Bone and Joint Diseases

Talipes equinovarus or clubfoot is a limb anomaly that is best regarded as a congenital dislocation at the talocalcaneonavicular joint. The cause is unknown, but clubfoot is probably caused by an arrested development at the 20-mm stage of embryonic life.1 Conditions such as cerebral palsy, spina bifida, poliomyelitis, and other neurological disorders or arthrogryposis are special cases whose management differs from that of congenital clubfoot. They will not be considered here.

The disorder occurs in about one per 1000 live births according to studies from Britain and Scandinavia.2 The incidence in Orientals is only about half that in Europeans, but in Polynesians the condition occurs about six times more often. A child born to a family where one sibling is already affected by the deformity is more likely to suffer from it than the normal population; a boy born to a family where there is already an affected girl is 20 times more likely to suffer from clubfoot.3 Children of an affected parent are more likely to suffer from the disorder. Studies of twins have shown that concordance is more common in homozygous than in heterozygous twins.4

Clubfoot is twice as common in boys as in girls and at least half the cases are bilateral. While there is clearly an associated genetic factor, its exact nature is not understood. The deformity

Discussion

Ferguson and Watson1 have recently suggested that emergency obstetric patients would fare better if they were brought immediately to hospital than if they waited for the arrival of the flying squad. Their suggestion was based on a retrospective analysis of 25 flying squad calls in South London and the conclusion that only 28% of these calls were justified. Since different areas of the country vary greatly, any such observations are chiefly of value in the area where the flying squad service studied is operational. I have examined the validity of this suggestion for the flying squad service in West Berkshire.

The first important finding is that the flying squad is slower at getting specialist treatment to the patient than an emergency ambulance call would be at getting the patient to the specialist treatment. The next question to consider, therefore, is which patients benefit from a rapid transfer to hospital and which would be safer assessed and treated before moving. Though opinions differ, there is undoubtedly considerable danger in moving patients with antepartum and intrapartum haemorrhage, severe pre-eclampsia, twins and breech presentations in labour, and any third-stage complications. A good case may be made for insisting that such patients should first be assessed and treated before any transfer. The patients who fall into these groups are marked with an asterisk in tables I and II. Of the patients seen on calls to GP units, 31 (86%) fell into one or more of these “at risk” categories. Obviously this represents a strong argument for retaining the flying squad service to GP units in this area. The case is further strengthened by the fact that most patients treated on such calls were able to remain at the GP unit. Of the remaining five patients, the one with secondary postpartum haemorrhage and the one with occipitoposterior position could have been transferred to the consultant unit by emergency ambulance, while the three uncomplicated low cavity forceps deliveries should have all been well within the scope of general practitioners on the obstetric list.

If the same “at risk” criteria are applied to patients seen by the flying squad in their own home 35 out of the 45 patients may be thus classified (78%). If one further eliminates those patients with a small antepartum haemorrhage in whom the final diagnosis was neither severe concealed or revealed abruptio placenta nor placenta praevia this still leaves 24 patients (53%). These figures contrast strongly with those of the South London study, where it was found in retrospect that only 28% of the calls were justified. Is the reason for this difference related to the much higher number of calls initiated by general practitioners in West Berkshire (84%) than in South London (4%)? Despite the high attendance rate of the general practitioner at the patient’s home it is, nevertheless, disappointing that they instituted treatment in only 16%, of calls.

The obstetric flying squad thus seem to have a vital part to play in modern obstetric care in West Berkshire. Though it is slightly slower than an emergency ambulance call, it would appear to be a far safer method of patient transfer, especially when one considers some of the potentially more dramatic emergencies that can be encountered in midwifery. It is clear, however, that the decision about the justification for each call—and hence the true merit of a costly and time-consuming service—lies principally with the general practitioner.

References


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may occur from a genetic predisposition if environmental influences are also present.

Pathological anatomy

There is a fixed structural deformity of both the forefoot and hindfoot at birth (fig 1). The hindfoot, including the talus and calcaneus, is in equinus, inversion, and adduction. The heel (principally comprising the cartilaginous anlage of the calcaneus) is small, and this is exaggerated because its posterior portion is tucked up under the medial malleolus when it is in equinus (figs 2 and 3). The forefoot is also in equinus, inversion, and adduction. Wasting of the calf muscles is present and persistent despite early and complete correction of the disorder.

![Image of bilateral congenital talipes equinovarus](image1)

**FIG 1—Bilateral congenital talipes equinovarus.** Left foot is more severely affected and head of talus meets floor on lateral side of foot, where a callosity will form if disorder remains uncorrected.

![Image of calcaneus deformation](image2)

**FIG 2—Calcaneus is in equinus and is tucked up behind ankle joint.** Rocker-bottom deformity has developed.

![Image of calcaneus inversion](image3)

**FIG 3—On right side calcaneus is grossly inverted and in equinus and sustentaculum tali approximates to medial malleolus.**

Careful clinical examination of the child is a prerequisite as the deformity is often associated with other abnormalities or forms part of a syndrome. Although primary treatment is unaffected, such conditions may have a considerable influence on the prognosis.

Treatment

It is a chastening reflection of the primary treatment of clubfeet that fewer than two-thirds are cured without surgery. A review of three different methods of primary treatment was carried out on 328 feet in 213 patients. Three techniques were used: (1) the Denis Browne splint; (2) gentle stretching and adhesive strapping fixation; and (3) manipulation and serial plaster-of-paris casts.

Examinations of these three techniques showed that the Denis Browne splint proved less successful than we believed. The best results were obtained with repeated gentle stretching and strapping (fig 4). Although the results of primary treatment with plaster casts leave much to be desired, and most patients treated in this way subsequently need surgery, better results were achieved after surgery than in those cases when surgery followed treatment with the Denis Browne splint.

![Diagram of criteria of correction](image4)

**CRITERIA OF CORRECTION**

Recognition of radiological as well as clinical features of correction has been only recently accepted. The criteria for correction are: (1) a foot that can be actively inverted and dorsiflexed above the right angle; (2) correction enabling the patient to walk on a mobile plantigrade foot with the heel down and in slight valgus, with a satisfactory longitudinal arch; and (3) both the forefoot and hindfoot must be corrected clinically and radiologically.

Standard radiographs taken regularly from the age of 3 months are essential in deciding whether or not the dislocation at the talocalcaneonavicular joint has been satisfactorily reduced.

**TECHNIQUE OF STRETCHING AND STRAPPING**

It is generally accepted that stretching should begin at birth. In correcting the foot a standard routine is used: the knee is
flexed and the lower part of the leg held by the surgeon’s hand, so that the index finger and thumb support the tibial and fibular epiphyses to avoid displacing them. The sides of the heel are grasped between the index finger and thumb of the opposite hand with the sole of the foot cradled in the palm or on the dorsum of the middle finger. The calcaneus is dorsiflexed and everted and the thenar eminence used to bring the forefoot into abduction and eversion to assume the position of dorsiflexion in alignment with the calcaneus (fig 5). Complete correction may not be achieved at the first attempt but stretching should be repeated every few hours by the doctor, nurse, physiotherapist, and, in particular, by the child’s mother. Stretching should be carried out at every feed and at every change of diaper. Full correction is usually obtained after a few days.

Maintenance of correction by adhesive strapping

When the foot has been stretched improvement is maintained by adhesive strapping. The foot is painted with tincture of benzoin. Three felt pads 2.5 cm wide are used. One pad is wrapped around the forefoot at the base of the toes, another is applied under the heel, and the third is placed just above the knee on the anterior surface of the thigh. With the lower leg flexed to bring the heel in line with the pad on the thigh adhesive strapping 2.5 cm wide is applied around the forefoot, over the felt, beginning on the outer border of the sole, passing over the dorsum and around the sole over the starting place, but not torn off. The foot is then held in maximum correction while the strapping is drawn tightly and passed over the felt above the knee joint and down the medial side of the leg. Another length of strapping is passed down the inner side of the leg and under the sole of the calcaneocuboid articulation and up the lateral side of the leg to bring the calcaneus into dorsiflexion and eversion. Further eversion may be obtained by passing a third piece of strapping circumferentially around the leg just above the ankle. This draws the first strap tightly to the leg (fig 6).

It may not be possible to obtain complete correction immediately but the foot is strapped in the maximum position of correction. The mother is taught to stretch the foot and is instructed to repeat the procedure frequently while the foot is still in adhesive strapping. Medical supervision is needed on alternate days for two weeks and further strapping should be placed over the original to increase correction; it is completely renewed weekly for the first two weeks. Stretching by the parents in the manner described, under close medical supervision, at weekly intervals after the first two or three weeks is essential. Although complete correction is usually obtained after two or three weeks, strapping is replaced at regular intervals with the foot in the corrected position until the child is walking. After three or four months, and particularly in larger and more vigorous babies, it may be necessary to retain the strapping below the knee; otherwise it is kicked off.

After two or three months the lateral radiograph may show the calcaneus in equinus and inversion because of a tight tendo-calcaneus. To persevere with stretching in these cases results in a rocker-bottom deformity and flat-topped talus. At this stage it is essential to elongate the tendocalcaneus through a transverse incision over the heel, releasing the medial insertion of the tendon by Z-plasty.

OPERATIVE TREATMENT

A successful conservative approach to managing clubfoot is possible only before the cartilaginous anlagen have become ossified and, in my experience, when treatment starts within the first month of life. At a later stage surgery of considerable magnitude is necessary: calcaneal equinus is corrected by elongating the tendocalcaneus and capsuleotomy of the talocalcaneal joint posteriorly and medially; the medial displacement of the navicular on the head of the talus that leads to contracture of the medial talonavicular ligament is corrected by dividing the talonavicular ligaments and replacing the navicular in its correct position in relation to the talar head. Elongation of tibialis posterior and other tendons that are tight and prevent full correction of the hindfoot and forefoot is necessary if full correction is to be maintained.

It is important that after the operation is completed the foot should lie easily in the fully corrected position, and this is maintained in a plaster cast for up to six months or a year, depending upon the age at which the operation is performed. The older the child the longer the period in a plaster cast.

Soft tissue operations on the foot give satisfactory results until the cartilaginous anlagen have become ossified at the age of about 4 years, but at this stage bony deformity becomes incorrigible and operations upon bone become necessary. Calcaneal osteotomy to correct the varus heel10 or medial release combined with calcaneocuboid fusion for the persistently adducted foot11 are necessary.

Persistent talonavicular and adduction deformity of the foot in the presence of weak peroneal tendons may be corrected by tibialis anterior transfer12 or tibialis posterior tendon transfer,13 to the lateral aspect of the foot. Such operations need careful assessment and indications for their use are few.

When persistent deformity is present in a foot that is skeletally mature, pain, callosities, and limitation of movement may engender considerable disability. In these cases it may be necessary to advise arthrodesis of the talocalcaneonavicular joint (triple arthrodesis), possibly the best known operation being that described by Kyerson14 in 1923.

Prognosis

Although it is difficult or impossible to compare one series with another, or indeed one foot deformity with another because we have no accurate yardstick of measurement, it is generally agreed that the primary treatment is conservative and that it
should begin at birth. The best results are obtained when children are treated in a special clinic with orthopaedic surgeon, nursing staff, and physiotherapists to supervise the patients’ care.

Stretching and strapping with early elongation of the tendo-calcaneus when necessary has proved to be the most successful method of treatment. In our clinic 206 children have been seen with clubfoot and 327 feet with severe or moderately severe deformity have been treated with stretching and strapping from birth. Of these, 136 feet needed tendo-calcaneal lengthening at 3 months. Two subsequently had a medial release operation, two tibialis anterior transfer, and two had calcaneocuboid arthrodesis. The results are sufficiently encouraging for us to reassure parents who have children born with this condition that a successful outcome without further surgical intervention is highly probable. If recourse to further operative treatment is necessary the results become progressively less satisfactory as the skeleton of the foot becomes more mature.

References

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7 Browne, D, Clinical Orthopaedics, 1956, 8, 91.

Where Shall John Go?

Newfoundland

DAVID THRUSH

British Medical Journal, 1977, 1, 222-224

“It is as though God had gathered together all the materials necessary for a great act of creation and then abandoned the task with the job only half done.”

It was August 1973: I had arrived in Newfoundland two days previously and was sitting on Signal Hill—a rocky headland which provides a panoramic view of the harbour and city of St John’s. The previous six months had been busy: I had leased my house; my work permit had arrived; and I had received my visa from the Canadian Embassy, who prophetically wished me a pleasant stay in Canada; I had visited the local library, and written to the Canadian Tourist Board but had been given little information about what to expect. I knew about fish; hunting; the inhospitable climate; and, since a schoolboy, had known the value of their stamps. One of my sources of information, which described a journey along the Trans-Canada highway, summed up Newfoundland in my opening quotation and that was the thought passing through my mind that Saturday afternoon. During the flight from Gander to St John’s I had seen only water, rock, and forest, and my first impression of St John’s was a hotchpotch of gaily-coloured wooden houses surrounded by gardens of weeds. In the next ten months, however, I was to develop a deep sense of belonging to this “island of the sea.”

During the ice age soil and vegetation were stripped from Newfoundland and deposited in the sea to form the Grand Banks. The influence of the ice age remains, and Newfoundland’s climate is determined by the Labrador current, which chills the shores, bringing with it drifting ice in the spring and summer. Off the southern coast, over the Grand Banks, the Labrador current meets the Gulf stream and produces ideal conditions for a proliferation of living organisms from plankton to whales. It was this life within the sea that turned Newfoundland into one of the world’s greatest fishing grounds. Regrettably modern fishing fleets, complete with factory ships, have shown a total disregard for the balance of nature; overfishing has resulted in a catastrophic fall in catches; and the Grand Banks are rapidly becoming barren. The decline in the fishing industry is Newfoundland’s greatest tragedy.

From colony to province

Newfoundland was England’s oldest colony until 1949 when it became Canada’s tenth and newest province, a change which continues to be vigorously debated. Although the discovery of Newfoundland is attributed to John Cabot in 1497, we now know that the island was inhabited by Norsemen in AD 1000. The province of Newfoundland consists of the island of Newfoundland and Labrador (on the mainland) and covers an area twice the size of Great Britain, but it has a population of only 560 000. Almost all are of British descent and you may still hear West-country accents and the Irish brogue. The coastline is gashed and convoluted with 6000 miles of bays, inlets, and fjords. Everywhere there are hidden rocks and reefs—called, with awful realism, sunkers. Part of the interior is barren, parts marshy, and there are large commercial forests. The most striking feature is the network of rivers and lakes and about one-third of the island is covered with fresh water.

Newfoundland is rich in history. Its placenames are unique and give a fascinating indication of the humour and hardships of the early settlers—Come-by-Chance, Seldom-Come-By, Run-by-Guess, Break Heart Point, Savage Cover, Little Paradise, Turnip Cove, Emily Storehouse Cove—and there is