THE OPERATIVE TREATMENT OF CHRONIC CALCANEAL PARATENONITIS

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The conservative management of chronic calcaneal paratenonitis is time-consuming and often unsatisfactory. A new, safe and simple technique is described. The crural fascia on both sides of the tendon is incised and left open, adhesions around the tendon are trimmed away, the strongly hypertrophied portions of the paratenon are removed and mobilisation is begun immediately after operation.

Between 1961 and 1978 201 such operations were performed on 182 patients 62 of whom were top-ranking Finnish athletes. Only five patients were not athletes. The results, including early return to full activity, were excellent in 169, good in 25 and poor in seven cases. After operation one of the patients gained an Olympic gold medal; others also have attained international prominence.

Calcaneal paratenonitis (sometimes called peritenonitis or peritendonitis) is common in athletes, especially long distance and middle distance runners. It is disabling and has compelled many top-class athletes to abandon their training. Howard (1937) and Rais (1954, 1961) have contributed a great deal to our understanding of the acute condition. According to Rais the chief aetiological factor is either acute fatigue of the muscle or blunt trauma at the musculotendinous junction; the sequel is circulatory disturbance and oedema of the muscle and of the peritenon. Crepitus is due to the movement of the tendon inside the fibrin precipitated from the fibrinogen-rich fluid.

Acute paratenonitis has been treated in a variety of ways including daily intravenous injections of heparin for three or four days, one or two local steroid injections into the sheath carefully avoiding the tendon itself, anti-inflammatory drugs by mouth, elevation of the heel of the shoe combined with restriction of activity, and physiotherapy including pulsed short-wave diathermy, ice-packs, massage and passive stretching.

When treatment fails, as it often does, and in untreated cases of acute paratenonitis, the fibrin in the tendon sheath becomes organised and adhesions bind the tendon to its surroundings. It is often this chronic condition for which the athlete first seeks medical advice after symptoms have been present for several weeks or even months. In chronic paratenonitis there is neither crepitus nor an effusion. Frequently there are tender nodules around the calcaneal tendon as well as diffuse thickening of the soft tissues.

Chronic paratenonitis is even more difficult to treat conservatively than the acute condition. The same methods have all been tried, with occasional success, but even then recurrence is common. Accordingly, the senior author has, since 1961, operated on those patients who have not responded to two or three months of conservative treatment. The object has been to free the adherent tendon from the surrounding structures.

Operative treatment has been previously described on a number of occasions. Eiselt in 1966 presented good results after ligating the veins of the Cockett group midway between the thinnest part of the calcaneal tendon and the musculotendinous border. Riede (1972) also claimed success with this operation, but many surgeons remained unconvinced (Ehricht and Passow 1972; Franke 1979). Williams (1973) recommended stripping the inflamed synovial tissues from around the tendons and this operation is similar to ours. Other published accounts (Williams and Sperryn 1976; Biehl and Harms 1977; Subotnick 1977) describe operations which differ from ours in several respects and most authors advocate immobilisation in plaster after operation.

MATERIAL

Between 1961 and 1978 182 patients with chronic calcaneal paratenonitis have been operated upon in our hospital; 19 were affected bilaterally, so that the total number of operations was 201. Among these were 62 top-ranking athletes who had represented Finland in international competitions; these include one who broke the 3000 metres steeplechase world record in 1968, another who was the 5000 metres and 10000 metres European Champion in 1971, and a third who was the 1500 metres Olympic Gold Medallist in 1972. These successes were achieved after the operative treatment.

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Table I lists the sporting activities of the patients in our series.

The mean age of all the patients was 27.5 years, that of the top-ranking athletes slightly lower (24.3 years). The youngest patient was a 12-year-old runner, the oldest a 53-year-old jogger. The commonest history was tenderness or burning pain above the heel, often worse when commencing their particular sport, and again after exercise. Most patients had great difficulty taking their first steps each morning. In 54 cases the pain was felt only during physical performance; in four the pain was first noted after bruising following a direct blow. The interval between the first symptoms and operation ranged from two months to 10 years (mean 7.5 months for all patients and 4.8 months for the top-ranking athletes). Crepitus at some stage was remembered by 102 patients. Local steroid injections had been given to 131 patients and heparin intravenously to 50. The series included 20 women, of whom seven were top-ranking athletes.

Before operation tenderness to palpation in the region of the calcaneal tendon was invariable. In 103 cases the most tender area was the middle third, in 49 it was the lowermost third, in 20 the uppermost third and in 29 cases tenderness was diffuse. One or two (occasionally more) tender nodules were palpable in 73 cases, mostly adjacent to the tendon. These can be visualised radiographically by injecting air into Kager’s triangle (Fig. 1; Kvist H. and Kajas S., unpublished). In 112 cases there was thickening and irregularity around the tendon. In only 16 cases was there an effusion and this was slight. No crepitus was palpable and all the patients were able to stand on the affected foot alone with the ankle plantarflexed. The right leg was affected in 106 cases, the left leg in 95. In all cases conservative treatment had been unsuccessful and the pain interfered with all strenuous physical activities. Most patients were recommended to refrain wholly or partly from exercise for one or two weeks before operation.

**OPERATIVE TECHNIQUE**

The anaesthetised patient lies prone on the operating table with his feet protruding beyond the edge. A seven-centimetre incision is made just anterior to the lateral aspect of the calcaneal tendon. Small subcutaneous veins are tied but the distal part of the small saphenous vein as well as the sural nerve (Fig. 2) are retracted forwards. The heel is situated on the right in this, as in all the following figures.
freed by blunt dissection and retracted forwards. An incision is made in the crural fascia (Fig. 3) to enable access into the closed space known as Kager’s triangle, where the calcaneal tendon covered with its epitenon normally moves freely within the surrounding paratenon (the loose areolar tissue surrounding the epitenon and filling the interstices of the fascial compartment in which the tendon is situated). Using fine scissors, the crural fascia is divided along most of the length of the tendon. At this stage it is easy to localise the adhesions linking the tendon to the inner aspect of the crural fascia (Fig. 3) and to the muscle sheaths at the base of Kager’s triangle (Figs 3 and 4). All adhesions are trimmed away on the lateral side. After this the peritenon externum (the hypertrophic paratenon on the posterior aspect) and the crural fascia covering the posterior part of the tendon are detached from the skin to which they may have become attached by adhesions (Fig. 5). The tendon is retracted and the procedure repeated on its medial aspect; again the adhesions may be trimmed away (Fig. 6) with scissors or cleared with a finger. The tendon is freed distally up to 1.5 centimetres from the calcaneum and proximally as far as the musculotendinous junction. Distally, small vessels in front of the tendon must be sought, lest they be divided instead of the adhesions (Schnorrenberg 1962). The most distal 1.5 or 2.0 centimetres of the tendon is normally attached to the skin (Lang 1960a, b) and this attachment is left undisturbed. At this stage the free tendon, covered with its epitenon and paratenon, can readily be inspected. If the paratenon is considerably thickened dorsolaterally, this portion is removed, particularly if it seems to be constrictive. If the epitenon has been damaged during the freeing procedure, it is sutured with the finest catgut. Even the smallest bleeding points are either cauterised or ligated. The crural fascia and the subcutaneous layer are not sutured. The skin is closed with a continuous suture.
After-care. The most important feature of after-care is that the leg should not be splinted; the patient begins dorsiflexion and plantarflexion of his ankle as soon as he recovers from the anaesthetic. Careful walking is begun on the third day. The mean duration of hospital stay was 4.5 days. The sutures are removed after 10 days and the patient is usually back at work in two or three weeks. Three or four weeks after operation he may gradually resume physical exercise and sport.

OPERATIVE FINDINGS
All cases revealed a thickened paratenon with fibrous adhesions between the tendon and its surroundings; these adhesions were strongest where definite nodules were observed, and some were remarkably tough. Among the toughest adhesions were 14 instances where small smooth nodules were on the tendon itself, evidently the sequel to partial rupture of the tendon. The 112 cases without distinct nodules, but with irregular thickening around the tendon, all revealed adhesions at operation. Of 16 cases who, before operation, had tenderness and only a slight effusion, eight had indisputable adhesions, but in the other eight it was impossible to establish whether the attachments to the surrounding tissues were normal or abnormal. All 20 cases in which Kager's triangle had been examined radiographically with air insufflation before operation displayed adhesions at the precise sites of the best defined shadows.

RESULTS
Despite being mobilised immediately after operation, only two patients developed any inflammatory changes around the incision. There were no other complications.

The results divided into three groups: 169 were excellent, 25 were good and seven were poor. The poor results were those with no apparent improvement; symptoms recurred as soon as physical activity was begun. These patients, three of whom were top-ranking athletes, were compelled to abandon all sport. The good results were those who still had some pain first thing in the morning or when beginning exercise, usually disappearing as exercise proceeded; they had no oedema, and the pain had not prevented them from undertaking physical activities or participating in sport. The excellent results were those with full recovery. Of 26 cases which recurred some months after operation (usually a year or more), 20 had a further operation, with good results. Three patients could not continue their sporting activities. Four patients had bilateral second operations and one had three bilateral procedures. Conservative treatment, begun as soon as the first symptoms of recurrence appeared, was successful in six cases. In most instances the affected tendon remained thicker than the healthy one for some months after operation, but resolution to almost normal thickness usually occurred.

DIFFERENTIAL DIAGNOSIS
Degeneration of the tendon itself can lead to its partial or total rupture. Partial rupture was considered to be very uncommon until Ljunqvist (1968) reported 24 cases, thus establishing its relative frequency. A small rupture may be difficult to distinguish from chronic paratenonitis and these injuries of only a few fibres heal even without immobilisation. The patient can stand on his toes but has pain on exertion. This present study included 14 cases with small, smooth nodes on the tendon itself, which was adherent to its surroundings at these sites. Probably these cases represent the sequelae of small tendon ruptures. In some instances this diagnosis was confirmed when the sheath was opened, and in a few the degenerative area was excised. All 14 cases have had excellent results.

Pain arising from the insertion of the tendon or from an inflamed calcaneal bursa should not present a diagnostic problem, since it is situated more distally than that from chronic paratenonitis.

DISCUSSION
The treatment of chronic paratenonitis, as generally practised, is far from satisfactory. The material in this present study is critical, since it includes a number of top-ranking athletes. The technique is simple and comprises: extensive division of the crural fascia which is left open; complete freeing of the calcaneal tendon, removing as much hypertrophied paratenon as necessary; and immediate mobilisation of the ankle after the operation. The high quality of the results has convinced the authors that this method of treating chronic calcaneal paratenonitis is fully justified. Early operation almost guarantees prompt return to competitive sport before the athlete is out of condition.

It is difficult to say whether the good results are due simply to the removal of the adhesions, or whether circulatory factors also are important. When ruptures of the calcaneal tendon are repaired and immobilised in plaster for six weeks, they undoubtedly develop adhesions; and yet the majority recover. It seems possible that leaving the crural fascia open is important, for this fascia may help to regulate the venous circulation in the area of the calcaneal tendon (Loetzke 1956); in plantarflexion it is pulled proximally along with the covering skin and this "milks" venous blood towards the heart. Theoretically fasciotomy could impair this function but, on the other hand, it may well diminish friction between the fascia and the tendon. Some authors certainly regard friction as important in calcaneal paratenonitis (Nisbet 1960; Burry 1971). Mobilisation immediately after operation is regarded as essential; it

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probably prevents the formation of new adhesions. The resistance of freshly sutured wounds to immediate stretching is surprisingly good and the time spent in hospital is short. Work and sport can both be resumed quite soon after operation.

At first we operated only after a very prolonged period of conservative treatment, but now we delay no more than two or three months. Operation should not be performed during the stage of acute paratenonitis. We insist on complete abstinence from any sport for two weeks before operation if there has been any suggestion of recent acute inflammation.

Operation does not preclude recurrence, but this has been uncommon, possibly because the patients have learned how to avoid predisposing factors. Partial ruptures of the tendon have, clearly, sometimes been treated as chronic paratenonitis; nevertheless, these patients also benefited from the operation, which seemed to contribute to the disappearance of their disability.

REFERENCES