Original Article

A 2-Year Review of the Rotary-Supported Ponseti Clubfoot Clinic in Lagos, Nigeria

Oladipo A. Adewole, Matthias O. Shoga, Omolara M. Williams[1], Olawale S. Famude[2], Michael O. Kayode, Samuel O. Idowu

Departments of Orthopaedics and [2]Physiotherapy, Lagos State University Teaching Hospital, [1]Department of Surgery, Paediatric Surgery Unit, Lagos State University Teaching Hospital, Ikeja, Nigeria

Abstract

Background: The Ponseti method is generally acknowledged to be the gold standard for congenital clubfoot treatment, worldwide. Although this treatment is considered to be cheap and effective, some patients in less affluent climes are unable to afford the treatment, which includes wearing of braces until the age of 4 years. **Objectives:** This study documents the experience of running a clubfoot clinic with the financial support from three rotary clubs for 2 years and aims to review the impact of the sponsorship and recommend a replication of this model in similar settings. **Materials and Methods:** This is a retrospective study of patients treated in our clubfoot clinic adopted by the rotary clubs from 20th September 2017 to 20th August 2019. Age at presentation, sex, laterality, Pirani score, number of casts to correction, brace compliance and complications were recorded prospectively in the International Clubfoot Registry hosted by The Center for Bioinformatics and Computational Biology at the University of Iowa, USA, and analysed using Microsoft Excel software. **Results:** A total of 136 patients were treated, 81 (60%) of which had bilateral deformities, totalling 217 feet. There were 71 males and 65 females, with a male-to-female ratio of 1:0.9. The age at first visit ranged from 0 to 10 years. The largest number, 74 patients (54.4%), was aged between 0 and 3 months, but only one was aged above 10 years, at presentation. Using the Pirani score, 71% had severe deformities (Pirani score of 4 and above). The tenotomy rate was 29%. The average number of casts to correction was 4.6. Sixty-eight patients received braces at subsidised rates of 50% of the cost. Only 5% of the feet relapsed after correction. **Conclusion:** The rotary club intervention in our clubfoot clinic was associated with an increase in the annual number of patients attending the clinic, but the relapse rates remained the same as with previous studies.

Keywords: Congenital clubfoot, foot abduction braces, ponseti method

Introduction

Congenital club foot is the most common musculoskeletal congenital anomaly in Nigeria.[1,2] The worldwide incidence varies from 1 to 7/1000 births.[3] In a study conducted in South-east Nigeria, the incidence reported was 3.4/1000 live births.[4] Congenital clubfoot is a deformity characterised by forefoot adduction, heel varus, equinus and cavus.[5] The Ponseti method has become the gold standard of management of this condition as it has been found to be a safe, simple and low-cost method of management without surgery.[6] This method consists of a weekly serial manipulation of the deformity and immobilisation in a long leg cast with the knee flexed to 90°. After an average of 5 serial manipulation and casting episodes, the deformity usually corrects, but between 70% and 90% in most series requires heel cord (Achilles tendon) tenotomy to correct residual equinus deformity.[7-9] Thereafter, the patients are required to wear foot abduction braces 23 h a day for 3–4 months and at nap and night time until age 4 years to prevent recurrence.[8] To further reduce costs, twice-weekly serial manipulation and casting has been successfully practiced for patients who have to travel long distances to receive treatment.[10,11] This way, they can complete the treatment within 2–3 weeks and return home. In the developing world, non-medically qualified personnel have been trained to treat patients using the Ponseti method and even trained to perform tenotomy.[12,13] Physiotherapists

Address for correspondence: Dr. Oladipo A. Adewole, Department of Orthopaedics, Lagos State University Teaching Hospital, Ikeja, Nigeria.
E-mail: l.adewole@yahoo.com

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have also successfully treated patients using this method with results comparable to other published work by doctors.[14] Thus, this method has been shown to be 'readily transferrable to non-doctor practitioners'.[12]

The Pirani scoring system developed originally by Pirani has been validated as a reliable tool to quantify the severity of a clubfoot deformity. It has also been used successfully in Nigeria to assess the severity of clubfoot and monitor the progress of treatment.[15] It consists of six parameters, divided into three midfoot and three hindfoot scores. The midfoot score consists of the curved lateral border of the foot, medial crease and uncovered lateral head of talus. The hindfoot score consists of posterior crease, emptiness of the heel and rigid equinus.[16,17] Each component of the midfoot and hindfoot is scored depending on the severity: 0 is normal, 0.5 is mild and 1 is severe. The total score (hindfoot and midfoot) ranges from 0 to 6, a normal foot score is 0 and the worst score is 6.

The Lagos State University Teaching Hospital (LASUTH) Ponseti Clubfoot Clinic was started in January 2012 in alignment with the worldwide trend of clubfoot management. Previous review of outcome of management of patients in our clinic showed non-compliance with treatment resulting in relapse largely due to inability of the parents to afford the out-of-pocket payment of the cost of care.[18] This prompted the proponents of the clinic to seek sponsorship from the rotary club, an organisation that supports timely Ponseti treatment for patients with clubfoot.

This is a review of our experience and a description of a financial intervention model that may be replicable and sustainable for other Ponseti club foot practitioners in the developing world.

Materials and Methods

This is a retrospective study including all patients who attended the LASUTH Clubfoot Clinic adopted by the rotary clubs from 20th September 2017 who had completed their treatment by 20th August 2019. The data were recorded prospectively in the International Clubfoot Registry hosted by The Center for Bioinformatics and Computational Biology at the University of Iowa, USA. Data collected included age at presentation, sex, foot affected (right, left or bilateral), aetiology (idiopathic/non-idiopathic), Pirani score, number of casts to correction, brace compliance and complications. The average cost per treatment was also documented. The data were analysed using Microsoft Excel spreadsheet program (Microsoft Office 365).

The study aims to document the experience of running the Clubfoot Clinic with the sponsorship and review the impact of reduced financial burden on the parents regarding treatment compliance and outcomes compared with the findings in our previous study.[18] Patients were not required to give informed consent for the study because the analysis used anonymous clinical data from the International Clubfoot Registry. All the patients agreed to be a part of the registry at the commencement of treatment by written consent.

The Ponseti treatment protocol used involved the Ponseti method of manipulation and application of a plaster of Paris cast from toe to groin. Before manipulation and casting, the severity was assessed using the Pirani score. The first manipulation and casting was directed at elevating the first metatarsal ray to correct the cavus. Thereafter, each subsequent cast was progressively abducted until 70° of foot abduction was achieved. Feet with a residual equinus, after heel varus and forefoot adduction were corrected, had heel cord tenotomy performed under local anaesthesia in the Clubfoot Clinic. This was done when the foot was able to dorsiflex between 0° and 10°, the Pirani mid-foot score being below 1 and hindfoot score above 1. The final cast was left in place for 3 weeks, after which an Iowa clubfoot brace was applied on removal of the cast.

Results

A total of 136 patients were treated during the period, 68 of which were new, presenting for the first time. There were 71 males and 65 females, with a male-to-female ratio of 1:0.9 [Figure 1]. The age at first visit ranged from 0 to 10 years, and most of them aged under 2 years. The largest number was aged between 0 and 3 months, only seven were aged between 2 and 5 years and 1 between 5 and 10 and 1 above 10 years [Table 1]. Eleven patients had received treatment from another facility before they visited the clinic.

Regarding laterality, 55 patients had unilateral clubfoot (24 left and 31 right) and 81 had bilateral deformities, totalling

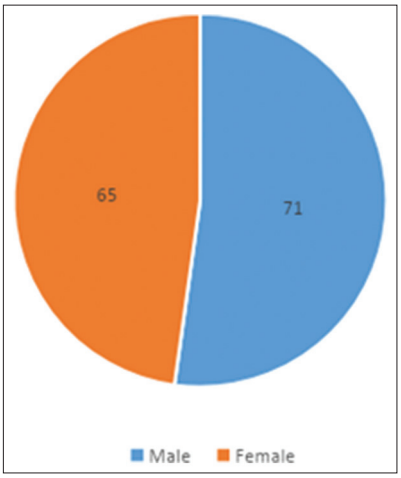

Figure 1: Sex distribution

Table 1: Grouped age

Age (months)	*n* (%)
0-3	92 (67.6)
3-6	12 (8.8)
6-12	17 (12.5)
12-24	10 (7.4)
24-60	3 (2.2)
60-120	2 (1.5)
Total	136 (100)

217 feet. Only six patients had a family history of clubfoot. One hundred and fifty-four clubfeet (71%) had an initial Pirani score of 4 or more [Figure 2]. The average number of casts applied before correction was 4.46 although 12 feet required 8 or more casts. Only 63 (29%) percutaneous Achilles tenotomies were performed. All 68 of the new patients received braces at subsidised rates of 50% of cost and brace compliance was good in 81 patients (60%), fair in 37 (27%) and poor in 18 (13%) [Figure 3]. The number of relapsed feet in the period was 11 (5%). The relapsed clubfeet were treated by casting and tenotomy where indicated. Only two patients were lost to follow-up. Some of the patients' braces were not immediately replaced when the children had outgrown them, apparently due to financial constraints. These patients eventually had the braces replaced with previously used ones. Five feet had cast complications (plaster sores) which necessitated interruption of casting for 1 week.

The average cost of each cast treatment, excluding tenotomy for children aged 2 years and below, was N1500 ($5 US). For those aged above 2 years, it was N2000 ($6.50 US). Each brace cost N5000 ($ 16.5 US) and the cost for each tenotomy was N180 (60 cents US). The direct labour costs could not be assessed because the personnel were full-time members of staff of the hospital who provided the services as part of their normal duties.

Discussion

Rotary clubs worldwide are known for their interventions in public health issues. Worthy of note is the kick polio initiative which was instrumental in eradicating polio from all the countries in the world, leaving a few cases in Pakistan and Afghanistan. A Canadian-led, rotary-funded pilot project was carried out in Uganda in 1999 which introduced the Ponseti method of treating clubfoot into selected areas. This was aimed at increasing awareness of the deformity and training suitable health professionals in the method. The project was the precursor of the Uganda Sustainable Clubfoot Care Project[19] funded by the Canadian International Development Agency now Global Affairs Canada[20] and the University Partnerships in Cooperation and Development programme.[21] The 6-year (2004–2010) collaborative project was led by the University of British Columbia with other partners including the Makerere University Medical School, the Makerere University School of Public Health, the Ugandan Ministry of Health and CBM International.[22]

In 2015, a Rotary Global Action Group (RAG4Club foot) comprised Rotarians whose purpose is to mobilise Rotarians and provide global leadership to support timely Ponseti Method treatment and appropriate care for all children born with clubfoot was officially recognised. The RAG4Clubfoot primarily works as a clearinghouse to facilitate links among rotarians and her partner, Ponseti International Association, to organise and plan Ponseti method training grants. In addition, they also:

- Recruit rotarians to join RAG4Clubfoot
- Work to reduce the stigma and raise awareness about clubfoot
- Assist to educate the general public, health professionals at all levels and government officials about the Ponseti method
- Encourage rotary districts to create global grants to support Ponseti method training of local health professionals.

It presently has projects in Argentina, Bolivia, Brazil, Columbia, Mexico and Nigeria.

The LASUTH Clubfoot Management Team was initially composed of three orthopaedic surgeons, one orthopaedic nurse and one physiotherapist. Patients were referred to the clinic from public and private health-care institutions within and outside Lagos State, South-western Nigeria. Early experience with the method in this clinic revealed the results similar to most other published works worldwide.[18] However, there were challenges with the funding of treatment, especially for foot abduction braces. Since non-compliance with the use of the braces is a well-known reason for recurrence,[23] special attention was paid to this aspect of treatment. In order to source

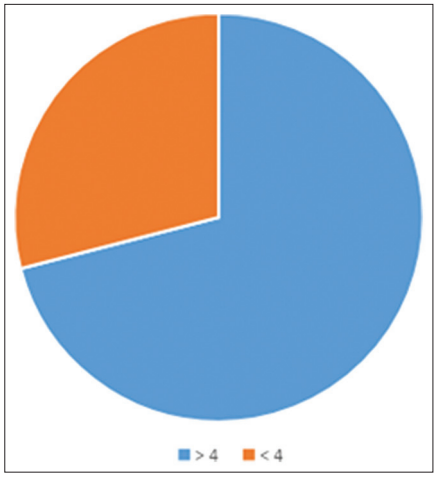

Figure 2: Pirani score

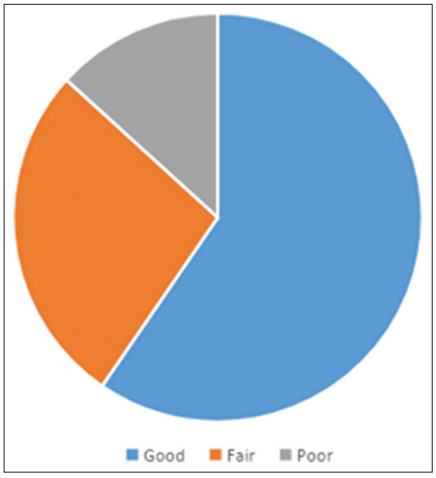

Figure 3: Brace compliance

for funding for the Ponseti treatment and alleviate the financial burden on the parents, the promoters of the clinic approached three Rotary clubs in District 9110, Nigeria, namely, the Rotary clubs of Victoria Island, Ikoyi and Gbagada, and all agreed to 'adopt' the clinic for a period of two years. All the plaster of Paris casts and orthopaedic wool padding were provided for the patients at no cost. Consumables for tenotomy (wide bore needles and local anaesthetic agents, latex gloves and disposable aprons) were also provided. The foot abduction braces were given to the patients at a subsidised rate of 50% of the cost. Previously used braces in good condition were recycled and given to the patients at no cost. The formal commencement of the programme was on 20th September 2017.

Congenital clubfoot management in the developing world remains a challenge even after the Ponseti method was introduced. Barriers to appropriate management include cost, distance from treatment centres and knowledge that the condition can be corrected. The Ponseti method has been proven to be a cheap and effective solution to the problem[24] even in neglected cases in places such as Brazil,[25] Nepal[26] and India.[27] Access barriers to treatment due to shortage of skilled taskforce have been addressed by task shifting and task sharing with physiotherapists, orthopaeadic nurses, orthopaedic technicians and orthopaedic clinical officers with satisfactory outcomes.[12,14]

In Nigeria, the Federal Ministry of Health has recognised the Ponseti method as the treatment of choice for congenital clubfoot, but no government funding has been earmarked for this purpose. The National Health Insurance Scheme covers a sparse proportion of the population and its coverage does not extend specifically to Ponseti management of congenital talipes equinovarus (CTEV). In Lagos state, children's health care is significantly subsidised by the state government; however, materials and resources for the Ponseti management of CTEV are procured by the parents. The out-of-pocket payment for the treatment can be very burdensome for both the rural and urban dwellers whose earnings are barely enough for basic sustenance of their families. This financial constraint was mainly responsible for non-compliance with the use of foot abduction braces as parents could not afford to buy the braces or replace them when they became too small.[18] Other reasons included that the parents were embarrassed, the babies were uncomfortable, and older children removed the braces. Accessing alternative non-governmental sources of health-care funding for Ponseti care would augment government resources and infrastructure, relieve the financial burden on parents and expectedly contribute significantly to ensuring compliance and completion of treatment. Investment in the health-care system within which the Ponseti treatment is usually delivered contributes to better outcomes.[28] With the intervention of the rotary clubs, we hoped to improve care and compliance by reducing the burden on the parents who had to pay for transportation, casts, tenotomy and braces.

In a previous 2-year study, 106 patients were treated in a 2-year period in the same treatment centre.[18] In this current review of the same period of 2 years, more patients (136) were treated. It is not clear what is responsible for this increase in the number of patients. It may be that the centre had become more popular because of the good outcomes of treatment achieved or perhaps it was because the treatment was subsidised. The age and sex distribution was largely unchanged. A similar proportion of patients had Pirani score of 4 and above, the average number of casts applied before correction was 4.46 and tenotomy rates were low. The initial phase of treatment of manipulation and casting was prompt as this was fully paid for by the sponsoring bodies. However, the relapse rates remain the same as in the previous review and could be attributed to the fact that, similarly, only 60% of the patients had good brace compliance. This may be because the braces were not completely free as the patients had to pay half of the cost. The thought behind asking that the braces be partly paid for was the generally perceived notion in the local culture that the devices would not be valued and used if they were completely free. The parents were quick to point out recurrence probably because the cast treatment was at no extra cost and they were informed that the recurrence was due to poor brace compliance.

While the direct cost of treatment was offset significantly, the indirect costs of treatment such as transport and loss of income during hospital visits were borne by the parents. Studies on the cost-effectiveness of the Ponseti method in Pakistan showed that the indirect household cost of treatment is substantial despite free diagnosis and treatment services and may still constitute a barrier for poor patients to access treatment.[29] This may be a justification for providing the braces at no cost to the parents in our current model. The main limitation of the study is the short duration of the study (2 years) and the small number of patients. The emphasis on long-term use of the braces must continue to be made through parental counselling and support.

Conclusion

The rotary club intervention in our clubfoot clinic was associated with an increase in the number of patients attending the clinic, but the relapse rates remained the same. More public enlightenment and parent education about the long-term use of the braces may contribute to improving the compliance. Our model of financial intervention may require some revision to provide the braces completely free; however, the model is replicable for other clubfoot practitioners in similar climes.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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