

BICEPS TENDON RUPTURE AFTER SUCCESSFUL REINNERVATION : A CASE REPORT

M. DEMUYNCK¹, R. M. ZUKER²

Although rupture of the long head of biceps is a fairly common event, its etiology in young healthy individuals has been assumed to be related to an extraordinarily strong muscle contraction.

In this report we describe such a rupture following minor trauma in a reinnervated muscle. The case brings up several points of interest concerning tendon tensile strength and potential for rupture.

Keywords : biceps tendon ; rupture ; reinnervation.

Mots-clés : tendon bicipital ; rupture ; réinnervation.

INTRODUCTION

Rupture of the long head of the biceps muscle is a common and well known injury. Several underlying disorders have been described as causes of biceps tendon rupture (8). Among these, degenerative changes in the glenohumeral joint and in the tendon of the long head are the most important in older people, while an unexpected, brisk contraction of the biceps is the commonest cause in young and athletic persons (1). As far as we know, there is no report on biceps tendon rupture following microneural repair of the musculocutaneous nerve (as part of an open brachial plexus injury).

CASE REPORT

This sixteen year old student sustained a power chainsaw injury which penetrated quite deeply into his brachial plexus just above the left clavicle in September 1981. The wound was closed in a local hospital and 10 days later he was referred to our hospital.

Clinical examination revealed loss of mobility of the left shoulder, loss of elbow flexion and forearm supination. Elbow extension and pronation, as well as wrist and finger movements were essentially normal. Anaesthesia was noted at the site of injury and along the radial volar side of the arm and forearm.

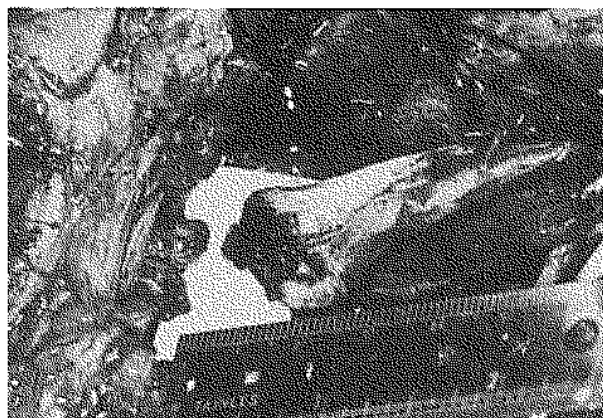


Fig. 1. — Transection of C4 root and superior trunk (C5-C6).

Two weeks after the initial trauma this young man was taken to the operating room for exploration of the brachial plexus. At operation a complete transection of C4 root and the superior trunk (C5-C6) was found (figure 1). The supra-

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scapular nerve was found to be avulsed from the muscle. It was carefully reinserted back into the muscle with the hope of functional return by neurotization. The lower plexus showed no injury but was explored and mobilized into the axilla, in order to facilitate direct repair of the upper plexus lesion. The C4 root and superior trunk were repaired without tension with the aid of the operating microscope (figure 2). The deltoid muscle and elbow flexors subsequently regained good muscle power, grade IV-V (figure 3). However, external rotators of the shoulder (M. supra- and infraspinatus) remained weak, grade III.

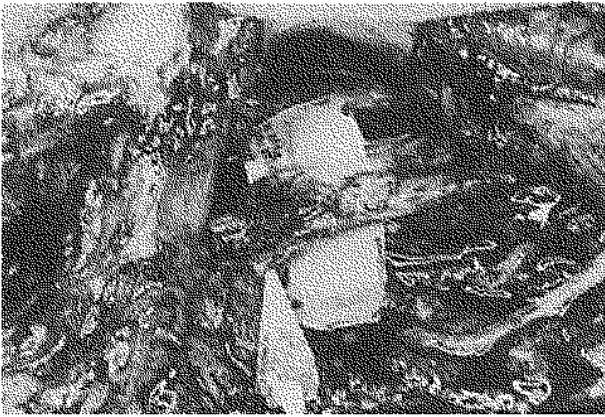


Fig. 2. — Microsurgical Direct Repair.

The young man took part in all activities including contact sports, hunting and motorcycling. He diligently followed a vigorous weight-lifting program to strengthen his muscles.

In October 1984, 3 years after the nerve repair, while engaging in a tug-of-war, he experienced a sudden snap and pain in the left shoulder and arm. Physical examination revealed the belly of the biceps muscle bulging in the lower third of the arm, with widening of space between deltoid and biceps (figure 4). Shoulder movement and elbow flexion remained very powerful. The surgical options and alternatives were explained to the patient. After due consideration he elected to strengthen his muscle by weightlifting and avoid further surgery.



Fig. 3. — Excellent Initial Recovery.

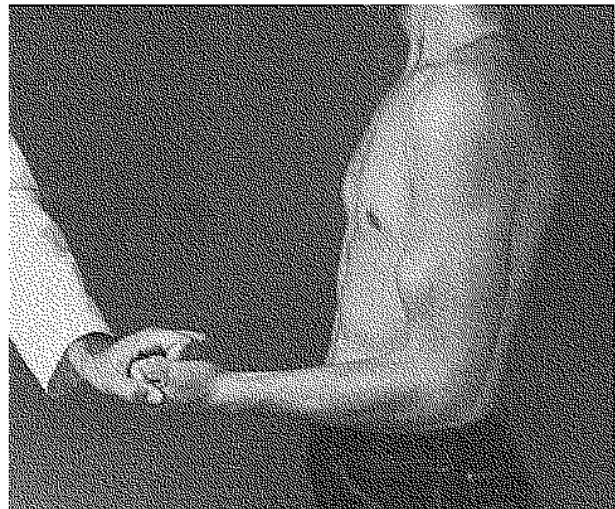


Fig. 4. — 3 Years Post Repair : Biceps Rupture.

DISCUSSION

Rupture of the tendon of the long head of the biceps muscle was first described by J. G. Smith in 1835. Morton in 1886 first reported the results of surgical repair. Gilcreest in 1934 reported 100 cases and gave a thorough description of the anatomy, pathology and treatment. He found that most ruptures occurred in the intra-articular portion and in the proximal musculo-

tendinous junction. Bateman describes the inter-tubercular fulcrum as the weak point where wear and tear of the tendon eventually leads to complete rupture.

The need for operative reconstruction is somewhat controversial (1). Soto-Hall and Strooth studied the power of flexion of the elbow and abduction of the shoulder with the arm in external rotation in patients with rupture of this tendon. Evaluation soon after rupture revealed a 20% decrease in the strength of elbow flexion and a 17% decrease in the strength of shoulder abduction. Late ruptures, however, showed no difference in strength. The strength of a ruptured biceps muscle has also been tested by Warren (5) *et al.* Two years after chronic ruptures of the long head of the biceps they failed to reveal any statistically significant loss of elbow flexion but an approximate 10% loss of elbow supination was noted.

Because of the minimal functional disability Watson-Jones considered operative reconstruction only in terms of cosmesis, while others support the need for reconstruction in young people and athletes. In case of reconstruction, some authors prefer to fix the tendon of the long head in the bicipital groove, while others (4, 5) prefer to suture the ruptured tendon back to the coracoid and short head of the biceps muscle to maintain the muscle action across the shoulder joint. When reconstruction is performed in middle-aged persons, rotator cuff tears must be suspected because of the high frequency of association with biceps tendon ruptures.

We report the history of a young healthy man who sustained an open brachial plexus lesion. A microneural direct repair was done as a delayed primary procedure. Subsequently the patient regained good function and muscle power (grade IV-V) in the elbow flexors and deltoid muscle. External shoulder rotation remained weak (grade III), due to inadequate recovery after neurotization with the suprascapular nerve. As a result of minor trauma, 3 years after the repair, he ruptured the tendon of the long head of the biceps muscle.

Some points warrant further discussion. Has the tendon tensile strength been weakened following a nerve repair? If so, has this intrinsic

weakness rendered the tendon susceptible to rupture? Gilcreest estimates the tensile strength of the tendon of the long head to be about 150 pounds, while in cadaver studies it was found to be from 150 to 200 pounds. Review of the English literature of the last 15 years gives no data on changes in tensile strength of muscle or tendons after successful reinnervation. The fact that this young man ruptured his biceps tendon as a result of only minor trauma may suggest a weakened tendon. The mechanical properties, especially tensile strength, of reinnervated muscle and tendon need further experimental attention.

The very good recovery of the biceps muscle after direct repair as a delayed primary procedure also warrants further attention. Seddon (12) states that the results of musculocutaneous nerve repair are excellent, indeed better than those of any other nerve in the body. Direct repair of brachial plexus injuries is however rarely possible (2, 3). Sedel (3) reports one case with transection of the upper trunk where direct repair was performed, but under slight tension. No recovery was noted after 4 years. In our case, by mobilization of the plexus into the axilla a direct repair was possible despite some crushing of the nerve ends related to the type of injury (chainsaw). He regained such muscle power in his biceps that he ruptured the tendon 3 years after neural repair. The overall favourable reputation of biceps recovery may be explained by the relatively short distance of nerve regeneration, so that the end organ is less likely to undergo end plate fibrosis.

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SAMENVATTING

M. DEMUYNCK, R. M. ZUKER. Ruptuur van de lange biceps kop na succesvolle reïnervatie.

Ruptuur van de lange kop is relatief frequent bij jonge personen en komt vooral voor na korte krachtige inspanning.

In dit artikel wordt een ruptuur van de lange kop beschreven in een gereïnerveerde bicepsspier na plexus laesie. De ruptuur was een gevolg van een mineur trauma. Bedenkingen omtrent peessterkte en risico op ruptuur na reïnervatie worden hierbij gemaakt.

RÉSUMÉ

M. DEMUYNCK, R. M. ZUKER. Rupture du tendon de long biceps après réinnervation réussie.

La rupture du tendon bicipital est relativement fréquente et se manifeste le plus souvent après une importante activité physique.

Dans ce rapport, une rupture du tendon bicipital est décrite sur un muscle réinnervé après lésion du plexus brachial. La rupture était la conséquence d'un traumatisme mineur. On peut s'interroger au sujet de la qualité du tendon et du risque de rupture après réinnervation.