

# Clinical Outcome of Metacarpophalangeal Joint Dislocation of the Thumb in Children: Case Series of 10 Patients

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## Abstract

**Objectives** Dislocation of the metacarpophalangeal joint of the thumb in children is an uncommon entity. The aim of this study was to evaluate the clinical outcome of pediatric patients with metacarpophalangeal joint dislocation of the thumb.

**Patients and Methods** Ten pediatric patients with metacarpophalangeal joint dislocation of the thumb were evaluated. Patients were studied prospectively over a period of 3 years. Parameters studied included patient demographics, type of dislocation, management, and any complications.

**Results** Mean age of patients was 6.8 years (range: 3–12 years). Seven patients underwent closed reduction and three patients were managed by open reduction. Of the total 10 patients, excellent results were obtained in 9 patients. One of the patients who reported on the fourth day of trauma and was managed by open reduction had mild joint stiffness with a range of motion of 10 to 40 degrees at final follow-up. None of these patients had infection or instability.

**Conclusion** After thorough clinical and radiological examination, closed reduction can be done in incomplete and simple complete dislocations of metacarpophalangeal joint of the thumb. Repeated closed reduction should be avoided in complex complete injuries. Early mobilization is advised to prevent joint stiffness.

## Keywords

- ▶ metacarpophalangeal joint
- ▶ dislocation
- ▶ volar plate
- ▶ children

## Introduction

Dislocation of the metacarpophalangeal (MCP) joint in children is uncommon and rarely reported.<sup>1</sup> The anatomy of dislocation of the MCP joint of the thumb is well understood. Collateral ligament ruptures, volar plate interposition, and metacarpal head entrapments in thenar muscles are accused for irreducible joint dislocation of MCP joint of the thumb in children.<sup>1–5</sup> The flexor pollicis longus tendon and volar plate create an ulnar moment and the sesamoid bones migrate to the open joint and lock the MCP joint into a dorsal dislocation.<sup>5</sup> MCP joint dislocations are classified into three types:

incomplete, simple complete, and complex complete dislocation.<sup>3,4</sup> Incomplete dislocations are those where the collateral ligaments are intact, and are managed by closed reduction.<sup>3,4</sup> In simple complete dislocation, the volar plate and collateral ligaments rupture but the volar plate is not interposed in the joint, which usually presents as hyperextension deformity and can be managed by closed reduction.<sup>3,4</sup> Complex complete dislocation has volar plate displaced and interposed in the joint, with the metacarpal and proximal phalanx usually lying parallel to each other. Complex complete type may require open reduction via dorsal or volar approach.<sup>1–4</sup> McLaughlin<sup>6</sup> explained that if not reduced through a proper

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**Fig. 1** Clinical picture of metacarpophalangeal joint dislocation of thumb in an 8-year-old patient showing flexion of interphalangeal joint.

technique, namely, hyperextension of the dorsally angulated proximal phalanx with a gentle push over the base of the phalanx and the metacarpal head, simple complete dislocation could be made complex and require operation.

To the best of our knowledge, there have been very few studies regarding the outcome of MCP dislocation of the thumb in children. Most of the studies are case reports. The highest number of patients reported is 37 by Maheshwari et al.<sup>3</sup> The aim of this study was to evaluate the clinical outcome of pediatric patients with MCP joint dislocation of the thumb.

## Patients and Methods

This prospective study was conducted on 10 consecutive pediatric patients with MCP dislocation of the thumb reporting to our institution. The study period was from March 2011 to May 2014. The study was conducted after obtaining approval from hospital ethics committee. All the cases were initially assessed in the emergency ward (►Fig. 1). Radiographs of affected hand in anteroposterior and lateral projection were taken to assess the type of dislocation (►Fig. 2). The affected limb was splinted, and patients were

provided adequate analgesia. Patients were treated after obtaining a proper informed consent. The patients' demographic data, dislocation type, mechanism of injury, type of intervention, range of motion (ROM) of MCP joint of the thumb at final follow-up, other clinical and radiological findings, and complications were recorded.

Incomplete and simple complete dislocations were managed by closed reduction using McLaughlin technique.<sup>4,6</sup> Complex complete and irreducible dislocations were treated by open reduction using either dorsal or volar approach. Thumb Spica immobilization was applied after reduction in all cases. Check X-rays were taken to review adequacy of reduction (►Fig. 3). Immobilization was continued for 4 weeks after reduction followed by active motion.<sup>4,6</sup>

## Results

Patients were followed up for a mean of 3 months (range: 6 weeks to 6 months) and assessment of results was done. The mean age of patients was 6.8 years (range: 3–12 years). In present study, there were nine male and one female patient. Eight dislocations were on the right side and two were on the left side. All the injuries were closed. Three children sustained injury while playing soccer, one during martial arts practice, and six during outdoor activities, usually due to axial blow with forced hyperextension of MCP joint (►Table 1). Of the 10 patients, 9 reported to our hospital within 24 hours of injury, while 1 patient reported on the fourth day of trauma.

All dislocations were dorsal with three being simple complete, two dislocations complex complete, and five dislocations incomplete. Closed reduction was achieved in seven patients. Of these, two patients required general anesthesia and closed reduction was done by McLaughlin technique. Five patients were reduced in emergency department under ring/digital block. Three dislocations required open reduction after one or two unsuccessful attempts at closed reduction. Open reduction was done using volar approach in one patient



**Fig. 2** Radiograph of an 8-year-old boy with dorsal metacarpophalangeal dislocation of the thumb. Closed reduction was done in this patient under general anesthesia.



**Fig. 3** Radiograph of the same patient in ►Fig. 2 after closed reduction showing complete reduction of joint dislocation.

and dorsal approach in two patients. In two of these patients, the fibrocartilaginous volar plate, joint capsule, and flexor pollicis longus tendon were found to be interposed in joint. After successful open reduction, we neither repaired soft tissue, nor used any hardware to maintain the reduction besides the thumb spica splint. Of all the 10 patients studied, 9 had excellent results at final follow-up, regaining full painless ROM at MCP joint of thumb without any instability and achieving good pinch strength. One patient managed by open reduction had mild stiffness with a ROM of 10 to 40 degrees with chronic pain in the joint. None of these patients had infection or instability.

## Discussion

The thumb stands apart functionally and anatomically from the other fingers. Functionally, it has the capability of performing as

a pincer and has wide ROM.<sup>2</sup> There is very scanty literature available regarding the MCP dislocation of thumb. Maheshwari et al<sup>3</sup> reported the largest case series about MCP dislocation of thumb, who described the outcome of 37 patients over a period of 15 years. This explains the rarity of the MCP dislocation of thumb as we received only 10 such patients over a period of 3 years. To the best of our knowledge, our study is the second largest series of pediatric MCP joint dislocations.

Kaplan<sup>7</sup> described the detailed anatomy of the similar lesion in index finger. Dorsal dislocation of the MCP joint of thumb in children is uncommon.<sup>1–3</sup> Volar dislocation is even rarer. In our study, all patients had dorsal dislocation, with none of the patients having volar dislocation. Study done by Maheshwari et al<sup>3</sup> showed 97.3% patients with dorsal dislocation.

Majority of the patients were males (90%), depicting their increased involvement in high athletic sports as compared

**Table 1** Master chart

Patient number	Age (y)	Sex	Side	Mechanism of injury	Management
1	8	Male	Right	Soccer	CR-GA
2	8	Male	Right	Soccer	OR-GA
3	9	Female	Left	Outdooractivities	CR-RB
4	12	Male	Right	Martial arts	CR-RB
5	5	Male	Right	Outdoor activities	CR-RB
6	10	Male	Right	Soccer	CR-RB
7	4.5	Male	Right	Outdoor activities	OR-GA
8	3	Male	Left	Outdoor activities	CR-GA
9	5	Male	Right	Outdoor activities	CR-RB
10	3.5	Male	Right	Outdoor activities	OR-GA

Abbreviations: CR, closed reduction; GA, general anesthesia; OR, open reduction; RB, ring block.

with girls (only 10%). Eighty percent of our patients had involvement of dominant hand and only 20% involvement of nondominant hand, thus further implying the outdoor activities and sports as the common mode of trauma. The findings of our study were consistent with Maheshwari et al.<sup>3</sup>

Clinical and radiographic features can be used to differentiate simple and complex dislocations.<sup>1–3</sup> A widened joint space on radiographic examination is suggestive of interposition of the volar plate, and an interposed sesamoid is pathognomonic for a complex dislocation.<sup>2</sup> Incomplete and simple complete dislocations can be managed by closed reduction and brief periods of immobilization followed by mobilization exercises to prevent the joint stiffness.<sup>3,4</sup> However, more complex and complete dislocations usually require open reduction via either dorsal or volar approach.<sup>1,3,4</sup> Stener<sup>8</sup> explained that dorsal dislocation of the MCP joint may injure not only the volar plate, but also the collateral ligaments and thus stressed the need for open reduction. The predominant structure preventing closed reduction is the volar plate; other obstacles include flexor tendons, the collateral ligaments, the capsule, and sesamoid bones.<sup>1,3,4</sup> Repeated attempts at close reduction should be avoided because this converts simple into more complex complete dislocation.<sup>3</sup> Volar or dorsal approaches are commonly used in open reduction depending on the surgeon's preference and presence of concomitant injuries.<sup>1</sup> Volar approach carries high risk of neurovascular injury and provides limited visualization of interposed volar plate.<sup>1</sup> We prefer dorsal approach for exploring MCP joint over the volar approach. Somani et al<sup>9</sup> also preferred dorsal approach for reducing complex MCP joint dislocation. In one of our patients, volar approach was used because of bad skin condition dorsally.

After successful open reduction, we neither repaired soft tissue, nor used any hardware to maintain the reduction besides the thumb spica splint. Somani et al<sup>9</sup> also did not use any hardware to maintain the reduction of MCP dislocation of the thumb. In a case series published by Maheshwari et al,<sup>3</sup> out of total 37 patients there was instability of the ulnar collateral ligament in only one case with a history of recurrent dislocation and there was no soft tissue interposition intraoperatively; the ulnar collateral ligament was reconstructed and the joint was immobilized with a Kirschner wire.<sup>3</sup>

We obtained excellent results in 90% of patients. One patient had mild stiffness with a ROM of 10 to 40 degrees and chronic pain in joint at final follow-up. This was most likely because of the reason that the patient reported on the fourth day after trauma and was not compliant with physiotherapy.

The limitation of our study was that the sample size studied was small. This may be due to rarity of the injury itself or the short period of the study. Despite the limitations, we think our study will contribute to the already existing scant literature in the management of MCP joint dislocation of the thumb in pediatric population.

## Conclusion

Dislocation of MCP joint of thumb in children is uncommon. After thorough clinical and radiological examination, closed reduction can be done in incomplete and simple complete dislocations. Repeated attempts of closed reduction should be avoided in complex complete lesions. Regardless of the approach, surgeon must know the anatomy well to prevent inadvertent injury to surrounding structures. Collateral ligament stability must be examined after reduction as it is commonly injured in dorsal dislocation. Early mobilization is advised to prevent joint stiffness.

## Note

Informed consent was taken from each patient's parent after explaining details of study in local language. Manuscript has been read and approved by all the authors, and has not been submitted to or is not under consideration for publication in another journal.

## Ethical Committee Clearance

Proper clearance has been taken from ethical committee of Government Medical College, Srinagar, India.

## Conflict of Interest

None.

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