THE SUPERFICIAL PERONEAL TUNNEL SYNDROME

RESULTS OF TREATMENT BY DECOMPRESSION

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We diagnosed entrapment of the superficial peroneal nerve in 17 patients (19 legs) with a mean age of 41 years. In all cases, plain radiographs of the leg, nerve-conduction studies of the superficial peroneal nerve and measurement of the intramuscular pressure at rest after exercise were normal. Diagnostic tests for nerve compression during rest after exercise produced pain and clinical signs in all.

We performed decompression of the superficial peroneal tunnel in 14 patients and local fasciectomy in three. Fourteen patients (80%) were free from symptoms or satisfied with the result.

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We have shown that normal conduction velocity at rest does not exclude entrapment of the superficial peroneal nerve.¹ This is best diagnosed by clinical examination after exercise.²

It has been shown that only 10% of patients with entrapment of the superficial peroneal nerve have a chronic lateral compartment syndrome¹ and decompression of the whole lateral compartment by fasciotomy may therefore be unnecessary in those who do not have a compartment syndrome.

We have evaluated the results of treatment by decompression of the peroneal tunnel in patients with a tunnel syndrome, and by local fasciectomy in patients with entrapment of the nerve for other reasons. All the patients had the

clinical signs of nerve entrapment, normal nerve-conduction studies and a normal intramuscular pressure.

PATIENTS AND METHODS

We made a prospective study of 480 patients with chronic leg pain, 17 of whom were found to have entrapment of the superficial peroneal nerve. There were nine men and eight women with a mean age of 41 years (17 to 71). Two patients had bilateral symptoms. They all gave their written informed consent for participation in the study, which was approved by the Ethical Committee of the University of Gothenburg.

The mean duration of pain and sensory dysfunction before diagnosis and treatment was four years ten months (1.5 to 11). No treatment had been successful. In all, plain radiographs of the leg, nerve-conduction studies and intramuscular pressures were normal. The symptoms had been initiated by trauma in four patients. Table I gives the details of the patients.

Clinical examination. Each patient was examined to record the range of movement of the hip, knee and ankle and the straight-leg raise test was performed. The stability of the knee and ankle was determined as was the presence of fascial defects. Patients with clinical signs of compression of the common peroneal nerve at the head of the fibula were excluded. Three provocation tests for nerve compression were undertaken at rest and then again at rest after exercise.¹ In the first, pressure was applied over the anterior intermuscular septum while the patient actively dorsiflexed the ankle. In the second, the foot was passively plantar flexed and inverted at the ankle. Finally, while maintaining passive stretch, gentle percussion was applied over the course of the nerve. Pain or paraesthesia caused by any of these tests suggested entrapment of the superficial peroneal nerve.

Diagnostic criteria. Entrapment of the peroneal nerve was diagnosed when sensation over the dorsum of the foot was decreased and there was pain at rest or during an exercise test, and when at least the first two of the three provocation tests described above were positive.

A chronic compartment syndrome was diagnosed when the intramuscular pressure at rest after exercise exceeded

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Table I. Details of 17 patients with entrapment of the superficial peroneal nerve

Case	Age (yr)	Gender	Activity level to pain	Cause	Concomitant symptoms	Pain duration (mth)	Postop activity level without pain	Subjective evaluation
1	35	M	Walking	Tunnel syndr	Venous insuff	30	Walking	Unchanged
2	64	F	Rest	Entrapment		84	Running	Good
3	71	F	Rest	Entrapment	Venous insuff	30	Walking	Excellent
4	17	M	Walking	Tunnel syndr		18	Running	Good
5	28	F	Walking	Tunnel syndr		120	At rest	Good
6	23	M	Rest	Tunnel syndr		48	Walking	Good
7	22	M	Walking	Entrapment	Post fasciotomy	36	Walking	Unchanged
8	63	M	Rest	Tunnel syndr		48	Unlimited	Excellent
9	50	M	Rest	Tunnel syndr		131	Walking	Good
10	54	M	Rest	Tunnel syndr	Trauma	36	Walking	Excellent
11	63	F	Rest	Tunnel syndr	Trauma	48	Running	Good
12	50	F	Rest	Tunnel syndr	Trauma	34	Unlimited	Good
13	27	F	Walking	Tunnel syndr		36	Running	Good
14	55	F	Rest	Tunnel syndr		60	Unlimited	Excellent
15	20	F	Running	Tunnel syndr			Unlimited	Good
16	27	M	Walking	Tunnel syndr	Fracture	120	At rest	Unchanged
17	30	M	Rest	Tunnel syndr			Running	Good

Fig. 1

Photograph at operation showing flattening of the nerve as it lies in the tunnel (between arrows) which has been decompressed.

Fig. 2

Diagram of the anatomy of the superficial peroneal tunnel.

35 mmHg and it took more than ten minutes for the elevated pressure to return to normal.³⁻⁵ The normal time for the post-exercise pressure to return to normal was six minutes.⁵⁻⁷

A peroneal tunnel syndrome was diagnosed in patients with symptoms and signs of entrapment of the superficial peroneal nerve in whom at operation a fascial tunnel longer than 3 cm was found at the anterior intermuscular septum.¹

Intramuscular pressure. This was measured by the meniscus method⁸ in the anterior and lateral compartments in five patients with exercise-induced leg pain. Recordings were made at rest after an exercise test which produced the clinical symptoms. The patients were allowed to choose their exercise, depending on their fitness and the time of the year, as follows: dorsiflexion of the ankle on a foot ergometer, walking indoors, or outdoor running on an 800 metre track.

Operative treatment. Before operation the site of nerve

compression in the leg was identified by the first of the three provocation tests already described.¹ Preoperative marking of the painful sites in the leg is important because of variation in the anatomy and an anomalous course of the nerve is common.^{1,9} Under general anaesthesia with a thigh tourniquet, a skin incision 6 cm long was made 1 cm dorsal to the markings of the painful sites (Fig. 1). The nerve was located at the proximal edge of the fascial defect in 15 patients and at the normal fascial exit in two. The roof of the peroneal tunnel was incised longitudinally until the nerve entered the belly of the peroneus longus muscle. The incision in the fascia was kept close to the anterior intermuscular septum (Fig. 2). The skin incision was extended proximally in patients with a long peroneal tunnel. In those with a fascial defect but no peroneal tunnel, the fascia was excised for about 2 cm proximally. The tourniquet was released and haemostasis carefully controlled. The skin was closed by a subcuticular suture.

Walking was allowed with crutches four hours after the operation and full weight-bearing after 12 hours.

The patients with bilateral symptoms had operations separated by six months.

All patients were followed up at a minimum of two years by an unbiased observer (PM) who did not participate in their treatment. The mean follow-up was 26 months (18 to 36). The patients answered a questionnaire, made a pain drawing and were assessed clinically. Those who were free from symptoms and enjoyed unlimited physical activity were classified as excellent. Those who rated themselves as improved and satisfied, but with mild residual dysaesthesia or pain, were rated as good.

Statistical analysis. The results are given as mean values. The difference between values before and after operation was tested using Fisher's exact test.

RESULTS

Fourteen patients (82%) were satisfied and three were not. Four were free from symptoms. Thirteen had some residual symptoms or complaints, of whom ten regarded themselves as satisfied. Three were not improved, but none became worse. Table I gives the details.

Of the 13 patients with residual symptoms two had aching legs, one had mild swelling in the leg and eight had pain during walking. Five had occasional calf muscle cramps, which were experienced only at night by three patients.

After operation four patients could undertake unlimited physical activity, in ten activity was increased but limited and in three it was unchanged. Ten patients had pain at rest before operation but only two had pain after ($p < 0.05$).

The mean length of the peroneal tunnel was 10.7 cm (7 to 16) in ten patients and less than 3 cm in four. It was absent in three patients. In 14 patients the nerve in the peroneal tunnel was thin. In 12 of these there was a visible waist at the exit from the tunnel and in the 15 in whom the muscle herniated through the fascial defect.

DISCUSSION

Our patients had suffered disabling pain for a mean of four years and had clinical findings of nerve entrapment with normal nerve-conduction studies. Those with residual symptoms after operation were still satisfied because they had less pain and were able to be more active. Four of the oldest patients were satisfied because they had no pain while supine in bed and were able to tolerate a cover on top of their legs and feet. Pain drawings were helpful in detecting residual symptoms produced by concomitant diseases. Most of the older patients and some of the younger patients had venous insufficiency, and the younger post-traumatic pain which was unrelated to nerve entrapment.

The nerve must be decompressed by complete opening of the peroneal tunnel close to the anterior intermuscular

septum to minimise the risk of residual irritation from the edge of the fascia and the muscle tissue, and to avoid muscle hernia (Fig. 2). Haemostasis after the tourniquet has been released and removed is especially important.

The differential diagnoses for the peroneal tunnel syndrome include the pseudoradicular pain syndrome,^{1,10} chronic lateral compartment syndrome, fascial defects with muscle herniation^{11,12} and lipomata.¹³ The condition may be induced by an ankle sprain,¹⁴ fasciotomy of the anterior compartment in patients with chronic anterior compartment syndrome^{1,2} or an anomalous course of the nerve.^{1,9} The nerve is compressed at the site of emergence from the lateral compartment. The clinical finding of extended pain over the anterior intermuscular septum at palpation was found to correlate with a peroneal tunnel syndrome.

Our study shows that complete fasciotomy is not necessary in patients with entrapment of the superficial peroneal nerve if they do not have a chronic lateral compartment syndrome. Treatment by decompression of the superficial peroneal tunnel is sufficient in patients with a peroneal tunnel syndrome. Those with compression of the peroneal nerve without a peroneal tunnel may be treated by local fasciectomy.

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