Congenital vertical talus open reduction surgery: Technique description and our twenty-years personal experience

Federica De Rosa, Giorgio Cecarini, Cristina Lazzotti, Daniele Sini, Carlo Origo

Orthopedics Department, SS. Antonio e Biagio e Cesare Arrigo Children's Hospital, Alessandria, Italy

Abstract

Congenital vertical talus foot is a complex deformity, characterized by a dislocation of the talus-calcanear navicular joint. It is a rare form of congenital flat foot, where the hindfoot is valgus and equine, the midfoot dorsiflexed and the forefoot abducted. Regardless of the type of classification, the therapeutic approach and prognosis must take into account the functionality and motility of the foot. Initial treatment is manipulative. After 3 months of age, it is possible to think about soft tissue surgery. In this study, we present congenital vertical talus feet treated at the Pediatric Orthopedics Department of SS. Antonio Biagio and Cesare Arrigo Children's Hospital of Alessandria from 1995 to 2022. All 8 patients (12 feet) underwent through the surgical operation technique of open reduction described by Tachdjian and further reviewed and subjected to the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score. The mean follow up is 13 years. Global functional result was good and surgery allowed the growth of the foot, which would otherwise be blocked by an ax that is the vertical talus. Questioned remotely, all patients perform sporting activities and wear normal footwear.

Correspondence: Federica De Rosa, Orthopedics Department, Children's Hospital, Azienda Ospedaliera SS. Antonio e Biagio e Cesare Arrigo, Spalto Marengo 46, 15121 Alessandria, Italy.
E-mail: federica.derosa@ospedale.al.it

Key words: Congenital vertical talus; open reduction; AOFAS score.

Contributions: All the authors gave substantial contributions to the conception, design of the work, the acquisition, analysis, and interpretation of data for the work; all the authors contributed equally drafting the work and CO, the Department Chief, revised it critically for important intellectual content; the work had the final approval of the version to be published of all the authors; all the authors reached an agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of interest: The Authors declare no conflict of interest.

Availability of data and materials: All data generated or analyzed during this study are included in this published article.

Ethics approval and consent to participate: The study is conformed with the Helsinki Declaration of 1964, as revised in 2013, concerning human and animal rights. All patients participating in this study signed a written informed consent form for participating in this study.

Informed consent: Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

Received for publication: 30 September 2022.
Revision received: 17 October 2022.
Accepted for publication: 17 October 2022.

Publisher's note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article or claim that may be made by its manufacturer is not guaranteed or endorsed by the publisher.

Licensee PAGEPress, Italy
La Pediatria Medica e Chirurgica 2022; 44(s1):292
doi:10.4081/pmc.2022.292

Introduction

Congenital vertical talus foot (rocker bottom foot) is a complex deformity, characterized by a dislocation of the talus-calcanear navicular joint. It is a rare type of congenital flat foot in which the forefoot is adducted, the midfoot is dorsiflexed, and the hindfoot is valgus and equine. One in 10,000 live births is the estimated prevalence, and 50% of these are "non-isolated forms," or forms linked to syndromes, genetic, or neurological disorders.[1]

There have been numerous classification proposals because not all congenital vertical talus feet share the same traits. The classification proposed by Coleman *et al.* is the most popular because it considers the only talus-navicular dislocation (type I) or the association with calcaneus-cuboid dislocation (type II).[2] No matter the classification, the therapeutic strategy and prognosis must consider the foot's functionality and motility.[3,4] A thorough medical history forms the basis of the diagnosis. The physical examination then focuses on the foot's "loss of movement," which is more accurately described as being non-reducible or non-propulsive. Always be done an X-ray. A gap between the talus and the cuneiform due to the scaphoid's dislocation, increased talus calcaneal divergence, and an external deviation of the foot with respect to the ankle can all be seen in the dorsoplantar projection.[5] However, the lateral projections in maximum dorsal or plantar flexion are crucial because they express the deformity's potential reducibility. In actuality, plantar flexion allows one to assess the forefoot's reducibility to the hindfoot while dorsiflexion examines the equinus' reducibility.[6]

Restoring the proper anatomical relationships between the talus calcaneus and the scaphoid is the treatment's goal. Early intervention is crucial because as time goes on, the retraction of the soft tissues becomes more structured and the bone deformity evolves, making non-operative correction impossible.

Initial treatment is manipulative. After 3 months of age, it is possible to think about soft tissue surgery. The surgical approach of reference is open reduction and fixation with K-wires.[7,8] On the other side, bony surgery, reserved for the worst cases, includes arthrodesis or multiplanar correction with external fixator.[9]

Materials and Methods

In this study, congenital vertical talus feet treated at the Pediatric Orthopedics Department of SS. Antonio Biagio and Cesare Arrigo Children's Hospital of Alessandria from 1995 to 2022 were analyzed. Meeting the inclusion criteria, the clinical and radiological data of 8 patients for a total of 12 feet were reviewed. Respectively 5 female and 3 male patients, in 4 children the involvement was bilateral, in the remaining 4 unilateral, with left-sided involvement in 3 out of 4. Six patients (10 feet) did not have positive familiarity or pathognomic signs for pathology syndromic or neurological, while a patient is suffering from oro-facio-digital syndrome and a child with VACTERL syndrome. The taking charge at our facility took place on average at the advanced 3rd year of age.

The mean follow up is 13 years.

Only the two infants were treated with corrective plaster casts.

Through only two surgical approaches (posterior and medial),[10] all patients underwent lengthening of the Achilles tendon, section of the calcaneosaphoid ligament, posterior capsulotomy, anterior and medial subtalar capsulotomy, T-capsulotomy of the talus-scaphoid joint, open reduction of the talus-calcaneus-navicular joint, fixation with Kirschner wires (one longitudinal along the inner column and one vertical between talus and calcaneus), capsular retensioning of the talus-scaphoid joint and legamente, shortening suture of the posterior tibial tendon according to the technique described in Tachdjian's Pediatric Orthopedics.[4] The average age at surgery was 3 years and 8 months. At follow up only 2 patients (3 feet) were treated by exosenotarsal calcaneus stop arthrosis for flat foot in the pre-adolescent age. Solely one foot received arthrodesis of the mid-tarsal joint at the age of 14. For the remaining 9 feet (75%) no subsequent surgical operation was necessary.

All patients were further reviewed and subjected to the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score.[11] Global functional result was good with a minimum value of 89 for 3 feet, 91 for 1 foot, 95 for 3 feet and 100 for the remaining 3 feet examined (Figure1, 2, and 3).

Discussion

The goal of the treatment of congenital vertical talus foot is to restore the correct anatomical relationships between the talus, calcaneus and the scaphoid, considering the talus as the fulcrum, therefore the reduction of the calcaneus and navicular must be sought around to the talus. Treatment must be as early as possible, since the retraction of the soft parts tends to structure and the bone deformity becomes evolutionary, making non-operative correction impossible. While always keeping in mind that a complete correction of the deformity cannot be achieved, the initial manipulative treatment aims to reduce stiffness and make the need for subsequent surgical treatment easier. Surgery before skeletal maturity must be dosed case by case, skillfully combining approaches on the soft parts and the skeleton, remembering that no technique is exempt from the risk of stiffness, hyper or hypocorrection and evolutionary degenerative arthrosis.

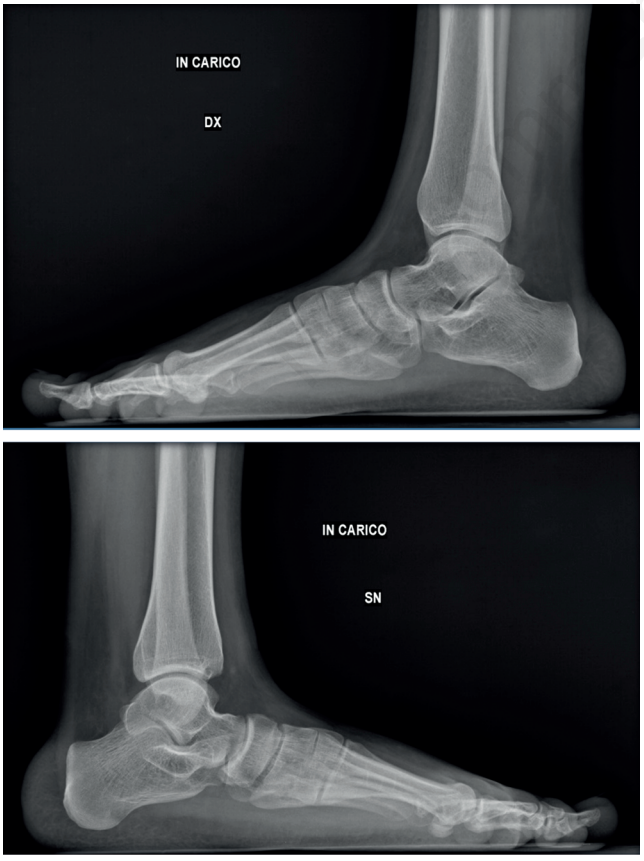

Figure 1. X-ray 25 years after surgery.

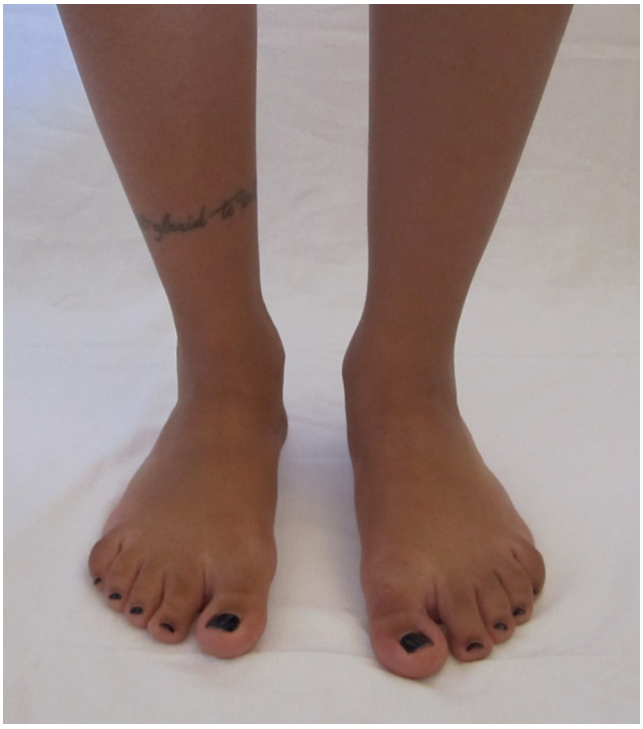

Figure 2. Clinical picture 25 years after surgery.

Category	Criteria	Points
Pain (40 points)		
	None	40
	Mild, occasional	30
	Moderate, daily	20
	Severe, almost always present	0
Function (50 points)		
Activity limitations, support requirement		
	No limitations, no support	10
	No limitation of daily activities, limitation of recreational activities, no support	7
	Limited daily and recreational activities, can	4
	Severe limitation of daily and recreational activities, walker, crutches, wheelchair, brace	0
Maximum walking distance, blocks		
	Greater than 6	5
	4-6	4
	1-3	2
	Less than 1	0
Walking surfaces		
	No difficulty on any surface	5
	Some difficulty on uneven terrain, stairs, inclines, ladders	3
	Severe difficulty on uneven terrain, stairs, inclines, ladders	0
Gait abnormality		
	None, slight	8
	Obvious	4
	Marked	0
Sagittal motion (flexion plus extension)		
	Normal or mild restriction (30° or more)	8
	Moderate restriction (15° - 29°)	4
	Severe restriction (less than 15°)	0
Hindfoot motion (inversion plus eversion)		
	Normal or mild restriction (75%-100% normal)	6
	Moderate restriction (25-74% normal)	3
	Marked restriction (less than 25% normal)	0
Ankle-hindfoot stability (anteroposterior, varus-valgus)		
	Stable	8
	Definitely unstable	0

AOFAS Ankle-Hindfoot Scale, Subjective Portion (90 points total)

Figure 3. AOFAS functional form from The American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score. Figure from Leigheb *et al.*[11]

Conclusions

An intricate and pernicious deformity is congenital vertical talus foot. A correct diagnosis is crucial. The goal of the early manipulative and surgical gestures are adapted case-by-case to the various clinical presentations, but the final goal remains to give the child a foot that is "propulsive". Post-operative X-rays are rarely satisfactory, and occasionally invasive surgical procedures are needed, which are now rarely used for other pathologies. However, the functional outcome, as shown by the renowned AOFAS score, provides us with justification. By using the Heyman-Herndon technique, we were able to expand the foot, which would have otherwise been prevented by the vertical talus, which acts as an "ax".

References

1. Miller M, Dobbs MB. Congenital vertical talus. J Am Acad Orthop Surg 2015;23:604-11.
2. Giannini S, Girolami M, Bertelli R. Il piede astragalo-verticale congenito. Progressi in Medicina e Chirurgia del Piede, Aulo Gaggi Editore, Bologna. 1991; 91- 93.
3. Alaee F, Boehm S, Dobbs MB. A new approach to the treatment of congenital vertical talus. J Child Orthop 2007;1:165-74.
4. Badgley CE. Primary and secondary deformities. Instructional Course Lectures 1953;10:147.
5. Coleman SS, Stelling FH 3rd, Jarrett J. Pathomechanics and treatment of congenital vertical talus. Clin Orthop Relat Res 1970;70:62-72.
6. Harris EJ. The oblique talus deformity. What is it, and what is its clinical significance in the scheme of pronatory deformities? Clin Podiatr Med Surg 2000;17:419-42.
7. Herring JA. Disorders of the foot. In: Tachdjian's pediatric orthopaedics. 3rd edition. Volume 1. Texas: W.B. Saunders Company; 2022. pp. 968-73.
8. Viladot Voegeli A, Viladot Pericé R. Lecciones sobre patologia del pie Mayo Ediciones, 2009.
9. Dobbs MB, Purcell DB, Nunley R, Morcuende JA. Early results of a new method of treatment for idiopathic congenital vertical talus. J Bone Joint Surg Am 2006;88:1192-200.
10. Mazzocca AD, Thomson JD, Deluca PA, Romness MJ. Comparison of the posterior approach versus the dorsal approach in the treatment of congenital vertical talus. J Pediatr Orthop 2001;21:212-7.
11. Leigheb M, Janicka P, Andorno S, et al. Italian translation, cultural adaptation and validation of the "American Orthopaedic Foot and Ankle Society's (AOFAS) ankle-hindfoot scale". Acta Biomed 2016;87:38-45.