ORIGINAL ARTICLE

Results of revision surgery in resistant club foot

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Abstract

Objective: To evaluate the outcome of revision surgery in resistant club feet.

Patients and Methods: This study was conducted in the department of orthopaedic surgery Jinnah Postgraduate Medical Centre Karachi and Abbasi Shaheed Hospital Karachi, from January 2006 to February 2008. A total of 13 patients (22 feet) were operated. There were 9 males and 4 females with a mean age of 3 years (range 6 months to 10 years). All of the patients were previously treated either by conservative or surgical management. Functional assessment was performed according to Addison's and Fixsen scoring.

Result: According to Addison's and Fixsen criteria, excellent result in 12 feet (54.45%), satisfactory in 10 feet (45.45%) and no poor result. No significant surgical complication occurred.

Conclusion: A more favourable outcome is achieved with grade II deformities then grade III. Multiple procedures are required to achieve correction in relapsed club foot, but leads to subtalar stiffness.

Keywords: club foot, relapse

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Introduction:

Talipes equinovarus is the most common congenital disorder of the extremities present at birth[1]. The term Talipes comes from the latin, which is a combination of talus means ankle and pes means foot. Club foot is a common term used to describe various deformities of foot, in which foot is like a golf stick. Congenital Talipes Equinovarus (CTEV) is the most common variety of club foot, in which the foot is plantar flexed and inverted[2].

The incidence of Club foot is approximately 1.2 per 1000 live births and is twice as common in boys[1,3,4]. Conservative treatment of CTEV usually starts soon after birth. Persistent and residual deformities require surgical corrections. Surgical corrections are reasonably successful in restoring normal foot[5]. However the relapsed rate of surgically treated club feet is about 25%[6,7].

The fore and mid foot deformities are the most persistent deformities[8]. Residual forefoot adduction and supination are present in 95% of cases. These persistent deformities result from undercorrection of the deformity at the time of initial surgery[7,9].

Residual club foot especially in older children is one of the difficult problems in orthopaedics. The optimum management for these relapses club feet is uncertain[5].

The aim of this study was to evaluate the outcome of revision surgery in clubfeet.

Patients and methods:

This is a retrospective, descriptive analytical study conducted in the department of Orthopaedic surgery Jinnah Postgraduate Medical Center and Abbasi Shaheed Hospital, Karachi. From January 2006 to February 2008, there were 13 patients (22 feet) of CTEV who presented with relapsed club foot. History, examination, grading of the deformity and radiological assessment was performed prior to the treatment of relapsed club foot.

Seven patients (12) feet were previously treated by casting and manipulation all were grade II[10]. Six patients (10) feet were previously treated by Turcos's11posteromedial release (PMR) procedure all were grade II except two patients who have grade III deformities.

The patients who were under 6 months and over 10 years of age, previously not being treated either conservatively or surgically were excluded. Club foot associated with other anomalies such as poliomyelitis, myelomeningocele, spina bifida, cereberal palsy, myopathy, arthrogryposis and congenital bands were excluded.

Nine patients were boys and four were girls with age range from 6 months to 7 years (mean 3 years). The mean follow up was 1.5 years ranged 1-2 years.

Radiological assessment:
Anteroposterior view were taken with the foot placed 30^0 of planter flexion on the cassette with x-ray tube directed 30^0 cranially centered on the ankle joint. The position of 30^0 plantar flexion of the ankle was achieved by placing the knees in 60^0 flexion over a triangular wooden frame. This position of the foot was chosen to prevent overlap of the distal tibia on the hindfoot[12,13,14].

On the anteroposterior radiographs, lines were drawn parallel to the medial border of the talus and the lateral border of the calcaneum. The angle formed by these two lines was measured and known as anteroposterior talocalcaneal angle (TCA-AP). Talocalcaneal angle normally is in between 25^0-55^0, greater than 55^0 indicates valgus, angle less than 25^0 indicates varus. Talo-first metatarsal angle (TMT) was measured by drawing line through centre of talus and centre of first metatarsal normally this is 5^0-15^0. Less than 5^0 indicates forefoot adduction, greater than 15^0 indicates forefoot abduction[12,13].

In the stress lateral radiographs, one line was drawn along the inferior border of the calcaneum and the second line was drawn along the long axis of the talus, bisecting the ossific nucleus. The angle formed by these two lines on the dorsiflexion was designated as the talocalcaneal angle (TCA) in dorsiflexion, when measured in plantar flexion named TCA in plantar flexion. The mean of the talocalcaneal angle was designated as the lateral TCA[12,14].

Radiographic evaluation was performed on anteroposterior and lateral foot x-rays, obtained prior to surgery, and postoperatively.

In all patients Turco's PMR was performed. Calaneo-cuboid (Dillwyn Evan[15,16]) arthrodesis was performed in 3 and Tibialis Anterior transfer was done in one patient in addition to PMR.

Postoperatively foot was immobilized in above knee plaster cast with ankle in plantigrade position. Stitches were removed after 3 weeks of correction under sedation and analgesia. No window was placed in plaster cast. Second plaster cast change was performed at 6th week at the outpatient clinic and surgical wound was revisited. Plaster cast was kept in corrected position for three months. Foot was protected in one patient (2 feet) in Denis Browne shoes for one year and pronator shoes were given in twelve patients (20 feet).

At follow up, all patients were evaluated by a thorough clinical examination and plain radiograph. Treatment outcome was assessed using the Addison's and Fixsen[17] criteria by evaluating pain, mobility of joint, foot wear and recreational activity. The maximum score is 9 points indicating excellent result, between 5-9 satisfactory and <5 poor result.

Result:
This study included 13 patients (22 feet). Nine were male and four were female with mean age of 3years (range from 6 months to 10 years). The mean follow-up was 1.5 years (range 1-2 years).

Nine patients (69%) presented with bilateral and four (31%) with unilateral deformities. Out of four unilateral, two had right side and two had left side. Seven patients (12 feet) were previously treated conservatively in plaster cast. Six patients (10 feet) had prior surgical correction.

All 13 patients (22 feet) has forefoot adduction, hindfoot varus and equinous. While in one patient (1 foot) there is imbalance between tibialis anterior and peronei in addition to equinovarus deformity.

Eighteen feet (81.72%) had grade II deformity and four feet (18.18%) had grade III deformities.

In all 22 feet Turco's PMR was performed, in 3 feet Dillwyn Evans osteotomies and in one patient Tibialis anterior transfer to cuneiform was performed in addition to PMR.

Overall result is excellent in 54.54% of feet and satisfactory in 45.45% of feet as shown in Table I.

Seven patients (12 feet) who had been treated conservatively had excellent results according to Addison's and Fixsens criteria. All of them belongs to type II deformity. Two of them had a unilateral and five of them had bilateral foot involvement.

Six patients (10 feet) who had previous surgical corrections had satisfactory results according to Addison's and Fixsens criteria. Among the six, three patients (6 feet) scored 8, one patient (2 feet) scored 7 and one patient (2 feet) score was 6. All these patients wear normal shoes, but of different sizes. They can participate in sports, but not in team events. The one, who scored 6, also had subtalar stiffness.

Four patients (8 feet) had superficial wound infection, which was treated by first generation cephalosporin. There were no neurovascular and growth plate injuries postoperatively. All osteotomies healed well in almost eight weeks.

In two patients (3 feet) we had to use short leg brace for six months, but in both of them the score was 6 which is satisfactory.

We have done the radiological assessment, but it doesn't have any direct effect on the functional outcome.

The mean TCA on antero-posterior view was 9.95^0 (ranges from 0^0-20^0) preoperatively and 38.50^0(range and 28^0-52^0) postoperatively.

Table 1: *According to Addison's Fixsens criteria*

Grade	No. of Feet (N=22)
Excellent	12 (54.54%)
Satisfactory	10 (45.45%)
Poor	No Poor Result

The mean TCA on lateral view was 7^0 (ranges from 0^0-12^0) preoperatively and 32.22^0 (range 20^0-52^0) Postoperatively.

The mean TMT was -50.35^0 preoperatively (range from -82^0 - 0^0) and 10.54^0 at followup (range from 0^0-16^0), showing a very good correction of forefoot adduction.

Discussion:

Congenital talipes equinovarus is one of the most common birth defects and relapsing club foot is one of the most difficult problem in orthopaedics[18,19]. Its management remains controversial[19]. The aim of treatment is pain free, plantigrade and mobile foot. Different treatment modalities from manipulation to soft tissue release have been reported[20].

The present trend is towards non-operative management with limited operative intervention (percutaneous Achilles Tenotomy) pioneered by Ponseti[19,21]. In our series of 22 relapsed clubfeet all had gone thru initial conservative management. According to ponseti poor result is due to poor technique rather than failure of conservative management. He had 89% of satisfactory result in his own hand[21]. To get such results, orthopaedist must adhere to the fundamentals and principles set by Ponseti[22].

The relapsed rate of surgically corrected CTEV is about 25% (range 13-50%)[6]. In our study group, 10 out of 22 feet (45.45%) had previous surgeries.

The variety of surgical procedures available, but in most cases posteromedial release as advocated by Turco was performed[22]. In our study all of the previously operated cases were also treated by PMR.

One of the major causes of relapse is under-correction at the time of initial surgery[23]. The others are over active tibialis anterior, incomplete follow-up and non-compliance of wearing orthosis.

Treatment for relapsed clubfoot include repeat soft tissue procedures, osteotomies of the foot, or ilizarove technique and triple arthrodesis[20,24].

We had performed PMR in all relapsed club foot. This surgical technique involves lengthening of tendo-Achilles and posterior tibial tendons with possible lengthening of the flexor hallucis longus and flexor digitorum communis tendons. Capsulotomies of the posterior ankle and posterior subtalar joint were routinely used with release of the medial and lateral subtalar joint advocated along with release of the telonavicular and or the subtalar joint was often performed[25].

We have done the Dillwyn Evan (calcaneo-cuboid) osteotomies in three patients, in addition to PMR. One of the criticisms of the Dillwyn Evans procedure is that growth arrest of the lateral column creates a small foot[16]. The size of the feet in our cases also shows loss of length, comparable with the findings of Wynne-Davies (1964)[26] and Laaveg and Ponsetti (1980)[27] conservatively treated feet. Suggesting that there is no difference between the Dillwyn Evan's and conservatively treated feet in this respect.

Valgus overcorrection may occur if thick calcaneo-cuboid wedge is excised[16]. Tachdjian[28] (1990) said that Evan's procedure carries a hazard of overcorrection into valgus, if performed before the age of eight years. All of our patients were under 8 years of age, but there was no overcorrection. Graham and Dent[16] also observed the same in their study. They had only one overcorrection, although all the patients were under eight years of age.

In one patient Tibialis Anterior (TA) was transferred to the third cuneiform in addition to the PMR, due to the muscular imbalance. The aim was to rebalance the muscle of the foot. In some cases the TA is more medially inserted in comparison to the normal foot[29]. In addition, a relative weakness of the peroneal muscles has been reported[30]. Garceau[31] concluded that TA transfer to the lateral aspect of the foot was a useful procedure to correct relapsing deformities. Laaveg and Ponseti in 1980[27], Cooper and Dietz in 1995[32], Ezra et al[30] in 2000 and Kuo et al[33] in 2001 recommend TA transfer to correct the relapsing clubfoot.

The radiological utility and their relationship to the clinical outcome is still debatable[34,35]. The pain free and fully functional feet could be considered as failure by some authors if it is anatomically imperfect. Others noted that despite anatomical and radiological imperfections most patients demonstrate excellent level of function[36].

Some articles describe certain associations, but didn't address the significance or lack of these radiological parameters[37]. In our study we didn't find any correlation in radiological and functional outcome.

The overall result in our study of relapsing clubfoot is 54.54% excellent and 45.45% satisfactory according to Addison's and Fixsen criteria[17].

Atar et al[6] reviewed 29 feet treated for relapsed clubfoot. There is a rate of 66% combined excellent and good results. This corresponds well with our study where we have 54.54% excellent result.

Lehman et al[38] reviewed 27 feet, 4-8 years old underwent revision surgery consisting of complete soft tissue release combined with a calcaneo-cuboid fusion. They reported 30% excellent, 48% good results.

No treatment can achieve normal foot function for relapsed clubfeet. The goal of any clubfoot surgery is to obtain a cosmetically acceptable, pliable, functional, painless and plantigrade foot.

Conclusion:

Our result indicates excellent outcomes for those operated on less severe deformity (grade II) and treated conservatively prior to the surgery. Successive surgery for relapsed clubfoot leads to subtalar stiffness.

The follow-up in our study is short. Relapsed continues to occur after surgical correction, during first decade. Therefore appropriate follow-up is recommended.

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