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The Management of Congenital Idiopathic Clubfoot Deformity: An Observational Study

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Abstract **Original Research Article**

Background: Club feet are a frequent birth defect, and congenital club foot is one of the most prevalent. Patients with this condition are often treated with surgery. A congenital club foot is a complicated joint malformation that may take many different forms. ***Objective:*** To observe the management of congenital idiopathic clubfoot deformity. ***Methodology:*** This research was conducted between January 2007 and December 2008 at the orthopaedic department of Bangabanghu Sheikh Mujib Medical University in Shahbag, Dhaka. Group-I included 13 patients with 19 feet who had surgery using Mckay's process, and Group-II included 12 patients with 17 feet who underwent surgery using Turco's technique, for a total of 25 patients with 36 feet. There was complete observance of all ethical norms. Medical history, physical exams, and specific tests all pointed to a positive diagnosis. Two groups then had surgery, one through the Turco incision and the other via the Cincinnati one. SPSS (Statistical Package for the Social Science) was used for the statistical analysis. ***Results:*** The next most common age range was between 12 and 17 years old. McKay's method had a success rate of 23.07%, whereas Turco's method achieved a success rate of 25.0%. There were around 75% males and 25% females in the Turco group. There were more men than women in McKay's group (61.53% vs. 38.46%). Four patients included their right foot (21.05%), three their left foot (15.80%), and six their both feet (63.15%) during McKay surgery. Of McKay's patients who had the treatment, just 10.54 percent had negative results, while the remaining 89.46 percent performed well. ***Conclusion:*** Everyone agrees that a congenital clubfoot abnormality should be surgically corrected. Bias was not a possibility. It may be advantageous for our people if this prospective research evaluating the results of the Turco and McKay surgical procedures for treating congenital clubfoot is completed.

Keywords: Congenital clubfoot, Deformity, McKay's method, Turco's method.

INTRODUCTION

A varied three-dimensional malformation of a complex system of joints, club foot is present from birth and may be congenital or acquired [1]. Secondary and adaptive structural changes involving the skeletal and soft tissues are already well established at the time of birth, and radiography is not useful in the first year of life because of this. The presumptions are that the essential abnormalities are located in the mid-tarsal joints and that the other components of the deformity are present. Including varus deformity of the heel, are secondary and adaptive; and that total repair of the basic deformity coupled with proper relaxation of all constricted soft tissues will result in a foot that is relatively normal in appearance. The condition known as clubfoot may be traced all the way back to the time of Hippocrates. Since that time, surgeons have spent decades discussing this topic in terms of its genesis, pathoanatomy, and treatment, and they have come to a variety of different conclusions. Surgery did not become a component of the treatment for clubfoot until 1831, when Stroneyer started utilizing tendoachiles lengthening. Before that time, the condition was managed medically [2].

There is a one to two percent chance of having a congenital club foot for every thousand live births. It affects both feet in 49 percent of cases and is more common in men than in women [3]. Of those affected, 29 percent have problems with their right foot and 22 percent with their left foot [4]. It is a multifactorial (Polygenic) condition, although in certain situations, it is transmitted as an autosomal dominant pattern with incomplete penetrance (40%) Despite the fact that it is a polygenic disorder, it is transmitted in this way [5]. The presence of joint laxity, congenital dislocation of the hip, tibial torsion, lack of certain tarsal bones, and a family

history of various foot malformations are all related with CTEV [6].

The degree of involvement in a patient's congenital clubfoot is taken into consideration while classifying the condition [7]. The deformity known as clubfoot may be broken down into three distinct categories: adduction, inversion, and equinovarus deformities. When contrasted to the rear foot, the forefoot assumes an abducted position [8]. Because the calcis of the medial side of the foot is rotated inward beneath the astragalus, the whole foot is forced into an inverted posture. The equus deformity may be broken down into two distinct components. The term "forefoot equinus" refers to a condition in which the forefoot is flexed plantarward more than the rear foot. The "ankle equinus" position is achieved by flexing the whole foot plantarward at the ankle joint. It is imperative that each of these three abnormalities be entirely fixed in the sequence that was indicated. The postural or minor club foot is rather rare, and it is possible to rectify the issue with relatively little effort. The moderate club foot is rather flexible, there is no crease running transversely across the sole of the foot, and the heal is plainly visible. Severe cases of club foot can only be treated successfully by surgical intervention [9]. The sole of the foot has a transverse wrinkle and the skin on the foot itself is quite taut. The foot itself is fairly short.

The treatment of congenital club foot should aim to produce a plantigrade foot that is functional, pain-free, and free of callosity. Additionally, the foot should have adequate mobility and be callosity-free. Finally, the foot should not need the use of specially adapted footwear [10]. The vast majority of experts are still of the opinion that all cases of congenital club foot should first be treated non-operatively. The initial therapy consists of daily manipulation of the foot without the use of anesthesia for a period of three months, and is then followed by adhesive-tape strapping of the foot in the position of correction [11,12]. After three months of following this regimen, surgical surgery was recommended in the event that the deformity did not respond to the treatment [13]. When planning the surgical treatment of the club foot, it is vital to keep in mind that equinus, varus, and adduction all occur concurrently rather than as distinct isolated motions of the foot and ankle. This is because equinus is the most common form of the club foot [14].

Procedures that require working with bone are often reserved for older children and are sometimes considered to be a last resort [15]. The posteromedial release, also known as the Turco operation, the posteromedial and restricted lateral release, also known as the Carroll procedure, and the complete posteromedial lateral release, also known as the McKay technique, are the three procedures that are available for the surgical treatment of congenital club foot [16]. Turco pioneered the one step soft tissue posteromedial release, which is one of the most used surgical techniques in use today. In order to realign the aberrant architecture of the bones, the posterior medial and subtalar soft tissue contractures need to be removed first. Next, the corrected alignment has to be fixed with a single Kirschner wire, which transfixes the talonavicular joint. In practice, the Meckay one stage subtalar soft tissue releae is a circumferential soft tissue release that involves the plantar, medial, and lateral portions of the foot. It is intended to specifically address the horizontal subtalar rotation of the calcaneus that is associated with congenital club foot. This rotation of the calcaneus occurs when a baby is born with a club foot [17]. In 1985, Simons compared the outcomes of the McKay one stage circumferential release with the Turco one stage posterior medial release. Both procedures were performed in a single stage. They said that the McKay treatment involves making a transverse circumferential incision, correcting the transverse plane deformity by performing a full subtalar release, and allowing early mobility of the foot by using a hinged cast [18].

Patients need postoperative serial plaster, club foot shoes, and follow up care since there is a possibility of postoperative problems and recurrence until the kid is old enough to attend school. The inflexible kind of congenital talipes equinovarous deformity may now be treated with a less intrusive surgery, which has been approved as the treatment technique of choice by a large number of surgeons in the current day [19].

Objective: To observe the management of congenital idiopathic clubfoot deformity.

METHODOLOGY

Type of study: This is a prospective observational study.

Place of study: This study was carried out in Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka-1000, Bangladesh.

Period of study: 1st January 2007 to 31st December, 2008.

Sample size: There were 25 participants in this research with 36 congenitally club feet.

Study Population: This research includes 25 individuals with 36 feet. Surgery was performed on 19 feet using the McKay process, and the remaining 17 feet using the Turco procedure.

Sampling Method: Random purposive sampling is the sampling method used.

Follow-up time: In Group I, the mean follow-up time was 8.92 months with an SD of 2.39 (ranging from 5 to 13 months), while in Group II, the mean follow-up time was 12.08 months with an SD of 4.07 (ranging from 6 to 17 months).

Inclusion criteria: A child with a club foot that was there from birth, The child is between 3 months and 3 years old, both sexes, One or both feet have a clubfoot, Type of club foot that is rigid.

Exclusion criteria: Between 3 months and 3 years old, A type of club foot that is not rigid, Type of club foot that doesn't bend or move, The club foot relapsed.

Study design: The researcher himself designed and drafted the questionnaire, taking into account key variables such as age, sex, presenting complaints with duration, clinical findings, associated medical condition, investigations, preoperative findings, and surgical outcome. The guide verified the questionnaire, and the researcher himself collected the data. Then, after patient selection, the investigator explained the aims, objectives, and procedure of the study, as well as the potential benefits to the patient, in a language that was easily understood by the patient or their attendant. Patients were encouraged to voluntarily participate in the study, and they were also given the option to disengage from the study at any time, even after they had volunteered. If patients consent, they will be enrolled in this study. Then, written informed consent was obtained from the patient or their attendant using a standardized form. The secondary spinal tumors were then appropriately diagnosed. The diagnostic procedure necessitates a comprehensive patient medical history and physical and neurological examinations. In addition, laboratory tests and imaging studies can reveal aspects of the patient's health that may not be apparent during the examination.

Surgical Methods and Procedures: All surgical procedures were performed under general anesthesia with tourniquet. Group-I comprised 13 patients with 19-inch feet who underwent McKay's procedure, while Group-II comprised 12 patients with 17-inch feet who underwent Turco's procedure.

Data Analysis: Collected data were manually edited, The information was then input into an SPSS software program, The entered information was inspected and validated, The computer program SPSS (Statistical Package for Social Science) was used to analyze the data.

Ethical issue: Protocol was approved by the ethical committee of the department of orthopaedic surgery, BSMMU, Dhaka.

RESULTS

Table 1 displayed the distribution of patients according to age. Patients aged six to eleven years old made up the vast bulk of the patient population. In McKay's method, the success rate was 30.76%, but in Turco's method, it was 33.33%. The age group from 12 to 17 was the next most popular age range. In the process developed by McKay, it was 23.07%, while in the procedure developed by Turco, it was 25.0%.

Table- 1: Age distribution of patients (n=25).

Age group (Months)	McKay's procedure No. (%)	Turco's procedure No. (%)
Upto 5	02(15.38)	01(8.33)
6-11	04(30.76)	04(33.33)
12-17	03(23.07)	03(25.0)
18-23	02(15.38)	02(16.66)
24-30	01(7.69)	01(8.33)
31-36	01(7.69)	01(8.33)

Table 2 showed the comparison of age between 2 groups. In McKay's procedure mean age was 14.76 ±9.36 and in Turco's procedure mean age was 15.59+9.59. Student t-test reveals no statistically significant difference (p. > 0.05).

Table-2: Comparison of age in 2 groups.

	Mean ± SD	t-value	p-value
McKay's procedure	14.76 ± 9.36	1.31	0.091
Turco's procedure	15.59 ± 9.59		

Table 3 illustrated the distribution of the patient's operating procedure and sexual orientation is shown below. The Turco group consisted of 75% males and 25% females overall. 61.53% of the people in McKay's group were male, whereas 38.46% were female. Through the use of the Pearson x^2 test, it was determined that there was not a statistically significant correlation between the sexes of the patients in the various groups.

Table-3: Sex distribution of patients (n=50)

Sex	McKay's procedure No. (%)	Turco's procedure No. (%)	P value
Male	08(61.53)	09(75.0)	0.67
Female	05(38.46)	03(25.0)	

Table 4 illustrated that right foot involvement occurred in 4 (21.05%) patients during the McKay surgery, whereas left foot involvement occurred in 3 (15.80%) patients, and both feet occurred in 6 (63.15%) individuals. During the Turco procedure, the right foot was involved in the treatment of 4 (23.50%) patients, the left foot was involved in the treatment of 3 (17.65%) patients, and both feet were included in the treatment of 5 (58.85%) patients.

Table-4: Distribution by side involvement

Side of involvement	McKay's Procedure N=19		Turco's Procedure N=17	
	No.	%	No.	%
Right foot	04	21.05	04	23.50
Left foot	03	15.80	03	17.65
Both foot	06	63.15	05	58.85
Total foot	19	100.0	17	100.0

Figure 1 showed congenital anomalies in percentage in Group-1 & Group-2. 8.33% syndactyly found in group 2 whereas 7.69% found in group 1. Cleft lip (15.38%) found more in group 1 than group 2 (8.33%). 83.34% were not associated with anomaly in group 2 whereas 76.93% had no anomaly in group 1.

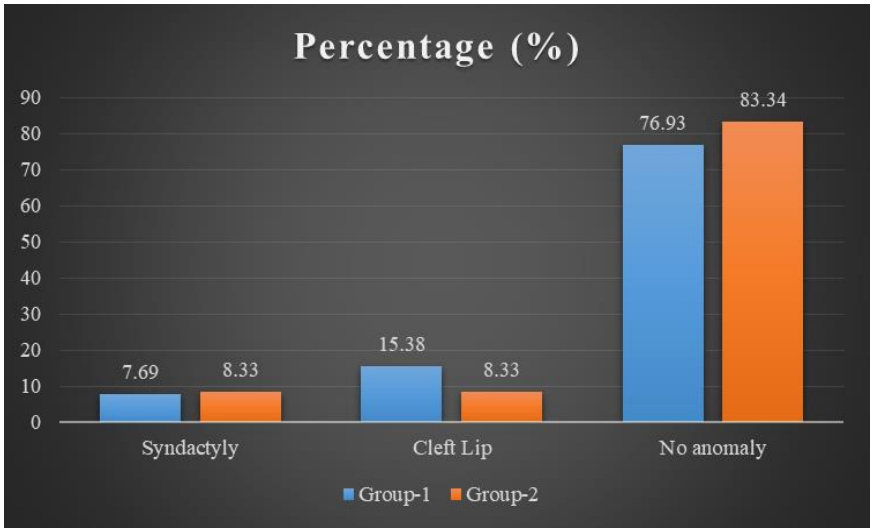

Figure- 1: Bar diagram showing associated congenital anomalies in percentage in Group-1 & Group-2.

The percentage of families in Groups 1 and 2 who had children with clubfoot was presented in Figure 2. In group 1, there was a history of club foot in 23.07% of the families, whereas in group 2, there was a history of club foot in 33.33% of the people.

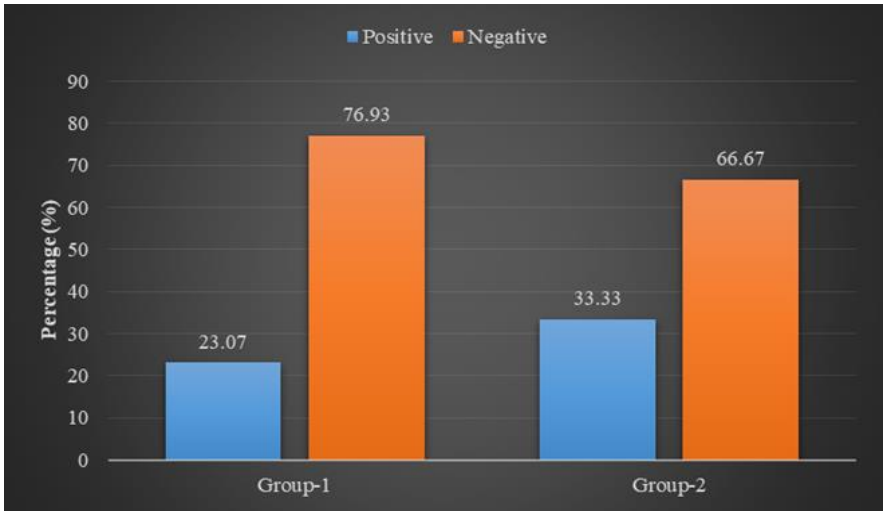

Figure-2: Bar diagram showing family history of clubfoot in percentage in Group-1 and Group-2

The early post-operative difficulties seen by Group-1 and Group-2 are shown in Figure 3. In group 1, early post-operative sequelae included a 7.69% incidence of blistering, 7.69% incidence of skin necrosis, and 7.69% incidence of skin infection. People in group 2 who had early post-operative complications had a blister incidence of 16.66%, a skin necrosis incidence of 7.69%, and a skin infection incidence of 7.69%.

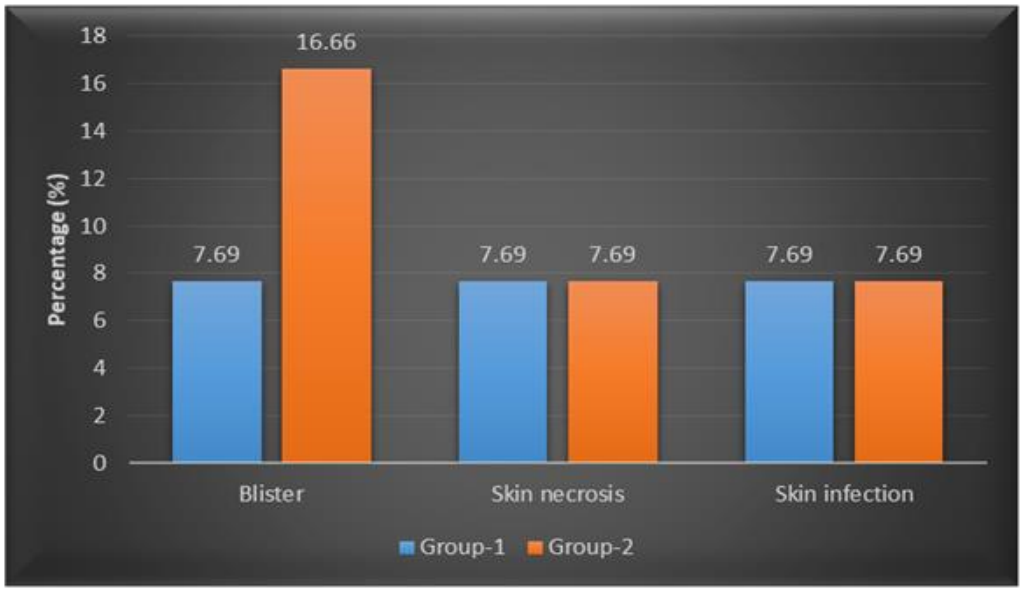

Figure-3: Bar diagram showing early post-operative complications in Group-1 and Group-2

The distribution of the final results was reported in Table 5. Only 10.54 percent of McKay's patients who had the procedure ended up with unfavorable outcomes, in contrast to the 89.46 percent who did well. Although 52.94 percent of Turco's patients had favorable outcomes, 47.06 percent did not. Using Fisher's exact test, we can see that there is a difference that is statistically significant. $p < 0.05$.

Table 5: Distribution of patients by the final outcome of the study (n=36)

Outcome	McKay's Procedure No. (%)	Turco's Procedure No. (%)	P value
Satisfactory (Excellent + Good)	17(89.46)	09(52.94)	0.02*
Unsatisfactory (Fair + Poor)	02(10.54)	08(47.06)	
Total	19(100)	17(100)	

Table 6 illustrated the various outcomes of the investigation. In McKay's method, the results were as follows: 89.46% were deemed acceptable, whereas 10.54 % were deemed unsatisfactory. In Turco's method, 52.94 percent of patients got good results, whereas 47.06 percent had poor results. A statistically significant difference may be seen by the use of Fisher's exact test. $p < 0.05$.

Table-7: Distribution of patients by the final outcome of the study (n=36).

Outcome	McKay's Procedure No. (%)	Turco's Procedure No. (%)	P value
Satisfactory (Excellent + Good)	17(89.46)	09(52.94)	0.02*
Unsatisfactory (Fair + Poor)	02(10.54)	08(47.06)	
Total	19(100)	17(100)	

DISCUSSION

In the current research, out of a total of 25, seven individuals (one each in Group-I and Group-II) had a positive family history of clubfoot, which corresponds to a percentage of 28 percent. Out of 25 patients with a rigid kind of clubfoot deformity, the current research found that 5 individuals had additional congenital defects (in both Group-I and Group-II). This accounts for 25% of the total. One patient in Group I had

syndactyly, and two patients in Group I had cleft lips. In Group II, one patient in Group I had syndactyly, and one patient in Group II had cleft lips.

In the current research, Group-I consisted of a total of 8 males and 5 females, while Group-II included a total of 9 males and 3 females. There were a total of 17 males (68.0%) and just 8 females (32.0%). When compared to the studies, there are a greater proportion of male patients (53.4%, 84.62%, and 66.67%) [20].

Seven patients in Group I had a unilateral clubfoot, whereas seven patients in Group II had a unilateral clubfoot. There were a total of 14 patients who were in both Group-I and Group-II, and there was evidence of bilateral involvement in 6 of the Group-I patients and 5 of the Group-II patients. Eleven patients, or 44.0%, were members of Groups I and II simultaneously. The degree of engagement on both sides is closer to 46.16% and 42.6% than it is to either 60.0% or 65.38% [20,21].

The ages of the patients in Group-I in the current study ranged from 3 months to 36 months (three years), with a mean age of 14.76 months and a standard deviation of 9.36 months. And in Group-II, the ages ranged from three months to three years, with a mean of 15.91 months and a standard deviation of 9.59 months. In Group-I, 13 patients with 19 feet were treated surgically by McKay's treatment, while in Group-II, 12 patients with 17 feet were treated surgically by Turco's method. Both groups had the same number of patients undergoing surgery. In this particular research, the majority of patients were within the age range of 6-11 months (30.76%) in Group-I, while 33.33% were within same age range in Group-II. While those aged 12 to 17 months make up the next most prevalent age group (23.07% in Group-I and 25% in Group-II respectively).

Four feet, or 30.76% of the total number of cases in Group-1's right side, while three feet, or 25% of the total number of cases, came from the left side. In this research, out of 25 instances, surgery was used to treat 13 cases (52%) using McKay's method, while surgery was used to treat 12 cases (48%) using Turco's approach.

In Group I, excellent results were achieved at a distance of 15 feet (78.94%), and good results were obtained at a distance of 2 feet (10.52%); thus, acceptable results were obtained at a distance of 17 feet (89.47%), and bad results were obtained at a distance of 2 feet (10.53%). In Group-II, fair results were achieved in 02 feet (11.76%), whereas outstanding results were obtained in 07 feet (41.18%). Therefore, satisfying results acquired in 02 (Excellent + good) were found in 9 feet (52.94%), while unsatisfactory results found in 08 (Fair + bad) were discovered in 8 feet (47.06%). Release of soft tissue in 55 feet, with a typical follow-up of three years and two months. In 82% of the instances, the outcomes were good to excellent, whereas in 18% of the cases, the results were fair to poor [22]. Surgery for clubfoot was performed at Columbus Children's Hospital using three distinct methods between the years 1981 and 1985, with a follow-up period of 16 months [16]. They exhibited good outcomes with the Turco treatment 48.0% of the time, the McKay procedure 62.5% of the time, and the Carol procedure 45.8% of the time. In the current research, early post surgical problems arose in three instances (23.07%) in Group-I. These issues included blistering in one patient (7.69%, case no. 7), skin necrosis in one patient (7.69%, case no. 9), and skin infection in one patient (7.69%, case no. 11). Early postoperative problems occurred in four instances (33.33%), including blisters in two patients (16.66%, case no. 8), skin necrosis in one patient (8.33%, case no. 8), and skin infection in one patient (8.33%, case no. 10). In Group-II, early postoperative complications occurred in 33.33 percent of cases. Patients who developed skin necrosis and infection were treated with dressing applied via a window in the plaster and cephalosporin antibiotics of the third generation. In Group- I, late problems occurred in 2 patients (15.38 percent), including stiffness in 1 patient (7.69 percent, Case no. 3), and deformity in 1 patient (7.69 percent, Case no. 5). In Group- II, three patients (24.99%) had late problems; among them were stiffness in one patient (8.33%, Case no- 4) and deformity in two patients (16.66%, Case no- 6).

CONCLUSION

According to the data, McKay's method had a higher percentage of successful outcomes (89.47%) than Turco's method (52.94%). Surgical correction of a congenital clubfoot deformity is universally recommended. Given the limited time frame, we believe that more research with a longer follow-up duration are required to confirm these findings. There was no potential for bias.

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