

Neglected Clubfoot; Surgical Treatment Algorithm Evaluation in Tertiary Care Hospital of Pakistan

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ABSTRACT

Background: The 1 in every 1000 infants are affected by the idiopathic club-foot. It is most commonly observed among the people living in the low middle income countries.

Objective: The study was carried out to evaluate the surgical treatment algorithm in case of neglected clubfoot among patients admitted at tertiary care unit.

Study design: It is a cohort based retrospective study conducted for the duration of six months from January 2022 to June 2022.

Material and Methods: The study was conducted on the 40 patients presented with clubfoot at the tertiary health unit, Khyber Teaching Hospital, Peshawar, were included. The patients mean age was 11 years. The range of patient's age was from 3 to 25 years. 13 patients went through bilateral intervention. And among these 40 patients there were 15 had received unilateral intervention for each foot. The basic features of the patients were recorded. There were 3 groups made containing operated clubfeet patients, first group included 15 patients, second and third group included 12 patients each.

Results: There were 29 patients that received only one follow-up visit. The patients visited their doctors for the first year after surgery but then the visiting attendance became irregular afterwards. The altered ICFSG data was compared for only those patients that completed at least three follow-up visits. The variation between the score of participants between group 1 and 2 was not significant statistically.

Conclusion: In case of neglected club-foot condition, PMR has shown excellent to fair results in patients especially children. Therefore, it can be proposed that PMR can be used to lessen the burden of neglected club-foot in the LMICs as it also has no side effects. There is a strong link between age and the surgical outcomes so the treatment must be done as soon as possible.

Keywords: Club-foot, PMR, ICFSG data, surgical outcomes.

INTRODUCTION

The 1 in every 1000 infants are affected by the idiopathic club-foot. It is most commonly observed among the people living in the low middle income countries¹⁻². The 80–91% of such live-births take place in low or middle-income countries (LMICs). Idiopathic clubfoot is also known as congenital talipes equinovarus. It is the most prevalent musculoskeletal congenital abnormality. It requires extensive orthopedic care. The muscular and bone level tendinous structures are representative of the idiopathic foot disease³⁻⁴. The midfoot cavus, hindfoot varus, and a hindfoot equinus are commonly observed in the idiopathic-club foot. This creates the common perception of a foot twisted inward with the sole positioned vertically rather than horizontally. In the developing and developed countries, the gold standard treatment for the club-foot idiopathic are the non-operative Ponseti. These become more effective if started before the walking age-period. However, access to quality care is still a problem in LMICs⁵⁻⁶. In LMICs, only 15% of affected children have access to treatment, because of the scarcity of the health resources and availability of the orthopedic near the residence. The clubfoot develops into a neglected clubfoot if it is delayed or not initiated before the walking age of the child. It puts the youngster at risk for decreased mobility, painful feet and restricted access to school⁷⁻⁸. Additionally, it has an effect on the child's social context. It decreases the family's standard of living. Due to loss of productivity it also burdens the community where the affected person resides. The surgical treatment is the ultimate solution of the neglected clubfoot. The limited and insufficient information is present in literature on the effects of surgical treatment for untreated clubfoot⁹. Because of the lack of resources in the LMIC there is almost scarce data about the club-foot patients is available. The need of the hour is to evaluate the long-term outcomes of the surgical treatment.

The study aimed to evaluate the results of surgical treatment in the patients with neglected clubfoot in Pakistan¹⁰.

MATERIAL AND METHODS

It is a cohort based retrospective study conducted for the duration of six months from January 2022 to June 2022. The 40 patients

with idiopathic club-foot admitted at the tertiary care unit Khyber Teaching Hospital, Peshawar, were included in this study. The ethical and review board committee of the hospital approved the study. The included patients willingly signed the consent. The mean age of the patients was 11 years. 13 patients went through bilateral intervention. The basic features of the patients were recorded. There were 3 groups made containing operated clubfeet patients, first group included 15 patients, second and third group included 12 patients each. The Laaveg-Ponseti score was measured and analyzed, it was categorized as excellent, good and fair. The score was found to be excellent in case of group 1 as compared to other two groups. Post-hoc subunit analysis was also carried out by using Dunn's test and data was shown below, the social questionnaire showed that the patients after two-year follow-up managed to wear normal shoes.

RESULTS

The 40 patients presented with clubfoot at the tertiary health unit of our institute were included. The mean age of the patients was 11 years. The range of patient's age was from 3 to 25 years. 13 patients went through bilateral intervention. And among these 40 patients there were 15 had received unilateral intervention for each foot. The basic features of the patients are described in table no.1. There were 3 groups made containing operated clubfeet patients, first group included 15 patients, second and third group included 12 patients each. The percentages were calculated and these refer to the extent of feet operated. The patients were asked to follow-up after their surgery, however among them there were 5 patients who didn't receive follow-up visits. There were 29 patients that received only one follow-up visit. The patients visited their doctors for the first year after surgery but then the visiting attendance became irregular afterwards. The attendance ratio of the patients in three groups is also described in the table no.1.

The altered ICFSG data was compared for only those patients that completed at least three follow-up visits. The variation between the score of participants between group 1 and 2 was not statistically significant. The Laaveg-Ponseti score was measured and analyzed, it was categorized as excellent, good and fair. The

score was found to be excellent in case of group 1 as compared to other two groups.

Post-hoc subunit analysis was also carried out by using Dunn's test and data was shown below, the social questionnaire

showed that the patients after two-year follow-up managed to wear normal shoes.

Table 1: The baseline features and the follow-up of patients

	Group 1 (posteromedial release)	Group 2 PMR plus bony intervention	Group 3 PMR plus triple arthrodesis	P value
Feet operated	15	12	12	
Gender male and female (%)	10 male;5 female	7 male;5 female	12 male; zero female	
Age (average)	9.1	10	23	0.0001
Subtypes of intervention				
PMR	13 (86%)	-	-	
PMR plus TATT	4 (13%)	-	-	
PMR plus cuboid	-	8 (66%)	-	
MTI and PMR	-	2 (16%)	-	
PMR plus MTI plus cuboid plus cuneiform	-	4 (33%)	-	
Follow-ups attendance				
2 months	5 (15%)	1 (8%)	-	
4 months	8 (53%)	-	-	
12 months	8 (53%)	-	-	
1.5 years	13 (86%)	9 (75%)	12 (100%)	
Modified scores of ICFSG				
2 months	5 (3-5)	8**	-	
4 months	5 (3-5)	-	-	0.54
12 months	6 (3-6)	-	-	
Laaveg-Ponseti test score average (SD)	80.1 (22.3)	79 (11)	34.8 (1.1)	
Excellent (91-100) n	6 (40%)	1 (8.3%)	-	
Good (81-90) n	3 (20%)	1 (8.3%)	-	
Fair (71-80) n	1 (6.6%)	3 (25%)	-	
Poor (less than 70) n	2 (13%)	1 (8.3%)	12 (100%)	
1.5 years follow-up Laaveg-Ponseti test score, median	86	77	33	0.004
Post-hoc subunit data study by using bonferroni correction				
Group 1 versus 2				1.0000
Group 1 vs 3				0.0231
Group 2 vs 3				0.0015

DISCUSSION

The study evaluates the surgical treatment algorithm in case of neglected clubfoot among patients admitted at tertiary care unit. Data of 40 patients was taken for analysis. Patients were fully aware of the study, and written consent was taken from them¹¹⁻¹². The patients were divided into three groups as described in table no.1. The retrospective investigation was carried out to find certain social, structural and functional results among patients that neglected clubfoot disease and were admitted to tertiary care unit. The children that received PMR reported good results irrespective of any additional bony intervention¹³. In case of triple arthrodesis, the results were not so good enough. There are multiple techniques used for surgeries, and also because of multiple inclusion criteria it becomes very complicated to study the outcomes and comparisons after performing surgical treatment. Similar is the case of Ponseti and surgical attention in case of LMICs it becomes very difficult to compare the results. Our studies match the previous findings carried out where the evaluation of the outcomes was made for neglected club-foot after the surgery¹⁴.

There were quite promising outcomes when Ponseti treatment was given to children, therefore its high standard was maintained in our studies as well. The surgical algorithms that were used in LMICs were in accordance with the algorithms we proposed in our studies¹⁵⁻¹⁶. We proposed that the Ponseti treatment can't be available all the time or it is not possible that this treatment is feasible every time. The number of untreated clubfoot cases was quite high, most of the patients were enrolled in schools, so after treatment their social status and their confidence level will be high and this will have a positive effect on them¹⁷.

As per previous studies it was found that in the case of LMICs the results were comparable after PMR surgery. Our data is in accordance with the previous study and it reconfirms that the patients receiving Ponseti treatment have good outcomes. In case

of previous studies¹⁸⁻¹⁹, the Laaveg-Ponseti scores were 92% and 79%, and in case of our results it was 86% and 77% which is slightly less than the other studies.

If we compare our results with the previous studies, the data from developed countries match our findings where triple arthrodesis was considered as a salvage technique for the patients of neglected club-foot and there were bad functional outcomes in the patient's groups²⁰. However, further studies are required to look for the association between triple arthrodesis and surgical outcome. There were some patients that needed additional bony intervention after the PMR as they have a bean shaped foot, a form of residual deformity. However, it was stated that by previous studies that the decision was made based on a complete clinical analysis instead of the age of the patients. Our data also assures this policy. As per previous studies it was shown that the ideal age at which surgery for club-foot can be done couldn't be found. As per previous study, there is no link between age of the patients and the outcomes of surgery. The modified Abrams;' criteria was used as the outcome evaluation score, and such results were very complicated to compare. In our study it was found that the age of the patient and the surgical outcome had a strong association at the 1.5-year follow-up. Which can support the point that club-foot condition should be treated as soon as possible as it can get worsen with the passage of time²¹⁻²².

Similar findings were obtained by many other authors as well who stated that the neglected clubfoot condition will have worse outcomes. However, there were certain short comings in our study as this study was only based on data taken from single tertiary care unit. So limited population based study was carried out. The sample size was quite small; therefore, reliable comparison couldn't be made. The follow-up time was 1.5 years in this study that's why it was impossible to get the analysis for comparison of puberty and outcome. Moreover, there were no pre-operative

scores that's why it was difficult to make comparison of the results²³.

CONCLUSION

In case of neglected club-foot condition, PMR has shown excellent to fair results in patients especially children. Therefore, it can be proposed that PMR can be used to lessen the burden of neglected club-foot in the LMICs as it also has no side effects. There is a strong link between age and the surgical outcomes so the treatment must be done as soon as possible. The ultimate decision of intervention should be only made by the surgeon operating the patient based on operative outcomes and evaluation. However, more studies are required to look for the best possible role of triple arthrodesis and its impact on decreasing the burden of neglected club-foot among children.

REFERENCES

- Pigeolet M, Imam S, Ninulescu GC, Kabir S, Smeesters PR, Mahmud H. Evaluation of a surgical treatment algorithm for neglected clubfoot in low-resource settings. *International orthopaedics*. 2022 Jan;46(1):61-70.
- Adegbehingbe OO, Adetiloye AJ, Adewole L, Ajodo DU, Bello N, Esan O, Hoover AC, Ior J, Lasebikan O, Ojo O, Olasinde A. Ponseti method treatment of neglected idiopathic clubfoot: Preliminary results of a multi-center study in Nigeria. *World journal of orthopedics*. 2017 Aug 8;8(8):624.
- Qudsi RA, Selzer F, Hill SC, Lerner A, Hippolyte JW, Jacques E, Alexis F, May CJ, Cady RB, Losina E. Clinical outcomes and risk-factor analysis of the Ponseti Method in a low-resource setting: Clubfoot care in Haiti. *PloS one*. 2019 Mar 14;14(3):e0213382.
- Smythe T, Nogaro MC, Clifton LJ, Mudariki D, Theologis T, Lavy C. Remote monitoring of clubfoot treatment with digital photographs in low resource settings: Is it accurate?. *PloS one*. 2020 May 15;15(5):e0232878.
- Mahmood T. Neglected clubfoot in an adolescent treated with posteromedial release-Case Report. *Journal of Pakistan Orthopaedic Association*. 2022 Jun 21;34(02):69-73.
- Malinga RJ, Madewo G, Orwotho N, Pirani SP, Afodun AM, Masud MA. A survey on idiopathic congenital talipes equinovarus (ICTEV) managed by the Ponseti technique at Mulago Hospital-Uganda. *The Pan African Medical Journal*. 2021;38.
- Smythe T, Wainwright A, Foster A, Lavy C. What is a good result after clubfoot treatment? A Delphi-based consensus on success by regional clubfoot trainers from across Africa. *PLoS One*. 2017 Dec 21;12(12):e0190056.
- Poenaru D. The burden of pediatric surgical disease in low-resource settings: Discovering it, measuring it, and addressing it. *Journal of pediatric surgery*. 2016 Feb 1;51(2):216-20.
- Ahmed S, Moosa S, Muhammad AA, Iftikhar S, Khan MA, Chinoy MA, Samad L. Eight-year review of a clubfoot treatment program in Pakistan with assessment of Outcomes using the Ponseti Technique: A retrospective study of 988 patients (1,458 Clubfeet) aged 0 to 5 years at enrollment. *JAAOS Global Research & Reviews*. 2022 Apr 1;6(4):e22.
- Banskota B, Banskota AK, Regmi R, Rajbhandary T, Shrestha OP, Spiegel DA. The Ponseti method in the treatment of children with idiopathic clubfoot presenting between five and ten years of age. *The Bone & Joint Journal*. 2013 Dec;95(12):1721-5.
- Turner J, Quiney F, Cashman J, Lavy C. The effectiveness of sustainable serial casting for clubfoot deformity in a low resource setting. *Malawi Medical Journal*. 2018 Mar 28;30(1):37-9.
- Ullrich S, Kisa P, Ozgediz D. Global children's surgery: recent advances and future directions. *Current opinion in pediatrics*. 2019 Jun 1;31(3):399-408.
- Foster HE, Scott C, Tiderius CJ, Dobbs MB, Ang E, Charuvanij S, Costello W, Kinnunen M, Lewandowski LB, Migowa A, Stones SR. Improving musculoskeletal health for children and young people—A 'call to action'. *Best Practice & Research Clinical Rheumatology*. 2020 Oct 1;34(5):101566.
- Smythe T, Gova M, Muzarurwi R, Foster A, Lavy C. A comparison of outcome measures used to report clubfoot treatment with the Ponseti method: results from a cohort in Harare, Zimbabwe. *BMC musculoskeletal disorders*. 2018 Dec;19(1):1-8.
- Gregory OO, Effiong AJ, Ebegi AI, Micheal E, Martin UA. Congenital Knee Dislocation: Challenges in Management in A Low Resource Center. *IOS R JDMS*. 2016;15:78-82.
- Penny N, Aroojis A, Mehtani A, Banskota B. Clubfoot Correction in Walking-age Children: A Review. *Journal of Foot and Ankle Surgery (Asia Pacific)*. 2021 Jul 8;8(3):103.
- Owen RM, Kembhavi G. A critical review of interventions for clubfoot in low and middle-income countries: effectiveness and contextual influences. *Journal of Pediatric Orthopaedics B*. 2012 Jan 1;21(1):59-67.
- Penny JN, Spiegel DA. Algorithm for neglected clubfoot and residual deformities following treatment. In *Global Orthopedics 2020* (pp. 397-406). Springer, Cham.
- Grimes CE, Holmer H, Maraka J, Ayana B, Hansen L, Lavy CB. Cost-effectiveness of club-foot treatment in low-income and middle-income countries by the Ponseti method. *BMJ Global Health*. 2016 May 1;1(1):e000023.
- Farmer D, Sitkin N, Lofberg K, Donkor P, Ozgediz D. Surgical interventions for congenital anomalies. *Disease control priorities*. 2015 Mar 23;1:129-49.
- Sheta RA, El-Sayed M. Is the Denis Browne splint a myth? A long-term prospective cohort study in clubfoot management using Denis Browne splint versus daily exercise protocol. *The Journal of Foot and Ankle Surgery*. 2020 Mar 1;59(2):314-22.
- Gosselin RA, Spiegel DA, Foltz M, editors. *Global orthopedics: caring for musculoskeletal conditions and injuries in austere settings*. Springer; 2019 Jun 11.
- Pigeolet M, Vital A, Daoud HA, Mita C, Corlew DS, Alkire BC. The impact of socio-economic factors on parental non-adherence to the Ponseti protocol for clubfoot treatment in low-and middle-income countries: A scoping review. *eClinicalMedicine*. 2022 Jun 1;48:101448.