Abstract

**Objective:** To determine the incidence, extent and site of saphenous neuralgia (anaesthesia, hyperaesthesia and pain) in the lower limb after harvesting of great saphenous vein (GSV) for coronary artery bypass grafting (CABG). **Methods:** Thirty-two consecutive patients (39 lower limbs) aged 58 ± 16 years undergoing CABG were prospectively reviewed. All patients were assessed pre-operatively to establish the presence of normal sensation, then at 3 days, 6 weeks and 20 ± 4 months post-operatively for symptoms or signs of saphenous neuralgia. The data were recorded on serial diagrammatic representations, and the area of sensory loss for each site was recorded at each review. The decrease in areas of sensory loss over time was investigated with statistical analysis. **Results:** Thirty-five (90%) of the lower limbs examined showed some degree of anaesthesia at 3 days with 23 (72%) still symptomatic at a mean follow up of 20 months. Hyperaesthesia and pain were infrequently noted. Anaesthesia was generally confined to three main areas, which were denoted sites A, B and C for descriptive purposes. The mean area of sensory loss in the lower limb at 3 days post-surgery was 53.4 cm², for an incision of mean length 42 ± 22 cm from the medial malleolus. This area reduced to 31.7 cm² by 20 months, and the decrease in area over time for each site was found to be statistically significant using analysis of variance for repeated measures and the Friedman–Rubin test. **Conclusions:** This study demonstrates that saphenous neuralgia after harvest of GSV for CABG is common. The main symptom is anaesthesia and certain areas may persist for some considerable time post-operatively. © 1999 Published by Elsevier Science B.V. All rights reserved.

**Keywords:** Saphenous neuralgia; Great saphenous vein; Coronary artery bypass grafting

1. Introduction

Saphenous neuralgia [1] describes the symptom complex which includes anaesthesia, hyperaesthesia and pain within the distribution of the saphenous nerve. This sensory nerve is closely related to the great saphenous vein during its subcutaneous course through the medial aspect of the leg, and the continuity of the nerve and its branches are at risk during any surgical procedure in this region. Arterial grafts are the first choice as a conduit for myocardial re-perfusion, however with advances in interventional radiology most coronary artery bypass grafting (CABG) procedures require several grafts. Despite the availability of synthetic conduits autogenous great saphenous vein (GSV) is the most commonly used conduit for myocardial re-perfusion and saphenous neuralgia is therefore seen after harvesting of various lengths of vein from the leg or thigh. It has also been described after varicose vein [2], arterial [3] and orthopaedic [4] procedures. We have investigated the incidence, extent and area of saphenous neuralgia after CABG with a prospective longitudinal cohort study.

2. Materials and methods

A prospective study was made of 32 consecutive patients undergoing CABG by a single consultant surgeon. In seven cases these had bilateral GSV stripping, making a total of 39 vein harvest sites for the study. Their mean age was 58 ± 16 years. Any patients with diabetes mellitus, peripheral vascular disease, varicose veins or previous lower limb injuries were excluded from the study. All lower limbs were examined pre-operatively to establish the presence of normal sensation to light touch and pin prick, and none had any significant soft tissue swelling of the legs. Most patients had the left internal mammary artery anastomosed to the left anterior descending artery, and the remaining two or three grafts used GSV as the conduit. Sufficient length and quality of GSV was harvested using sharp soft tissue dissection from the medial malleolus to mid-thigh, with all 39 lower limbs having GSV stripped in the leg. Only 25 of the lower limbs required the harvest to extend above the knee to provide suitable vein for the grafts.
At operation every effort was made to preserve the continuity of the saphenous nerve or its branches. The wounds were closed using two layers of continuous absorbable sutures, with the use of a suction drain if the wound extended into the thigh. A compression dressing was applied to the lower limb immediately after the wound was closed, which was replaced with an above knee anti-thrombotic embolic stocking 3 days later and continued for a further 6 weeks. The lower limbs were assessed for sensory change to the modalities of light touch and pin prick. The incidence and site were recorded on a diagrammatic representation, and the extent measured using a one cm² transparent grid. All 39 lower limbs were reviewed at 3 days and 6 weeks post-surgery, and 32 (82%) of these were examined at a mean of 20 months post-surgery. The data were recorded on serial diagrammatic representations and transferred to a computerised database for statistical analysis with SPSS software.

3. Results

Thirty-nine lower limbs were reviewed after GSV harvesting at 3 days and 6 weeks, in which 25 (64%) of the harvest sites extended above the knee. The 32 (82%) lower limbs reviewed at a mean of 20 months post-surgery formed the complete data set, of which 22 (69%) harvest sites extended above the knee. The mean length of incision used was 42 ± 22 cm from the medial maleolus.

The major symptom of the saphenous neuralgia complex reported was anaesthesia (Table 1), with sensory loss to both light touch and pin prick, whilst other symptoms were reported very infrequently. Dermatitis was also noted in one patient around the distal aspect of the incision. The sensory loss was generally found to occur in three main sites (Fig. 1), and have been designated: anterior to the skin incision in the leg (site A), posterior to the skin incision in the leg (site B) and posterior to the skin incision at the knee (site C). Each site was directly adjacent to the skin incision and extending for a variable distance perpendicular from it. Frequently areas of anaesthesia were noted on one side of the scar with normal sensation immediately the other side. No areas of sensory loss were identified that did not extend to the skin incision.

Anaesthesia was found consistently throughout all three sites, with site A (anterior to the skin incision in the leg) most commonly affected. The areas that the patients described for their sensory loss was noted by the examiner to be reasonably accurate and reproducible at subsequent review when plotted on their diagrammatic representations, and some patients described almost exactly the same sites at their 20 month review. The pattern of sensory loss was also consistent with one or two patches of anaesthesia described within each site, whilst some patients experienced no sensory loss at all for a particular site.

The areas of sensory loss were noted to decrease over time (Table 2) from a total mean sensory loss of 53.4 cm² at 3 days to 31.7 cm² at 20 months. This is demonstrated (Fig. 2) with the lined area marking the lesser extent at 20 months and the dotted and lined areas combined representing 6 weeks.

4. Statistical analysis

The complete data set of the 32 lower limb harvest sites...
was investigated using statistical analysis for a decrease in the areas of sensory loss for sites A, B and C with serial review at 3 days, 6 weeks and 20 months. The mean areas of sensory loss for each site were tested with repeated measures analysis of variance, and are significant: site A $P < 0.001$, $F = 14.03$, site B $P = 0.001$, $F = 7.31$ and site C $P = 0.002$, $F = 6.99$.

In view of the lack of normality of these data (multiple zeros) analysis using the Friedman–Rubin distribution free alternative to the analysis of variance was used. The differences between the median scores are significant: site A $P < 0.001$, $S = 30.59$, site B $P = 0.004$, $S = 11.13$ and site C $P = 0.005$, $S = 10.65$.

### 5. Discussion

The saphenous nerve is the terminal sensory branch of the femoral nerve (L 2,3,4), supplying the skin of the anteromedial aspect of the leg through its two major divisions: the sartorial and infrapatella nerves. It arises anterior to the femoral artery within the adductor canal, and perforates the anterior wall of the canal, travelling around the medial border of sartorius to become closely associated with the GSV in the subcutaneous tissues of the leg. It gives a medial articular branch to the knee and numerous cutaneous branches as it descends through the leg with the vein, with its terminal branches supplying the skin around the medial malleolus.

Saphenous neuralgia describes the symptom complex of anaesthesia, hyperaesthesia and pain in the area innervated by the saphenous nerve [1].

It is a recognised complication of CABG [5], however the actual incidence remains unknown. The mechanism of injury is thought to be from local division of the nerve or its branches, or from compression by post-operative soft tissue swelling. Nair [6] has reported sensory loss after GSV harvesting, documenting 92 and 88% immediately post-operation, falling to 19 and 5% after 14–18 months in wounds that were closed in two layers and a single layer, respectively. This study also reports less hyperaesthesia and pain with wounds that were closed with only a single layer, and concludes that there is better preservation of cutaneous sensation if the wound is closed using this method. Wellwood [2] has reported the incidence and area of sensory loss seen after GSV stripping with a vein stripper, documenting 50% of patients experiencing a mean loss of 39.2 cm² at 3 months if the vein is stripped upwards, and 23% of patients reporting a mean loss of 36.5 cm² at 3 months if the vein is stripped downwards. The incidence, extent and site of saphenous sensory loss and its change with time has not previously been reported.

In this study sufficient vein was harvested for each myocardial re-perfusion procedure. If the GSV was of sufficient calibre or quality or fewer grafts required, then a shorter incision to the knee was sufficient, however if more vein was required then the harvest was continued proximally into the thigh. The fact that the study has demonstrated sensory loss only in the areas of the leg and behind the knee adds weight to the theory that the saphenous nerve is damaged with the harvest, as almost no sensory loss was noted in the thigh where cutaneous branches of the obturator nerve must have been transected.

The decreasing mean areas of sensory loss within this cohort with time for areas A, B and C show a clear trend, although recovery may only be partial even after several months. It is noted that for a more scientific assessment of this phenomenon electro-physiological studies may have

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**Table 2**

<table>
<thead>
<tr>
<th></th>
<th>3 Days</th>
<th>6 Weeks</th>
<th>20 Months</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site A</td>
<td>28.7 cm²</td>
<td>22.9 cm²</td>
<td>18.6 cm²</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>(0–100)</td>
<td>(0–85)</td>
<td>(0–74)</td>
<td></td>
</tr>
<tr>
<td>Site B</td>
<td>15.1 cm²</td>
<td>10.9 cm²</td>
<td>8.7 cm²</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0–75)</td>
<td>(0–80)</td>
<td>(0–68)</td>
<td></td>
</tr>
<tr>
<td>Site C</td>
<td>9.6 cm²</td>
<td>6.1 cm²</td>
<td>4.3 cm²</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>(0–100)</td>
<td>(0–102)</td>
<td>(0–88)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53.4 cm²</td>
<td>39.8 cm²</td>
<td>31.7 cm²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0–275)</td>
<td>(0–267)</td>
<td>(0–230)</td>
<td></td>
</tr>
</tbody>
</table>

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Fig. 2. Clinical photograph demonstrating areas of sensory loss at 20 months (dots) and 6 weeks (dots plus lines).
produced a more complete analysis. However in view of the practicalities of data acquisition at serial review, the modalities of light touch and pin prick with their subjective limitations were accepted.

Urayama [3] has reported an 18% incidence of saphenous neuralgia after femero-popliteal bypass grafting. However in this series the symptoms were not found to be related to GSV harvest or below knee anastomosis, but rather postulates that the injury occurs to the nerve at the site of its leaving the adductor canal from manipulation of the limb during the procedure. There is a growing recognition of the association between saphenous neuralgia and dermatitis around the harvest site. Reported cases [7] also document objective sensory loss around the leg wounds, and we confirm a low incidence of this complication in our own series.

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References