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A NOVEL TECHNIQUE TO RECTIFY ANTERO-MEDIAL PROXIMAL RADIUS STUMP INSTABILITY FOLLOWING RADIAL HEAD EXCISION: A CASE REPORT

Ulfin Rethnam[1] and Amit Sinha*[2]

[1]Department of Trauma &Orthopaedics, University Hospital of Wales Cardiff, United Kingdom
[2] Department of Trauma &Orthopaedics, Glan Clwyd hospital, Betsi Cadwaladr University Health Board, Bodelwyddan, United Kingdom.

Corresponding Author:- **Amit Sinha**
E-mail: amitani2000@yahoo.co.in

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ABSTRACT
The management of comminuted fractures of the radial head is difficult and controversial. Radial head excision is a common surgical option. Resection of the radial head has been associated with proximal radial migration, valgus instability and posterolateral elbow instability secondary to unrecognised ligamentous injuries. We report a rare and unusual case of antero-medial instability of the proximal radius after radial head excision. A method of reconstruction using the distal biceps tendonis described.

INTRODUCTION

Radial head fractures are common injuries accounting for 33% of elbow fractures [1]. Primary excision of the radial head or radial head replacement is considered in severely comminuted fractures of the head of the radius (Mason type 3) as the radial head is rarely amenable forreconstruction. Studies have reported good to excellent long term outcome following radial head excision [2-4].

Radial head excision may be associated with valgus elbow instability (medial collateral ligament injury) or proximal radial migration (interosseous membrane injury) in patients with unrecognised ligamentous injury of the elbow [4-6]. A rare posterolateral instability of the elbow following radial head excision has been described [7].

We report the first case of antero-medial instability of the proximal radius stump following radial head excision and describe a surgical stabilisation technique using the distal biceps tendon.

CASE REPORT

A 59 year-old nurse sustained a comminuted fracture of the head of the radius (Mason 3)of her left elbow (non-dominant) following a fall. Clinically and radiologically there were no concerns from her distal radio-ulnar joint or the interosseous membrane of the forearm. Due to the comminution of the fracture, she underwent a primary excision of the radial head. This was followed by a period of physiotherapy to mobilise the elbow aggressively. She presented 10 months following surgery with complaints of discomfort in her elbow. Any rotational movement of the forearm was associated with painful clicking at the elbow. Any attempts at lifting caused a prominence of the proximal stump of the radius on the anterior aspect of the elbow associated with extreme discomfort. This affected her function during daily activities of living.

On clinical examination active flexion of the elbow to 90^0caused an antero-medial subluxation of the proximal radius, which was confirmed on radiographs

(Fig.1). Rotational movements were restricted in both supination and pronation and were accompanied with a painful click at the elbow. There was no distal radio-ulnar joint instability or tenderness with full dorsiflexion and palmar flexion of the wrist. Following assessment a surgical stabilisation of the proximal radial stump was performed and the patient was followed up for 2 years. The surgery was performed 10 months after the initial injury.

Surgical technique

The patient was positioned supine with the elbow supported on a radiolucent arm table. The proximal radius and ulna was exposed using the Boyd's approach. The proximal radial stump was found to be very mobile and lying anterior in relation to the capitellum. The next step was to identify the distal biceps tendon and trace it to its insertion. The distal 4cms of the tendon was mobilised (Fig. 2). The tendon was split vertically and one half of the split tendon was divided proximally leaving it's insertion to the radial tuberosity intact (Fig. 3).

The split tendon together with the surrounding soft tissues was fashioned as a new annular ligament. This was then wrapped around the proximal radius stump as a sling and firmly anchored to the posterolateral aspect of the ulna through drill holes using absorbable sutures (Fig. 4).

At the end of the procedure the proximal radius stump was found to be stable in its new near anatomical position. The limb was immobilised in plaster with the elbow in 90º of flexion and forearm in neutral rotation for a period of six weeks followed by intensive physiotherapy.

At follow up in two years the patient had complete relief of the pre-operative instability and pain. She had full range of flexion and extension of the elbow (Fig. 5). Although her forearm pronation was full range, her supination was only 15^0 from neutral (Fig.6).

This restriction of supination limited certain activities that needed more supination. However, this had not interfered with activities of daily living. Her elbow flexion power was grade 5. Stress lateral radiographs of the elbow using a 2kg weight in her hand did not cause antero-medial instability of the proximal radius stump (Fig 7). An anteroposterior view showed normal alignment of the radius (Fig.8). At final follow up she was very pleased with the outcome of surgery.

Fig 1. Antero-medial subluxation of proximal radial stump (anteroposterior & lateral radiographs)

Fig 2. Illustration showing exposure of distal biceps tendon and planned vertical split 4cm from insertion to radial tuberosity.

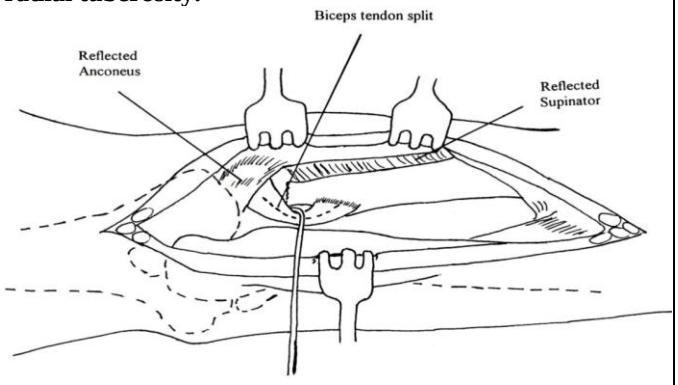

Fig 3. Illustration showing split distal biceps tendon

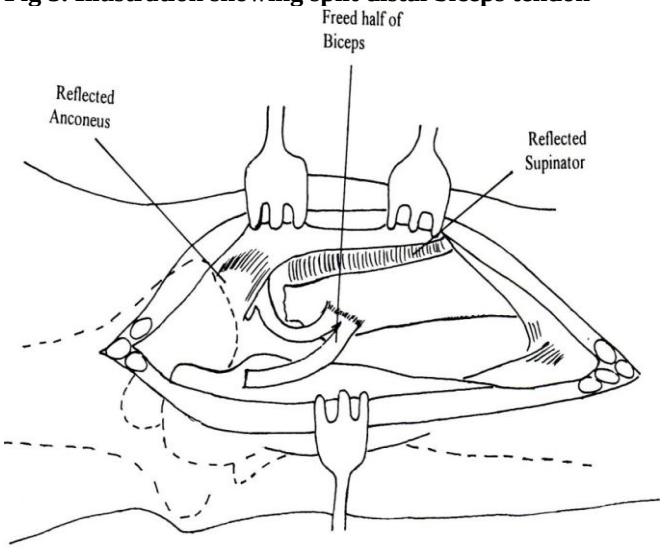

Fig 4. Illustration showing new annular ligament fashioned from distal biceps tendon wrapped around proximal radius stump

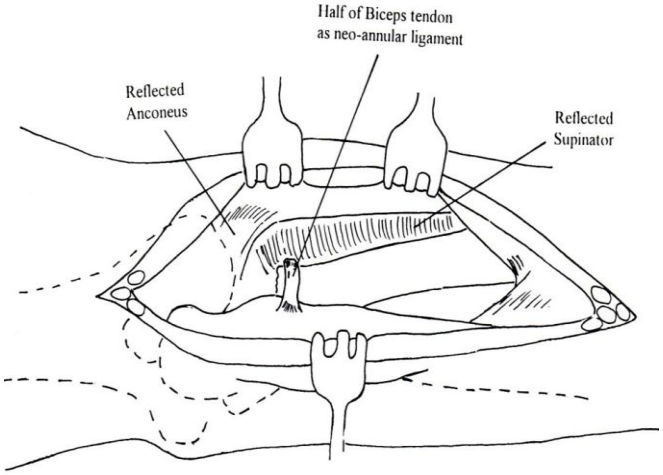

Fig 5. 2 year follow up reveals full flexion and extension of elbow

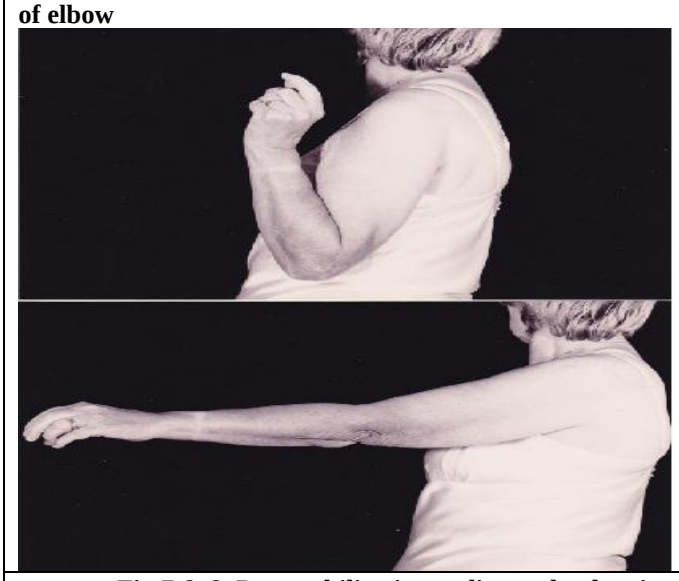

Fig 6. 2 year follow up reveals full pronation and 15^0 supination from neutral

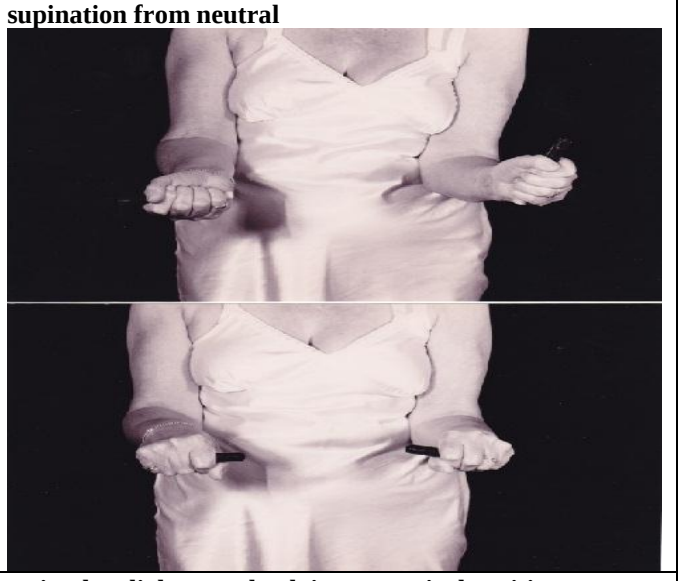

Fig 7 & 8. Post stabilisation radiographs showing proximal radial stump back in anatomical position

DISCUSSION AND CONCLUSION

Radial head fractures constitute between 1.7% - 5.4% of all fractures and 17%-19% of all elbow injuries [8]. Radial head fractures were classified by Mason into 3 types. Type 1 fractures are marginal and undisplaced, type 2 displaced and type 3 comminuted [9]. Management of type 1 and 2 fractures is conservative if the displacement is < 2mm.Type 2 fractures with displacement of > 2mm are treated by open reduction internal fixation [10]. Management of type 3 fractures has been controversial. Radial head excision, prosthesis replacement or reconstructions by internal fixation are surgical options available for these fractures [10].

The radial head functions as a secondary stabiliser to valgus instability especially with a medial collateral ligament deficiency. It provides a significant contribution to force transmission across the elbow joint [11]. Proponents of replacement or reconstruction of radial head raise concerns over stability of the elbow following radial head excision [12, 13].

Radial head excision for radial head fractures has been described in the early 1900s (9). Excellent to good long term outcome following primary radial head resection has been reported. The problems following radial head excision have been proximal migration of radius, development of osteoarthritis, proximal radioulnar synostosis and late valgus instability of the elbow [13]. Radial head excision in the presence of a medial collateral ligament injury can lead to valgus instability. Proximal migration of the radius is seen secondary to injury to the interosseous membrane. Posterolateral instability of the elbow has been described following radial head excision. This has been postulated due to a concurrent injury to the lateral ulnar collateral ligament.

Our case showed an antero-medial subluxation of the proximal radial stump following radial head excision. We believe that loss of check rein conferred by the annular ligament, unopposed action of the biceps and rupture of the proximal interosseous membrane would have allowed for the severe degree of antero-medial subluxation. Studies have shown the importance of the annular ligament in stability of the proximal radius. The greatest radiocapitellar force transmission occurs between 0 and 30º of flexion.

This reduces with increasing flexion at the elbow [10]. In the absence of the radial head and the annular ligament the biceps tendon overacts to lift the proximal radial stump anteriorly with increasing flexion. This would explain the disabling symptoms experienced by the patient during lifting activities.

The aim of surgery was to provide stability of the proximal radial stump with the risk of limiting some rotational movements of the forearm. Stability would abolish pain and provide increased strength which was achieved.

Antero-medial instability of the proximal radial stump is a rare complication following excision of the radial head. We believe that there were three contributing factors in this case: radial head excision, proximal radio-ulnar dissociation due to rupture of the proximal part of the interosseous membrane and altered biomechanics leading to over activity of the biceps brachii. Based on our result we recommend stabilisation of the proximal radial stump for antero-medial instability following radial head excision by reconstructing a new annular ligament with a split distal biceps tendon.

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