ABSTRACT

A 32-year-old man presented with chronic closed transection of the biceps brachii of the right arm after 30 months of conservative treatment. Magnetic resonance imaging showed atrophy of both long and short heads of the biceps brachii, with a 5-cm defect secondary to proximal and distal retraction on either side of the tear. There was a similar defect in the coracobrachialis, but the triceps brachii was normal. The self-rated overall arm status was 4 out of 10 (using a visual analogue scale). Objective functional deficit was measured using a dynamometer. Forearm flexion and supination strength of each arm at 120º/s was tested. The patient had a 34% deficit (40 vs. 61 Nm) in peak torque during forearm flexion and a 22% deficit (10 vs. 12 Nm) during forearm supination. The patient could not maintain maximal torque throughout the range of motion, with an approximately 50% deficit in the later part of the range of motion. The patient underwent reconstruction of the biceps brachii using an interposition Achilles tendon allograft.

INTRODUCTION

Traumatic closed transection of the mid-biceps has been reported in military parachutists and after blunt motor vehicle trauma.1 In military parachutists, the static line is not between the arm and thorax for safe deployment. If the line is medial to the arm, a sudden force imparted to the mid-portion of the anterior upper arm can result in closed transection of the biceps brachii, followed by haematoma, swelling, and muscle retraction. Immediate surgical repair can restore forearm flexion power, endurance, and muscle contour.2 If left untreated, significant functional and cosmetic deficit may result. Delay in presentation may result in weakness in forearm flexion and supination with fatigability and pain, despite extensive physical therapy and rehabilitation.3–4 Significant muscle retraction and adhesions also make surgery difficult and outcomes poor.3–4 We assessed functional and biomechanical...
deficits in a patient with chronic closed transection of the biceps brachii.

CASE REPORT

In October 2009, a 32-year-old, right-hand dominant, military parachutist presented to our hospital 30 months after sustaining a traumatic closed transection of the biceps brachii of the right arm. Initial treatment had been non-operative with ice, immobilisation, and then physical therapy. He had returned to active duty, but functional impairment had persisted.

Clinical examination revealed a palpable defect in the biceps at the level of the deltoid tuberosity accentuated by resisted forearm flexion and supination. Sensation in the territory of the lateral cutaneous nerve in the forearm was normal, with no Tinel’s sign over the course of the musculocutaneous nerve.

Magnetic resonance imaging showed atrophy of both long and short heads of the biceps brachii, with a 5-cm defect secondary to proximal and distal retraction on either side of the tear (Fig. 1). There was a similar defect in the coracobrachialis, but the triceps brachii was normal.

Subjective functional deficit was assessed using the Disability of the Arm, Shoulder and Hand (DASH) score and the Upper Limb Functional Index (ULFI). The overall DASH score was 92 (maximum=100), but the work module score was 56 and the sports module score was 50 (normalised to 100), indicating substantial patient-reported disability in these 2 modules. Regarding the ULFI, there was an 8% deficit, but in 5 activities of the patient’s choice (climbing, weight training, pull-ups, jump checking, and soldiering), the deficit was 60%. The self-rated

Figure 1 Magnetic resonance imaging showing closed traumatic transection of the biceps brachii of the right arm.

Figure 2 Torque at 120% for the right and left (control) arms during forearm (a) flexion and (b) supination.
overall arm status was 4 out of 10 (using a visual analogue scale).

Objective functional deficit was measured using a dynamometer. Forearm flexion and supination strength of each arm at 120°/s was tested. The left arm was used as a control. Four trials of reciprocal, concentric motion were performed; each was interspersed with a 3-minute rest. Results of the first and last trials were discarded; the remaining trial with higher peak torque values was plotted to indicate the magnitude, location, and decrement throughout the range of motion (ROM). During forearm flexion, the peak torque was reached at the early ROM on the right and at the mid ROM on the left (40 vs. 61 Nm, 34% deficit). The maximal torque could not be maintained throughout the ROM on the right, whereas there was no decrement throughout the ROM on the left. The mean torque during the second half of the ROM was 23 versus 46 Nm. During forearm supination, the corresponding peak torque was 10 and 12 Nm (22% deficit) reached at 12% throughout the ROM on both sides. Maximal torque decrement was 67% (at mid ROM) on the right and 27% on the left. The mean torque during the second half of the ROM was 3 versus 5 Nm.

After a 5-minute rest, muscle endurance of each arm was tested. 30 continuous, reciprocal forearm flexion/extension movements at 120°/s were performed. The mean peak torque for trials 2 to 4 (start) was compared to that for trials 27 to 29 (end). The respective start and end peak torque values were 36 and 32 Nm (11% decrement) on the right versus 56 and 38 Nm (32% decrement) on the left.

The patient underwent reconstruction of the biceps brachii using an interposition Achilles tendon allograft. He returned to his country after surgery.

**DISCUSSION**

Closed transection of the biceps brachii is uncommon. Functional deficits persist when presentation is delayed, or when the patient is treated non-surgically. In 9 patients with untreated distal biceps tendon rupture, the mean reduction in peak torque was 35% during forearm flexion and 46% during forearm supination. The decrement in torque throughout the range of motion was not assessed. An isolated peak torque measurement may underestimate the functional deficit. In our study, the decrement throughout the ROM was measured for forearm flexion and supination. This is important as the position of forearm flexion/supination cannot be optimised in certain tasks and sporting manoeuvres. This functional deficit was also reflected in patient-reported outcome scores. Surgery was necessary to restore normal function; delayed repair results in poor outcomes.

**REFERENCES**