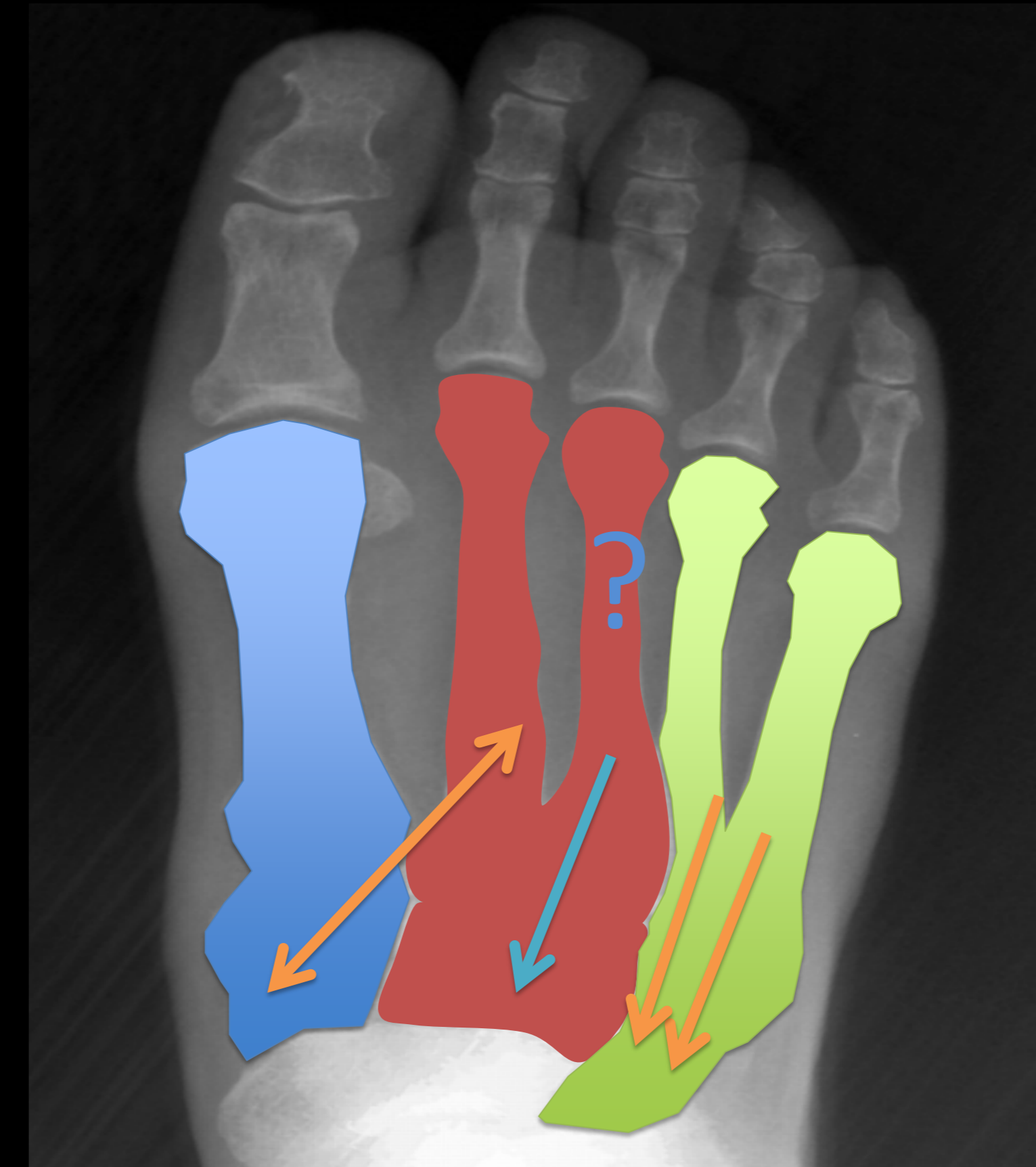


Background

Controversy exists in management of Lisfranc injuries regarding when stabilisation of the third tarsometatarsal joint (TMTJ) is necessary. Whilst the “Home Run Screw” between the medial cuneiform and 2nd metatarsal can be inserted extra-articularly and the relatively mobile lateral column (4th& 5th metatarsal articulation with the cuboid) can be adequately stabilised with temporary percutaneous k-wires, stabilisation of the 3rd ray requires either trans-articular screw fixation (risking chondrolysis and OA) or bridging plate fixation (requiring an additional open approach, longer operation and metalwork removal). We used a cadaveric model to assess the contribution of 3rd TMTJ stabilisation to overall stability and determine when additional stabilisation of the 3rd TMTJ is necessary.

3 Column Theory



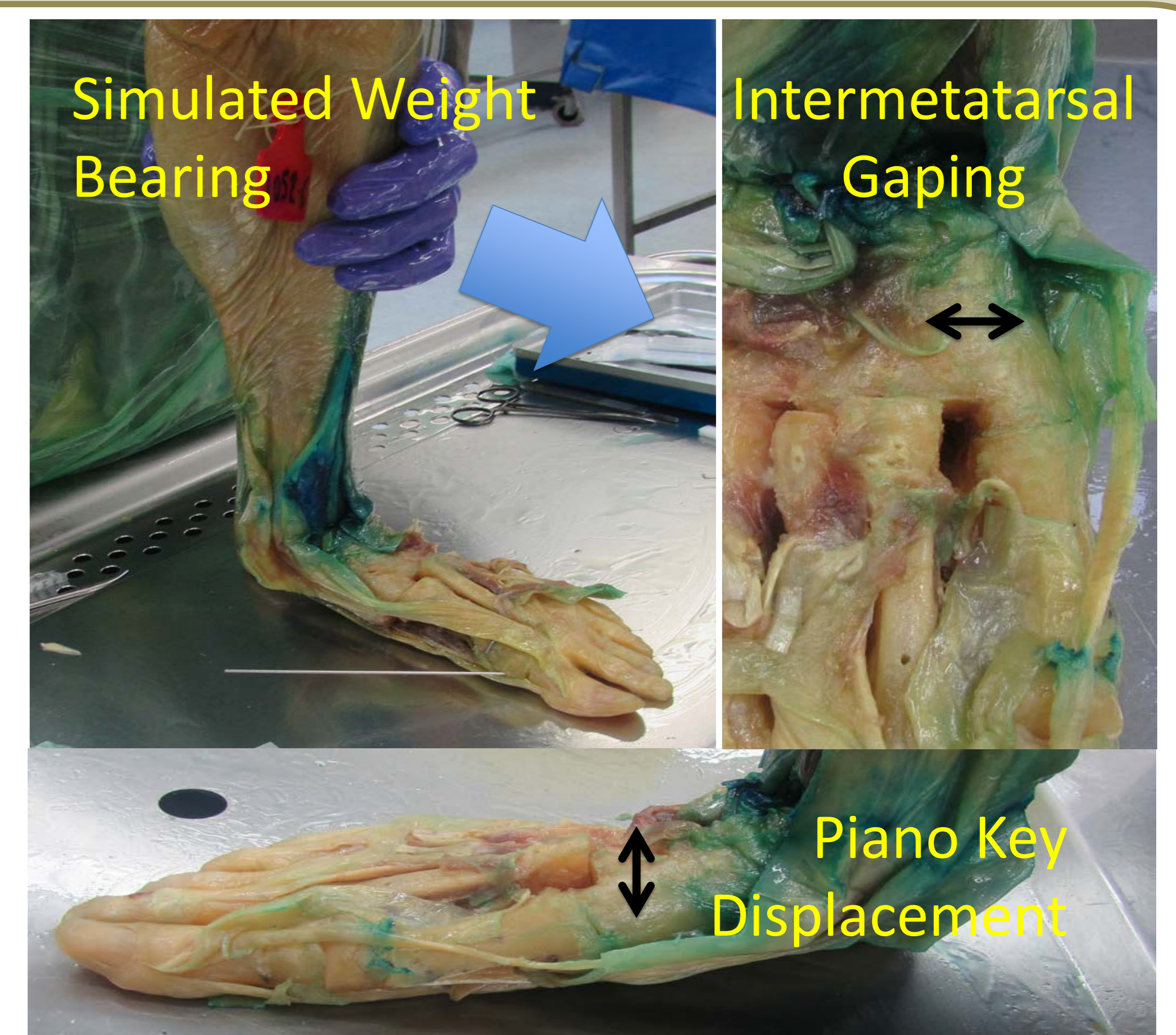
Medial Column
- 1st metatarsal
- Medial cuneiform

Middle Column
- 2nd & 3rd Metatarsals
- Middle & Lateral Cuneiforms

Lateral Column
- 4th & 5th Metatarsals
- Cuboid

Methods

Using 8 Theil embalmed specimens. Simulated weight bearing measurements of 1st - 2nd intermetatarsal gaping & tarsometatarsal joint (TMTJ) dorsal displacement at each ray (1st to 5th) were taken: 1) At baseline; 2) After division of the Lisfranc Ligament (LfL); 3) After additional division of the plantar tarsometatarsal ligaments (TMTLs); 4) After fixation with distal to proximal 2nd metatarsal to medial cuneiform “home run” screw (HRS) combined with 4th/5th metatarsal to cuboid 1.6mm K-wires; 5) After further division of 3rd to 4th intermetatarsal ligaments and; 6) After additional trans-articular K-wire fixation of 3rd TMTJ.



Results

	1st	2nd	3rd	4th	5th	1 st /2 nd IM Gap
Baseline (intact specimens)	0	0.14	0.1	0	0.14	0
Lisfranc Ligament (LfL) divided	0	0.14	0.1	0	0.14	4.5
LfL + Plantar Tarsometatarsal Ligts (TMTLs) divided	4.5	5.1	3.6	2	1.3	4.5
HRS + 4 th /5 th MT to Cuboid K Wires	0	0	0.33	0	0	0
3 rd to 4 th Intermetatarsal ligts (IMLs) divided	0	0	2.5*	0	0	0
HRS + 4 th /5 th to Cuboid + 3 rd TMTJ transarticular K wire	0	0	0	0	0	0

All measurements in mm

Conclusions

1. Division of the Lisfranc ligament alone caused 1st-2nd intermetatarsal gaping, but no piano key displacement.
2. Additional division of plantar tarsometatarsal ligaments caused piano key displacement (but no further increase in 1st/2nd metatarsal gaping).
3. Fixation with 2nd metatarsal to medial cuneiform “Home Run Screw” and 4th/5th metatarsal to cuboid k-wires stabilised both piano key and intermetatarsal gaping.
4. Further division of the 3rd/4th intermetatarsal ligaments caused 3rd TMTJ piano key displacement which was stabilised by trans-articular 3rd TMTJ K-wire fixation.
5. **Routine stabilisation of the 3rd TMTJ is not necessary in cases where the 3rd-4th intermetatarsal ligaments are intact. Intra-operative stability testing of the 3rd TMTJ should be performed after home run screw and 4th & 5th ray k-wire fixation to assess whether is it necessary.** Avoiding intra-articular screw placement in cases where the 3-4th intermetatarsal ligaments are intact has the short-term benefits of reduced surgical exposure and shorter operative/tourniquet times as well as potential longer-term benefits of reduced risk of chondrolysis and OA.

Jacques Lisfranc de St. Martin

(1790 – 1847)



“Surgery is bright when operating, but it is still brighter when there is no blood and mutilation and yet leads to the patients recovery”