Medial capsular repair and first metatarsal mobility in hallux valgus surgery

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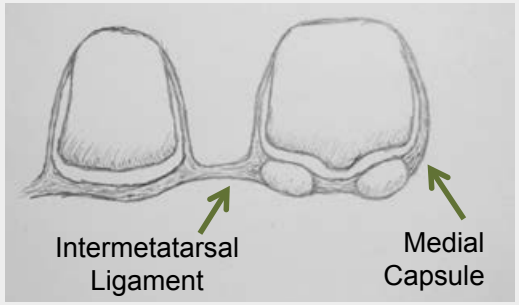
Background

Trends in surgery for hallux valgus include:

- Minimally invasive surgery without medial capsular repair
- Lapidus fusion for 1st metatarsal “hypermobility”

Previous studies show the intermetatarsal ligaments and plantar aponeurosis are the primary stabilisers of the 1st metatarsal [1].

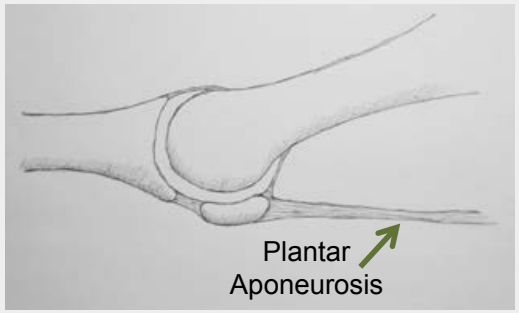
Increased mobility of the 1st metatarsal is associated with transfer metatarsalgia [2].



Aims

To observe the mobility of the 1st metatarsal at stages of hallux valgus correction by distal metatarsal osteotomy, to determine the role of the MTP medial capsule and its repair in this deformity.

Secondary aims were to correlate 1st metatarsal mobility with measures of hallux valgus and foot shape.



Measurement method

Motion of the 1st metatarsal in relation to the 2nd metatarsal was measured after the method described by Greisberg (2010) [2].

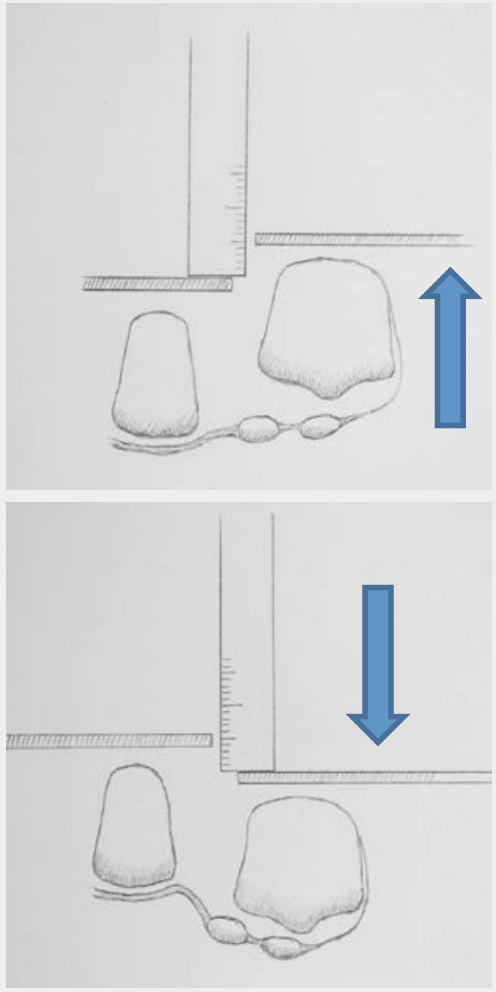
Manual pressure was applied holding the foot in plantigrade position.

Dorsal displacement in mm was measured at the level of the metatarsal heads.

Plantar displacement was measured in a similar manner.

Dorsal and plantar displacements were summed to give total movement.

Measurements taken:
1. Pre-capsulotomy
2. Post-capsulotomy
3. Post-osteotomy fixation
4. Post-capsular repair



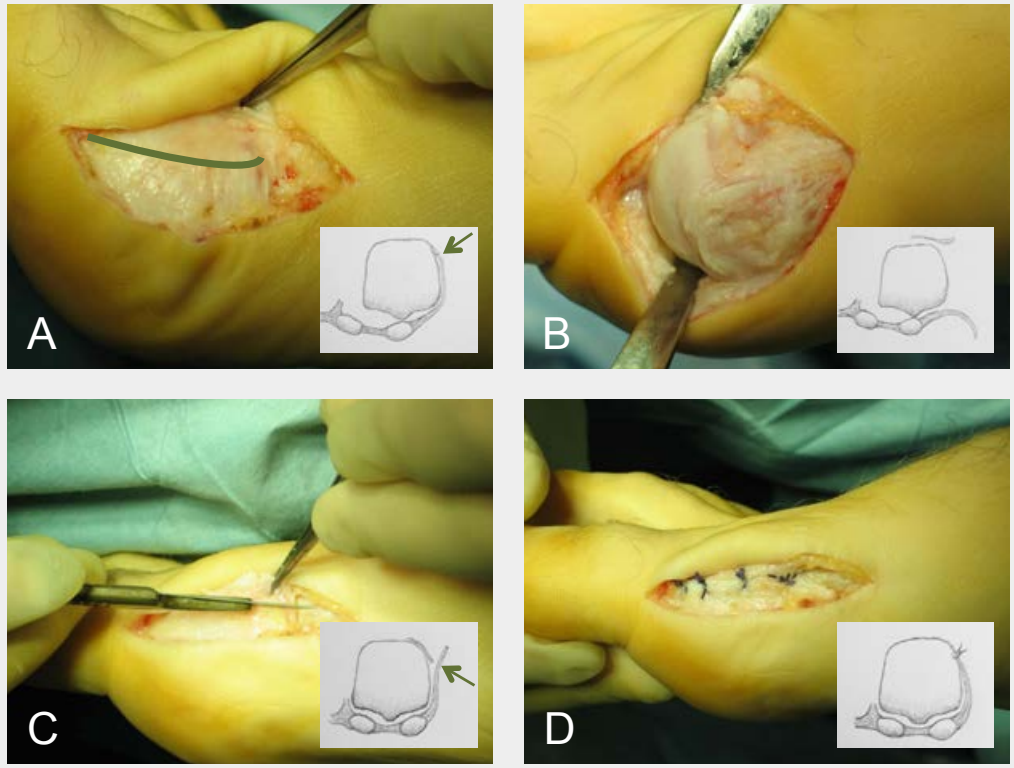
Operation method

A. Longitudinal MTP joint capsulotomy through the isometric point on metatarsal.

B. Metatarsal head and sesamoid articulation exposed.

C. After displacement and fixation of the osteotomy redundant medial capsule is excised.

D. Medial capsule repaired anchoring it to a drill hole in the dorsal distal metatarsal shaft.



Patients

	Mean	Range
Age	51	18 - 70
Gender	2 male	14 female
Hallux valgus angle	29	17 - 40
1st-2nd intermetatarsal angle	13	7 - 18
Talo-1st metatarsal angle (Meary)*	-5	-18 - +6

* - extended / + plantarflexed

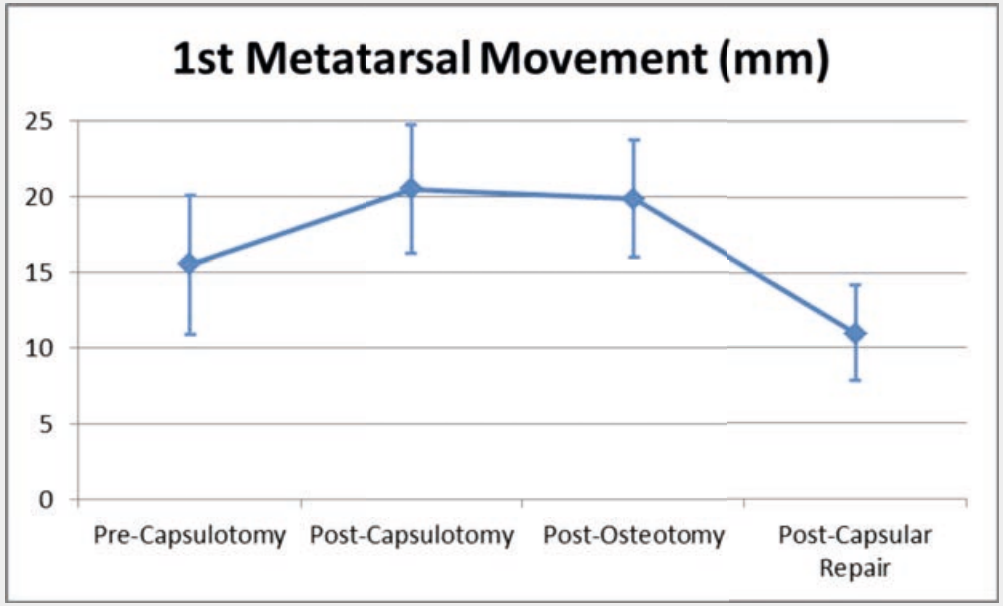
Results 1

Metatarsal mobility increased after medial capsulotomy
($p << 0.0001$)

No further change in metatarsal mobility after osteotomy

Metatarsal mobility reduced after medial capsular repair
($p << 0.0001$)

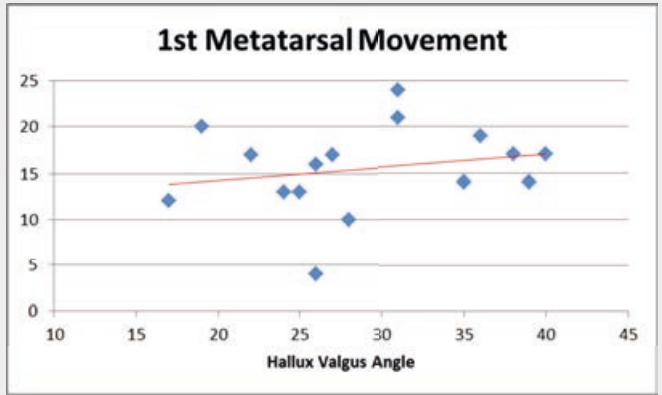
Medial capsular repair after osteotomy reduced metatarsal mobility compared with before capsulotomy
($p << 0.0001$)

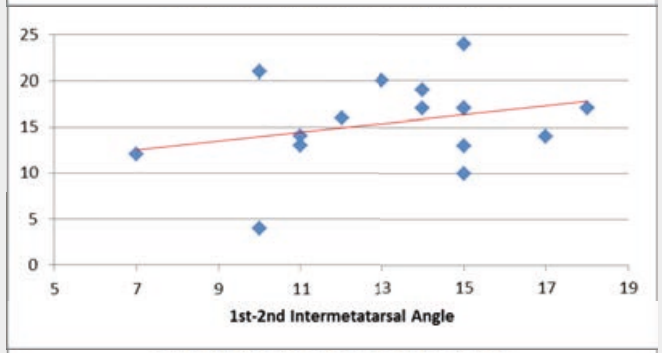


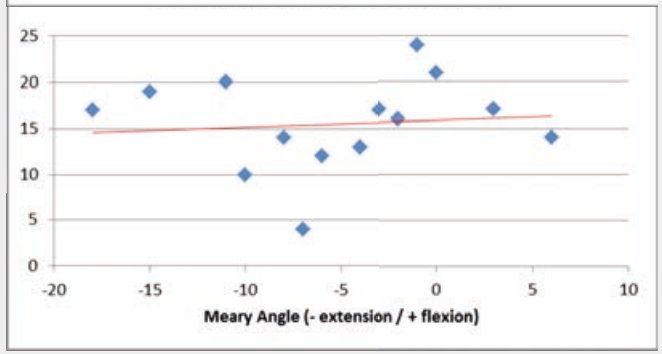
Results 2

No correlation between first metatarsal mobility before capsulotomy and:

- Pre-operative hallux valgus angle
- 1st-2nd intermetatarsal angle
- Talo-1st metatarsal angle





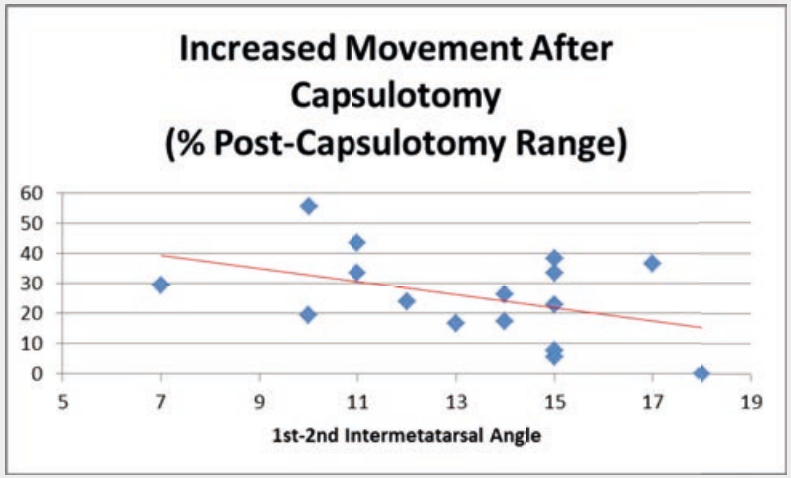


Results 3

There was a negative correlation between the pre-operative 1st-2nd intermetatarsal angle and the increase in 1st metatarsal mobility seen after capsulotomy.

(A large pre-operative intermetatarsal angle is associated with a small increase in metatarsal mobility after capsulotomy. A small pre-operative angle is associated with a greater increase in mobility after capsulotomy)

There was no correlation between the pre-operative hallux valgus angle and the increase in 1st metatarsal mobility seen after capsulotomy.



R = -0.437, p = 0.0451

Conclusions 1

- Medial capsular repair is important in controlling the mobility of the 1st metatarsal after correction of hallux valgus by distal metatarsal osteotomy.
- This is likely to reduce the risk of transfer metatarsalgia [2].
- The increased 1st metatarsal mobility seen after medial capsulotomy confirms that the distal ligamentous attachments of the metatarsophalangeal joint are the primary stabilisers of the metatarsal [1].
- "Hypermobility" of the 1st metatarsal determined clinically cannot be due to instability at the cuneo-1st metatarsal joint because further increase in mobility is seen after MTP medial capsular release in this group of patients.

Conclusions 2

- A wider 1st-2nd intermetatarsal angle is associated with greater incompetence of the medial capsule in its support of the 1st metatarsal.
- Increased 1st metatarsal mobility in this group of patients is not associated with flat foot deformity.

References

1. **Khaw F-M, Mak P, Johnson GR, Briggs PJ** Distal ligamentous restraints of the first metatarsal. An in vitro biomechanical study. *Clin Biomechanics* 2005;20:653-8.

2. **Greisberg J, Prince D, Sperber L** First ray mobility increase in patients with metatarsalgia. *Foot Ankle Int* 2010;31:954-8.