

Dorsal Metacarpophalangeal Dislocations of Thumb in Children-Clues to the Clinical Decision Making and a Dorsal Approach to Open Reduction

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ABSTRACT

Dorsal Metacarpophalangeal joint dislocation of thumb in children is a rare occurrence. All the three different types, namely Simple Complete, Complex Complete and Incomplete dislocations have been described in this article with clinical and radiological clues to differentiate the closely reducible (simple) dislocations from irreducible ones (complex). A simple approach to treatment decision making has been adopted for all cases, starting with attempt of closed reduction which if fails, moving to open reduction.

First case is a simple dorsal dislocation presenting after fall injury with hyperextension deformity of thumb Metacarpophalangeal joint that was reducible by closed maneuver. Second case presented with pain and inability to move thumb Metacarpophalangeal joint, with less marked deformity than the first case. Closed reduction failed and open reduction was done with dorsal approach to the metacarpophalangeal joint after volar plate interposed in the metacarpophalangeal joint was pushed anteriorly. Third case was an incomplete dorsal dislocation that was reduced closed.

Dorsal metacarpophalangeal dislocation of thumb in children is rare injury. Diagnosis needs a high index of suspicion as complex dislocation can be missed due to less obvious deformity. Dorsal approach to open reduction of complex dislocation is a direct and reliable approach.

KEY WORDS

Dislocation, Joint, Metacarpophalangeal, Volar plate

INTRODUCTION

Very few cases of Dorsal Metacarpophalangeal (MCP) dislocations of thumb in children have been reported. They are classically divided into three types by Farabeuf: Incomplete, simple complete and complex complete dislocations.¹ Various structures that block closed reduction in dorsal complex thumb MCP joint are volar plate, sesamoids, flexor tendons and adductor muscles.²⁻⁴ Although simple MCP dislocations have consistently good outcomes, complex dislocations are associated with variable presentations and outcomes.

We have described three cases presenting to us within a period of six months in 2016 at a tertiary care hospital in Nepal. They represent three different types of dorsal MCP dislocations; first case being simple complete, second- a complex complete and third- an incomplete dislocation.

Complex dislocation was reduced via dorsal approach after removal of the volar plate interposition.

CASE SERIES

This gives a complete representation of all three types of dorsal MCP dislocations of thumb in children, salient clinical and radiographic features along with treatment options for each of them.

Case 1

Eleven year old boy with a history of fall on ground while playing three hours prior to presentation in Emergency room, presented with pain and deformity of the left thumb (fig. 1a). Examination showed hyperextension deformity

Table 1. Summary of the recent literatures on dorsal metacarpophalangeal dislocations.

Author	Number of patients	Patient Age	Treatment	Result in follow up	Remarks
Sulko ⁵	7	9 years (mean)	Closed: 6 Open: 1	Good in all	Cases from 1993-2002
Khurshed et al. ⁶	10	6.8 (mean)	Closed: 7 Open: 3	Excellent: 9 Stiffness: 1	
Blucher et al. ⁷	2	4 (mean)	Open: 2	Full ROM Normal power	Delayed Presentations,
Trew CA et al. ⁸	21		All Open		Dorsal approach better than volar



Figure 1a. Hyperextension deformity of the thumb MCP joint at presentation

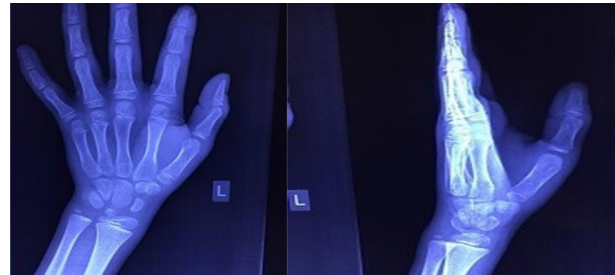


Figure 1d. Post reduction radiograph showing congruently reduced MCP joint



Figure 1b. Radiograph of the hand showing complete dorsal dislocation of the MCP joint of the thumb

and restricted movement of the MCP joint of the thumb. Radiographic examination revealed dorsal dislocation of the thumb MCP joint (fig. 1b). Reduction was attempted in the procedure room, with exaggeration of deformity and pushing the base of the proximal phalanx over the metacarpal head achieving reduction of the joint. Correction of deformity and gain in range of movement of joint clinically suggested reduction (fig. 1c). Reduction was confirmed with radiographic examination of hand (fig. 1d). Thumb was splinted with MCP joint in 20 degrees of flexion for three weeks. Full range of motion of MCP joint was obtained in a month after removal of the splint. There was no residual pain or instability during the follow up visits.



Figure 1c. Post reduction clinical picture showing reduced MCP joint

Case 2

Ten year old boy presented with pain and deformity of the right thumb six hours following fall from a bicycle. Deformity and painful restriction of the thumb movement was seen during examination (fig. 2a). Radiographic examination revealed dorsal dislocation of the thumb MCP joint (fig. 2b). Closed reduction was tried under intravenous anesthesia (fig. 2c). But it was unsuccessful. Dorsal midline incision was made over the MCP joint and joint was opened between the extensor pollicislongus and brevis (fig. 2d). There was interposition of fibrocartilagenous volar plate between the metacarpal head and base of proximal phalanx (fig. 2e). It was pushed volarly with the help of a Penfield dissector (fig. 2f). Reduction of the joint was achieved, which was confirmed under C-arm fluoroscopy (fig. 2g,h). After the closure of the wound, MCP joint was splinted with a plaster of paris slab for 3 weeks in 20 degrees of joint flexion. Movement was encouraged after slab removal. There was no pain or instability of joint on subsequent follow up visits. Patient was followed for a period of one year.



Figure 2a. Clinical photographs of MCP dislocation of thumb. Deformity is less obvious than case 1

Case 3

Twelve year old boy had a fall from a bicycle two hours prior to presentation in Emergency room and sustained injury to his right thumb. Radiograph revealed partial dorsal dislocation of the thumb MCP joint. It was reduced closed and immobilized in a splint for three weeks. He

had complete recovery of function in a month following removal of splint, without residual pain or instability.



Figure 2b. AP and Oblique view of hand showing MCP dislocation of thumb. Note the distraction of joint surfaces of the metacarpal head and proximal phalanx



Figure 2c. Closed reduction was attempted with dorsiflexion of MCP and base of proximal phalanx pushed volarly over the head of metacarpal.



Figure 2d. Dorsal approach to the thumb MCP, between EPL and EPB.



Figure 2e. Entrapped volar plate between metacarpal head and proximal phalanx, preventing closed reduction

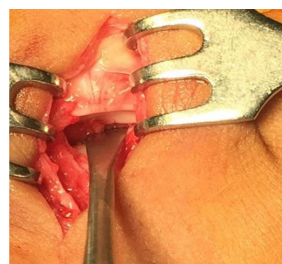


Figure 2f. Volar plate was pushed anteriorly using a Penfield dissector



Figure 2g. Congruously reduced MCP joint.



Figure 2h. Reduction of joint confirmed with fluoroscopy



Figure 3b. Post reduction radiograph confirming the reduction of joint.

DISCUSSION

Dorsal metacarpophalangeal dislocation of thumb in children is uncommon. Hence, there are very few cases being reported in the literature. Complex dislocation requiring open reduction is even rarer. Mean age of the patients reported in different literatures range from four to ten years.⁴⁻⁷ Our cases had a mean age of 11 years. We have one complex dislocation among three cases of dorsal metacarpophalangeal dislocation of thumb in children. The three cases represent the all three types of dorsal MCP dislocations. Hyperextension injury has been described as the mechanism of injury causing dorsal MCP dislocations.⁹ However, our pediatric patients could not remember the exact mechanism of injury, although all of them had history of fall on ground from bicycle or while playing. Diagnosis of dorsal MCP dislocations needs a high index of suspicion especially for the complex ones, as these are associated with less obvious deformity as seen in our case as well.⁶ Although some cases may show dimpling of skin on volar side of the MCP joint due to interposition of volar soft tissues in the joint in complex MCP dislocations, they were not seen in our case.¹⁰ Radiographically, complex dislocation of MCP joint shows parallel metacarpal and proximal phalanx with increased joint space due to the interposed soft tissues.^{11,12} These x-ray features were obvious in our case as well. Simple dislocation showed hyperextension of MCP joint where as complex dislocation showed parallel metacarpal and proximal phalanx. But this injury may be overlooked clinically in initial evaluation of patient and these patients have delayed presentations. Delayed presentation of MCP dislocations is associated with greater need of open reduction.⁷ Since our cases presented within hours (mean duration from injury to presentation 3.66 hours) of injury, our decision of treatment of such cases was straightforward. We followed a simple algorithm of treatment, starting with closed reduction maneuver, failing which we proceeded to open reduction in one case. Inappropriate closed reduction maneuver with longitudinal traction for simple MCP dislocations can complicate into complex type, necessitating open reduction.¹³ Hence, closed reduction maneuver should consist of exaggeration of the deformity with hyperextension of MCP joint, followed by pushing the base of proximal phalanx volarly over metacarpal head (McLaughlin technique).^{2,14} Intravenous anaesthesia is preferred for manipulation of

these dislocations of children. Reduction of joint can be felt. Reduced joint has a nearly normal range of movement. But caution should be taken to prevent hyperextension of joint producing redislocation. Since MCP dislocation produces injury to volar soft tissue stabilizers of the joint, immobilization of MCP in 20 degrees of flexion allows adequate healing of the torn volar capsuloligamentous structures and the volar plate.¹⁴ When closed reduction attempt failed, open reduction is to be carried out via dorsal or volar approach.¹⁵⁻¹⁷ Dorsal approach is favoured over volar approach for the open reduction of complex dorsal MCP dislocations of thumb. Dorsal approach needs less operative time for complex metacarpophalangeal dislocations (45 minutes) than volar approach (70 minutes). Volar approach is also associated with requirement of a secondary dorsal approach for the successful reduction of joint.⁷ Likewise; dorsal approach avoids the risk of injury to digital nerves and vessels.¹⁸ Therefore dorsal approach was chosen for reduction of our complex dislocation. It was a direct approach to the joint. The interposed volar plate was apparent blocking the reduction of the joint. The volar plate was pushed volarly with the help of a penfield dissector. The curvature of this instrument along with blunt tip allowed the volar soft tissue to be easily pushed over the metacarpal head without cartilage injury, producing reduction of the MCP joint. Use of this simple instrument can also be extended to percutaneous reduction of complex MCP joint dislocations.¹⁹ MCP joint was again immobilized in 20 degrees of flexion for three weeks, to let soft tissue healing. Intraoperatively, redislocation of the MCP joint occurred with hyperextension of the joint, which was again reduced similarly. Hence, special precaution is advised to prevent redislocation after initial reduction. Mobilization of joint was started after three weeks of surgery as mentioned in the literature.

Our recommended steps in treatment of Metacarpophalangeal (MCP) dislocations of thumb:

1. Evaluate the thumb clinically with high index of suspicion. Complex dislocation is less obvious.
2. Radiograph should be evaluated to look for signs of complex dislocations; parallel metacarpal and proximal phalanges, increased joint space.
3. Under intravenous anaesthesia in operative room, closed reduction should be tried with Mclaughlin Technique.
4. If closed reduction fails, open reduction with dorsal midline approach to MCP joint should be done.
5. MCP joint should be immobilized in splint with 20 degrees of flexion for three weeks.
6. Range of movement of MCP joint is started after three weeks.

Results of early open reduction of dorsal MCP joint dislocations are consistently good. Even those cases that need surgery because of delayed presentations will have a reasonably good range of movement of the joint and grip strength. Our cases also had normal range of movement of thumb MCP with no signs of instability or residual symptoms, indicating complete recovery of function.

Metacarpophalangeal joint dislocation of thumb in children is a relatively uncommon injury. Closed reduction should be attempted with appropriate technique in all cases. Complex dorsal dislocations can be approached via dorsal or volar approach; however dorsal approach is more favoured. Volar plate is commonly interposed between the articular surfaces preventing closed reduction. After surgical reduction, the joint should be immobilized at 20 to 30 degree of flexion in a splint. Outcome of treatment is consistently good after both surgical and nonsurgical methods.

REFERENCES

1. Farabeuf LHF. De la luxation du ponce en arrière. *Bull Soc Chir.* 1876; 11: 21-62.
2. McLAUGHLIN HL. Complex "locked" dislocation of the metacarpophalangeal joints. *Journal of Trauma and Acute Care Surgery.* 1965 Nov 1;5(6):683-8.
3. Maheshwari R, Sharma H, Duncan RD. Metacarpophalangeal joint dislocation of the thumb in children. *Bone & Joint Journal.* 2007 Feb 1;89(2):227-9.
4. Tavin E, Wray Jr RC. Complex dislocation of the index metacarpophalangeal joint with entrapment of a sesamoid. *Annals of plastic surgery.* 1998 Jan;40(1):59-61.
5. Sułko J. Metacarpophalangeal joint dislocation of the thumb in children. *Chirurgianarządowruchu i ortopediapolska.* 2004;69(5): 331-3.
6. Khursheed O, Haq A, Rashid S, Manzoor N, Shiekh S, Mushtaq M. Clinical Outcome of Metacarpophalangeal Joint Dislocation of the Thumb in Children: Case Series of 10 Patients. *Journal of hand and microsurgery.* 2016 Apr;8(01):013-6.
7. Blucher N, Srinivasan S, Bass A. Delayed Presentation of Metacarpophalangeal Joint Dislocation of the Thumb in Children Requiring Open Reduction: Two Cases Reported and Review of Literature. *Journal of orthopaedic case reports.* 2015 Jul; 5(3):5.
8. Trew CA, Lam WL. Habitual dislocation of the thumb metacarpophalangeal joint in children. *Journal of Hand Surgery (European Volume).* 2017 Sep;42(7):753-4.
9. Ishizuki M, Nakagawa T, Ito S. Hyperextension injuries of the MP joint of the thumb. *The Journal of Hand Surgery: British & European Volume.* 1994 Jun 1;19(3):361-7.
10. Hall RF, Gleason TF, Kasa RF. Simultaneous closed dislocations of the metacarpophalangeal joints of the index, long, and ring fingers: A case report. *Journal Of Hand Surgery.* 1985 Jan 1;10(1):81-5.
11. Ip KC, Wong LY, Yu SJ. Dorsal dislocation of the metacarpophalangeal joint of the thumb: a case report. *Journal of Orthopaedic Surgery.* 2008;16(1):124-6.
12. Takami H, Takahashi S, Ando M. Complete dorsal dislocation of the metacarpophalangeal joint of the thumb. *Archives of orthopaedic and trauma surgery.* 1998 Nov 1;118(1-2):21-4.

13. Farabeuf LH. Précis de manual opératoire, édition définitive. Traitement des luxations métacarpo-phalangiennes par arthrotomie. 1895: 725-35.
14. Kojima T, Nagano T, Kohno T. Causes of locking metacarpophalangeal joint of the thumb and its non-operative treatment. *Hand*. 1979 Oct(3):256-62.
15. Durakbasa O, Guneri B. The volar surgical approach in complex dorsal metacarpophalangeal dislocations. *Injury*. 2009 Jun 1;40(6):657-9.
16. Hughes LA, Freiberg A. Irreducible MP joint dislocation due to entrapment of FPL. *Journal of Hand Surgery*. 1993 Dec;18(6):708-9.
17. Becton JL, Christian Jr JD, Goodwin HN, Jackson 3rd JG. A simplified technique for treating the complex dislocation of the index metacarpophalangeal joint. *JBJS*. 1975 Jul 1;57(5):698-700.
18. Green DP, Terry GC. Complex dislocation of the metacarpophalangeal joint: correlative pathological anatomy. *JBJS*. 1973 Oct 1;55(7):1480-6.
19. Sodha S, Breslow GD, Chang B. Percutaneous technique for reduction of complex metacarpophalangeal dislocations. *Annals of plastic surgery*. 2004 Jun 1;52(6):562-5.