

Introduction:

Dorsiflexion osteotomy of the first metatarsal is commonly performed to address first ray plantarflexion in cavovarus foot reconstruction. Traditionally performed via a dorsal closing wedge, a dorsiflexion slide osteotomy permits similar correction of deformity while allowing for intra-operative adjustment. The purpose of this study is to describe the dorsiflexion slide osteotomy to address first ray plantarflexion, analyze post-operative radiographic changes, and perform a computer-based simulation of weight bearing post-operatively. Secondary goals include an analysis of union rates and associated complications.

Methods:

12 patients undergoing dorsiflexion slide osteotomy for cavovarus foot reconstruction from 2018-2020 were studied. Age, gender, and concomitant procedures performed were recorded. Pre and post-operative talo-first metatarsal angles were measured as well as translation in millimeters achieved surgically. Union rates as well as any associated post-operative complications were recorded. Finally in association with the Center for Applied Biomechanics at our institution, a computer-based simulation was performed to examine ground reactive forces in weight bearing comparing a control to a foot with a 5mm dorsiflexion slide osteotomy of the first metatarsal performed.

Results:

All patients undergoing first metatarsal dorsiflexion slide osteotomy underwent concomitant procedures, most commonly to address hindfoot varus, ankle instability, or peroneal tendon pathology. There was a significant improvement (7.9° , 95% CI 3.2-12.6 $^\circ$) from pre ($13.8^\circ \pm 5.8^\circ$) to post-operative ($6^\circ \pm 5.3^\circ$) talo-first metatarsal angles ($p = 0.022$). Average translation achieved during surgery was $6.1\text{mm} \pm 1.5$. There was a moderate correlation ($r = 0.55$) between amount of translation achieved and correction of talo-first metatarsal angle. In computer simulation, a 5mm dorsiflexion slide demonstrated a 74% reduction in ground reactive force compared to non-surgical control. 9/12 patients went on to full bony union on post-operative radiographs. 3/12 patients had inadequate follow-up radiographs to determine whether bony union occurred. 2 patients ultimately required hardware removal due to prominence.

Conclusions:

Patients undergoing dorsiflexion slide osteotomy demonstrated improved first ray plantarflexion as demonstrated by significantly improved talo-first metatarsal angles. In simulation, the dorsiflexion slide osteotomy reduces ground reactive force through the first metatarsal by 74% and thus may reduce symptoms such as metatarsalgia or sesamoiditis. More study is needed to evaluate and compare clinical outcomes between first metatarsal dorsiflexion slide and wedge osteotomies.