■ CHILDREN'S ORTHOPAEDICS

The effect of a dedicated Ponseti service on the outcome of idiopathic clubfoot treatment

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We report the effect of introducing a dedicated Ponseti service on the five-year treatment outcomes of children with idiopathic clubfoot.

Between 2002 and 2004, 100 feet (66 children; 50 boys and 16 girls) were treated in a general paediatric orthopaedic clinic. Of these, 96 feet (96%) responded to initial casting, 85 requiring a tenotomy of the tendo-Achillis. Recurrent deformity occurred in 38 feet and was successfully treated in 22 by repeat casting and/or tenotomy and/or transfer of the tendon of tibialis anterior, The remaining 16 required an extensive surgical release.

Between 2005 and 2006, 72 feet (53 children; 33 boys and 20 girls) were treated in a dedicated multidisciplinary Ponseti clinic. All responded to initial casting: 60 feet (83.3%) required a tenotomy of the tendo-Achillis. Recurrent deformity developed in 14, 11 of which were successfully treated by repeat casting and/or tenotomy and/or transfer of the tendon of tibialis anterior. The other three required an extensive surgical release.

Statistical analysis showed that children treated in the dedicated Ponseti clinic had a lower rate of recurrence ($p = 0.068$) and a lower rate of surgical release ($p = 0.01$) than those treated in the general clinic.

This study shows that a dedicated Ponseti clinic, run by a well-trained multidisciplinary team, can improve the outcome of idiopathic clubfoot deformity.

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Idiopathic congenital talipes equinovarus (CTEV) is one of the most common congenital musculoskeletal abnormalities, affecting one in 1000 children.[1] It is now almost universally treated by non-surgical means, starting as soon as possible after birth.[2,3] There has been a marked change in its management over the past two decades. Extensive soft-tissue release, previously the accepted standard treatment,[4,5] is now largely reserved for resistant and syndromic CTEV.[4,6] Many methods of non-surgical treatment have been described[4,7] but the Ponseti method[8] is now widely used.

The Ponseti method was first introduced as the standard treatment for idiopathic CTEV in our hospital in 2002 and we reported our initial results in 2006.[9] During the first two years, children were treated in general elective paediatric orthopaedic clinics by all members of a group of paediatric orthopaedic consultants. Subsequently, after an increase in demand for this method of treatment, we established a dedicated weekly specialist Ponseti clinic in which all CTEV patients were seen, under a single consultant with an interest in paediatric foot conditions assisted by orthopaedic trainees and a specialist physiotherapist. The clinic was supported by a dedicated team of plaster technicians and an orthotist to enable children to receive all aspects of their care during the one visit. At this 'one-stop clinic' the parents of newly-referred infants had the Ponseti method explained to them. We also screened for developmental dysplasia of the hip (DDH) using ultrasound in view of the reported association between DDH and CTEV.[10] Patients were followed-up by the multi-disciplinary team. A consultant was present to monitor progress and to determine if tenotomy of the tendo-Achillis was needed and when it should be scheduled. The Ponseti method was strictly followed. All members of the multidisciplinary team continually emphasised the need for strict compliance to limit the rate of recurrence. The dedicated clinic also allowed parents the opportunity to meet others in the programme and to learn from their experiences, and to observe children at various stages of treatment.

The purpose of this study was to compare the five-year outcome of children with idiopathic CTEV treated in a general paediatric orthopaedic clinic between 2002 and 2004 with those treated in a dedicated Ponseti clinic between January 2005 and December 2006.

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Table I. A comparison of recurrence of deformity of the clubfoot according to the setting in which the Ponseti treatment is undertaken

	Recurrence	No recurrence	Total
Non-dedicated (%)	38 feet *(39.6)*	58 feet *(60.4)*	96 feet
Dedicated (%)	14 feet *(19.4)*	58 feet (*80.6)*	72 feet
Total	52 feet	116 feet	168 feet

Patients and Methods

This study involved a retrospective review of the medical records of all children treated for idiopathic CTEV in general paediatric orthopaedic clinics between November 2002 and November 2004,[5] and those treated in dedicated Ponseti clinics between January 2005 and December 2006.

All children were treated using the protocol described by Ponseti[8,11] which was started as soon as possible after birth. Casts were applied by two members of a Ponseti-trained multidisciplinary team. A consultant orthopaedic surgeon or Ponseti-trained specialist physiotherapist manipulated and positioned the foot, while a plaster technician applied an above-knee cast. If necessary, tenotomy of the tendo-Achillis was undertaken under general anaesthesia in the operating theatre. Following a successful initial correction, children were placed in a Denis Browne foot abduction orthosis. This was worn full-time for three months, and part-time at night and for naps until four years of age. Thereafter, children had an annual clinical review.

Between November 2002 and November 2004, 66 children (50 boys and 16 girls) with 100 idiopathic clubfeet were treated by the Ponseti method in general paediatric orthopaedic clinics. Their median age at presentation was five weeks (1 to 60).

Between January 2005 and December 2006, 53 children (33 boys and 20 girls) with 72 idiopathic clubfeet were treated by the Ponseti method in a dedicated weekly Ponseti clinic under a single responsible consultant, a Ponseti-trained specialist physiotherapist and plaster technicians. The median age at presentation for this group was three weeks (1 to 45). The severity of the deformity was assessed (NKG) using the Pirani club foot score[12] which has been validated by independent reviewers.[13] We recorded the differences in the incidence of patients requiring tenotomy, those who failed to respond to initial casting, those who developed a recurrence and those who required a subsequent soft-tissue release.

Statistical analysis. The differences in outcome between the two groups were compared using Fisher's exact test. In addition, the relative risk of recurrence of the two groups was compared by constructing a two-by-two contingency table and calculating the 95% confidence intervals (CI) for the findings. A p-value of < 0.05 was considered statistically significant.

Results

For children treated in the general paediatric orthopaedic clinic, the mean total Pirani score was 5 (4 to 6) at presentation and 0.5 (0 to 1) after treatment with boots and bars. Their feet required a mean of six casts (2 to 12) and 85 (85%) needed a tenotomy of the tendo-Achillis. In all, four feet did not respond to serial manipulation and casting, nor the addition of a tenotomy. These four were termed 'resistant' clubfeet and were treated by extensive soft-tissue release. The remaining 96 feet were considered 'responsive'. Of these, 38 (39.5%) had relapsed by the time of their five-year follow-up: three feet required repeat serial casting alone, seven required tenotomy, 12 required transfer of the tendon of the tibialis anterior, 13 needed extensive surgical release and three feet were corrected with an Ilizarov frame.

For children treated in a dedicated Ponseti clinic, the mean total Pirani score was 5 (2.5 to 6) at presentation and 0.2 (0 to 1) following treatment with boots and bars. Their feet required a mean of six casts (2 to 12) and 59 (82%) needed a tenotomy. This was not statistically different from the incidence in the non-dedicated programme (Fisher's exact, $p = 0.88$). All 72 of these feet were 'responsive'. However, the difference in the incidence of responsive feet was not significantly better in the Ponseti clinic than in the general clinic (Fisher's exact, $p = 0.14$). At five-year follow-up, 14 of the 72 feet had relapsed. Of these, four required repeat serial casting alone, three a tenotomy of the tendo-Achillis, four a transfer of the tendon of the tibialis anterior, one an extensive soft-tissue release and two (in one child) needed bilateral Ilizarov correction. The number of responsive feet which relapsed was significantly less in the Ponseti clinic (Fisher's exact, $p = 0.068$), as was the likelihood of requiring extensive subsequent soft-tissue surgery or the application of an Ilizarov frame (Fisher's exact, $p = 0.01$).

The likelihood of recurrence, calculated from a 2×2 contingency table, was 2.7 times greater (95% CI 1.3 to 6.0) for club feet treated in a general paediatric setting than when the same condition was managed in a dedicated Ponseti clinic (Table I).

Complications. Of those children treated in a general paediatric orthopaedic clinic, five needed the cast re-applied because of loosening and two because they developed bruising and swelling of the leg. In the dedicated Ponseti group, two children required a change of cast due to limb swelling and one child developed bruising of the leg.

One child treated in a general paediatric orthopaedic clinic needed surgery for a neurovascular injury sustained at the time of the Achilles tenotomy. The posterior tibial artery had to be ligated and the posterior tibial nerve repaired. This was the only complication of tenotomy of the tendo-Achillis in the study.

Discussion

The Ponseti technique has revolutionised the treatment of clubfoot[14] and is now the standard method used to treat idiopathic CTEV in our hospital. There is little literature which compares Ponseti treatment undertaken in a dedicated clinic with that provided in a general paediatric orthopaedic clinic.

This study shows that a dedicated clinic run by well-trained staff results in a lower rate of recurrence and reduces the need for extensive surgical releases.

A dedicated Ponseti clinic has a number of advantages. Firstly, continuity of care is maintained: this has been shown to improve compliance with treatment and patient satisfaction.[15,16] As a complete Ponseti team is present, the clinic can offer a one-stop visit, which improves parental satisfaction, and enables parents to see children at various stages of their treatment.

We recognise that this study has some limitations. It is accepted that the median age at presentation of the children treated in the dedicated Ponseti clinic was three weeks compared with five weeks for those treated in the non-dedicated general paediatric orthopaedic clinic. The earlier presentation could have resulted in some improvement in outcome, but we do not believe that this alone could explain the difference between the two groups. Furthermore, we believe that the ease of referral to the dedicated clinic was in some respects responsible for the earlier presentation.

When the technique was first introduced, we had little experience of the Ponseti method. Our study suggests that increased experience and the frequent use of this technique are needed to obtain the best outcome.

We found no difference in the mean number of serial casts applied between the two groups of patients, and no statistically significant difference in the number of clubfeet which required an Achilles tenotomy or failed to respond to initial serial casts ($p = 0.88$ and $p = 0.14$, respectively). From these observations, we feel that the improved outcome is possibly attributable to greater compliance with the use of the orthosis once the plaster phase of the treatment has ended, known to be a significant factor in preventing relapse.[17] We also believe the development of parental support groups in recent years, along with the wealth of information now available on the internet, has had a positive effect on improving parental compliance with the Ponseti method.[18]

Despite the limitations of this study, we believe that children with clubfeet benefit from treatment in a specialist centre which offers a bespoke multi-disciplinary service under the leadership of one or two consultants. Our results and experience also confirm that there is a learning curve with the Ponseti regime.

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