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RESEARCH ARTICLE

Atypical clubfoot :Early Identification and treatment by modification of standard Ponseti technique .

Anil Gupta[1], Aamir Hakak[2] ,Rajinder Singh[3], Abdul Ghani[4],Javaid Ahmad[5]

1. Head of department, Department of Orthopaedics, Government Medical College, Jammu.
2. Resident, Department of Orthopaedics, Government Medical College, Jammu.
3. Associate Professor,Department of Orthopaedics, Government Medical College, Jammu.
4. Assistant Professor,Department of Orthopaedics, Government Medical College, Jammu.
5. Resident, Department of Orthopaedics, Government Medical College, Jammu.

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Corresponding Author

Anil Gupta

Abstract

Title: Atypical Clubfoot: Early Identification and treatment by modification of standard Ponseti technique.

Introduction:
Atypical clubfoot is a clinical variant of idiopathic clubfoot which requires early detection by the orthopaedician and modification in the standard protocol of treatment as described by Ponseti. The goal of treatment is to reduce or eliminate its four components so that the patient has a functional foot and leads a normal life.

Material and methods:
We identified 16 patients with 16 idiopathic atypical clubfoot deformity .Clinically, atypical clubfeet is defined as having rigid equinus, severe plantar flexion of all metatarsals, a deep crease above the heel, a transverse crease in the sole of the foot, short foot and a short and hyperextended first toe.

Results: Correction was achieved in all patients by modifying the standard Ponseti manipulation and casting technique. The mean number of casts that were applied to obtain correction was 7 (range four to nine casts). Tenotomy was done in all feet. At the time of last follow up all the feet were considered clinically cured.

Conclusion: Modified Ponseti method is a safe and effective treatment for congenital idiopathic atypical clubfoot and radically decreases the need for corrective surgery

INTRODUCTION

Over the course of treatment of idiopathic clubfoot by ponseti technique some feet show resistance to treatment. These feet have typical features like short foot, smaller great toe, deep planter crease. These feet are not usually identified by orthopaedicians initially but over the course of treatment these features become more apparent. Turco (1994) advised against surgery in these feet. He classified them as atypical clubfeet.Ponseti et al.(2006)advised about change in his standard treatment in these feet . We performed these modifications in the standard Ponseti technique of manupulations and casting to see whether this modified treatment regimen would result in correction and maintenance of the correction for these atypical clubfeet.

Materials and methods :

Sixteen patients with 16 clubfeet were chosen. They were classified as atypical clubfeet as they showed resistance to standard casting technique and had following features: feet were short and stubby, deep crease present over sole of foot , deep crease above the heel, sever equinus and supination,forefoot in adduction and planterflexion of all metatarsals.(figure 1)

There were 10 boys and 6 girls. Average age of patients was 3.2 months (range 1- 5 months). Treatment had been started in our institute and from outside by applying plaster casts. In some cases outside the institute below knee casts had been applied. We excluded syndromic clubfoot & clubfoot associated with neuromuscular disorders.The average follow-up was for 2 years (range 1 to 3 years). In all these patients plaster casts were applied. In some cases who had been treated outside our institution below knee casts had been applied (range 4- 18) .

In all these cases standard ponseti technique was modified. Correct identification of talar head is paramount. It is done by moving index finger and thumb down medial and lateral malleoli and then grasping the head of talus. With the other hand forefoot is abducted which causes movement at Talo-calcaneo-navicular joint and thus in the precise identification of talar head. In these cases anterior process calcaneum is prominent and can be mistaken for head of talus which lies above the anterior process of calcaneum. Abduction is done by putting thumb on lateral aspect of head of talus. Index finger of same hand is put behind lateral malleolus. Using thumb and index finger of other hand abduction is done.(figure 2)

Abduction is done upto 20 to 40 degrees only. Standard abduction of 70 degrees is not done. Abduction is always kept less than 40 degrees. Abduction beyond 40^0 leads to abduction at tarsometatarsal joints and thus disruption of this joint. While abduction is being done , the foot usually come s into alignment with the long axis of the leg. This usually leads to slippage of cast which may cause foot edema and skin excoriation. To prevent this we applied the cast with the knee bent to 110^0 . Proper moulding of the cast was also performed. To prevent bunching of excessive cast behind the knee, we applied slab of cast anteriorly on the knee to strengthen the cast. A similar slab was applied behind ankle. When desired abduction was obtained , the metatarsals were still severlyplanterflexed. Here another modification was performed. Thumbs of both hands were placed under the heads of 1^{st} and 5^{th} metatarsals. Index fingers of both hands were placed dorsally over the talar head and dorsiflexion of metatarsals and ankle was performed(figure 3).Tenotomy was performed in all cases at 1.5cm above the posterior deep crease. Post tenotomy dorsiflexion of $5^0 – 10^0$ was usually obtained. Post tenotomy cast was applied for 3 weeks. If ankle dorsiflexion of less than 5^0 was obtained post tenotomy than cast was applied for 1 week only and a new cast was applied weekly with increasing dorsiflexion till 5^0-10^0 of dorsiflexion was obtained. Following cast removal Dennis Brown splint was applied. Feet were kept at 40^0 abduction on both normal and affected sides unlike standard Ponsetiprotocol , where feet are kept at 70^0 abduction on affected side and 45^0 abduction on normal side (figure 4). Brace was applied for 23 hours for first 3 months. During the hour when the brace was removed two exercises were performed. One , the child was made to squat for 10 minutes. Second, the parent passively dorsiflexed the affected foot for 10 minutes. Following initial 3 months in brace,weaning from brace was done with 2 hours of bracing time reduced every month until night time bracing (12 hours) was started and was advised to be kept for 3-4 years.

Results

The average age of the patients at the start of treatment was 3.2 months(range, 1-5 months). All the twenty patients had unilateral clubfoot.The mean number of cast that were applied to obtain correction was 7 (range four to nine casts). Percutaneous tendo Achilles tenotomy to correct the residual equinus deformity was done in all patients .The average follow-up was for 2 years (range 1 to 3 years).At the last followup, all feet were well corrected (figure 5) with mean ankle dorsiflexion of 15° (range, 10°–20°).

Figure 1: The photographs show a three and half month-old infant with atypical clubfoot. Atypical clubfeet have a characteristic rigid equinus and a short and hyperextended first toe, transverse crease in the sole of the foot and another deep crease above the heel.

Figure 2 : A photograph shows the hand position for manipulating and holding an atypical clubfoot. The index finger should rest over the posterior aspect of the lateral malleolus while the thumb of the same hand applies counter pressure over the lateral aspect of the head of the talus

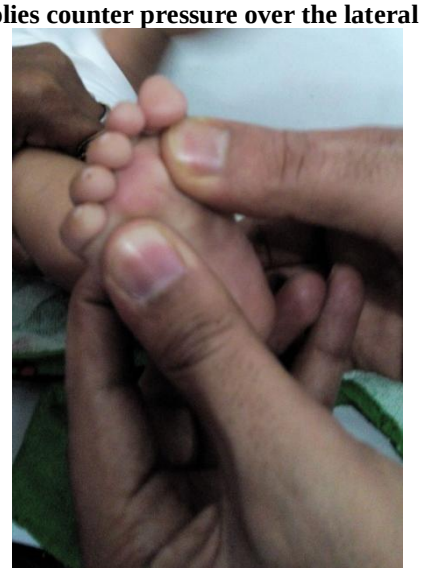

Figure 3 : A photograph showing modification of Ponseti method. Metatarsals are being extended by two thumbs over heads of 1st and 5th metatarsals. Heel is also being dorsiflexed.

Figure 4: clinical photograph showing dennis brown splint applied with both feet in 40^{0} abduction.

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Figure 5 : clinical photograph showing correction of deformity of atypical clubfoot on right side.

Discussion

Orthopaedicians have been treating idiopathic clubfoot successfully using Ponseti technique (Chotel et al.,2002; Colburn and Williams,2003) . However there is a small subset of clubfoot which does not correct or shows resistance to correction by standard Ponseti method. These feet are short and stubby. The hindfoot is in severe equinus and varus .The calf muscles are small and the tendoAchillis is long, wide, and tight. The forefoot is adducted and all metatarsals are in severe plantar flexion. There is a deep crease across the sole of the foot and another above the heel. The great toe is short and in dorsiflexion.

Applying casts by standard Ponseti methods leads to grotesque deformities in these cases. There develops hyperabduction of forefoot at tarso-metatarsal joint but caves and equinus do not get corrected. There occurs slippage of cast causing sores over boney prominences and edema of the foot.

This type of clubfoot is difficult to treat and requires modification of standard Ponseti technique. Adduction of forefeet should not be corrected beyond 40^0 to prevent hyperabduction at tarso-metatarsal joint. Adduction should be corrected by keeping thumb on lateral aspect of talar head and index finger of same hand behind lateral malleolus. This also corrects heel varus. Once the heel varus is corrected, the planter-flexed forefoot and the equinus are corrected simultaneously by forcefully dorsiflexing the metatarsals with both thumbs while keeping index fingers of both thumbs on dorsal aspect of talar head. The cast is re-enforced by applying a posterior slab behind the ankle. To prevent the cast from slipping , knee is immobilized at 110^0 of flexion and it is re-enforced with a slab applied anteriorly over the knee. A tenotomy is performed before applying the last plaster castto facilitate correction of anunyielding equinus.

Our study had some limitations. First a small number of patient group was chosen. Second , follow up of patients was for smaller duration of time. A longer duration of follow up is required to see the rate of relapse in the patients. Third , radiographic follow up to see boney correction was not done. This limits our assessment of radiographic correction but not clinical correction.We have found that the foot's shape, length, and dorsiflexion improves a few months after correction therefore, we have not found it necessary to obtain radiographs. Also at the time of last follow up all the feet were considered clinically cured. We also did not use severity scoring system because most of the thechildren had been refered to us for further treatment. Therefore, we have no information regarding initial severity. We do not know the precise number or sorts of manipulations and castings performed because we relied mainly on information from the parents. Therefore, we cannot conclude whether the treatment failed due to improper manupulations or the rigidity of feet themselves.

Thus our experience shows that an orthopaedic surgeon requires to be vigilant in order to identify an atypical clubfoot. There is need of modification of standard Ponseti techniquein case of atypical clubfeet.This modificationessentially corrects the deformity thus obviating the need for surgery in most children. Once an atypical clubfoot is corrected,the foot develops normally.

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