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CASE REPORTS

Successful primary repair of chronic latissimus dorsi rupture: a case report and review of the literature



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Latissimus dorsi ruptures are exceedingly rare injuries that are most often sustained during overhead movement with hyperextension or hyperabduction of the brachium.^{8,9,12} Most documented cases involve individuals who participate in vigorous overhead activities, such as Major League Baseball players,⁴ water skiers,^{10,11} and steer wrestlers.^{2,9} Although conservative^{2,6,13,14} and operative approaches^{4,5,9,10,11} have both demonstrated favorable clinical outcomes, surgical repair may be indicated in a young individual with significant upper extremity demands.^{4,5,10} We describe a case of successful primary repair of a chronic latissimus dorsi rupture sustained in an active duty United States military service member during Special Forces training.

Case history

A 26-year-old active-duty male first lieutenant in the United States military presented to our clinic with persistent right upper extremity weakness 5 months after sustaining a traction injury to his right arm during Special Forces training. He described pain and a tearing sensation localized over the

proximal medial brachium when he fell from a balance beam onto an abducted arm during an obstacle-training course at Ranger school. Afterward, the patient was able to return to training and the pain eventually subsided, leaving him with persistent weakness that was most appreciable during row and overhead pull-down maneuvers.

On presentation, physical examination revealed loss of the posterior axillary contour (Fig. 1) in addition to marked weakness with extension, and to a lesser extent, adduction and internal rotation of his right arm. Radiographs of the shoulder and humerus were unremarkable, and magnetic resonance imaging (MRI) was largely equivocal, with the exception of an indistinct latissimus dorsi insertion and evidence of fatty infiltration (Fig. 2).

The results of an electromyogram, after correlation with the physical examination and MRI, suggested isolated chronic disruption of the latissimus dorsi tendon at its insertion on the proximal humerus. The patient desired to attempt Special Forces training again and thus elected to proceed with operative treatment.

The patient was placed in a lazy lateral decubitus position. We performed a modified anterior axillary approach, similar to the 2-incision technique described by Ellman et al,⁴ with a primary anterior axillary incision and a secondary counterincision overlying the posterior axillary fold. The insertion of the latissimus dorsi was exposed through the anterior incision deep to the pectoralis major and superficial to the teres major tendon, both of which were intact.⁴ Although the

The William Beaumont Army Medical Center Institutional Review Board approved this protocol (#10/20).

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Figure 1 Preoperative clinical evaluation demonstrates loss of posterior axillary contour.

latissimus dorsi insertion also appeared intact, probing demonstrated decreased tension. No rupture was directly visualized through the anterior incision. Therefore, a small counterincision was made in line with the posterior aspect of the axillary fold and exposed to the site of disruption, which was myotendinous in nature and adherent at the distal extent to the teres major.

Once liberated, the tendon excursion was deemed to permit primary repair. A single Mason-Allen grasping suture and 2 running Krackow stitches were made with #2 FiberWire (Arthrex, Naples, FL, USA) to secure the proximal tendon stump, providing for 6 core sutures. The proximal stump was tunneled to the anteriorly based incision (Fig. 3) and repaired at the native insertion site with one Bio-SwiveLock (Arthrex) knotless suture anchor, reinforced with a double-loaded 5.5-mm Bio-Corkscrew (Arthrex) suture anchor as well as an additional double-loaded metal anchor more proximally because of the increased bone density (Fig. 4). The suture limbs were then tied superior-to-inferior.

Digital probing demonstrated a stout repair. The posterior axillary contour had been restored (Figs. 5 and 6). While directly visualizing the repair from the medial border of the intertubercular groove medial to biceps groove, the right upper extremity was then taken through a full range of motion, and no gapping was evident.

Postoperatively, the patient was enrolled in physical therapy, with focus on range of motion for the first 6 weeks, starting with assisted range of motion exercises, followed later by passive range of motion, after which he was progressed to

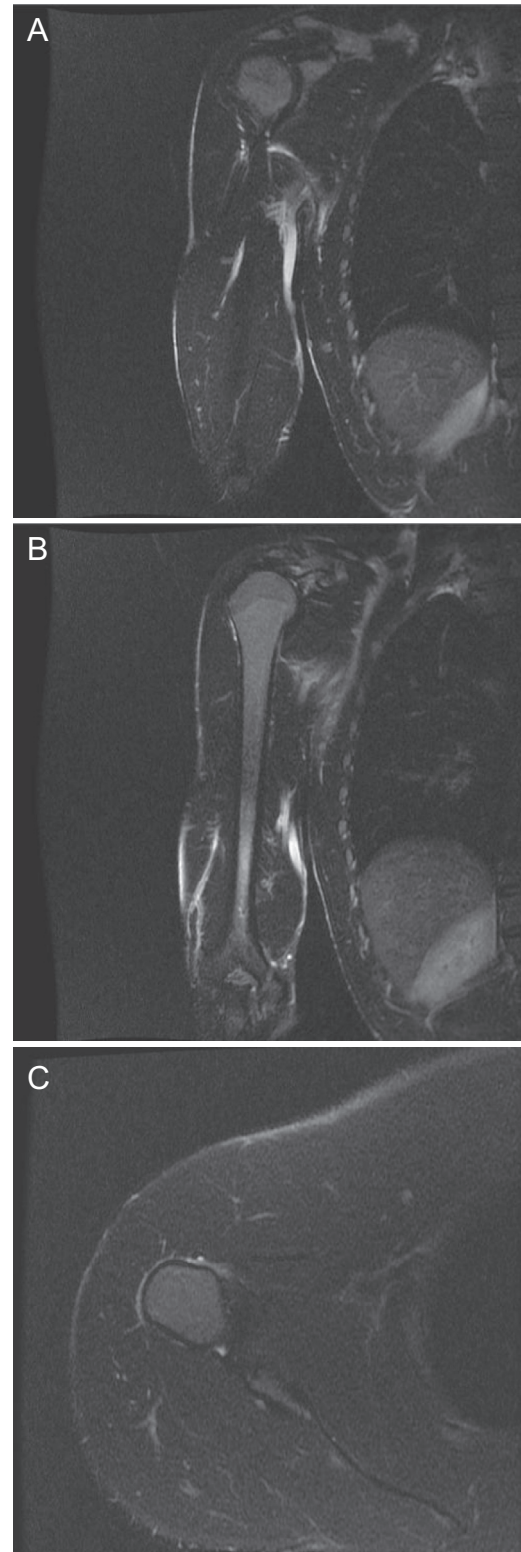


Figure 2 Sequential T2 magnetic resonance imaging cuts in (A,B) coronal and (C) axial views demonstrate absence of latissimus dorsi insertion with intermediate signal suggestive of scar tissue.



Figure 3 The proximal stump was captured and tunneled through the anteriorly based incision.



Figure 4 Postoperative radiographs demonstrate the site of repair with a double-loaded metal anchor visualized.

strengthening approximately 5 to 6 weeks after the operation.³ He was permitted return to full activity by 6 months, at which time he was able to perform weighted pull-ups as he had before his injury, noting only mild soreness the following day. By this point he had regained full painless active range of motion and strength. At the time of final follow-up at more than 3 years after the operation, his Short Form-36 Health Survey Physical Component Score was 59.6, and the Mental Component Score was 40.6.

Discussion

Latissimus dorsi ruptures are very rare injuries on which there is limited literature guiding diagnosis and management. As such, the “gold standard” for treatment remains to be elucidated. The tendon of the latissimus dorsi muscle is more commonly noted in the literature to be used in the repair of irreparable rotator cuff tears because of the immense strength



Figure 5 Postoperative clinical evaluation demonstrates restoration and maintenance of the posterior axillary contour.



Figure 6 Postoperative clinical evaluation shows maintenance of posterior musculature.

of the tendon, thus isolated tendon ruptures are uncommonly reported.^{1,7}

Documented injuries are exclusive to overhead athletes and military recruits, including reports among Major League Baseball pitchers,^{3,4} steer wrestlers,⁹ water skiers,^{10,11} rock climbers,¹² CrossFitters (CrossFit, Inc., Washington, DC, USA),⁶ and British service members.¹⁴ Most patients report hyperabduction^{4,5} or resisted adduction injuries to the arm with an ensuing report of an index popping or burning sensation about the posterior axilla.^{2-4,10,11} Functional limitations are most appreciable during overhead activities, reaching behind the back, rowing maneuvers, and pull-ups and muscle-ups.^{3,8,12}

On gross inspection, there may be visible bulging of tissue of the posterior axilla³⁻⁵ in addition to loss of the posterior axillary contour.¹² Although latissimus dorsi rupture is a clinical diagnosis, suspicion can be supported by results of an MRI or electromyogram, but imaging may be equivocal in chronic cases.

Nonoperative management has been largely successful among noncompetitive athletes¹⁴; however, outcomes of conservative treatment among athletes with significant upper extremity demand are less certain given the resultant reduction in strength.⁸ Butterwick et al² described conservative treatment of a rupture in a professional steer wrestler. Although at the time of final follow-up (4.5 months), range of motion was full and painless, the steer wrestler subjectively felt that his strength was only 90% of the uninjured side in adduction and internal rotation. Similarly, Friedman et al⁶ conservatively managed a myotendinous rupture in a CrossFit athlete. They found that the patient was able to resume training at 3 months but noted a continued functional deficit at the 6-month follow-up. In the case of a British service member who was treated with a conservative approach, at 12 months after the initial injury, the patient was able to perform 8 pull-ups but was limited by pain over his posterior axilla and was unable to resume contact sports.¹⁴

Although there are admittedly unquantified risks of surgical repair of latissimus dorsi tendon ruptures, it is clear that nonoperative management risks subjecting patients to residual strength deficits that may limit their level of athletic performance. Furthermore, the success of repair in the chronic setting remains to be qualified but may be complicated by tendon retraction and muscle atrophy.⁴ In our patient, we were able to perform a primary repair despite the chronic nature of the injury. This may be attributable to the larger size of the tendon as well as to the adhesion that formed between the proximal stump and the teres major, thereby limiting the degree of retraction, analogous to tethering of chronic distal biceps rupture by the lacertus fibrosis.

Operative treatment has been advocated by most authors for patients who are involved in high-demand athletic endeavors such as wrestling, water skiing, rock climbing, and professional baseball.^{3-6,8,9,11,12} Ellman et al^{4,5} support that although conservative management with functional rehabilitation may portend a good recovery in recreational athletes, competitive and professional athletes should undergo surgical repair to maximize strength and return to their respective sports.

A Major League Baseball pitcher who sustained a complete latissimus dorsi tendon injury while pitching underwent operative repair.⁴ Intraoperatively, the avulsed tendon edge was palpated, but because retraction exceeded 5 cm, the surgeons were concerned about putting the radial nerve at risk for injury if they were to blindly clamp the tendon. As a result, the authors created a posterior axillary counterincision, which allowed for visualization and retrieval of the tendon. At the beginning of the following season, approximately 8 months after surgery, the patient had regained full strength, velocity, and control and was able to pitch again at his preinjury level.⁴

Most of the literature evaluating repairs after latissimus dorsi ruptures involves acute (<6 weeks)^{4,5,8-10} or subacute injuries (>6 weeks but <2 months).³ Chronic tendon ruptures are not well documented, and thus, the outcomes and repair or reconstructive options remain unexplored. In one of the only reported cases, Livesey et al¹² performed a primary repair in a semiprofessional rock climber who had sustained the complete injury 2 years before presentation. The authors reported that despite the retraction of the myotendinous stump, a successful primary reinsertion was performed using the aforementioned 2-incision approach. There was shortening of the stump, but the authors were able to deliver the tendon by the humeral attachment using Ethibond sutures (Ethicon, Inc., Somerville, NJ, USA) using a transosseous repair technique. At final follow-up 16 months after the operation, the patient was able to continue rock climbing and eventually regained full strength.¹² Similar to our patient, despite the chronicity of the injury and high-level upper extremity demands, the patient was able to return to full function without deficits after primary surgical repair.

Prompt recognition and evaluation of latissimus dorsi tendon injury is crucial for preventing strength deficits and shortening rehabilitation time. The most common reason for delayed presentation is misdiagnosis, given the nonspecific clinical presentation and imaging. This is especially true in patients who are not competitive upper extremity athletes and may not be exposed to such high-demand activities that would unmask the weakness attributable to a rupture.

Various surgical approaches for latissimus dorsi tendon repair have been proposed, including 1- incision and 2-incision approaches.^{4,8,10} The 2-incision approach is more popular given the improved capacity for tendon mobilization and visualization, preservation of local neurovascular structures, and for reportedly superior cosmetic outcomes.^{4,5} However because of the limited literature on these injuries and even less on surgical management of ruptures, evidence supporting one approach over another is merely anecdotal.

Conclusion

We found that operative management using a 2-incision approach for primary repair of a chronic myotendinous rupture of the latissimus dorsi in a young individual with intense daily upper extremity demands enabled return to training and previous activities, such as pull-ups, at his preinjury level. Management should be tailored to the age and functional demands of the patients.

Disclaimer

The authors, their immediate families, and any research foundations with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

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