

CLINICAL IMAGE

NONTRAUMATIC UPPER-EXTREMITY MASS AND CONTUSION

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CASE PRESENTATION

A 78-year-old right-hand-dominant male presents to urgent care after experiencing sudden pain and popping in the right upper extremity while lifting an object in the garage. The patient noted weakness in his arm but denied any change in right upper-extremity range of motion after the event. No imaging was obtained, and the patient was sent home with a diagnosis of right upper-extremity contusion. Over the next couple of weeks, he noticed resolution of pain and onset of ecchymosis in the right proximal upper extremity (Figure 1). There was noticeable swelling in the right upper arm. The patient denied previous symptoms in the arm or shoulder. The patient's past medical history is positive for hypercholesterolemia, hypertension, diabetes mellitus type 2, hypothyroidism, urinary retention, and anxiety. His medications include metformin, Benicar (olmesartan), Synthroid (levothyroxine), Tragenta (linagliptin), glipizide, clonidine, Flomax (tamsulosin), Lipitor (atorvastatin), carvedilol, and Lexapro (escitalopram).

FIGURE 1:

(A) Patient's arm shown at partial extension with significant ecchymosis and bulbous Popeye deformity.

(B) Patient's arm at 90-degree flexion with ecchymosis.



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The authors have no conflicts of interest or financial disclosures.

QUESTIONS

1. What is the most likely diagnosis of this patient's arm pain and swelling?

- Biceps tendon rupture
- Carpal tunnel syndrome
- Humerus fracture
- Rotator cuff tear
- Triceps tendon rupture

Correct answer:

A. *Biceps tendon rupture*

Biceps tendon rupture is characterized by ecchymosis, retraction of the muscle belly, and palpable defect in the upper extremity of the patient.¹ Rupture of the long head biceps tendon may present with anterior shoulder pain that distinguishes it from a triceps tendon rupture.¹ Carpal tunnel syndrome commonly presents as pain or paresthesia following the median nerve distribution in the hand.² Humerus fracture is less likely due to mechanism of injury in this case. A rotator cuff tear will typically present with distinct shoulder pain and decreased range of motion due to pain.

2: What are predisposing factors that can lead to this injury?

- Azithromycin use
- Chronic glucocorticoid use
- Hypertension
- Low level of low-density lipoprotein (LDL)
- Osteoarthritis

Correct answer:

B. *Chronic glucocorticoid use*

There are a variety of risk factors that increase the likelihood of biceps tendon ruptures. Chronic steroid use is the most common medication to cause this pathology.³ Other risk factors shown to increase risk of biceps tendon rupture include smoking and hyperlipidemia.^{4,5} Most pathophysiology has described an increase in tumor necrosis factor alpha (TNF α) and interleukin (IL)-6, which leads to inflammation and structural weakness in the tendon.⁶ Concurrent use of fluoroquinolones with glucocorticoids is also known to increase the risk of tendon rupture by 46-fold.⁷

The incidence of distal biceps tendon rupture, also known as Popeye arm, is 2.55 out of every 100,000 patients per year in the United States.⁸ Middle-aged males are most affected, particularly those with an increased body mass index and a history of smoking.⁸ The biceps tendon has a long and short head that work together as supinators of the forearm and flexors of the elbow.¹ The long head of the biceps tendon is most commonly involved in ruptures.¹ The mechanism of injury for biceps tendon rupture is not fully understood; however, it is believed to be related to rotator cuff pathology.⁹ The mechanism of injury most commonly seen with biceps tendon rupture is during eccentric contraction of the biceps muscle.¹ Examples of said exercise include catching a falling heavy object and forcefully extending a flexed elbow when the biceps muscle is already fully contracted.

Medications, metabolic abnormalities, and chronic disease have been shown to affect the structure and integrity of tendons.¹ Histopathology of ruptured biceps tendons shows a disorganized fiber orientation with elevated levels of proteoglycan, matrix metalloproteinases, and type III collagen.¹ Certain medications, such as fluoroquinolones and corticosteroids, are known for increasing the risk of tendinopathy and tendon rupture.⁷ The rate of tendon rupture after fluoroquinolone use is approximately 2.5 cases per 10,000 patients per year.³ The combination of fluoroquinolones and corticosteroids in patients over 60 years old increased cases to 19.6 cases per 10,000 patients.^{3,10} Of tendon injuries, the Achilles tendon consists of over 95% of cases, potentially due to the weight and force on the tendon during weight-bearing movements.⁷ β -hydroxy β -methylglutaryl-CoA (HMG-CoA)-reductase inhibitors and aromatase inhibitors have also been associated with weakened tendons.⁴ For this patient, his use of atorvastatin for hypercholesterolemia may have increased his risk of tendon rupture.⁷

Additionally, the patient's comorbidities may have contributed to his risk of tendon tear. Increased serum cholesterol promotes lipid deposition systemically, with deposition in tendons in patients as young as 15 years old.¹¹ This process gives rise to elevated inflammatory cytokines, such as TNF α and IL-6, and structural alterations that may cause weakening of the tendons.⁶ Elevated total cholesterol, LDL, and triglycerides have been found in patients with altered structure and increased tendon thickness.⁵ Similar to the mechanism of action of tendinopathies seen with chronic corticosteroid use, there is an increased risk of rupture diabetes though less frequent.¹² Chronic glucocorticoid excess as seen in diabetes quickens collagen cross-link formation leading to thicker and stiffer tendons that are more prone to rupture.¹² Other systemic diseases that confer a greater risk of tendon rupture include gout, rheumatoid arthritis, and chronic kidney disease.⁴

Biceps tendon ruptures are commonly diagnosed clinically. They can be categorized as partial or complete tears and by location—proximal or distal. In complete tears, retraction of the biceps muscle belly results in an upper-arm mass termed "Popeye deformity" (Figure 1).¹ Other symptoms include antecubital pain and muscle weakness.¹³ Partial ruptures may present with the same signs and symptoms but more subtly.¹ The most specific finding in biceps tendon injury is bicipital groove point tenderness. This can be exhibited by having the patient internally rotate the

affected arm 10 degrees, which places the groove facing forward.¹⁴ The lack of visible and palpable defects like the bulbous mass often seen in complete distal tears can lead to delayed diagnosis. The diagnosis of partial ruptures can be made with the aid of imaging when symptoms persist or the clinical picture is unclear. Though ultrasound can assist in diagnosis, magnetic resonance imaging (MRI) presents a definitive diagnosis.¹⁵ Ultrasound overall has a sensitivity of 49% and specificity of 97%.¹⁶ One drawback of MRI is its weakness in detecting partial biceps tendon tears.¹⁷ However, MRI provides an excellent evaluation of the superior labral complex and biceps tendon, which are involved in full tears. Proximal biceps tendon ruptures, more often seen in elderly patients, may present with no other symptoms except pain with occasional proximal arm ecchymosis and weakness.¹ Proximal tears are often associated with rotator cuff affliction and should be monitored for shoulder girdle muscle atrophy and shoulder impingement.¹ Unlike proximal biceps tendon tears, distal tendon rupture presents with weakness of elbow flexion and forearm supination.¹

Clinical provocative tests have been established in aiding diagnosis in biceps tendon tears. The hook test is useful in determining a complete distal biceps tendon tear by examining the lack of insertion of the biceps tendon distally at the radial tuberosity.¹⁸ This test is conducted by positioning the patient's arm in 90-degree flexion followed by supination. A positive test is shown from the inability to hook the index finger under the distal tendon. Additionally, the Ruland biceps squeeze test is performed by positioning the patient's elbow in 60- to 80-degree flexion with pronation of the forearm.¹⁸ A positive test results from no supination of the forearm or wrist when squeezing the distal biceps muscle belly.

Initial management of a biceps tendon rupture is typically conservative with the use of analgesia, such as nonsteroidal anti-inflammatory drugs (NSAIDs), and rest.¹ Unlike in patients with proximal biceps tendon ruptures, distal biceps tendon tears should have a surgical consultation as soon as possible.¹⁹ Often, surgical refixation is required to regain full strength of forearm supination and function.¹⁹ Surgical candidates should have an early repair to decrease the risk of scar-tissue formation and retraction of the tendon.¹ Complete recovery of distal biceps tendon rupture without intervention is possible with conservative treatment, but has a risk of 40% loss of supination strength and nearly 15% decrease in grip strength.¹ The two surgical techniques used for exploration and repair of distal tendon ruptures are the single-incision and dual-incision approach.²⁰ Adverse effects of these techniques can include lateral antebrachial cutaneous nerve and posterior interosseous nerve injury with heterotopic ossification.^{20,21} Signs of abnormal bone tissue growth within soft tissue include loss of range of motion, localized inflammation, and elevated alkaline phosphatase.²² Full postoperative recovery can take approximately 4 months with a physical therapy regimen.²⁰ With conservative treatment, the Popeye deformity and pain are expected to lessen in 4 to 8 weeks.¹ The recovery period for conservative treatment is less than that expected with surgery, but this option poses risk of the aforementioned loss of supination and grip strength.²³ Patients with diabetes and other metabolic syndromes have been found to have worse outcomes following treatment of tendon-related pathology.¹²

Biceps tendon rupture has the potential to be a life-altering injury with long-term effects on upper-extremity muscle strength, particularly in distal biceps tendon tears. It is imperative for the family physician to be aware of the diagnosis and possible complications to properly manage this injury. If patients have associated comorbidities or are on medications that increase their risk of tendon ruptures, they should be educated on injury prevention. The patient in this case did not undergo any treatment. His symptoms gradually improved over the following 3 weeks without any residual complications.

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