Acta Orthop. Belg., 2009, **75**, 595-598

ORIGINAL STUDY

Relocation of a dislocated long head of biceps tendon is no better than biceps tenodesis

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A displaced Long Head of Biceps (LHB) tendon is commonly encountered in association with subscapularis rotator cuff tears. Management options for the displaced tendon consist of tenotomy, tenodesis or relocation with reconstruction of the biceps pulley.

We present 16 patients in whom LHB relocation and reconstruction of the biceps pulley, was performed in association with subscapularis rotator cuff repair. During follow-up ultrasound scanning was used to assess LHB mobility and location.

Eight of the 16 patients had a static LHB tendon at an average follow-up of 26 months. Four of the 6 patients who had a groove deepening procedure combined with the tendon relocation had a static tendon on ultrasound scanning.

Relocation of the LHB and reconstruction of the biceps pulley appears to offer no advantage over tenotomy or tenodesis alone when managing the displaced LHB tendon in conjunction with subscapularis tears.

Keywords : long head of biceps ; dislocation ; subscapularis tendon tear.

INTRODUCTION

When undertaking rotator cuff repair involving the subscapularis tendon, a subluxed or dislocated long head of biceps tendon is frequently encountered (*5,10*). Historically, the LHB has been managed using tenotomy, tenodesis or relocation of the biceps tendon with reconstruction of the proximal sling.

Although satisfactory results have been obtained with tenodesis and tenotomy (*5,10*), relocation with reconstruction of the proximal pulley is a more anatomical procedure that leaves the LHB tendon in place and aims to leave a mobile tendon to continue to act as a depressor of the humeral head. However, relocation with reconstruction is a technically more demanding procedure that has mixed results in terms of patient satisfaction post-operatively (*5*). There are, to date, no reports of LHB function following relocation.

We present a series of 16 patients who underwent LHB relocation as part of their subscapularis repairs, and comment on the ultrasound findings of the LHB mobility and function post-operatively

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No benefits or funds were received in support of this study

PATIENTS AND METHODS

We retrospectively reviewed 16 patients who had undergone a biceps relocation procedure in conjunction with a subscapularis rotator cuff repair. At clinical review prior to surgery, all patients had weakness of subscapularis, and 15 of the 16 patients had a positive Gerber's lift off test (*6*). Pre-operative ultrasound scans (USS) confirmed a subscapularis tear in 12 of the 16 patients, and an associated subluxed or dislocated long head of biceps tendon was present in 9 of the 16 patients.

A glenohumeral joint arthroscopy was initially performed in the lateral decubitus position and if an isolated subscapularis tendon tear was confirmed, the patient was transferred to the supine position, and the tear repaired through a deltopectoral approach. If subscapularis and supraspinatus tendon tears were noted at glenohumeral joint arthroscopy, then an anterosuperior approach was used with the patient remaining in the lateral decubitus position to repair both tears. Rotator cuff repair was performed using a double row repair consisting of medial rotator cuff anchors (Panalok Quickanchor Plus, Mitek Worldwide, Norwood. MA, USA) and lateral transosseous 1/PDS sutures (Ethicon, North Ryde, NSW, Australia). At operation the condition of the LHB was inspected. If no delamination, flattening or degeneration was found at inspection of the tendon, then a decision to relocate was made.

Reconstruction of the LHB pulley was achieved via repair of the subscapularis (and the supraspinatus when involved). A corkscrew anchor was placed at the superior edge of the lesser tuberosity. One limb of the suture was used to repair the subscapularis and the other to reconstruct the transverse portion of the LHB pulley. Groove deepening was performed in 6 patients by using a burr. For these six patients the groove was either eroded or too shallow to retain the LHB.

Post-operatively all patients were rested in a sling with a body strap preventing external rotation. Passive elevation to 90° and passive external rotation to neutral was allowed for 6 weeks. Active motion was introduced after this period, but resisted external rotation or elbow flexion was not allowed for a further 6 weeks. All 16 patients attended for a surgical review.

Ultrasound scans were performed on all patients by a musculoskeletal radiologist. All examinations were performed using a 5-12 MHz linear transducer with a HDI unit (Advanced Technology Laboratory, Bothell, Wash, USA). The position and integrity of the LHB tendon was confirmed and an assessment made of tendon gliding within the bicipital groove with movement of the shoulder and elbow.

The operating surgeon and/or an Orthopaedic Fellow followed up all patients clinically at 6 weeks, 3 months, 1 year and yearly from then.

Between 1997 and 2003, 16 patients (13 male and 3 female), with an average age of 61.9 years, have undergone rotator cuff repair combined with LHB relocation in one institution by a single surgeon (SNB). The average duration of symptoms before presentation was 50 weeks (range 4-520). Follow-up is an average of 44.9 months (range 14-83 months). There were 11 right and 5 left shoulders. The dominant arm was affected in 11 cases. Eleven patients had an associated supraspinatus repair, using the same double row technique. All LHB subluxations or dislocations were in the anteroinferior direction. All five isolated subscapularis tears were present in the dominant arm. All patients had arthroscopic evidence of subacromial impingement and underwent arthroscopic subacromial decompression in conjunction with the rotator cuff repair.

RESULTS

Post-operative USS demonstrated that the LHB was gliding in the groove in 8 patients and static in 8 patients, at an average follow-up time of 26.2 months. The average duration of symptoms in those with a static LHB was 14 weeks (range 4-33) compared to 86 weeks for those with a gliding LHB (range 6-520). Of the six patients that had a groove deepening procedure, four had a non-mobile LHB tendon. One patient who had undergone repair combined with a groove deepening procedure had a second operation to manage acromioclavicular joint arthrosis 47 months after the index procedure. An ultrasound examination 7 months post index operation revealed a LHB tendon within the groove but it was thinned. It was noted at the time of the second operation that the bicipital groove was empty. One patient had a recurrent subscapularis tear on USS ; the LHB however remained located within the groove but it was non-mobile.

DISCUSSION

The LHB is enclosed within a tendo-ligamentous pulley as it enters the glenohumeral joint. The

pulley lies at the lateral edge of the rotator interval and is composed of the coracohumeral ligament (CHL), superior glenohumeral ligament (SGHL), and fibres of the supraspinatus tendon (*12*). The pulley, and in particular the 'U-shaped' reflection of the SGHL acts to stabilise the LHB by limiting anterior displacement. Rotator interval lesions can disrupt the pulley with subsequent LHB displacement. First described in the 17th century, a displaced LHB tendon was rarely diagnosed but with the advent of arthroscopy has become a common finding. Walch *et al* noted a 16% incidence of LHB displacement in a review of 445 rotator cuff repairs (*10*), and Lafosse *et al* reported an incidence of LHB instability of 45% in a series of 400 arthroscopic rotator cuff repairs (*7*). Bennett (*2*) reported a 47% incidence *(21/45*) of LHB pulley pathology associated with subscapularis tears, which if not repaired can lead to LHB displacement. Clinical examination is unreliable (*10*) when examining for displaced LHB tendons and we recommend a glenohumeral arthroscopy prior to open rotator cuff repair to avoid missing hidden LHB pathology.

The postulated role of the LHB as a depressor of the humeral head is controversial and is probably minimal in a normal tendon (*8*). Although Warner *et al* demonstrated superior migration of the humeral head in the abducted shoulder with a LHB rupture (*11*), electromyographic studies have failed to demonstrate any significant biceps activity in this position (*8*).

Published management options with displaced LHB tendons involve tenotomy (*5,10*), tenodesis (*4*), or relocation (*5*) with reconstruction of the pulley. Isolated LHB tenotomy or tenodesis produces a satisfactory outcome both in the presence of irreparable rotator cuff tears (*9*) and in the presence of repaired subscapularis tendons (*5*), independent of the pre-operative LHB condition (*5*). Tenotomy is often combined with tenodesis especially in patients who may find a proximal biceps lump unacceptable. Tenodesis produces a more stable proximal biceps (*13*), which prevents potential functional loss when compared with tenotomy alone.

Relocation of the LHB and reconstruction of the pulley can produce significant improvements in Constant scores (*1*) when groove-deepening procedures are not performed. However, when combined with groove deepening procedures relocation can potentially lead to either an *in situ* tenodesis or a LHB tendon rupture (*5*). *In situ* tenodesis occurred in the majority of patients in our series who had a groove deepening procedure. The duration of symptoms was less in those patients who had a static tendon on USS (14 vs 86 weeks) although the results are skewed by one patient with a duration of symptoms of 520 weeks in the gliding group. If the LHB becomes tenodesed *in situ* there is potential for internal impingement of the tendon in internal rotation and anterior elevation (*3*) as occurs with the 'hourglass biceps tendon'. This however was not evident clinically in the 8 patients in our series with a static LHB post-operatively.

The strengths of this paper are that it is a single surgeon series with a long follow-up and independent ultrasound assessment. The weaknesses are that it is a retrospective series essentially comparing LHB relocation with deepening and LHB relocation alone. However on the basis of the results presented in this paper it would not be ethical to carry out a randomised controlled trial comparing the results of reconstruction of the biceps pulley, tenotomy alone, and tenodesis.

In summary, LHB relocation produced a tenodesis *in situ* in 50% of our patients. This was especially evident if relocation was combined with a groove deepening procedure. Although the patient satisfaction results of relocation are satisfactory, tendon mobility is poor and offers no great advantage over tenotomy or tenodesis alone.

Acknowledgements

The authors would like to express their gratitude to Dr. A. Hooper Franzcr who performed all of the ultrasound scans.

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