

CASE REPORT

Complete rupture of the triceps brachii muscle

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Br J Sports Med 2002;**36**:467–469

The case is reported of a professional ice hockey player who sustained an intramuscular rupture of all three heads of the triceps brachii muscle. After surgical repair, he made a complete recovery and was able to return to professional ice hockey.

Avulsion of the triceps tendon is an uncommon injury, but intramuscular rupture of the triceps brachii muscle is extremely rare. Anzel *et al*¹ reviewed a series of 1014 cases of muscle and tendon injuries and found that only eight of these involved the triceps; four of the eight resulted from open lacerations. An extensive review of the literature showed only six previously reported cases of intramuscular rupture of the triceps.

CASE REPORT

A 31 year old Norwegian professional ice hockey player, playing in the United Kingdom at the time, presented for evaluation of non-dominant left arm weakness of three weeks duration. He had sustained an injury to his left arm during a game of ice hockey when he was hit directly across the middle and posterior part of the arm by an opponent's stick, after which he lost balance and went into a wall with his stick held in his hand at waist height. He was unable to continue with the game because of what he described as a tearing sensation and severe pain in his arm. He was assessed by the team physiotherapist and doctor, and was given a broad arm sling with advice to start gentle supervised physiotherapy as the pain settled. Gradually the pain settled but he still had considerable residual weakness of arm extension.

On physical examination, a palpable gap in the substance of the triceps muscle was found and he was unable to hold the arm in an extended position. He denied the use of anabolic

steroids. A diagnosis of intramuscular rupture of the triceps was made and a magnetic resonance imaging scan requested. This was reported as normal and did not show any conclusive evidence of rupture of the triceps.

The patient underwent surgical exploration through a mid-line posterior incision. An incision through the triceps aponeurosis revealed the site of the rupture involving mainly the long and medial heads of the triceps but also extending into the lateral head. The muscle ends were contracted and oedematous, with considerable distortion of the anatomy (fig 1).

In an attempt to define the anatomy, the intermuscular aponeurosis, separating the lateral head of triceps from the



Figure 1 Rupture of the triceps brachii muscle involving mainly the long and medial heads but also extending into the lateral head.

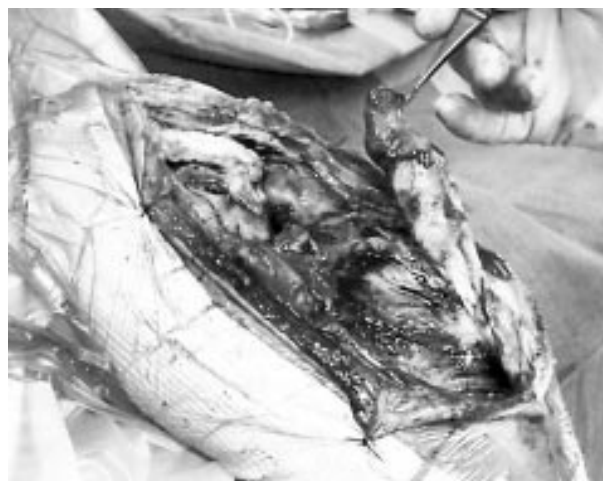


Figure 2 The intermuscular aponeurosis (held by the forceps) separating the lateral head of the triceps from the long and medial heads was mobilised.



Figure 3 Mobilisation of the torn muscle bellies.

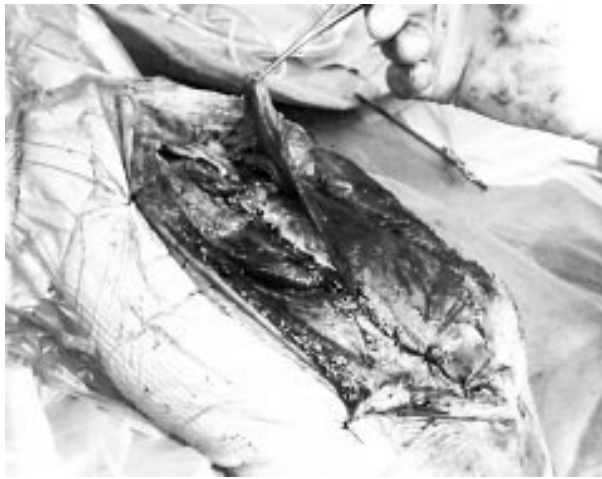


Figure 4 The final repair. The torn ends of the muscle have been sutured together but mainly to the intermuscular aponeurosis. The triceps aponeurosis (held by the forceps) is being replaced and sutured back into place.

long and medial heads, was mobilised (fig 2). The muscle bellies were further mobilised as best as possible (fig 3). Repair was carried out by suturing the torn ends of the muscle together, with difficulty because of the oedema and retraction of the cut ends, but mainly because of the intermuscular aponeurosis. Finally, the triceps aponeurosis was replaced and sutured back into place (fig 4).

The patient returned to Norway where further follow up and supervised physiotherapy was undertaken. Six months after the operation, he had gone back to playing ice hockey at a professional level.

DISCUSSION

Disruption of the triceps can occur in one of three anatomic locations: the tendon attachment to bone, the musculotendinous junction, or in the muscle substance, in decreasing order of frequency. Tarsney² stated that cases involving disruption of the triceps at its insertion into the olecranon are more accurately termed “avulsion of the triceps” with “rupture” being used for intramuscular or musculotendinous disruption of the triceps.

Numerous authors have noted the rarity of these injuries.¹⁻⁹ The most common mechanism of injury resulting in avulsion of the triceps tendon has been reported to be a fall on the outstretched hand with the elbow in mid flexion, with or without a concomitant direct blow to the posterior aspect of the elbow.¹ Farrar and Lippert¹⁰ stated that the most common mechanism of injury was a deceleration stress superimposed on a contracted triceps muscle, with or without a concomitant blow to the posterior aspect of the elbow.

There are increasing reports of major tendon avulsion and rupture in patients with chronic renal failure and secondary hyperparathyroidism.¹¹⁻¹⁶ Wagner and Cooney⁸ reported a case of rupture of the triceps at the musculotendinous junction in a patient with diabetes mellitus, nephrolithiasis, essential hypertension, and obesity. Another group of patients presenting with rupture and avulsion of the triceps tendon are those with a history of using anabolic steroids. Bach *et al*⁴ reported the case of a 33 year old Olympic weightlifter who ruptured the long and lateral heads of the triceps at the musculotendinous junction. His past medical history was significant for anabolic steroid usage for four months preceding the injury. Sollender *et al*¹⁷ reported four cases of triceps tendon rupture in weightlifters, two of whom had received local steroid injections for pain in the triceps. All four had taken oral anabolic steroids before the injury.

The first reported case of intramuscular rupture of the triceps brachii muscle was by Penhallow¹⁸ in a 35 year old man

Table 1 Intramuscular rupture of the triceps brachii muscle

Reference (year)	Age	Sex	Mechanism of injury	Diagnostic scan	Treatment	Extent of injury	Follow up	Result
Penhallow ¹⁸ (1910)	35	M	Struck by a large box above elbow	None	Surgery	Complete rupture of long and partial rupture of medial head	1 month	Complete recovery
Montgomery ¹⁹ (1920)	20	M	Arm was struck and compressed by taiboard of truck	None	Surgery	?complete rupture of all three heads	2 months	Full tone & strength
Aso & Torisu ²² (1984)	28	M	Hit while practising kendo	x Ray	Surgery	Partial separation medial head from shaft of humerus	18 months	Complete recovery
Aso & Torisu ²² (1984)	36	F	Overhead serve playing volleyball	x ray, CT scan	Non-operative	Not specified	19 months	Complete recovery
O'Driscoll ²⁰ (1992)	25	M	While white-water kayaking	None	Non-operative	Clinical examination: complete rupture of long head	10 years	Isometric strength equal to other arm but 5-10% decrease in endurance strength
Sheps <i>et al</i> ¹ (1997)	13	M	Initial injury while waterskiing later aggravated during golfing	Ultrasound, MRI scan	Non-operative	Rupture of the long head	approx. 2 years	Can carry out ADL without significant disability, but Cybex testing reveals significant extension and pronation deficit
Present	31	M	Playing ice hockey when struck on back of arm by opponent's stick and went into wall with stick held at waist height	MRI scan	Surgery	Rupture of all three heads	6 months	Playing ice hockey at professional level

CT, Computed tomography; MRI, magnetic resonance imaging; ADL, activities of daily living.

who was struck by a large box above the elbow. Surgical exploration showed a complete rupture of the long head and partial rupture of the medial head of the triceps brachii muscle, which was repaired. Since then, a further five cases have been reported¹⁹⁻²² (summarised in table 1). None of these patients were reported to be suffering from any previous medical problems or gave a history of anabolic steroid use. This is in contrast with cases of avulsion of the triceps tendon or rupture at the musculotendinous junction which are increasingly being seen in association with various disease conditions and use of anabolic steroids (see above).

Diagnosis in all cases could be made on clinical grounds. The pathognomonic features are inability or weakness of extension of the elbow and a palpable gap in the substance of the muscle. Depending on the duration of the injury, bruising, ecchymosis, and localised tenderness may be present. Further imaging studies may be performed to help to define the exact extent of the injury, but the results should be viewed with caution as is well illustrated in our case where the magnetic resonance imaging scan was reported as normal with no evidence of rupture of the triceps muscle.

Only one of the six cases reported can be presumed to be of a complete rupture of all three heads of the triceps.¹⁹ A further two cases involved the long head,^{20, 21} one of the medial head²² and one of uncertain extent but definitely partial as the patient had good power on triceps testing.²² Penhallow¹⁸ had found a rupture of the long and partial medial heads during surgery. In our case the rupture involved all three heads, which was repaired. Two of the cases were treated surgically and a further three non-operatively. One patient underwent surgical exploration but no repair was carried out as the muscle was already found to be scarred and adhered²² (table 1).

Too few cases have been reported to allow a conclusion to be drawn about whether operative or non-operative treatment is the best option for intramuscular rupture of the triceps brachii muscle. We would agree with O'Driscoll²⁰ that non-operative treatment is effective and can be recommended for patients who do not require great endurance strength in elbow extension, but would hasten to add that this may be true only in cases of partial rupture, and that in all cases of confirmed or suspected complete intramuscular rupture of the triceps surgical repair would seem to be essential to restore functional extension strength to the elbow.

In conclusion, intramuscular rupture of the triceps brachii muscle is a rare injury usually seen in young, otherwise healthy people, involved in sporting activities. Including this case, only seven cases have been reported in the English literature, with only two being of a complete rupture of all three heads.

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Take home message

- Intramuscular rupture of the triceps brachii muscle is seen in young healthy people involved in sporting activities
- Diagnosis can be made on clinical grounds but further imaging studies should be performed to establish the full extent of the injury
- The decision to treat conservatively or operatively should be made on the basis of the extent of the injury and the functional requirements of the patient

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Accepted 12 April 2002

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