Endoscopic saphenous vein harvesting versus ‘open’ technique.  
A prospective study

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Abstract

Objective: Preparation of the great saphenous vein for coronary artery bypass grafts is usually performed through one or many cutaneous incisions. A technique of endoscopic harvesting is now available. An aim of the study was to compare both methods, prospectively. 

Methods: Sixty coronary artery bypass grafting patients were randomly assigned to two groups according to saphenous vein harvesting technique: 30 patients to group 1 – open harvesting technique (OHT) and 30 patients to group 2 – endoscopic harvesting technique (EHT). The results were assessed on the basis of (1) clinical outcome (hematomas, inflammations), (2) length of the cutaneous incisions compared to length of the segment of vein harvested, (3) time of harvesting, (4) postoperative pain. Results: Both groups were comparable in terms of: age, sex, diabetes, peripheral artery disease, site of harvesting, number of anastomoses, and length of the vein harvested. Both the length of the cutaneous incisions and the postoperative pain were decreased in the EHT group. Harvesting time was increased in the OHT group. Conclusions: Endoscopic saphenous vein harvesting allows improved aesthetic aspect, less postoperative discomfort, with an increased time in harvesting in the beginning. © 1998 Elsevier Science B.V. All rights reserved

Keywords: Coronary artery bypass; Endoscopic harvest of saphenous vein

1. Introduction

Coronary artery bypass grafting is now one of the most often performed cardiac operations. This surgery requires various conduits, with the saphenous vein remaining a conduit of choice. Complications of saphenous vein harvesting include cellulitis, hematoma, edema, neuralgia and ischemic sequelae [1,2]. Delayed in wound healing, necrosis and infections are seen in between 4 and 6%, and preoperative predictors of morbidity include: peripheral vascular artery disease, obesity, diabetes, female sex, preoperative steroid treatment, and anemia [3,4].

Although greater saphenous vein harvesting is performed mostly through an extended medial lower incision, other techniques with multiple incisions have been described [5,6], including a technique using endoscopic harvesting [7–11]. We report here our evaluation between the ‘open’ technique and endoscopic harvesting.

2. Patients and methods

2.1. Patients

A total of 60 coronary artery bypass grafting patients between July 1 and December 12 were randomly assigned to two groups according to greater saphenous vein harvesting technique: 30 patients into group 1 – ‘open’ or standard harvesting technique (OHT) and group 2 – endoscopic harvesting technique (EHT).

The length of the incisions, and of the harvested veins were measured, as well as the time of harvesting, which was counted from skin incision to complete leg-incision closure. Between the 7th and the 10th postoperative days, several items were recorded by the nurses team, which included: hematomas, delay in wound healing, local inflammation, and pain. Pain was assessed by a numerical scale from 0
to 10. The patients were evaluated between the 7th and the 10th postoperative days after they were freely ambulating, and they were questioned as to the maximum level of leg pain they encountered. The answer was given orally and written on a scale, with 10 being described as an excruciating pain, and 0 as no pain at all ever experienced throughout their stay. All patients were operated on with the same aesthetic and operating technique.

Patients were randomly assigned to either group. Patients which were not included in the protocol included: emergency surgery, prior bilateral greater saphenous vein stripping, major saphenous vein varices which precluded use of the vein, exclusive arterial revascularization, preoperative continuous intravenous therapy.

2.2. Technique

Before the operation the greater saphenous vein was marked from the medial malleolus to the thigh with a sterile marker. This allows a limited dissection of the tissue surrounding the vein, and minimizes tissue flaps. The leg is entirely prepared and draped in order to allow complete mobilization of the limb as necessary.

Endoscopic saphenous vein harvesting technique.

The instrumentation used is commercially known as the saphenous vein harvesting kit (Ethicon Endo-Surgery, Cincinnati, OH). It includes a subcutaneous dissector, a retractor, a vessel dissector, and a 5-mm endoscopic clip applier (Ethicon Endo-Surgery). In addition, it is necessary to use standard endoscopic equipment: television monitor, light source, fiberoptic camera, and a 5.5-mm lens (30° angled, 300 mm in length), and 5 mm bipolar scissors (Ethicon Endo-Surgery).

We prefer to start at the medial malleolus and a 3–4 cm longitudinal incision is made (Fig. 1). Blunt and sharp dissection of the greater saphenous vein is performed along the extent of the incision. The subcutaneous dissector is then gently inserted in the incision and advanced under television guidance. It is advanced following the anterior aspect of the vein. Once the tunnel is created, the vessel retractor is put in place and dissection of the vein is performed alternatively with the help of scissors and of the vessel dissector (Fig. 2). Side-branches of the saphenous vein are identified, ligated with the endoscopic clips applier (Ethicon Endo-surgery) and divided with 5-mm scissors (Fig. 3). For larger branches it is safer to clip both sides, whereas for small branches, bipolar cautery with scissors is usually sufficient. The anterior branches can sometimes be very difficult to ligate safely. It is usually necessary to rotate the retractor slightly which will better expose the collateral and allow an easier ligation. In the beginning it is easier to make a small counter-incision (1 cm) in order to ligate the anterior collateral, and avoid undue traction or tearing of the vein. This incision can then be used to continue the dissection with scissors or vein stripper.

Once the desired vein length is dissected, the vein is ligated with the endoscopic clip applier and divided. It is then easily removed through the incision, cannulated and all side-branches are then ligated, if necessary, with 5-mm clips. The quality of the vein was assessed by the surgeon as the vein is gently flushed with a solution of heparin and papaverin. Any trauma to side branches or the endothelium was noted as was the need to repair small side branches avulsion with 7-0 Prolene.

All incisions are then closed in layers before heparin is given, and the leg is wrapped with Kerlex and ACE bandages. The wrap is left in place for 24 h. In the case of obesity, we have left a small suction drain for 24–48 h in the harvest site.

Statistical analysis was done using the non-paired Stu-
dent’s t-test for continuous variables and Fisher’s exact test for categoric data. Statistical significance was assumed at P-values \(<0.05\).

3. Results

Patients’ characteristics are summarized in Table 1. Both groups were comparable for age, sex ratio, diabetes and peripheral vascular disease. The majority of the veins were harvested in the calf in 93\% (28 patients in both groups). A thigh incision was used only in case of redo coronary surgery, or when additional vein length was needed. The mean length of vein harvested in group 1 was 21.8 cm, and 27.6 cm in group 2. The cumulative mean cutaneous incision length was 27 cm in group 1 and 4.7 cm...
Table 1
Prooperative characteristics of patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Open group</th>
<th>Endoscopy group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>30</td>
<td>30</td>
<td>n.s.</td>
</tr>
<tr>
<td>Mean age (years ± SD)</td>
<td>68.9 ± 6.7</td>
<td>68.8 ± 9.4</td>
<td>n.s.</td>
</tr>
<tr>
<td>Sex</td>
<td>n.s.</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>3</td>
<td>5</td>
<td>n.s.</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>5</td>
<td>7</td>
<td>n.s.</td>
</tr>
<tr>
<td>Harvest site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thigh</td>
<td>2</td>
<td>2</td>
<td>n.s.</td>
</tr>
<tr>
<td>Calf</td>
<td>28</td>
<td>28</td>
<td></td>
</tr>
</tbody>
</table>

n.s., not significant; SD, standard deviation.

cm in group 2. Therefore, the mean cumulative cutaneous incision length divided by the mean length of the harvested vein was 97% in group 1 and 21.7% in group 2. However, the time of harvesting was increased in the endoscopic group (37.9 min vs. 48.5 min). The quality of the vein assessed, as previously described, showed no differences in either group, since in five patients of each group, small branches avulsion were repaired with fine Prolene. Also, no reoperation for bleeding or tamponade occurred in either group. There were no differences between the two groups in terms of hematomas (three vs. five), or local inflammation (one vs. one). Local pain was reduced in the video group with a mean pain score of 1.8 in group 1, and 0.6 in group 2. Also, only five patients in the video group complained of pain, all presented a local hematoma.

3.1. Discussion

Greater saphenous vein harvesting is now a routine procedure, and long-term patency of the graft is linked to its harvesting technique. The vein must be handle with great care in order to minimize trauma to its intima and adventitia. Also, collaterals must be carefully ligated or clipped in order to avoid tearing or secondary bleeding. The endoscopic technique allows harvesting without undue tension and with minimal handling. The dissection should be started with scissors in order to separate the vein from its adjacent tissue, in order to visualize all collaterals. The vein stripper must be used as an adjunct in the dissection, as it can sometimes create tension on the adventitia or the collateral resulting in small injuries. Apart from its obvious improved esthetic results, this technique markedly reduces local pain. In this series the majority of patients in the endoscopy group were pain free, whereas the majority of patients in the classic technique complained of slight pain. All patients with some pain in the minimal harvest group presented some degree of hematoma locally. One patient developed a hematoma after heparin was started before leg closure. The majority of hematomas could have been prevented by better wrapping of the leg and/or the use of a small suction drain. However, most postoperative pain is usually neurological and linked to either section or injury to the saphenous nerve which is a sensitive branch of the cranial nerve. The risk of nerve injury is usually due to the important connection between the vein and the nerve [12], also due to crossing of the nerve on the vein on the medial to upper one-third of the calf [13], and from the numerous branches of the nerve crossing the vein anteriorly [14]. Therefore, in order to avoid direct trauma to the nerve, we prefer to perform an incision on the lower aspect of the medial malleolus where the nerve is usually not totally adjacent to the vein [12], and to continue the dissection gently separating the nerve from the vein. Concerning the choice of the harvesting site, it depends on the patient’s medical history. We prefer to use the calf vein due to its better quality, and to the higher percentage of thigh hematomas [15]. However in diabetics or peripheral vascular disease patients, harvesting at the thigh is necessary in order to minimize infectious and ischemic complications. In this latter case, the endoscopic technique reduces skin flaps and lymphatic channel injuries.

The time required for saphenous vein harvest is increased in the minimal harvest group, but this is linked to the learning curve. In the last ten patients the time required was similar to that for the open technique (45 min).

In conclusion, our results suggest that endoscopic saphenous vein harvest is feasible for myocardial revascularization. It offers many advantages over the open technique and can be performed safely.

References

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