Rotary subluxation of the metacarpophalangeal thumb joint: a case report

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ABSTRACT
Irreducible rotary subluxation of the metacarpophalangeal joint (MCPJ) of the thumb is a rare entity. Open reduction is indicated when signs of irreducibility are seen on the radiographs. We present one such case caused by displacement of the sesamoid bone into the intercondylar notch of the first metacarpal bone. A 35-year-old woman sustained a twisting injury to her right thumb by pronating and hyperextending it while attempting to retrieve things that she had dropped into a basin conduit. True lateral radiographs showed rotary subluxation of the thumb MCPJ, a sesamoid bone overlapping with the metacarpal head, and loss of the subsesamoid joint space and an incongruent MCPJ on full flexion. A high level of clinical suspicion is needed to diagnose this rare entity.

Key words: dislocations; metacarpophalangeal joint; radiography; sesamoid bones; thumb

INTRODUCTION
Irreducible rotary subluxation of the metacarpophalangeal joint (MCPJ) of the thumb is a rare entity. A case of a locked thumb secondary to radial sesamoid entrapment in the MCPJ has been reported.1 Hyperextension injury of the volar plate complex has resulted in mechanical dysfunction and subsesamoid joint arthritis.2 Sesamoid displacement into the MCPJ, a rare cause of clicking thumb without genuine dislocation, has also been described.3 Open reduction is indicated when signs of irreducibility can be seen on the radiographs. Some radiographic signs can be easily missed, but these are imperative for making the diagnosis.

CASE REPORT
In October 2006, a 35-year-old woman presented with a twisting injury to her right thumb by pronating and hyperextending it while attempting to retrieve things that she had dropped into a basin conduit. She was unable to oppose her thumb to her other fingers.
Radiographs showed rotary subluxation of the MCPJ, with respect to the condyles of the proximal phalange. To achieve a true lateral projection of the first metacarpal bone, the thumb was pronated 90° from neutral wrist rotation to overlap the 2 condyles of the metacarpal head. The MCPJ was also incongruent (uneven joint space) on full passive flexion. The sesamoid bone overlapped with the intercondylar notch of the first metacarpal head, resulting in a loss of the subsesamoid joint space (Figs. 1a and 2a).

This condition could not be reduced using closed reduction. The patient underwent open reduction under Bier’s block. A transverse incision was made on the skin crease over the MCPJ, and the neurovascular structures were protected. The radial sesamoid bone was found jammed into the intercondylar notch with an intact radial accessory collateral ligament and intersesamoid volar plate. There was no rupture of the joint capsule, accessory collateral ligament or intersesamoid volar plate. The radial sesamoid bone was trapped snugly in the intercondylar notch with its attached soft tissue, which was also infeasible to reduce using a closed method. An A1 pulley was released over the radial side and the flexor pollicis longus was retracted ulnarily to facilitate open reduction. A pair of forceps was used to retrieve the sesamoid bone and its attached soft tissue from the notch with some difficulty, owing to soft-issue interposition. The MCPJ rotary subluxation was then reduced.

To ensure restoration of normal sesamoid-condyle articulation, free of any residual soft-tissue interposition, the distal part of the capsule was opened for inspection. This procedure may lead to volar contracture after breaching the joint capsule and is not necessary as long as radiographs show reduction

Figure 1 A true lateral projection of the first metacarpal showing (a) rotary subluxation of the metacarpophalangeal joint (MCPJ): (A) overlapping of 2 condyles of the metacarpal head, (B) rotary subluxation of the MCPJ with respect to condyles of the proximal phalange, (C) the MCPJ is incongruent (uneven joint space) on full passive flexion, and (D) a sesamoid bone overlaps with the intercondylar notch of the first metacarpal. (b) The normal MCPJ, sub-sesamoid joint spaces, and full MCPJ flexion are restored after open reduction.

Figure 2 A cross-sectional view of (a) displacement of the radial sesamoid with its soft tissue into the intercondylar notch of the metacarpal, and (b) normal sesamoid-condyle articulation of the first metacarpal.
of the MCPJ rotary subluxation on a true lateral projection of the first metacarpal bone, restoration of normal MCPJ and subsesamoid joint spaces, and full MCPJ flexion (Figs. 1b and 2b).

Postoperatively, the thumb was splinted in 30° flexion for 3 weeks to prevent displacement of the sesamoid bone into the notch, and to relax the volar soft tissue. Free mobilisation was allowed after 3 weeks. The patient regained painless, full movement in abduction, flexion and opposition, and remained so at the 3.5-year follow-up.

DISCUSSION

The thumb MCPJ is vulnerable to abduction and hyperextension injuries, such as skier’s thumb and MCPJ dislocation, respectively. Our case illustrates an easily missed thumb injury that can happen in daily life after a trivial injury.  

The thenar sesamoids are present in 100% of human hands. The radial sesamoid lies within the radial margins of the palmar plate. It is located at the origin of the fibrous tunnel of the flexor pollicis longus. Surrounding it are several ligaments and muscular structures, including the accessory collateral ligaments that insert into the lateral margins of the sesamoids. The adductor pollicis tendon inserts on the ulnar sesamoid, whereas the flexor pollicis brevis tendon inserts on the radial sesamoid. Figure 3 shows the normal relationship between these stabilising sesamoid structures. The thumb sesamoid bone can fit snugly in the intercondylar notch of the metacarpal bone with its soft-tissue attachments.

The patho-mechanism of dislocation of the thumb MCPJ has been described. In 23 cadaver hands with reproduction of locked thumb caused by a forced hyperextension injury, a mild hyperextension deformity of the MCPJ in an irreducible position was made. Closed reduction was successful in 7 hands, but the other 16 required open reduction. In the latter group, the proximal palmar ligament was ruptured transversely, with its distal part riding over the volar prominence of the radial condyle of the metacarpal together with the accessory collateral ligament. This dislocated part of the ligament formed a constricting bundle on the distal joint surface of the condyle that prevented closed reduction. In our patient, the MCPJ was subluxed secondary to sesamoid bone displacement to a locked location, without rupture of the palmar ligament or volar capsule.

In our patient, the most salient radiographic sign was the loss of subsesamoid joint space, suggestive of sesamoid bone displacement. The sesamoid bone was found to overlap with the metacarpal head, known as the overlapping sign. As the MCPJ incongruity may not be identified in radiographs, this sign may be the only clue for making a diagnosis of this subtle MCPJ subluxation. Passive flexion of the MCPJ caused impingement against the proximal phalange, opening up the dorsal joint space, and creating an incongruent MCPJ. These radiographic signs suggested the sesamoid bone and MCPJ dislocation would not be reducible using closed reduction. During surgical exploration, manual traction on the thumb could not return the sesamoid bone to its original position owing to snug displacement of the sesamoid and its soft-tissue envelope into the intercondylar notch.

CONCLUSION

A high level of clinical suspicion is needed to diagnose this rare entity. When a thumb cannot flex at the MCPJ, and the overlapping sign is seen on radiographs, a diagnosis of sesamoid displacement into the intercondylar notch should be made. To
prevent post-traumatic arthritis of the MCPJ, an open reduction is necessary if closed reduction fails to restore normal thumb movement, a congruent MCJP, and the subsesamoid joint space. Further cadaver studies are imperative for understanding the biometric properties of the sesamoid bone and intercondylar notch, the patho-mechanisms, and radiographic features associated with sesamoid bone displacement.

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REFERENCES