Case Reports and Series

Ponseti Method versus surgical treatment in a teenage girl with neglected clubfoot: a case report

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ABSTRACT

Introduction: Congenital clubfoot is the most common foot deformity. It affects 1 - 7/1000 live births. Clubfoot is considered neglected when it has not been treated before the child walks. The treatment of choice in these patients is usually the correction of the deformity with external fixation. However, this treatment is not exempt from complications and does not restore the anatomy.

Case: Sixteen years-old female with neglected bilateral clubfoot underwent extended posterior internal release and gradual correction with an external fixator on her right foot. Due to the poor results and tolerance to the surgical treatment of the right foot, she underwent the Ponseti Method on her left foot. Gait analysis was performed six months after the treatment was completed. The joint relations were closer to normal in the limb treated with the Ponseti method, and the gait pattern was similar in both feet.

Conclusion: The Ponseti method is a treatment option for neglected clubfoot even in skeletally mature patients. This technique has not only been shown to restore foot anatomy and reduce the risk of overcorrection. It is also better tolerated by the patient and brings lower costs to the health insurance system.

Introduction

Clubfoot is the most common congenital foot deformity. This complex tridimensional deformity involves the hindfoot, midfoot, and forefoot, affecting 1-7 out of 1000 live births. Most cases are male children, and approximately 80% of the cases are born in low-income and middle-income countries. It is estimated that 850 children are born with clubfoot in Colombia yearly. The treatment of choice in children diagnosed with clubfoot is the Ponseti Method, which consists of serial casting, Achilles tendon percutaneous tenotomy, and the Iowa brace use. Successful outcomes have been reported in patients treated with the Ponseti Method in long-term follow-up studies.

It is considered a neglected clubfoot when it remains untreated after walking age. Neglected clubfoot is more challenging to treat than a newborn's clubfoot because the tarsal bones in younger children are mainly composed of cartilage and respond to Ponseti manipulation and casting. Additionally, walking-age children's feet are stiffer because of the child's growth and weight-bearing. It is essential to emphasize that in neglected clubfoot, the bones are ossified in a misaligned position because of exposure to abnormal forces. Neglected clubfoot is still a significant public health problem in many low and middle-income countries. Patients with neglected clubfoot are commonly treated with various surgical techniques.

In some cases, a gradual correction with an external fixator is needed. For this type of treatment, the proportion of clubfoot recurrence and major complications like soft tissue contractures, neurovascular complications, infections, and limb length discrepancy is greater than 25%. Additionally, patients treated with surgical procedures are less cost-effective than non-operative management (Ponseti method: manipulation, serial casting, and braces) that is practical and consistent in low- and middle-income countries.

Despite the advantages reported in the Ponseti Method treatment, it isn't the treatment of choice for neglected clubfoot. That happens due to the difficulty of follow-up and, in most cases, the low socioeconomic conditions of those patients reduce adherence to Ponseti Method. Additionally, there isn't enough evidence and protocols that...
support the Ponseti Method as the treatment of choice for neglected clubfoot.11,12

Case Report

The patient was a 16-year-old female with neglected bilateral clubfoot. She walked on the dorsolateral aspect of the feet due to a severe cavus, equinus, and varus deformity (Image 1). The patient was first treated by a surgeon who decided to use the surgical treatment. The surgery performed were: extended posterior internal release and external Ilizarov fixator implantation on her right foot. The surgery included abductor hallucis muscle tenotomy, the master knot of Henry liberation, talonavicular, subtalar, and tibiotalar joints capsulotomy, and Z lengthening of the Achilles and posterior tibial tendons. She had the external fixator for five months. During all that time, the patient was depressed and in pain because of the procedure.

After the external fixator extraction, a long-leg plaster cast was applied for one month, and an ankle-foot orthotics was immediately prescribed. The pain and affection disorder presented by the patient with the fixator motivated the treating surgeon to send the patient to the clubfoot care center. The orthopedist decided to use the Ponseti method on the left foot.

The left foot presented 50° of equinus, 40° of adductus, 30° of varus, and 40° of cavus. Six serial long-leg plaster casts were required to correct the deformity. The casts were applied with the knee at 90°, as the Ponseti Method indicates. Before the surgical intervention, the left foot presented -20° of adductus, 10° of equinus, neutral hindfoot, and cavus absence.

The patient underwent Achilles percutaneous tenotomy and transference from the anterior tibial tendon to the third wedge. A long-leg plaster cast with the ankle in 10° of dorsiflexion, 25° of abduction, the leg in external rotation, and the knee in flexion of 90° was applied. Hospital discharge was given before 24 hours. Six weeks after surgery, the cast was removed. The patient started gait training and anterior tibial tendon strengthening. The left foot was plantigrade with 10° ankle dorsiflexion.

Gait analysis six months postoperative reported a right GDI of 94.1 left GDI of 86. Symmetrical decrease of monopodal supports was observed. There was left tibial-internal torsion with supination of the foot. The right foot had valgus, adductus and anterior cavus. The kinematics showed absence of bilateral plantiflexion and internal rotation of the left foot. Kinetics showed severe reduction of plantiflexor moments and absence of bilateral ankle power. The length of the left gastrignemius was shortened. In the podobarometry it was evident that the support of the right foot was predominantly in the midfoot. While in the left foot it was distributed between the hindfoot and the midfoot.

After three years of follow-up the deformities were corrected (Image 2a). The radiograph of the right foot showed a calcaneal pitch of -24°, Meary angle 20° associated with dorsal dislocation of the tarsus, flat top talus, cavus anterior, and no adductus. The left foot had a calcaneal pitch of 0°, Meary’s angle -18°, additionally presented adductus of the forefoot (Image 2 b-c).

In economic terms, the total amount of the inversion of the right foot was 37.980.680 COP (meaning USD 10.023). On the other hand, the money invested in the Ponseti Method treatment for the left foot was 8.610.356 COP (tellingUSD 2.272). The difference in the value between the two feet was USD 7.751, being the right foot much more expensive compared to the left foot.

Discussion

Most cases of neglected clubfoot are reported in low and middle-income countries because of the social boundaries to accessing health services and timely treatment.13,14 The first consultation of the presented patient was at the age of 16, despite having a severely impaired gait and quality of life.

Treatment for neglected clubfoot in adults is a challenge for surgeons due to the complexity of the multi-apical deformities. Soft tissue restrictions, chondral defects, and pressure injuries secondary to improper foot support lead to unsuitable shoe fitting. Many surgical alternatives, including wide releases with subsequent stiffness, a high risk of neurovascular complications, and skin necrosis, have been described in the treatment of neglected clubfoot. Normal foot anatomy with these interventions is not guaranteed.7,8,12,13,14
Clubfoot recurrence rate with surgical management reaches 25% in some series. Results have been considered poor in half of the patients 25 years after the intervention. These results gave rise to the Ponseti Method as an alternative to treat those patients, showing a lower rate of complications and overcorrection. Studies have also reported some series. Results have been considered poor in half of the patients with values more similar to the foot treated with an Ilizarov external fixation treatment. C. X-ray of the left foot treated with Ponseti method, joint relationships are almost normal.

Ponseti Method, compared to the external fixation, is more cost-effective to the health system, an item that is especially important to low and middle-income countries. As we reported in our case, the difference in the value between the two feet was USD 7,751. As Grimes et al. said, the average cost of the Ponseti treatment was USD 167 per patient, which is less than a tenth of the cost of many other treatment modalities currently used. Hussain et al. established the same pattern in Pakistan. This group reported that the Ponseti Method was the dominant clubfoot treatment method, with an incremental cost-effectiveness ratio of $1,225.

**Conclusion**

The Ponseti Method should be considered an excellent and accessible option to treat neglected clubfoot, especially in low and middle-income countries. This treatment has shown economic, social, and health advantages over the surgical treatment of neglected clubfoot. Studies with a higher level of evidence and sufficient power should be performed in patients with neglected clubfoot to assess whether the Ponseti method is superior to standard treatment.

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**Ethical considerations**

The patient gave her written informed consent to use the medical history and photos in this publication.

**Informed Patient Consent**

Complete written informed consent was obtained from the patient for the publication of this study and accompanying images.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**References**


