# Lower versus upper leg saphenous vein composite grafts based on the left internal thoracic artery: A randomized study

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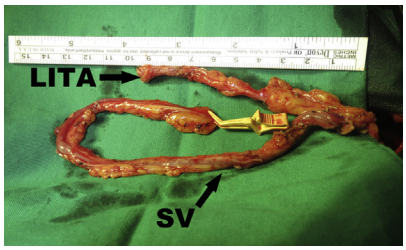
## ABSTRACT

**Objectives:** The ''lower versus upper leg saphenous vein (SV) composite graft based on the left internal thoracic artery (ITA) for coronary artery bypass grafting'' trial was designed to compare the histologic, immunohistochemical, and angiographic findings of lower versus upper leg SV composite grafts.

**Methods:** Twenty-six patients with multivessel coronary artery disease were prospectively randomized to undergo revascularization using a lower leg (n = 13) or upper leg (n = 13) SV composite graft based on the in situ left ITA. The SV was harvested with a ''no-touch'' technique, and 2 excess segments were removed from the distal and proximal portions of each SV conduit. Another proximal segment was removed from the reversed SV composite graft, which had been dilated by the native ITA pressure. Hematoxylin and eosin staining, immunohistochemistry, and early and 1-year postoperative angiographic results were compared.

**Results:** The histologic study showed that the proximal and dilated proximal SV conduit lumen diameters were smaller in the lower leg group than in the upper leg group (proximal, 623 ± 143 $\mu$m vs 858 ± 266 $\mu$m; $P = .008$; dilated proximal, 1138 ± 419 $\mu$m vs 1477 ± 353 $\mu$m; $P = .047$). However, there were no differences in the lumen diameters of the distal SV segments in terms of immunohistochemical comparisons, diameters, patency rates, or filling frame counts of the SV conduits on early and 1-year postoperative angiograms between the 2 groups.

**Conclusions:** Although the proximal segment luminal diameters were smaller in the lower leg SV, there were no differences in the immunohistochemical results or patency rates on early and 1-year postoperative angiograms between the lower and upper leg ''no-touch'' SV conduits. (J Thorac Cardiovasc Surg 2018;■:1-9)




Composite graft (left internal thoracic artery and ''no-touch'' saphenous vein).

**Central Message**

No statistically significant difference was found in the immunohistochemistry or in the early and 1-year postoperative patency rates between the lower and upper leg ''no-touch'' saphenous vein conduits.

**Perspective**

No statistically significant difference was found in the immunohistochemical results or the 1-year patency rates between the lower and upper leg ''no-touch'' saphenous vein conduits, suggesting uncertain advantage in using either one of the saphenous veins as a conduit in coronary artery bypass graft surgery.

See Editorial Commentary page XXX.

ADULT

The great saphenous vein (SV) is the longest vein in the human body and remains a widely used conduit of choice in coronary artery bypass graft surgery (CABG), although lower long-term patency rates and worse clinical outcomes have been reported after CABG performed with SV conduits than after CABG performed with arterial conduits.[1-3]

Recent studies have suggested that using a minimally manipulated SV as a composite graft based on the in situ left internal thoracic artery (ITA) could overcome the limitations of SV grafts.[4-6] In addition, a ''no-touch'' SV harvesting technique, in which the vein is harvested with a pedicle of surrounding tissue, has been suggested to further improve the SV patency by increasing the preservation of vessel integrity.[7,8]

The great SV runs from the ankle to the region of the femoral triangle, and there are differences in vessel diameter and localization between the lower and upper leg SV. However, few studies have evaluated the functional or morphologic differences between the lower and upper leg

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**Abbreviations and Acronyms**

CABG = coronary artery bypass graft surgery
ITA = internal thoracic artery
KLF4 = Krüppel-like factor 4
LLV = lower leg vein
SMD = standardized mean difference
SRF = serum response factor
SV = saphenous vein
ULV = upper leg vein
VSMC = vascular smooth muscle cell

SV,[9-11] and the choice of the lower versus upper leg SV as a conduit in CABG has been the surgeon's preference. The aim of this study was to compare the histologic and immunohistochemical differences and the early and 1-year postoperative angiographic results between the lower and upper leg SV harvested with a "no-touch" technique and used as composite grafts based on the in situ left ITA.

## METHODS

### Study Design

The study was designed according to the Consolidated Standards of Reporting Trials statement.[12] This study, the Lower versus Upper leg saphenous vein coMposite graft based on the lEft internal thoracic artery for coroNary artery bypass grafting (LUMEN) trial, was a randomized, controlled, open-label clinical trial. The institutional review board approved the study protocol on October 25, 2013 (approval number H-1308-077-514), and all of the study patients provided informed consent (ClinicalTrials.gov identifier, NCT01974492).

Of 50 patients who underwent first-time isolated CABG at our institution between November 2013 and February 2014, 26 patients were eligible for this study because they met the following criteria: 40 to 75 years of age, scheduled to undergo CABG for multivessel coronary artery disease on a nonemergency basis, and expected to receive a Y-composite graft based on the in situ left ITA for complete revascularization. The eligible patients (n = 26) were randomly assigned in a 1:1 manner to 1 of the 2 surgical strategies on the basis of the side-arm conduit used to construct the Y-composite graft: the lower leg SV Y-composite graft (group LLV, n = 13) or the upper leg SV Y-composite graft (group ULV, n = 13; Figure 1). The exclusion criteria included patients with an unavailable SV, a history of a previous cardiac surgery, or a medical history that might limit the possibility of midterm follow-up, such as malignant disease. Patients with an estimated left ventricular ejection fraction ≤25% were also excluded because of the possibility of the need for an additional conduit in a dilated left ventricle.

After the pericardium was opened and the coronary arterial anatomies had been assessed for availability for revascularization using a Y-composite graft, randomization was performed using a block randomization method stratified according to patient age (40-60 years old vs 61-75 years old) and sex. The table for randomization was provided by the Clinical Research Institute of Seoul National University Hospital, and a doctor who was not involved in this study informed the surgeon of the harvesting site (lower vs upper leg). There were no statistically significant differences in the demographic data or preoperative risk factors between the 2 groups (Table 1).

### Surgical Strategies

All of the patients underwent off-pump CABG during the study period, and the basic surgical procedures and strategies for off-pump CABG and the technique for harvesting the SV have been previously described.[5,8]

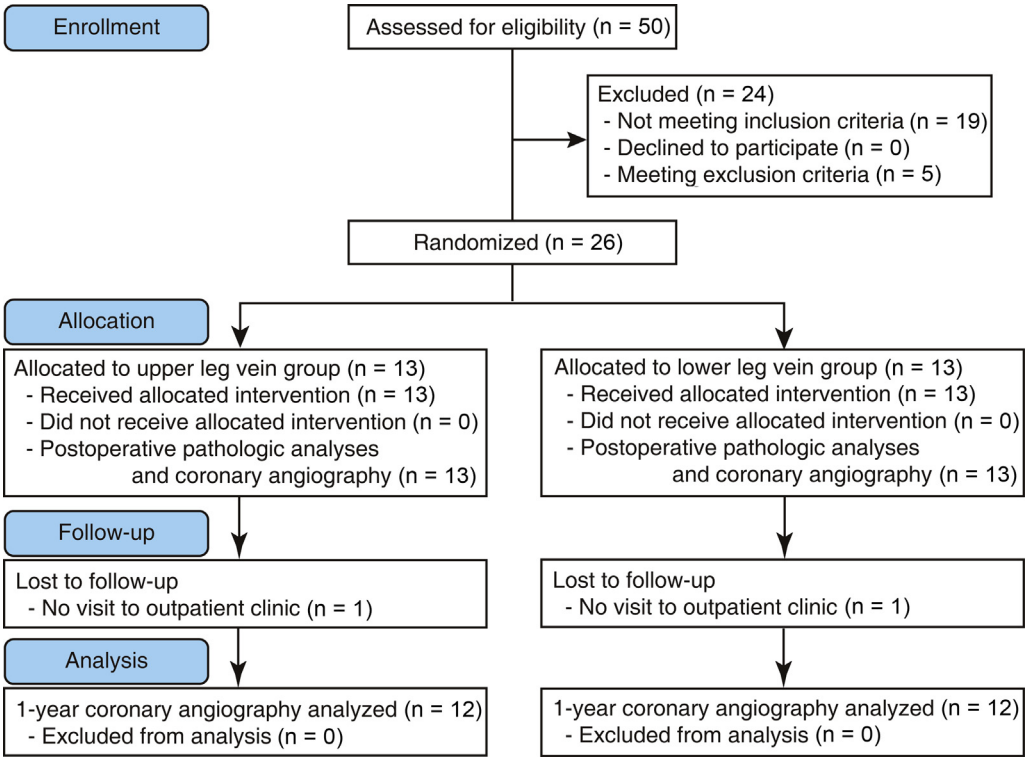


**FIGURE 1.** Consolidated Standards of Reporting Trials flow diagram.