Case Report

Atraumatic Deltoid Rupture with a Chronic Massive Rotator Cuff Tear: A Case Report and Surgical Technique

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1. Introduction

Rupture of the deltoid muscle is a rare condition that can result in disabling functional limitations of the arm. It is most often reported in literature as a postoperative complication after open rotator cuff repair (RCR) or reverse total shoulder arthroplasty (rTSA) where the anterior deltoid was released for surgical exposure. Glenohumeral steroid injections, chronic rotator cuff tears (RCTs), and trauma have all also been described as potential predisposing etiological factors [1–6]. In cases with concomitant RCTs, early recognition and treatment is crucial as management options can become drastically limited [7].

We report a rare case of spontaneous atraumatic deltoid rupture with an underlying massive RCT. Herein, we describe the unique clinical presentation, advanced imaging findings, intraoperative findings, and 12-month postoperative outcome. The patient provided consent for data concerning the case to be submitted for publication.

2. History and Preoperative Findings

The patient is a 73-year-old, right-handed female with a past medical history of a chronic massive RCT of the right shoulder diagnosed 3 years prior to current presentation. At that time, she described unremitting pain in the anterior shoulder exacerbated by overhead activities and lifting objects. Magnetic resonance imaging (MRI) confirmed a massive RCT with supraspinatus, infraspinatus, and subscapularis muscle atrophy (Figure 1). As her symptoms persisted despite a course of physical therapy, surgical treatment with rTSA was recommended. However, given reasonable functional capacity, she refused surgical intervention.

Nine days prior to the current presentation, the patient noted an acute onset of weakness, pain, bruising, and deformity of the right shoulder. She denied any significant lifting, falls, or trauma that led to her symptoms despite multiple questions. Physical examination was remarkable for a palpable defect just distal to the antero-lateral aspect of the
acromion (Figure 2). The torn deltoid muscle was retracted and rolled back distally resulting in a palpable mass. In addition to preexisting strength deficits related to massive RCT (external rotation lag sign, drop arm sign), there were deficits in abduction due to deltoid deficiency. Passive range of motion (ROM) of the right shoulder was severely limited by pain and guarding. A new MRI reconfirmed the massive RCT involving the supraspinatus, infraspinatus, and subscapularis tendons, all with fatty atrophy (grade 3 and higher) and anterior deltoid head rupture from the acromion with distal migration of the muscle mass (Figure 3).

Given the acute nature of the injury and potential impact on feasibility of future rTSA, extensive discussion was conducted regarding treatment options which included nonoperative treatments (observation and supervised therapy if or when pain improved), surgical repair of the deltoid only, or surgical repair of the deltoid with concomitant insertion of rTSA. After much consideration, the patient decided to proceed with the surgical repair of the deltoid without rTSA.

3. Surgical Treatment and Postoperative Care

With the patient in a beach chair position, a superior incision was made from the coracoid process, over the anterior lateral corner of the acromion, extending posteriorly by about 8 cm. Upon blunt subcutaneous tissue dissection, the thin fascia overlying the anterior and lateral portion of the deltoid was noted. In fact, the torn deltoid could not be immediately visualized as this fascia was directly overlying the muscle (Figure 4(a)). With palpation, however, the area of rupture could clearly be identified. The fascia was incised distally from the antero-lateral corner of the acromion. Residual hematoma was immediately identified and evacuated.

The underlying shoulder joint was evaluated and the massive RCT was confirmed and retracted medial to the glenoid rim. The tear included all of the supraspinatus and infraspinatus tendons, as well as the upper subscapularis tendon. Despite attempts, the tendons could not be mobilized for repair.

Intraoperative inspection of the deltoid revealed that both the anterior and middle deltoid heads had avulsed from their origin and retracted distally and posteriorly. The deltoid muscle was secured provisionally with strong resorbable sutures (FiberTape sutures x3 [Arthrex, Naples, FL.]) passed in a Mason Allen configuration as described by Gerber et al. (Figure 4(b)) [8]. After blunt mobilization for maximal excursion, the deltoid origin eventually could easily reach the acromion to restore normal anatomy. The sutures were passed vertically from the inferior to superior surface of the lateral and anterior border of the acromion via drill holes. In order to minimize the likelihood of bone "cut out,” these sutures were tied over a 3-hole mini plate (Stryker, Kalamazoo, MI) on the superior surface of the acromion with the arm in abduction to reduce stress on the repair (Figure 4(c)). During movement of the shoulder, even at full adduction and rotation, minimal stress was noted at the repair site. The wound was then closed in layers.

The arm was immobilized in a splint with the shoulder in 30 degrees of abduction for the first 2 weeks, which was then switched to a simple sling. Physical therapy for passive motion was scheduled to start at 4 weeks with the allowance for active motion at 8 weeks.

4. Outcome

Due to COVID-19 pandemic, the patient was able to comply with postoperative rehabilitation for only the first 9 weeks. At that time, her ROM revealed passive shoulder flexion to 100° and external rotation (ER), with the arm at the side, to 30°. Active flexion and ER were 60° and 20°, respectively. She did a home exercise program thereafter. One-year follow-up was conducted via telemedicine as the patient did not wish to return for an in-person visit due to the ongoing pandemic. The patient was asked to complete seven
patient reported outcome measures (Table 1). When asked about her postoperative shoulder function, she stated it was grossly unchanged from preoperative status. Additionally, the patient reported that her pain is now minimal and noted discomfort only at the extremes of her shoulder ROM and after strenuous use.

5. Discussion

Deltoid ruptures have been reported in the setting of chronic RCTs, steroid injections, sclerotic changes, open RCR or acromioplasty, trauma, calcific tendinopathy, and chronic subacromial bursitis [3–6]. Sclerotic changes of the humeral
ruptures are confi-
table concerns, to our knowledge, only 7 atraumatic deltoid
ature of the deltoid muscle [4, 5, 9, 12]. Despite these theoret-
it has been proposed that underlying RCTs can disrupt the
degeneration with increased risk for rupture [2–5]. In turn, the superiorly
migrated humeral head may then impinge the deltoid origin
against the edge of the acromion leading to muscle fiber
degeneration with increased risk for rupture [2–5]. As such,
it has been proposed that underlying RCTs can disrupt the
intrinsinc shoulder dynamics and lead to an atraumatic rupture
of the deltoid muscle [4, 5, 9, 12]. Despite these theoretical
concerns, to our knowledge, only 7 atraumatic deltoid
ruptures are confirmed in the literature [2–4, 11].

From available reports, new onset or sudden worsening
of shoulder pain is the most common presenting symptom;
further suspicion may be raised by swelling, ecchymosis,
arm weakness, and decreased ROM [2, 5]. In conjunction
with these typical findings, our patient presented with a pa-
nable defect just distal to the antero-lateral aspect of the
acromion which has been reported to be fairly rare, occurring
in only 8.3% of the patients described by Ilaslan et al.
[5]. Of the 24 patients reported in their study, all patients
suffered from tears to the middle deltoid [5]. Though initial
intraoperative inspection of the ruptured deltoid was diffi-
cult to discern as the overlying fascia remained intact despite
the injury, our patient revealed rupture to both the anterior
and middle heads of the deltoid.

The available literature on deltoid ruptures is relatively
sparse, but does include reports of these ruptures in the set-
ing of an existing RCT [2–4, 11]. Ilaslan et al. and Colak
et al. reported a review based on imaging of this injury.
The former found in 8,562 shoulder MRIs, only 24 patients
(0.3%) had both injuries while the latter found this concurren-
ce in only 46 of the 111,889 shoulder MRIs reviewed
(0.04%) [3, 5]. The remaining 4 articles found 7 patients

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<th>Postoperative score</th>
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<tr>
<td>PROMIS Upper Extremity</td>
<td>24.8 ± 2.2</td>
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<tr>
<td>PROMIS Pain Interference</td>
<td>63.3 ± 2.2</td>
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<tr>
<td>PROMIS Pain Intensity</td>
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<td>PROMIS General Life Satisfaction</td>
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<td>American Shoulder and Elbow Surgeons Score</td>
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<td>Constant Murley</td>
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<tr>
<td>Subjective shoulder value</td>
<td>30</td>
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with concurrent injuries, further affirming the scarcity of
this diagnosis [2–4, 11]. Tay and Collin described a case
Though this may be possible in a very specific patient subset,
deltoid function is critical for rTSA and typically not recom-
manded unless deltoid function is optimal [5, 9, 12–14]. A
superimposed tear of the deltoid in nonsurgically managed
RCT patients can drastically reduce their functional capac-
ity. Thus, an extensive discussion must address the potential
long term limitations that can remain without surgical
management.

6. Conclusion

Despite RCTs being among the most common shoulder
pathologies to occur, subsequent atraumatic deltoid muscle
rupture is a very rare complication [15]. RCT patients that
present with acute shoulder pain, deformity, or sudden
dered deltoid rupture.

Data Availability

No archived datasets were relevant to the preparation of this
manuscript.

Additional Points

The authors of this paper certify that they have no affiliations
with or involvement in any organization or entity with any
financial or nonfinancial interests pertinent to the
subject matter discussed in this manuscript.

Consent

No written consent has been obtained from the patient as
there is no patient identifiable data included in this case
report.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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