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From disability to mobility: A surgical approach to severe foot deformity following childhood clubfoot

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Abstract

Clubfoot, when inadequately treated or left to progress, can lead to severe structural deformities in adulthood, significantly impairing function and quality of life.

We present the case of a 52-year-old male with a complex foot deformity as a long-term sequela of childhood clubfoot.

The patient exhibited a supinated and adducted foot, bearing weight on the lateral rays while the first ray remained non-weight-bearing, leading to instability, gait impairment, and chronic pain.

Preoperative planning was crucial, involving 3D reconstruction models based on CT scan to fully assess the structural abnormalities and guide the surgical strategy. Correction was achieved through a percutaneous varus osteotomy of the calcaneus, navicular resection, percutaneous cuboid osteotomy, talo-cuneiform arthrodesis, and wedge osteotomy of the proximal phalanx of the toes. This comprehensive reconstructive approach successfully realigned the foot, achieving near-normal anatomical positioning. Remarkably, at just twelve weeks postoperatively, the patient was able to walk with full support of the foot, demonstrating rapid functional recovery and pain relief.

This case underscores the potential of tailored surgical reconstruction to restore mobility and significantly improve quality of life, even in long-standing severe foot deformities. Early clinical outcomes suggest that, with careful planning and execution, functional restoration can be achieved in a short timeframe, offering renewed mobility to patients suffering from similar conditions.

Keywords: Clubfoot, adult deformity, reconstructive surgery, varus osteotomy, navicular resection

Introduction

Idiopathic clubfoot, or congenital talipes equinovarus (CTEV), is the most common musculoskeletal congenital malformation needing intensive orthopedic treatment ^[1], affecting approximately 1/1000 alive born infants ^[2].

A clubfoot presents with malformation at the bony, tendinous, muscular, and articular Level ^[3-4]. The foot presents with a midfoot cavus, forefoot adduction, hindfoot varus, and a hindfoot equinus. This gives the typical image of an inward turned foot with the sole of the foot being positioned vertically instead of horizontally ^[3-7].

Conservative therapy usually starts soon after birth. Persistent and residual deformities often require surgical treatment. The relapse rate of surgically treated clubfeet is about 25% (range, 13–50%) ^[8].

Reported late sequelae of treated congenital clubfoot deformities include recurrent or residual deformity (cavus, heel varus, forefoot adduction), pes planovalgus deformities, pain, limited ankle and subtalar range of motion, limitation of activities, abnormal gait, talar collapse, among other ^[9]. Forefoot and midfoot deformities are the most common persistent deformities ^[10]. Some studies show that residual forefoot adduction and supination are present in 95% of residual clubfeet ^[11] with the majority of these deformities resulting from undercorrection at the time of primary operative treatment. That said, relapse is most often the consequence of inadequate primary surgery, but may also result from originally stiff and nonreducible feet predestined to need multiple reoperations ^[12].

A neglected or inadequately treated clubfoot leads to gait lameness, pain and functional disability, impacting the quality of life of patients. Surgical management of these sequelae remains challenging, requiring tailored approaches.

In this article, we report the surgical approach of a complex foot deformity as a long-term sequela of childhood clubfoot in a 52-year-old male.

Case Report: A 52-year-old man with a history of untreated congenital clubfoot presented to our outpatient clinic complaining of daily pain, severe functional limitation, and impaired quality of life. The patient had no other medical conditions neither chronic medication. He reported several soft-tissue surgeries in other institutions during childhood,

without significant improvement. On physical examination, the left foot demonstrated a supinated and adducted position, with a valgus deformity of the hindfoot secondary to prior treatments. Weight-bearing was mainly supported by the lateral rays, while the first ray remained non-weight bearing. (figure 1).



Fig 1: Clinical examination of the foot showing a supinated and adducted position associated to a valgus deformity of the hindfoot; weight-bearing was supported only by the lateral rays.

Preoperative radiographs demonstrated a complex multiplanar deformity with a forefoot adduction and supination, clawing of the toes and marked elevation of the first ray. Weight-bearing alignment showed hindfoot valgus with predominant load transmission through the lateral rays.

Lateral projections showed a cavus configuration with loss of weight-bearing of the medial column and degenerative changes of the midfoot articulations. These findings correlated with the patient's functional complaints and guided the surgical planning. (figure 2)



Fig 2: Pre-operative radiographs demonstrating a complex deformity of the left foot; degenerative changes on the midfoot were evident, as well as a cavus on the lateral projection.

In addition to conventional radiographs, computed tomography (CT) with three-dimensional (3D) reconstructions was obtained. This provided a detailed assessment of the complex multiplanar deformity and bone morphology, allowing accurate visualization of the

relationships between the talus, calcaneus, and midfoot bones. Patient-specific 3D models were used to simulate corrective surgical treatment, which proved fundamental for surgical planning. The 3D reconstructions guided the decision-making regarding surgical procedure. (figure 3)



Fig 3: Preoperative planning was crucial, involving 3D reconstruction models based on CT scan to fully assess the structural abnormalities and guide the surgical strategy.

The corrective surgery consisted of multiple steps, each aimed at addressing a specific component of the complex deformity: (figure 4)

1) A percutaneous varus osteotomy of the calcaneus

Performed to correct the hindfoot valgus deformity, restore physiological alignment of the calcaneal axis, and rebalance load distribution across the foot.

2) Resection of the navicular

Indicated due to severe deformity and incongruity of the talonavicular joint, with degenerative changes. The navicular acted as a “block” preventing proper alignment of the medial column; its removal allowed for realignment and facilitated arthrodesis.

3) Cuboid osteotomy

To shorten and realign the lateral column, thereby

correcting forefoot adduction and improving congruence between the midfoot bones. This helped balance the medial and lateral columns of the foot.

4) Talo-cuneiform arthrodesis with plate fixation

Aimed at stabilizing the medial column and lowering the elevated first ray. By fusing the talus directly to the first cuneiform, medial column support was restored, enabling the first ray to participate in weight-bearing.

5) Percutaneous wedge osteotomies of the proximal phalanges of the toes

Performed to correct claw toe deformities secondary to chronic imbalance and altered biomechanics. These osteotomies improved digital alignment, reduced pain, and optimized overall foot function and shoe wear tolerance.



Fig 4: Intra-operative fluroscopy showing surgical procedures. On the right, patient left foot after surgery demonstrating the initial success of the surgery.

The patient was immobilized with a cast for the first 4 weeks, followed by a Walker Boot until 8 weeks. During the early postoperative period, he developed significant foot swelling, which required close monitoring. Weekly wound

inspections were performed to assess healing, manage edema, and prevent complications. Despite the initial swelling, the surgical wound progressed without signs of infection or dehiscence. (figure 5)



Fig 5: Weekly evaluation of the foot, to guarantee there were no early complications such as compartment syndrome or skin necrosis.

Progressive weight-bearing was initiated after boot removal. At 3 months post-operatively, the patient was ambulating without crutches, and at 6 months he achieved an

autonomous, pain-free gait without claudication. (figure 6 and video 1)



Video 1: At six months postoperatively, the patient was able to walk with full support of the foot, demonstrating rapid functional recovery and pain relief.



Fig 6: Functional weight-bearing and near anatomical position was restored, 6 months post-op.

Follow-up radiographs at 3 and 6 months demonstrated satisfactory bone healing, no hardware-related

complications, and maintenance of the near-anatomical realignment of the foot. (figure 7 e 8).



Fig 7: Radiographs at 3 months post-op; satisfactory evolution with no complications related to hardware.



Fig 8: Radiographs at 6 months post-op; calcaneus osteotomy is consolidated and there's fusion of talo-cuneiform.

Discussion

Clubfoot is a common musculoskeletal congenital abnormality that leads to locomotor disability and worsens substantially when left untreated. Adult neglected clubfoot is rare in developed countries but represents a major challenge when encountered.

Over time, correctable deformities become fixed and more difficult to manage, and often complicated by degenerative changes or sequelae of previous unsuccessful surgeries, resulting in the need for extensive open surgery [13].

The management must therefore be individualized, balancing the need for correction, preservation of function, and minimization of complications.

Several surgical options have been described for severe and neglected deformities. Historically, surgical procedures for recurrent CF have included soft tissue releases, tendon transfers, and bony osteotomies. Despite the effectiveness of these methods, they all present a high rate of complications and recurrence [14].

The Ilizarov method and other external fixation techniques allow gradual correction through distraction osteogenesis and progressive soft-tissue adaptation. These approaches have the advantage of fine-tuning correction over time and avoiding extensive resections. However, they are often associated with prolonged treatment duration, pin-site infections, patient discomfort, and the need for high compliance [15].

In the case presented, the deformity was complex and rigid, with previous surgical scarring, midfoot degenerative changes, and significant malalignment of both the hindfoot and forefoot. For these reasons, a stepwise targeted reconstruction was preferred over gradual correction. Preoperative CT and 3D reconstructions were essential to understand the exact morphology and to simulate the necessary procedures. The surgical plan aimed to correct each component of the deformity: hindfoot valgus with calcaneal osteotomy, medial column incongruity with navicular resection and talo–first cuneiform arthrodesis, forefoot adduction with cuboid osteotomy, and digital deformities with percutaneous phalangeal osteotomies.

This directed, “by steps” approach allowed us to achieve near-anatomical realignment and restore weight-bearing through the medial column, with the additional benefit of shorter treatment time compared to external fixation methods. The postoperative course, although initially complicated by significant edema, progressed without major complications. Radiographs at three and six months confirmed satisfactory healing and maintenance of correction, supporting the long-term potential of this reconstruction.

Ultimately, this case illustrates that while techniques such as the Ilizarov method remain valuable tools in neglected foot deformities, targeted reconstruction guided by advanced imaging and 3D planning can be an effective alternative, especially in cases where deformity complexity or previous surgical history make gradual correction less feasible.

Conclusion

This case demonstrates that neglected adult clubfoot, even after multiple failed surgeries, can be successfully managed with comprehensive surgical reconstruction guided by 3D planning. Early clinical outcomes suggest that, with careful planning and execution, functional restoration can be achieved in a short timeframe, offering renewed mobility to patients suffering from similar conditions.

Conflict of Interest

Not available

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