INTRODUCTION

During upper limb movement, changes in the length of the nerve bed occur. The nerve conforms to this changed environment by a limited amount of extensibility, but mainly by longitudinal excursion (McLellan and Swash 1976). The greatest movement of the median nerve occurred with hyperextension of the wrist joint, with movement of the nerve greater in the distal part of the limb in comparison to the proximal region (McLellan and Swash 1976). The peripheral nerves of the upper limb move over a considerable distance with joint motion (Dellon et al 1984; Wright et al 1996), but blood flow to the nerves can be impeded if this movement is affected by tethering of the nerve to surrounding connective tissues. Similar pathology occurs in the peripheral nerve of the lower limbs (Schon 1994). The purpose of the recent study was to measure excursion of major lower limb peripheral nerves, related to sagittal plane movements of the major joints of the lower limb.

METHODS

The longitudinal excursions of the sciatic nerve and its two components (the tibial and the fibular nerves) were measured using the lower quarters of ten human cadavers. Each limb was fixed to a wooden platform (120x45cm) by using three screws that penetrated the substance of the bone of the vertebral column and pelvis (cut in the median plane) at the following positions; L5 and S2 vertebrae posteriorly, and the pubic bone anteriorly. The wooden platform was secured to a laboratory table with clamps. Dissection of musculotendinous units and ligaments allowed joint motion similar to the normal ranges defined by the American Association of Orthopaedic Surgeons (1965).

The excursion was measured by mobilising the hip, knee and the ankle in the sagittal plane - over the flexion-extension arc. A 5/0 black braided silk suture (ETHICON, Inc.) was tied to the tested nerves at the following points: (a) For the sciatic nerve, a point midway between the ischial tuberosity and the knee joint. (b) For the tibial nerve, a point midway between the knee joint and the malleoli (medial and lateral). (c) For the fibular nerve, a point as it winds around the fibular neck. The displacement of the tied suture was measured against a fixed reference point, which was a standard screw drilled into the underlying bone and fixed in place with superglue. The joint axes markers were positioned according to the descriptions of Winter (1990), by embedding nails into the appropriate bony landmarks.

RESULTS AND DISCUSSION

General results for the sciatic nerve and its tibial component are summarised in Table 1. Excursion of the sciatic nerve did not occur during extension of the hip from the normal position of rest. The fibular nerve did not move at the site of interest, when each joint was moved through its flexion-extension arc. It was, however, noticed that it moved over a considerable distance when inversion-eversion were initiated.

Nerves move considerably with joint motion and this longitudinal sliding is highlighted with adjacent joint motion. The importance of this longitudinal excursion arises when tethering of the nerve in its compartment is released or nerve repair is performed. It is important that this longitudinal sliding is maintained post-surgery if the instituted treatment is to be effective.

SUMMARY

Longitudinal excursion of the sciatic nerve is most affected by proximal joint motion, while tibial nerve excursion is most affected by hip and ankle motion. Excursion of the fibular nerve, related to sagittal joint motion only, occurs in its proximal portion, when it is within the sciatic nerve sheath.

REFERENCES


ACKNOWLEDGEMENTS

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<table>
<thead>
<tr>
<th>Nerve</th>
<th>Hip</th>
<th>Knee</th>
<th>Ankle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sciatic</td>
<td>24.4 ± 3.5</td>
<td>7.1 ± 1.4</td>
<td>4.8 ± 0.6</td>
</tr>
<tr>
<td>Tibial</td>
<td>10.0 ± 1.2</td>
<td>1.9 ± 0.6</td>
<td>13.1 ± 1.8</td>
</tr>
</tbody>
</table>

Table 1: Nerve excursion related to the full range of lower limb joint flexion-extension (mm; mean ± SD)