THE RESULTS OF TRACTION INJURIES TO THE COMMON PERONEAL NERVE

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Platt (1928) described the association of common peroneal (lateral popliteal) nerve paralysis with severe adduction injury of the knee, an injury he called the "ligamentous peroneal nerve syndrome." The knee injury consists of rupture of the lateral capsule close to the tibial margin, avulsion of the biceps tendon, rupture of the lateral ligament and of both cruciate ligaments, and rupture of the ilio-tibial tract. This is accompanied by paralysis of the common peroneal nerve from traction, the injury varying in severity from a lesion in continuity to complete disruption of the nerve (Fig. 1).

Mitchell (1930) reported two cases of dislocation of the knee complicated by foot drop. No recovery was recorded over three months but there was no indication of the end-result. Watson Jones (1931) reported a case in which the nerve recovered within ten weeks. Ferguson and Allan (1939) studied the anatomy of the syndrome at necropsy, and Novich (1960) reported a patient with complete rupture of the nerve, which was resected and sutured: no motor function was regained but some sensory recovery was recorded—this was possibly because of sensory overlap from neighbouring nerves.

Two small series of this uncommon lesion have been published, from which some impression of the prognosis may be gained. Platt (1940) reported nine cases which he collected over twenty years. Five complete ruptures were treated by resection and suture, with complete recovery in two cases. Of four lesions in continuity, one was a neuropraxia which recovered in four weeks. In the remaining cases there was little or no naked-eye evidence of a lesion in the nerve trunk: there was failure to recover in two and spontaneous recovery in one.

Hight and Holmes (1943) reported eight patients, four of whom had a complete rupture of the nerve trunk. The other four had lesions in continuity with considerable macroscopic changes. Resection was carried out in all. In two, the resection was so extensive that repair was not feasible. In the six cases in which the nerve was sutured there were five complete failures and one incomplete recovery. Seddon (1960) had come to the conclusion that "owing to the great longitudinal extent of the damage in the nerve trunk, surgical repair of these injuries is hardly ever worth attempting in any situation."

It is on the impressions gained from the report of Hight and Holmes that traction lesions of the common peroneal nerve have earned their evil reputation. Because of this I was prompted to record a personal series of six cases collected over the past eight years. In this series there were two complete ruptures of the nerve trunk, both treated by resection and...
suture. The first patient had considerable motor and sensory recovery and is considered to have gained a good functional result. The second case was exceptional in that the patient had full sensory and motor recovery (this patient was shown at the British Orthopaedic Association Meeting in Glasgow in 1960). Of the four lesions in continuity, three were explored but not resected, and all recovered fully. The fourth was not explored and recovered spontaneously.

CASE REPORTS

The two cases of rupture with resection and suture are detailed below.

Case 1—A crane slinger aged twenty was struck on the right knee by a heavy load. At primary operation the cruciate ligaments, lateral ligament and lateral capsule were repaired and the nerve ends were approximated with one suture (Fig. 2). Four months after the injury eight centimetres of nerve were resected. Six months later the nerve was re-explored because the marker system was thought to be inaccurate. The suture line was found to have come apart and the nerve was resutured with heavier material and new markers were inserted. Recovery continued for two years after the operation and the functional result was good. Most of the sensory loss was regained (Fig. 3). The tibialis anterior contracted at force 5 (Medical Research Council grading), the extensor digitorum longus contracted at force 4 and the peroneal muscles at force 4. There was no recovery in the extensor hallucis longus or the extensor digitorum brevis. The patient was able to extend his foot to a right angle and did not require an appliance. He did not have overaction of the peronei as described by Seddon (1960), which is such a disadvantage when partial recovery is achieved.

Case 2—A motor cyclist sustained a typical ligamentous peroneal nerve syndrome in a road accident. On admission, the lateral side of the knee was exposed, and the cruciate ligaments, the lateral ligament and the ilio-tibial tract were repaired after removal of the lateral meniscus. The common peroneal nerve was found to be completely ruptured and the ends were approximated. Three months later, seven centimetres of the nerve were resected and a formal nerve suture was done. Full recovery, motor and sensory, occurred in eighteen months (Figs. 4 and 5).

There were four traction lesions in continuity and in none of these cases was the nerve resected.

Case 3—A crane slinger aged twenty sustained an adduction injury to his left knee. At exploration four days later the cruciate ligaments and the lateral ligament were found ruptured
and were repaired after removal of the lateral meniscus. There was considerable bruising of the nerve sheath over about ten centimetres. The texture of the nerve felt normal. Paralysis began to recover at six months and was fully recovered at nine months.

**Case 4**—A man aged nineteen was struck across the left knee by an iron girder, sustaining a complete dislocation of the knee. The dislocation was reduced and the knee was protected in a plaster for ten weeks. Paralysis of the common peroneal nerve was still present five months after the injury, so the nerve was explored. There was a lesion in continuity with patchy fibrosis over about five centimetres. The nerve started to recover at five months and was completely recovered in a year.

![Figure 4](image1.png)
![Figure 5](image2.png)

Case 2. Figure 4—Active dorsiflexion of the foot illustrates the excellent recovery in all muscles. Figure 5—To show the original sensory loss which recovered completely.

**Case 5**—A crane slinger aged thirty-nine sustained a dislocation of the knee with a complete tear of the lateral ligament and cruciate ligaments, demonstrated by applying an adduction strain to the knee under anaesthesia; the degree of tilt obtained was not compatible with intact cruciate ligaments. Treatment was by immobilisation of the knee. The drop foot began to recover in six weeks and was completely recovered in four months. The nerve was not explored.

**Case 6**—A child aged six years was struck on the knee by a piece of coal when a fire exploded. Her knee was shattered and widely adducted; the common peroneal nerve sustained a traction lesion. Three months later there was no recovery so the nerve was exposed. A localised fibrotic area about a centimetre in extent was discovered. The drop foot started to recover at four months and was completely recovered in one year. This was thought to be a traction nerve lesion well removed from the point of entry of the coal because no debris or coal dust was found anywhere in the region of the nerve.

**DISCUSSION**

From a review of the three series of cases described, certain observations could be considered pertinent. Highet and Holmes (1943) attributed their disappointing results to a secondary traction lesion which they believed was produced when the flexed knee was gradually returned to the extended position. From my experience with the first case of complete nerve
disruption, some of these failures could be attributed to separation of the nerve ends at an early stage, from tension on the sutures with consequent breakdown of the anastomosis. In fact, separation of less than a centimetre could vitiate any chance of recovery. In either case, the problem is directly proportional to the size of the gap left after the nerve has been resected.

Also, the greater the gap, the greater will be the difference in diameter of the two nerve ends, which makes accurate apposition of the nerve fibrils difficult. It must be remembered that the peroneal nerve is mainly motor, and, although it should not have the prognosis of the repair of a mixed nerve such as the median, it has some sensory fibrils.

Finally, the greater the gap, the more the nerve has to be mobilised in order to approximate the nerve ends, with the consequent increased likelihood of impairment of its blood supply. On the other hand, in some cases with lesions in continuity up to five centimetres the nerve has eventually recovered. It therefore seems that inadequate resection of the nerve would be less liable to cause failure of recovery than a painstaking attempt to get above and below a lesion of over ten centimetres.

The problem of immobilising the limb is also connected with separation of the nerve endings, and it seems that in the repair of all common peroneal nerve injuries the hip, the knee and the ankle should be immobilised. It is important to explore the nerve at the right time. Platt (1940) advocated early exploration and said that, in lesions repaired after three months, the results were disappointing. I did not find this to be the case. It appears that the best time is between the third and the fifth months, when the extent of the intraneural fibrosis is the most easily assessed. Platt also said that some of the bad results in his series were in lesions in continuity, when the nerve was apparently normal. This may have been because the assessment of the damage was made too early, as it was in the first lesion in continuity reported here. Furthermore, I believe that the nerve is more amenable to suturing with heavier material at this time, which makes the anastomosis a little more secure. It may be added that the neuropraxic lesion is less liable to be explored unnecessarily, as it appears to start recovering before the third month.

It must be agreed, however, that if the suture line separates the nerve will not recover. I found the usual system of two markers to be inadequate.

As will be seen from Figure 6, the distance between two markers is dependent on the distance of the x-ray tube from the nerve. Experimentally I have shown that a difference of a few centimetres in the distance of the x-ray tube from the nerve can distort this measurement, and give the impression that the markers are in the same position whereas in actual fact the two nerve ends have separated. I therefore devised the three-marker system in which one marker is placed on one side of the anastomosis and two markers on the other side. The accuracy of this method is independent of the position of the x-ray tube, and merely depends on a constant distance between each lateral marker and the central one.

CONCLUSIONS

Considering my series and that of Platt, it appears that all common peroneal nerves in the ligamentous peroneal nerve syndrome must be explored if there is no evidence of recovery in three months. Although traction lesions can be extensive, they seem to vary considerably.
It seems that in some there is an analogy with the way a draper can break string with his fingers with a snapping-like action which produces only a localised lesion in the string; so that not all lesions are as extensive as is often supposed even though they are complete ruptures.

Salvage procedures such as the Lambrinudi triple fusion and the posterior bone block are not without their disadvantages and are no substitute for successful nerve recovery. Furthermore, there is no disadvantage in delaying these procedures until the nerve has been given a chance to recover. However, there may be a good reason for transplanting the tibialis posterior muscle through the interosseous membrane on to the dorsum of the foot at the same time as the common peroneal nerve is repaired, as it could be replaced if the nerve recovery were first rate.

I would like therefore to make a plea for a more conservative resection of complete lesions, as it is better to leave some parts of the nerve in which damage is very slight and which may recover as some lesions in continuity do, rather than have too big a gap with inability to approximate the nerve ends, especially because Hidget and Holmes (1943) have shown the prognosis in extensive resection as very disappointing. On the whole, lesions in continuity without severe changes should not be resected. No doubt some lesions will be so extensive that the results will be disappointing but I cannot subscribe to the view that the lesion is not worth treating.

**SUMMARY**

1. A series of six traction lesions of the common peroneal nerve in association with a severe adduction force to knee is described.
2. The reasons for failure of the nerve repair are discussed.
3. A new system of radiological marking of the anastomosis is described.
4. A less pessimistic view of the prognosis is taken than heretofore, and the management of the injury is discussed with a recommendation that a more conservative resection be done three months after the injury.

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**REFERENCES**


