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Surgical reconstruction of chronic latissimus dorsi tear using Achilles tendon allograft

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The function of the latissimus dorsi muscle (LD) includes extension, adduction, and internal rotation (IR) of shoulder. The medial attachments of the LD are the spinous processes of the inferior 6 thoracic vertebrae, thoracolumbar fascia, iliac crest, and inferior 4 ribs, and the lateral attachment is the floor of the intertubercular sulcus on the anterior side of the humerus.[14,17] Rupture of the LD is extremely rare, with a limited number of cases reported in the literature.[2,3,5,7,9-13,16] Reported mechanisms of injury include forceful resisted extension and/or adduction.[3,5,7,9-13,15] Both conservative and surgical treatments have been outlined as management approaches.[2,3,5,6,9-13,15,16,18] Only 1 chronic case of LD rupture has been reported that was managed surgically with a primary repair.[13]

We report a case of chronic rupture of the LD that was managed surgically by using non-irradiated Achilles tendon to reconstruct the symptomatic and irreparably ruptured LD. To our knowledge, no similar case has been previously reported in the literature.

Case study

A 56-year-old man was referred to our office with right shoulder pain and weakness for 6 months. The onset of symptoms began while he was being pulled up by a towrope while waterskiing. He felt a "pop and tearing" in the posterior axilla followed by immediate pain located at the back of his shoulder, accompanied by blue discoloration and swelling. He underwent athletic therapy after his acute symptoms had subsided (about 1 month after injury). This was carried out for approximately 6 weeks and included passive range of motion (pendular exercises); active-assisted range of motion in forward flexion and IR and/or external rotation (ER) (wall walking, assisted using the other arm or with a stick); therapeutic ultrasound; and gentle massage. Because of a lack of progress, the patient sought further consultation.

Preoperative assessment

At presentation to the orthopedic surgeon 6 months after injury, the patient's main concerns were cramping pain located at the back of the axilla and weakness of the right shoulder. He denied any history of steroid use or tendon rupture. He was an avid golfer and cyclist and believed that his symptoms were preventing him from participating in these activities. He indicated difficulty (pain, weakness) with motions requiring reaching, for example, raking leaves, as well as activities such

Written informed consent was obtained from the patient for publication of this case report and the accompanying figures.

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Figure 1 Posterior view of right shoulder showing empty posterior axillary area and distal bulge of latissimus dorsi muscle (*oval*).

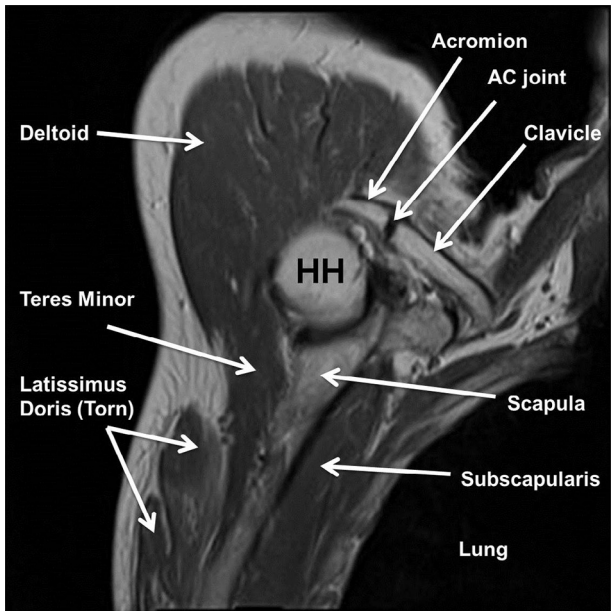

Figure 2 T2-weighted magnetic resonance imaging scan in coronal plane showing torn latissimus dorsi tendon. The patient is positioned with the arm fully abducted and externally rotated. *AC*, acromioclavicular; *HH*, humeral head.

as cycling and hiking, especially over rough terrain. He was a retired dentist and was right hand dominant and in good health.

Clinical examination findings showed a normal cervical spine. There was a definite bulge in the muscle belly of the right LD compared with the contralateral side (Fig. 1). This bulge was accentuated by muscle contraction and was the site of pain with resisted downward adduction with the shoulder in extension and 90° of abduction. It was also tender to deep palpation. The patient had full range of motion. On the basis of the Medical Research Council manual muscle testing scale (MMT), he had weakness (–4) in extension, adduction, and IR, which was consistent with the patient's complaints of weakness.[1] Shoulder strength in the unaffected limb and bilateral elbow extension and flexion strength were normal. The findings of special tests to assess impingement and instability, as well as the rotator cuff, biceps anchor, and biceps tendon, were negative. The distal neurovascular examination showed normal findings. Radiographs of the right shoulder showed no evidence of bony avulsion. Non-contrast magnetic resonance imaging showed a complete avulsion of the LD (Fig. 2).

Treatment options were discussed with the patient. Botulinum toxin A was offered to reduce the muscular symptoms and cramping as a first-line intervention.[4] No evidence for its use for this specific condition was found, but its use has been well established for muscular pain in neuromuscular disorders. The patient refused this because the weakness would most likely not have been addressed. Surgical options that were considered included tenodesis of the LD to the teres major or an attempt at delayed primary repair of the LD; however, there was not enough tendon length present to make this a viable approach. Semi-tendinosus autograft was not considered strong enough to reconstruct this large muscle-tendon unit and thus was not proposed to the patient. Reconstruction with Achilles allograft was discussed, and the patient consented to undergo open reconstruction of the LD with non-irradiated Achilles tendon allograft. Surgery took place 9 months after the index injury.

Operative technique

After the introduction of a general anesthetic, the patient was intubated and placed in the lateral decubitus position with the right side uppermost. The right upper extremity was prepared and draped in standard fashion that was extended to include the hemithorax. The forearm was held in sterile fashion with a commercially available positioner to keep the shoulder in 70° of abduction and 45° of forward flexion at maximal IR. Maximal IR is necessary to fix the graft initially because some stretching out of the graft over time is expected. Positioning the shoulder in 70° of abduction and 45° of forward flexion prevents making the graft too tight and still allows proper exposure of the axilla for the surgical approach. One gram of a first-generation cephalosporin antibiotic was administered intravenously before the first incision.

An inverted J–shaped posterior axillary incision 20 cm long was used (Fig. 3). This was started around 3 cm distal to the tip of the scapula, extended proximally parallel to the lateral border of the scapula, curved around the apex of the axilla, and then passed distally 3 cm parallel to the posterior arm crease. A posterior deep flap was elevated to retrieve the LD muscle. It was found retracted medial to the lateral border of the scapula. It was mainly muscular, with no significant