
CLINICAL ARTICLE

Early results of the Ponseti technique for a clubfoot clinic in South Africa

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Abstract

An audit was performed at a South African clinic in an attempt to compare results with those already published internationally. The aim was to determine the outcome and need for further surgery using this technique. A retrospective review was performed of a single surgeon practice using the Ponseti technique on all patients presenting with a clubfoot deformity.

Patients with less than one year of final follow-up were excluded. A total of 70 patients were reviewed (106 feet). Patients were seen at a mean age of 3 months and 20 days. A mean of 6.5 casts were applied. The Achilles tenotomy rate was 74% (78 feet). A good outcome with complete correction was achieved in 63 feet (59%). Overall recurrence requiring re-plastering occurred in 24 feet (23%) and further surgery (other than Achilles tenotomy) was required in seven feet (7%).

The Ponseti technique is a successful and rewarding method of treating all children with clubfeet. The technique must be done according to Ponseti's principles with attention to detail, rigorous parent education and close follow-up. Prior treatment was not associated with a worse outcome. Greater awareness and education regarding the Ponseti technique is mandatory to ensure early successful treatment.

Introduction

Clubfoot is a congenital deformity consisting of equinus, hind foot varus, cavus and forefoot adduction (*Figure 1*). The goal of treatment is to obtain a functional, mobile plantigrade foot. A variety of manipulative methods have been used to correct clubfeet, including the Kite method,¹ the French functional method² and the Ponseti technique.³ Surgery has been popular in the past but recently a trend in the international literature has shown an increase in the successful use of manipulative techniques.

Since 1950, the Ponseti technique has been used in the management of clubfeet with good long-term outcome.^{4,5} In recent years the Ponseti technique has gained popularity and general acceptance in the international orthopaedic community.

Surgery has been popular in the past but recently a trend in the international literature has shown an increase in the successful use of manipulative techniques



Figure 1: Clubfoot



Figure 2: Weekly Ponseti plasters



Figure 3: Percutaneous TA tenotomy

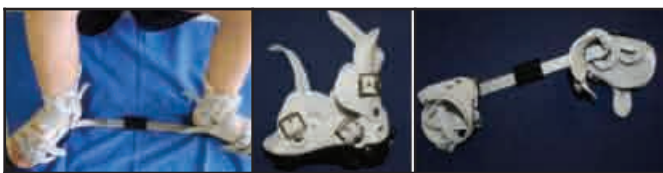


Figure 4: Mitchell's abduction brace



Figure 5 and 6: Recurrence (hindfoot varus, cavus and metatarsus adductus) undergoing recasting

Descriptive and analytical statistics were used to evaluate results

The purpose of this article is to review the details of treatment using the Ponseti technique and to assess the early results and need for further surgery.

Materials and methods

A retrospective review was performed of a single surgeon practice using the Ponseti technique on all patients presenting with a clubfoot deformity.

The medical records of 106 patients with clubfeet were retrospectively reviewed.

All the patients were seen in a private clinic and the vast majority were on a medical aid. Thirty-six patients were excluded due to inadequate follow-up or follow-up of less than one year, leaving a study population of 70 patients who were routinely followed up.

The patients were grouped into two groups according to whether treatment had been given prior to presentation. The first group (group 1) included 44 patients who had no previous treatment while the second group (group 2) included 26 patients who had some form of treatment prior to presentation. This treatment consisted of plastering as well as surgery (mainly postero-medial release) but often the details were not available.

Overall there were 43 boys (62%) and 27 girls. Thirty-four patients had unilateral clubfeet, giving a total of 106 affected feet for review. The right foot was involved in 58 cases (55%).

The mean age at presentation for treatment was 3 months and 20 days (range 1 day to 40 months). The mean age at follow-up was 2 years and 5 months (range 1-6 years).

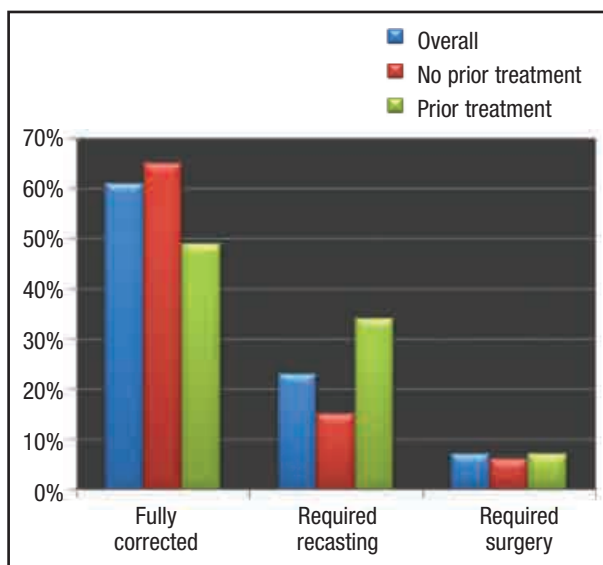
The clubfeet were treated by strict Ponseti protocol. After correction was achieved with weekly plasters (Figure 2), Achilles tenotomy was performed in theatre under general anaesthetic (Figure 3), if indicated (dorsi-flexion less than 10°). The foot was then re-cast in maximum correction and after 3 weeks a Mitchell foot abduction brace (Figure 4) was applied full time (23 hours a day) for 3 months and then for nights and naps until 4 years of age. The patient was seen initially monthly till 3 months in the foot abduction brace and then every 3-4 months.

Descriptive and analytical statistics were used to evaluate results. The data was compared using the Chi-square test or Fishers exact test (significant if p value less than 0.05). The SAS Institute Inc. Cary, NC, USA programme was used to identify significant relationships within each of the data groups.

Information obtained from the medical records included a family history of clubfoot, other birth defects, treatment (if any) prior to first visit, Pirani score, number of pre-tenotomy casts applied, number of percutaneous Achilles tenotomies performed, non-compliance of foot abduction brace, number of patients requiring recasting for recurrence, need for additional surgical procedures and final outcome. Final outcome was assessed by the senior author (ME) and any residual deformity was recorded.

Table I: Review of Ponseti technique

	Number of feet	Follow-up	TA tenotomy rate	Outcome	Recurrence	Comments
Cooper <i>et al</i> ^a	71	34 years	38%	78% good or excellent	53%	ATT
Laaveg & Ponseti ^b	104	19 years	40%	90% satisfied	46%	ATT at 33 months
Morcuenede <i>et al</i> ^c	319		83%	84% correction	16%	72% treated elsewhere
Dobbs <i>et al</i> ^d	86	2 years	86%	69% correction	41%	Recurrence due to non-compliance
Overall	630		70%			
Current study	106	2 years 5 months	74%	61% fully corrected	23% (requiring recasting)	7% required other surgery

**Figure 7: Graph showing final outcome in terms of correction, need for recasting and need for other surgery**

Results

There was a 16% incidence of a positive family history of clubfoot (11 patients).

Twelve patients had an associated birth defect (17%) – two arthrogryposis multiplex congenita, two congenital hip dislocations, one contralateral congenital vertical talus, one congenital renal anomaly, one trisomy 18, one cleft palate, one cleft lip, one pulmonary stenosis, one cardiac defect (repaired surgically) and one Down's syndrome.

Twenty-six patients (37%) received treatment elsewhere prior to first presentation (group 2).

The overall mean Pirani score at initiation of treatment was 5.3 (range 3-6) and just prior to tenotomy was 1.4 (range 0.5-3).

There was no statistically significant difference in terms of residual deformity between groups 1 and 2 using the Chi-square test

A mean of 6.5 plasters was required to gain correction of the affected feet (range 2-18). There was no statistically significant difference between groups 1 and 2 using the Chi-square test.

Seventy-eight feet (74%) required a percutaneous Achilles tenotomy at a mean age of 5.6 months (range 1- 31). There was no statistically significant difference between groups 1 and 2 in terms of the number of Achilles tenotomies performed using the Chi-square test.

Sixty-five feet were fully corrected (61%) at the last follow-up. The remaining 41 feet had some minor residual deformity – the deformities were recorded as follows: 20 metatarsus adductus, 10 relapses (equino-varus), five over-active tibialis anterior, three hindfoot varus, two cavus and one equinus deformity (Figures 5 and 6). There was no statistically significant difference in terms of residual deformity between groups 1 and 2 using the Chi-square test.

Twenty-four feet (23%) required recasting because of recurrence. Seven of these were fully corrected and the remaining 17 are being observed for minor residual deformities (Figure 6). Fifteen per cent of group 1 and thirty-four per cent of group 2 required recasting.

Overall, only seven feet (7%) required other forms of surgery – three postero-medial releases (two for arthrogryposis multiplex congenita), three abductor hallucis tenotomies and one anterior tibial tendon transfer (ATT) (Figure 7). There was no statistically significant difference between the two groups using the Chi-square test.

Minor blistering occurred in nine feet (8%) using the Mitchell foot abduction brace. At least 11 patients (16%) were non-compliant with the bracing. These eleven patients had 15 involved feet, of which six (40%) had a relapse of deformity.

The patients were followed up to a mean age of 2.4 years (range 1-6).

Discussion

Long-term follow-up, using the Ponseti technique, has been performed showing good results.^{3,6} Laaveg and Ponseti had only 40% of feet treated with Achilles tenotomy compared with 74% of the feet in the current study. Laaveg and Ponseti had a 46% rate of recurrence, which was addressed at a mean age of 33 months with anterior tibial tendon transfer (ATT) and subsequent good outcome. Ninety per cent of these patients were satisfied with the function and appearance of their feet.⁶ Our early results compare favourably with this study as 39% of our feet had a recurrence at last follow-up. So far the oldest children treated from birth are 6 years old. The majority of our recurrences are currently being observed. The low rate of anterior tibial tendon transfer in our group of patients may be due to the short follow-up, the increase in foot abduction bracing from two years to four years and more aggressive recasting. The newer Mitchell boots are far easier to manage so compliance is likely to be better.

Table 1 shows the outcome of clubfeet treated with the Ponseti technique.^{4,6-8} Our 74% Achilles tenotomy rate compares favourably with the overall quoted rate of 70%. Sixty-one per cent of our cases were fully corrected at final follow-up with a very low requirement for other surgery (7%).

One of the advantages of the Ponseti technique is its ability to be done by properly trained non-surgical health care providers.^{9,10} This can potentially relieve pressure off already burdened facilities where theatre time is at a premium and orthopaedic surgeons are not always readily available. This is especially relevant in an African context where ongoing research is being performed in Uganda.¹¹ The Achilles tenotomy can be performed in the outpatient rooms but the senior author (ME) does not have space or staff to do this at present and so they are currently performed in theatre.

Recent studies suggest a 10-40% incidence of relapse, which has been closely associated with brace compliance, following initial correction.¹² Relapse can be addressed with recasting, repeat Achilles tenotomy or anterior tibial tendon transfer, depending on the type of recurrence and the age of the patient.

In the current series, 65 feet (61%) were fully corrected at a mean age of 29 months. This requires ongoing follow-up given that recurrence was only addressed at 33 months in Laaveg and Ponseti's original work.⁶ Forty-one feet (39%) had a mild recurrence at last follow-up. Twenty-four feet (23%) required recasting because of recurrence. Seven of these were fully corrected at last follow-up and the remaining 17 were being observed for minor residual deformities. The Pirani and Dimeglio scores have been useful in initial assessment and assessment prior to tenotomy but not for assessment of recurrence.¹³⁻¹⁵ The issue of recurrence and further management is controversial. The assessment of recurrence is often subjective and not related to one specific feature.

Bensahel *et al* described a classification for final outcome based on morphology, functional assessment and radiological features.¹⁶ The International Clubfoot Study Group Score¹⁷ was based on this score in an effort to standardise outcome. It is complex and requires a child who will be compliant with specific muscle strength testing. In our group of patients this was not generally possible as the mean age was 2 years and 5 months. In addition no radiographs were taken routinely and will need to be done at final follow-up if this scoring system is to be used.

The effect of culture has been raised as a determinant of compliance with bracing and therefore outcome. The effect of cultural factors has not been shown to have an influence on the outcome of the patients in an Indian setting.¹⁸ Ongoing studies are being performed to assess outcome using the Ponseti method at 4 years of age in Uganda.¹¹ A correlation between non-compliance with bracing and educational level has been described in rural America.¹⁹ There is currently no data to assess the influence of culture in the African setting. The exact number of non-compliant parents is difficult to assess, as most would say they are compliant but on deeper questioning would admit to periods of non-compliance. It must be stated that most of the parents in this study were generally well educated, working class people with medical aid cover. Further studies will need to be performed in a government hospital setting in South Africa to assess the success of Ponseti casting and bracing compliance in particular.

Conclusion

The Ponseti technique is an extremely successful and rewarding method of treating children with clubfeet if it is done properly with rigorous parent education, follow-up and attention to detail. Early initiation of treatment resulted in good outcomes and a low recurrence rate. Outcome after prior treatment was equally good. Greater awareness and education regarding the Ponseti technique is mandatory to ensure early successful treatment, especially in areas where facilities and skills are scarce.

This article is the sole work of the authors.

No benefits of any form are to be received from a commercial party related directly or indirectly to the subject of this article.

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