THE TREATMENT OF CONGENITAL CLUB FOOT

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An attempt has been made to assess the results of a method of treatment in 186 club feet in infants. The stimulus to study this problem came from the suggestion that insufficient knowledge was available to judge which of three early treatments was the best (Lloyd-Roberts 1964). It is hoped that this analysis may enable fact to replace supposition when the results of early treatment are discussed.

MATERIAL

Three hundred and sixteen classical club foot deformities were seen in this unit in the five-year period 1956 to 1961 (Fig. 1). Postural deformities and deformities caused by neurological disorders were excluded from the study. Forty-two feet had been treated differently by another member of staff. Forty-three had been referred to us in an uncorrected state after initial treatment had been given in other hospitals. Because of shifting population another forty-five were lost to us before they reached three years after beginning treatment. Thus 130 feet were not included in this study, leaving 186 feet treated by the same method for analysis.

METHOD OF TREATMENT

Manipulation and splintage—The infants were admitted to cots in a children’s orthopaedic ward soon after the mother was allowed up after her confinement. There was no waiting list. When the infant was established on a weight-gaining diet and clinical photographs had been taken, manipulations were begun. No attempt was made to concentrate on one particular aspect of the deformity. Without anaesthesia a thumb was placed over the head of the talus and the forefoot was pushed firmly outwards and upwards (Fig. 2). A small pad of felt was then stuck over the lateral aspect of the head of the talus and a single padded Denis Browne splint was applied carefully to maintain the position achieved. Until the equinus was corrected this splintage
was awkward. Inch-wide Elastoplast was used. The manipulation was repeated daily for about ten days. Toward the end of this period the forefoot adduction and inversion were usually corrected and the last few days were spent on the equinus. For this correction the flexed index and middle fingers straddled the ankle, the thumb pushed the foot up by applying pressure to the tarsus, not the metatarsals, and the crooked middle finger pulled down on the calcaneus. When the equinus was corrected the double Denis Browne splint was applied (Fig. 3). At the end of this period a swollen, reddened, corrected foot was obtained. A general anaesthetic was then given and further forcible manipulation was performed to produce over-correction of all elements of the deformity. A padded plaster was then applied from the groin to the base of the great toenail with knee at right angles and the foot in slight calcaneovalgus (Fig. 4). The child was then allowed home for a month. Thereafter the plaster was removed and routine weekly manipulation and Denis Browne splintage begun. As before, a pad was placed over the lateral aspect of the head of the talus and padded splints were used, the cross bar being bent a little if further eversion was required.

This continued weekly until the child began to stand. The parents then provided two pairs of boots. On one pair a double-hinged bar was fitted, maintaining lateral rotation at

FIG. 3
The position after twelve daily manipulations. Note that the strapping extends to the base of the great toenail and no gaps are left between its turns.

FIG. 4
The plaster holding the over-corrected position applied with the child under anaesthesia about fourteen days after the beginning of treatment.
all times (Fig. 5). The second pair had the heels removed and a quarter-inch outer sole raise applied for walking (Fig. 6). At no time was the foot left unsplinted.

The parents were taught to manipulate the foot repeatedly, aiming at touching the fibular shaft region with the fifth toe. The children were seen monthly by one of us. This continued until the age of five when shoes with an outer raise were used instead of boots and night splints were omitted. Radiographs were used only in a minority to assess correction.

![Fig. 5](image1)
The double hinged bar for night wear holding the foot in differing degrees of lateral rotation. Owing to the double hinge the child does not pull the foot out of the boot.

![Fig. 6](image2)
Modified lace-up boots for walking, used from age of 1 to age of 5 years.

**TREATMENT OF RELAPSE**

**Manipulation and plaster**—All deformities were corrected after manipulation under anaesthesia and the purpose of the subsequent treatment was to maintain correction of all elements of the deformity. If there was a loss of correction anywhere relapse had occurred.

When it was clear that there was recurrence of equinovarus the problem was carefully assessed and if relapse was mild the child was admitted for manipulation under anaesthesia and plaster fixation, repeated at two weeks to gain an over-corrected position which was maintained for six weeks. If the relapse was severe and deformity was felt to be unyielding, operation was performed.

**Soft-tissue correction**—An angled incision was made, the skin incision was deepened to the deep fascia and the flaps raised. The neurovascular bundle was then isolated. The tibialis posterior was lengthened by Z-shaped incision and the flexor digitorum also was elongated in almost all cases. All tight tissues were then excised leaving the talo-navicular and subtalar joints open. Attention was then paid to the hindfoot: the tendo calcaneus (Achillis) was lengthened and posterior capsulotomy of ankle and subtalar joints was done. The foot then lay in the corrected position with the navicular bone replaced in line with the neck of the talus. The tendon of tibialis posterior was then sutured. (Average lengthening one and a quarter inches.) The tendo calcaneus was sutured. (Average lengthening one and a half inches.) The skin was closed and plaster applied. Two weeks later the plaster and sutures were removed and the foot was pushed into as much calcaneovalgus as the skin would stand. The plaster was re-applied and was retained for three months. After removal of plaster boots with an outer raise were worn.

This line of treatment was used without significant alteration in 186 feet.
RESULTS

The results have been assessed at three and five years from the beginning of treatment. In our experience relapse beginning after three years is rare.

A foot is acceptable if it is plantigrade with a central weight-bearing heel, possesses active eversion and extension, causes no symptoms and will fit into normal footwear. Slight degrees of metatarsus varus have been ignored (Figs. 7 and 8).

Results at three years—Of the 186 feet, 117 (63 per cent) were acceptable and sixty-nine (37 per cent) were not. The 117 comprised sixty-five treated by manipulation and splintage alone, nineteen which relapsed and were made acceptable by manipulation and plaster and thirty-three which were made acceptable by soft tissue correction, preceded in ten by manipulation and plaster.

Results at five years—Ninety-six feet should have been available but nine were lost to follow-up between three and five years, seven of these being acceptable when last seen, and two having had soft tissue corrections and being in plaster at the time of review. Of the remaining eighty-seven feet, seventy-six (87.5 per cent) were acceptable and eleven (13.5 per cent) were not. The seventy-six comprised twenty-four which did not relapse, eighteen which relapsed in the first two years and were made acceptable by the age of three and thirty-four which relapsed in their third year and were acceptable at the age of five. The eleven unacceptable feet comprised seven extremely fibrotic feet which defied all attempts to correct, one soft tissue correction too recent to assess and three which failed for no particular reason to pass the acceptability tests.

Figures 9 and 10 summarise these results and indicate the time when relapse occurred. Only six feet in four children showed relapse after three and a half years: one foot because of prolonged illness, two because of parental failing and three for no obvious reason.

![Fig. 7](image1)
![Fig. 8](image2)

A typical example of the acceptable group. Photograph taken two years after bilateral soft-tissue correction.

Table I shows the effect of delay in treatment as judged by the incidence of relapse before the age of one year and at the age of three years.

Relapse was more frequent in those in whom treatment began after the first month of life, but no significant difference in relapse rate was found between those whose treatment began in the first two weeks and those in the third and fourth weeks.
TABLE I
INCIDENCE OF RELAPSE RELATED TO AGE AT COMMENCEMENT OF TREATMENT

<table>
<thead>
<tr>
<th>Age at beginning of treatment</th>
<th>Number relapsed at age of 1 year</th>
<th>Total</th>
<th>Percentage</th>
<th>Number relapsed at age of 3 years</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>First fortnight</td>
<td>1</td>
<td>29</td>
<td>3.4</td>
<td>16</td>
<td>25</td>
<td>64</td>
</tr>
<tr>
<td>Second fortnight</td>
<td>3</td>
<td>93</td>
<td>3.2</td>
<td>47</td>
<td>81</td>
<td>58</td>
</tr>
<tr>
<td>Third fortnight</td>
<td>5</td>
<td>60</td>
<td>8.3</td>
<td>32</td>
<td>43</td>
<td>74</td>
</tr>
<tr>
<td>Later</td>
<td>4</td>
<td>39</td>
<td>10.3</td>
<td>26</td>
<td>37</td>
<td>70</td>
</tr>
<tr>
<td>Number of feet</td>
<td></td>
<td>221</td>
<td></td>
<td>186</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total of 186 feet treated by manipulation and splintage for 1 year

- 65 acceptable
- 121 relapsed

8 at under 12 months
25 at 12-18 months
23 at 18-24 months
65 at 24-36 months

- 65 remain acceptable
- 19 made acceptable by manipulation
- 33 made acceptable by soft-tissue correction
- 60 relapsed late or treated for relapse but not acceptable

117 or 63 per cent acceptable
69 or 37 per cent unacceptable

Fig. 9
Results at 3 years shown diagrammatically.

Total of 87 feet treated by manipulation and splintage for 1 year

- 24 acceptable
- 63 relapsed

- 24 remain acceptable
- 18 made acceptable by age 3 years and remain so
- 34 made acceptable around age 3 years and remain so
- 11 treated for relapse but unacceptable

76 or 87.4 per cent acceptable
11 or 12.6 per cent unacceptable

Fig. 10
Results at 5 years shown diagrammatically.
DISCUSSION

The treatment described has advantages over its rivals in that it is easily understood by staff and parents. It does not entail long periods in hospital. The operation attacks the main causes of the deformity and it does not shorten or stiffen the foot. The period in plaster is three months and in over 87 per cent of patients treatment is completed before schooling begins.

No originality is claimed for soft-tissue correction. We have found that if relapse is going to occur there is a loss of passive movement within three months of removing the plaster—that is six months after operation and in one year the criteria of acceptability are not present. Feet acceptable one year after soft-tissue correction remain satisfactory. We now have 280 feet one year or more since operation, of which twenty-nine (11 per cent) have relapsed. Repeat operations are difficult and unsuccessful and recurrence of deformity after adequate soft tissue correction is best treated by bony operations. The best age for soft tissue correction is between two and three and a half years, at which time bony deformity is not marked enough to jeopardise the result.

SUMMARY

1. The results of treatment of 186 club feet have been reviewed.
2. Early strong repeated manipulation and splintage produced correction in all, but only sixty-five out of 186 remained acceptable at three years. The other 121 relapsed.
3. Relapse occurred in the first year in eight, between twelve and eighteen months in twenty-five, between eighteen and twenty-four months in twenty-three, and between twenty-four and thirty-six months in sixty-five.
4. Relapse was slightly commoner when treatment began after the first month of life.
5. Relapse was treated either by manipulation and plaster or by soft-tissue correction, leaving fifty-two out of 121 acceptable at three years and sixty-nine which were not acceptable (this includes those in plaster after soft-tissue correction, necessitated by relapse around the ages of two and a half and three and is thus adversely loaded).
6. The three year results in 186 feet were studied: 63 per cent were acceptable and 37 per cent were not. Five year results in eighty-seven feet were studied: 87.4 per cent were acceptable and 12.6 per cent were not.
7. Soft-tissue correction is described. It produced 89 per cent acceptable feet but 11 per cent relapses in 280 operations.

REFERENCE