EARLY OUTCOMES OF PONSETI SERIAL CASTING IN TREATING IDIOPATHIC CLUBFOOT AT PAKISTAN INSTITUTE OF PROSTHETIC AND ORTHOTIC SCIENCES

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Abstract

AIM: To evaluate early outcomes of Ponseti serial casting in treating clubfoot.

METHODS: A retrospective survey on 30 patient's medical record files was conducted. Among these 30 patients 19 were male and 11 were female from 0-3 years of age. Early outcomes of Ponseti serial casting was determined by comparing the pretreatment and post treatment pirani score. Also, the effect of age, gender and positive family history on severity of clubfoot was determined.

RESULTS: The mean age of the cases with CTEV was estimated to be 1.26 ± 0.44. The male to female ratio calculated was 1.7:1. Age and severity of clubfoot has no significant relationship ($p>0.36$). Association of tenotomy and pre-treatment score of the right foot was 0.246 and for the left foot it was 0.974. which showed no significant association between the pre treatment pirani score and tenotomy. Pre and post ponseti technique data was analyzed through t- test which gave significant value of $p<0.00$, this states that Ponseti serial casting is effective in treating clubfoot.

CONCLUSION: Ponseti serial casting is effective treatment for treating patients with clubfoot deformity. The progression of age on severity of clubfoot, Tenotomy on initial Pirani score and prevalence of gender on positive family history has no significant relation.

KEY WORDS: Ponseti technique, Club foot, CTEV, Pirani score, serial casting, Idiopathic clubfoot.

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INTRODUCTION

Clubfoot the most common congenital deformity was first portrayed in the Egyptian fine art in the ancient times and then the Hippocrates mentioned the deformity in the medical literature for the first time in 400 BC.[1] Club foot is a malformation of the sole both in shape and position leading to faulty ground contact.[2] This disorder is caused by genetic alterations that lead to static as well as dynamic disorders.[2] Its incidence is 1.2 out of thousand live births, in which 50% of the cases are bilaterall.[3] Males are effected twice more than the females.[3] In a study done in three different hospitals of London from 1991 to 2000, fetal ultrasounds were taken at 18-33 gestational weeks which revealed that 51.4% clubfoot cases were idiopathic while 48.6% cases had other pathological conditions.[3] The ethnic difference in clubfoot incidence is stated to be lowest (0.6%) amongst Chinese population and highest (6.8%) among Polynesian population and that of Caucasian population is 0.1%.[4] Clubfoot is 33% common in monozygotic twins and 3% in dizygotous. The first degree relatives are more prone to have clubfoot than distant relatives.[5] The incidence of clubfoot in first degree female relatives is 4.3% and that of males is 1.3%.[5]

Although in Pakistan clubfoot is the most common congenital structural foot deformity yet there are not many studies that show the exact figure of incidence/prevalence of clubfoot in Pakistan due to scarcity of research studies in this area. In one study the incidence of clubfoot in Pakistan is estimated to be 1.5 per 1000 live births and the prevalence is not high enough to demand for independent facilities purely dedicated to treat clubfoot.[6] Clubfoot has been managed in past both surgically and non-surgically. The surgical intervention follows two approaches; total subtalar release and posteromedial release. Both these surgical interventions

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correct foot alignment but they do manifest adverse effects which are notable, for example; excessive postoperative scaring, overcorrection, under correction, ischemic necrosis, rigid, painful, arthritic foot.[3]

The non-surgical methods used to correct club foot are French functional method, Kites technique, Ponseti technique. Among all these techniques Ponseti technique is the most renowned technique used by the orthopedic surgeons and physical therapists nowadays.[3] It is a non-invasive technique.[3] In this technique, consecutive successive manipulation is done at foot followed by serial casting so that the foot is brought back to its normal alignment.[3] Following this, the patient gets a plantigrade structural painless foot.[3] When compared to surgically treated clubfoot which were reported to be 33%, Ponseti technique had 78% good results.[7]

Complications reported with the above mentioned treatment protocols are overcorrection, foot drop, equinus gait, knee hyper extension and relapse.[3] Recurrence rate of clubfoot is reported to be in 15% of the cases that may happen due to the poor compliance of the splints or boots or due to incompetence of the therapist.[7]

In Pakistan, Ponseti technique is used by the Physical therapists, Orthotists and Orthopedic surgeons to treat clubfoot. In KP mostly the patients with clubfoot are referred to PIPOS. The influx of patients is very high therefore researchers need to evaluate the results of the Ponseti technique done in PIPOS in order to analyze the effectiveness of the technique, complications associated with it and the causes of the complications of the respective technique. The result of this study will identify the success rate of Ponseti serial casting in PIPOS and it is a contribution to the literature in strengthening the evidence of effectiveness of Ponseti serial casting.

METHODS

This retrospective observational survey was performed from July 2014 to December 2014, in the clubfoot department of PIPOS. In this study available medical record files of 105 clubfoot patients were studied. Out of 105 files, 48 files had no treatment sheets. 57 files that contained treatment sheets were studied. Among these 26 were excluded on the basis of exclusion criteria which was the syndromic type i.e. club foot associated with neuromuscular conditions like spinal dysraphisms, arthrogryposis, poliomyelitis and clubfoot secondary to cerebral palsy. Any other limb abnormality and the patients who discontinued their treatment in the middle, recurrent clubfoot, patients who did not get physical therapy and casts minimum three sessions at PIPOS were also excluded. Out of remaining 31 files 1 file had incomplete information. Remaining 30 which fulfilled the inclusion criteria i.e. Age: 0 – 3years, males and females both, patients with congenital idiopathic unilateral/bilateral clubfoot who received application of more than three serial casts were included in the study. Initial assessment data was recorded as well as the Pirani score before, after and during each visit was recorded. Any complications mentioned were also listed.

Collection of the relevant information from already done assessment sheets and the SOAP notes was carried out, all those cases of male and female patients of age 0-3 years with idiopathic clubfoot treated by Ponseti technique were included in the study in which more than 3 serial casts were applied, and all those files were excluded which showed the pathological or syndromic type of clubfoot, recurrent clubfoot, less than three casts application and the patients who discontinued their treatment in the middle.

Ponseti technique in PIPOS is followed according to the international protocol in which consecutive successive manipulation is done at foot so that the foot is brought back to its normal alignment.[3] Patients get a plantigrade structural painless foot.[3] In this technique navicular is moved medial to talus bone during the consecutive serial casting.[3] In addition, the cuboid bone is brought into its normal state with the calcaneus.[3] The sequence followed by the therapist is that first of all the cavus foot is treated.[3 8] Then the adductus component of the foot is manipulated, after that the varus component and at last the equinus is treated.[3 8] This all is done through serial casting.[3 8] The cast is applied in such a way that the knee is at 90 degrees to the leg.[3 8] And the leg is turned to correct the abnormal rotation of the tibia.[3 8]

The serial casting is continued for about two months where every week the new cast is applied along with the manipulation.[3 8] Achilles tenotomy may also be required during or after the casting process to further improve the equinus component of the clubfoot.[3 8] After tenotomy cast is applied for about three weeks to maintain the correction and give time to tendon for proper healing.[3 8] When the foot is corrected through casting then splints or shoes are prescribed by the therapist to the child to wear 24 hours a day for first three months, after that the splints are wore at night for next 4 years.[3 8] The Denis-brown shoes help to prevent the relapse.[3 8]

RESULTS

Patients recruited in the study were from age 0 to 3years with the mean age of the cases with CTEVestimated to be 1.26 ± 0.44 with a positive skewness value of 1.11 which shows that there were more cases in the young aged group (figure 1). Out of 30 cases, 19 (63.3%) male and 11 (36.6%) female, the male to female ratio calculated was1.7:1 (figure 2).

Relationship of age and severity of clubfoot was analyzed, the chi-

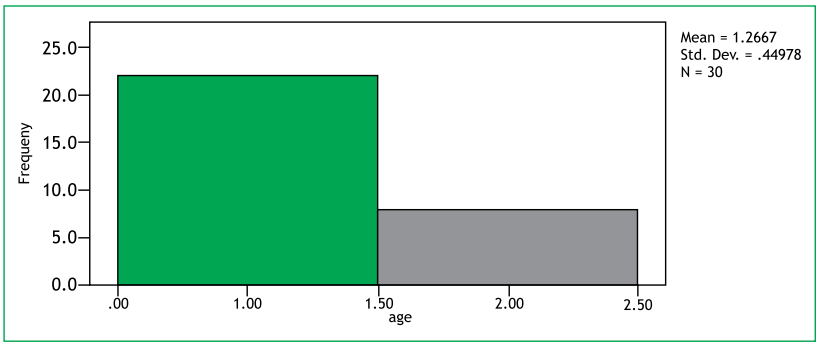

Figure 1 Mean age of the patients with CTEV

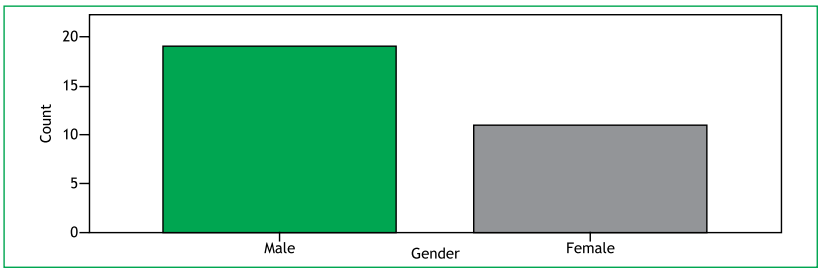

Figure 2 Male to female ratio

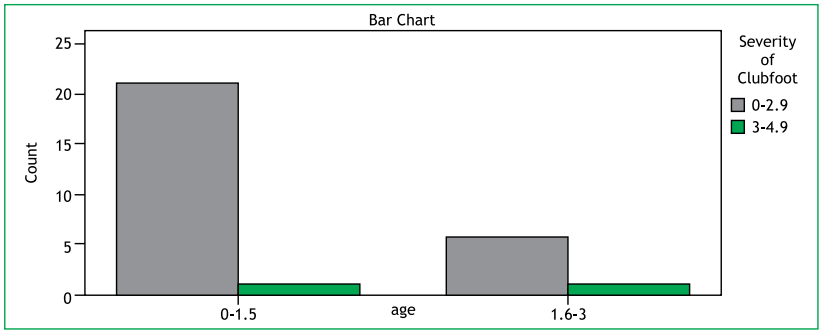

Figure 3 Relation between age and severity of clubfoot deformity

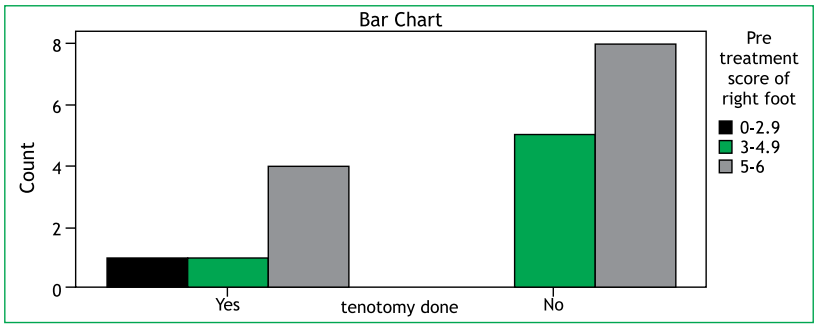

Figure 4 Relation between tenotomy and pretreatment score

square test value was found to be P<0.36 which is not significant i.e. there was no relationship found between age and the severity of CTEV in this study (figure 3).

The data was analyzed to find out the association between tenotomy and pretreatment scores of right and left foot. The chi square values of the cross tabulation of tenotomy and pretreatment score of the right foot was 0.246 and for the left foot it was 0.974. The results show no association between the tenotomy and pretreatment score in this study (figure 4).

The relationship between the gender and family history was analyzed to be insignificant through chi square test which showed that among 19 male cases there were 6 (31.6%) cases with positive family history and 13(68.4%) cases with no positive family history of clubfoot. While out of 11 female cases there 3 (27.7%) cases had a positive family history and 8 (72.7%) cases had no family history of clubfoot (figure 5).

The Ponseti technique was analyzed to be effective in treating patients with Clubfoot. Pre and post treatment data was analyzed through t- test which gave significant value of p<0.00. which states that Ponseti serial casting is effective in treating clubfoot.

DISCUSSION

The most popular technique used nowadays to treat clubfoot is the Ponseti method which involves serial casting for about 8 weeks followed by orthotic management which takes 3 to 4 years for full correction of the foot. The unique thing about this technique is the manipulative technique and physical therapy intervention like stretching of contracted musculature, which is done before every new cast application. It helps maintain the ranges of the foot and in maintenance of proper alignment of the bony structures of the foot. Tenotomy is done in cases where there is rigid equinus and the deformity cannot to be treated otherwise. The main objective was to find the effectiveness of Ponseti serial casting in treating the clubfoot as well as to find the correlation of early treatment with the correction, correlation of need for tenotomy based on initial Pirani scoring, and correlation of male to female ratio with positive family history. Also, to determine any complications associ-

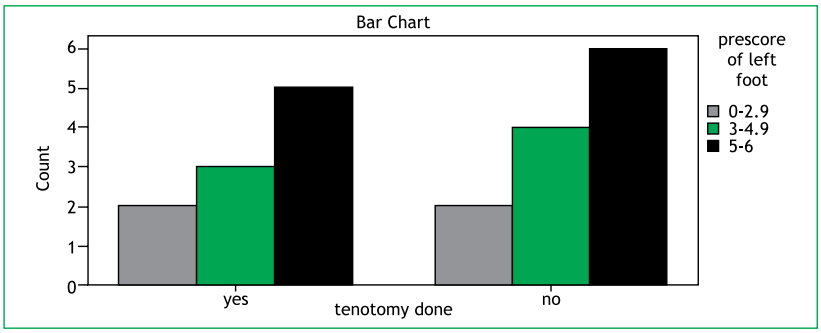

Figure 5 A bar chart showing tenotomy and pretreatment scores of patients with clubfoot

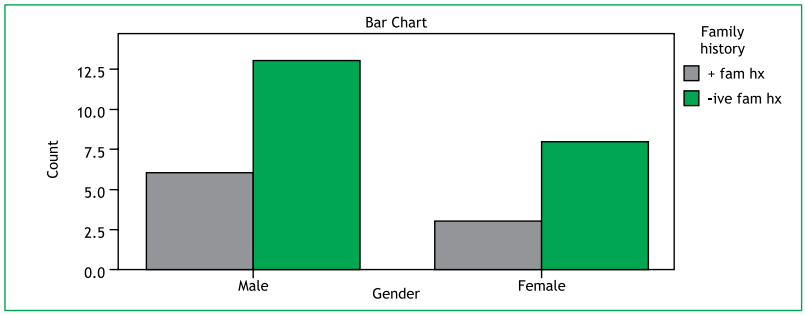

Figure 6 Relation between age and family history

ated with the deformity that affects the treatment plan adversely.

The 30 patient record files were studied for the pre and post treatment scores, family history, complications, tenotomy and other basic information like name, age, gender and no of casts applied. The statistical analysis of the effectiveness of Ponseti serial casting compared to other research studies found during the literature search were the same.[3 6 8 9] Data also revealed that 19 patients (63.3%) were males and 11(36.6%) were females. The gender based prevalence of clubfoot i.e. male to female ratio was found to be 1.7:1 which is in accordance with the ratio found in literature i.e. 2:1 in the world. Pulak S explained the greater prevalence of males than females by suggesting that females need more predisposing factors than males to develop clubfoot.[9] The mean age of the patients in this study was found to be 1.26 ±0.44. The positive skewed Result revealed that the more patients were in the younger age group (0-1.5years). M.S Patil in his study found that the age at the beginning of the treatment does have influence over the correction of the clubfoot, younger children require less casts and have less relapse rate than the older ones.[1] Age and severity of clubfoot showed no significant results that means the severity of clubfoot does not depend upon the age of the patient that is, with the Passage of time there is no effect on the severity of the clubfoot. The pretreatment scores of both the feet were analyzed with the need for tenotomy and results were non-significant i.e. need for tenotomy does not depend upon the pre- treatment Pirani score. According to research studies tenotomy depends upon the rigidity of the equinus forefoot which is not correctable with the manipulation, physical therapy and casting. Before treatment one cannot predict the need for tenotomy of the Achilles tendon. The analysis of family history with prevalence of clubfoot in males and females didn't reveal any difference as well.

This study had some limitations which is why the results cannot be generalized. Sample size was only 30 patients. For better overview of the technique it should be increased in studies in the future. Very few studies have been done in KP on Ponseti technique so there was very little evidence available to support the result of this study in the context of KP. Major limitation was the time, given time period was very limited to conduct the study on this topic so the sufficient number of sample couldn't be arranged for the study. The study was done at PIPOS which may not represent the whole province KP. More than one clinician performed the Ponseti technique on patients so there is a possible chance of personal error in the study. Specific population of clubfoot is taken so the results cannot be applicable to all clubfoot population.

CONCLUSION

This research was carried out to find the early outcomes of Ponseti serial casting. The results showed that Ponseti serial casting is effective in treating clubfoot. The results also show that the progression of age has no effect on severity of clubfoot. Tenotomy does not depend upon the initial Pirani score of clubfoot and that prevalence on gender base does not depend on positive family history.

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NOTES ON CONTRIBUTORS

The study was part of AA Bachelors in Physical Therapy Education. DAK supervised the dissertation, and was involved in every part of the analysis, idea's development, and write-up.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

ETHICS APPROVAL

The approval/permission was obtained from Khyber Medical University Research and Ethics Board.

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