Radiologic Outcomes After First Metatarsophalangeal Fusion With and Without Lag Screw Fixation


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First Metatarsophalangeal Arthrodesis

- Common procedure for treatment of symptomatic advanced Hallux rigidus, severe Hallux valgus deformity, Hallux varus and inflammatory arthropathy compromising the great toe.
- Successful fusions provide pain relief, and a stable first ray during gait while sacrificing motion.
- Reported fusion rates range between 90 and 100%.
- Time to fusion is variable, with reported percentages of fusion ranging between 74 and 92% at a minimum of 6 weeks.
Goals and Hypothesis

- To evaluate radiological outcomes after first MTP fusion comparing postoperative coronal and sagittal MTP alignment and union rates between groups with and without lag screw fixation.

- Our hypothesis is that there would be no differences between both groups in regards to postoperative alignment and fusion rates.
Methods

- Retrospective review comparing patient that underwent 1st MTP fusion by a single surgeon (Senior author) between 2011 and 2015.
- All patients underwent conical joint preparation and were subjected to two different types of stabilization:
  a) With a locking plate placed in compression mode.
  b) With a lag screw to provide compression followed by placement of a locking plate.
- Patient age between 18 and 75 years old.
- Failed non-operative treatment.
- Advanced stage hallux rigidus with positive grinding test.
- Severe or recurrent hallux valgus deformity with 1st MTP joint degenerative changes.
- Autoimmune conditions and severe 1st MTP deformity.
- Active infection in ipsilateral foot.
- Prior failed attempt for 1st MTP fusion.
- Non compliance with postoperative Follow up and recommendations.
- Follow up of less than 6 weeks.
1st Metatarso Phalangeal Fusion

- Dorsal approach to the 1st MTP joint
- Reamed conical preparation of articular surfaces followed by subchondral bone perforations with a Kirchner wire.
- Stabilization with compression plate or lag screw and neutralization plate.

Postoperative management

- Heel weight bearing as tolerated in postop shoe.
- Follow up at 2 weeks for suture removal.
- Transition to Supportive shoe with carbon fiber plate at 6 weeks.
Evaluation of Radiologic outcome

Alignment Parameters:
- Preoperative Hallux valgus angle (HVA)
- Postoperative Hallux Valgus angle (HVA)
- Postoperative Dorsiflexion angle (DFA)

Rate of union:
- Radiographic evaluation at 2 - 6 weeks, 3 - 6 months, yearly
- CT ordered to confirm suspected non unions
Results

Patient population
- 98 patients were subjected to 1st MTP arthrodesis between 2011 and 2015.
- 84 patients met inclusion criteria and were analyzed in our study.
- Average age was 59 years (38-84)
- 67.9% female versus 32.1% male.
- Average Follow up was 7.6 months (min 1.4 - max 37.9)

Method of Fixation
- Lag screw and plate 39% (33 pts)
- Compression plate 61% (51 pts)

Indications for 1st MTP Fusion
- Hallux Valgus 37%
- Hallux Rigidus 51%
- Autoimmune 9%
- Hallux Varus 5%
Preoperative HV angles did not show a significant difference between patients subjected to screw fixation and neutralization plate or compression plate.

Postoperative HV angles varied between the groups with and without lag screw in patients with hallux rigidus (p=0.006) in contrast to patients with hallux valgus that showed no variation (p=0.3).
Patients with hallux valgus underwent a larger correction of HV angle (mean 20.2 deg) compared to patients with hallux rigidus (mean 5.8 deg) (P <0.001).

No difference found in degree of correction between patients that underwent Lag screw and neutralization plate or no lag screw and Compression plate.

The Dorsiflexion angle showed a mean of 26 degrees after 1st MTP fusion in patients with hallux valgus and hallux rigidus, no difference was noted. (P=0.4)
Fusion rates after 1st MTP fusion

- The percentage of fusion was lower in patients with hallux valgus and autoimmune disease compared to hallux rigidus and hallux varus.
- Union rates did not vary amongst groups after fixation with or without lag screws (P = 0.1)

Patients with hallux valgus without lag screw fixation showed the highest non-union rate.
- Lag screw fixation did not make a difference in the rate of fusion in hallux rigidus (P=0.5).
Complications

-19% of the patients sustained complications.

- Highest in patients with autoimmune disease (50%), followed by hallux valgus (25.8%), hallux varus (25%) and hallux rigidus (9.3%)

- 8 patients had painful hardware, 4 sustained deep infections that required irrigation and debridement with hardware removal, 4 had failure of hardware associated with nonunion and 2 patients sustained superficial wound infections.

Diabetes and Smoking

- 8.3% of the patients had diabetes and 30% reported tobacco abuse.
- A 43% nonunion rate was associated to diabetes whereas a 24% nonunion rate was associated to smoking tobacco.
- Patients with diabetes had a 43% rate of complications.
- Tobacco was associated with complications in 20%
Conclusions

- Final alignment in the coronal (HV angle) or the Sagittal (Dorsiflexion angle) was not dependent on the method of fixation.

- The Union rates were highest after MTP fusion in patients with hallux rigidus compared to hallux valgus or autoimmune disease.

- 1st MTP fusion without lag screw showed higher rates of non union amongst patients with Hallux Valgus.

- No association was noted between Diabetes, Smoking and complications or rates of nonunion.

Discussion

- Success of 1st MTP fusions may be related to the quality of preparation and surgical technique rather than the method of fixation.

- The increased number of nonunions in hallux valgus patients may be related to the degree of deformity correction and fixation without lag screw compression although this did not show to be significant.

- Higher numbers of patients with comorbidities like Diabetes and Smoking are needed to show statistically significant differences.
References


- Satya K et al. Intermetatarsal Angular Change Following Fusion of the First Metatarsophalangeal Joint. Foot & Ankle International/Vol. 30, No. 5/May 2009