THE USE OF TIBIALIS POSTERIOR AS A DORSIFLEXOR

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Our interest in tendon transplantation in leprosy was first aroused by the report of Brand (1952), and the possibility of using tibialis posterior as a dorsiflexor was further stimulated by the report of Watkins, Jones, Ryder and Brown (1954), who had used this muscle in poliomyelitis by bringing it through the interosseous membrane. Since we began this series Brand (1956) has stated that he has been using tibialis posterior as a dorsiflexor for some time. The technique that Brand employed is, however, rather different from the one that we have used.

MATERIAL

This report is based upon a study of fifty-six cases, mostly treated at the Buloh Leper Settlement. All except two patients in this series were suffering from leprosy.

Lateral popliteal palsy is one of the commoner effects of leprosy, and for a long time splints have been the only form of treatment. Fortunately, the tibialis posterior muscle is seldom paralysed in this disease.

Selection of cases—The following were the criteria used: 1) complete paralysis of the muscles supplied by the lateral popliteal nerve; 2) a reasonable range of passive dorsiflexion; and 3) an active and powerful tibialis posterior. Age was not considered: the youngest patient was aged ten years, and the oldest was sixty-four.

THE OPERATION

Four incisions are used. Through the first incision, on the medial side of the foot, the tendon of tibialis posterior is freed from its attachment to the tuberosity of the navicular bone and divided just distal to this. Its attachments to the other bones of the foot are cut. Through a second incision just behind the medial malleolus the tendon is hooked up and brought out through the wound. Through the third incision, about six inches long and just lateral to the crest of the tibia, the tibialis anterior is exposed and stripped from the antero-lateral surface of the tibia. The muscle, together with the anterior tibial nerve and artery, is retracted laterally to expose the interosseous membrane. This is incised close to the tibia throughout the length of the incision, and small transverse incisions are made at the upper and lower ends. A probe is passed alongside the tibialis posterior tendon from behind the medial malleolus into the anterior compartment of the leg. Care must be taken to keep the probe close to the lateral margin of the tibia lest it be passed through the fibres of the muscle belly. The tendon is then sutured to the probe, and pulled through gently into the anterior compartment. The tendon is then passed laterally behind the tibialis anterior. This method has been found more satisfactory than trying to pass a blunt hook round the muscle from the anterior incision as suggested by Watkins *et al.*

The point of insertion of the tendon of tibialis posterior into the dorsum of the foot may be varied according to the deformity present, but in the average case experience has shown that the intermediate cuneiform is the most satisfactory site. The area is exposed through a fourth incision, and a tunnel is made through the bone with a gouge.

A "pull-out" wire is inserted into the tendon, and the suture and tendon are drawn subcutaneously into the wound on the dorsum of the foot. The wire is then threaded on to a straight needle and thereby passed through the tunnel in the bone and out on to the sole

of the foot. The foot is fully dorsiflexed, the tendon is pulled well down into the tunnel and secured firmly.

In early cases the wire was tied over a piece of thick rubber tubing, but this was apt to

FIG. 1
Case 1—Drop foot before operation.

FIG. 2

Case 1—Range of active movement after operation. In this case the tendon was inserted too far laterally, with consequent eversion and bow-stringing.

cause pressure sores, so the method was changed. An oval lead plate pierced with two small holes is moulded to the sole of the foot, and the ends of the wire suture are drawn through the holes and tied firmly over rubber tubing.

A catgut suture is inserted through the tendon and through the periosteum in front of the tunnel through the bone. A well padded plaster is applied and slit.

Post-operative management—The skin sutures are removed after three weeks, and a new plaster is applied. The second plaster is removed seven weeks after operation, and the wire suture is withdrawn. Weight bearing is not allowed for a further two weeks.

Re-education—This is surprisingly easy in most patients. Satisfactory active movement is usually demonstrated on the day that the plaster is removed. Many patients had active control of the transplant when the skin sutures were removed. Some of the less intelligent patients proved more difficult to re-educate, but all ultimately learnt to control the transplanted muscle.

FIG. 3

Case 2—A typical range of active movement after operation in a case of leprosy.

COMPLICATIONS

Infection—There was one case of severe infection in a patient suffering from diabetes and tuberculosis in addition to leprosy, and it was feared that the result would be a failure. Although part of the tendon separated as a slough, however, satisfactory function was finally obtained.

Mild infection occurred in a further six cases, always in the wound on the dorsum of the foot, and it seemed to start about the withdrawal suture which emerged through the wound. In the last twenty cases the withdrawal suture has been brought out through the skin an inch proximal to the wound, and there has been no infection in these cases.

Too lateral insertion of the tendon—In five cases the tendon had been attached too far laterally, and dorsiflexion was accompanied by eversion. In no case was this defect severe enough to worry the patient.

Too medial insertion of the tendon—Marked inversion of the foot occurred only once. In this case the tendon was exposed again and split longitudinally, one half being then sutured to the lateral side of the tarsus. The result is good.

Bow-stringing of the tendon—Four patients showed marked bow-stringing of the tendon. Although this is unsatisfactory from a cosmetic point of view none of the patients wished to

have further treatment for its correction. It should be remembered that the tibialis anterior tendon is normally prominent when the muscle is contracting against resistance.

Pain—In two cases pain persisted for three or four months after operation, but gradually diminished.

Constriction of interosseous space—In one of the early cases the interosseous membrane had been invaded from both sides by new bone, and only an extremely narrow gap remained. A three-inch piece of the fibula was removed to allow the tibialis posterior to be brought forward. The result was satisfactory.

FIG. 4

Case 3—Range of active movement restored in a case of poliomyelitis.

Since then radiographs have been taken before operation to show the width of the interosseous spaces. In one other case the interosseous gap was shown to be narrow; so the tendon was brought round the medial side of the tibia.

Oedema—In the earlier cases walking was allowed immediately after the plaster was removed, seven weeks after operation, and persistent oedema proved troublesome on several occasions. Later, the patients were not allowed to walk until two weeks after the plaster had been removed, and this complication was eliminated.

Pyogenic arthritis—One patient developed staphylococcal arthritis of the ankle some weeks after operation, and after he had been walking well.

TABLE I
RESULTS IN FIFTY-SIX CASES

Satisfactory	49
Slightly improved	3
Failed	1
Death from another cause	1
Unknown	2

RESULTS

A satisfactory result is considered to have been gained when the transplanted tendon functions actively with a sufficient range of controlled movement to allow the patient to walk well. It is not suggested that these patients have a normal range of dorsiflexion and plantar-flexion. The results are shown in Table I. Illustrative cases are shown in Figures 1 to 4.

DISCUSSION

It was hoped that this operation would achieve two things: a greatly improved gait, and a reduction in the high incidence of ulceration along the outer side of the foot that is seen in patients with lateral popliteal palsy from leprosy.

We believe that the first objective has been obtained in most cases.

So far, there has been no recurrence of ulceration in patients with a satisfactory transplant, because they no longer walk on the outer side of the foot. The time that has elapsed is short, and a further review after a much longer interval will be necessary.

Although this series includes only two cases of drop foot from poliomyelitis, the results are so satisfactory that we feel that this operation should be considered in the cases that do show a suitable pattern of paralysis.

SUMMARY

1. Fifty-six cases of tibialis posterior transplant for drop foot are reported.
2. The results are known to be satisfactory in forty-nine of the fifty-six cases.
3. Serious complications have been few.
4. Re-education has been easy in the great majority of cases.

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