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## ORIGINAL ARTICLE

# A Comparison Study Between Transosseous Pull Out and Anchors in Gamekeeper's Injury

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### Abstract

**Background:** When the thumb's metacarpophalangeal (MCP) joint has a ligamentous lesion, the joint becomes noticeably unstable, which is common.

**Aim:** To assess the functional and clinical outcomes of two different reconstruction methods of the metacarpophalangeal joint (ulnar side) of the thumb (pullout suture and anchor) in unstable injuries.

**Patient and methods:** This was a prospective study of 30 cases admitted to Al-Azhar University Hospitals (El Hussein Hospital and Sayed Galal Hospital) with ligamentous injuries of the MCP joint (ulnar side) from August 2018 until February 2022.

**Results:** Regarding outcome distribution among the studied patients, we found that 19 (63.3 %) were excellent and 8 (26.7 %) were good. While only two patients were fair and one patient was poor.

**Conclusion:** Regarding our findings and literature results, there are excellent results from using anchors or transosseous pull-out, but there is a substantial variance among the groups regarding operative, physiotherapy, and healing time for the anchors group. Treatment for injury of the metacarpophalangeal joint of the thumb with surgical and nonsurgical methods was safe and effective as it allowed early recovery of range of motion and excellent initial results.

**Keywords:** Comparison study, Transosseous pull-out, Anchors and Gamekeeper's injur

## 1. Introduction

When the thumb's metacarpophalangeal (MCP) joint has a ligamentous lesion, the joint becomes noticeably unstable, which is common. The ulnar and radial collateral ligaments serve as the main stabilizers of the metacarpophalangeal joint during opposition and grasp. Damage to the thumb metacarpophalangeal joint's radial collateral ligament occurs less commonly than injuries to the ulnar side.<sup>1</sup>

The most frequent injury is an ulnar collateral ligament sprain (UCL). If the diagnosis is delayed, the MCP joint may have chronic impairment, an ineffective treatment plan, or the ligament complex's increasing attenuation. Ligament repair may be used to treat patients with chronic instability.<sup>2</sup>

The term 'skier's thumb' refers to the UCL injury that occurs most frequently and increasingly frequently in skiers who fall while gripping onto ski poles. Basketball players, participants in grappling sports like wrestling, and practitioners of the martial arts all frequently use it.<sup>3</sup>

The MCP joint is condylar, not a hinge joint. It mostly engages in flexion and extension, but it can also rotate and move in slight adduction and abduction. Static constraints and dynamic stabilizers give joints stability. Kinematics are typically changed in patients who have suffered damage to the MCP joint's supporting components. This causes the joint to sublux continuously, which causes pain and weakens the thumb's ability to pinch and perform other crucial tasks. Surgery for joint repair, reconstruction, or arthrodesis can be used to address the

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joint laxity and instability of the injured MCP joint. These therapies aim to bring back the MCP joint's pain-free stability and normal operation.<sup>3</sup>

Some researchers have implemented the use of early active motion protocols following damage and surgical repair of the UCL of the thumb in an effort to lessen thumb stiffness and capitalize on this advantageous influence of motion on ligament recovery.<sup>4</sup>

The aim of the work was to assess the functional and clinical consequences of two different reconstruction methods of the metacarpophalangeal joint (ulnar side) of the thumb (pullout suture and anchor) in unstable injuries.

## 2. Patients and methods

This was a prospective research of 30 cases admitted to Al-Azhar University Hospitals (El Hussein Hospital and Sayed Galal Hospital) with ligamentous injuries of the MCP joint (ulnar side) from August 2018 to February 2022. Inclusion criteria: age between 18 and 65; injury isolated to the MCP joint (Ulnar side); unstable injuries to the UCL. Exclusion criteria: open wounds, fractures larger than a ligamentous avulsion, osteoarthritis of the MCP joint, and associated metaphyseal and diaphyseal fractures. Stress views are positive when they are greater than 10° varus or valgus.

### 2.1. Management

History: age of patient, sex, and mechanism of injury  
clinical examination: inspection: edema, deformity, effusion, and Palpation: tenderness, valgus, and varus tests of both sides investigations: radiography (anteroposterior, lateral, and oblique) + stress views; computed tomography (CT): thin cuts if there are avulsion fractures; and MRI: in case there is no fragment but doubt of soft tissue injury. Preoperative Preparation: full lab routine preoperative investigation, anchors 2.7 with needle, and proline 2/



Fig. 1. An S-shaped incision is centered on the ulnar side of the thumb metacarpophalangeal joint.



Fig. 2. Identifying and protecting the superficial sensory nerve of the radial nerve subsequently.

0 operative details: with the aid of a tourniquet, the surgical approach was carried out on 20 patients under general anesthesia and 10 patients under regional anesthesia Fig. 1.

Identification and protection of the superficial sensory nerve of the radial nerve followed as dissection continued down to the level of the ligament Figs. 2–5.

### 2.2. Post operative instructions

- (1) Hospital stays: patients are kept for a day-long observation period.
- (2) Splinting: from 5 to 6 weeks
- (3) Dressing: once daily for 1 week.
- (4) Follow-up: Patients were followed after 1.5 months radiologically (X-ray).
- (5) Physiotherapy: isometric possible early starts after 5 weeks for 2 weeks, then active motion without resistance for 1 week, then active against resistance for 2 weeks.

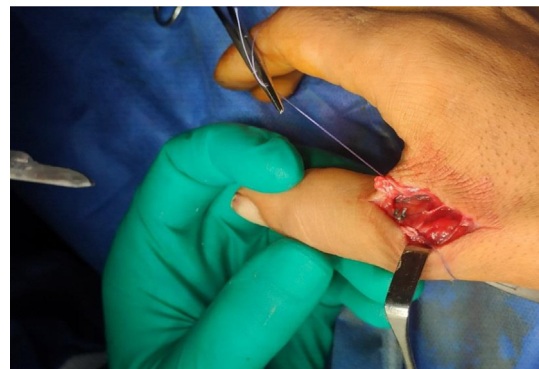


Fig. 3. An identification was then made at the junction of the ulnar collateral ligament and dorsal capsule. 15 patients were repaired by transosseous pull-out: two separate holes at the base of the proximal phalanx. A 2.7 mm PushLock anchor, loaded with 1.3 mm suture tape and 2–0 proline, was placed into this hole, securing the tape and suture in place. Incision at the lateral side and dissection of the superficial sensory nerve to prevent injury and fear of paresthesia the 2–0 proline suture was utilized to conduct an immediate remedy on the ligament back to the volar-ulnar base of the proximal phalanx.

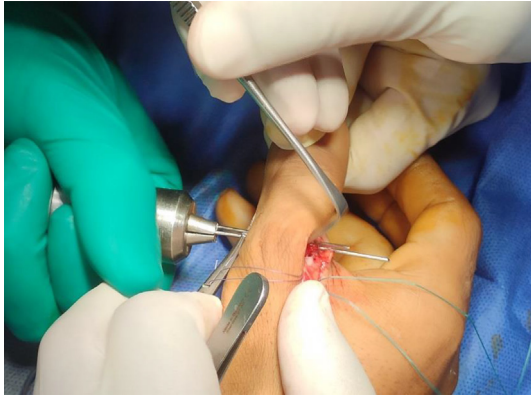


Fig. 4. Transosseous Pull out through 2 separate holes at the base of the proximal phalanx. Fifteen patients were successfully fixed using this surgical technique, and the same size drill bit and anchor were utilized regardless of the patients' stature.

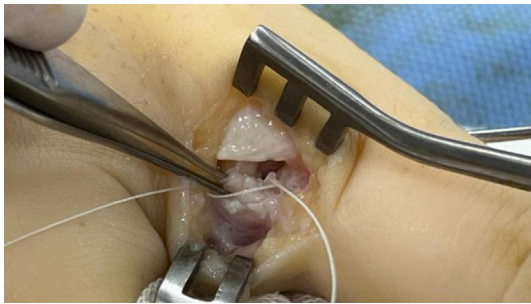


Fig. 5. Two sutures to a bone anchor in the base of the proximal phalanx.

- (1) The wound was irrigated and closed in the standard manner.
- (2) The capsule around the repair site was reinforced with fine, absorbable sutures. A local anesthetic was injected at the incision site for postoperative pain control.



Fig. 6. Follow-up radiography Antero-Posterior and Lateral Views showing thumb fixed by anchors.

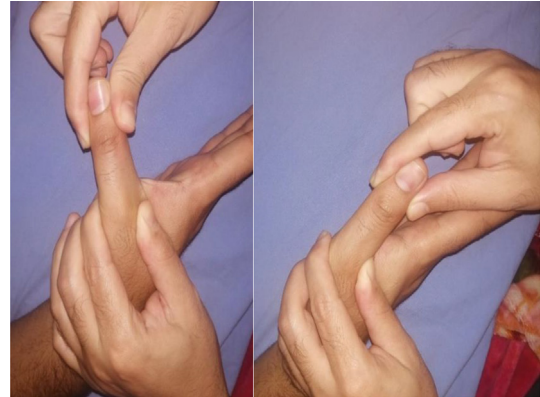


Fig. 7. Photograph indicating ulnar stress and radial stress on a right thumb metacarpophalangeal joint follow-up 6 months after repair.

### 3. Results

The present study included 18 (60 %) patients were males and 12 (40 %) females, with a mean age of 40.33 ± 8.91 years, a range of 28–53 years, and range 28–53 years, and mean BMI of 26.34 ± 2.62 kg/m<sup>2</sup>. Meanwhile, 11 (36.7 %) patients were rural, and 19 (63.3 %) patients were urban. 20 (66.7 %) of patients were due to trauma, and 10 (33.3 %) of patients were due to falls. The mean duration since injury was 5.54 ± 2.36 days; 66.7 % of the patients came through a day. 70 % of the patients had injuries on the dominant side. After 6 months of operation, 3.4 % of patients suffered from loss of thumb strength, 3.4 % suffered from stiffness, 20 % suffered from pain, and 0 % suffered from thumb instability. The mean pain was 3.54 ± 1.16, the mean grip strength was 69.75 ± 10.46, and the mean JOM was 75.4 ± 12.73. While postoperative the Disabilities of the Arm, Shoulder and Hand (DASH) was 24.3 ± 6.52, 53.3 % of the patients were very satisfied, 30 % were moderately satisfied, 4 patients were not satisfied but could work, and only one patient was not satisfied and unable to work. 19 (63.3 %) of patients were excellent, and eight (26.7 %) of patients were good. While only two patients were fair and one patient was poor. There is a substantial variance among the groups regarding healing and physiotherapy time for the Anchors group. 33.3 % of patients had injuries on the ulnar side as 'proximal phalanx avulsion fracture,' 50 % as 'proximal head

Table 1. Age and sex distribution among the studied patients.

Variables	Patients (n = 30)	
	Mean ± SD	Min – Max
Age (y)	40.33 ± 8.91	28–53
Sex	N (%)	
Male	18 (60)	
Female	12 (40)	



avulsion, 10 % as 'head metatarsal avulsion,' and 6.7 % as 'rupture fracture' Table 1.

This table shows that the mean age was  $40.33 \pm 8.91$  years and the range was 28–53 years. Of the studied patients, 18 (60 %) were males, and 12 (40 %) were females Table 2.

This table shows that 70 % of the patients had injuries on the dominant side Table 3.

This table shows that there is a substantial variance among the groups regarding splint time for the Anchors group Table 4.

This table shows that there is no substantial variance among the groups regarding Range Of Movement (ROM) Table 5.

This table shows that there is a good prognosis in patients with anchors between the groups regarding clinical presentation Table 6.

This table shows that there is no substantial variance among the groups regarding DASH Table 7.

This table shows that there is no substantial variance among the groups Table 8.

Table 2. Injury on the dominant side among the studied patients.

Variables	Patients (n = 30) N (%)
Dominant side	20 (66.7 %)
Nondominant side	10 (33.7 %)

Table 3. Splinting time among the studied patients.

	Splint time (week)
Studied Patients (n = 30)	Mean $\pm$ SD
Anchor	$5.12 \pm 0.461$
Transosseous pull out	$6.28 \pm 0.544$
P-value	<0.001

Table 4. Range of motion among the studied patients at the last follow-up.

Studied Patients (n = 30)	Range of motion
	Range
Anchor	
Flexion	30–60°
Extension	0–7°
Transosseous pull out	
Flexion	25–55°
Extension	–1–6°

Table 5. Clinical presentation among the studied patients after 6 months.

Variables	Anchor (n = 15) N (%)	Transosseous pull out (n = 15) N (%)	P-value
Loss of strength	2 (6.7 %)	4 (13.4 %)	0.271
Stiffness	1 (3.7 %)	3 (53.3 %)	0.715
Pain	4 (13.4 %)	6 (20 %)	0.439
Instability	0	1 (3.7 %)	0.464

This table shows that there is a substantial variance among the groups regarding physiotherapy time for the Anchors group.

#### 4. Discussion

Regarding the demographic and clinical information for the 30 patients under study, we discovered that 18 (60 %) of them were men and 12 (40 %) were women with a mean age of  $40.33 \pm 8.91$  years and a range of 28–53 years, as well as a mean BMI of  $26.34 \pm 2.62$  kg/m<sup>2</sup>. While 19 (63.3 %) patients were urban and 11 (36.7 %) patients were rural. The current study, supported by Haug *et al.*<sup>5</sup> aimed to identify hazard factors for treatment failure and report on long-term outcomes after surgical repair of a thumb RCL tear. 43 patients who had experienced RCL injuries were included in the study. Age was 43.5 on average (range 18–80 years). There were 33 men and 10 women in the group. In the study by Patel *et al.*<sup>6</sup> the UCL was repaired at the thumb metacarpophalangeal joint using suture anchors and suture tape augmentation with the aim of assessing the early outcomes. The six patients in the suture tape augmentation group had an average age of 50 (range: 25–61).

There were three men and three women among the patients. The mean age of the intraosseous suture anchor repair group was 45 (range: 33–74). There were 3 men and 3 women among the patients. Another objective of Gibbs and Shin<sup>7</sup> was to assess the efficacy of suture tape augmentation for the thumb UCL. 18 thumbs from 17 talented high-level, collegiate, and professional athletes are involved in this research. The patients' ages ranged from 15 to 31 years old at the time of surgery, with a mean age of 22.9 years. Our findings indicated that 10 (33.3 %) of the patients were injured due to a fall, whereas 20 (66.7 %) of the cases were injured due to trauma. In agreement with our research, Haug *et al.*'s<sup>5</sup> found

Table 6. Postoperative DASH among the studied patients.

Studied Patients (n = 30)	DASH
	Mean $\pm$ SD
Anchor	$25.4 \pm 6.73$
Transosseous pull out	$23.88 \pm 6.34$
P-value	0.530

Table 7. Satisfaction and return to work among the studied patients.

Variables	Anchor (n = 15) N (%)	Transosseous pull out (n = 15) N (%)	P-value
Very satisfied	9 (60 %)	7 (46.7 %)	0.715
Moderately satisfied	4 (26.7 %)	5 (53.3 %)	
No satisfied but working	2 (13.3 %)	2 (13.3 %)	
No satisfied, unable to work	0	1 (6.7 %)	

Table 8. Association between side and healing among the studied patients.

Variables	Anchor (n = 15)	Transosseous pull out (n = 15)	P-value
Healing time	≤5 weeks (n = 9)	>6 weeks (n = 6)	0.831
	8 (88.9 %)	6 (100 %)	
	≤5 weeks (n = 8)	>6 weeks (n = 7)	
	7 (87.5 %)	6 (85.7 %)	

that falls, impacts, or handball injuries were the primary causes of trauma in the cohort of patients they evaluated. The study by Werner et al.<sup>8</sup> found that thumb hyperextension during a game was the most frequent cause of damage. According to Agout et al., the injury was linked to a fall in 35 (52.2 %) patients, a direct impact in 13, a sporting activity in 12, and a car accident in 7, and it was associated with a direct influence in 13.4 % of patients. 22 (32.8 %) of the patients had work-related trauma. Regarding the clinical traits of the patients under study, our findings showed that the mean time after injury was 16.54 8.36 days. On the dominant side, 66.7 % of the cases experienced injuries. However, the study by Wang et al.<sup>1</sup> said that the average period from injury to surgery was 5 months, in contrast to the study by Haug et al.,<sup>5</sup> which stated that the average time was 5.54 2.36 days (range: 6 weeks–18 months). Seven thumbs were hurt on the dominant hand, whereas nine thumbs were hurt on the nondominant hand. While Werner *et al.*<sup>8</sup> study statistics show that skill position players recovered from surgery in an average of 12 days as opposed to 43 days for nonskill position players, Our results showed that six months after the start of the trial, 3.4 % of patients reported a loss of thumb strength, 3.4 % experienced stiffness, 20 % experienced pain, and 0 % experienced thumb instability. According to the research, total destruction of the thumb UCL has been linked to reduced pinch strength, pain, instability, and finally, clinical osteoarthritis.<sup>9</sup>

That's what our exploration uncovered. As far as the postoperative clinical assessment, the mean aggravation among the review members was 3.54 1.16, the normal hold strength was 69.75 10.46, and the typical JOM was 75.4 12.73. The run was 24.3 6.5 after the technique. Haug et al.'s analysis

nonetheless found that 31 % of cases 11 11 covered uneasiness in the impacted MCP-1 joint. Patients missed work for 3–12 weeks following a medical procedure, with a middle shortfall of about a month and a half. The joint was steady and reached a firm stop in all members. Postoperatively, the loads of the hold and key grasp were 8.3–62.0 kg (mean: 32.7 kg) and 1.8–11.1 kg (mean: 8.4 kg), respectively. The middle scramble score was 3.8 and it went from 6.3 to 31.3. The scramble sports module had a typical score of 11.8 while the work module had a typical score of 8.7. The range for the SF36 was 30.0–54.0, with a middle score of 45.0. As indicated by Wang et al.'s study, the postusable Visual Analogue Scale (VAS) during play improved when contrasted with the pre-employable score ( $P$  0.01). The post-employable Scramble score (3.8 8.0) is positive when contrasted with a populace of ordinary university above competitors (1.81 3.57), yet it is less useful when contrasted with an overall public reference bunch (10.10+/14.68). They likewise uncovered that post-employable joint capability, for example, scope of movement and laxity, were practically identical to the unaffected contralateral side, as were grasp and parallel squeeze qualities. Tip-squeeze strength is lower contrasted with the unaffected side; however, it is equivalent to progress in years and a sex-matched reference bunch.

Additionally, the study by Werner et al.,<sup>8</sup> revealed that all players had essentially arrived at their past degree of play (university). Six competitors eventually played in the NFL. For the general gathering, the typical Fast Scramble score was 1 out of 100 (95 % certainty stretch [CI], 0.4e2.3). The regular Speedy Scramble sport score was 1 out of 100 (95 % CI, 0.0e1.9), while the average Fast Scramble work score was 0 out of 100 (95 % CI, 0.0e0.0). None of the competitors revealed needing their wounds carefully fixed. No postoperative issues, like firmness, disease, or tactile issues, were found during the record survey or the latest in-person follow-up. The study by Patel et al.<sup>6</sup> additionally noticed that the normal interphalangeal (IP) joint flexion and thumb MCP joint flexion at last development for patients who had stitch tape expansion were 65 and 73°, separately. The scramble score

was 4.3 by and large, 4.3. Patients who had an intraosseous stitch anchor fix had a typical thumb MCP joint and IP joint flexion of 50 and 60°, separately, at last development. The scramble score was 38 by and large. In neither one of the gatherings were there any issues or additional cycles. With respect to the dispersion of patient fulfillment among the review's members, we found that 53.3 % of them were very fulfilled, 30 % were fairly fulfilled, 4 were disappointed yet ready to work, and only one was disappointed and unfit to work.

In the concentrate by Wang et al.,<sup>1</sup> eleven out of twelve competitors said they might want to have a similar technique once more. The indistinguishable 11 competitors apparently expressed that they were 'cheerful or exceptionally happy with the strategy'. Out of 67 treated patients, 48 (87.3 %) were blissful (29 %) or extremely fulfilled (58 %) with the result, as per the study by Agout et al. In this review, the essential fix brought about great outcomes, with 95 % of patients fulfilled or incredibly fulfilled, while 30 % of patients were not exceptionally fulfilled in the tendon reproduction bunch.

Concerning appropriation among the concentrated patients, we saw that 19 (63.3 %) of patients were superb and 8 (26.7 %) of patients were great. While just two patients were fair and one patient was poor.

This comes in concurrence with the study by Catalano et al.,<sup>10</sup> who selected 26 patients (16 in the maintenance bunch, 10 in the recreation bunch). At a normal developmental age of 59 months, there were no genuinely massive contrasts in MCP or interphalangeal joint movement, grasp or squeeze strength, or MCP joint dependability among the two groups. In light of a recently evolved evaluating framework, there were 96 % great to superb outcomes in their series (12 phenomenal and 3 great outcomes in the maintenance gathering and 8 magnificent and 2 great outcomes in the reproduction bunch). In general, fulfillment was superb for the two gatherings. The objective of rehabilitation will be to enhance the joint's active stability, particularly in the musculature safeguarding the injured ligament. During the healing phase, techniques to increase amplitude must be employed with caution so as not to impair the passive stabilization structures. The most essential finding of this study is that both anchor and transosseous pull-out have outstanding outcomes; however, there is a substantial difference between the groups in terms of operative, physiotherapy, and healing time for the anchor group and the transosseous pull-out group. This research demonstrated that the use of a suture anchor is an additional method for achieving a reliable and stable repair. The procedure was

technically straightforward (30 min operative time) and avoided the potential complication of radial sensory branch neuroma associated with pull-out suture techniques.

The primary limitations of this research are the absence of a control group, the nonrandom nature of the UCL repair, and the surgeon's discretion in performing the procedure. In our small sample size, we have not observed any severe complications; however, a larger series is required to identify any potential rare complications. The follow-up MRI was not performed on all patients due to ethical and financial considerations.

#### 4.1. Conclusion

Regarding our findings and literature results, there are excellent results from using anchors or transosseous pullout, but there is a substantial variance among the groups regarding operative, physiotherapy, and healing time for the anchors group. Treatment for injury of the metacarpophalangeal joint of the thumb with surgical and nonsurgical methods was safe and effective as it allowed early recovery of range of motion and satisfactory early consequences.

#### Disclosure

The authors have no financial interest to declare in relation to the content of this article.

#### Authorship

All authors have a substantial contribution to the article.

#### Conflicts of interest

The authors declared that there were NO conflicts of Interest.

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