

Unilayer Closure of Saphenous Vein Incision Lines is Better than Bilayer Closure

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Abstract: *Objective:* To examine early results in patients with incision lines closed only along the skin and subcutaneous tissue after removal of the great saphenous vein during coronary artery bypass surgery.

Materials and Methods: We enrolled 82 patients who underwent elective operations in our clinic between December 2008 and April 2009. The patients had similar demographic characteristics, and the method of incision closure was chosen randomly. Three patients were excluded due to in-hospital mortality. The saphenous incision lines were closed using continuous skin sutures in 41 patients (Group 1) or using continuous subcutaneous sutures followed by continuous skin sutures in 38 patients (Group 2). Patients were followed every day that they were in the hospital, in the first week after being discharged, and at the end of the second month after discharge. The incision lines were evaluated for hematomas, infection, edema, pain and numbness.

Results: During the follow-up performed in-hospital and in the first week after discharge, infection, edema and numbness were observed significantly more often in Group 2 than in Group 1. Hematoma was observed more often in Group 1, and pain was observed more often in Group 2, but neither of these findings reached statistical significance. During the follow-up at the end of the second month after discharge, infection, edema, and numbness were observed significantly more frequently in Group 2.

Conclusion: In patients undergoing saphenous removal using standard procedures, it is sufficient to close the incision line using only skin sutures.

Keywords: Saphenous vein graft, subcutaneous closure, coronary bypass surgery.

INTRODUCTION

After the first use of saphenous vein grafts in coronary bypass surgery by Favaloro *et al.* in 1967, it has become a routine procedure. Conventional open saphenous vein harvesting techniques during coronary artery bypass surgery are the primary cause of postoperative leg wounds. Although many types of minimally invasive saphenectomy equipment are commercially available, the use of this equipment substantially increases operation costs, and access may be limited in the clinical setting.

In general, saphenous vein grafts (SVGs) are prepared using a conventional incision from the anterior aspect to the proximal aspect of the medial malleolus. For cases in which the SVG is prepared using a conventional incision, complications may occur during the postoperative period, including cellulitis, saphenous vein neuralgia and late leg edema. [1, 2].

The leg complication rate in cases with SVGs prepared using a conventional incision ranges between 2 and 4% [3].

Our aim in this study was to investigate the influence of the closure technique on the possible complications for cases in which SVGs were prepared using conventional techniques.

MATERIALS AND METHODOLOGY

A total of 82 patients undergoing elective surgery in our clinic between December 2008 and April 2009 were included in the study. The patients had similar demographic characteristics, and the closure method was chosen randomly (Table 1).

All patients underwent a median sternotomy and typical aorta-caval cannulation with a pump oxygenator. None of the patients had additional cardiac pathology or peripheral arterial or venous disease. There were no differences among the patients in terms of operation time or number of bypasses. The left internal mammary artery (LIMA) was removed in all patients and anastomosed to the left anterior

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Table 1. Demographic Characteristics and Operation Features of the Patients Studied. NS, not Statistically Significant

	Group 1 (n=41)	Group 2 (n=38)	p
Age (years)	63.1±11	63.7±9.6	NS
Gender (M/F)	31/10	28/10	NS
Body surface area (m ²)	1.77±0.2	1.84±0.1	NS
Diabetes mellitus (n)	20	16	NS
EuroSCORE	2.3±1.8	2.1±1.5	NS
Peripheral arterial disease	0	0	
Peripheral venous disease	0	0	
Additional cardiac pathology	0	0	
Preoperative right leg measurements (cm)	35±2.5	34.9±4.8	NS

descending artery. Other bypasses were performed using the saphenous vein.

Three patients were excluded from the study due to mortality. The saphenous incision line was closed using only continuous skin sutures in 41 patients (Group 1), whereas it was closed using continuous subcutaneous sutures followed by continuous skin sutures in 38 patients (Group 2).

The SVG was harvested in all patients *via* a linear incision from the medial malleolus to the inguinal area, through the saphenous trace. The length of saphenous vein harvested was proportional to the number of bypasses to be performed. Both the graft and the venous collaterals at the side of leg were tied using 4/0 silk sutures. Bleeding was controlled only with ligation along the dissection line. In all cases, the SVG was harvested from the right lower extremity. The subcutaneous tissue was closed using absorbable, 2:0 Coated Vicryl sutures with a round needle (ETHICON, Belgium), whereas the skin was closed using absorbable, 2:0 Coated Vicryl sutures with a sharp needle (ETHICON, Belgium). Following closure, the leg was wrapped with a sterile elastic bandage.

The patients were followed daily during hospitalization, in the first week after discharge and at the end of the second month after discharge. Measurements were recorded, and averages were calculated. The incision lines were assessed for hematomas, infection, edema, pain and numbness.

Hematomas and infection were evaluated by clinical examination, whereas edema was evaluated using a tape measurement at the same level. The patient's medical history was used to evaluate pain and numbness.

STATISTICAL METHOD

For the analysis of the demographic, preoperative, operative, and postoperative data and the results of each group with the method of median +/- t standard deviation and with the utilization of SPSS 17.0 statistics software to get the categorical data X² (chi-square) and to get the multiple Variables and the Independent-Samples- T Test methods were utilized. Values lower than 0.05 for p value were considered as significant.

Results

There were no differences between groups in terms of age, gender, body surface area, number of bypasses performed, hospitalization period, diabetes mellitus (DM), EuroSCORE value or leg incision level ($p>0.05$) (Table 1).

The surgically data shown in Table 2.

When measurements taken during the hospitalization period and in the first postoperative week were compared, infection, edema and numbness were found to be significantly more common in Group 2 than in Group 1 ($p<0.005$). There were no differences in leg diameter at the point where the saphenous vein was harvested (Table 3).

During follow-up in the second month after discharge, patients in Group 1 had no significant complaints about the leg from which the saphenous vein was harvested. Patients in Group 2, however, had significant complaints about numbness and pain (Table 4).

DISCUSSION

When an SVG is prepared using a conventional approach, it begins at the anterior aspect of the medial malleolus and is extended depending on the length of venous graft required. This region has scarce subcutaneous supportive tissue, however, and shows poor wound healing. Particularly in obese patients with diabetes and peripheral vascular disease, even footwear can traumatize the area, resulting in complications [1, 2]. In all of our patients, the saphenous incision line began at the medial malleolus and was extended along the saphenous incision line to the required graft length.

Complications occur in the leg from which the saphenous vein is harvested in approximately 1-24% of cases in which the SVG is prepared using a conventional incision [4]. This rate is even higher in female patients and in patients with DM, peripheral vascular disease or left ventricular dysfunction [5]. There is no clear information regarding why complications in the leg from which the saphenous graft is harvested are more frequent in female patients; however, coronary artery disease is more common in the postmenopausal period in females. It has been suggested that changes in es-

Table 2. Operative Data. NS, Not Statistically Significant

	Group 1 (n=41)	Group 2 (n=38)	P
Under knee	18	12	NS
Above knee	23	26	NS
Incision length (cm)	40±5.5	43± 6	NS
Incision/leg ratio	0.48	0.51	NS
Hospitalization period (days)	7.3±3	8±2	NS
Total operation time (min)	224±43	239±55	NS
Number of bypasses	3.1±1.8	3.2±2.1	NS

Table 3. Data Obtained During Hospitalization and in the First Week after Discharge. NS, Not Statistically Significant. *Measured using the Leg-O-Meter

	Group 1 (n=41)	Group 2 (n=38)	P
Hematoma	6 (14%)	2 (5.2%)	NS
Infection	2 (4.8%)	8 (21%)	0.033
Pain	6 (14%)	8 (21%)	NS
Edema	3 (7%)	10 (26%)	0.023
Numbness	2 (4.8%)	12 (31.5%)	0.002
Number of patients with complaints	6 (14%)	8 (21%)	NS
Right leg diameter (cm)*	37.1±3.5	40.2±4.8	NS

Table 4. Data from Follow-up During the Second Postoperative Month. NS, Not Statistically Significant. NS, Not Statistically Significant. *Measured using the Leg-O-Meter

	Group 1 (n=41)	Group 2 (n=38)	P
Hematoma	0	0	-
Infection	0	2 (5.2%)	0.05
Pain	1 (2.4%)	4 (10.4%)	NS
Edema	1 (2.4%)	6 (15.7%)	0.04
Numbness	0	10 (26%)	0.001
Number of legs with complaint	1 (2.4%)	6 (15.7%)	0.04
Right leg diameter (mean cm.)*	36.1±3.1	40.4±4.5	NS

trogen levels during this period could compromise wound healing. In our study, there were no differences between the two groups in terms of risk factors.

Various methods have been used to reduce leg complications arising from SVG preparation. Some of these include stripping modifications, incision lines in the form of skin bridges along the saphenous vein trace and endoscopic techniques. The latter have become more common recently, and removal of the saphenous vein has even been carried out using a laryngoscope [6-11]. In a study of endoscopic vein

harvesting with 50 cases, Carrizo *et al.* [9] found lymphedema in 5 cases (10%) and ecchymosis in 6 cases (12%), and the procedure was necessarily shifted to an open method in 2 cases (4%). Although that study showed that an endoscopic approach could be safely used within a short period, the resulting complications were not negligible. An endoscopic approach, however, offers better cosmetic results. Based on studies using an endoscopic approach, graft availability and the prevention of complications have led to expectations of good long-term outcomes, indicating that endoscopic proce-

dures for minimally invasive vein or artery harvesting are more practicable [10].

In contrast, in a study conducted by Terada *et al.* [12], edema and dysfunction did not occur following SVG preparation using a traditional incision in subjects with normal venous circulation. When no particular findings are present, SVGs in our clinic are harvested using a traditional incision and direct view, and this method was used for all of the patients in this study.

The correct method to determine leg edema is to measure leg volume because leg circumference measurements do not always provide accurate results. Leg volume can be measured using optoelectronic methods or high-resolution magnetic resonance imaging, although the validity of this approach has not yet been completely confirmed. Alternatively, validated methods such as dynamic leg volume devices and plethysmography can be used. These methods are expensive, however, making their routine use difficult. Therefore, we used a measuring tape mounted on a fixed surface (the Leg-O-Meter) to evaluate leg edema. In a study conducted by Berard *et al.*, the reliability of the Leg-O-Meter was found to be over 97%. Based on this finding, we preferred to use this practical and reliable device [13, 14].

CONCLUSION

The saphenous vein is still the most common graft in patients undergoing coronary bypass due to its ease of use, ease of accessibility and dimensions. Although many methods have been reported for harvesting the saphenous vein, the most commonly used and most reliable method is an open incision under direct vision. Closure of the skin and subcutaneous closure along the incision line may cause complications such as nerve compression, damage to the lymphatics, compromised blood supply and associated infection, pain and edema. These complications may even overshadow the benefits obtained from coronary bypass. As shown in this study, however, using only skin closure prevents many of the

above-mentioned complications and, therefore, should be the method of choice.

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