

Repair of acute ulnar collateral ligament injury of the thumb metacarpophalangeal joint with an intraosseous suture anchor

Chetan Nerpagar¹, Sumit Raghute¹

¹(Hand And Vascular Surgeon, Department of Orthopaedics, MIMER Medical College & BSTR Hospital, Talegaon-Pune)

¹(Junior Resident, Department of Orthopaedics, MIMER Medical College & BSTR Hospital, Talegaon-Pune)

Abstract:

Background:

Ulnar collateral ligament (UCL) injuries of the metacarpophalangeal (MCP) joint of the thumb are common. Complete rupture can be a debilitating injury, resulting in decreased grip and pinch strength.

Materials and Methods: Twenty consecutive patients with 20 complete tears of the ulnar collateral ligament of the thumb metacarpophalangeal (MP) joint were treated with primary repair using a miniature intraosseous suture anchor and stabilized with JESS fixator.

Results: Fourteen patients were evaluated by clinical examination or by questionnaire at an average of 8 months after repair. Loss of interphalangeal joint motion averaged 15° on the involved side versus the other side, while loss of MP joint motion averaged 10°. There was no significant difference on stress testing measurements between repaired and nonrepaired thumbs. There were no instances of nerve injury, infection, device failure, or reoperation.

Conclusion: Repair of UCL of the MCP joint of the thumb with this technique is an effective, durable, and safe method to allow restoration and maintenance of a stable, pain-free thumb.

Key Words: suture anchor, intraosseous, ulnar collateral ligament, JESS fixator

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I. Introduction

Collateral ligament injuries are noted in all the digits of hand but are commonly seen in the ulnar collateral ligaments (UCL) of the thumb metacarpophalangeal joint (MCP)⁽¹⁾. These constitute the most common injuries occurring at the base of the thumb accounting for 86% of all these injuries⁽²⁾. Campbell has coined the term "Gamekeepers thumb" as the injury is seen in gamekeepers due to chronic valgus strain at the metacarpophalangeal joint⁽³⁾. However, Gerber et al. popularized the term "skier's thumb" for the acute injuries occurring in skiers due to the hyperabduction trauma to the base of the thumb while holding their ski poles during the fall⁽⁴⁾. Other mechanisms of injury include fall on outstretched hand leading to forceful radial and palmar abduction, fall from two wheeler/bicycle wherein the thumb gets stuck behind the handle bar, other sports associated with thumb UCL rupture are soccer, hockey and basket ball⁽⁵⁾⁽⁶⁾⁽⁷⁾. In children these injuries are rare however due to the presence of immature skeleton a hyperabduction trauma leads to Salter Harris Grade 3 avulsion of UCL insertion and rarely a complete tear is visible⁽⁸⁾⁽⁹⁾. Other associated injuries with tears of ulnar collateral ligament include avulsion fractures, dorsal capsular tears and volar plate tears. Patients commonly come to the hospital with pain, swelling and ecchymosis around the MCP joint and tenderness is present on the ulnar aspect of the MCP joint⁽¹⁰⁾⁽¹¹⁾⁽¹²⁾. On clinical examination, a prominent palpable lump (Stener lesion) is palpated which represents the ulnar collateral ligament being proximally and superficially placed by the interposed adductor aponeurosis. It is seen in 64% to 87% of all complete ruptures⁽¹³⁾⁽¹⁴⁾⁽¹⁵⁾. There is pathological rotation of the thumb. Incomplete tears of UCL are managed conservatively with spica cast for 4-6 weeks and thus differentiating these tears from the complete ones is necessary as the latter is almost always managed surgically⁽¹²⁾.



The thumb metacarpophalangeal (MCP) joint ulnar collateral ligament (UCL) is made up of two parts, the proper ulnar collateral ligament (PCL) and the accessory ulnar collateral ligament (ACL). The PCL has its origin proximal to the base of the head of the MCP joint and its insertion on the volar side of the proximal phalanx. The ACL takes its origin just palmar to that of the PCL and runs parallel to the PCL to its insertion present on the proximal phalanx. Together they ensure the flexor and extensor stability of the base of the thumb. However, there are some other components that also take part in maintaining stability in the joint.

These can be divided into static and dynamic components. Next to the PCL and ACL, the shape of the joint, the dorsal capsule and the volar plate constitute the static components. The most important of the dynamic components is the adductor pollicis muscle. This muscle has its insertion onto the proximal phalanx which is partly superficial to and partly deeper than the UCL. This relationship is crucial in understanding how a Stener lesion occurs in these type of injuries. If the MCP joint is in flexion, it is the PCL and the dorsal capsule which are getting taut and therefore the most important stabilizers in that position. The reverse applies to the ACL and the volar plate, which are taut when the MCP joint is in extension. This is important to know when testing for the stability of the joint. When laxity during testing is only seen with the MCP in flexion, an isolated PCL rupture is most likely suggested. If this laxity is seen in flexion and extension, a complete rupture of the PCL and ACL is most likely⁽¹⁷⁾⁽¹⁸⁾. Diagnosis of UCL tears is based upon valgus stress testing on plain radiographs. However, MRI is seen as a gold standard modality with a sensitivity of 96%-100% and specificity of 95-100%⁽²⁹⁾⁽³⁰⁾⁽³¹⁾⁽³²⁾.

The operative management of acute thumb ulnar collateral ligament rupture includes surgical repair with Bunnell pull-out suture which is tied over a padded button on the radial side, placement of 3-0 mersilene grasping suture into the ligament and pass through the drill holes, use of interference screw docking technique⁽¹²⁾⁽²¹⁾.

II. Aims and objectives

Our study aims at prospectively evaluating 14 patients who presented to the tertiary care centre with acute complete rupture of thumb MCP joint UCL Injury treated with primary repair using a miniature intraosseous suture anchor at an average duration of 8 months after the repair.

III. Materials and Methods

20 patients presenting with acute rupture (<4 weeks) of thumb MCP ulnar collateral ligament to the A&E department of MIMER Medical College & BSTR Hospital from March 2018 to March 2019 were included in the study after taking proper written and informed consent. Patients <18 years, bilateral affection, those presenting late (4 weeks after injury) and those who had underlying arthritis of MCP joint were not included in the study.

11 patients presented with a history of fall on outstretched hand while playing some kind of sport whereas 9 of them had history of fall from two wheeler with thumb getting caught in the handle of the vehicle.

Patients had pain, tenderness and ecchymosis at the base of the thumb on the ulnar aspect while some patients also had palpable swelling over the base similar to Stener lesion (particularly in those patients presenting >3 weeks). All patients were subjected to valgus stress testing in 30° MCP flexion and in extension and standard anteroposterior, lateral and oblique views were taken to visualise any avulsion fracture and subluxation/dislocation of the proximal phalanx.

The presence of 30 degree valgus laxity and 15 degree difference as compared to the normal side with absence of a firm end point is considered to be a complete UCL tear and is an indication for operative treatment (16). Out of the 20 patients, 6 had firm end point on valgus stress test and thus were diagnosed with partial UCL tear and managed conservatively with thumb spica and the rest 14 had absence of firm end point and were diagnosed to be complete UCL tears and thus were included in the study and operated using this technique. In those patients whom the valgus stress testing was painful, a local injection of 2ml lignocaine 2% infiltrated into the MCP joint improved the testing as described by Cooper et al (19). In case of an undisplaced fracture, it is assumed that if the initial trauma couldn't displace the fracture the stress during valgus test is not sufficient to displace the fracture (20).

A slightly curved dorsoulnar longitudinal incision based radially is taken over thumb metacarpophalangeal joint. The superficial radial nerve branches are identified and protected as they pass distally on each side of thumb MCP joint. Identification of adductor aponeurosis is done which is then separated from the joint capsule (12). Out of the 14 patients 10 had Stener lesion where the intact adductor aponeurosis was found entrapped between the ruptured UCL and its insertion at the base of proximal phalanx. The proximal and distal part of ruptured UCL were identified. Temporary fixation of MCP joint was done with the help of Kirschner wire and mini JESS (Joshi's External Stabilization System) fixator. 12 patients had avulsion from the base of proximal phalanx while only 2 had avulsion located proximally over the head of 1st metacarpal bone and intraosseous miniature suture anchor of size 1.5mm or 1.3mm is inserted into the proximal phalanx base in 12 cases while they were inserted in the head of 1st metacarpal in 2 cases and the suture threads are tied to the proximal and distal fragment of ruptured UCL respectively.



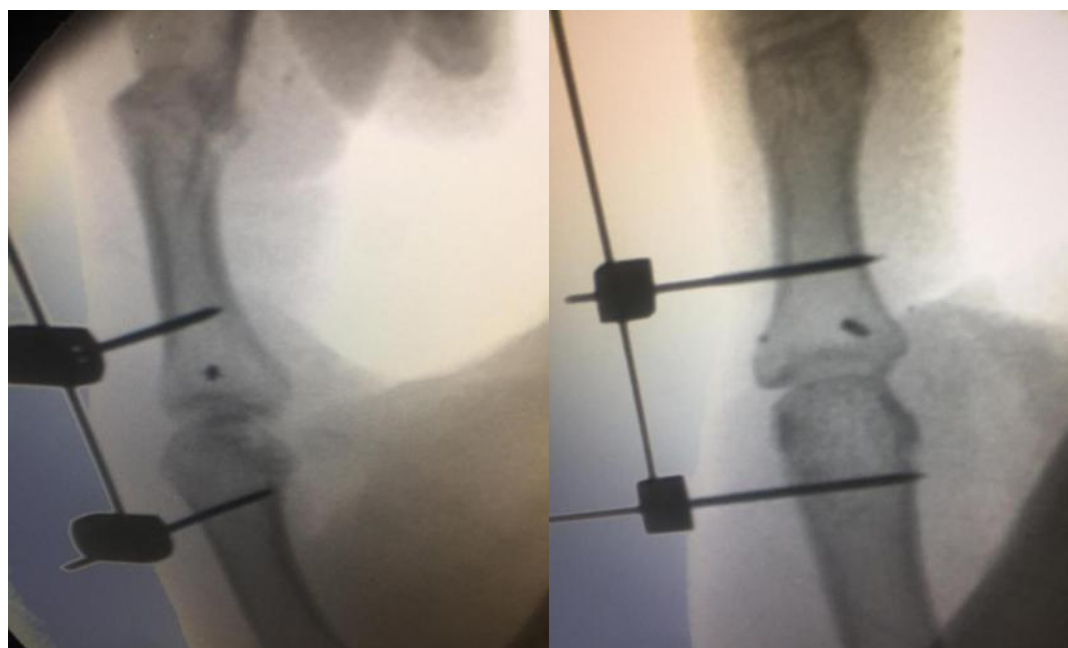


Thumb immobilization was maintained in a JESS fixator for 3-4 weeks sparing the distal phalanx keeping the interphalangeal joint free and active range of motion exercises of the interphalangeal joint is encouraged immediately after the procedure to prevent adhesions of the extensor tendons postoperatively and later on a removable splint was given for 3 more weeks which was removed 5-6 times a day during controlled range of motion and strengthening exercises of the MCP joint. After attainment of full range of motion and adequate strength, no pain on valgus testing the splint was discontinued and sports activities were resumed. In our study, it occurred at around 13.5 weeks on an average (12-15 weeks).

Range of motion, pinch strength and grip strength were tested beginning from 6 weeks post operatively and test for stability with valgus stress test was done beginning at 9 weeks after surgery.

Immediately postoperatively radiographs were taken and at monthly intervals for a period of first 4 months then every 3 monthly interval for the first year after which radiographic imaging was done in patients every 6 months. After return to work or sports, the patient was called for follow up every 1-3 months.

The patients were followed up for a duration of 8 months post surgery



IV. Result

Fourteen patients were evaluated by clinical examination and by questionnaire method at about 8 months after the repair. There was loss of interphalangeal joint motion which averaged about 15° whereas loss of MCP joint motion averaged about 10° on the involved side versus the normal side

The mean time for which the patients remained out of duty was about 11 weeks, whereas the mean return back to unrestrained physical activity was 13.5 weeks. All patients had full active range of motion of the treated thumb at the final follow-up evaluation, which was a minimum of 8 months after surgery. All patients had equal stress testing stability and normal pinch grip when compared to that of the untreated thumb, allowing all patients to return to preinjury activity level, including sports, except one (96% of patients). During final follow-up, radiographs showed no implant related complications and no osteoarthritic changes in the MCP joints. Only two patients had a lumpy swelling at the ulnar aspect of the MCP joint, one of which was tender on palpation.

Results were as follows:

Sr.No.	Age/Sex	Duration of presentation post injury	Side	Loss of MCP joint motion	Loss of IP joint motion	Outcome
1.	21y/M	3 days	Left	12°	16°	Good
2.	37y/M	15 days	Left	11°	15°	Satisfactory
3.	25y/F	20 days	Right	13°	16°	Satisfactory
4.	28y/M	7 days	Left	9°	14°	Acceptable
5.	19y/M	6 days	Right	8°	16°	Satisfactory
6.	45y/M	18 days	Right	10°	15°	Acceptable
7.	36y/M	2 days	Left	11°	14°	Satisfactory
8.	15y/F	11 days	Right	8°	13°	Good
9.	24y/M	14 days	Right	10°	12°	Good
10.	22y/M	7 days	Left	9°	14°	Satisfactory
11.	29y/F	17 days	Right	10°	12°	Good
12.	42y/M	4 days	Right	11°	15°	Acceptable
13.	33y/F	12 days	Left	7°	16°	Acceptable
14.	41y/M	14 days	Right	8°	15°	Good

V. Discussion

Different techniques have been described for repair of UCL injuries of the thumb, including direct repair to the periosteal tissues at the base of the proximal phalanx of the thumb, transosseous sutures tied over a bone tunnel or over a button on the radial aspect of the MCP joint as well as repair using suture anchors. Despite the increased expense of the suture anchors, we have found that suture anchors provide effective fixation as well as reliable results in addition to saving operative time, avoiding exposed suture materials, or adding a radial incision. This has been also concluded by many authors in recent literature(22)(23)(24)(25)(26).

Most authors advocate surgical repair of suspected complete injuries. However, there are two studies that report nonoperative treatment for suspected complete injuries.

Landsman *et al.*⁽²⁷⁾ studied 40 patients with suspected complete ruptures who were treated with thumb immobilization for 8-12 weeks. They were followed up for an average of over 2 years. They reported that only 15% of patients did require surgical stabilization, whereas 85% of these patients had no signs of instability, pain, arthrosis, or stiffness. Pichora *et al.*⁽²⁸⁾ also reported very good results with bracing, but three of the 32 patients at final follow-up reported failure of treatment with persistence of symptoms.

VI. Conclusion

As there is higher degree of unpredictability of conservative treatment and difficulty encountered in delayed operative intervention of UCL tears of thumb, operative treatment with intraosseous microsuture anchors provides a satisfactory, effective and durable technique for achieving a stable MCP joint and pain-free thumb.

However, our sample size was only 14 patients hence we would like to undertake the study using increased sample size to confirm our findings

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