Isolated Pectoralis Minor Rupture – Case Report and Systematic Review

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ABSTRACT

Background: Isolated Pectoralis Minor ruptures are a rare and comprehensive review of its presentation and management is lacking. Our objective is to describe a case of an isolated pectoralis minor rupture and systematically review the literature for its prevalence, mechanism of injury, presentation, appropriate investigations and treatment. Methods: After presenting the case, we performed a systematic review of the English literature on PUBMED and MEDLINE from inception to June 2018 with the MeSH search terms of “pectoralis minor” AND “isolated” AND “rupture” OR “tear”. Results: Our case was a healthy non-elite male who sustained the injury from forced shoulder abduction and extension while playing rugby league. He presented with anterior shoulder and chest pain, with sub-pectoral swelling. An MRI confirmed the diagnosis, and he was successfully treated non-operatively with a resolution of symptoms and return to full work activities within nine weeks. The systematic review identified six cases of isolated ruptures. Most injuries were sustained during contact sport with forced shoulder abduction and extension or direct impact to the chest wall causing anterior shoulder pain. MRI confirmed the diagnosis in all cases, and non-operative treatment successfully resulted in symptom resolution within three months. Conclusions: Isolated pectoralis minor injuries are rare. Affected patients are usually young fit individuals who sustain the injury following a direct blow to the shoulder or hyper-abduction and extension injury of the arm. They typically present with tenderness over the anterior shoulder with limitation in shoulder ROM. MRI is the optimal diagnostic modality, and the treatment is non-operative.

KEYWORDS Myofascial pain, Duane SyndromeReview, Orthopaedics, Contact Sports, MRI, Rugby

Introduction

Pectoralis significant ruptures are common and well documented in the literature [1, 2, 3, 4, 5, 6]. In contrast, rupture of the pectoralis minor, which lies deep to the pectoralis major,
significant functional limitations[9, 10]. Furthermore, patients who have their pectoralis minor harvested for a surgical donor in reconstructive surgery don’t have significant functional sequelae[11]. Thus, it is suggested that patients with isolated pectoralis minor injuries will have minimal to no long-term dysfunction.

We present an intriguing case of an isolated pectoralis minor rupture in a non-elite sportsman, who was a manual labourer and who sustained the injury while playing rugby league. Also, we perform the first systematic review on isolated pectoralis minor ruptures to determine the patient demographic at risk, the common mechanisms of injury, presentation, diagnostic modalities, treatment and prognosis.

Case Report

Consent was obtained from the patient to present his case. A 27-year-old fit and well male, who is a scaffolder by trade, was playing rugby league when he sustained a hyper-abduction and extension injury to his right upper limb during a tackle. There was no direct impact to the chest or right upper limb. He felt a tearing sensation and immediate pain in his anterolateral thorax and axilla. He did not experience any symptoms of shoulder instability and was able to continue playing the rest of the match. He then presented to the hospital with persistent pain in the same region. His initial visual analogue pain score (VAS) was 8/10 and disability of arm shoulder, and hand score (DASH) was 86.7.

His clinical examination revealed diffuse tenderness to palpation of the anterolateral thorax and axilla. He had no visible bruising but had deep-seated swelling expanding his right pectoral region (Figure 1). His inferior border of the pectoralis major was palpable but tender. His shoulder range of motion (ROM) was limited by pain. Shoulder protraction and stressing his pectoralis major worsened this pain. His rotator cuff was intact, and he had no neurological deficits.

An x-ray of his right shoulder was unremarkable (Figure 2).

An MRI scan was then performed (Figure 3). This revealed a complete rupture of the pectoralis minor tendon at the musculotendinous junction with 5–7cm retraction of the muscular fibres and a large haematoma (3 x 4.5 x 7.5cm) within the defect. There were no other injuries identified.

He was treated non-operatively with a broad arm sling for comfort and encouraged a range of motion as comfort permitted. By two weeks his pain, function and range of motion had significantly improved (VAS 5, DASH 47.5). He was able to elevate his arm to shoulder height, had a symmetrical internal rotation of his shoulder but a lack of external rotation (75 degrees on the right compared to 90 degrees on the left). He had minor swelling evident over the superolateral aspect of pectoralis muscles with associated tenderness to palpation. Resisted internal rotation and adduction caused pain, but no other resisted movements induced any discomfort. At six weeks, he had full passive and active ROM at the shoulder. The pain was exacerbated with shoulder elevation and palpation of the medial coracoid (VAS 2, DASH 10.8). There was no pain on stressing of the rotator cuff. However, there was subtle wasting over the deltopectoral region. By eight weeks he commenced part-time work, by nine weeks he was asymptomatic and returned to full-time work.

Systematic Review

Methods

We performed a systematic review of the literature from inception to 08 June 2018 by PRISMA guidelines[12]. We included journal articles, communications and conference proceedings. Observational studies (prospective cohort, nested case-control, or case-control, retrospective cohort), case series, non-randomised studies, and randomised controlled trials (RCTs) were searched in PUBMED and MEDLINE. The computer-based searches combined free and MeSH search terms and a combination of keywords related to the diagnosis (e.g. “pectoralis minor” AND “isolated” AND “rupture” OR “tear”). Only articles published in English were considered and were restricted to humans. Reference lists of relevant articles were manually scanned for additional studies likely to have been missed by the electronic search.
Figure 3: Representative MRI images of the patient at presentation. E-G) Series of T2-weighted coronal images of the pectoral region showing the rupture of the pectoralis minor with the formation of a haematoma in the resulting space. Note the fraying of the pectoralis minor tendon attachment to the coracoid process evident in image F. H) Axial T2 weighted MRI further illustrating the isolated pectoralis minor rupture. I) Sagittal T1 weighted MRI of the chest indicating the presence of proximal frayed pectoralis minor fibres as well as a complete rupture of the muscle belly. The resulting space is filled with a haematoma.

Study selection

Our PICOS criteria were patients with isolated pectoralis minor ruptures in any empirical study design. We excluded studies that (i) had associated skeletal or musculotendinous injuries; (ii) had neurological injuries causing pectoralis minor dysfunction without rupture or tear; and (iii) had cases of post-operative pectoralis minor dysfunction without rupture or tear. We did not utilise a minimum follow-up as an exclusion criterion.

Data screening and extraction

One author (FG) performed the initial screening of titles and abstracts to retrieve potentially relevant articles. A detailed evaluation of the full texts of these relevant articles was conducted to determine whether they met all inclusion criteria and both authors conducted this independently.

Results

Initial searches identified 1130 articles. After exclusion criteria were implemented and duplicates removed, five articles (six cases) were identified that reported isolated pectoralis minor ruptures (Figure 4).

The patient demographics and risk factors, as well as mechanism of injury, are shown in Table 1. The reported treatment and prognosis are shown in Table 2. Patient 1 was a professional female football league player[13]. Patient 2 and 3 were professional male NFL players[14]. Patient 4 was a professional male ice hockey player[15]. Patient 5 was a high-school male football player[16], and patient 6 was an elderly patient with end-stage renal disease on haemodialysis[17].

Discussion

Isolated pectoralis minor ruptures are rare. They usually present with anterior shoulder or chest wall pain after direct impact or a shoulder abduction injury during contact sport. Patients typically present with local tenderness medial to the coracoid, with sub-pectoral swelling and no cutaneous bruising. MRI scanning is the diagnostic modality of choice and conservative management with physiotherapy appears to enable patients to return to elite sport within a month. Non-elite athletes take longer to return to play but rapidly improve their pain and function with a resolution of symptoms by three months.

Our patient experienced a similar injury to others previously reported in the literature. He experienced a shoulder abduction and extension injury without direct shoulder or chest wall impact. In all cases, we feel that the mechanism of injury is likely to be forced scapula retraction either indirectly by shoulder abduction and extension, or directly by direct impact. This movement tractions the pectoralis minor and therefore risks rupture.

Our patient presented with anterior shoulder pain similar to all other previously reported cases. His pertinent examination findings included tenderness medial to the coracoid process and the anterolateral thorax, axilla and inferior border of the pectoralis major. He also had sub-pectoral swelling expanding his right pectoral region, but no cutaneous bruising. This is expected considering the anatomical location of the pectoralis minor being deep to the pectoralis major. Furthermore, MRI imaging reveals the confined sub-pectoral location of the haematoma.

With the clinical suspicion of an isolated pectoralis minor rupture, all previous reports advocate an MRI scan to diagnose the injury[13, 14, 15, 16, 17]. Our patient underwent an MRI scan, which identified a complete isolated rupture of his pectoralis.
Table 1 Summarised information of the previously reported cases of isolated pectoralis minor injuries.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Sex</th>
<th>Comorbidities</th>
<th>Aetiology (MOI)</th>
<th>Symptoms</th>
<th>Signs</th>
<th>Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>F</td>
<td>None</td>
<td>Direct impact to anterior shoulder</td>
<td>Anterior shoulder pain</td>
<td>Tenderness over coracoid process and sternal margin of pectoralis major. Pain with shoulder abduction and external rotation.</td>
<td>MRI</td>
</tr>
<tr>
<td>2</td>
<td>Late 20s</td>
<td>M</td>
<td>None</td>
<td>Whilst practicing blocking drills, Injury occurred when shoulder was in abduction and flexion and arms in extension</td>
<td>Anterior shoulder pain</td>
<td>Tenderness over coracoid process and sternal margin of pectoralis major. Pain with shoulder abduction and external rotation.</td>
<td>MRI</td>
</tr>
<tr>
<td>3</td>
<td>Late 20s</td>
<td>M</td>
<td>None</td>
<td>Whilst practicing blocking drills, Injury occurred when shoulder was in abduction and flexion and arms in extension</td>
<td>Anterior shoulder pain with loss of strength.</td>
<td>Pain and weakness of shoulder adduction.</td>
<td>MRI</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
<td>M</td>
<td>None</td>
<td>Direct impact with shoulder in abduction, extension and external rotation.</td>
<td>Anterior shoulder and chest wall pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>M</td>
<td>None</td>
<td>Direct impact to anterior shoulder and chest</td>
<td>Anterior shoulder and chest wall pain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>59</td>
<td>M</td>
<td>Type I diabetes mellitus with end stage renal failure on dialysis.</td>
<td>Non-traumatic</td>
<td>Anterior shoulder and chest wall pain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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We advised pendulum exercises and shoulder range of motion (ROM) within the range of comfort for the first two weeks. He then underwent progressive supervised ROM from 2-6 weeks, including scapulothoracic motion. After six weeks, progressive strength training was undertaken.

The systematic review of the literature suggests excellent functional outcomes with a return to pre-injury activity within a few weeks. It should be noted that although earlier literature indicated a relatively short recovery time for the professional athletes who sustained pectoralis minor ruptures, there is no data on the clinical sequelae in non-elite athletes and manual labourers. Our patient improved his symptoms by six weeks and returned to full work duties by nine weeks post-injury.

Irrespective of fitness level, there is an absence of long-term data regarding the prognosis of this injury. This is predominantly due to the rarity of this injury and paucity of literature. However, reports of patients with Poland Syndrome (congenital absence of pectoralis minor) indicate minimal to no functional limitation[11]. This information, in addition to the rapid return to elite sports, suggests that these injuries should not cause longer-term functional deficits.

This study is limited by the paucity of literature on the topic and the inclusion of a single case. Furthermore, the optimal non-operative treatment protocol for these patients is not well defined in the literature. Finally, objective muscle strength testing was not performed in our case and has not been performed previously, as seen in the literature. Despite these limitations, this study offers a comprehensive review of the currently available literature to aid the diagnosis and treatment of patients affected by isolated pectoralis minor ruptures.

**Conclusion**

Isolated pectoralis minor injuries are rare. Affected patients are usually young fit individuals who sustain the injury following a direct blow to the shoulder or hyper-abduction and extension injury of the arm. They typically present with tenderness over the coracoid and the pectoral muscle belly with limitation in the shoulder ROM. Although basic investigations are used in the workup, an MRI is optimal to confirm the diagnosis. Treatment is non-operative with physical therapy, NSAIDs, ROM limitations as well as scapular stabilisation exercises. The expected prognosis is promising with a return to pre-injury functional levels and return to play within a few weeks following the injury.

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**Competing Interests**

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**References**


