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COMPARISON OF TWO SURGICAL APPROACHES IN CLUBFOOT: SINGLE POSTEROMEDIAL RELEASE VERSUS COMBINED POSTEROMEDIAL AND LATERAL RELEASES

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Abstract

This comparative prospective study was conducted to assess surgical outcome and post-operative complications in 70 children with 115 idiopathic clubfeet treated at Basrah General Hospital. Children up to age of 5 years were included. There were 49 males and 21 females. Male to female ratio was 2.3:1. The deformity was bilateral in 61.4% and unilateral in 38.6% of cases. The indications for surgery were failure of early conservative treatment and late patient presentation beyond 6 months of age. Patients were placed into two groups; group A in whom a standard posteromedial soft tissue release through single incision including 58 feet (19 moderate, 28 severe, and 11 very severe), whereas in group B, combined posteromedial and lateral releases through two separate incisions in 57 feet (19 moderate, 28 severe, and 10 very severe). Analysis of data reveals that combined release is superior to single release in the rates of operative wound breakdown and more important in term of correction of initial preoperative clubfoot deformity for which the surgery was performed. Postoperative skin necrosis occurred in 8.8% of combined release feet compared to 17.2% in single posteromedial release feet. With combined release 87.7% of feet obtained satisfactory deformity correction outcome in contrast to only 63.8% in single release feet. The most common single residual deformity reported in this study following surgical correction whether by single posteromedial release (13.8%) or by combined release (12.3%) was forefoot adduction. The risk of wound infection was approximately the same for both procedures 8.6% in single release, and 8.8% in combined release.

The study showed that the proportion of satisfactory deformity correction results decreases as the patient age at operation increases, particularly if single posteromedial release alone was performed. With single release a 100% satisfactory deformity correction outcome will be obtained only if surgery was performed during the first 6 months of life, beyond which this rate had dropped to 63.6% when operation was delayed to the age of 7-12 months, and to 25% at 1-3 years of age. After 3 years of age single posteromedial release alone did not yield any satisfactory results. On the other hand a100% satisfactory results were obtained in all feet treated with combined release during the whole period of the first 3 years of life, after which the rate of satisfactory results decreased to 50%. The study highly recommends the use of combined posteromedial and lateral release through two separate incisions when operating on clubfeet above the age of 6 months. This is a very valuable procedure with high success rate both in correcting the initial deformity and minimizing the rates of surgical wound breakdown.

Introduction

Congenital idiopathic clubfoot (talipes equinovarus) is one of the most common congenital orthopedic anomalies which still continues to challenge the skills of the orthopedic surgeon as it has a notorious tendency to relapse irrespective of whether the treatment was conservative or by operative means. Confusion and divergent opinions regarding etiology,

pathogenesis, treatment and prognosis still exist[1]. To appreciate the condition one must consider the foot as a whole. The deformity is an equinus and varus of the hindfoot and adduction and supination of forefoot with cavus. As the child grows adaptive changes develop in the bone and soft tissue as the result of the abnormal position. There are many controversies in assessing the severity of deformity, the role of operative versus non-operative treatment, optimum age at surgery, type of incision and postoperative regimen of immobilization. Ponseti method of conservative treatment is very useful, if started very early in life, done by experienced orthopedic surgeon, and proper type of splint till four years of age when recurrence rate would disappear[2]. Surgical treatment of clubfoot is indicated after failure of conservative treatment and supported by limited operative intervention .The list of operative procedures is endless as no single procedure gives a long-lasting correction. The surgery must be tailored to correct the specific elements of the deformity taking in consideration the age of patient at time of surgery[3,4]. Surgical goal is concentric reduction of talo-navicular and calcaneo-cuboid joints[1]. Deformity of bones and joint are rarely completely corrected. Operating time of clubfoot is debatable[5-8], most surgeons delay surgical intervention until the infant is 4-6 months age. In small foot and earlier age there is abundant amount of fatty tissues with small bone and cartilage structure.

Patients and methods

Between October 2005 and October 2007, a group of 70 children with 115 idiopathic congenital Talipes equino varus club feet was evaluated and treated surgically in a prospective comparative study at the orthopedic unit of Basrah general hospital. Children up to age of 5 years were included. Other varieties of club foot such as neuropathic, postural, and arthrogryposis as well as recurrent club feet after previous surgical correction were excluded from the study.

Forty nine patients (87 feet) were males representing 70% of patients and the remaining 21 (28 feet) were females representing 30%. Male to female ratio was 2.3/1. The deformity was bilateral in 43 patients (61.4%) and unilateral in 27 patients (38.6%). Involvement of the left foot was recorded in 70 % of the unilateral deformity. Positive family history of clubfoot was found in 14% of patients (10 out of 70). Age at operation was 3-6 months in 54 feet (termed early cases in the study), and more than 6 and up to 60 months in the remaining 61 feet (termed late cases in the study). Dimeglio[9] classification was utilized to assess the severity of clubfoot deformity into moderate, severe and very severe grades. The indications for surgery were: failure of conservative treatment (serial manipulative correction and casting) and late presentation more than 6 months of age.

Operative details

In essence the operation is an extensive release of all the structures contributing to the deformity. Tourniquet was used in every case. The patients were divided into two groups:

Group A: Single incision (Turco's posteromedial release): this was performed in 58 feet (19 moderate, 28 severe, and 11 very severe).

Group B: Two separate incisions (Combination of posteromedial release and lateral release): performed in 57 feet (19 moderate, 28 severe, and 10 very severe).The lateral release was soft tissue or combination of soft tissue and bony surgery which included:

1- Release of all capsular structure of calcaneo-cuboid joint (other

than the lateral capsule) which is retained as locating hinge against which reduction is held.
2- Mobilization of the tendons of the peroneus longus and brevis.
3- Release of the calcaneo-cuboid ligament.
4- Division of the calcaneofibular ligament.
5- Wedge resection of the calcaneo-cuboid joint (if the age is 3-5 years).

Postoperative care:

The limb is held in a well padded above knee complete plaster of Paris.
No attempt is made to maintain full correction until the skin is healed at two weeks. Stitches are removed after two weeks at which time full correction is maintained in a long leg plaster cast for one month. Thereafter splint is worn day and night until the child begun to walk. Follow-up visits were arranged , the first visit at two weeks, the second at one month, the third at three months, the fourth at six months and the last at one year. In each visit the following six parameters were assessed; presence or absence of wound infection, skin necrosis, forefoot adduction, equinus deformity, heel varus deformity, and recurrence of all elements of clubfoot.

Results

Surgery was performed at age 3-6 months in the majority of cases (54 feet representing 47% of all feet), in 22 feet (19.2%) at age 6-12months, and in 23 feet (20%) at 13-36 months as shown in table I.
Table II shows that the most frequent grade of club foot severity encountered in the study was the severe grade in 56 feet (48.6%), followed by moderate in 38 (33%), and lastly very severe in 21 feet (18.4%) as table II shows.

Table I: Distribution of patients according to age at operation.

Age (months)		Group A		Group B		Total	
		Feet	Per cent	Feet	Per cent	Feet	Per cent
Early	3-6	27	23.5	27	23.5	54	47
Late	7-12	11	9.6	11	9. 6	22	19.2
	13-36	12	10.4	11	9. 6	23	20
	36-60	8	6.9	8	6.9	16	13.8
Total		58	50.4%	57	49.6%	115	100%

Table II: Distribution of patients according to severity of clubfoot deformity

Severity grade	Group A		Group B		Total	
	Feet	Per cent	Feet	Per cent	Feet	Per cent
Moderate	19	16.5	19	16.5	38	33
Severe	28	24.3	28	24.3	56	48.6
Very severe	11	9.7	10	8.7	21	18.4
Total	58	50.5	57	59.5	115	100

To assess the results of operative treatment regarding correction of the deformity, the method of Main et al of clinical evaluation was used[10]. The results were graded excellent, good or poor on strict criteria.
Excellent refers to obtaining normal function and appearance of the foot.

Good refers to obtaining normal function with a plantigrade foot, no fixed deformity and the ability to dorsiflex and evert the foot to the neutral position. Poor if activity is limited in any way; Residual fixed deformity, such as hindfoot equines, heel inversion, forefoot varus, cavus or excessive planovalgus, inability to dorsiflex and evert the foot to the neutral position, or the need for secondary operation.

In this study the outcome of deformity correction was described as satisfactory (sum of excellent and good results), and unsatisfactory which included the poor results only. Applying the above criteria, for group (A) feet treated by single posteromedial release, satisfactory results were obtained in only 63.8% feet (37 out of 58), compared to 87.7% (50 out of 57) satisfactory results obtained in group (B) feet of combined release. This indicates that the rates of successful correction of deformity were greater among group (B) than among group (A) fee as shown in table III.

Table III: Outcome of surgery regarding deformity correction (groups A & B).

Results		Group A		Group B		Total	
		Feet	Per cent	Feet	Per cent	Feet	Per cent
Satisfactory	Excellent	23	39.7	37	64.9	60	52.2
	Good	14	24.1	13	22.8	27	23.5
	Sum	37	63.8	50	87.7	87	75.7
Unsatisfactory	Poor	21	36.2	7	12.3	28	24.3
Total		58	100%	57	100%	115	100%

The commonest complications directly related to the operation were wound infection, necrosis of skin at wound edges and recurrence of the deformity as shown in table 4. Superficial wound infection which responded fully to frequent wound dressings and oral antibiotic therapy had occurred in 5 feet (8.6%) of group A, and in 5 feet (8.8%) of group B. Necrosis of skin edges was reported in 10 feet (17.2%) of group A, and in 5 feet (8.8%) of group B. All cases healed eventually by debridement and frequent wound dressing without the need for skin graft or major reconstructive procedures. The risk of this complication was greater in group A as compared to group B. Recurrence of deformity was the most frequent complication of operative treatment of clubfoot in the study. Recurrence rate of deformity among group (A) was higher than among group (B) since some form of recurrent deformity had occurred in 21 feet (36.2%) of group A, and in only 7 feet (12.3%) of group B. The most frequent single residual deformity recurred after operative treatment was forefoot adduction representing 38.1% of all recurrent deformities in group (A) feet (8 out of 21 recurrent feet), and the only deformity that recurred in all 7 (100%) recurrent feet in group (B) as shown in table V.

Table IV: Complications of surgery in all operated feet groups (A & B).

Complication	Group A		Group B		Total	
	Feet	Per cent	Feet	Per cent	Feet	Per cent
wound infection	5	8.6	5	8.8	10	8.7
Skin necrosis	10	17.2	5	8.8	15	13
Recurrent deformity	21	36.2	7	12.3	28	24.3

Table V: Recurrence of deformity after surgery (groups A & B).

	Group A		Group B		Total	
Residual deformity	Feet	%	Feet	%	Feet	%
Forefoot adduction	8	38.1	7	100	15	53.6
Equines	4	19	0	0	4	14.3
Heel varus	4	19	0	0	4	14.3
Combined	5	23.9	0	0	5	17.8
Total	21	100%	7	100%	28	100%

When final outcome of surgery is related to the age at the operation, 100% satisfactory results were reported in both groups when surgery was performed early within the first 6 months of age. Operation after 6 months of life would result in progressive reduction in the rates of satisfactory deformity correction results in group (A) feet from 63.6% at 7-12 months, decreasing to 25% at 13-36 months, to become 0% at 37-60 months. With the combined release (group B), still 100% satisfactory deformity correction results were obtained when performing surgery from above the age of 6 months and up to 3 years, above which the satisfactory results had dropped to 50% as table VI shows.

Table VI: Deformity correction in relation to age at surgery (groups A & B).

Deformity Correction		3-6 months				7-12 months				13-36 months				37-60 months			
		A		B		A		B		A		B		A		B	
		F	%	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Satisfactory	Exc.	16	59.3	22	81.5	4	36.4	8	72.7	3	25	8	72.8	0	0	0	0
	Good	11	40.7	5	18.5	3	27.2	3	27.7	0	0	3	27.2	0	0	4	50
	Sum	27	100	27	100	7	63.6	11	100	3	25	11	100	0	0	4	50
Unsatisfactory	Poor	0	0	0	0	4	36.4	0	0	9	75	0	0	8	100	4	50
Total		27	100%	27	100%	11	100%	11	100%	12	100%	11	100%	8	100%	8	100%

Discussion

Many controversies in the treatment of idiopathic clubfoot exist in literatures, such as the role of operative versus nonoperative treatment, optimum age of surgery, type of incision and postoperative immobilization regimen. The goal of treatment is to obtain painless, normal looking foot with good mobility and function. Most orthopedic surgeons would agree that the initial treatment of club foot patient should be conservative and any club foot which cannot be corrected or only partially corrected within 3-4 months of serial manipulation and casting is considered resistant and surgery is usually contemplated[11]. The list of operative procedures is endless as no single procedure gives a long-lasting correction. The surgery is tailored to the deformity[3,12]. The two important factors to achieve lasting correction are that complete correction of all components must be obtained and this correction must be maintained while the tarsal bones remodel. The rationale behind Turco"s posteromedial release was that the deformity is due to congenital subluxation of the talocalcaneonavicular joint, the correction of the abnormal tarsal relationship is prevented by rigid pathologic soft tissue

contractures[1].McKay et al[13] and Herzenberg et al[14] Have shown that the presence of an internal rotation deformity of the calcaneus cannot be adequately corrected by a posteromedial release alone. Other causes of recurrence may be due to type of surgery, complete release of all the structures that participate in the deformity, postoperative immo-bilization (proper type of the splint and duration of the splint). Part of the reason that the foot relapses is the surgeon's failure to recognize the underlying pathoanatomy of the disease.

When comparing the outcome of surgery for clubfeet in this study, it was evident that combined release through two separate incisions (group B) feet gave much more superior outcome compared to posteromedial release alone through single incision (group A) feet in regard to the rates of wound edge necrosis and the more important the correction of initial pre-operative deformities for which surgery was performed. The risk of wound infection was approximately the same for both procedures 8.6% in single release, and 8.8% in combined release. Necrosis of skin edges occurred in 8.8% of combined release feet (group B) compared to 17.2% rate in single release feet (A). After posteromedial incision Wellington et al[15] found wound breakdown in 19.6% whereas Bethan et al[16] reported only 3.7%. Porats et al[17] found wound slough following two separate incisions to be 3.7%.The outcome of satisfactory deformity correction in this study was 87.7% for group (B) feet compared to only 63.8% for group (A) feet. It is not easy to compare our results precisely to the results of other studies since substantial difficulties in outcome research for clubfoot deformity exist for a number of reasons such as variability in the severity of the deformity as well as the age of initial presentation. Many studies in the clubfoot literature have small size and include patients from infants to adolescent's .In addition different studies utilized different parameters to assess the final outcome following operative treatment in clubfoot such as subjective[18], objective[19], and radiographic parameters[20,21]. While Main et al[10] found excellent results in more than half of cases following posteromedial release surgery, Lau et al[4] in his study found 80% satisfactory results after the same procedure, as also Turco[22] who had found excellent and good results in 83.8%. Other studies showed variable results: Magone et al[23] found poor and fair results in 52% following three different procedures. Gunther[24] found excellent and good results following serial casting and additional posterior release in about 59.7%. For separate incisions the results in literatures were also variable. Pandy et al[25] in their study found that unsatisfactory results following two separate incisions were 18%.

The most common single residual deformity reported in this study following surgical correction whether by single posteromedial release or by combined release was forefoot adduction. In the literatures, forefoot deformity is also the most common residual one following surgery on clubfoot regardless to the number of incisions or procedure performed[11,26]. It was reported in 38.1% of all recurrent deformities in group (A) clubfeet in the study which is in accordance to the result obtained by Daniel et al[117] who reported 35.5% residual forefoot adduction deformity following surgery but much higher than the rate of 17-19% reported by Mamoun[27] in his study following posteromedial release. In group (B) clubfeet forefoot adduction was the only recurrent deformity (7out of 7 feet). Tak et al [11]

found fixed deformity following two separate incisions were forefoot adduction deformity 26.7%.

The optimal age for surgical intervention has always been controversial. Turco[1] and Dangle major[28] recommend surgery at or around one year of age reporting the disadvantages of early surgery to be difficulty in the identification of the anatomical structures and in the handling of the small cartilaginous bones when operating on a small foot. Furthermore it is hard to hold the small foot in plaster. One major benefit of operating close to the age of walking is that it takes advantage of the normal physiological stimulus of weight bearing for remodeling .While Osterman & Merikato[5] recommend surgery at the earlier age of three to six months to utilize the remodeling potential of the foot. This study agrees with the results of Edmondson et al[7] and Simon[29] who had found that best results would be obtained when operation on club foot is performed early. In this current study inverse relationship was found between the age of the patient at operation and the outcome. Performing surgery after 6 months showed that combined release (B) was superior to single release (A) in correcting the deformity. It is clear that the proportion of satisfactory results decreases as the age at which operation is performed increases. This was so evident in posteromedial release group (A) feet in which the 100% rate of satisfactory deformity correction achieved when operation performed at first 6 months of age had decreased to 63.6% when operation was delayed to the age of 7-12 months, 25% at 13-36 months of age. On the other hand , group B combined release surgery allowed greater flexibility in delaying surgery especially if other co morbidities in the infants like recurrent respiratory tract infections and anemia would otherwise force the surgeon to defer operation. A 100% satisfactory results were obtained in all group B feet operated upon within the whole period of the first 3 years of life. High failure rate was reported by Sanghvi[30] when surgery was performed after the age of three years. This was also reported in this study, with group (A) feet the chance of obtaining satisfactory correction results when operating at 36-60 months of age was almost nil. but with group (B) feet ,there is still a 50% chance to obtain satisfactory results using combined release (mostly bony resection of calcaneocuboid joint on the lateral side) at the same age.

Conclusion

Surgery at an early age as possible in clubfoot that failed to respond to conservative treatment gives better results. Satisfactory results is more when the operation done in the first six months of life.

The use of two different surgical approaches in the treatment of idiopathic club foot can lead to different outcome. Combined posteromedial and lateral release through two separate incisions is a very valuable procedure with high success rate regarding both correcting clubfoot deformity and decreasing the rates of skin complications of surgery.

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