

PI case study March 2013 ORIENTATION OF GRAFT



Figure 01. Pre-op x-rays

48 yo female who is 13 years S/P aggressive cheilectomy and staked head c/o painful 1st MTPJ and she has noticed her toes are shifting medially Xrays reveal loss of dorsal 1st metatarsal bone substance, a staked metatarsal head, and hallux varus (**Figure 01**).

Goal: to fuse 1st MTPJ and maintain length.

Plan: 1st MTPJ fusion with an inter-positonal bone graft

Autogenous bone graft is preferred.

Iliac crest or calcaneal?

Calcaneal is the ideal graft for 1st MTPJ fusion ~ cancellous bone

Optimal fixation... one which apposes and stabilizes the graft to bone interface

Date of surgery 9-21-2011

Technique/Sequential steps:



Figure 02.

1. Resect 1st MTPJ surfaces in a planar en block fashion to allow for zero degrees of dorsiflexion
2. Harvest the calcaneal graft at the dorso-lateral superior margin of the calcaneal body.
Resect less than 1/2 width of the calcaneal body from lateral to medial and leave the medial cortex intact. (**Figure 02**). The graft should be large enough to effectively bridge the proximal phalanx to the to the 1st metatarsal (in this case the graft was 1.0cm wide in the frontal plane x 1.5cm in the sagittal plane x 1.0cm in the transverse plane).
3. Back fill the calcaneal graft harvest site with grafting material. Save additional bone grafting material for use at the 1st MTPJ fusion site. A closed suction drain may be used at this site (**Figure 03**).
4. Distract hallux and place graft into fusion site
5. With graft in place select appropriate plate (a locking plate without intrinsic angular correction is preferred).
 - a. The plate is placed dorsally in direct contact with the 1st metatarsal & proximal phalanx
 - b. There will be a sagittal plane gap between the plate and the graft. This gap is typically required as the graft will need to be suspended a few millimeters from the plate in the sagittal plane for proper cancellous bone to cancellous bone apposition.
 - c. Select a central screw hole within the plate for graft fixation.
 - d. Measure or estimate the distance between the graft and the plate.

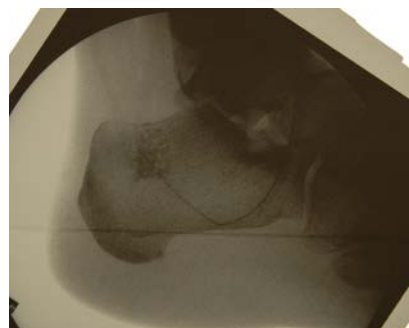


Figure 03.



Figure 04.



Figure 05.

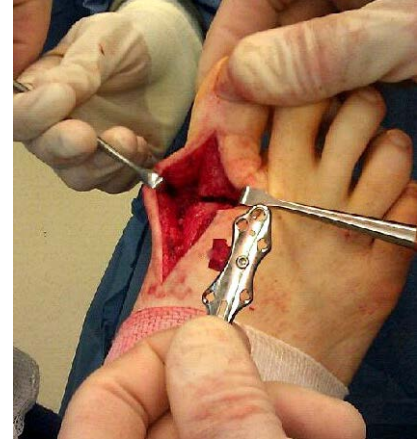


Figure 06. (Substituted from another case for educational purposes)

6. Remove the plate and graft from the fusion site and fixate the graft to the plate. Do not engage locking threads at this time.
 - a. Use the distance measured in 5.d. above (as a guide) to suspend the graft from the plate (**Figure 04**).
 - b. Rotate the graft so the cancellous margins are directed towards the apposing margins of the proximal phalanx and 1st metatarsal (**Figure 05**).
 - c. Place plate and fixated graft within fusion site once again to confirm proper depth of the graft.
 - d. If utilizing a locking plate then remove the plate and graft and engage locking threads at this time (**Figure 06**). Place the plate and fixated graft into the fusion site for final positioning.
7. Place temporary fixation (1.6mm wire) to appose the three bones in proper alignment.
 - a. A wire(s) is placed percutaneously along the plantar half of the fusion site from the proximal phalanx medially and exiting the metatarsal laterally. If possible this pin is not placed into the graft.
 - b. Take intra-operative x-rays to confirm anatomic alignment.
 - c. Note: An inter-fragmentary screw is not recommended for 2 reasons:
 1. Use of a screw will reduce the amount of bone to bone contact at the fusion site, and
 2. The screw may disrupt graft integrity.
8. Fixate plate to proximal phalanx and 1st metatarsal and remove temporary fixation.
9. Irrigate thoroughly and backfill the fusion site with bone grafting material as needed (**Figure 07**).



Figure 07.

8 week postop x-rays (Figure 08)



Figure 08.

8 week postop CT scans (Figure 09)

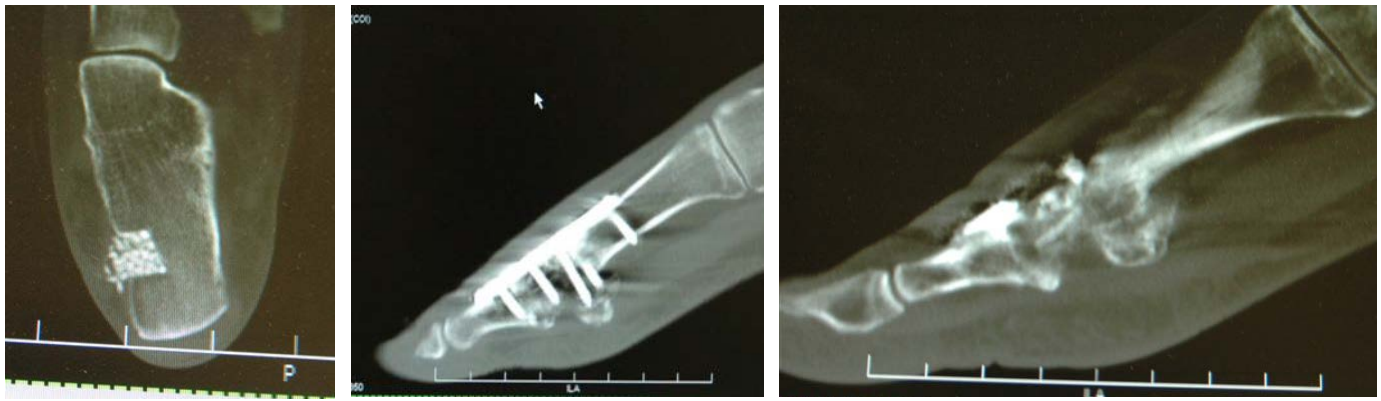


Figure 09.

7 ½ month postop x-rays show graft incorporation at both harvest and fusion sites (Figure 10).



Figure 10.

Post-operative management:

1. Non-weightbearing for 8-10 weeks.
2. CT scan at 8 weeks – Request a 1mm slice thickness technique to evaluate the fusion site. This scan is performed just prior to weightbearing and should note significant fusion (Figure 11).
3. External bone stimulator may be used for patients who are deemed a high risk for non-union.
4. Care is taken in the recovery phase to avoid stress fractures arising from the calcaneal graft site. A postoperative cast boot is used for weight-bearing for approximately 6-8 weeks.

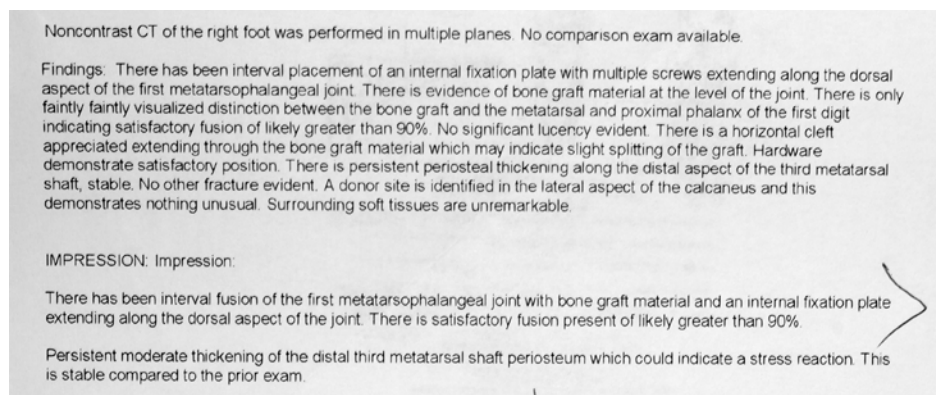


Figure 11.