REPAIR OF THE CALCANEAL TENDON

AN IMPROVED TECHNIQUE

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We report the use of a simple new technique for the repair of recent and old, neglected disruptions of the calcaneal tendon, which can be used where there is a wide gap. We reviewed 13 patients from one to six years after operation; all had good objective and subjective results. Four had minor skin complications.

Rupture of the calcaneal tendon is a disabling condition, which is difficult to treat if there is a gap or defect between the two ends of the disrupted tendon. Such a gap may result from several factors acting singly or in combination: open laceration followed by infection; delay in diagnosis, allowing retraction and degeneration of the tendon; fraying of the ends, necessitating excision, especially after local cortisone injection (Justis 1987).

The aim of treatment is the restoration of continuity at a tension which gives normal power of plantar flexion and normal ankle mobility. Postoperative complications, especially re-rupture, should be minimised (Ma and Griffith 1977).

Methods of treatment include the use of a fascia lata graft (Zadek 1940; Tobin 1953), peroneus brevis tendon transfer plus a reinforcing graft (Teuffer 1974), strips of fascia and a fascial tube (Bugg and Boyd 1968), a V-Y tendinous flap (Abraham and Pankovich 1975), plantaris tendon graft (Lynn 1966), and a strip of gastrocnemius tendon turned down from the proximal stump (Bosworth 1956).

We now present the results of a technique which was developed by the senior author (SW-M).

PATIENTS

From 1983 to 1989, we treated 13 patients with complete rupture of the calcaneal tendon by operation at Tanta University Hospital. There were ten men and three women, aged 17 to 61 years. The ruptures were left-sided in four cases.

Direct open injury had occurred in six men during agricultural work. In all six the injury had been misdiagnosed as a skin wound and sutured by general practitioners. The wounds had broken down, and become infected and painful. The damage to the tendon was then revealed in the infected field. These patients were first treated by antibiotics, selected by culture and sensitivity tests, and by daily dressings. In four of them skin healing was obtained. One wound remained open and another developed an abscess which required surgical drainage.

In five patients (four male) the tendon ruptured during normal or athletic activities, and they gave the typical story of sudden pain behind the ankle, at first attributed to a blow. Three of these were diagnosed early and had an operation within one week. The other two were misdiagnosed as ankle sprains, and they presented to us after three to four weeks complaining of inability to walk normally. Neither patient could walk on tiptoe.

Two female patients had had local corticosteroid injections for retrocalcaneal pain and swelling, and rupture had occurred thereafter with minimal trauma.

Thompson's test (1962), performed with the patient lying prone by squeezing the relaxed calf muscles, demonstrated lack of plantar flexion in all patients. O'Brien's needle test (1984) was performed only in the last four cases and was positive in all.

Operative technique. Under general or spinal anaesthesia, a tourniquet is applied and the patient placed prone with the knee slightly flexed and the foot fully plantar flexed by a sand bag. A longitudinal midline incision is made from the calcaneus to the proximal third of the calf. The subcutaneous tissue is incised and an attempt is made to retain the paratenon as a separate layer. The ends of the tendon are exposed and any ragged ends or scar tissue (in old cases) are excised.

A strip of fascia 2 cm × 15 cm is then elevated proximally from the median raphe of gastrocnemius and the calcaneal tendon. The upper end of this strip is freed and reflected distally; its distal end is left attached to the tendon at a site 3 cm proximal to the rupture (Fig. 1). This strip is then woven into the distal 3 cm of the proximal tendon fragment by passing it transversely

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Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Figure 1 – A 2 cm-wide strip is freed from the median raphe of gastrocnemius and the calcaneal tendon.

Figure 2 – Diagram to show the weaving of the strip in the distal 3 cm of the proximal stump.

Figure 3 – The strip is passing through the tendon to emerge through the centre of its distal end.

Figure 4 – A drill hole is made through the calcaneum.

Figure 5 – The pull-out sutures are tightened over a pad and the stumps are sutured.

through a slit to emerge on the lateral side (Fig. 2). Another slit is made distal and slightly posterior to the first, to allow the graft to emerge through the centre of the tendon stump; it then appears as a continuation of the natural tendon (Fig. 3). The graft is pulled tight and anchored to the proximal tendon by non-absorbable interrupted sutures.

The superior surface of the calcaneus anterior to the distal stump of ruptured tendon is cleared to expose bone, and a drill hole is made emerging through the heel (Fig. 4). It is widened enough to receive the graft, which is sutured on itself to form a tube and secured by pull-out sutures.

The tension of the calcaneal tendon is then adjusted with the knee flexed and the ankle plantar flexed, before the pull-out suture is tightened over a strip of rubber drain and a piece of gauze (or a button) on the plantar aspect of the heel (Fig. 5). The ends of ruptured tendon can then be sutured to the graft, and, if they are long enough, to each other.

The gap in the tendinous covering of gastrocnemius at the site of the strip is closed by absorbable sutures (Figs 4 and 5). The tendon and the repair are covered by paratendinous tissue as far as possible and the skin

sutured. An above-knee plaster cast is applied to hold the knee in 30° flexion and the ankle in 20° equinus. After six weeks the plaster cast and the pull-out sutures are removed and a below-knee plaster cast is applied with the ankle in less equinus. This cast is changed every two weeks until a neutral position is attained, when the patient is allowed to start partial weight-bearing, soon progressing to full weight-bearing. The cast is discarded at seven to ten weeks and active ankle exercises are started.

RESULTS

The site of tendon rupture was just proximal to its insertion in eight patients, and 2.5 to 3.5 cm more proximal in five. In ten cases there was a gap of 1.5 to 4 cm which could not be closed by plantar flexion of the ankle and flexion of the knee. This was often the result of excision of scar tissue from both ends of the tendon.

Patients were reviewed every three months in the first year, every six months in the second year and then annually. There were no re-ruptures. All patients were able to stand on their toes by six months from the operation, though the height of the heel above the floor

varied. There was loss of ankle movement of 10° or less in five cases and of 11° to 15° in four. This was usually due to limitation of dorsiflexion.

At final follow-up the calf circumference was equal on both sides in three cases, reduced by less than 10 mm in seven cases and by 10 to 15 mm in three. All the patients were able to walk long distances, and could use stairs without significant discomfort. They were all satisfied with the operation.

Complications. There were no pulmonary emboli, or evidence of thrombophlebitis. Skin healing was delayed by superficial infection in four cases.

DISCUSSION

Late cases of disruption of the calcaneal tendon, from either misdiagnosis or improper treatment, are infrequent, but present a problem in management.

The most common cause of injury in our series was division by a sharp object, usually some part of farm equipment. Treatment in rural health units by skin suture without exploration or debridement led almost invariably to infection and skin breakdown which delayed the discovery of the tendon injury (Justis 1987). Even when the diagnosis has been made, treatment must be delayed until infection is controlled and the skin has healed. Such infection causes more tendon destruction and this may create a considerable gap.

Most papers on calcaneal tendon injury deal only with spontaneous subcutaneous rupture (Bugg and Boyd 1968; Lea and Smith 1972; Jessing and Hansen 1975; Edna 1980; Cetti, Christensen and Reuther 1981; Garden et al 1987; Aldam 1989); only two report a few cases of open laceration, usually diagnosed and treated early (Inglis et al 1976; Inglis and Sculco 1981). The 46% of open lacerations in our group and the delay in treatment make our series unique.

Local injection of corticosteroids for painful heel conditions, a feature of two of our patients, was associated with fraying which necessitated excision of large segments of the tendon to expose healthy fibres.

This balance of our cases led us to seek a method of surgical reconstruction adequate to deal with delayed diagnosis, infection, frayed tendon ends and a wide gap. Our method is a modification of that of Bosworth (1956), using a stronger, wider flap. We turn the strip down at a more proximal level to allow it to be woven into the distal part of the proximal stump, appearing through its centre and making the repair less bulky. This helps to avoid delayed healing by reducing pressure on skin which has a tenuous blood supply (Haertsch 1981a,b). We anchor the graft to the calcaneum using the method described by Cole (1940) which has the advantage of tendon-to-bone healing rather than the less secure tendon-to-tendon repair. The strip can replace the original tendon and direct suture of the two stumps is not necessary if approximation cannot be achieved without excessive

tension. In many of our patients the distal site of the rupture, near the calcaneum, would have made direct repair very difficult. The technique restores continuity at the proper tension and has sufficient strength to resist re-rupture. Despite the difficult nature of the cases our final results are comparable with those reported in other series (Bugg and Boyd 1968; Gillies and Chalmers 1970; Ma and Griffith 1977; Persson and Wredmark 1979; Cetti et al 1981; Aldam 1989).

Reduction of calf circumference is usual, even many years after rupture (Arner and Lindholm 1959; Ralston and Schmidt 1971), but we found little reduction of the power of plantar flexion. Lea and Smith (1972) attributed the reduction in bulk of the calf muscles to an altered configuration of triceps surae.

Any change in the range of motion of the ankle indicates tendon shortening or lengthening (Arner and Lindholm 1959; Gillespie and George 1969; Garden et al 1987). Most of our patients had some loss of dorsiflexion, due to shortening, but this did not seem to affect function. Indeed, some shortening may make plantar flexion more powerful.

Our technique can be applied to nearly all types of calcaneal tendon rupture, but is especially useful in neglected cases, those with wide defects and those with a small or absent distal stump.

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