

## Case Report

## Unusual Complete Proximal Biceps Tendon Rupture 罕有的肱二頭肌近端肌腱完全斷裂——病例報告

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## ABSTRACT

Proximal biceps brachii tendon rupture is an unusual presentation in young individuals. This report is an extremely rare case of a complete rupture of the proximal biceps brachii tendon in a young patient as a result of a high-energy water-skiing injury. It was associated with displacement of the biceps muscle into the forearm with skin necrosis. The patient was treated successfully by débridement of the skin and complete resection of the biceps brachii muscle.

## 中文摘要

肱二頭肌近端肌腱斷裂在年輕人是一個罕有的病狀表徵。這是一個極為罕見的病例，一個年輕的病人在滑水時受到高能量的創傷而引致肱二頭肌的近端肌腱完全斷裂，它併發肱二頭肌移位到前臂及皮膚壞死。我們利用皮膚清創並完全切除壞死的肱二頭肌成功治愈此罕見的病例。

## Introduction

The biceps muscle is the strongest supinator of the forearm and assists the brachialis in elbow flexion.<sup>1</sup> Rupture of the long head of the biceps is usually seen in older adults, often in conjunction with rotator cuff tears, superior labrum anterior to posterior (SLAP) lesions, or tendinosis secondary to chronic subacromial impingement.<sup>2–4</sup> In rare instances, proximal biceps ruptures are seen as a result of high-energy trauma and may result from an overloading flexion force or flexion against the forced extension.<sup>5</sup> We report a case of complete proximal biceps brachii tendon rupture in a young, active patient due to a high-energy water-skiing injury.

## Case Report

A 26-year-old man was “water-skiing” on a hydrofoil chair. While doing a variety of jumps and flips, he needed to rest his hands and gripping muscles by transiently placing the tow handle against his flexed left elbow. The chair was caught and flipped suddenly, causing a violent extension force on his elbow. The hydrofoil chair crashed and the patient experienced immediate pain

and swelling in the left arm and forearm. He was an otherwise healthy wakeboarding instructor who smoked a half pack of cigarettes per day.

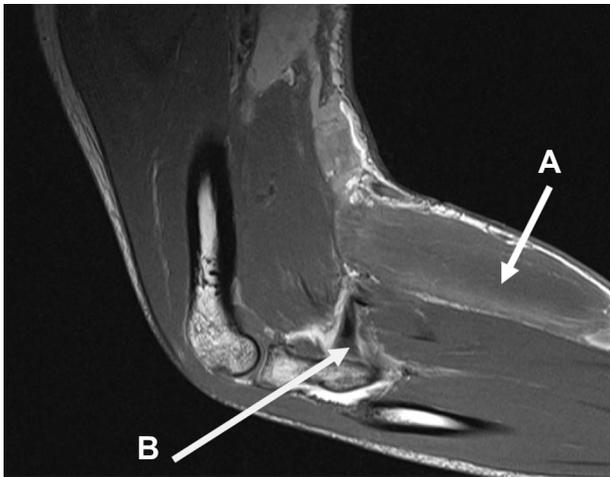
He was initially assessed at a local hospital, and plain radiographs revealed no fractures or dislocations. The diagnosis of a severe contusion of the left arm and forearm was made by the emergency room physician. Primary treatment consisted of sling immobilization and analgesic agents.

Two weeks later, the patient was referred to our orthopaedic service for severe pain and blisters over the forearm. No symptoms of numbness or paresthesias were present.

Physical examination revealed a healthy, muscular, 26-year-old man with gross swelling involving the left elbow and forearm. There were bruises and blisters on the volar aspect of the left forearm, and atrophy of the left arm was noted. There were no open wounds or discharge. The compartments of the left arm and forearm were soft, with no pain noted on passive stretching of the fingers. His left shoulder movement was full. The active and passive range of left elbow motion is 20–100 degrees. Weakness of elbow flexion and extension was noted. The neurovascular examination was normal. A diagnosis of proximal biceps tendon rupture complicated with closed degloving injury of the forearm was made.

The plain radiographs of the left arm, elbow, and forearm did not reveal any fractures or dislocations. Magnetic resonance

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**Figure 1.** Sagittal magnetic resonance imaging cuts showing the displacement of the biceps muscle into the forearm (arrow A), with the distal biceps tendon still intact (arrow B).



**Figure 2.** Photograph of the patient's forearm with skin necrosis in the volar forearm and antecubital fossa.

imaging (MRI) showed the entire biceps muscle had been avulsed at the proximal musculotendinous junction (both heads) just distal to the pectoralis major tendon and the muscle was displaced into the volar forearm. The distal tendon and its insertion on the radius appeared intact. The pattern of injury and displacement suggested denervation and devascularization of the biceps muscle belly (Figure 1).

Skin necrosis developed on the volar aspect of the forearm and antecubital fossa (Figure 2). Débridement of the necrotic skin and subcutaneous tissue was performed. The biceps muscle was found

lying under the degloved antecubital and forearm skin while the origins were ruptured. The muscle belly flipped over and its proximal part became distal to the muscle insertion, which was still attached to the proximal radius. The muscle was confirmed to be denervated, devascularized, and necrotic. The biceps muscle belly was resected in total, along with the distal tendon (Figure 3A and B). The arm and proximal biceps tendon stumps were not explored. Scar contracture at the antecubital fossa was released.

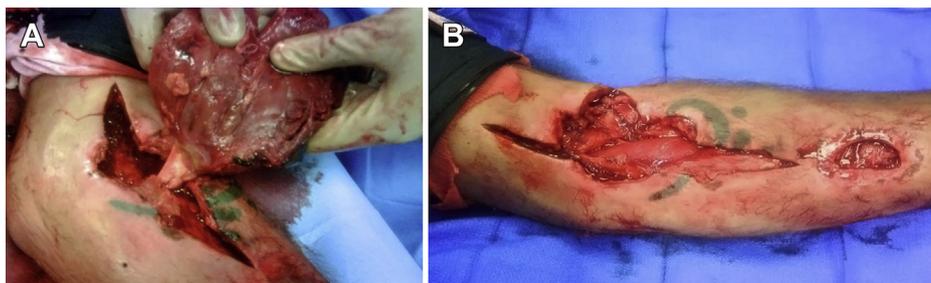
A limited forearm fasciotomy also was performed. Despite resection of necrotic skin and release of scar tissue, 20 degrees of elbow flexion contracture was noticed intra-operatively but passive elbow flexion, supination, and pronation were full. The wound healed by secondary intention with regular dressing.

At 3 weeks postoperatively, physiotherapy was started. The patient's recovery and rehabilitation were excellent. At the final assessment, 12 weeks after the surgery, there were no symptoms of pain or sensory deficit. He returned to work and ordinary activities with no apparent problem. Elbow and shoulder motion was normal. There was a slight reduction of flexion and supination strength compared to the uninjured side.

## Discussion

Disruption of proximal biceps tendon is unusual in patients <50 years. Our patient suffered from a high-energy traumatic rupture of the short and long heads of the proximal biceps, with necrosis of the biceps muscle. The partial necrosis of the volar forearm skin might be due to a degloving shearing injury caused by the rope handle, or due to a slingshot mechanism. Moorman et al<sup>6</sup> reported a case similar to ours, with proximal rupture of the biceps brachii with slingshot displacement of the biceps brachii into the subcutaneous forearm. Similarly, they described denervation and devascularization of the muscle, and treatment included excision of the biceps brachii muscle followed by an uneventful recovery.

Pratt and Tennent<sup>7</sup> reported the injury to the long head of the proximal biceps tendon in a 36-year-old man during arm wrestling. Miller and Solomon<sup>4</sup> reported a paralabral rupture of the long head of the biceps tendon in a 28-year-old man from light weight lifting. DiChristina and Lustig<sup>8</sup> and Carmichael et al<sup>9</sup> reported isolated tears of the short head of biceps muscle belly in water skiers in which the mechanism of injury was a sudden jerk of the flexed elbow to extension by the tension of the tow rope as the boat accelerated away. Heckman and Levine<sup>10</sup> reported a traumatic closed transection of the biceps brachii in a military parachutist, as a result of a sudden localized force on the mid-portion of the anterior surface of the arm created by the static line. They reported favourable results with surgical repair, aspiration of the hematoma, reduction of the gap in the biceps, and splinting of the elbow in acute flexion. Comparing our case to that of Moorman et al,<sup>6</sup> the mechanism of injury was very similar but our patient



**Figure 3.** (A) Intraoperative photograph showing the devascularized and denervated biceps muscle with intact distal biceps tendon. (B) Intraoperative photograph showing the appearance of the wound after debridement of skin and excision of the biceps muscle.

developed extensive skin necrosis, which was not true in the Moorman case.

In conclusion, complete rupture of proximal heads of biceps brachii is unusual and mostly a result of high-energy injury in young individuals. Early recognition of these high-energy soft tissue injuries, careful clinical examination, and MRI, especially in the absence of bony injury, may help to reach the diagnosis earlier. The differential diagnosis includes forearm compartment syndrome, fracture, and elbow dislocation. Complete muscle resection followed by a rehabilitation program provides a good outcome.

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