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Impact of Tibialis Anterior Tendon Transfer in Relapsed Clubfoot Management

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The clubfoot incidence among the white population is around 1.5 per 1,000 births. A male: female ratio of 2:1 has been determined. Abnormalities in either structure or function of the foot can alter this pattern and lead to areas of dangerously abnormal pressure where callosities or other injury can occur. This study is aimed to determine the efficacy of tibialis anterior tendon transfer in treatment of cases of dynamic foot supination in relapsed clubfoot, difference between split and total tendon transfer and detect any complications A technical study was conducted at Pediatric Unit of Orthopedic Surgery Department, Zagazig University Hospitals on a total of 12 patients (9 males and 3 females) with 1 bilateral, 7 right feet and 4 left feet. The 9 males were (1 bilateral, 5 right foot and 3 left foot). All patients fulfilling the inclusion criteria included in the study in a time period of 6 months after a tendon transfer were performed. Patient was allowed to resume normal life with no bracing or orthosis. Any residual deformity or complication of foots were evaluated. The mean age of 4.83±0.71 with minimum 4 years and maximum 6 years, regard sex male was majority with 75% and female 25%. A about 58.3% were right and 33.3% were left and just one case was lateral 8.3%. Dimeglio score was significantly improved postoperatively compared with preoperative assessment. There was significant positive correlation between score and age. A about 75% of patients were very satisfied and 25% were satisfied postoperatively. There no other complications detected postoperatively except 2 cases had infection. Tibialis anterior transfer is a very successful operation for treatment of cases of dynamic foot supination with no significant complications.

Keywords: Tibialis Tendon Transfer, Clubfoot and Dimeglio score

INTRODUCTION

Clubfoot is a congenital foot deformity in which the infant's foot is turned inward in degrees up to facing sideways or even upward (Carey et al.2003).The incidence of clubfoot among the white population is between 1.2 and 2.4 per 1,000 births. A male: female ratio of 2:1 has been determined.The incidence varies considerably between races (Pavoneet al.2018).

There are many degrees of severity and rigidity found in idiopathic clubfoot. Two main classification systems are commonly used to assess these feet. The Catterall-Pirani system consists of six features, with a higher score indicating a more rigid foot deformity (Piraniet al.2001). Dimeglio score has been used since 1995 for assessing and classification of clubfoot to determine the severity and efficacy of the treatment. It's based on a scale from 0-20 according to 4 parameters (equinus, varus, adduction and derotation around the talus) (Dimeglioet al.1995). The Standard treatment for Clubfoot is The Ponseti Method which is a series of weekly manipulations, casting and bracing of

the foot. Percutaneous Achilles Tenotomy may be needed in some cases after 4 to 6 weeks to completely correct the deformity (Fan et al.2017).

There have been several modifications to the procedure of transferring the tendon whether in its origin or insertion, split or complete transfer. The most recent and commonly used technique these days is transferring the whole insertion of tibialis anterior tendon from the medial cuneiform and 1st metatarsal bones to the lateral cuneiform bone. This procedure has proved great success in correcting the relapse without affecting the long-term functions of the foot (Joshua et al.2015). So according to the nature of this condition, clinical assessment is the main and may be only way for diagnosis of the relapsed talipes. Radiological evaluation may be needed by X-ray to be sure there is no other bony abnormalities or any need for other types of corrective surgeries (Ebeed et al.2019). Therefore, the present study is aimed to determine the efficacy of tibialis anterior tendon transfer in treatment of cases of dynamic foot supination in relapsed clubfoot, difference between split and total tendon transfer and detect any complications of the procedure.

MATERIALS AND METHODS

A technical study was conducted at Pediatric Unit of Orthopedic Surgery Department, Zagazig University Hospitals on a total of 12 patients (9 males and 3 females) with 1 bilateral, 7 right feet and 4 left feet. The 9 males were (1 bilateral, 5 right foot and 3 left foot). The 3 females were (2 right foot and 1 left foot). All patients fulfilling the inclusion criteria included in the study in a time period of 6 months**.**

Inclusion and Exclusion Criteria:

Age of children group (2-6) years old. Relapsed cases after initial correction by Ponseti Method by Dynamic Supination. While, Children below 2 years and above 6 years of age Cases of clubfoot treated by other methods rather than Ponseti and associated neuromuscular conditions or syndromes were excluded.

Preoperative assessment:

Serial manipulations and casts is essential to correct forefoot adduction, supination, varus and hindfootequinus deformities preoperatively. Standing AP and Lateral X-rays to ensur the presence of lateral cuneiform as its usually present at 2.5 years. confirm that forefoot adduction is corrected in AP x-ray and equinus and cavovarus are corrected in lateral x-ray.

Tendon Transfer Technique:

The position the patients supine on a radiolucent table. All patients received general anesthesia. Allocate the Tibialis Anterior Tendon on the medial dorsum of the foot opposite the medial cuneiform and first metatarsal. Then about2cm longitudinal incision opposite the insertion and slightly distal for dissecting sharply and carefully through skin and subcutaneous tissue till reach the tendon sheath and incised it in line with the tendon fibers. Bu use a Graham Hook, elevate the tendon up using a scalpel, scissors to dissect the tendon and release it from the surrounding tissue up to its proximal part and inferior extensor retinaculum. The tendon prepared by a strong non-absorbable suture and Bunnell type stitch to secure the distal 2-3cm of the tendon.

Postoperative evaluation:

Knee cast is done and non-weight bearing for 6 weeks then removed wiyh stiches and patient is allowed to resume his normal life with no bracing or orthosis. Evaluate the foot for any residual deformity or complications.

Statistical analysis:

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. Paired t test, correlation by Pearson's correlation. P value was set at <0.05 for significant results &<0.001 for high significant result.

RESULTS

The present study included 12 cases 9 males and 3 females to assess outcome of Tibialis Anterior Tendon Transfer in Management of Relapsed Clubfoot. The mean age of 4.83±0.71 with minimum 4 years and maximum 6 years, regard sex male was majority with 75% and female 25% (Table 1). Regarding side distribution among studied group, about 58.3% were right and 33.3% were left and just one case was lateral 8.3%(Table 2).

Dimeglio score was significantly improved postoperatively compared with preoperative assessment (Figure 1). There was significant positive correlation between score and age (Figure 2).

Table1: Age and sex distribution among studied group (12 cases)

		Age	
Mean± SD		4.83±0.71	
Median (Range)		5.0 (4-6)	
		N	%
Sex	**Male**	9	75.0
	Female	3	25.0
	Total	12	100.0

Table2: Side distribution among studied group

		N	%
Side	**Right**	7	58.3
	Left	4	33.3
	Bilateral	1	8.3
	Total	12	100.0

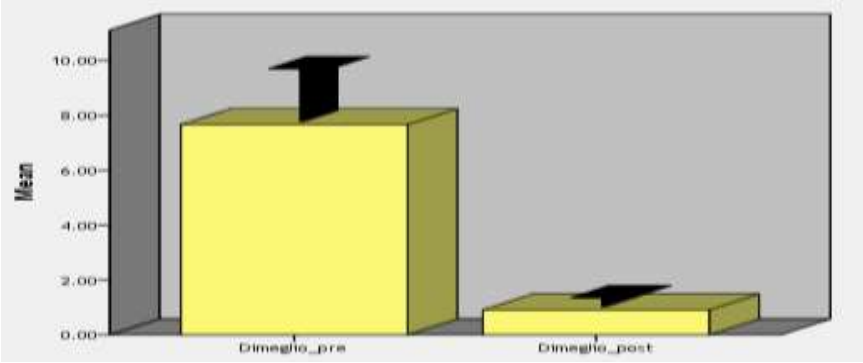

Figure 1: Dimeglio score pre and post distribution among studied groups.

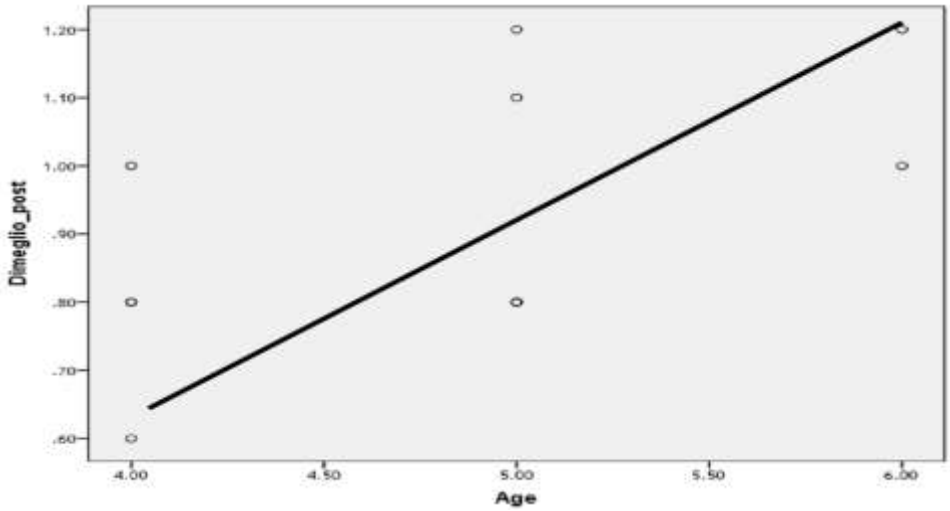

Figure (2):Correlations between age and dimeglio score

Table 3: Satisfaction distribution among studied group

		N	%
Satisfaction	**Satisfied**	3	25.0
	Very satisfied	9	75.0
	Total	12	100.0

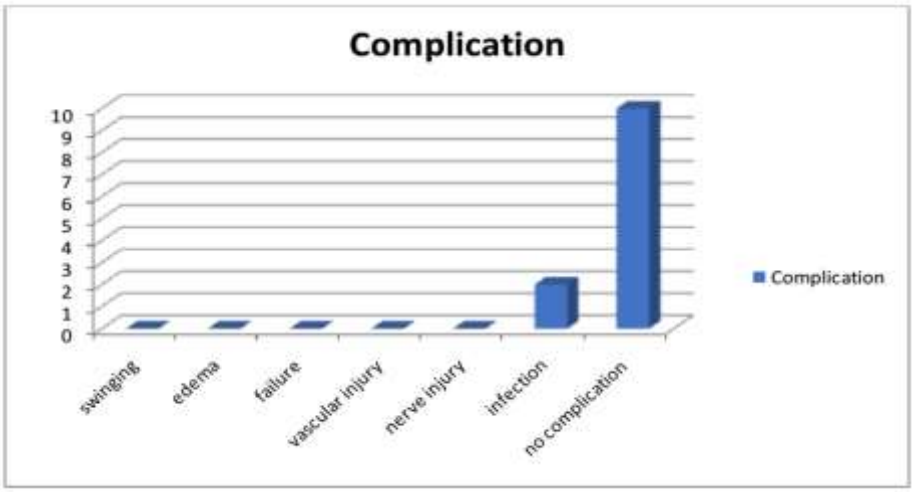

Figure 3: Complication distribution among studied group

Concerning satisfaction distribution among studied group, about 75% of patients were very satisfied and 25% were satisfied postoperatively (Table 3). Complication distribution among studied group showed that 16.75 (2 cases) only had infection. There no other complications detected postoperatively (Figure 3).

DISCUSSION

In the clubfoot, active and passive mobility of the anterior part of the foot and toes is only slightly restricted. In most cases at birth, the forefoot adduction can be corrected to a near normal position at the Lisfranc line, and the metatarsals can be flexed and extended through a normal range of motion.Even in cases where the first cuneiform metatarsal joint is medially slanted, the first metatarsal can be moved into the proper alignment with the other metatarsals, thereby eliminating the cavus (Stouten et al.2018).

Abnormalities in either structure or function of the foot can alter this pattern and lead to areas of dangerously abnormal pressure where callosities or other injury can occur. Simple observation of the foot alone could mislead the clinician, but analysis of plantar pressure can assist anatomical inspection (Wallanderet al.2010). Both forefoot adduction and hindfootvarus lead to the bean-shape of the foot. As this occurs, the foot is converted into a rigid lever that supports the body at the time of toe off (Holt et al.2015). This deformity may be resulted from an abnormal relationship between tarsal bones associated with soft tissues contractures. Twisting of the calcaneus and the navicular around the talus as congenital dislocation of the talocalcaneonavicular joint (Fan et al.2017).

The most common time of presentation of the relapse is between 2.5 to 5 years of age as this is the period of rapid growth of the foot.Dynamic foot supination is the commonest form of clubfoot relapses counting around 68% of cases. The treatment of choice for dynamic foot supination is "Tibialis Anterior Tendon Transfer" (El-Fadlet al.2018).

The preset study was aimed to determine the efficacy of tibialis anterior tendon transfer in treatment of cases of dynamic foot supination in relapsed clubfoot, difference between split and total tendon transfer and detect any complications of the procedure.

In our study, children with club feet were unilateral and representing 92% while, the bilateral cases were only one case out of the 12 patients. There were 75% males and 25% females. These results are agreement with Wijayasinghe et al. (2018) who conducted a total number of 354 patients and found the ratio of 2.7:1 regarding males and females respectively.

This explained by Kruse et al.(2008) who suggested that females, on the contrary of males, need more genetic load to be affected. This might explain thehigher incidence of clubfoot in males than females found in this study.

In our study, the postoperative evaluation of feet in according to dimeglio score were ranged around 7.5 score before surgery which became around 1 postoperative which means great success. These results are agreeing with Eid et al (2014) who reported that no poor or fair outcome post-operatively.

Regarding the postoperative complications, only two out of twelve patients presented with skin infection and were treated by antibiotics and resolved completely. These results concur with Kumar et al (2017) who stated thatThe big problem of clubfoot management in the developing countries that might yields unpredictable results is the ignorance of parents.

Our results represented a positive correlation between age and dimeglio score. This go similarly with Agarwalet al. (2018) who concluded that the younger the patient the better the postoperative results and patients older than 6 years tibialis anterior transfer may not be sufficient alone and may need other procedures which is also what we found in our study that the younger the patient the faster he goes back to normal activity postoperative

CONCLUSION

Tibialis anterior transfer is a very successful operation for treatment of cases of dynamic foot supination with no significant complications. Total tendon transfer is better than split transfer in cases of dynamic foot supination as patients benefit from the whole strength of the newly transferred muscle and not part of it and won't need any other procedure afterwards or recurrence. It's always preceded by serial castings and manipulations to allow the foot to accommodate the new post-operative changes.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

AUTHOR CONTRIBUTIONS

. All authors read and approved the final version.

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