INTRODUCTION
Posterior tibial tendon dysfunction (PTTD) often leads to adult acquired flatfoot deformity. Loss of the tendon’s inverter function results in a progressively lower medial longitudinal arch, hindfoot valgus and forefoot abduction. Treatment varies based on surgeon preference, but typically consists of a medial slide calcaneal osteotomy (slide) and a flexor digitorum longus (FDL) tendon transfer. The concept of a medial displacement calcaneal osteotomy with a posterior distraction (distraction) has been introduced, and demonstrated to significantly reduce the inversion force requirement for heel rise compared to the slide. This finding is significant as it suggests that the distraction is more efficacious than the slide in correcting deformity. However, it has not been validated on a flatfoot model.

The purpose of the current study was to compare the performance of the slide and distraction osteotomies in a flatfoot model. It was hypothesized that the distraction would provide more correction of deformity than the slide.

METHODS
Twelve fresh-frozen cadaver foot-ankle specimens were tested. Radiographs were taken to screen for exclusion criteria. The proximal portion of each specimen’sibia was potted in epoxy. Electromagnetic tracking sensors (Polhemus FASTRAK, Colchester, VT) were used to monitor kinematics of the talus, cuboid, calcaneus and navicular. The specimen was placed in a custom loading apparatus. Stepper motors acting on a plexiglass footplate were used to apply ground reaction force (GRF) components (vertical, mediolateral, antero-posterior) to the plantar aspect of the foot. Freeze clamps secured the Achilles, posterior tibial (PT), peroneus brevis (PB) and peroneus longus (PL) tendons to individual stepper motors to simulate muscle activation. Force transducers connected in series with the tendons and stepper motors provided force feedback. A neutral reference position corresponding to quiet standing (vertical tibia, plantigrade foot, Rz = 357 N vertical) was defined as 0° joint orientation.

Each specimen was tested with the tibia oriented at an angle consistent with the early heel rise portion of the gait cycle under four experimental conditions: intact, flatfoot, slide and distraction. The protocol consisted of three trials of data acquisition under each condition. Each trial consisted of incremental loading in five steps under a closed-loop feedback position control strategy. The target position was 7° plantarflexion of the calcaneus under GRF components of 50% body weight (Rx = 27 N anterior, Ry = 13 N medial, and Rz = 357 N vertical). PT load was 116 N to simulate an FDL tendon transfer. The concept of a medial displacement calcaneal osteotomy with a posterior distraction (distraction) has been introduced, and demonstrated to significantly reduce the inversion force requirement for heel rise compared to the slide. This finding is significant as it suggests that the distraction is more efficacious than the slide in correcting deformity. However, it has not been validated on a flatfoot model.

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RESULTS
The talonavicular joint became more dorsiflexed/abducted/everted following creation of a flatfoot model. After the slide osteotomy, the target load condition produced a significantly corrected talonavicular joint orientation (-0.63° ± 4.84° adduction, p = 0.007; -2.88° ± 5.40° inversion, p = 0.005). The distraction osteotomy also produced a significantly corrected joint (-0.17° ± 6.15° adduction, p = 0.014; -0.61° ± 9.13° inversion, p = 0.007). However, neither procedure significantly corrected talonavicular plantar flexion (slide: -1.48° ± 8.11°, p = 0.048; distraction: -0.47° ± 6.48°, p = 0.096). Furthermore, no statistically significant difference was found for any of the talonavicular joint orientations between the slide and distraction conditions (plantarflexion: p = 0.278; adduction: p = 0.183; inversion: p = 0.098).

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