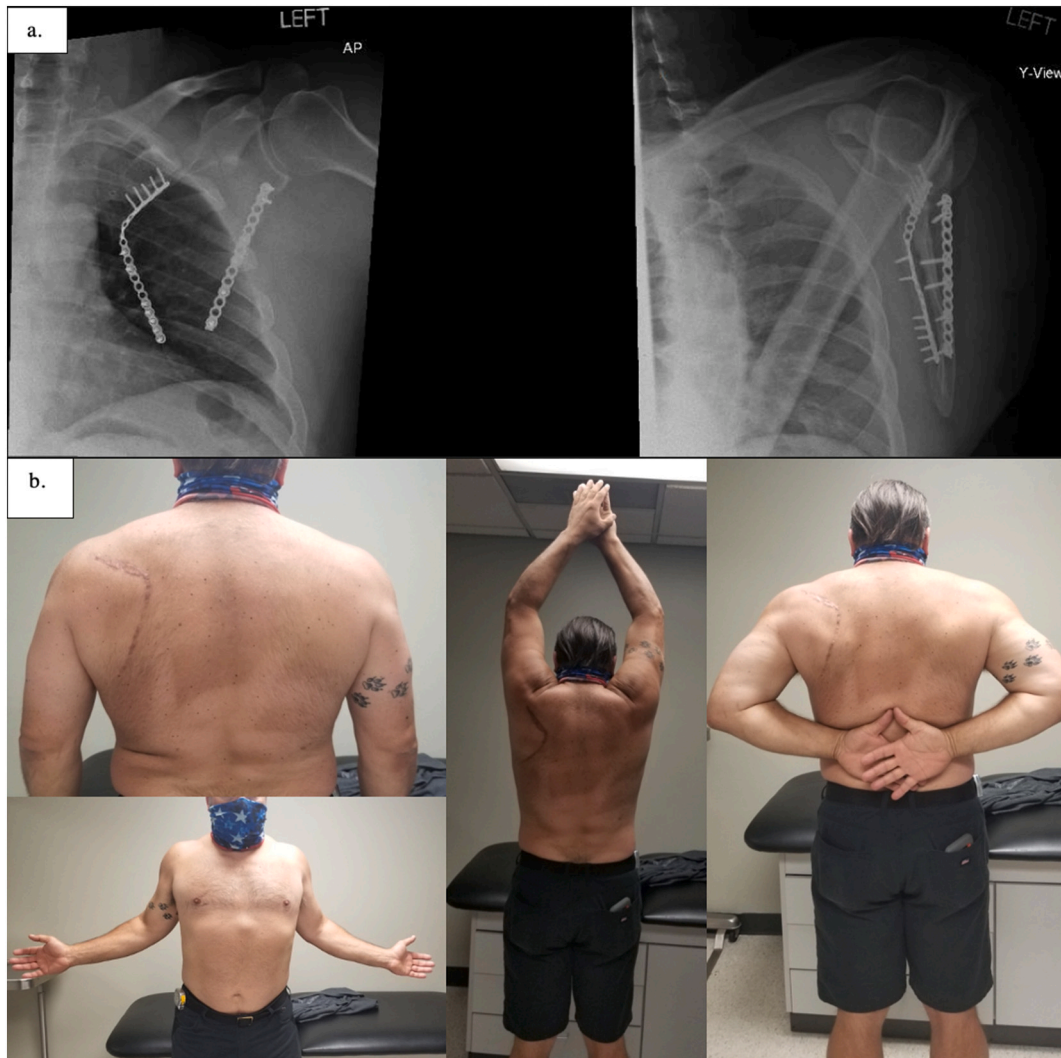


Fig. 3. a: AP (left) and Scapular-Y (right) radiographs of the left shoulder at final follow-up demonstrating stable fixation with complete healing of the fracture.

b: Clinical photographs from 2-year follow-up visit demonstrating well-healed surgical incision, symmetric shoulder girdle musculature, and full range of motion.

approximately 3 cm and 1.5 cm along the medial and lateral borders with a small amount of residual callous was noted. The nonunion site was taken down and ends of the fracture fragments were debrided. The fracture was reduced anatomically and provisionally clamped. Medial fixation was performed with a pre-bent 2.4 mm locking compression reconstruction plate. Fixation of the lateral border of the scapula was obtained with a 2.7 mm locking compression plate with locking and nonlocking screws. Intraoperative fluoroscopy was taken and confirmed anatomic reduction of the non-union as well as appropriate placement of the implants (Fig. 2). Local bone graft, harvested during debridement portion of the procedure, was morcellized and impacted along the nonunion site. The soft tissue flap was fixed to the scapular spine and to the medial border of the scapula with transosseous #2 Ethibond sutures and #1 Vicryl sutures. The remaining soft tissues were closed in standard fashion. The patient was discharged from the hospital on post-op day 1. He was instructed to be non-weight bearing on his left upper extremity in a sling.

At 8 weeks post-operatively, radiographs demonstrated bridging callus across the fracture. He was started on physical therapy for the left shoulder at this time and was kept to 1-pound weight-lifting restrictions. At 6 months post-operatively radiographs demonstrated complete healing of the fracture. Vigorous physical therapy with rotator cuff muscle strengthening exercise was prescribed.

The patient was seen again at one and two years post-operatively. At final follow up he had returned to pre-injury baseline functional status. Final radiographs re-demonstrated complete healing of the non-union (Fig. 3a). On physical examination he had symmetric shoulder girdle musculature. Full, painless, range of motion of the left shoulder was restored (Fig. 3b). He had regained 5/5 strength in the left shoulder periarticular musculature.

Throughout his clinical course patient reported outcome measures (PROMs) including SANE score, Quick Dash, SST, and American

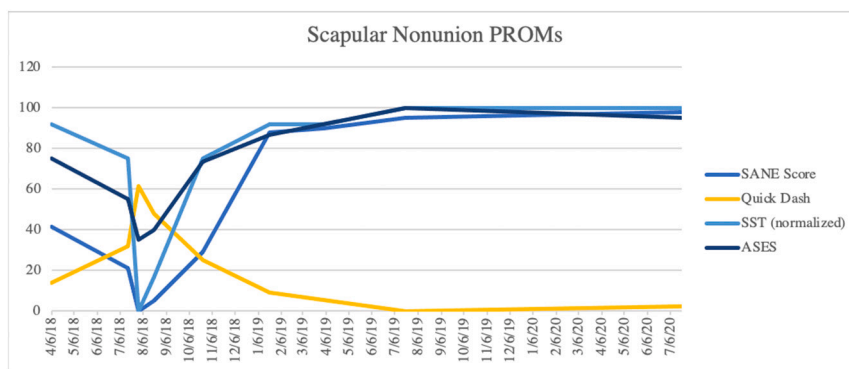


Fig. 4. Trends in patient reported outcome measures from 4/6/18 (initial visit) to 7/6/20 (two-years post-operatively).

Shoulder and Elbow Score (ASES) were collected. These scores were collected pre-operatively, and at each subsequent visit. At final follow up SANE Score was 97.92, Quick DASH was 2.27, SST was 100, and ASES was 95. Improvement well-above the minimum clinically important difference (MCID) was reported for all scores (Fig. 4).

Discussion

Scapular fractures, specifically those of the scapular body, are frequently managed non-operatively with satisfactory outcomes. Symptomatic scapular body fracture nonunion has only been reported twice in the literature [9,10]. Gupta et al. reported a case of symptomatic scapular body nonunion that was treated with ORIF and local bone grafting. Intraoperatively it was discovered that the teres major muscle was interposed between the two bony fragments, and they hypothesized this was the cause of the nonunion in this case. Treatment with ORIF and local bone graft resulted in successful union of the fracture with a pain-free shoulder and vast improvement in range of motion [10]. Ferraz et al. reported a case of scapular body fracture with intraarticular extension into the glenoid. They suggest that the nonunion occurred in their patient due to the significant initial displacement and comminution of the fracture [9]. Following ORIF with iliac crest bone grafting their patient went on to union of the fracture and at two-year follow-up had full, painless range of motion and 5/5 muscle strength.

Our patient was diagnosed with symptomatic scapular body fracture nonunion that had failed conservative management. Intraoperatively there was no interposition of muscles or soft tissue between fracture fragments that could have contributed to failure of the initial fracture to heal. We hypothesize that the nonunion in this case was due to the initial displacement of the fracture with wide diastases of the fragments and loss of bony contact.

Following ORIF with local autologous bone grafting our patient went on to successful union of the fracture as well as dramatic improvement in shoulder function. At final follow-up he had full, painless range of motion of the left shoulder and had returned to pre-injury functional status. Patient reported outcome measures collected throughout the course of his treatment demonstrated improvement well above the MCID for all outcome measures collected. We suggest based on our experience and the experience of the authors of the two previously published reports of operative fixation of scapular body nonunion that ORIF with bone grafting for symptomatic nonunion of a scapular body fracture is a safe treatment option and may result in improved patient outcomes.

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