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Decompression for peroneal nerve entrapment

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I reviewed 24 patients after decompression for peroneal entrapment neuropathy; in 3 cases the lesion was bilateral. There were 15 males and 9 females; mean age 44 (12-72) years. The etiology was an operation around the knee in 12, a tibial fracture in 2, a slight compression in 1, an ankle sprain in 2, excessive climbing in 2, sitting in a cross-legged position in 4, and in 4 cases no reason was found. There was foot drop in 15 and ankle instability in 12 cases. The nerve was decompressed after an average period of 17 months (4 days-8 years). Immediate relief of symptoms was achieved in 14 cases, slower relief in 10, and in 3 cases there was no recovery. In peroneal neuropathy, decompression should be considered after 2 months without recovery and after 4 months when recovery is slow.

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Peroneal entrapment neuropathy (PEN) is one of the most frequently encountered nerve injuries of the lower extremity. In general, therapy has been conservative. Only a few papers have been published concerning operative treatment of peroneal nerve entrapment (Nobel 1966, Sidey 1969, Sandhu & Sandhey 1976, Vastamäki & Solonen 1981). I have studied the results of operative treatment of PEN.

Patients and methods

There were 15 males and 9 females with PEN involving 27 legs; the mean age was 44 (12-72) years (Table 1). Other types of peroneal nerve involvement, such as severe traction and contusion palsies, were excluded. The average time between the onset of symptoms and the operation was 17 months (4 days-8 years). The postoperative observation time was 14 months (1 month-5 years).

There was total peroneal paralysis in 11 cases, a paralysis of the muscles supplied by the deep peroneal nerve in 4 cases, and a paresis of some degree in 12 cases. Pain was usually present, but paresthesiae and numbness were less common. Local tenderness over the nerve at the neck of the fibula and a positive Tinel sign were found in 25 cases. In 5 cases the Tinel sign had progressed to the leg.

The etiology was an operation around the knee in 12 cases, a tibial fracture in 2, an ankle sprain in 2, working in the kneeling or cross-legged position in 4, excessive walking or climbing in 2 cases, and a slight compression injury in 1 case. In 4 cases, no reason was found. In 7 cases, a plaster cast was used after a knee operation or as fracture treatment; 3 of these patients had experienced compression of the cast at the neck of the fibula. There were no diabetics or alcoholics. Enmg investigations were carried out. The mean motor conduction velocity measured between the popliteal space and the ankle on the affected side was 38 (21-51) m/s and on the unaffected side 50 (44-54) m/s.

At operation the nerve was carefully decompressed and the tendinous arch of origin of the peroneus longus was divided. The site of entrapment seemed to be the tight fascia over the nerve in 16 cases and the border of the peroneus longus in 8 cases. In 3 cases there was no obvious entrapment; in 2 of these cases the nerve was blurred.

During operation the common peroneal nerve and its branches were tested by using electrical stimulation. In most cases an area of pressure could be seen in the nerve. After releasing the tourniquet a dark red color was often observed for some minutes, indicating venous stasis.

Results

Out of 15 cases with paralysis, 5 showed complete recovery immediately or within a few days, 2 within a few weeks, and 6 within 1 year; 4 of these cases had been paralyzed for more than 6 months. Two did not recover within 18 months; in these cases the time be-

Table 1. Peroneal nerve entrapment, patients' data.

Case no.	Sex and age	Etiology	Nerve Injury[a]		Operative delay (mos)[b]	Operative findings[c]		Recovery[d]	Follow-up time (mos)
			Peroneus superfic	Peroneus profund		Pressure area	Nerve blurred		
1[e]	F 41	Excessive walking	2	2	4 days	1	0	2	16
		None	2	2	3	2	1	2	16
2	M 25	Knee operation (osteoch.diss.)	1	1	9	2	1	2	1
3	M 36	Knee ligament operation	1	1	40	0	1	2	28
4	M 26	Resection of the fibula	1	2	6	2	2	1	20
5	F 72	Prox. tibial osteotomy	0	1	9	1	0	1	6
6	M 28	Popliteal cyst exstirpation	2	2	5	2	2	1	1
7	F 61	Proximal tibial fracture	0	1	3	2	0	2	30
8	F 36	Knee arthrodesis	1	1	37	2	2	2	2
9	M 64	Proximal tibial fracture	2	2	1	1	1	1	37
10	F 53	Prox. tibial osteotomy	1	1	68	1	2	2	27
11	M 43	Sitting in cross-legged posit.	0	1	6	1	1	2	3
12[e]	M 34	Working in kneeling position	0	1	2	0	0	2	1
		and excessive climbing	0	2	12	0	1	2	1
13	M 45	Working in kneeling position	2	2	9	2	0	2	3
14	F 12	Elongation of the femur	1	2	2	2	2	2	36
15	M 48	Ankle sprain	2	2	2	1	2	2	1
16	F 70	Total knee arthroplasty	2	2	1	2	2	2	30
17	M 32	Excessive climbing	2	2	3	2	1	2	2
18[e]	M 56	Meniscectomy	0	2	92	2	0	0	18
		None	0	1	36	2	0	0	18
19	F 66	Total knee arthroplasty	2	2	1	2	2	2	60
20	M 21	Ankle sprain	2	2	78	1	1	0	18
21	F 47	Knee ligament operation	0	1	8	1	0	2	1
22	M 46	None	0	1	4	2	0	2	1
23	M 59	Slight compression injury	2	2	4	2	2	2	4
24	M 46	None	0	1	24	2	0	2	1

[a] 0 = no injury, 1 = paresis, 2 = paralysis.
[b] Time between the onset of symptoms and the operation.
[c] 0 = no obvious, 1 = mild, 2 = severe.
[d] 0 = no, 1 = partial, 2 = full recovery.
[e] Bilateral.

tween the onset of symptoms and the operation was 7 and 8 years (Table 1). There was a slight peroneal paresis in 12 legs. Nine recovered completely immediately or within a couple of days, and 2 within a few weeks. One paresis without any obvious etiology had persisted for 3 years and did not recover within 18 months.

One patient (No. 1) developed PEN on the left side without any obvious cause, and 3 months later the same on the right side after excessive walking for several days in stores. The left side did not show improvement. Recovery took place a few weeks after surgery. One patient (No. 12) suffered PEN on the left side temporarily for 1 year and on the right side for 2 months. He could not work in the kneeling position or climb uphill without experiencing symptoms. All of his symptoms disappeared immediately after surgery.

In 2 patients the operation failed. In 1 of them (No. 18), the lesion was bilateral. PEN developed on the right side after a meniscectomy and on the left side 5 years later without any evident etiology. Bilateral decompression 3 years later was unsuccessful. At operation the muscles innervated by the deep branch of the peroneal nerve were found to be pale and fibrotic. The second failed cases (No. 20) was not operated on until 6 years after the onset of symptoms. A total wasting of peroneal muscles had occurred and 2 years later a tibialis posterior transfer was performed.

Discussion

Peripheral entrapment neuropathy is defined as a state of altered transmission in a periph-

eral nerve because of mechanical irritation from related anatomic structures, from which a neuropathy may arise. During its course the common peroneal nerve passes around the neck of the fibula, where it is subject to direct trauma, pressure, or other injuries. The entrapment may be caused by direct injury, by external or internal pressure or by indirect causes, such as an ankle sprain (Seddon 1972).

Peroneal nerve entrapment neuropathy has a good tendency to recover spontaneously, but recovery may take 1 or 2 years, and it may be incomplete, requiring the patient to use a peroneal brace (Mansoor 1969, Rose et al. 1982, Sasaki et al. 1984). On the other hand, operative decompression of the peroneal nerve is a safe, easy, and brief operation taking at most 20 minutes. In most instances recovery is rapid or will take place after a few days or a few weeks (Sidey 1969, Sandhu 1984). Unfortunately, my investigation contains only patients subjected to decompression. However, there were 5 recovered patients with operative delay of more than 1 year. Four of them recovered immediately and 1 within 1 month.

During the operation, division of the tendinous arch of origin of the peroneus longus muscle from the fibula is particularly important. Sandhu & Sandhey (1976) determined that nerve compression became more pronounced with passive inversion of the foot. They considered that the nerve becomes linked over the tendinous lateral edge of the soleus during active contraction of this muscle, and the pressure effect by the tendinous posterior margin of the peroneus longus will be more pronounced. Bosien et al. (1955) found mild peroneal weakness at late follow-up in 22 per cent of ankle sprains in students, and observed close correlation between the incidence of residual symptoms and instability, and the presence of weakness. However, they believed that there was overstretching and disuse of the muscles rather than injury to the nerve. Later, Sidey (1969) emphasized that the mild involvement of the peroneal nerve may resemble lateral ligamentous instability of the ankle after inversion injury. He concluded that PEN may be the cause of a great deal of persistent ankle disability, also observed among my patients. Nobel (1966) and Meals (1977) emphasized the role of a posttraumatic intraneural hematoma as a cause of PEN. There was no such hematoma in my series.

PEN after use of a tourniquet has been described (Moldover 1954, Garland & Hughston 1979). Garland & Hughston's (1979) patients recovered with 6 months, but by simple nerve decompression they would probably have recovered immediately.

The course of recovery reflects the type of damage induced to the nerve (Rydevik & Lundborg 1977, Sunderland 1978). An immediate recovery indicates a metabolic block, whereas recovery over a period of weeks reflects a neurapraxia, i.e., a local conduction block based on myelin damage, but still with axonal continuity. Cases requiring several months or 1 year to recover probably indicate axonal degeneration. According to the speed of recovery, it seems that the pathophysiologic lesion was a metabolic block in 14 cases, local myelin damage in 4, and axonal damage in 9 cases. The mean operative delay was shortest (12 months) in metabolic block cases and longest (25 months) in the cases with axonal damage.

In many cases before decompression of the nerve, electrical stimulation did not induce muscle contraction, but after decompression and release of the tourniquet muscle contractions were achieved, indicating a removed metabolic block. In these cases recovery was particularly rapid.

In conclusion, peroneal entrapment neuropathy should be treated operatively if there is no recovery within 1 or 2 months or if the recovery is very slow. In cases with incomplete spontaneous recovery or with incomplete paralysis, decompression can result in complete recovery, even after many years.

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