International Journal of Research in Orthopaedics
Chauhan P et al. Int J Res Orthop. 2017 Mar;3(2):197-201
http://www.ijoro.org

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20170031

Management of congenital vertical talus: comparison between mini invasive reduction and extensive surgical technique in early age

Prakash Chauhan[1]*, Sharvil Gajjar[2]

[1]Department of Orthopedics, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat, India
[2]Department of Orthopedics, Government Medical College, Surat, Gujarat, India

Received: 19 December 2016
Revised: 02 January 2017
Accepted: 06 January 2017

***Correspondence:**
Dr. Prakash Chauhan,
E-mail: drpiyushpujara@gmail.com

ABSTRACT

Background: About one baby in 10,000 is born with the foot deformity known as vertical talus. In about half of those cases, both feet are affected. The disorder occurs with equal frequency in boys and girls. Vertical talus is a rare deformity of the foot which is diagnosed at the time of birth.
Methods: Present study was performed at Department of Orthopedics, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat. In the study 40 patients who were treated for unilateral or bilateral congenital vertical talus at a single institution which lead to 60 treated feet in the study. Patient with bilateral symptoms were randomly selected for one foot in the study.
Results: The mean normative pain score was found to be 58.0 in the minimally invasive group compared with 28 in the extensive release group (p =0.032). There was no difference between the two groups in the transfer and basic mobility domain. The normative global function domain was higher in the minimally invasive group (48.3) compared with the extensive soft-tissue release group (34.3, p =0.03).
Conclusions: Longer-term follow up and studies with large sample size are still necessary to determine whether the improved outcomes are maintained into the adulthood and whether the superior outcome is related to the reduce scarring in the patient.

Keywords: Vertical talus, Congenital, Invasive group, Extensive surgery

INTRODUCTION

About one baby in 10,000 is born with the foot deformity known as vertical talus. In about half of those cases, both feet are affected. The disorder occurs with equal frequency in boys and girls.[1] Vertical talus is a rare deformity of the foot which is diagnosed at the time of birth. Because babies are born with the condition, it is also known as congenital vertical talus. It is one of the causes of a flatfoot in the new born. One foot, or both feet, may be affected. Although it is not painful for the new born or even the toddler, if it is left untreated, vertical talus can lead to serious disability and discomfort later in life.[2]

The talus (TAY-lus) is a small bone that sits between the heel bone (calcaneus) and the two bones of the lower leg (tibia and fibula). The tibia and fibula sit on top and around the sides of the talus to form the ankle joint. The talus is an important connector between the foot and the leg, helping to transfer weight across the ankle joint.[2]

In vertical talus, the talus bone has formed in the wrong position and other foot bones to the front of the talus have

shifted on top of it. As a result, the front of the foot points up and may even rest against the front of the shin. The bottom of the foot is stiff and has no arch — in fact, it usually curves out — and is often described as "rocker bottom.[3]

Vertical talus is usually diagnosed at birth (perhaps even before birth if an ultrasound is performed during the pregnancy). Other foot deformities in the new born are more common and vertical talus is often initially misdiagnosed as some other type of new born flatfoot, or even as a clubfoot.[4]

The exact cause of vertical talus in not known. Many cases of vertical talus, however, are associated with a neuromuscular disease or other disorder, such as arthrogryposis, spina bifida, neurofibromatosis, and numerous syndromes. Your doctor may decide to perform additional tests to discover whether your infant has any of these other conditions. Most cases of vertical talus are idiopathic, meaning the cause is unknown. Sometimes it is associated with abnormalities in the chromosomes.[5] These abnormalities result in a syndrome or neuromuscular disorder that in turn disrupts the foot's structure. A medical examination or blood test usually determines whether or not the condition is idiopathic. However, there is increasing evidence that these unknown causes are related to defects in genes involved in early limb development.

Prevention of vertical talus is not possible. It is unlikely that anything you did during pregnancy could have caused the disorder. Although the most common treatment for vertical talus is surgery, your doctor may recommend a trial of nonsurgical treatment. This includes a series of stretching and casting designed to increase the flexibility of the foot and even in some cases correct the deformity all together. Some doctors also recommend continued physical therapy exercises to stretch the foot and improve flexibility.[6]

Several authors beginning with Osmond-Clark in 1956, Herndon and Heyman in 1963, and Coleman in 1970, described a staged, 2-incision reconstructive surgery.[7,8] After noting a high rate of complications with the two staged procedure, Ogata and Hoenecker recommended a single stage procedure with a medial approach. In 1987, Seimon described a single stage dorsal approach with the talonavicular joint reduced and held with k-wire and the Achillis tendon lengthened percutaneously.[9,10] Stricker and Rosen, have published their experience with this technique, as have Mazzocca and Thomson, and both groups have noted excellent results with minimal complications.[11] Dunacn and Fixsen transferred tibialis anterior to the neck of talus and claimed good results.[11]

The challenge in treating vertical talus is how to best achieve the desired outcome of a mobile, plantigrade, pain free, and functional foot. Bracing and/or shoe modifications alone do not provide correction and often result in pain and long-term disability. The traditional surgical approach involving extensive soft-tissue release, while effective for gaining initial correction in many cases, is associated with several potential complications, including wound necrosis, osteonecrosis, inadequate correction of the deformity, stiffness of the ankle and subtalar joints, and amputation in extreme cases.[12] A minimally invasive technique for correcting vertical talus that relies primarily on serial casting was introduced almost ten years ago. Multiple centers have reproduced the effectiveness of this technique in achieving initial correction (both radiographically and clinically), while maintaining excellent motion in the foot and ankle, for patients with both isolated and non-isolated vertical talus.[12] In the present study, we compare the long-term outcomes of clinical and radiographic correction, foot function in patients with vertical talus treated with either the minimally invasive method or extensive soft-tissue release surgery.

METHODS

Present study was performed at Department of Orthopedics, Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat between January 2014 to November 2014. Ethical clearance was taken from the institutional ethics board and informed consent was obtained from all the participants in the study 40 patients who were treated for unilateral or bilateral congenital vertical talus at a single institution which lead to 60 treated feet in the study. Patient with bilateral symptoms were randomly selected for one foot in the study. For the study following were kept the inclusion criteria which were as follows: 1) Diagnosis of vertical talus confirmed by lateral radiograph and 2) follow up period of three years was achieved after treatment. X-ray in maximum dorsiflexion and maximum planter flexion lateral view of foot was taken. Based on the criteria out of 40 patients we could include 30 patients only. Rest of the patients were lost in follow up period for some or the other reason. Exclusion criteria were as follows: 1) children with oblique talus deformity because they do not require any treatment, 2) postoperative radiograph lost, 3) patients lost on follow up parents did not signed the consent form and 4) Patients with neurological disorders (e.g. cerebral palsy, myelomeningocele, spinal dysmorphism, etc.)

In the present study the demographics of the patients were recorded. The patients were divided into two groups one is patients who underwent minimum invasive group and other is patient undergoing extensive release group. The choice of treatment was purely based on the decision of the surgeon only. The average age in the group of minimum invasive technique was found to be 8.4 months and that for extensive release group was found to be 18.9 months. The mean follow up period was found to be 3 years.

Radiographs of the feet were made at the time of clinical diagnosis and post treatment period. Later on the follow

up period the lateral radiograph were made. The examiner in the study were not aware of the type of treatment underwent by the patients. Radiographic angles were measured twice by the same examiner and the mean of the two measurements were recorded. With the help of hand held goniometer ankle range of all patients was measured by the examiner. Paediatric outcomes data collection instrument questioner was completed by the parents or guardian. Standardized scores are raw scores on the range of 0 to 100, with 100 being the best possible score; to make the scores comparable across various scales, the normative score was calculated on the basis of data from the general healthy population, which has a mean normative score of 50. Thus, a patient scoring >50 is above the mean of the general healthy population.

Figure 1: Preoperative radiograph.

Figure 2: Postoperative radiograph.

Statistical analysis

Preoperative and postoperative limb-specific range of motion and preoperative radiographic measurements were compared for the two combinations of treatment method utilized using one-way analysis of variance (ANOVA). When the overall model was significant ($p < 0.05$), least-squares means were used to perform all pairwise between-group comparisons, with particular interest in the comparison between the two treatments for vertical talus. Within the ANOVA, a statistical contrast was used to test the a priori hypothesis that values for the minimally invasive method were similar to those for the extensive-surgery group.

RESULTS

On the basis of the demographic of the patients following details were noted. Out of the 30 patients included in the study, 16 were males and 14 were females. Eighteen patients were included in the minimally invasive group and twelve patients were included in the extensive soft-tissue release group provided PODCI data. At the end when the evaluation of the PODCI scores was done it was found that PODCI scores for pain were better in minimally invasive group as compared to extensive surgical group. The mean normative pain score was found to be 58.0 in the minimally invasive group compared with 28 in the extensive release group ($p = 0.032$). There was no difference between the two groups in the transfer and basic mobility domain. The normative global function domain was higher in the minimally invasive group (48.3) compared with the extensive soft-tissue release group (34.3, $p = 0.03$).

Radiographic values

Preoperative radiographic values were similar between the two treatment method groups ($p > 0.18$ for all variables). The correction of hind foot valgus (anteroposterior talar axis-first metatarsal base angle) was greater in the minimally invasive group (37.1^0 versus 25^0, $p = 0.043$). The correction of all other radiographic values was similar for both treatment method groups ($p > 0.1$ for all variables). No other complications or abnormality were found in the patients of both the groups.

Table 1: Demographic distribution of the patients in the study.

Sex	Number
Male	18
Females	12
Total	30

Table 2: Mean age of the patients of individual groups.

Groups	Means age
Minimum invasive	8.4 months
Extensive surgery	18.1 months

Table 3: Postoperative PODCI scores.

	Minimally invasive	Extensive surgery	P value
No. of patients	18	12	
Pain	58	27	0.032*
Transfer & basic mobility	43.2	46.8	0.61
Global function	46.4	30.2	0.035*

* indicates statistical significance at $p \leq 0.05$

DISCUSSION

Congenital vertical talus, also known as congenital convex pes valgus, is an uncommon foot deformity that is present at birth and has an estimated incidence of 1 in 10,000. It is characterized by a fixed dorsal dislocation of the navicular on the talar head and neck resulting in a rigid flatfoot deformity.[13] It occurs as an isolated deformity (idiopathic) in approximately half of all cases and is associated with neuromuscular and genetic disorders in the remaining cases. Fifty percent of children have bilateral involvement and there is no sex predilection. Left untreated a congenital vertical talus cause's significant disability long term. Ambulation is usually not delayed but the gait is usually awkward with difficulty balancing.[14]

The main purpose of the treatment of the vertical talus is to restore the normal anatomical relationships between the talus, navicular, & calcaneus. Most of the treatment protocols have been involving more complex reconstructive procedures that is either one-stage or two-stage procedures.[11] However, these extensive procedures also been linked with a large number and variety of complications such as talus avascular necrosis, stiffness of ankle and subtalar joint, pseudoarthrosis, and under correction of the deformity that may require to undergo secondary procedures.[15]

The minimally invasive method to treat vertical talus was developed to provide an alternative surgical approach so that a more mobile, functional foot could ultimately result. In the current study, we used clinical, radiographic, and functional outcomes to demonstrate the ability to achieve correction using the minimally invasive method for isolated and non-isolated vertical tali and to maintain it at a mean follow-up of seven years.

Since Seimon published his original article, there have been no further published studies assessing the efficacy of the technique, to our knowledge.[10] Instead, more extensive soft tissue release procedures have been developed. Although good correction can be achieved with these extensive surgical procedures, long-term problems are reported, including stiffness of the ankle and subtalar joints. Patients with clubfoot treated with extensive soft-tissue releases have similar long term problems, and this recognition contributed to the popularity of the minimum invasive method of clubfoot management

Furthermore, we were able to show that patients treated with the minimally invasive method had better long-term foot flexibility and pain scores compared with those treated with extensive soft tissue release surgery. It would now be difficult to perform a prospective study, as the minimally invasive method has become the standard of care for initial treatment of vertical talus because of the more favourable short-term results.

CONCLUSION

The minimally invasive treatment method for vertical talus did provide with better long-term ankle range of motion and pain scores compared with extensive soft-tissue release surgery. Longer-term studies are still necessary to determine whether the improved outcomes are maintained into the adulthood and whether the superior outcome is related to the reduce scarring in the patient.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Harris EJ. The natural history and pathophysiology of flexible flatfoot. Clin Pediatr Med Surg. 2010;27:1-23.
2. Kim H, Weinstein S. Flatfoot in children: Differential diagnosis and management. Curr Orthopaed. 2000;14:441-7.
3. Khan K, Brown J, Way S, Vass N, Crichton K, Alexander R, et al. Overuse injuries in classical ballet. Sports Med. 1995;19:341-57.
4. Horan F, Beighton P. Orthopaedic problems in inherited skeletal disorders. Springer Sci & Business Media. 2012.
5. Graham Jr JM, Sanchez-Lara PA. Smith's recognizable patterns of human deformation. Philadelphia: Elsevier Health Sciences; 2015: 79-82.
6. Cummings RJ, Davidson RS, Armstrong PF, Lehman WB. Congenital clubfoot. J Bone Joint Surg Am. 2002;84:290.
7. Jacobsen ST, Crawford AH. Congenital vertical talus. J Ped Orthopaed. 1983;3:306-10.
8. Coleman SS, Stelling III FH, Jarrett J. Pathomechanics and treatment of congenital vertical talus. Clin Orthopaed Rel Res. 1970;70:62-72.
9. Ogata K, Schoenecker PL, Sheridan J. Congenital vertical talus and its familial occurrence: an analysis of 36 patients. Clin Orthopaed Rel Res. 1979;139:128-32.
10. Seimon LP, Orth MC. Surgical correction of congenital vertical talus under the age of 2 years. J Ped Orthopaed. 1987;7:405-11.
11. Hegazy MM, Ismail SM, Hassan AS, Hantera IS. New Technique for the Single Stage Management of Congenital Vertical Talus by Percutaneous Tenotomies, Open Talonavicular Reduction and Percutaneous K-Wire Fixation. Med J Cairo Univ. 2015;83:265-73.
12. Yang JS, Dobbs MB. Treatment of congenital vertical talus: comparison of minimally invasive and extensive soft-tissue release procedures at minimum five-year follow-up. J Bone Joint Surg Am. 2015;97:1354-65.

13. 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.
14. Alaee F, Boehm S, Dobbs MB. A new approach to the treatment of congenital vertical talus. J Children's Orthopaed. 2007;1:165-74.
15. Hamblen DL, Simpson H. Adams's outline of orthopaedics. 11th edition. UK: Elsevier Health Sciences; 2009: 51,170.

Cite this article as: Chauhan P, Gajjar S. Management of congenital vertical talus: comparison between mini invasive reduction and extensive surgical technique in early age. Int J Res Orthop 2017;3:197-201.