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## CONGENITAL CLUBFOOT

*A Follow-up of 58 Children Treated During 1964-1969*

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The object of this study is to present the results of treatment of congenital clubfoot in the Department of Orthopaedic Surgery U, Rigshospitalet, Copenhagen, during the years 1964-1969. The main purpose of the study is to clarify the cause of relapse in the operated cases.

### MATERIAL

The series comprised 58 children treated for idiopathic congenital clubfoot. Children with clubfoot secondary to myelomeningocele, poliomyelitis or other clearly neurological or muscular disorders were not included in the present series. "Clubfeet" which were corrected after a few weeks of manipulation were not included in this series.

The sex incidence and method of treatment are illustrated in Table 1. 77 per cent were treated operatively.

In eight children the clubfoot was combined with other congenital deformities (Table 2). In the two patients with arthrogryposis the diagnosis was questionable as the hip and knee joints were later described as normal.

### METHOD

All initial treatment was conservative. Manipulation of the feet was commenced in the obstetric department as early as possible after birth, and a retaining bandage of elastic flannel was applied (Thomassen 1941). In the manipulation therapy it was attempted, by passive stretching of muscles, tendons, ligaments, and joint capsules, to overcome the deformity maintained by soft tissue contractures and thus normalize the relationship between the bones. The manipulations were continued daily by a specially trained physiotherapist and the mother was instructed how to carry out the manipulations herself every evening.

When the child was one month old, a polyethylene cast (Plexidur®) was applied and corrected according to the position of the foot during the following months. When the child was three months old a qualified orthopaedic surgeon made a

*Table 1. Sex incidence and method of treatment in 58 children with congenital clubfoot.*

58 children	37 boys	25 unilateral = 25 feet	{	Operative treatment	21
				Conservative treatment	4
	21 girls	12 bilateral = 24 feet	{	Operative treatment	20
				Conservative treatment	4
	21 girls	16 unilateral = 16 feet	{	Operative treatment	12
				Conservative treatment	4
		5 bilateral = 10 feet	{	Operative treatment	5
				Conservative treatment	5

75 feet of which 58 operatively treated = 77 per cent operatively treated.

*Table 2. Coincident deformity in eight children with congenital clubfoot.*

Syndactylia	2
Congenital dislocation of hip	2
Palsy of facial nerve	1
Omphalocele	1
Arthrogryposis?	2

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thorough evaluation of the position of the foot and decided whether further treatment should be operative or conservative. At the same time an X-ray examination was performed. Lateral exposures were made with the foot in maximum dorsiflexion; frontal exposures with the foot in neutral position.

Indications for continued conservative treatment were:

- a) active dorsiflexion to a right-angled position and passive dorsiflexion to 20° past a right-angled position.
- b) passive correction of varus component in the hindfoot.
- c) passive correction of adduction of forefoot.
- d) passive pronation of forefoot to 20°.
- e) on X-ray the angle between the longitudinal axes of the talus and the calcaneus in dorso-plantar as well as in lateral exposures should exceed 30°.

Abnormally small ossification centres in the hindfoot and severe leg atrophy were contraindications to conservative treatment.

In cases where continued manipulation therapy was decided upon, the child was checked by the physiotherapist two or three times weekly and by the doctor in an outpatient clinic every second or third month. The polyethylene cast was worn 24 hours a day. At the age of one year the cast was changed to a night bandage of leather and when starting to walk the child was equipped with shoes with a late wedge. The night bandage was continued up to the age of six or eight years.

If the above-mentioned requirements for continued conservative treatment were not fulfilled the child was admitted for surgery. The purpose of the operative procedure was to remove all the fibrotic tissue which was preventing the foot from adjusting to the neutral position and further to divide contracted capsules and ligaments and lengthen shortened tendons at the posterior and medial side of the foot. It was considered of great importance to reduce the navicular bone when displaced medially.

#### *Surgical technique*

The incision was made from the medial side of the tendo achilles, over the tip of the medial malleolus, and along the medial side of the foot to the first metatarsophalangeal joint. The achilles tendon and the posterior tibial tendon were always lengthened. The posterior ankle capsule was divided and the peroneal tendons inspected. The deltoid ligament, the talo-calcaneal ligaments and all ligaments around the navicular bone were sectioned. Occasionally, when there was marked adduction of the forefoot the abductor hallucis muscle was stripped. After this procedure a plaster cast was applied with the foot in an overcorrected position. The cast was changed after two and six weeks and removed after three months. The late postoperative treatment followed the same principles as the conservative treatment, i.e. a polyethylene cast up to the age of one year followed by a leather night bandage. Postoperative manipulations were restricted so as not to cause postoperative fibrosis. Check-ups were discontinued when the child was six to eight years old.

#### RESULTS

At follow-up the feet were classified into five groups according to Table 3 (Reimann 1967). 23 per cent were conservatively treated. These were all good or fair (if poor they underwent operation). The age of the children at operation is shown in Table 4. The postoperative period of observation ranged from 2½ years to 7½ years (Table 5). In one case only, the long, curved skin incision led to cutaneous necrosis, which healed in two months.

There was a high rate of reoperations. As seen in Table 3, 12 feet were classified as "poor". For this reason 11 feet were reoperated (19 per cent). The parents of one patient refused reoperation. One child was reoperated upon twice. Both reoperations were performed at another hospital. One patient was reoperated bilaterally, the rest unilaterally.

One surgeon was responsible for 43 of the operations whereas 15 operations were performed by five different surgeons. There was no difference in the frequency of reoperations in these two groups. The second operations were performed one to five years after the first, the average time being two years after the first operation. So far, the

Table 3. Clinical results of the treatment of 75 clubfeet.

	Conservative treatment	Operative treatment
<i>Group I</i> Anatomically satisfactory shape without deformity, un- hindered walking, active dorsal flexion to a right-angled position or beyond, and active pronation to the normal position	11	22
<i>Group II</i> Anatomically satisfactory shape without deformities apart from easily redressable adduction of the forefoot or toes. Function as in group I.	5	17
<i>Group III</i> Anatomically considerable adduction of the forefoot which cannot be corrected manually to normal, hindfoot normal or in slight varus (0-5°). Good function with active dorsal flexion to a right-angled position, active pronation to normal or almost normal position	1	6
<i>Group IV</i> Anatomically slight varus and/or equinus deformity of the hindfoot as well as adduction of the forefoot. De- formities not fixed. Unhindered walking, active dorsal flexion and active pronation to normal or almost normal.		1
<i>Group V</i> Anatomically unsatisfactory with a fixed varus and/or equinus deformity of the hindfoot. Function unsatisfactory.		12
Group I + II: Good.    Group III + IV: Fair.    Group V: Poor.		

Table 4. The age at operation of the children with 58 clubfeet.

Age	Feet	
1-3 months	2	} = 26 early operated
4-6 months	24	
7-12 months	14	} = 32 conservative treatment unsatisfactory
13-18 months	9	
19-24 months	7	
> 24 months (31 and 33 months)	2	
<b>Total</b>	<b>58</b>	

*Table 5. Postoperative period of observation in 58 operated clubfeet.*

Period of observation	Feet
2½–3 years	5
> 3–4 years	10
> 4–5 years	16
> 5–7½ years	27
58	

period of observation after the second operation has been too short to permit a final evaluation of the results. No bone operations were performed.

As the main purpose of the study is to clarify the causes of postoperative relapse we found it of special interest to go through the case histories of the 11 "poor" cases.

*Case 1: J. N. 030265. Severe congenital right-sided clubfoot.*

The child lived under poor social conditions with his unmarried mother. During the first year of life he had lived in institutions and the mother had the child adopted at the age of 1½ years. The usual treatment schedule was adopted; soft tissue release performed when the child was four months old. The immediate postoperative result was very good. Follow-up visits to our outpatient clinic at frequent intervals were planned but the patient did not attend until after adoption.

At the age of three years the child refused to wear the night splint. Reoperated at the age of 4½ years. At reoperation the same procedure was followed as in the primary operation.

*Case 2: M. F. 160166. Severe congenital right-sided clubfoot.*

Routine therapy was adopted. Soft tissue release at the age of five months. On removal of the plaster cast the foot was described as good. The treatment was later continued at another hospital and two reoperations have been performed there.

*Case 3: A. M. O. 231265. Left-sided congenital clubfoot.*

The patient was born on the Faroe Islands where the primary treatment was given. The patient was seen at our clinic for the first time at the age of four months. There was a varus deformity of 60°, adduction of 80° and equinus of 40°.

A soft tissue release was made and the patient returned to the Faroe Islands. Three months postoperatively there was a varus deformity of 10°, adduction of 20°, equinus of 10° all of which could be passively corrected to neutral position. It was not possible to make regular postoperative examinations and after one year reoperation was performed.

*Case 4: A. W. T. H. 240267. Congenital severe bilateral clubfeet.*

Mother unmarried factory worker. The child spent the first six weeks of life in a paediatric department with suspected congenital heart failure. This was not verified. In poor condition on admission. Usual manipulations not carried out. Bilateral soft tissue release was performed when the child was seven months old. Plaster casts removed after 2 weeks and the feet described as excellent. The patient

was not brought to regular follow-up for almost a year. When she was three years old, she was reoperated upon bilaterally.

*Case 5:* D. S. 311068. Severe left-sided clubfoot.

Followed from birth; operated upon at three months of age, but only lengthening of the achilles tendon and posterior capsulotomy were performed with a primary good result. Relapse was obvious after 1½ years and the child was reoperated.

*Case 6:* F. C. 120168. Right-sided clubfoot.

The diagnosis was overlooked at birth, and the child referred to our clinic when two months old. Soft tissue release when five months old, usual procedure followed. Immediate result was good, but reoperation indicated at the age of one year.

*Case 7:* K. H. 110767. Born on the Faroe Islands. The patient came to our clinic at the age of nine months with pronounced untreated bilateral clubfeet. Operated on admission and returned to the Faroe Islands. Postoperative follow-up neglected.

Reoperated on the left side, 2 years old. It was noticed at operation that the amount of fibrosis usually seen in these patients was only moderate in this case. Is this because she was not treated with manipulations?

*Case 8:* K. H. 130368. Right-sided congenital clubfoot. Child of a single mother in poor social circumstances. Several hospital admissions for bronchitis. The mother did not understand the importance of splinting.

Treated in our outpatient clinic and operated on at the age of eight months with satisfactory result. Reoperated at the age of four years.

*Case 9:* T. H. 020766. Advanced bilateral congenital clubfeet with the forefoot in 90° adduction. Followed from birth at our clinic. At birth, suspected dislocation of the hip and at the age of four months, X-ray showed subluxation of the left hip. He was operated on bilaterally, and in this case the hips were included in the post-operative plaster cast.

Immediately on removal of the plaster cast after three months it was recorded that the right foot was unsatisfactory. Usual follow-up treatment. Reoperation on the right foot performed when he was five years old.

The hips were treated by a night splint for two years and then recorded as normal.

*Case 10:* J. J. H. 140169. Pronounced right-sided congenital clubfoot.

The mother was single. Soft tissue release at the age of three months with usual technique. On removal of the plaster cast the foot was good. Postoperative night splinting was irregular. Reoperated at the age of two and a half years.

*Case 11.* M. I. A. 270769. Left-sided congenital clubfoot.

Primary operation performed when he was six months old following the usual technique, and with a primary good result. Postoperatively great difficulties in making the parents accept the necessity of the night splint and the result was poor: Marked adduction of the forefoot, and the heel only reached the floor with some hyperextension of the knee joint. At the age of three years and nine months reoperation was refused by the parents.

## DISCUSSION

There are still divided opinions concerning the optimal primary treatment of congenital clubfoot. It is generally agreed that the first treat-

ment of the newborn infant with clubfoot should be manipulation (Thomassen 1941, Bertelsen 1957, Reimann 1967, Rydell & Magnusson 1970), followed by some method of splinting. There are still new devices being reported (Reimann & Lyquist 1970, Rydell & Magnusson 1970).

Conservative treatment with manipulation and splinting is still advocated, either with stepwise correction and plaster casts (Kite 1963) or manipulation and splinting (Denis Browne 1934).

Early soft tissue release was described by Contargyris (1931) and later advocated by Bertelsen (1957) and Reimann (1967). We have found early operative treatment indicated in cases where conservative treatment had not led to satisfactory results by the age of three months, i.e. residual contractures and deformities were still present (Reimann 1967). Somppi & Sulamaa (1971) operated even earlier, preferably at the age of two weeks. Our technique of soft tissue release has been described earlier (Hersh 1967, Reimann 1967, Judet 1970).

In our clinic we have succeeded in starting manipulative treatment from birth except for the three patients from the Faroe Islands and two other neglected cases.

Only a few children in our series were operated on at the age of three to four months. The soft tissue release was performed at the age of seven months or older in more than half the series. Surprisingly, Fjeldborg (1971) in his material found that age was of minor significance for the institution of treatment as long as it was not postponed beyond the age of six months. However, Fjeldborg does not make it clear whether it was the mild cases which had the later treatment.

In our series there was no difference in the results whether the children were operated on in the age of 3-4 months or later. But it must be emphasized that we did operate the severe cases at an early stage and only the originally mild cases in which conservative treatment had failed were operated on at a later stage.

The rate of reoperations was high (19 per cent). In the literature little information has been given concerning the incidence of reoperations in published series. Reimann (1967) reported 18 reoperations on 224 feet with lengthening of the achilles tendon, but did not mention the rate of relapse in 57 feet on which medial release was performed. Blockey & Smith (1966) had 11 per cent reoperations, but in their material only 186 of 316 patients were followed. Somppi & Sulamaa (1971), in their series of feet operated at an early stage, found poor results in 20 per cent, but did not state the number of reoperations.

We found it of special interest to make an assessment of the 11 "poor" cases in our series in which indications for reoperation were found. In six cases (1, 3, 4, 7, 8, and 10) the histories revealed severe social problems, in two other cases (6 and 11) the manipulative treatment and splinting had been more or less neglected. This pattern of social problems including parental neglect is a well-known risk in the treatment of congenital clubfoot (Judet 1970). In one recurrence (case 5) the operative procedure was restricted to lengthening the achilles tendon and performing a posterior capsulotomy; no medial release was done. One patient (case 9) relapsed in spite of treatment which followed the principles of the Department. This case was complicated by the presence of a hip dislocation as well as bilateral clubfeet.

## SUMMARY

A series of 58 children with 75 idiopathic congenital clubfeet is presented. Early soft tissue release was performed in 77 per cent. The main purpose of the study was to clarify the causes of postoperative relapse. The results were poor in 12 feet, 11 (19 per cent) were reoperated. On re-evaluation of the "poor" cases we found severe social problems involved, including parental neglect.

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