

# The Role of Arthroscopy of Acute and Chronic Painful Thumb Metacarpophalangeal Joint

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**Purpose:** There has been few published on arthroscopy of metacarpophalangeal joint (MCPJ) despite increasingly being used worldwide. The purpose of this study was to investigate the effectiveness of arthroscopy for pathologies around MCPJ of the thumb.

**Methods:** Between September 2007 and June 2015, 56 patients (56 thumb) who underwent arthroscopy of the MCPJ were retrospectively studied. Preoperative diagnoses, which were made through physical examination, plain radiograph, stress radiography, ultrasound, and magnetic resonance images (MRI), were compared with arthroscopic findings. Therapeutic arthroscopic surgeries were performed according to the needs of each patient. Functional outcomes were assessed with physical examination as well as disabilities of the arm, shoulder and hand (DASH) score and Michigan Hand outcomes Questionnaire (MHQ) score at an average 7.3 months follow-up.

**Results:** Six patients who suspected with collateral ligament injuries in MRI confirmed different diagnoses under arthroscopy. At final follow-up, the mean range of flexion contracture of the MCPJ was 5°, and the mean range of further flexion was 52.7°. Grip and pinch strength averaged 87.2% and 79.3% of contralateral side. Mean DASH and MHQ score were improved from 48.1 and 44.6, preoperatively to 14.9 and 26.3, postoperatively ( $p < 0.001$ ,  $p = 0.012$ , respectively). All patients were satisfied with their outcomes at final follow-up, except 4 patients who noted joint stiffness or chronic pain around the thumb.

**Conclusion:** Our results revealed that arthroscopy is helpful for both diagnostic and therapeutic purposes of acute and chronic painful MCPJ of the thumb. However, further studies are needed to expand the applications of arthroscopy of MCPJ of the thumb.

**Keywords:** Metacarpophalangeal joint, Collateral ligament injury, Volar plate injury, Arthroscopy

## INTRODUCTION

With advancement of arthroscopic technique, arthroscopy has become feasible in most human joints. The

metacarpophalangeal joint (MCPJ) is an ideal candidate for arthroscopic surgery because the joint can be expanded with simple traction, as well as the intra-articular anatomy which can be easily visualized and identified<sup>1</sup>.

Arthroscopy of finger joints was first described in 1979 by Chen<sup>2</sup>. Since then, however, there has been little published on arthroscopy of MCPJs and it is not yet in widespread worldwide.

Although there are many other diagnostic tools, such as magnetic resonance imaging (MRI) and computed tomography (CT) with advanced development of medical science, these tools do not provide enough information for a correct diagnosis. Otherwise, arthroscopy is a more suitable tool for detecting intra-articular lesions, and it can also be used for the treatment of such lesions<sup>3,4</sup>. Furthermore, arthroscopy is useful in the treatment of Stener lesion, Skier's thumb, gamekeeper's thumb, degenerative arthritis, and rheumatoid arthritis of the MCPJs, or for any other intra-articular lesions.

The purpose of this study was aimed to investigate and reinforce the effectiveness of arthroscopy for MCPJ lesions with a retrospective analysis of patients who had undergone this procedure.

## MATERIALS AND METHODS

Fifty-six patients (56 thumb) who had undergone arthroscopy of the MCPJ of the thumb were retrospectively assessed. All procedures were performed by single surgeon from September 2007 to June 2015. Cases of any of the following were included in our analysis: (1) ulnar collateral ligament rupture of the MCPJ of thumb, which is called "Skier's thumb" or "Gamekeeper's thumb", (2) radial collateral ligament rupture, (3) volar plate injury along with instability, (4) post-traumatic arthritis accompanied by volar plate adhesion, (5) intra-articular fracture, (6) rheumatoid & degenerative arthritis, and (7) synovitis. Arthroscopic surgery has been demonstrated as helpful in all of these pathologic conditions in previous literatures<sup>5-8</sup>. Exclusion criteria were as follows: (1) previous history of infection around the MCPJ of thumb, (2) radiographic evidence of deformities or congenital anomalies, (3) severe arthritis requiring arthrodesis or arthroplasty, (4) instability similar to that of the unaffected hand, which indicated extremely pliable joint.

After applying inclusion and exclusion criteria, medical

records, including plain radiographs, MRI, ultrasonography (US), and arthroscopic images were reviewed.

The study group was comprised of 46 men and 10 women with a mean age of 37.5 years (range, 15-69 years). Among them, 40 patients were related to trauma, including sports activity (14 patients), slips (10 patients), traffic accidents (5 patients), and other minor traumas. The remaining 16 patients who were not related to trauma were ambiguous in terms of onset and cause.

Nineteen patients were diagnosed to have volar plate injury along with instability, 17 ulnar collateral ligament injury, 11 radial collateral ligament injury, 7 proximal phalanx avulsion fracture, and 9 with sesamoid arthritis, respectively, repeatedly. The other 11 patients were diagnosed with synovitis, calcific periartculopathy, ectopic calcification, locked joint, or rheumatoid arthritis. Among them, one patient also had both wrist carpal tunnel syndrome, and another patient also had ipsilateral ulnocarpal impaction syndrome. These patients were treated at once, respectively. Preoperative diagnoses were made according to the results of physical examination, plain radiograph, stress view of simple radiograph, MRI, and US. All patients who were suspected to have sustained collateral ligament or volar plate injuries, were assessed via stress view of simple radiograph before surgery. MRI and US were available for 31 patients and 16 patients, respectively.

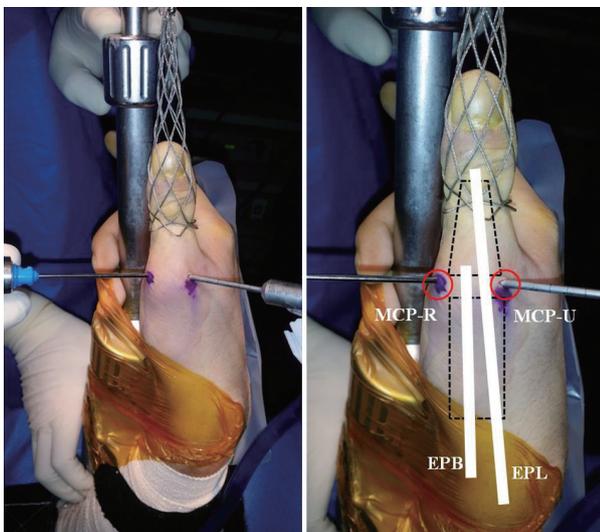
All of patients were performed arthroscopic exam for confirming whether the preoperative diagnosis is correct. After arthroscopic examination, we performed several additional therapeutic arthroscopic surgeries according to each intra-articular pathologies.

Patients were assessed for range of motion of the treated finger, disabilities of the arm, shoulder and hand (DASH) score, Michigan Hand outcomes Questionnaire (MHQ) score, and grip & pinch strength, preoperatively and postoperatively.

### 1. Surgical procedure

Patient was placed in a supine position under brachial plexus block anesthesia with tourniquet control. The patient's arm was held on a hand table with the shoulder

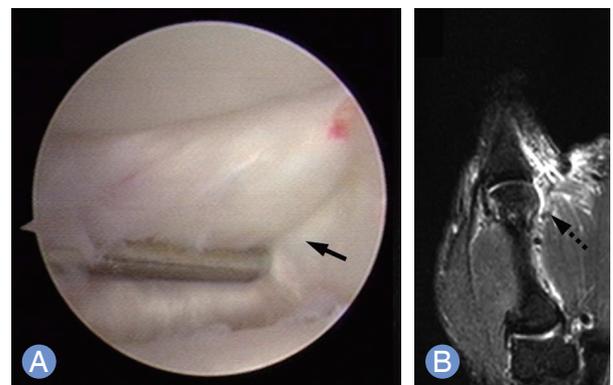
abducted. A finger trap was applied to the affected finger, and traction was applied at about 2.5 to 4.5 kg of tension with a traction tower. Two standardized (MCPJ and ulnar) portals, which were both side of the extensor tendons, were made (Fig. 1). The targeted portal sites were marked with a marking pen. A 23 gauge needle was inserted to identify the joint space, and 2 milileter of normal saline were injected via the needle to bring about distention of the joint. A 0.5 cm transverse incision was made along the skin crease and the subcutaneous tissue was dissected with fine mosquito forceps. A cannula with a tapered end trocar was introduced into the MCP radial portal; care was taken not to scratch the articular surface of the metacarpal head, particularly in a tight joint. The trocar was removed and a 1.9 mm arthroscope (30° lens) was placed in the MCP joint. Continuous saline infusion was accomplished with 3 L of normal saline connected to the cannula, which was allowed to fill the joint. The cannula before the arthroscope was inserted to avoid trapping air inside the joint. Debridement and synovectomy were performed with a 2.0 mm shaver to visualize the joint surfaces and the ligaments. And then, an inspection of the intra-articular appearance of the collateral ligaments and volar plate was performed. The integrity of the intra-articular structures was validated by using a probe. After



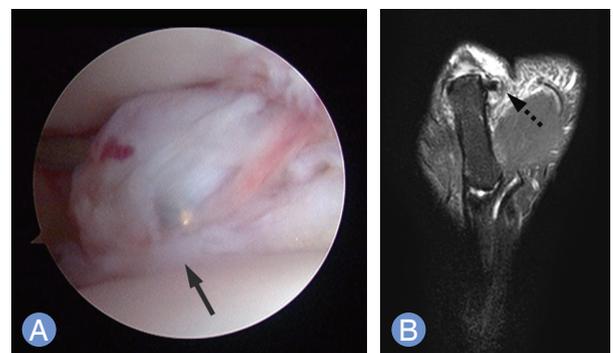
**Fig. 1.** Arthroscopic portals of the metacarpophalangeal joint of the thumb. MCP, metacarpophalangeal joint; EPL, extensor pollicis longus; EPB, extensor pollicis brevis.

arthroscopic examination, we performed several additional procedures according to each intra-articular pathologies. In a setting of instability of the MCPJ, we tried to find whether the injury involved either the proximal or distal attachment of the collateral ligament of the MCPJ (Fig. 2) and whether the thumb had Stener lesion (Fig. 3). This process was important to elevate the correct end of the ligament during open repair. We performed open repair of the torn collateral ligaments which had gross instability during arthroscopic inspection in all cases, except avulsion fracture of the proximal phalanx. Surgical repair of injured ligament was performed in a standard fashion of the open technique using a suture anchor<sup>9</sup>.

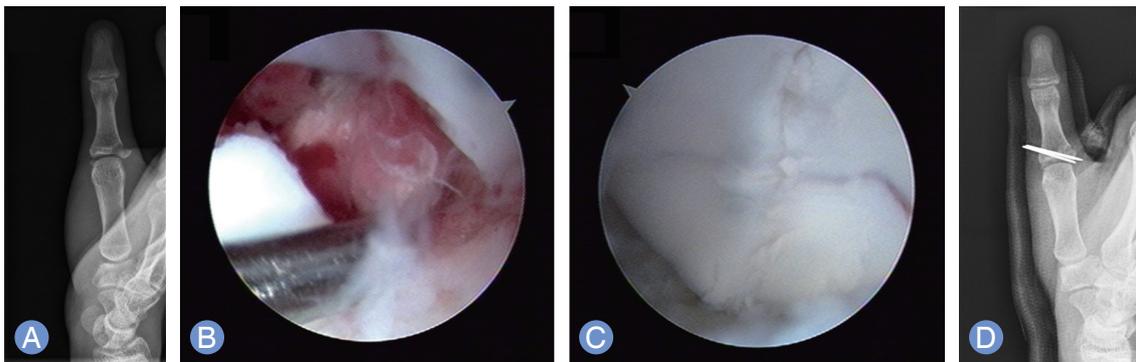
Avulsion fractures of the proximal phalanx were able to be treated with an arthroscopically assisted approach if sizes of the fragment were enough to fix them. After ac-



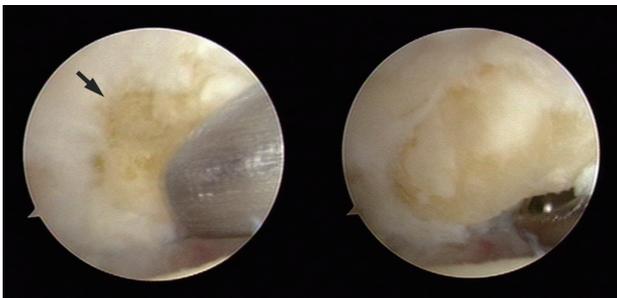
**Fig. 2.** (A) Arthroscopic finding of UCL rupture (arrow). (B) Magnetic resonance images finding of UCL rupture (dotted line arrow). UCL, ulnar collateral ligament.



**Fig. 3.** (A) Arthroscopic finding of Stener lesion (arrow). (B) Magnetic resonance images finding of Stener lesion (dotted line arrow).



**Fig. 4.** (A) Preoperative X-ray of avulsion fracture of first proximal phalanx. (B) Arthroscopic finding of avulsion fracture of first proximal phalanx. (C) After arthroscopic reduction. (D) Postoperative X-ray after arthroscopic reduction and percutaneous pinning.



**Fig. 5.** Arthroscopic finding of sesamoid fracture.

curate reduction of the fragment was obtained by using a probe, provisional K-wires driven into the proximal phalanx under fluoroscopy were advanced across the fracture site into the avulsion fragment. The percutaneous pins were removed at 6 to 8 weeks after surgery (Fig. 4).

Specific attention was paid to any associated injuries including volar plate injury or sesamoid fracture which may affect the prognosis. Associated sesamoid fractures were treated with arthroscopic excision using a small bur (Fig. 5). If volar plate injuries were accompanied, which were confirmed by probing the integrity of the structure, we tried to repair them during surgical repair of the collateral ligament.

Synovectomy was performed with a motorized shaver or an electrothermal device (mini-VAPR, Depuy Mitek Inc., RaynHam, MA, USA) for inflammatory arthropathy and infectious arthritis as well as synovial biopsy. Isolated early degenerative arthritis was treated with arthroscopic debridement after assessment and staging were complet-

ed. Calcific periarthropathy of the MCPJ was also treated arthroscopically.

## RESULTS

In 6 of 56 cases, there were differences between preoperative diagnosis and arthroscopic findings, thus our treatment plan was changed at that time. Among them, two patients, who were suspected of both radial and ulnar collateral ligament injuries of the MCPJ of the thumb were proved to have only one side ligament injury under arthroscopy. These patients underwent ligament repair of only one side confirmed under arthroscopy. Two thumbs, which noted only ulnar collateral ligament injury on MRI, showed to have associated volar plate injury on arthroscopy. The last two cases, which were suspicious of ulnar collateral ligament injury, were proved to be intact on the ligament. These patients did not require open repair. Two of 56 patients with collateral ligament injury noted sesamoid fracture during arthroscopic examination. They were treated with arthroscopic excision. Seven patients with collateral instability underwent arthroscopic reduction and percutaneous pin fixation for avulsion fracture of the proximal phalanx. Two patients with calcification around the MCPJ of the thumb underwent arthroscopic debridement. Synovectomy was performed in two patients with chronic synovitis.

All of the patients were available for final follow-up and the average follow-up period was 7.3 months (range,

0.5–49 months). The mean DASH and MHQ score were improved from 48.1 and 44.6, preoperatively to 14.9 and 26.3, postoperatively ( $p < 0.001$ ,  $p = 0.012$ , respectively). The average grip and pinch strength at final follow-up were 87.2% (range, 65%–100%) and 79.3% (range, 60%–100%) of contralateral side, which were improved from 60.9 % (range, 20%–80%) and 45.1% (range, 0%–60%) of contralateral side, preoperatively. Fifty-four of 56 patients (96.4%) showed 90% or more range of motion compared to contralateral side (mean, 96.5%; range, 5°–52.7°). Two patients suffered stiffness of the MCPJ of the thumb: one was measured at 0° to 30° in flexion and the other 10° to 40°, respectively. Two patients treated with arthroscopic debridement for synovitis or calcific periartropathy complained chronic pain on the MCPJ of the thumb. These patients required per oral medication for pain control. All patients except for those 4 patients with moderate limitation of range of motion or chronic pain were satisfied with their outcomes at the time of the last follow-up. No case developed infection.

## DISCUSSION

The introduction of arthroscopic surgery has allowed minimal postoperative pain, fast rehabilitation, and a generally easy recovery to activities of daily living. A fair number of papers on arthroscopic surgery of the MCPJ have been published with current trend. However, the volume of published literature describing MCPJ arthroscopy is still lacking in comparison to reports discussing other joints, particularly in Korea. Nonetheless, the MCPJ is ideally suited for arthroscopic evaluation and treatment. The neurovascular structures are not in close proximity to the arthroscopic portals. The bony and tendinous landmarks are generally easy to identify. Although the MCPJ is relatively small joint, visualization and navigation of the joint are easily accomplished after sufficient inflation with injecting 2 milliliter of normal saline. Lastly, the learning curve is relatively short<sup>9</sup>.

Choi et al.<sup>1</sup> reviewed 34 cases of MCPJs which had undergone arthroscopic surgery for various reasons and revealed that patients' satisfaction was excellent. Patients'

pain scores improved significantly, and grip and pinch power recovered such that there was no significant difference between the affected side and the contralateral side at the final follow-up. Wall and Goldfarb<sup>10</sup> reviewed 9 cases of MCPJ arthroscopic surgery, and found good clinical outcomes in terms of DASH and VAS scores. Ryu and Fagan<sup>5</sup> performed arthroscopic reduction for Stener<sup>11</sup> lesions in 8 patients who suffered acute ulnar collateral ligament rupture, and all cases had excellent outcomes, though there was a lack of objective data. Badia<sup>8</sup> researched arthroscopic reduction of bony Gamekeeper's thumb, and demonstrated its practicality. 12 patients were treated, and every patient was able to return to his/her previous activities within 3 months; no complications were found. Furthermore, there have been several reports that describe the usefulness of MCPJ arthroscopy for synovectomy in rheumatoid arthritis<sup>7,8</sup>, burring of the chondral defect<sup>12</sup>, removal of loose bodies<sup>7</sup>, resection and interposition arthroplasty<sup>13</sup>, reduction of Bennett fracture<sup>14</sup>, and debridement of synovial hypertrophy and cartilaginous fibrillation<sup>14</sup>. We also showed that arthroscopy was outstandingly effective for the treatment of MCPJs with ulnar or radial collateral ligament injuries, volar plate injuries, intra-articular fractures, arthritis, and synovitis.

Although many studies have revealed excellent outcomes of arthroscopy on MCPJs, there are some complications. Extensor or flexor tendon injuries, neurovascular bundle injuries, articular cartilage damage, persistent chronic pain, limitation of the range of motion, and wound-related problems are the main complications associated with arthroscopy<sup>1</sup>. There is also one report on the need for further surgical intervention, such as fusion or arthroplasty, because of post-traumatic osteochondral defects or osteoarthritis<sup>1</sup>. We found complications after arthroscopic surgery of the MCPJ in 4 of 58 patients (6.9%). 2 of them had limitations in their range of motion, and the other 2 patients experienced chronic pain which required medication.

Initially, we considered conservative treatment for the patients who complained pain on the MCPJ of the thumb and had no gross instability on physical examination.

However, when the pain remained or even aggravated over 3 months, arthroscopic exam was performed. We performed synovectomy alone if no definite ligament tear was found under arthroscopy. We found that six of 58 cases showed a difference between preoperative MRI findings and arthroscopic findings. This indicates that the results of MRI can skew the true incidence of the ligament injuries around the MCPJ of the thumb although MRI is considered a useful adjunct to evaluating patients with traumatic instability of the finger joint. In that sense, arthroscopic findings are thought to be superior for the diagnosis of intra-articular lesions, which also aids to prevent over-treatment or misdiagnosis in those problematic cases.

We also found that the mean DASH and MHQ scores, grip and pinch strength, and range of motion of affected thumb improved significantly at final follow-up. It could suggest that the arthroscopy is valuable for treatment of the MCPJ.

No definite indications or outcomes have been published to date. In Korea, there was one report that discussed the efficacy of arthroscopy of the MCPJs<sup>15</sup>, but it was limited to cases of acute ulnar collateral ligament rupture. We have strength that our study reviewed more cases and expanded the indications for arthroscopy.

There are some limitations to this study, including its retrospective design, relatively small sample size, and lack of comparative study with a control group. That preoperative MRI or US images were unavailable for some patients is another limitation, because the authors could not compare the diagnoses based on scans with those based on arthroscopy in those cases. Finally, we could not make long-term conclusions because some patients did not return to the hospital when their symptoms were gone.

## CONCLUSION

Arthroscopy of the MCPJ of the thumb is a simple, safe, and effective procedure. The authors hope that this study will encourage the use of arthroscopy and that arthroscopy of MCPJ of the thumb becomes a standard procedure in the near future. However, further studies are necessary

to expand the applications of arthroscopy of the MCPJ of the thumb.

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## 급성 또는 만성 통증성 무지 중수지 관절에서 관절경의 역할

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**목적:** 세계적인 추세에도 불구하고 아직 한국에는 중수지 관절경에 대한 문헌이 많지 않다. 이 연구의 목적은 무지 중수지 관절경의 효용성을 밝히는 것이다.

**방법:** 2007년 9월부터 2015년 6월까지 무지 중수지 관절경을 시행받은 56명의 환자를 후향적 분석하였다. 이학적 검사, 단순 및 부하 방사선 검사, 초음파, 자기공명영상 검사를 통해 진단하였고, 각 환자의 필요에 따라 치료하였다. 평균 7.3개월 추시 관찰을 하였고, 기능적 결과는 이학적 검사와 disabilities of the arm, shoulder and hand (DASH), Michigan Hand outcomes Questionnaire (MHQ) score를 통해 평가하였다.

**결과:** Magnetic resonance images에서 측부 인대 손상이 의심되었던 6예의 환자에서 관절경을 통해 다른 소견을 관찰할 수 있었다. 마지막 추시 시 평균 굴곡 구축 5°, 평균 후속 굴곡 52.7°였다. 평균 악력 및 파지력은 건측의 87.2%, 79.3%였다. DASH와 MHQ는 수술 전 평균 48.1, 44.6에서 수술 후 14.9, 26.3로 호전되었다( $p < 0.001$ ,  $p = 0.012$ ). 관절 운동 제한과 만성 통증 등 합병증이 발생한 4예를 제외한 모든 환자가 수술 결과에 만족하였다.

**결론:** 본 연구를 통해 무지 중수지 관절경이 급성 및 만성 무지 중수지 관절통에서 진단적 목적뿐 아니라 치료적으로도 사용될 수 있음을 알 수 있었다. 엄지 손가락 중수지 관절경의 적용 확대를 위해서 더 많은 연구가 필요할 것으로 생각된다.

**색인단어:** 중수지 관절, 측부 인대, 수장판, 관절경

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