Modified anconeus muscle transfer as treatment of failed surgical release of lateral epicondylitis of the elbow

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The purpose of this study was to evaluate the safety and the effectiveness of a new modified anconeus transfer technique in revision surgery for refractory lateral epicondylitis of the elbow. A modified anconeus muscle transfer was performed in nine patients with persistent symptoms after previous surgical release of the common extensor origin. The original technique was modified by using only half of the anconeus muscle. Patients were clinically evaluated, including quickDASH score and grip strength measurement. At a mean follow up period of 36 months, 4 patients had an excellent result, 3 a good result and 1 a poor result. All patients rated their clinical situation as better than before surgery. All but one patient said to be happy with the result and they would undergo the procedure again. The mean quickDash score at the follow up was 10.6 (SD 14.4). No complications were observed. The modified Anconeus muscle transfer is a safe and effective procedure in patients with persistent lateral epicondylitis complaints after a previous surgical release.

Keywords : Tennis elbow, lateral epicondylitis, extensor carpi radialis brevis, Anconeus transfer

INTRODUCTION

Lateral epicondylitis is a painful and functionally limiting entity primarily affecting a young population (35 to 50 years). The pathophysiology remains poorly understood. A wide scoop of conservative and operative treatment protocols exist but there is no consensus on which treatment is the best. The anconeus muscle transfer is normally propagated as a salvage procedure after failed surgical treatment for lateral epicondylitis.

The main function of the small triangular anconeus muscle is taking part in extension of the forearm and stabilization of the elbow joint (*3*). It can be looked at as a continuation of the triceps brachii muscle. Its potential in covering defects around the elbow as a muscle pedicle flap has been described by many surgeons. The anconeus muscle is vascularised by 2 arterial pedicles : the recurrent posterior interosseus artery (RPIA) and the medial collateral artery (MCA) (Fig. 1). The MCA was found to be the minor pedicle and the RPIA the major one[9]. When the muscle is rotated over the radiocapitellar joint, using the neurovascular pedicle as described by Pankovich, the mean area covered is about 7 cm (*2,7,9*).

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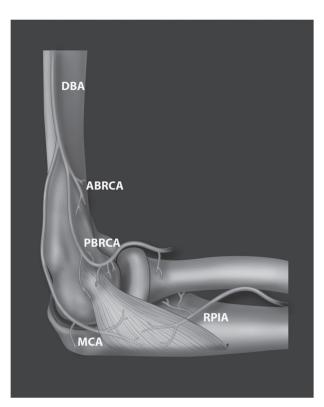   E-mail : luyckx.thomas@gmail.com

Fig. 1. — The arterial supply of the anconeus muscle. DBA: deep brachial artery, ABRCA : anterior branch of the radial collateral artery, PBRCA : posterior branch of the radial collateral artery, MCA : medial collateral artery, RPIA: recurrent posterior interosseous artery.

Anconeus muscle transfer has already proved to be a good treatment alternative in patients with persistent lateral epicondylitis. Almquist was the first one to use it together with debridement of the common extensor origin on the lateral epicondyle. Using this muscle flap made a more extensive debridement possible and this technique provided an excellent result in 94% of the cases in primary surgery (*5*).

According to our experience, a postoperative mass on the lateral epicondyle due to the bulky muscle has been reported by almost all patients. It was theorized that there was no need to transfer the whole anconeus muscle onto the lateral epicondyle as it can be quite big. Therefore, a modified anconeus transfer was developed using only half of the anconeus muscle.

In this study, we present this technique and hypothesize that it would prove safe and equally effective in the treatment of failed tennis elbow surgery.

MATERIALS AND METHODS

Eleven consecutive cases of modified anconeus muscle transfers for treatment of persistent lateral epicondylitis after previous surgical release were retrospectively selected. All procedures were performed at the orthopaedic department of the AZ Delta hospital (Roeselare, Belgium) between 2002 and 2009 by the senior author (JN). All patients were selected for re-evaluation. Two patients were lost to follow up and were subsequently excluded. Nine patients were available for follow up. Patient records were reviewed and patients were clinically re-evaluated. All patients had been diagnosed with a lateral epicondylitis of the elbow that was resistant to conservative treatment. They underwent a classic surgical release of the common extensor origo at the lateral epicondyle. All these interventions were performed by the senior author at our department (JN). After surgical release, all had been treated with the same rehabilitation protocol that consisted of cast immobilization of 2 weeks followed by physiotherapy. Severe complaints persisted in all these patients. Corticosteroid injections were administered in 8 out of 9 patients with no relief of complaints. Eventually, modified anconeus muscle transfer was performed in all these 9 patients as a salvage procedure with a mean delay of 16.9 months after the index surgery. One patient was operated at 115 months after previous surgery. This case consisted of a late recurrence of complaints in a patient who had been pain free for many years. After exclusion of this patient, the mean delay after the index surgery was 5.3 months.

The load of the work that patients performed was rated from light to heavy. Return to full duty was recorded. All patients were clinically re-evaluated, including quickDASH score and a questionnaire. Roles and Maudsley scoring were used to evaluate outcome with an excellent result defined as : no pain, full movement, full activity, a good result as : occasional discomfort, full movement and full activities, a fair result as : some discomfort after prolonged activity and a poor result as : pain limiting

activities (8). Cybex grip strength measurements were performed in all patients en compared to the contralateral side.

Operative technique

A longitudinal incision of about 5 cm was made starting from the lateral epicondyle.

A wide excision of the common extensor tendon origin combined with an excision of scar tissue was performed proceeding distally to the level of the radial head. Next the anconeus muscle was exposed through incision of the superficial aponeurosis.

The anconeus muscle was then devided obliquely from anterior to posterior to enable mobilisation of half of the anconeus muscle (Fig. 2). After dissecting the posterior border of the anconeus from the ulna, the proximal part of the muscle could be mobilised and rotated anteriorly.

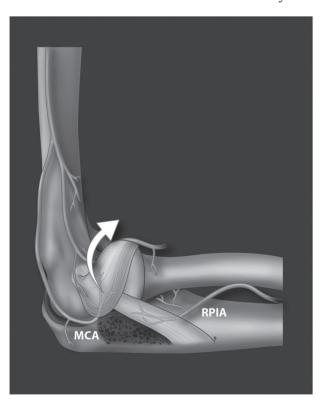In this way the proximal part of the anconeus was mobilised on the medial collateral artery and

Fig. 2. — The modified anconeus transfer. Half of the anconeus muscle is raised on the MCA (medial collateral artery) and rotated over the radiocapitellar joint. The other half remains in place with the RPIA as vascular supply.

the distal part of the anconeus remained in situ vascularised by the recurrent posterior interosseus artery. The transfered anconeus part was sutured in place with interrupted 3/0 absorbable sutures. The tourniquet was released and haemostasis was performed. Closure was done in separate layers. Postoperative rehabilitation program consisted of cast immobilisation for 10 days, followed by a brace for 3 weeks.

RESULTS

The mean age at the following up of our patients was 49.9 years (SD 9.1). Three patients were male, 6 female. The right side was operated upon in 5 patients, the left side in 4. The operated side was the dominant side in 5 patients. The mean duration of the symptoms before anconeus transfer was 12 months (SD 10.2). Six patients were categorized as having a heavy-duty job. Three patients had a moderate one.

The mean follow up time was 39.9 months (SD 28.6) with a minimum follow up of 4 months.

No postoperative complications were observed. No mass was observed at the lateral epicondylitis in all patients.

All patients were employed before their first classic epicondylitis release. None of them was able to resume work after the first intervention. Eight out of 9 patients were able to resume their job after the anconeus transfer. One patient had to change his heavy-duty work due to his elbow problem ; all others were able to resume their original job.

Eight patients had full range of motion of the elbow with full extension. In 1 patient, an extension deficit of 5° persisted. The mean grip strength at the operated side was 266 N (SD 137). The mean grip strength at the contra-lateral side was 292 N and the mean difference between the two sides was 26 N (SD 71) in advantage of the non-operated side. All but one patient had grip strength of the involved side that was more than 70% of the uninvolved side. If the dominant side was involved, the grip strength was more than 90% of the uninvolved side in all patients.

Complaints before the operation were rated as severe for 8 patients and moderate for 1 patient.

Roles and Maudsley scoring postoperative showed an excellent result for 5 patients, a good result for 3 and a bad result for 1 patient. Eight patients were happy with the operation and would do it again immediately. One patient would not choose to undergo this surgery again. All patients considered their complaints to be better as compared with their status before the operation. The mean quickDash score at the follow up was 10.6 (SD 14.4).

DISCUSSION

The most important finding of this study was that the modified anconeus muscle transfer was a safe and effective treatment for patients with persistent complaints of lateral epicondylitis after surgical release.

The anconeus muscle transfer has been shown to be a valuable treatment in both primary and revision surgery for tennis elbow. Some even reported better results for primary anconeus transfer when compared to standard surgical release (*1*). There might be several reasons for the success of this procedure. First, the anconeus transfer allows a wider resection of the scar tissue and a more extensive debridement. This was said to be the key to success in this type of revision surgery. Organ et al reported a success rate of 83% after revision debridement without anconeus transfer (*6*). The wider resection also involves some risks. Damage to the collateral and annular ligament are not infrequent and elbow instability may occur as a result. Also fistulae are a common complication after extensive debridement. Second, a great deal of vascularity is brought into the area with the anconeus muscle. Decreased vascularity is one of the proposed pathophysiologic concepts. Schneeberger and Masquelet studied the arterial vascularization of the ECRB in cadavers and found that the vascular pattern was highly consistent, with the major source of vascularization being the radial recurrent artery, and that the undersurface of the extensor tendon origin was macroscopically avascular (*10*). A more recent study of the microvasculature anatomy of the lateral epicondyle showed two hypovascular zones : one at the lateral epicondyle and the other one 2-3 cm distal to the extensor insertion (*2*). This zone of hypovascularity corresponds with the region of the undersurface of the ECRB that is vulnerable to contact and abrasion against the lateral edge of the capitellum during elbow motion (*4*). Enhancing vascularity in this region might promote the tendon healing and reduce the need for extensive debridement.

We hypothesized that there was no need to transfer the whole anconeus muscle onto the lateral epicondyle and therefore we modified the technique to a partial transfer of only the proximal part. The debridement that was performed on the lateral epicondyle in our patients was not extensive as described by other authors. We believe that the main healing effect is induced by the promoted vascularity. Theoretically, vascularity of the distal part of the anconeus muscle that is not transferred should not be a problem as the RPIA is preserved (Fig. 1). Moreover the RPIA has been shown to be the major vessel to the anconeus muscle. No complications were observed in our series. Another theoretical advantage of preserving the distal part of the anconeus is that whereas in the classic technique the RPIA is getting involved in a scar, now it can be preserved in our technique. Schneeberger has shown that the RPIA also provides blood flow to the common extensor origin (*10*). Preserving this vascular pillar together with the distal part of the anconeus might promote the healing potential on the lateral epicondyle. So our technique provides maximal vascularity in two ways : it brings the muscle tissue onto the lateral epicondyle and it preserves the blood flow of the RPIA. Despite the fact that the debridement had not been as extensive as described by others and despite the fact that only part of the anconeus muscle had been used, our results were very good with 5 excellent results and 3 good ones. Eight out of 9 patients were able to resume their work.

A postoperative mass on the lateral epicondyle due to the bulky muscle has been reported by most patients after classic anconeus transfer. Also the defect near the ulna was frequently noted. The bulky mass was much smaller with our technique. The fact that only the proximal part of the anconeus muscle had been used, enabled us to limit the skin incision.

Our study has several limitations. First limitation is associated with its retrospective nature of the

study and its limited number of patients. Prospective research is needed to confirm these results. Bias was reduced by the fact that patients had all undergone their index surgery by the same surgeon with the same surgical technique. Second limitation is the fact that there were no interval quantitative results reported following the first intervention and prior to the 2nd intervention.

CONCLUSION

Our results indicate that the modified anconeus muscle transfer is a safe and reliable technique providing excellent results in case of persistent severe symptoms after previous surgical release of lateral epicondylitis of the elbow.

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