

Distal Bicep Brachii Rupture Repair: Relevance of Secondary Fixation with Interference Screws in Endobutton Technique

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Received: November 13, 2020; Published: December 31, 2020

Abstract

Background: Anatomic repair is the standard of care of distal bicep brachii tendon rupture. Endobutton fixation have demonstrable superior load to failure compared to other fixation options and in order to achieve anatomic repair, some investigators have added secondary fixation using interference screws. We questioned the relevance of this secondary fixation and we sought to evaluate the difference in the functional outcome of patients who had distal bicep brachii tendon rupture repair with endobutton with interference screws and those without interference screws.

Method: A retrospective study of 48 patient who underwent distal bicep brachii tendon repair looking at biodata of patient, duration between the injury and repair, the type of fixation technique, complications and the quick dash score.

We included all patient who had distal bicep tendon rupture repair with either endobutton alone or endobutton with interference screw and the following were excluded from the study ; patients who had double incision techniques, repair of chronic rupture that require a graft, background ipsilateral upper limb injury or neurologic deficit.

All obtained data were analysed using the Statistical Package for Social Sciences (SPSS) version 22 (IBM SPSS Incorporated, Chicago, Illinois) and obtained values expressed in percentages.

Result: All patients were male with mean age of 43.72 ± 9.12 years and average duration to surgery from the time of injury was 22.47 ± 54.78 days. There was no significant statistical difference between the treatment groups with respect to the quick dash score, complications.

Injury to the lateral antebrachial nerve was the commonest complication and there was no re-rupture in both treatment groups.

Conclusion: Both treatment are effective in the management of distal bicep brachii tendon rupture and addition of an interference screws was not advantageous rather would have increased the cost and duration of the surgery.

Keywords: Endobutton; Interference Screws; Bicep Brachii; Quick Dash Score

Introduction

Distal bicep tendon rupture is a relatively uncommon presentation in the orthopaedic emergency care and accounts for only 3% of the orthopaedic injuries with occurrence mainly in the active male population [1]. The standard of care is an anatomic repair of the ruptured tendon in this population and this has been documented to have an improvement in the flexion and supination strength [1-5].

Treatment of this injury have evolved recently with advent of various fixation techniques and the aims of this evolution is to avoid or minimize complications [6]. The 2 incision technique have the drawbacks of higher risk of posterior interosseous nerve injury, heterotrophic calcification and revision operation despite availing adequate exposure while one incision technique limits exposure and makes the exact anatomic reattachment a challenge and increase the tendency of weakness of the supination if the reattachment is placed more anteriorly [5,7].

Fixation options includes the use of endobutton, interference screws, suture anchors and trans osseous tunnel with no clear clinical evidence supporting one fixation method over the other [8]. Endobutton techniques have been described to have superior load to failure compared to the other options but have the drawback of having a gap formation which might not prevent macro-motion and pistoning effect at the repair site with cyclical loading [9,10].

In order to achieve a more anatomic repair, insertional screws have been added to the endobutton fixation [6,9]. These fixation techniques in isolation requires forcing the tendon end through an intramedullary tract and offers the possibilities of altering the anatomic structure and an inadvertent development of a non-anatomic repair [1]. The combination of these two fixation techniques may be argue to cause more damage to the tendon anatomic structure and lead to poor outcome.

We questioned the relevance of a secondary fixation in the form of an insertional screw fixation to the endobutton fixation given the possibilities of the aforementioned points and we seek to explore if there is any difference in the functional outcome in patient who had endobutton fixation alone or endobutton fixation in addition with an interference screw looking at the long term functional outcome and complications.

Method

We performed a retrospective evaluation of the distal bicep tendon fixation/repair that was carried out in our facility between January 2015 and December 2019. All the operation notes were retrieved from the information data base looking at the biodata of patient, duration between the injury and repair, the type of fixation technique, complications and the quick Dash score.

We included all patient who had distal bicep tendon rupture repair with either endobutton alone or endobutton with interference screw and the following were excluded from the study; patients who had double incision techniques, repair of chronic rupture that require a graft, background ipsilateral upper limb injury or neurologic deficit.

A total of 48 patients met the inclusion criteria and all these patients had one incision technique that was either a transverse incision or a longitudinal incision measuring 4 - 5 cm situated 2 - 3 cm distal to the antecubital fossa crease. The fascia is incised, and the lateral antebrachial cutaneous nerve is identified and protected. Intermuscular dissection between medial border of pronator teres and brachioradialis was done up to the point of identifying the radial tuberosity and the forearm is fully supinated and extended to protect the posterior interosseous nerve while facilitating the exposure of the footprint of the radial tuberosity.

The distal stump of the bicep tendon was identified and retrieved into the wound with the elbow in slight flexion in order to enhance exposure and when necessary tenolysis is done to free the tendon from the fibrosus lacertus. The freed tendon is isolated and a number of 5 polyester suture (Ethibond Excel, Ethibond; Johnson and Johnson, USA) is used to whip stitched the stump and the loose suture is passed through the 4 hole endobutton (4.0 mm x 12 mm endobutton CL ultra, Smith and Nephew, Andover, MA, USA) with one of the suture limb passing through the central middle two holes and the other suture limb passing through the outer two hole in a reverse manner without tangling the sutures. The exposed radial tuberosity is debrided and a guide wire 2.7 mm x 15 mm is passed through the tuberosity in about 30 degree ulnar ward. The tendon is sized and corresponding endoscopic cannulated drill size is chosen to drill the near cortex and a 4.5 mm endobutton is used to drill the far cortex. The wound is copiously irrigated to remove and the properly aligned tendon is ready for insertion into the intramedullary canal. The endobutton is mounted on the endobutton holder and inserted into the intramedullary canal to the posterior cortex and the endobutton is deployed unto the posterior cortex. The suture is tensioned to allow the tendon to come in approximation with the posterior cortex and one of the suture limb is passed through the tendon and thereafter knotted in front of the anterior cortex.

In patients who had insertional screw secondary fixation, an appropriate size insertional screw (PEEK Tenodesis screw, Arthrex Inc, Naples, FL, USA) was passed into the hole on the radial size in order to move the tendon to the original position and enhance supination strength.

Wound is closed in layer, protective dressing applied and patient discharged to a rehabilitative protocol of early passive range of motion from day one then gravity assisted range of motion after 2 week and gradual return to heavy activities at 3 - 5 months. Patients were seen in the clinic and complaints from the patient were documented.

Patient were approached through a letter to complete a patient report outcome questionnaire quick disability of arm, shoulder and hand (DASH) score and return to the department.

All obtained data were analysed using the Statistical Package for Social Sciences (SPSS) version 22 (IBM SPSS Incorporated, Chicago, Illinois) and obtained values expressed in percentages.

Result

All the patients were male with an average age of 43.72 ± 9.12 years and more patients ruptured the right bicep tendon which accounted for 64.6%. Average time to surgery was 22.47 ± 54.78 days with the longest duration to the surgery seen in a patient who had surgery 365 days post injury.

	E (n=17)	E+I (n=31)	P-value
Quick DASH	10.40±20.57	11.48± 13.93	0.57
Age	44.29±9.08	43.41±9.28	0.77
Complication rate			0.13

Table 1: Comparisons of the quick DASH, age and complication rate.
E- endobutton only, E+I- Endobutton with interference screw, Quick DASH=quick disability of the arm, shoulder and hand ,n-number of individual.

Patients who were treated with endobutton fixation alone had slightly better quick DASH score than those treated endobutton with interference screw fixation but there was no significant statistical difference in the functional outcome between treatment groups. Injury to the lateral antebrachial nerve was the commonest complications and all affected patients recovered completely.

Complications	n =48	%
Reduced ROM	1	2.1
Infection	1	2.1
LACN	14	29.2
Scar	1	2.1

Table 2: Frequency of complications in all the patients.
ROM- range of motion, LACN-lateral antebrachial cutaneous nerve, n-total number of patients studied.

There was nil significant statistical difference in the rate of complication and ages of patients in both treatment group.

Discussion

The use of endobutton fixation was first described by Bain., *et al.* and it was found to offer a superior biomechanical properties with respect to ultimate strength and superior fatigue compared to other fixation techniques [10]. The addition of an interference screw was developed to prevent gap formation between the healing tendon and the bone and possibly to enhance a more anatomic repair without necessarily improving the strength of fixation [9,10].

Previous biomechanical study has sought to compare the outcome in endobutton technique and endobutton with the addition of interference screws in a cadaveric study and did not find any advantage in the repair mechanics and a possible increase in cost and duration of surgery [9]. The purpose of this study was to compare the functional outcome in both fixation techniques and we found no statistical difference in the treatment modalities though the DASH score of the endobutton fixation appears slightly better than those treated with interference screws.

The complication rate in this studies was 33.3% and neuropraxia to the lateral antebrachial nerve was the commonest and the only nerve injury reported in our study however in a meta-analysis study on the complications of distal bicep tendon repair, single incision approach was found to have a complication rate of 28.3% and nerve injuries (lateral antebrachial nerve, PIN, median nerve, radial nerve) accounted for 15.7% which was unlike 29.1% of nerve injury seen in our study [2].

Injury to the lateral antebrachial nerve is a known complication of the single incision approach which has been attributed to degree of soft tissue retraction during the preparation of the bicipital tuberosity [11,12]. We recorded increased rate of injury to the lateral antebrachial nerve and it could be suggested that maybe we exerted excessive soft tissue in comparison with other investigators.

One of the main reason for the need for insertional screws is to enhance a more anatomic repair and prevent re-rupture, we did not find any re-rupture in all the patient treated in this study [6]. Our finding suggests that both fixation techniques are effective in the treatment of distal bicep tendon rupture though this could be related to the compliance of patients in the early post-operative period especially patient who prevent excessive forces across the fresh repair.

The use of endobutton and an interference screws have been previously described to be an effective treatment but the question of its relevance in the treatment of patient is not justified as its clear from our study that there is no difference in the both function and complication rate in patient who had sole treatment with the endobutton. The addition of interference screw to an endobutton fixation would have attributed more cost and duration to the surgery. What we cannot deduce from this study is that the impact of the interference screw on the healing tendon considering the possibility of altering the anatomic structure of the tendon while passing additional device through the intramedullary canal in order to enhance fixation.

Limitation of this study include its retrospective nature, lack of a protocol for the follow up and inability to evaluate other functional outcomes that would have been taken into consideration if the study is a prospective study. Despite these limitations, the study reported finding consistent with other studies on the topic, maintained identifiable inclusion criteria and can act as a pilot study for a future prospective study.

Conclusion

Our finding demonstrated that secondary fixation with an insertional screw does not improve the outcome in distal bicep brachii repair but rather would contribute to the cost and the duration of the surgery as such it represent a questionable addition in the treatment of distal bicep rupture repair.

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Volume 12 Issue 1 January 2021

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