

LONG HEAD OF BICEPS(LHB) AS A PROTECTOR OF ROTATOR CUFF REPAIR- A NEW TECHNIQUE. CASE REPORT AND REVIEW OF LITERATURE



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Abstract:

Arthroscopic repair of massive rotator cuff tear remains a difficult task in Orthopaedic practice. Chronic cases have retraction of the rotator cuff tendons, which makes a tension free repair a difficult task to achieve. In addition, poor quality of muscle tissue due to fatty infiltration of the muscles increases the chances of failure. Superior migration of head of humerus due to superior capsular deficiency in chronic cases would put the repaired cuff under tension postoperatively and increase the chances of failure. Therefore, superior migration of head should be prevented to maintain the antero-posterior force couples and stability of the shoulder joint. Many procedures have been described for massive rotator cuff tears in younger age group and/or in the absence of arthritis including debridement, partial/ complete repairs, tendon transfers, balloon spacers and superior capsular reconstruction. The present article describes a new technique where we used the long head of biceps as a superior checkrein in addition to the repair of rotator cuff tendons. In our technique, the intraarticular attachment of long head of biceps at the supraglenoid tubercle is left intact. The biceps tendon is then fixed to the supraspinatus footprint behind the bicipital groove. A biceps tenotomy is then performed 1 cm lateral to the repair point. This technique not only prevents superior migration of head of humerus but also protects the repaired rotator cuff, resulting in better healing rates.

Introduction:

Repair of massive rotator cuff tear remains a challenging task in Orthopaedic practice. Achieving tendon repair at its footprint is desirable but sometimes becomes difficult due to tear size, retraction of torn tendons, fatty infiltration of muscles and degenerative changes [1-5]. In patients having rotator cuff arthropathy, reverse total shoulder arthroplasty has now become a widely accepted treatment with good clinical and functional outcome [6-7]. For patients with massive rotator cuff tears who are relatively younger and don't have any degenerative changes in the joint, multiple treatment strategies have been advised by different authors [8-14]. These include debridement with or without biceps tenotomy, interval slide, partial rotator cuff repair, patch augmentation, tendon transfers and more recently superior capsular reconstruction.

In chronic massive rotator cuff tears, it is impossible to oppose the torn ends without causing undue tension on the repaired tissue. Restoration of the antero-posterior force couple and preventing superior migration is the key to the glenohumeral stability after the repair procedure.

Fascia Lata autograft for superior capsular reconstruction was described by Mihata et al in younger patients with decreased acromiohumeral distance, without excessive arthritic changes [15]. We used the same principle of superior capsular reconstruction to augment the repair in massive rotator cuff tears. In our technique, a portion of long head of biceps was used as an additional restraint to superior migration of humeral head.

This article describes a new technique in which the long head of biceps attachment at the supraglenoid tubercle is left intact. The biceps tendon is incorporated in the repair at the anterior part of the cuff footprint just posterior to the bicipital groove. The portion of the tendon between glenoid and footprint will then act as a superior restraint to the proximal migration of the humeral head and would also protect the repair. The tenotomy of the long head of biceps tendon is done 5-10 mm lateral to the footprint fixation over the greater tuberosity of the humerus.

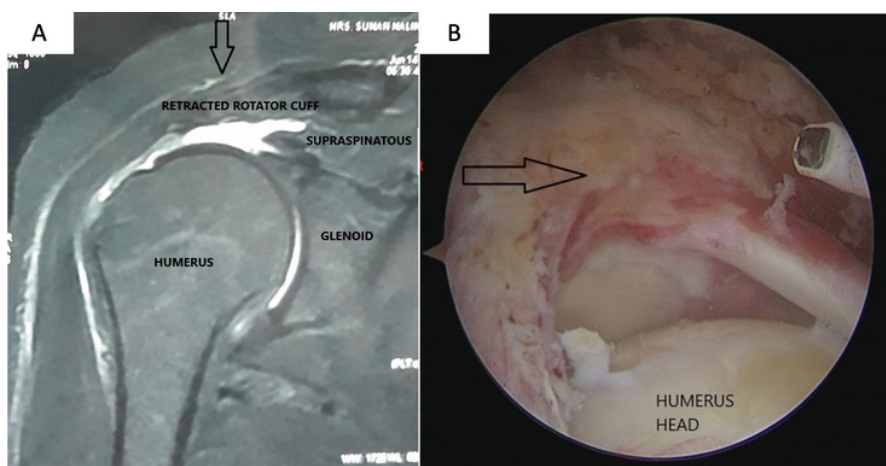


Fig 1: Pre-operative retracted cuff. A: Coronal MRI cuts showing the retracted cuff. B: Arthroscopic images showing retracted cuff (Arrow)

Operative technique:

We use general anaesthesia & interscalene block for these patients. The patient is positioned in a lateral decubitus position. A standard posterior portal is used for initial diagnostic arthroscopy. Assessment of glenohumeral cartilage, long head of biceps and rotator cuff is done. For this technique to be considered, the long head of the biceps should be intact. Then scope is moved to the subacromial space and bursa is debrided and the rotator cuff is again assessed for retraction and mobility (Fig 1). The scope is now moved to the posterolateral portal which serves as a viewing portal for the rest of the procedure. Additional working portals are made laterally and anterolaterally as per requirement. Adequate release of the rotator cuff is done by using a radiofrequency probe. Rotator cuff mobility is again assessed by using a grasper and pulling it towards the footprint. The ability to bring the torn ends of the cuff to the footprint without much tension would be desirable but not always possible.

The next step is to prepare the cuff footprint on the greater tuberosity by using a burr to make it raw for better tendon to bone healing. We use double-loaded 5.5mm suture anchors (Healix Advance BR/ PEEK) for our cuff repairs. An antegrade suture passing device (Expressw III Autocapture + Suture Passer) is used to pass two sutures of each anchor through the cuff to achieve a Mason-Allen configuration (Fig 2). 2-3 anchors are usually required to cover the footprint on the greater tuberosity.

Long head of biceps (LHB) is visualised and sutures from the anterior most anchor are used to fix it by using 2 simple knots. The position of anterior anchor is at the footprint of supraspinatus tendon posterior to the bicipital groove. Biceps tendon is then tenotomised 1cm lateral to its fixation on the greater tuberosity. Side to side repair of biceps tendon with anterior margin of cuff can be considered to cover the leftover gap. We prefer not to do it to avoid causing more damage to the tendon.

At the end, subacromial decompression is done to remove any bony spur or osteophytes from undersurface of acromion. Final construct is evaluated from both subacromial and intraarticular side.

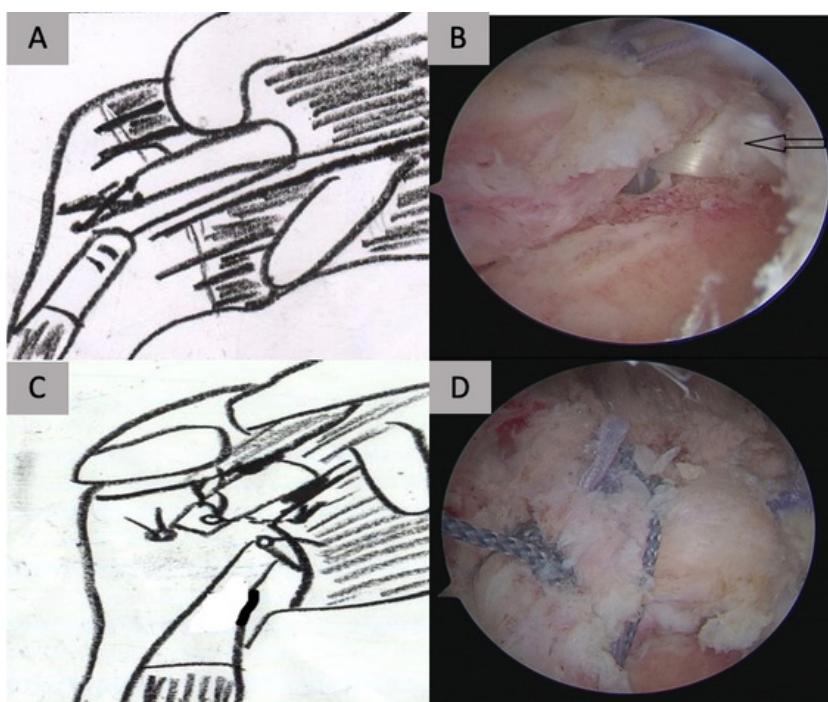


Fig 2: Surgical technique. A & B: Schematic diagram & Arthroscopic image of biceps interposition. C & D: Schematic diagram & Arthroscopic image final construct of the repaired massive rotator cuff tear with tenotomy of the tendon distal to fixation

Post-op Rehabilitation:

Arm is placed in 30° abduction with an abduction pillow for 6 weeks. Active hand, elbow and wrist exercises are allowed from postoperative day one. Only gentle pendular exercises of the shoulder are allowed for 4 weeks. Passive shoulder mobilization is started at 4 weeks followed by active-assisted exercises and withdrawal of abduction pillow at 6 weeks. Progressive capsular stretching and range of motion exercises are allowed to achieve active shoulder movements required for doing day to day routine activities. Strengthening or resistance exercises are started only after 5-6 months.

Cases:

Case 1:

A 54-year-old female presented in outpatient department with pain and an inability to move her right shoulder. She gave a history of injury 6 months back. Now she presented with painful movements and weakness of the right shoulder. The radiograph showed proximal migration of the humeral head on AP view. MRI showed a massive rotator cuff tear with the size of 5 cm involving supraspinatus and infraspinatus with stage 3 retraction according to Patte classification of rotator cuff retraction.

On arthroscopy, the tendon margins were freshened and the cuff was released both on bursal and articular side to increase the excursion for attachment at the footprint. Interval slide was done to improve the cuff excursion. The long head of biceps was used to reinforce the repair construct after the anterior and the posterior limb of the cuff tear was attached to the footprint with the anchor suture. The long head of biceps tendon was tenotomised at 1 cm distal to its attachment over the footprint. The distal end of tendon was left free without tenodesis.

Case 2:

A 40 year old male presented to outpatient department with 7 months old post traumatic massive rotator cuff tear. MRI showed massive rotator cuff tear involving supraspinatus and infraspinatus with stage 3 retraction and tear of subscapularis involving its upper half. Subscapularis tendon repair was done using a 5.5mm Fastfix double-loaded suture anchor followed by supraspinatus and infraspinatus repair as per the above mentioned technique. A long head of biceps was used to reinforce the repair construct in this patient also and tenotomy was done 1 cm distal to its fixation over the footprint.

Discussion:

The superior capsule is a key static stabilizer of the shoulder joint. Burkhart et al described the role of the superior capsule in rotator cuff pathologies [16]. In recent years, superior capsular reconstruction (SCR) with fascia lata autograft has found wide acceptance in younger patients with irreparable rotator cuff tears with promising clinical results [15]. SCR restores the shoulder function by recentering the humeral head and improving glenohumeral kinematics. Recently, many authors have tried to avoid the conventional techniques of biceps tenotomy/ tenodesis while dealing with massive rotator cuff tears. Instead, they have proposed to use the long head of biceps as a locally available autograft in many different ways to either augment the rotator cuff repair or to act as a static superior stabilizer. This might also provide additional vascular supply from the intact proximal end. Sano et al used LHB as a tendon patch

graft for massive irreparable rotator cuff tears. He performed tenodesis and then resected the intraarticular part of LHB and used it as a tendon patch graft between the remnant cuff tendons and the footprint [17]. Hermanowicz et al described a Biceps patch technique for irreparable rotator cuff tears. He placed 2-3 mattress sutures passing through supraspinatus, infraspinatus and LHB simultaneously. These mattress sutures provide more strength for whole complex and avoid untying of knots. In this way, the rotator cuff remnants are transferred onto the LHB tendon. Next, the LHB tendon is tendered to the center of greater tuberosity using the lasso-loop technique [18].

The most recent literature has few cadaveric studies on superior capsular reconstruction with an LHB autograft [19,20,21]. They have shown LHB to be biomechanically equivalent to the TFL autograft in the prevention of superior humeral migration by providing a basic static ligamentous support superiorly. Some other authors have described similar techniques based on principles of superior capsular reconstruction [22,23,24]. But to our knowledge, there is no study or case report showing clinical results of these techniques in patients with massive rotator cuff tears.

In principle, our technique of using LHB as a superior stabilizer of humeral head has technical resemblance to some of these cadaveric studies and technical descriptions. This technique has some advantages over the convention superior capsular reconstruction with fascia Lata graft. No extra incisions are required and there is no donor site morbidity. In addition, the superior stabilization with LHB protects the rotator cuff repaireduring the healing phase by providing static ligamentous support superiorly(Table I).

There are some concerns related to this technique. LHB is considered a major pain generator in the shoulder[25] and its use as a superior stabilizer can potentially lead to a painful shoulder. Moreover, Biceps attachment to the glenoid can also develop degenerative changes later on and can lead to a painful shoulder. Another concern is that this technique cannot be employed in the absence of the biceps tendon or anatomical variations of the biceps or if degenerative changes are present in the tendon [26]. Popeye's sign when present is more of a cosmetic concern rather than any functional disability. Further studies with a large sample size and a longer follow up are needed to establish the long-term benefits of this technique.

Advantages	Disadvantages
<ul style="list-style-type: none"> ● No donor site morbidity ● Increased healing potential due to increased vascularity ● Protects the rotator cuff repair by preventing superior migration ● No anchor on glenoid site ● Technically easier than SCR with TFL graft ● Cost effective 	<ul style="list-style-type: none"> ● Popeye sign in some patients ● Pain from Biceps anchor ● Cannot be done in case of torn/absent LHB or presence of degenerative changes

Table I: Advantages and disadvantages of this technique

Conclusion:

Repair of massive rotator cuff tears with long head of biceps reinforcement prevents the superior migration of the humeral head and provides better clinical outcomes with significant improvement in muscle strength by avoiding undue tension.

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- Conclusion:
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