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Minimally Invasive Vein Harvesting with the SaphLITE Retractor System: Is It Really Better?

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ABSTRACT

Background. The value of newly developed techniques for saphenous vein harvesting remains controversial. Which technique offers the most benefits is still unknown. The aim of this study was to compare the conventional vein harvesting through a continuous skin incision method with 2 less invasive methods and evaluate surgical advantages and postoperative results.

Methods. In this prospective study, 110 patients scheduled for coronary artery bypass grafting were randomized into 3 groups: vein harvesting by standard continuous skin incisions (group I), conventional bridge technique (group II), and the SaphLITE retractor system (group III). Particular interest was paid to collecting intraoperative data and postoperative clinical results.

Results. The ratio of vein length to incision length was 0.89 for group I, 1.9 for group II, and 3.3 for group III. Dissection time per centimeter of vein harvested and time for wound closure were found to be 1.23 min and 0.77 min for group I, 0.89 min and 0.57 min for group II, and 0.96 min and 0.46 min for group III. No wound infection was seen in either group; conduit quality, postoperative pain, and mobilization were similar. Hematoma and edema formation were less frequent in groups I and II. The best cosmetic results were seen in the SaphLITE group.

Conclusions. Less invasive vein harvesting techniques, especially with use of the SaphLITE retractor system, yield favorable clinical results, particular with respect to cosmetic appearance. Compared to the conventional approach, the SaphLITE method is suitable for routine vein harvesting because it has fewer complications and is easy and fast to perform. Because the bridge technique does not require special instruments, it has economic advantages.

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INTRODUCTION

Saphenous vein harvesting through long, continuous skin incisions has an extended history in cardiac surgery. In recent years, minimally invasive techniques have begun to gain ground in cardiac surgery. Cosmetic considerations have been the primary impetus behind the development of various methods of minimally invasive vein harvesting. The surgical spectrum encompasses a wide range of techniques, from intermittent skin incisions to totally endoscopic vein harvesting [Lumsden 1996; Lutz 1997; Newman 1999; Goel 2000]. More and more patients request that such methods are used. Patients' wishes and cosmetic considerations alone cannot justify the introduction of novel methods, however. It is essential to assess not only suitability and feasibility of each individual technique but also their safety, associated complications, and postoperative results [Cable 1998]. Finally, cost considerations need to be included when weighing the pros and cons of particular techniques.

This study was designed to address these aspects. Two minimally invasive approaches, using the SaphLITE retractor system (TeleFlex medical, Research Triangle Park, NC, USA) and the standard bridge technique performed with regular surgical instruments, were compared to conventional vein harvesting through a long, continuous incision.

MATERIALS AND METHODS

One hundred ten patients (34 women and 76 men, 46-82 years of age) scheduled for elective coronary bypass grafting were enrolled and randomized. Patients were assigned to 1 of 3 operation groups: conventional open vein harvesting (group I), standard bridge technique (group II), or vein harvesting with the SaphLITE system (group III). Each group was operated on by a certain team and the participants of each group were chosen by lot. Severe varicosities, preexisting skin conditions (eg, psoriasis), and a history of surgical procedures on the lower extremities were exclusion criteria.

Conventional Vein Harvesting

The exposure of the graft was performed through a continuous skin incision over the greater saphenous vein (GSV) from the medial malleolus advancing proximally. After the vein dissection, side branches were divided between ligatures followed by distal and proximal division of the saphenous vein and ligature of both stumps. After placement of a drain, wound closure was performed by means of a running subcu-

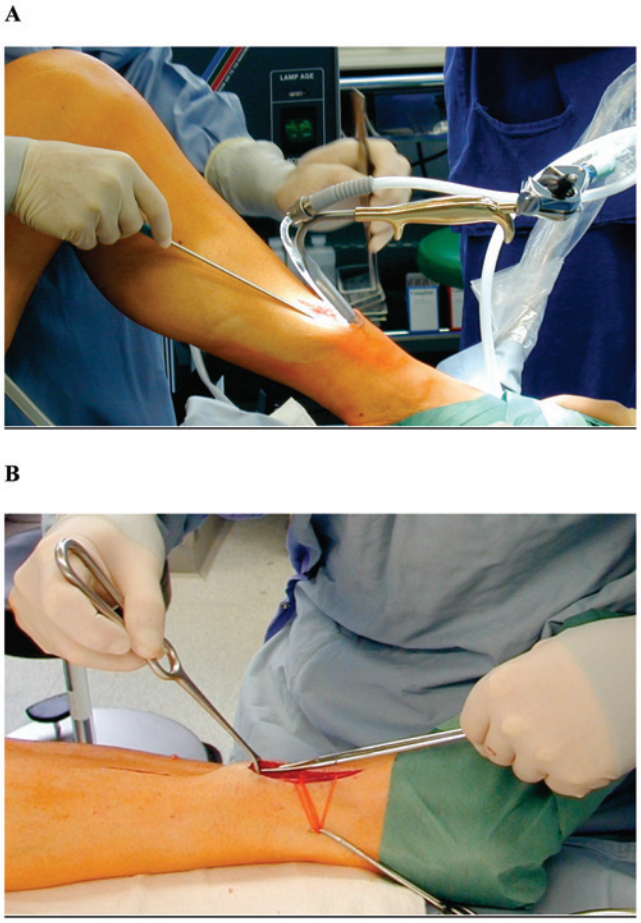

Figure 1. A, Intraoperative site using SaphLITE retractor system for minimally invasive vein harvesting. B, Standard bridge technique; a simple way of vein harvesting with standard instruments, no extra tool is necessary.

taneous suture, a running intracutaneous suture, a sterile dressing, and an elastic bandage.

Standard Bridge Technique

Several 4-cm skin incisions with approximately 4-cm intervening skin bridges were made. Then the exposed vein under vision was directly dissected and the vein inside the tunnels was exposed and dissected using Langenbeck retractors, a vein dissector, and standard instruments. Titanium clips were applied to any side branches. Drains were inserted in some areas and simple interrupted subcutaneous sutures, a running intracutaneous suture, a sterile dressing, and an elastic bandage were used to complete the operative procedure (Figure 1A).

SaphLITE System

A few 3-cm to 4-cm skin incisions with 8-cm to 18-cm intervening skin bridges were made over the course of the GSV. The vein was dissected by exposure under vision, by additional exposure using the lighted retractor system, and by further dissection inside the tunnel using long, standard instruments and the vein dissector. Simultaneous clipping of some side branches and division of others was necessary. The remaining open branches of the venous conduit were ligated after harvesting. After drain insertion in some areas, simple interrupted subcutaneous sutures, running intracutaneous sutures, a sterile dressing, and an elastic bandage were used to complete the procedure (Figure 1B).

The following intraoperative parameters were recorded or calculated: total length of incision, length of individual incisions, number of incisions, length of skin bridges, length of vein, length of vein to length of incision ratio, time for harvesting, wound closure time, time to harvest 1 cm of vein, wound closure time per cm of vein, crossover to different technique, quality of harvested vein (as assessed by the surgeon), and complications. Actual costs of the retractor system were calculated. Until patients were discharged, the following parameters were evaluated using a predefined scale of 0-3: hematoma formation, edema, infection, skin edge redness/necrosis, pain, mobilization, cosmetic appearance.

RESULTS

In group I, the ratio of vein length to incisional length was .89, in group II it was 1.9, and in group III it was 3.3 (Figure 2). The time for dissecting 1 cm of vein was 1.23 min in group I, .89 min in group II, and .96 min in group III. The time required for wound closure was 0.77 min in group I, .57 min in group II, and .46 min in group III (Figure 3). There were no crossovers to the open technique. Conduit quality was not significantly different between groups. In group I, 1 case of skin edge necrosis and 1 case of a localized wound infection were observed. One case of grade 3 hematoma and 1 case of grade 3 edema were seen in group I and none in groups II and III. A mild degree of edema formation occurred in all 3 groups; localized hematomas as well as postoperative discomfort were similar. Patients were mobilized without obvious differences between the groups. The cosmetic results were assessed in descending order as follows: group III, group II, group I (Figure 4). Group I and II vein harvesting costs were comparable; the costs were consider-

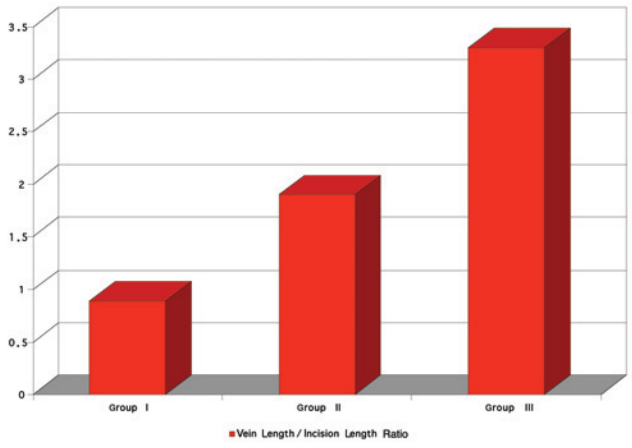

Figure 2. Vein length to incision length ratio. The retractor system (group III) represents the best result (maximal vein length with minimal incision), followed by the standard bridge technique (group II).

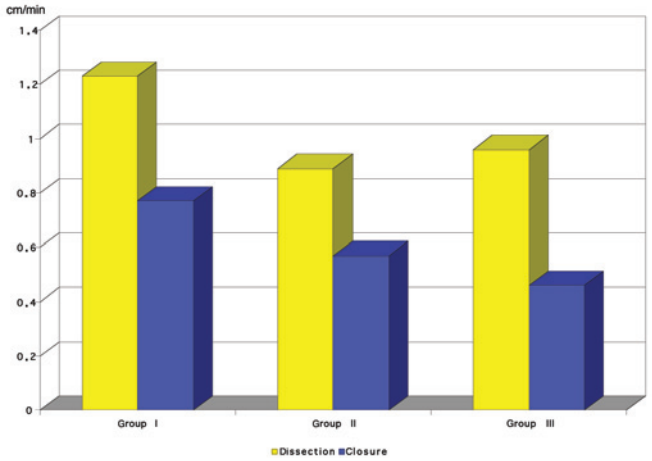

Figure 3. Vein dissection time and wound closure time. There is no significant difference between the 3 groups.

ably higher in group III. One single use of the retractor system is about 80 €. Additionally on-off costs of about 10,000 € for the basic system have to be calculated.

DISCUSSION

In recent years, new techniques for minimally invasive vein harvesting in coronary artery surgery have appeared at a breathtaking rate. Despite the lack of clinical data, some methods were advertised for routine use. The following issues need to be addressed prior to introducing a new technique. Is the method as safe as conventional techniques (ie, does it have an identical complication rate)? Is the technique suitable and is its routine clinical use feasible? If these criteria are fulfilled, which reasons support the introduction of the particular method? This study was designed to consider these issues. Two minimally invasive vein harvesting techniques were compared to the conventional method.

Using the retractor system, the harvested vein length per cm incisional length compares favorably with the conventional approach and also with harvesting through intermittent skin incisions. Surgical trauma and possible subsequent complications are therefore significantly reduced [Greenfield 2001]. On the other hand, the risk of postoperative bleeding is increased because the side branches inside the tunnel can not always be adequately ligated [Isgro 1999]. This problem is solved by consistent use of postoperative compression.

The time required for vein harvesting is not significantly different between the groups. After overcoming the learning curve, the new methods can be performed as quickly as the conventional technique. In most cases, the somewhat abbreviated time required for wound closure is not clinically relevant, because harvest site wound closure and coronary bypass grafting are usually performed simultaneously.

In comparison with the conventional approach, the minimally invasive techniques have similar complication rates; in fact, extensive hematomas and edema occur less frequently. Major complications were not seen with any method. Because of the methods' identical safety, patient safety concerns are not a distinguishing issue [Coppoolse 1999; Rinia-Feenstra 2000]. In this context, one has to point out that the SaphLITE system, in the original sense, cannot be called a minimally invasive system in the same way an endoscopic system can, for example. Nevertheless the optical result is similar to that of minimally invasive systems.

The crucial advantage of minimally invasive techniques, and for the retractor system in particular, is the cosmetic result. A markedly shortened incision means excellent cosmetic appearance and better patient satisfaction. The shortest incision length is achieved by using the retractor system, albeit from the surgical point of view the bridge technique is not much more invasive. In this era of growing importance of patient acquisition, this factor should not be ignored [Horvath 1998; Fabricius 2000].

The economic impact of the new methods requires comment. The costs of the standard bridge technique approximate those of open vein harvesting, but the expenses associated with the retractor system are clearly higher. Even if growing case numbers make the initial investment worthwhile, the per case costs will still be significantly higher because of higher running costs. This is where a balance between cosmetics and economics needs to be reached.

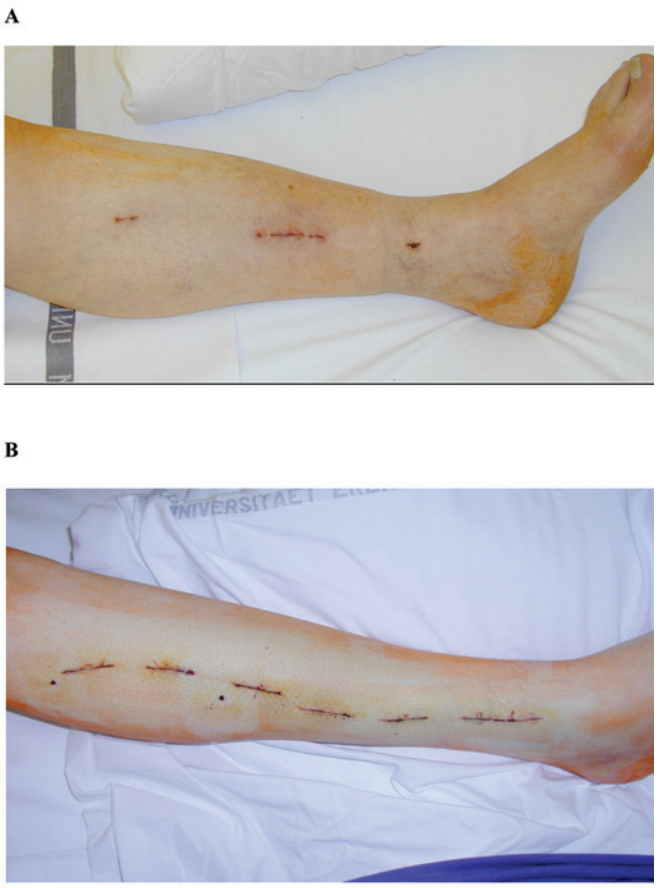

Figure 4. A, Postoperative result using retractor system 4 days after CABG. B, Standard bridge technique leads to excellent clinical outcome with low costs.

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