Correction of neglected idiopathic club foot by the Ponseti method

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The Ponseti method of treating club foot has been shown to be effective in children up to two years of age. However, it is not known whether it is successful in older children. We retrospectively reviewed 17 children (24 feet) with congenital idiopathic club foot who presented after walking age and had undergone no previous treatment. All were treated by the method described by Ponseti, with minor modifications. The mean age at presentation was 3.9 years (1.2 to 9.0) and the mean follow-up was for 3.1 years (2.1 to 5.6). The mean time of immobilisation in a cast was 3.9 months (1.5 to 6.0).

A painless plantigrade foot was obtained in 16 feet without the need for extensive soft-tissue release and/or bony procedures. Four patients (7 feet) had recurrent equinus which required a second tenotomy. Failure was observed in five patients (8 feet) who required a posterior release for full correction of the equinus deformity.

We conclude that the Ponseti method is a safe, effective and low-cost treatment for neglected idiopathic club foot presenting after walking age.

Congenital idiopathic club foot is a complex deformity which occurs in an otherwise normal child. Conservative treatment is generally accepted as the first choice for correction of the deformity. Many different methods are used, most of which involve manipulation and casting.1-14 For many years in Brazil the method of choice was that described by Kite.1 This approach required many months of treatment and often resulted in incomplete or defective correction needing extensive corrective surgery. Limited health-care budgets for non-emergency operations have resulted in long waiting lists for surgical treatment, with many children having neglected club feet after walking age.

After successfully treating many children with club foot by the Ponseti method, and based on previous experience which showed good results up to the age of two years, we have expanded the indications for the use of this method to older children with neglected club feet.15 We have evaluated the results of the Ponseti method in children with neglected club feet after walking age.

Patients and Methods
Between March 1997 and July 2003, 178 patients with congenital idiopathic club foot were treated by one of the authors (AFL) at two major referral hospitals in São Paulo, The Hospital Santa Marcelina and Escola Paulista de Medicina. Of these, 17 children (24 feet) had presented after walking age (Fig. 1). All were Brazilian, two of Caucasian and 15 of African descent. All had a severe deformity, corresponding to a Pirani score16 of 4 or 5. The ‘empty heel’ was not present in any of the children. None had undergone any previous treatment. The corrective procedure was fully explained to the parents and children, and informed consent was signed authorising the treatment and photographic documentation.

There were 12 boys and five girls with a mean age at presentation of 3.9 years (1.2 to 9.0).

The guidelines for the treatment followed the Ponseti method17 with minimal modifications. The foot was abducted to approximately 30˚ to 40˚, instead of the 70˚ recently recommended for younger children.15 The ‘empty heel’ was not present in any of the children. None had undergone any previous treatment. The corrective procedure was fully explained to the parents and children, and informed consent was signed authorising the treatment and photographic documentation.

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surgeon (AFL). No sedation was required and one suture was used to close the wound. A simple posterior release was indicated in those feet in which full correction of the deformity had not been obtained, resulting in satisfactory alignment of the forefoot and midfoot.

As described by Ponseti,18 bracing is important to prevent relapse. A standard foot abduction brace was applied initially in four patients, but compliance was poor. Their parents reported use for less than two hours per night. Therefore we decided to use a custom-made ankle-foot orthosis (LESF, São Paulo, Brazil) in all children, worn on a full-time basis for a mean of 11.7 months (10 to 12) (Fig. 2).

Anteroposterior (AP) and lateral standing radiographs of the feet were taken pre-operatively, immediately after correction, and at the time of the latest follow-up (Fig. 3). On the AP view, the talocalcaneal and the talar-first metatarsal angles were recorded. On the lateral view, the talocalcaneal angle was measured. The Beatson-Pearson index19 (sum of the talocalcaneal angle in the AP and lateral views) was used for overall radiological assessment.

We evaluated the age of the child at the first visit, the number of casts required for correction, the degree of ankle dorsiflexion after tenotomy, complications of casting and residual deformities. These variables were related to the need for extensive corrective surgery and the incidence of relapse.

Results
The mean follow-up was 3.1 years (2.1 to 5.6). No patient was lost to follow-up. Correction was obtained with a mean of nine casts (7 to 12). The mean time of immobilisation in a cast was 3.9 months (1.5 to 6.0). A percutaneous tenotomy of tendo Achillis was performed in all patients with a mean ankle dorsiflexion after tenotomy of 5° (0° to 10°). The last cast was maintained for five weeks to allow healing of tendo Achillis.

Complications of casting occurred in four patients and included erythema, slight swelling of the toes, and redness of the skin due to excessive pressure. No infections, skin necrosis, neurovascular compromise or profuse bleeding after tenotomy were observed. No problems with healing were seen after the tenotomy, even in the older patients. Five children developed some osteopenia secondary to
immobilisation which resolved in a few months after removal of the cast.

Four children (7 feet) required a further tenotomy for recurrent equinus at a mean of 3.7 months (2 to 5) after the initial correction, while five (8 feet) needed a posterior release for full correction of the hindfoot. In these cases, correction was achieved by performing Z-lengthening of the Achilles and capsulotomy of the ankle and subtalar joints. No medial release was necessary.

The mean range of movement at the last follow-up was dorsiflexion of 5˚ (0˚ to 10˚), plantar flexion of 30˚ (25˚ to 43˚), inversion of 10˚ (2˚ to 15˚) and eversion of 5˚ (0˚ to 12˚). A major improvement in cosmesis was observed in all children and all were able to wear normal shoes for the first time in their lives. Clinically, 16 feet (66.6%) were considered to have a good result, with a plantigrade foot and no pain, without the need for further surgery. Dynamic supination was present in four feet, but caused minimal disturbance of gait.

Before treatment all feet had almost parallel axes of the talus and calcaneus with a Beatson-Pearson index of less than 10˚. After correction, the mean Beatson-Pearson index was 42˚ (37˚ to 62˚). Adduction was fully corrected in all patients as measured by the talus-first metatarsal angle which had a mean value of 9.7˚ (6˚ to 12˚) on the AP view. In eight there was mild flattening of the talus and slight residual medial displacement of the navicular (Fig. 3).

Discussion

There is a geographical variation in the prevalence of idiopathic club foot, but most cases occur in developing nations. As a result, many children born with this deformity do not receive treatment and grow up with neglected club feet. This can cause considerable physical, social, psychological and financial burdens on the patient and their families. Adults with untreated club feet can experience pain and disability, and have difficulty in finding a job which accommodates their limitations.

Treatment for neglected feet ranges from extensive soft-tissue release to complex correction using different types of external fixator, corrective osteotomy and triple arthrodesis. However, these techniques are long and costly and have a significant rate of complications.

The results of our study have shown that neglected club feet can be successfully treated using the Ponseti method. All our patients achieved full correction with a mean of nine casts. All wore normal shoes, did not complain of pain, were able to walk without a limp, and participated in the normal activities of daily living. Both the children and their parents were very satisfied with the result of treatment.

We have found it necessary to modify the Ponseti technique to some extent in these neglected feet. We found that manipulations were required to last for five to ten minutes instead of the relatively short time needed in young children. This allowed greater stretching of the soft tissues which are less elastic, and possibly a reduction in the number of casts. We also changed the cast every two weeks to allow more time for remodelling. We only corrected the foot to 30˚ to 40˚ of abduction instead of the 70˚ which is usual in younger children, but this did not jeopardise the final correction. In this age group the method proved to be more effective at correcting deformities of the forefoot and midfoot than of the hindfoot, as demonstrated by the need for a posterior release in five children (8 feet). No foot required a medial or lateral release.

Finally, we found that children over the walking age did not tolerate the standard Ponseti foot abduction brace and therefore we used an ankle foot orthosis. We have recommended its use on a full-time basis for 12 months. This seemed to be sufficient to prevent late relapses, although further studies will be necessary to validate this recommendation.

Mild dynamic supination was seen in four feet, but did not interfere with gait. Therefore we did not find it necessary to perform transfer of the tendon of tibialis anterior.

Recurrent equinus in seven feet required a second percutaneous tenotomy of the Achilles.

We are aware that the sample size in our study is small and further studies will be necessary to understand fully the limits of this method in neglected club feet. However, the results of our study are very encouraging for the treatment of this problem by a simple, effective, and inexpensive method in countries with limited resources for health care.

Supplementary Material

A table showing the clinical details and results of the 17 patients is available with the electronic version of this paper on our website at www.jbjs.org.uk

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References