



## Statement of Purpose

There has been some debate on the amount of deformity correction and what deformities can be corrected in the setting of a total ankle arthroplasty. We present a case of a patient with rigid clubfoot and severe multiplanar deformity who after deformity correction procedures was able to undergo a total ankle arthroplasty with long term success and preservation of near normal gait pattern. Our purpose is to show that even in the setting of severe deformity the total ankle arthroplasty can still improve function and reduce pain.

## Case Study

82 y/o male presented to our office in 2005 with painful, long-standing, congenital, clubfoot deformity. He also presented with equinus deformity, significant osteoarthritis and joint contracture of the ankle. His deformity was rigid on exam with very limited inversion and eversion. He had palpable pulses and mild edema of the ankle. As a retired individual his goal was to be able to garden and go for walks without so much pain.

Conservative treatment was attempted and included physical therapy, steroid injections, bracing, anti-inflammatory medication, Medrol dose pack and activity modification. These conservative measures were exhausted and patient requested further intervention. All risks and benefits of surgery were presented to the patient who elected for reconstructive foot surgery and total ankle arthroplasty.

A lateral calcaneal slide with midfoot dorsiflexory osteotomy, subtalar joint arthrodesis, talonavicular arthrodesis and a lateral ankle ligament repair were performed. Four weeks later a total ankle arthroplasty was performed through an anterior incision using the Agility total ankle system.

The patient did develop a superficial wound and infection post operatively that was resolved with oral antibiotics and local wound care. After 6 months of post-operative follow up the patient was then seen once a year for the next 14 years. He currently is able to garden and go for walks with only mild discomfort and has near normal biomechanics.

Figure 1. Pre-operative AP



Figure 2. Pre-operative Lateral

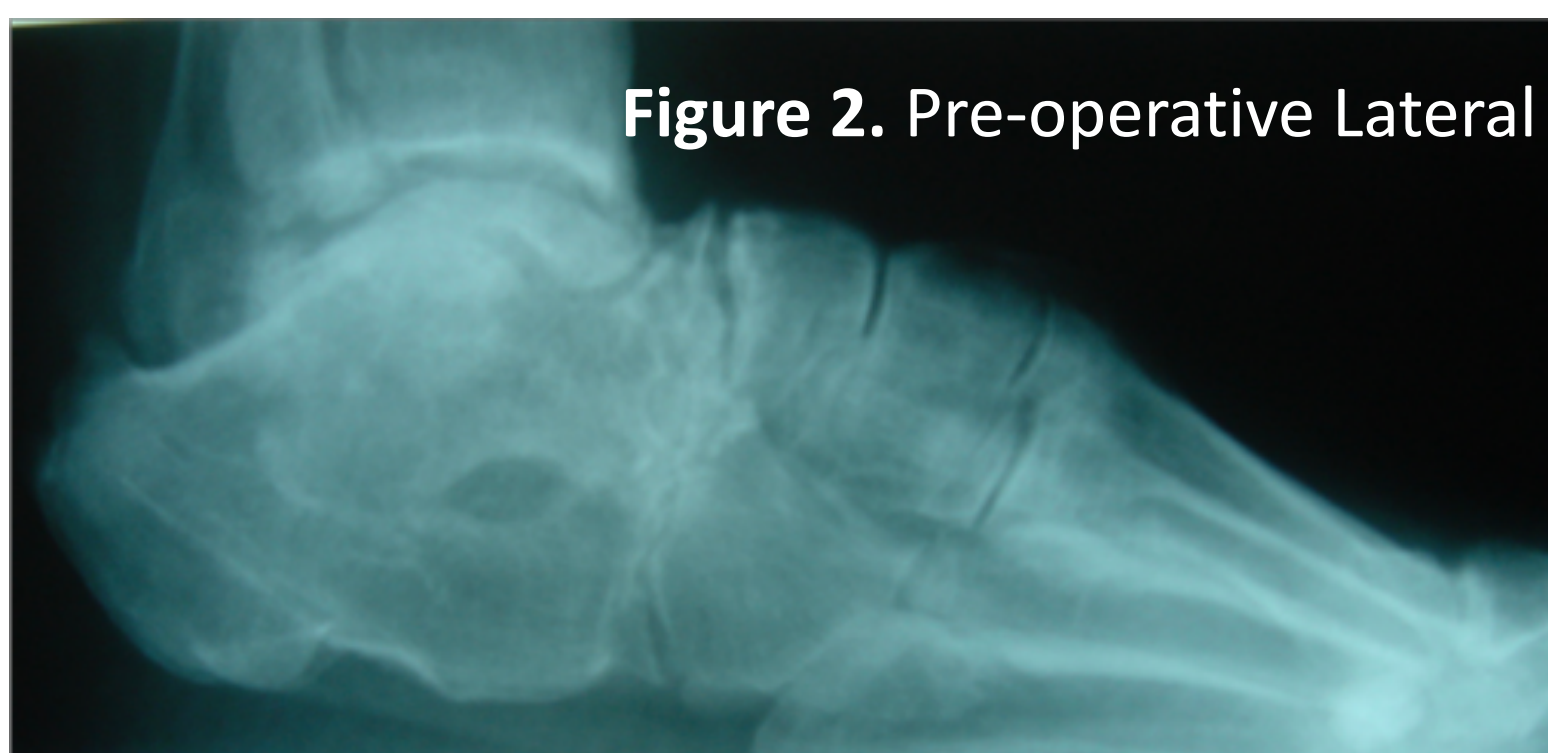


Figure 3. (right) Intraop foot reconstruction

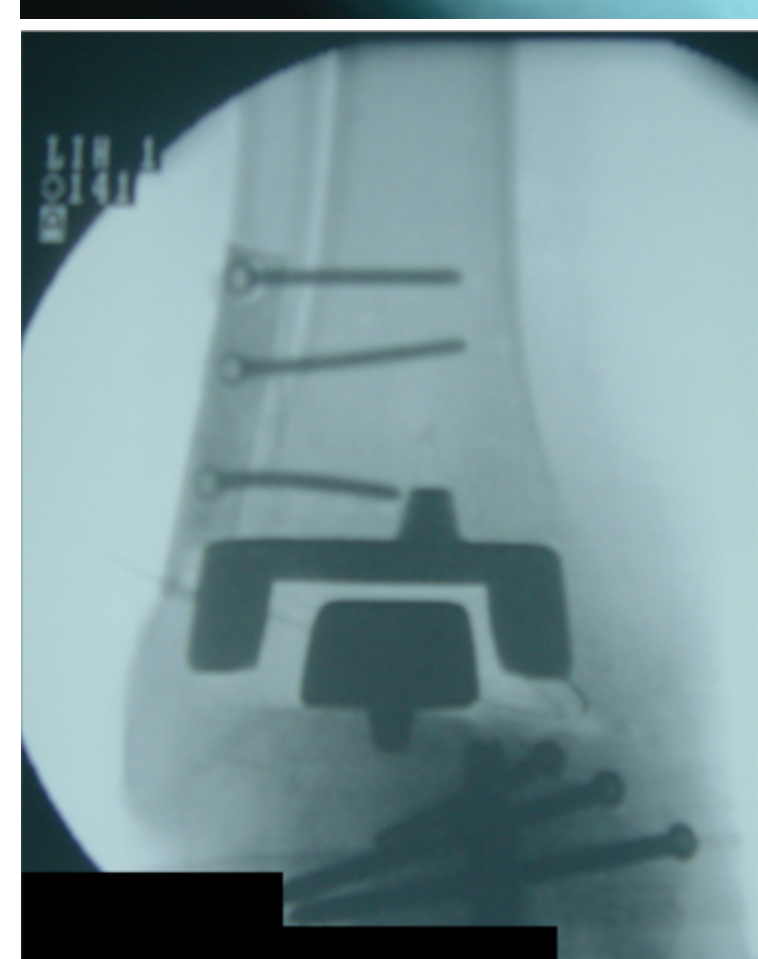


Figure 4. (left) Intraop AP TAR



Figure 5. (right) 14 year post-op AP



Figure 6. (left) 14 year post-op Lateral

## Literature Review

Haskell et al reported 86 patients, 35 with >10 degrees of coronal plane malalignment either varus or valgus deformity. At two year follow up tibiotalar alignment was maintained however those with varus or valgus deformity of > 10 degrees were ten times more likely to have edge loading with greater than 4 degrees of frontal plane deviation from initial post-operative alignment. (1)

Of their 200 patients reported Wood et al had 39 patients with greater than 15 degrees of varus or valgus with 18% (7/39) developing edge loading. Three of those patients had successful hindfoot realignment and three had implant removal with ankle fusion. Only 2% of the patients with less than 15 degrees of malalignment had edge loading and concluded that malalignment less than 15 degrees is a relative contraindication(2)

In their 2016 biomechanical study, Grier et al observed that of their 93 patients, 38 had greater than 5 degrees of varus preoperatively. Patients with neutral, varus or valgus malalignment, maintained correction at 12 and 24 months. They monitored in a gait study lab the coronal plane motion of the ankle as well as the biomechanics of the knee and hip. They demonstrated no significant difference in patients with varus valgus or neutral preoperative alignment. The biomechanics in all patients improved and were closer to normal than preoperatively. (3)

Kim et al developed their own algorithm approach to total ankle replacement in the varus ankle in their series of 23 ankles with greater than 10 degrees of varus and 22 neutral ankles compared at 27 month follow up. Only 1 revision in each group was performed with the varus revision consisting of soft tissue rebalancing and the neutral revision going on to arthrodesis. There was no difference in clinical or radiographic outcome or failure rate.

## Analysis and Discussion

The importance of the mechanical axis is mandatory in order for a total ankle replacement to maintain alignment and success. In cases involving total ankle replacements, one must restore near normal biomechanics in order to have a correct and pain-free functioning total ankle replacement both in the short and long-term. An anterior tibiotalar angle of about 90° in the sagittal plane and a neutral hindfoot and ankle position in the frontal plane are necessary to maintain alignment and success. We also recommend staging procedures with patients who have large deformities.

## Conclusion

There is a paucity of long term follow up studies in total ankle arthroplasty and only very small studies show a varying degree of deformity correction and successful outcome leading to a difficulty in determining absolute and relative contraindications. This case study shows that when the deformity is adequately corrected and with proper patient expectations long term success of total ankle arthroplasty with severe deformity correction is possible.

## References

1. Haskell, Andrew, and Roger A. Mann. "Ankle arthroplasty with preoperative coronal plane deformity: short-term results." *Clinical Orthopaedics and Related Research* 424 (2004): 98-103.
2. Wood, P. L. R., and S. Deakin. "Total ankle replacement: the results in 200 ankles." *The Journal of bone and joint surgery. British volume* 85.3 (2003): 334-341.
3. Grier, A. Jordan, et al. "The effect of tibiotalar alignment on coronal plane mechanics following total ankle replacement." *Gait & posture* 48 (2016): 13-18.
4. Kim, B. S., et al. "Total ankle replacement in moderate to severe varus deformity of the ankle." *The Journal of bone and joint surgery. British volume* 91.9 (2009): 1183-1190.