**Title:** Pedicled Vascularized Calcaneus Transfer: A Novel Surgical Technique for Tibial Deficiency To Improve Functional Outcome

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**Background:** Tibial deficiency (TD), also known as tibial hemimelia, is a congenital lower limb deficiency that involves a spectrum of deformities of the tibia, ranging from a hypoplastic to completely absent tibia.1-3 Due to the rarity of TD and wide spectrum of presentation, there is no standard treatment or reconstructive procedure recommended. In many cases of TD presenting with tibial absence, early ablative procedures or partial amputation are suggested as treatment.4.5 Previous reconstruction efforts require prolonged staged surgeries that may take months, which can be detrimental for the patient’s development. To date, there is a lack of reconstructive techniques that prioritize functional outcome and reduced recovery time to promote normal developmental milestone achievement.

**Case:** A 2-month-old male presented with absent bilateral tibias, with the classification of Paley Type 5c (**Figure 1**). At 1 year and 24 days, a bilateral fibular resection with pedicled vascularized calcaneus transfer was performed (**Figure 2**), allowing for transfer of the calcaneus along with the overlying glabrous skin and soft tissues to the end of the femur. The flaps were designed to incorporate residual nerve structures to preserve sensation to the calcaneal skin as well as reduce the risk of neuroma formation. The patient was permitted to bear weight after the four-week post-operative follow-up. After six-month follow-up, the patient was able to pull to stand and walk with assistance without complaints of pain (**Figure 3)**. No complications have been noted up to date at 9-month follow-up.

**Discussion:** This novel reconstructive technique of bilateral pedicled vascularized calcaneus transfers for bilateral tibial deficiency allowed for the preservation of calcaneal skin, reduced the risk of neuroma formation, and avoided amputation or prolonged staged reconstruction. Due to the nature of a single surgery, non-weightbearing recovery time was decreased, which is crucial for preserving motor and functional developmental milestones.

**Images/Tables/Charts:**



**Figure 1:** Radiographic when the patient was 8 months old. (A). Anteroposterior view of the right lower extremity Demonstrates absent tibia with dislocation and severe flexion contracture of the knee, and subluxation or dislocation of the ankle; (B). Anteroposterior view of left lower extremity demonstrating absent tibia with dislocation or subluxation of knee and dislocation of ankle.



**Figure 2**: Fluoroscopic anteroposterior image. (A) Right lower extremity demonstrating a smooth pin inserted through the calcaneus into the distal femur; (B) Left lower extremity demonstrating a midshaft femur osteotomy and smooth pin inserted through the calcaneus into the femur.



**Figure 3:** Patient at 4-week post operative with prescribed Stubbies for weight bearing activities

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