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CLUB FOOT AFTER TREATMENT;
PATTERN AND CAUSES OF RELAPSES WITH PONSETI TECHNIQUE

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ABSTRACT… Background: Ponseti technique for club foot treatment has become more popular during the last decade. But the most common problem following correction by Ponseti technique is the relapse of deformity. **Setting:** Dow University Hospital as well as other hospitals were included in the study. **Period:** April 2013 to April 2016. **Methods**: 335 children with idiopathic club foot presented in OPD with relapse, treated with Ponseti technique. Pirani scoring was used to assess the severity of relapse. Children with both unilateral and bilateral involvement, aged up to 5 years were included. 335 children with idiopathic club feet who underwent treatment with Ponseti technique, presented with relapse of deformity were enrolled in the study. **Results:** There were 207(59.7%) boys and 128(37%) girls. Mean age at presentation for casting (previous treatment age) was 5.98 months (SD ±6.07), and 153(44.2%) had Right sided involvement, 112 (32.4%) had left sided involvement and 69(19.9%) had bilateral involvement. Mean age at which relapse occurred was 24.7 months (SD ±7.35). The mean Pirani score was 4.78 (SD ±4.30). Percutaneous heel cord tenotomy was done in 286 (82.7%) children. Number of cast to maintain initial correction was 7.58 (SD ±1.19).Out of 335 patients 246(71.1) used brace and out of them 123 (50%) used brace up to one year, 70 (25.5%) used for1-2 years, 30 (15.5%) used for 2-3 years and 23 (9%) used for 3-4 years. **Conclusion:** Ponseti method is safe and effective method of treatment for club foot. Despite the proper use of Ponseti method, relapses and recurrences still occurs due to certain factors. The best treatment for recurrent club foot is prevention in the form of consistent primary treatment, constant use of braces and regular follow up

Key words: Club Foot, Relapse, Brace.

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INTRODUCTION

Congenital talepes equinovarus is one of the most challenging musculoskeletal abnormalities of children. There are four components of the deformity; equinus, fore foot adductus, hind foot varus and cavus. Ponseti method is the most successful and first choice of treatment which consists of serial manipulation and casting with or without tenotomy. Ponseti technique of club foot has a 90% success rate for initial correction. Relapse even after treatment varies from 10-30% depending on the amount of follow up.[1] Regardless of the mode of treatment, club foot has a strong tendency to relapse[2] because of the tendency to relapse, no matter the foot was treated by conservative or operative means.[3] There has been increased interest in Ponseti method of treatment of club foot in recent years. It is a conservative way of treating club foot in which manipulation followed by casting on weekly basis is done. Achilles tendon tenotomy is done under local anesthesia followed by foot abduction orthosis in order to prevent relapse.[4] The Ponseti technique has drastically decreased the number of surgeries and complications arising from surgeries in the management of club foot.[5,6]

Noncompliance with Ponseti brace protocol is a major factor associated with relapse. Bracing plays a pivot role in maintenance of corrected club foot and keeps the foot in overcorrected position in order to maintain the correction.[7]

Ponseti method is effective and safe treatment method and it radically decreases the need for extensive corrective surgery.[8] Despite proper use

of Ponseti method some feet can be fully corrected to plantigrade functional foot, whereas others will still present with residual equinovarus deformity. In the recent literature, the failure rate of Ponseti method ranges from 3%-5%.[9] However the results are far superior as compared to surgical treatment with respect to deformity correction, prevention of overcorrection and markedly improved functional outcome.[10]

Relapse by most authors is defined as "any foot following successful correction with ponseti technique, requiring further intervention to correct the deformity".[11,12] Some authors have used the Pirani or Dimeglio score to rate the relapses. Some authors have used the descriptive terms depending on the foot morphology i.e. Adductus, varus, Equinus or combination. The initial relapses are usually supple, as the muscle imbalances causing dynamic deformities which if not treated in time, lead to rigid deformities. Foot Abduction orthosis plays an important role in maintenance of correction.[13] Post reduction abduction bracing protocol is crucial to follow in order to avoid recurrences.[14] Ponseti method is effective if the parents comply with the bracing protocol to maintain the correction. If parents are noncompliant many major and minor recurrences are inevitable.[15]

Rationale of this study is to evaluate the common pattern of relapses after Ponseti technique as we are commonly using this technique in our country. No study has yet been conducted in our country regarding this subject. So our study will be helpful to fill this gap so that appropriate steps should be taken to avoid such pattern of relapses.

MATERIAL AND METHODS

335 children with idiopathic club foot presented in OPD with relapse feet treated with Ponseti technique, treated in Dow University Hospital as well as other hospitals were included in the study during the period of April 2013 to April 2016. After taking informed consent from the parents of the patients, for enrollment in the study children were examined in detail and checked for other deformities because only idiopathic club foot were to be included in the study. Pirani scoring was used to assess the severity of relapse. Children with both unilateral and bilateral involvement, aged up to 5 years were included. Mean follow up of 3 years was done for any relapse. Inclusion criteria was all children with idiopathic club foot, age five years and below, treated with Ponseti technique in any hospital. Exclusion criteria was children above five years with Non Idiopathic club foot (e.g. club foot associated with myelocele, myelomeningocele, Arthrogryposis multiplex congenital and other neuromuscular causes). Those cases treated with methods other than Ponseti technique were also excluded. Patients with relapse were registered in our study initially by doing physical examination in order to rule out cases of non-idiopathic club foot. After taking informed consent by thr respondents, a questionnaire comprising of 18 questions was filled by the research team members themselves. Each baby was assessed for the severity of deformity on the basis of Pirani scoring. Questionnaire consisted of the demographic features e.g. name, age, sex, involvement of foot (unilateral or bilateral). Pirani scoring at the time of relapse, age at the initiation of treatment, number of casts done previously, Achillis tenotomy (done or not done) and age at which relapse occurred, were noted. Demographic data of the family, including monthly income, highest education level attained by the parents and compliance with the use of brace, were studied in relation to the risk of recurrence.

Noncompliance was judged on the criteria of not using braces up to the age of four years. Pattern of relapse was assessed by dividing the deformities into Hind foot equinus and varus, fore foot adduction and supination and cavus and all four deformities together.

RESULTS

335 children with idiopathic club feet who underwent treatment with Ponseti technique, presented with relapse of deformity. There were 207 (59.7%) boys and 128 (37%) girls. Mean age at presentation for casting was 5.98 months (SD ±6.07), and 153 (44.2%) had left sided involvement, 112 (32.4%) had right sided involvement and 69 (19.9%) had bilateral

involvement. Mean age at which relapse occurred was 24.7 months (SD ±7.35). The mean Pirani score was 4.78(SD ±4.30). Percutaneous heel cord tenotomy was done in 286 (82.7%) children. Number of cast to maintain initial correction was 7.58 (SD ±1.19). Regarding frequency of causes of relapses, Out of 335 patients 246 (71.1) used brace and out of them, 123 (50%) used brace up to one year, 70 (25.5%) used for1-2 years, 30 (15.5%) used for 2-3 years and 23 (9%) used for 3-4 years, which is the main cause of relapse after treatment. Other causes of relapse e.g. education level of the parents, 225 (65%) were middle level passed, 92(26.6%) were graduates and only 18 (5.2%) were masters, similarly monthly income of the parents 81(23.4%) were belonging to the group earning < Rs.10000, 195 (56.4%) were earning Rs. 10000-25000 and 59 (17.1%) were belonging to the income group >25000.

Regarding pattern of relapses (as shown in Table-II) 193 (55.8%) feet had adduction deformity, 81 (23.4%) had supination and 61 (17.6) had both adduction and supination deformity. 91 (26.3%) had hind foot equinus, 98 (28.3%) had hind foot varus and 57(16.5%) had both equinus and varus(as shown in Table-I). 160(46.2%) had a cavus deformity, 13(3.8%) had all four deformities.

Chi square test used to see the relation between education level and income of the parents with the rate of relapse. Results showed association between the use of brace and rate of relapse, i.e. those who did not comply with the brace had a recurrence.

Pattern of Relapse

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hind foot Equinus	91	26.3	27.2	27.2
	Hind foot varus	98	28.3	29.3	56.4
	Both	57	16.5	17.0	73.4
	None	88	25.4	26.3	99.7
	34	1	.3	.3	100.0
	Total	335	96.8	100.0	
Missing	System	11	3.2		
Total		346	100.0		

Table-I

Fore foot involvement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Adduction	193	55.8	57.6	57.6
	Supination	81	23.4	24.2	81.8
	both	61	17.6	18.2	100.0
	Total	335	96.8	100.0	
Missing	System	11	3.2		
Total		346	100.0		

Table-II

DISCUSSION

Treatment of club foot has evolved from extensive surgical correction to less invasive methods of correction that was primarily developed by Ponseti.[16] Surgical corrections of the club foot may show late relapses which may require additional surgery.[17] Complications following club foot surgery e.g. skin problems; foot stiffness, bony deformities and soft tissue scarring are common. Although Ponseti method is reported to give reliable results, in children older than 2.5 years relapsed deformity may occur.[18] Relapse rate is reported in 54% of patients.[19] Ponseti and Smoley in 1963, reported the results in 67 patients

with 94 club feet with initial success of 80%.[20] Since 1990 after the long term successful result was reported during a 30 years follow up, this method has been used widely throughout the world.[21,22]

After correction with Ponseti Method, recurrence of club foot deformity was found to be associated with certain risk factors for example noncompliance and education level of the parents. According to study by Dobbs et al, noncompliance was the factor related mostly to the risk of recurrence, with an odd ratio of 183 (P<0.00001) this is comparable to our study which shows the higher recurrence rate in parents with the low compliance.[23] The same studies shows Parental education as a significance risk factor for recurrence (odd ratio = 10.7, P < 0.0.A study conducted in New Zealand by Geoffrey et al showed that parents of twenty six babies (51%) complied with abduction bracing protocol and only three of them had major recurrence. Greater risk reduction for recurrence (odd ratio, 0.2; p =0.009) was associated with good compliance with brace, On the other hand those who did not comply with bracing protocol, had a five times greater chance of recurrence24. According to results of our study, out of 335 patients 246 (71.1%) used brace and out of them, 123 (50%) used brace up to one year, 70 (25.5%) used for1-2 years, 30 (15.5%) used for 2-3 years and 23 (9%) used for 3-4 years. Patients who abandoned brace in early period were associated with the high rate of recurrence. This became evident when we applied chi square test (P value<0.05). The other factors like parental income, age of the patients at the initiation of treatment, severity of the deformity at the time of presentation in OPD were not found to have significant effect on the recurrence p value (p value >0.05).

According to Goriainov et al relapse is defined as any deformity occurring after the commencement of the Foot Abduction Orthosis that requires further treatment. In their study 17 feet out of 80 relapse with a mean interval of 23 months after the initiation of FAO. Their study shows that higher initial Pirani score was related with late relapse.[25] This contradicts with our study which shows no significant association with pirani scoring and the rate of relapse (p value: 0.05).

Forefoot adduction and supination are found to be the commonest deformity, which may present in up to 95% of the children. In this deformity the foot looks the same as before the initiation of the treatment. According to parents the deformity is same or some time more severe, despite the fact that the hind foot is fully corrected the forefoot seems to be deformed.[26] Supination results from predominance of tibialis anterior muscle to its antagonist, primarily the peroneal muscles.[27] Atul Bhaskaret-al showed dynamic forefoot adduction or supination that presents as intoeing is the commonest pattern of the relapse in patients treated with ponseti technique and was seen in 24 childrens which is consistent with our study which shows 193(55.8%) feet had adduction deformity, 81 (23.4%) had supination and 61(17.6) had both adduction and supination deformity. In this group of patient, they encouraged parents to improve the compliance with FAO and even full time FAO (22 hours per day) was advised in 10 cases. Discontinuation of night Time FAO or poor compliance or duration of splint wear less than 12 hours are the factors associated with the poor result after Ponseti techniques that's leads to unsatisfactory outcome.[1] Fixed fore foot adduction can be treated by a laterally based wedge resection from the cuboid. Size of wedge is measured according to predetermined amount of cuboid to correct the fore foot adduction.[28]

There are several limitation of this study since it is a single center study with a limited sample size, there are chances of bias in patient selection. Children who were treated previously elsewhere to be included in this study the possibility of partial correction at initial treatment cannot be ruled out because to differentiate between incomplete correction and true relapse is difficult. The duration of study is 3 years i.e. 3 year of follow up in children with relapse were included in the study. There is a need of the hour to do multicenter studies with greater sample size in order to achieve data from other centers and improve validity of the study.

CONCLUSION

Ponseti method is safe and effective method of treatment for club foot. Despite the proper use of Ponseti method, relapses and recurrences still occurs due to certain factors. Deformities encountered in patients with relapsing club foot comprise of various degree of equinus, varus, adduction, supination and cavus, among all fore foot adduction is the most frequent pattern followed by supination, hind foot varus, equinus and cavus. The main cause of relapse is noncompliance with brace. The best treatment for recurrent club foot is prevention in the form of consistent primary treatment, constant use of braces and regular follow up.

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We can't help everyone,
but everyone can help someone.

– Ronald Reagon –

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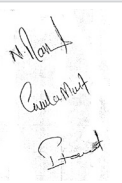
1	Dr. Nusrat Rasheed	Literature Search, Sample size calculation, Data entry, SPSS work, Article writing.	
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