Incidence and Importance of Lower Extremity Nerve Lesions After Infrainguinal Vascular Surgical Interventions

T. Busch*, J. Strauch, I. Aleksic, H. Sirbu and H. Dalichau

Department of Thoracic, Cardiovascular and Vascular Surgery, Georg-August-University Göttingen, Germany

Objectives: to determine the incidence of peripheral nerve lesions after arterial vascular surgery of the lower extremity.

Materials and methods: 436 patients who underwent peripheral vascular surgery from January 1992 until December 1996 underwent a detailed postoperative neurological examination.

Results: 147 patients underwent profundaplasty, 140 above-knee femoropopliteal bypasses, 106 below-knee femoropopliteal bypasses and 56 femorotibial bypasses. There were 182 women and 254 men. Peripheral nerve lesions were observed in 11 patients (4%) after primary operations. 166 patients underwent reoperations (38%) and 55 of these developed nerve lesions (33%).

Conclusions: reoperation carries an 8-fold increased risk of nerve lesions compared with patients undergoing primary surgery. Detailed explanation of the risk of peripheral nerve lesions before vascular surgery of the lower limb is advisable.

Key Words: Nerve lesions; Sensory deficit; Arterial revascularisation; Lower limb.

Introduction

Peripheral nerve lesions can occur as a complication of various surgical interventions. However, this issue has not yet been investigated systematically in vascular surgery. Most reports describe the incidence of peripheral nerve lesions after orthopaedic or trauma surgery.1 In addition, nerve lesions are often caused by ischaemic syndromes.2 The underlying mechanism is persistent malperfusion of the particular nerve. The incidence of nerve lesions in thrombo-obliterative disease of the lower extremities and other vasculitis ranges from 50% to 88%.3,4 The exact causative mechanism of peripheral nerve lesion after surgery remains speculative. Detailed information about presence and extent of potential underlying mechanisms like penetrating trauma, pressure, stretch, ischaemia or external temperature is often incomplete.5,6

This study aimed to assess the incidence of nerve lesions after vascular surgery of the lower extremity.

Material and Methods

Four hundred and thirty-six patients who underwent infrainguinal revascularisation of the lower limb between January 1992 and December 1996 were evaluated for sensory deficits postoperatively (Table 1). There were 182 women (42%) and 254 men (58%) with a mean age of 70.5 ± 5.8 years. Patients with peripheral aneurysms, previous thromboembolecomy or generalised vasculitis, polyneuropathy, traumatic vascular injury and entrapment were excluded because of the possibility of pre-existing sensory deficits or irreversible nerve lesions.7

The diagnosis of sensory deficits was established by means of a detailed history and neurological examination preoperatively and before discharge.6 Superficial sensory function was assessed by the two-point-differentiation method according to Weber for the tributaries of different nerves and by the ninydrine test according to Moberg.8 The Weber test differentiates between blunt and pointed. The Moberg test assesses deficits of sweat secretion. The physician has to wear rubber gloves in order to avoid creating
false results by his/her own sweat secretion. The patient presses the anatomic area of interest, e.g. the palm, against paper and the physician draws the margins around this area with a pencil. Then, the sheet of paper is placed in a 1% ninhydrine solution. Afterwards, the sheet is dried at 110°C for 2-3 min. Since ninhydrine stains certain amino acids in human sweat pink, one can easily differentiate anhidrotic areas from normal areas. No further neurophysiological tests, e.g. nerve conduction velocity measurements, were conducted.9 Statistical analysis for categorical data was performed with the Chi-squared test.

Anatomical overview

All injured nerves originate from the lumbosacral plexus. The femoral branch of the genitofemoral nerve, one of its two main branches runs caudally adjacent to the iliac artery inside the fascia surrounding the artery. The nerve supplies the skin of the inguinal crest above the femoral triangle coursing through the lacuna vasorum below the inguinal ligament. If injury of the femoral branch occurs, patients complain of a burning pain sensation in the groin and a sensory deficit.10 The cutaneous lateral femoral nerve courses medially to the anterior superior iliac spine and below the fascia lata. Several centimetres below the inguinal ligament the nerve enters the fascia and supplies the skin of the anterolateral aspect of the thigh. Both nerves may be harmed by dissecting vessels in the groin and by inclusion in sutures11,12 (Fig. 1).

The anterior cutaneous branches of the femoral nerve penetrate the sartorius muscle, enter the fascia lata on its medial aspect and extend to the greater saphenous vein. The branches supply the medial aspect of the thigh after spreading across the vessels in the thigh.13 Injuries due to surgery of the femoral artery by direct trauma or suturing have been described.6,12 The saphenous nerve is the longest branch of the femoral nerve. After accompanying the femoral artery into the adductor canal, the nerve follows the dorsal edge of the sartorius muscle. It joins the greater saphenous vein below the knee. It supplies the anteromedial parts of the lower leg and the foot.14 It gives rise to the infrapatellar branch above the medial condylus supplying the skin on the medial aspect of the knee and below the tibial tuberosity.13 Both nerves can be injured when exposing the popliteal artery (Fig. 2).

Surgical approach

We always approach the femoral artery via the lateral route, utilising a longitudinal incision in order to avoid cutting through the inguinal lymph nodes. The above-knee popliteal artery is approached by a longitudinal incision on the medial side of the upper leg.
Table 2. Peripheral nerve lesions after primary arterial revascularisation (n = 270)

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior cutaneous branches (femoral nerve)</td>
<td>n = 3 (1.2%)</td>
</tr>
<tr>
<td>Femoral branch (genitofemoral nerve)</td>
<td>n = 1 (0.4%)</td>
</tr>
<tr>
<td>Saphenous nerve</td>
<td>n = 1 (0.4%)</td>
</tr>
<tr>
<td>Infrapatellar branch</td>
<td>n = 3 (1.2%)</td>
</tr>
<tr>
<td>Lateral cutaneous femoral nerve</td>
<td>n = 3 (1.2%)</td>
</tr>
</tbody>
</table>

Table 3. Peripheral nerve lesions after repeat arterial revascularisation (n = 166)

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior cutaneous branches (femoral nerve)</td>
<td>n = 51 (31%)</td>
</tr>
<tr>
<td>Femoral branch (genitofemoral nerve)</td>
<td>n = 2 (1.2%)</td>
</tr>
<tr>
<td>Femoral nerve</td>
<td>n = 1 (0.6%)</td>
</tr>
<tr>
<td>Lateral cutaneous femoral nerve</td>
<td>n = 1 (0.6%)</td>
</tr>
</tbody>
</table>

Discussion

Lesions of sensory and mixed nerves cause dysesthesia presenting as numbness, tickling and burning pain. Sensory deficits of the lower limb can considerably impair quality of life, especially after successful arterial revascularisation. Until now, the incidence of peripheral nerve lesions with resultant sensory deficits after arterial vascular surgery of the lower limb has not been studied systematically. These nerve lesions are attributable to iatrogenic injuries during dissection. This is particularly important in reoperations when scarring dramatically increases the chance of injury. Injury by suturing is another potential cause of postoperative sensory deficit. Given the high incidence of reoperations in peripheral vascular surgery, complete elimination of peripheral nerve lesions is unlikely. One can only try to reduce scarring by dissection in proper anatomical planes and careful suturing.

In conclusion, peripheral nerve lesions occurred in 4% of all patients undergoing primary infrainguinal revascularisation. The incidence of peripheral nerve lesions was significantly higher in patients undergoing reoperation. To avoid potential malpractice claims, thorough preoperative patient education regarding nerve lesions after vascular surgery is advised. The potential reversibility and the relevance of persistent sensory deficits is the focus of an ongoing study.

References


Accepted 31 August 1998