

Ponseti method for treatment of congenital club foot

Abdulnasser Ahmed Al-Wali

Department of Orthopedic Surgery, Faculty of Medicine and Health Sciences, Aden, Yemen

Correspondence to Abdulnasser Ahmed Al-Wali, MD, Department of Orthopedic Surgery, Al-Gamhoria Teaching Hospital, Aden, Yemen
 Fax: +967 2 345405;
 e-mail: alnasser@y.net.ye

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Objective

In the present study we aimed to present the experience with the Ponseti technique for correcting club foot deformity in children at the Al-Gamhoria Teaching Hospital Aden, Yemen.

Patients and methods

The current study was a prospective study for the treatment of idiopathic club foot deformities, grades II, III and IV. The study was carried out at Al-Gamhoria Teaching Hospital, Aden City, Yemen. A total number of 122 feet, of 72 patients, were treated (50 bilateral and 22 unilateral). Out of 72 patients, 47 were boys and 25 were girls. The mean age was 6 months (range 2 weeks–38 months). The patients had not received any treatment prior to this. The patients had manipulation casting in accordance with the Ponseti technique. Percutaneous Achilles tenotomy was performed in the presence of persistent equinus. Maintenance of correction was obtained with the use of a locally custom-made orthopedic shoe. The mean follow-up period was 21 months (range 10–46 months).

Results

A total of 103 feet (84%) were treated successfully using the Ponseti method of casting with locally custom-made orthopedic shoes. Nineteen feet had relapse of one or more of the deformities. They required either further casting or surgeries.

Conclusion

The Ponseti method proved efficient in correcting the idiopathic congenital club foot deformities, and that the problem of abduction brace can be overcome by using physiotherapy and orthopedic shoes designed for club foot.

Keywords:

congenital club foot, idiopathic club foot, Ponseti method

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Introduction

Congenital club foot is a complex deformity that is difficult to correct. It has a tendency to recur until the age of 6 or 7 years. The deformity has four components: equinus, varus, adductus, and cavus. The aim of our study was to eliminate these deformities so that the patient has a functional, pain free, plantigrade foot, with good mobility and without calluses, and that he need not wear the modified shoes [1].

There is nearly universal agreement that the initial treatment of idiopathic congenital club foot should be nonoperative, regardless of severity of the deformity. Today, nonoperative treatment typically involves serial gentle manipulation followed by the application of a short or long leg cast in weekly intervals [2].

While these techniques are the mainstay of nonoperative intervention in North America, physiotherapy and continuous passive motion without immobilization have been successfully used in France [2].

These methods have a potential to be successful when applied correctly, and authors have reported a success rate of 15–50% [2].

A notable exception is the Ponseti method, which involves serial manipulations, a specific technique of cast application, and a possible percutaneous Achilles tenotomy. The method is reported to have short-term success rates approaching 90% [3], and the long-term results have been equally impressive [3,4].

The unsatisfactory results associated with complete soft-tissue releases at 10–15 years of follow-up [5], and the long-term success reported with the Ponseti method have led to a renewed interest in this method.

Despite this interest, success with the Ponseti method when it has been used by other orthopedists has not been demonstrated so far [6]. We have been using this method since 2004, and in this study we shared our limited experience in using it at least to minimize the extent of surgeries, if required, which is a great goal in the developing countries.

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Patients and methods

Ours was a prospective study of treatment of 122 feet, of 72 patients, with idiopathic club foot deformities. All the cases had been treated at Al-Gamhuria Teaching Hospital, Aden, Yemen. The mean age was 6 months (ranged from 2 weeks to 38 months). The cases with deformities associated with arthrogyriposis, myelomeningocele, and other etiologies were not included in this study.

All the cases had not received any treatment before. The mean follow-up period was 21 months (10–46 months).

All the patients were classified according to Dimeglio *et al.* [7]. System for club foot: 58 had grade II (48%), 45 had grade III (37%) and 19 had grade IV (15%) deformity.

Grade I feet (mild deformities) were excluded from the study.

The correction of all the cases were initiated in the first 2 weeks after the first examination disregarding the age of the baby. During these 2 weeks, the parents were instructed how to properly massage and how to exercise the deformed foot. In all the cases the Ponseti instructions of correction and application of the casts were strictly followed.

The cavus was corrected first by supinating the forefoot and dorsiflexing the first metatarsal.

It was observed that forefoot and hind foot were aligned because of the correction of cavus [8]. Pronation of the foot was thus avoided carefully [8].

To correct the varus and abduction, the foot in supination had been abducted while counter pressure was applied with the thumb against the head of the talus. During the plaster casts, it was observed that the head of the talus had been reduced and gradually covered by navicularis, and abduction of the foot had decreased supination. However, the foot was never pronated. When the foot was completely abducted it had become plantigraded and simultaneously the calcaneus became everted.

Consequently, varus of the calcaneus had been corrected. During the manipulation touching the calcaneocuboidal joint or the heel was avoided so that the calcaneus could be corrected freely.

On each follow-up, with an interval of 7 days after removing the plaster of Paris, a 2–3 min gentle manipulation was applied before the new plaster cast was replaced.

The plaster cast was applied according to the Ponseti method, and the parents were informed to check the circulation of the child foot and were instructed to remove the cast in case of any doubt. About 7–12 casts were used.

To correct the equines, following correction of the foot adduction and varus of the heel, the ankle was dorsiflexed. In patients with persistent equinus, the Achilles tenotomy was performed under general anesthesia.

Postoperative plaster cast was applied for 3 weeks. After removal of the final plaster cast, the patients were asked to wear locally custom-made orthopedic shoes and the parents were asked to take a training course on physiotherapy (3 days course of 30 min time) by a physiotherapist. The shoes were made of metal, canvas material and leather. Their length was up to just 4 cm above the ankle joint.

According to the Ponseti method, the dorsum of the foot should leave the metatarsophalangeal joint free. One metal bar posteriorly and two metal bars one medially and the other laterally away from metatarsophalangeal joint.

These shoes and physiotherapy were recommended up to the age of 4 years when operative procedures like tendon transfer could be applied if necessary.

The Pirani scoring system [9] was used to assess the response to treatment. It is based on hind-foot and mid-foot deformities. In each of these groups, there were three deformities that were assessed (Table 1). These score one point each if present and fixed, half a point if mild, and zero if absent.

A total score of 6 represents a severe club foot, with a score of 0 representing a normal foot. A corrected club foot deformity may still score of 0.5–1 on the Pirani scale because of mild deformity of the hind foot or skin creases, and may take many years to score 0.

Table 1 The Pirani scoring system

Deformity	Present and fixed (1)	Mild (0.5)	Absent (0)
Hind-foot deformities			
Posterior heel crease	1	0.5	0
Empty heel	1	0.5	0
Rigidity of equinus	1	0.5	0
Mid-foot deformities			
Curvature of lateral border of foot	1	0.5	0
Medial crease	1	0.5	0
Lateral head of talus	1	0.5	0
Total score			

For the purpose of this study, the results presented are for children who had been evaluated for least 6 months since starting the physiotherapy and the wearing of the locally custom-made orthopedic shoes. We recommend parents to keep their children under our supervision up to the age of 4 years to enable any further intervention if required. Ideally, a follow-up is required up to the skeletal maturity to confirm the outcome of any study on club foot. This, however, was not the purpose of this study.

Results

A total of 122 feet of 72 patients (50 bilateral and 22 unilateral) were included in this study. Of the total number of patients, 47 were boys and 25 girls.

With the mean follow-up of 21 months, 103 feet (84%) were treated successfully using the Ponseti method of casting followed by wearing locally custom-made orthopaedic shoes and physiotherapy. Overall, 50 out of the 58 cases of grade II club foot at the end of treatment were with Pirani score 0.5 and eight had a score of 1.5, 31 of the 45 cases of grade III had a Pirani score 1.0 and six had a score 1.5, and 14 out of the 19 cases of grade IV had a Pirani score 1.0 and five had a score 1.5. Nineteen cases had a relapse 6 months after wearing the shoes: one in grade II, eight in grade III, and 10 in grade IV (Table 2).

The most common relapsed deformities were supination in 11 cases (13%) (recommended to be treated by physiotherapy and anterior tibialis transfer at the age of 4 years), and adduction in five cases (6%) (treated by further casting and physiotherapy). The cavus was less common — three cases (4%) — and was usually treated by casting or fasciotomy.

Only in three cases (1%) of grade IV club foot more surgeries were required to overcome a multidirectional relapse.

Only in 17 cases (21%) the Achilles tenotomy was not required. In all the other cases it was performed at the end of the weekly casting, followed by 3 weeks cast and then the wearing of the orthopaedic shoes and physiotherapy (Table 3).

Discussion

The Ponseti treatment for clubfeet has been gaining popularity due to the good results demonstrated by Ponseti and other institutions. In Aden, Yemen the Ponseti method is not popular because of lack of experience and facilities (the Denis–Browne brace is not available).

Table 2 The end results of treatment according to club foot deformity grades

Grade	Total number of cases [n (%)]	Cases with Pirani score (0.5)	Cases with Pirani score (1.0)	Cases with Pirani score (1.5)
Grade II	58 (48)	50 (86)	0 (0)	8 (14)
Grade III	45 (37)	0 (0)	31 (69)	14 (11)
Grade IV	19 (15)	0 (0)	14 (74)	5 (26)

Table 3 The number of relapsed cases according to club foot deformity grades

Grade	Total number of cases	Number of relapsed cases (%)
Grade II	58	1 1.7
Grade III	45	8 18
Grade IV	19	10 52

In 2004 we started introducing the Ponseti method for correction of club foot in Aden City after giving an intensive training on this method. To overcome the need for Denis–Browne brace, we used our custom-made orthopedic shoes with continuous passive exercises, first by physiotherapist and later on by the parents, for continuous wearing of the shoes up to the age of 4 years.

Achieving 84% successful correction of club foot in this study is an acceptable good result. Similar results were reported by Laaveg and Ponseti [3] (89%) in North America, Goksan [10] (95%) in Istanbul and Pirani and colleagues (80%) in Uganda. Despite that, Morcuende JA, *et al.* [11] insist on the importance of the proper anatomical correction of the deformities of club foot, proper application of the cast and, more importantly, the use of Denis–Brown brace to prevent the relapse. We found that even without using the brace we may have good results and at least we could minimize the extent of surgery, which is technically and economically demanded as an important goal provided that the details of the technique are strictly adhered to.

Conclusion

The Ponseti method proved efficient in correcting the idiopathic congenital club foot deformities, and that the problem of abduction brace can be overcome by using physiotherapy and orthopedic shoes designed for club foot.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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