Original Article

Experience with Accelerated Ponseti Technique for Treatment of Idiopathic Clubfoot in a Regional Orthopaedic Hospital in Nigeria

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Abstract

Introduction: Idiopathic talipes equinovarus (ITEV) '*aka clubfoot'* is the most common foot deformity in children. Ponseti technique had been accepted as a standard method for correction. The traditional Ponseti technique for correction is well known. Accelerated Ponseti technique is said to offer some advantages over the standard technique. The aim of this study was to determine and document the efficiency and success rate of accelerated Ponseti technique. **Methods:** This was a prospective interventional study which lasted 26 months from February 2017 to April 2019. Twenty-eight patients with 42 feets who met the inclusion criteria were recruited. They had serial manipulation and casting twice every week till percutaneous tenotomy was done as indicated. Final cast usually applied after tenotomy and left for 3weeks. Each patient was followed up for a year corresponding to 9 months after the commencement of night bracing. Data were analysed using SPSS version 20. **Results:** The mean age was 8.1 months with a range of 1–36 months. The mean Pirani score recorded was 4.4, while the mean number of casting sessions was 3.6 and the mean duration of treatment was 12.4 days. The tenotomy rate recorded was 42.9%. Pre-bracing assessment of Pirani score, passive ankle dorsiflexion and foot abduction done and repeated after a year revealed optimal correction. The relapsed rate at 1 year was 4.8%. The only complication observed was pressure sore in a patient. **Conclusion:** The accelerated Ponseti technique is an efficient method of treatment of ITEV in a much shorter time with a higher success rate. It facilitates compliance with treatment.

Keywords: Accelerated Ponseti technique, idiopathic talipes equinovarus, Ponseti technique, tenotomy rate

Introduction

Idiopathic talipes equinovarus (ITEV) '*aka'* Clubfoot is a developmental abnormality of the foot which occurs in the mid-trimester. The major components of the deformity include adduction deformity in the forefoot, cavus in the midfoot and heel varus with equinus deformities of the ankle. The aetiology is idiopathic in about 80% of involved patients.[1,2] The incidence varies among racial groups and geographical locations, but ranged between 1 and 7/100 live births.[1,2] The Ponseti method is the gold standard of treatment. This involves weekly manipulation and casting with or without percutaneous tenotomy.[2,3] All the components of the deformity are in most cases corrected within the first six Ponseti manipulations and casting sessions, with the exception of the ankle equinus which commonly requires percutaneous tendoachilles tenotomy.[4,5] However, the Ponseti method has been modified such that manipulation and casting can be done once every 5 days in a study done in USA (Morcuende *et al*. 2005),[5] twice in a week (i.e., Monday and Friday) in an Indian study[6] and thrice in a week in a Malawian study East Africa (Harnett *et al*. 2011),[7] these was referred to as accelerated Ponseti method.[3] This has

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been shown to give good results, comparable to the standard Ponseti method and with the advantage of achieving correction within a shorter time frame. However, there is the paucity of literature on this accelerated Ponseti method in the Nigerian setting or West African sub-region. The aim of this study was to determine the efficiency, success rate and tenotomy rate using the accelerated Ponseti method as well as the duration of treatment and casting sessions.

Methods

Study setting

This study was conducted in National Orthopaedic Hospital, Enugu South-East Nigeria. It is one of the Regional Orthopaedic hospitals in Nigeria with a Pediatric Orthopaedic Unit that accepts patients from South-East and South-South Nigeria.

Study design

We conducted a prospective interventional study on patients under 4 years of age with ITEV who presented in the club foot clinic for 26 months from February 2017 to April 2019.

Inclusion criteria

All patients <4 years who presented with newly diagnosed idiopathic clubfoot and informed consent was obtained from parents/guardians.

Exclusion criteria

Patients that underwent surgical correction before presentation; the patient who were previously treated before referral, clubfoot associated with neural tube defects, tibia deficiency and arthrogryposis were excluded.

Sample size

This was determined by convenience. A total of 28 patients with 42 feet met the inclusion criteria.

Research tool and data collection

A structured questionnaire designed by the research group captured the biodata of the patients, Pirani score at each casting session, number of casting sessions, relapse rate, degree of ankle dorsiflexion, pre- and post-tenotomy, pre- and post-bracing assessment. Assessment of patients and documentation through a structured pro forma were done during each visit to the clubfoot clinic. The principal researcher, co-researchers and research assistants administered the structured questionnaire.

Procedure

Each patient had the Ponseti method of manipulation and casting with a modification that sessions of treatment were done twice weekly (i.e. on Monday afternoon and Friday morning).[6] The pirani score of each foot was obtained at presentation, before each session of manipulation and casting and at the end of treatment. The cavus deformity was corrected with the first cast by supinating the forefoot. The hindfoot varus, forefoot adduction were corrected simultaneously by gentle abduction of the forefoot with the fulcrum of manipulation at the head of the talus. This manipulation was continued for about one to three minutes before casting in the most corrected position. A toe to groin cast with the knee flexed to 90° was used to maintain the correction. Equinus correction was actively done if necessary when passive foot abduction is at least 50°. Percutaneous tendo-achilles tenotomy was required for completion of equinus if the passive dorsiflexion angle was <10°, at the time of correction of all other deformities. This was done in the clinic under local anaesthesia. The plaster cast applied after percutaneous tendoachilles tenotomy was retained for 3 weeks. At removal of the final cast, the patients were placed on a foot abduction brace which was worn 23 h a day for the first 3 months and thereafter at night time and day naps as per the Ponseti bracing protocol, up till 4 years of age, even though follow-up was done for 1 year after the commencement of bracing, which mark the end point of our study.

Statistical method

The generated data were presented in texts, figures and tables. Analysis was done with SPSS statistics (version 20; IBM Corp., Armonk, NY, USA). The level of significance was at $P < 0.05$.

Ethical statement

Ethical approval was obtained from the institutional research and ethics committee.

Results

The mean age was 8.1 months with a range of 1–36 months. Seventy-five per cent of the patients were less than a year old, Figure 1. The majority 64.3% of them were males. Half of the patients had bilateral clubfeet and 28.6% had only the right foot affected.

The mean Pirani score was 4.43 ± 1.70, the mean casting sessions were 3.61 ± 1.52 and the mean duration of treatment was 12.36 ± 5.45 days.

The tenotomy rate was 42.9%.

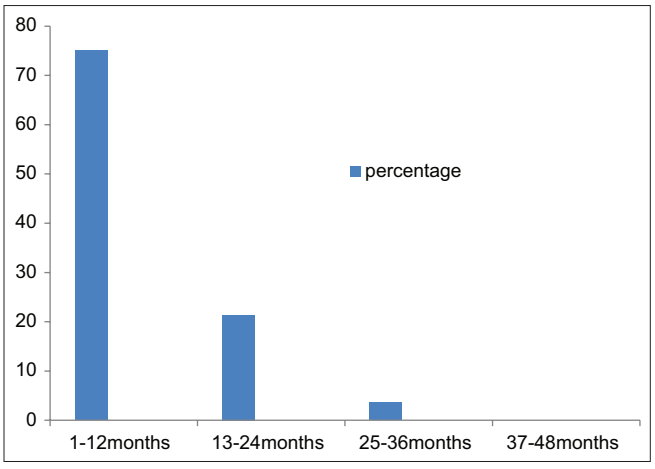


Figure 1: Age distribution of patients

Table 1: The mean Pirani score, passive ankle dorsiflexion and foot abduction angle at precasting, bracing and follow-up assessment

Assessment parameters	Precasting	Prebracing	At 1 year of bracing during follow up
Pirani score	4.43±1.70	0.18±0.03	0.03±0.23
Passive ankle dorsiflexion	18.10±8.24	28.31±11.08	28.38±9.09
Passive foot abduction angle	38.75±7.45	56.95±9.13	58.07±9.13

The relapse rate at 1 year was 4.8%, which occurred in 2 feet (at 3 months and 1 year).

Pre-bracing assessment of Pirani score, passive ankle dorsiflexion and foot abduction, which was also repeated at 1 year revealed reducing values, as shown in Table 1.

Discussion

The Ponseti technique has undergone various modifications in different climes to improve its efficiency and efficacy for various reasons. In some African countries, it was modified to fortnightly due to poverty, poor compliance, poor accessibility to health care and inadequate manpower. Some other types of modifications include; twice weekly, thrice-weekly and once every 5 days serial manipulation and casting.[5-7] This was to reduce treatment time, improve compliance and reduce the cost of care.

In our study, the casting sessions were twice a week which was similar to that reported by Sharma *et al.* 2016[6] different from that reported by Harnett *et al.* 2011[7] where sessions were thrice weekly and Morcuende *et al.* 2005[5] where the casting sessions were once every 5 days.

In our study, the finding of an average of 13 days and about four casting sessions were required to achieve corrections with a range of one to eight sessions. This was similar to that reported by Harnet *et al.* 2011 and Sharma *et al.* 2016 where an average of 16 and 15 days respectively were required to achieve full correction while Morcuende *et al.* 2005 reported that 90% of his patients required less than five casting sessions to achieve full correction with a range of one to seven sessions. These findings imply less man-hour loss by caregivers, shorter treatment time and reduce the cost of hospitalisation for those from the interstate. This will improve compliance and enhance confidence in the treatment method. These intangible benefits were also noted in the articles published in the USA, Australia and India, respectively.[6-8]

Our finding of low tenotomy rates was in sharp contrast to that reported in literature using the conventional Ponseti method where tenotomy rates were very high >80%.[9,10] This may be due to the age of the study sample and the hindfoot Pirani score.[11]

Our study reveals a low relapse and complication rate which is comparable to that reported by an author in the USA whose recurrence rate was 8%.[5] This could imply that increasing the frequency of casting may pose no additional risk to the patients.

The limitations to this study are that the sample size was small compared to other studies and the age of the patients varies (casting sessions may increase with older patients and brace compliance could be affected).

Conclusion

The accelerated Ponseti technique has high level of efficiency, success rate and enhances confidence in the treatment technique. It can be used as an alternative to the standard Ponseti technique whenever there is an indication for rapid correction.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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