A proposed clinical criteria to determine the type of surgical management for Resistant or Relapsed Clubfeet

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ABSTRACT

Objective: To introduce a simple clinical criteria for assessment of residual or relapsed idiopathic club foot and to improve its outcome by appropriate surgical management.

Methods: This descriptive study was conducted in the Department of Pediatric Orthopedic surgery The Children's Hospital, Lahore, from June 2014 to June 2018.All patients meeting the inclusion criteria were clinically assessed for dorsolateral hump, midfoot crease, hind foot crease and equinus and were divided into three groups according to the severity and number of these deformities present. Surgery was done according to the pre- decided plan for each group on all club feet. Patients were followed up at 3 months, 6 months and at 1 year after surgery and outcome were evaluated according to the functional rating system for club foot surgery.

Results: We had a total of 35 children with mean age of 21 months (range 6 to 36 months). Male were 24(68.5%) and female were 11(31.4%). Bilateral clubfeet were present in 15(42.8%) and unilateral residual idiopathic club foot in 20(57.1%) making it 50 club feet. A total of 8 (16%) patients had flexible dorsolateral hump only so required posteromedial release procedure while 23 (46%) patients had flexible dorsolateral hump with half midfoot crease with or without hind foot equinus so required posteromedial and abductor planter release. In 19 (38%) feet rigid dorsolateral hump with or without other deformities were present and they underwent posteromedial, lateral and abductor planter release. Outcome was excellent in 26 (52%), good in 19 (38%), fair in 4 (8%) and poor in 1 (2%) of patients.

Conclusion: The choice of surgical procedure according to the properly assessed residual or relapsed deformity by our proposed clinical criteria makes the surgical management precise and gives excellent and good results in residual or relapsed idiopathic club foot.

Key Words: Congenital, Clubfeet, Talipes Equinovarus

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INTRODUCTION

Clubfoot is a common birth defect of foot. It can either present as an isolated anomaly or associated with a syndrome. The incidence of clubfoot is 1-2/1000 live births but can be higher in certain populations.[1-3] Its incidence varies with genetic background, gender and race. Clubfoot is common in males with a male to female ratio of 2-3:1 and in more than 50% of the cases, it is bilateral.[2,4] Clubfoot has multiple components and they can occur in different combinations along with variable degree of severity. The typical clubfoot is seen in equinus and varus position and it can be flexible or rigid. The etiology of clubfoot is unknown but has been implicated on environmental and genetic factors leading to loss of angiogenesis, myogenesis, neurogenesis, chondrogenesis or ontogenesis.[5] A Magnetic resonance imaging (MRI) study of mutant mice model showed 'arrest of normal development' during embryonal foot rotation. However precise mechanisms are not known.[6,7] It is postulated that in clubfoot there is regional growth disturbance resulting in hypoplasia of the medial and posterior aspect of foot as well as leg relative to normal.[8] Clubfoot is a clinical diagnosis, but additional help can be sorted by determining radiographic angles.[9] In order to determine the best treatment and prognosis clubfoot must be classified. Ponseti and Smoley, Harrold and Walker, Catterall,

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Dimeglio and Shafiq Pirani are leading names in classifiying clubfoot.[10] Their proposed classification systems give information on the severity of clubfoot however they are inadequate in terms of determining treatment for resistant or relapsed.

In late 1990s the Ponseti Method of Clubfoot treatment(proposed by Dr.Ignacio Ponseti in 1948) became the rage.[11] Conservative treatment is now the prime choice in all clubfeet irrespective of the severity of deformity. This method is safe and effective treatment as it drastically reduces the need for curative surgery. However, there are a considerable number of patients 3% to 5%[12] who fail to improve conservatively and thus need surgery. Relapse is also reported up to 41% and 48% by two different studies after conservative management of clubfoot patients.[13,14]

After relapse of clubfoot the choices are again for conservative as well as the surgical options. The surgical options include postero-medial release with complete sub-talar release.[15,16] Most surgeons prefer to perform the same procedure in relapsed or resistant clubfeet foregoing the severity seen. These feet occasionally need a tailored individualized approach to achieve correction.[17]

Unavailability of a standard protocol to classify the resistant or relapsed clubfoot deformity and failure to take the correct road map right from the start is part of the reason that the foot relapses.[10] Therefore we proposed a clinical criteria which can be employed in relapse or recurrent clubfeet after failed conservative treatment to plan an appropriate surgery.

METHODS

This descriptive study was conducted in the Department of Pediatric Orthopedic surgery. The Children's Hospital, Lahore, from June 2014 to June 2018.The study was approved by ethical board of the hospital. Patients presenting to the outpatient department of Pediatric Orthopedics of The Children's hospital with clubfeet were evaluated for residual deformity after initial conservative management. We included all children with residual idiopathic clubfeet and relapsed idiopathic cases with age between 6 months to 3 years. Children with syndromic and neuromuscular variety of clubfoot, previously operated clubfoot and neglected clubfeet were excluded. Informed consent from parents were obtained. Patients were classified according to the relapsed or residual deformity present into grade A, B and C which were further divided into 2 subtypes each. Dorsolateral hump(**Grade A**) mean the prominence on dorsal aspect of foot occurs due to subluxation of talo-navicular joint. If this prominence disappear after abduction of foot, it is called reducible/flexible dorsolateral hump (Sub type A1) but if this prominence do not disappear after abduction of foot then it's called rigid dorsolateral hump(sub type A2). Mid-foot crease(**Grade B**) that falls short of lateral boarder of foot will be called half crease(Sub type B1) and the mid foot crease that proceed up till the lateral boarder of foot is called full midfoot crease(Sub type B2). Equinus(**Grade C**) without Hind foot crease(C1) and with Hind foot crease(C2). For each patient there was a surgical plan according to the type and number of deformities present which included 'Posterior release' only, 'Posterior and abductor planter release', 'Posterior along with abductor planter and lateral release' (Table I).

All the patients were kept in ward for 2 days after surgery and were observed for any complication. Patients were discharged and called for removal of stitches and change of cast after 2 weeks. Cast was removed at 6 weeks and braces were applied. Patients were called for follow- up at 3 months, 6 months and 1 year after surgery. Final assessment was done one year after surgery following the 'Hospital for Joint Diseases (HJD) Functional rating system for clubfoot surgery'.[18] Results were categorized according to the scores as Excellent (85-100 points), Good (70-84 points), Fair (60-69 points) and Poor (less than 60 points).Data was analysed with SPSS version 22.Frequency and percentages were calculated for important variables like age, gender, site. Data presented in tables.

RESULTS

We had 35 children in our study out of which 24 (68.5%) were male and 11(31.4%) were female. Male to female ratio was 2.2:1. A total of 15(42.8%) children had bilateral clubfeet while unilateral residual idiopathic club foot in 20(57.1%) The mean age of the study patients was 21 months with a range of 6 to 36 months. Dorso-lateral hump was present in all clubfeet; it was flexible in 31 (62%) and rigid in 19 (38%) feet. Mid-foot crease was also present in all cases. There was half crease in 17 (34%) while 33 (66%) clubfeet had full mid-foot crease. Hind-foot crease equinus was present in 43 (86%) cases while 7 (14%) clubfeet had no hind-foot crease. Majority(46%,n=23) of the feet had posterior release(PR) and abductor planter release(APR). Posterior release , abductor planter release and lateral(LR) release were done in 19(38%) feet while

8(16%) feet had posterior release only. Outcome was assessed by HJD Functional rating system for clubfoot surgery. Scores were excellent in 26 (52%), good in 19 (38%), fair in 4 (8%) and poor in 1 (2%) patient at the end of a period of 6 months. (Table II).

Table I: Surgical plan according to the proposed criteria.

NO.	GRADE	DEFORMITY	TYPE OF RELEASE
1	A1 ± C1 or C2	Flexible Dorso-lateral hump ± Equinus	Posterior release only
2	A1 + B1 or B2 ± C1 or C2	Flexible Dorso-lateral hump + half or full mid-foot crease ± Equinus	Posterior release + abductor planter release
3	A2 + B1 or B2 ± C1 or C2	Rigid Dorso-lateral hump + half or full mid-foot crease ± Equinus	Posterior release + Abductor planter release + Lateral release

Table II: Surgery outcome according to the Hospital for Joint Diseases (HJD) Functional rating system for clubfoot surgery'

Grading	PR	PR+APR	PR+APR+LR	Percentage
Excellent	5	15	6	52.0%
Good	3	7	9	38%
Fair	0	0	4	8%
Poor	0	1	0	2%
Total	8	23	19	100%

DISCUSSION

In our study of 35 children (50 feet) 24 (68.5%) were male, 11(31.4%) were female and male to female ratio was 2.2:1 which is comparable to previous studies that have showed ratios of 2.4:1 and 2.5:1.[2,4] Bilateral feet were present in15(42%) children which is slightly less as reported in literature; however the small data precludes any demographic conclusions. Mean age in our study was 21 months.

We classified resistant or relapsed clubfoot deformity by three simple clinical parameters i-e dorso-lateral hump whether it was flexible or rigid, mid-foot crease whether it is half or full crease, and equinus with or without hind-foot crease. Ponseti and Smoley [19] classified clubfoot in 1963 based on supination at forefoot, varus at heel, dorsiflexion at ankle and presence of tibial torsion. Based on these parameters clubfoot was described as good, acceptable or poor. Harrold and Walker[20] considered the flexibility of deformity whether the foot had the ability to go beyond neutral position as grade I, or it was fixed in equinovarus position <20 degrees as grade II and >20 degress as grade III. In the Catterall System[21] the progression of clubfoot deformity was classified into four patterns: Resolving, tendon contracture, joint contracture, and false correction patterns based on abnormal features of hindfoot and forefoot. Dimeglio [22] described a detailed scoring system based on degrees of four measurements i-e equines, varus, derotation and adductus in sagittal or horizontal plane. The scale includes presence of medial creases, cavus, a posterior crease and calf musculature atrophy. Accordingly the deformity can be graded as benign, moderate, severe or very severe. All these classifications were studied and none was found to be satisfactory for determining treatment in recurrent or relapsed clubfeet.[10]

Clubfoot deformity classified by Shafiq Pirani[23] consists of 6 categories. The categories are curvature of the lateral border of the foot, medial crease, uncovering of the lateral head of the talus, posterior crease, emptiness of the heel, and degree of dorsiflexion. Each category is scored as 0, 0.5, or 1. The best score is 0, and the worst score is 6. The Pirani scoring system identifies the severity of the clubfoot and can be used to monitor the correction but a low score does not exclude the possibility that a surgical procedure may be required.

In our study surgical procedure planned was according to the components of deformity present. Only posterior release was done in 8 (16%) patients who had flexible dorso-lateral hump. Posterior and abductor planter release was done in 23 (46%) patients who had

flexible dorso- lateral hump along with a mid-foot crease. Posterior, lateral and abductor planter release was done in 19 (38%) patients who had rigid dorso-lateral hump with or without other deformities. Mean outcome of our study after a period of 1 year was excellent (82.70%).

Several studies compared different procedures in resistant clubfeet. No significant difference was found in the surgical results of modified posteromedial release and modified complete subtalar release in one study[23] while results of another study suggest that complete subtalar release yields better postoperative correction than posteromedial release.[15]

Bensahel treated[17] 142 clubfeet by a one-stage medio posterior release for residual deformity persisting after conservative therapy. The talo navicular joint and hindfoot were released to achieve correct alignment. Long-term good results were seen in 87% of the idiopathic subgroup of residual clubfeet.

Our study was not able to assess the long-term outcome of the different type of procedures that were performed according to the proposed classification. Any difficulties faced by the patients in the form of stiffness and persistent pain in the treated feet were not assessed due to the short follow up. We recommend further long-term studies to assess the proposed method of classification.

CONCLUSION

The choice of surgical procedure according to the properly assessed residual or relapsed deformity by the suggested clinical criteria makes the surgical management precise and gives excellent and good results in residual or relapsed idiopathic club foot.We therefore recommend our criteria for managing residual club feet in children.

Conflict of Interest: There is no conflict of interest in this study amongst the authors

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Authorship and Contribution Declaration

Mumtaz Hussian, conception and design of the study, acquisition of data, interpreted the data,
Ayesha Saeed, revised the manuscript critically for important intellectual content
Khandah Fishan Mumtoo, drafted the manuscript
Abdul Latif Sami, final approval of the version for publication