Endoscopic vein harvest of the lesser saphenous vein in the supine position: a unique approach to an old problem†


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Abstract

OBJECTIVES: To obtain a suitable conduit from the lesser (short) saphenous system for use in coronary artery bypass surgery. We wanted to perform this while the patient was in the supine position as to not disrupt the standard operation, and at the same time, utilizing the endoscopic vein harvest technique with its obvious abilities to decrease vein harvest morbidity. We also theorized that through endoscopic techniques instead of the open technique we could harvest greater lengths of conduit, thus providing quality vein segments for additional grafts if needed.

METHODS: We were able to perform endoscopic vein harvest while in the supine position with one unique centrally located incision that has not been previously described.

RESULTS: The lesser saphenous vein harvested in the described technique provided excellent conduit for our patients that were conduit poor. The endoscopic technique allowed increased length of harvested segments, by giving us the ability to travel under the gastrocnemius muscle with minimal morbidity as opposed to the open technique, where the traditional endpoint is the aforementioned muscle. Conduits were harvested successfully from 14 of 16 candidates. No wound infections or healing problems were experienced. Neurovascular integrity was maintained in all patients.

CONCLUSIONS: Endoscopic vein harvest of the lesser saphenous vein with the patient in the supine position is safe, effective and affords conduits for a unique subset of patients undergoing coronary artery bypass grafting.

Keywords: Coronary artery bypass grafting • Greater saphenous vein • Lesser saphenous vein • Endoscopic vein harvest • Repeat CABG • Society of Thoracic Surgeons

INTRODUCTION

In recent years, patients undergoing coronary artery bypass grafting (CABG) have been sicker and older and have had higher comorbidities than patients in the past [1]. It has been shown that on average 10% of CABG patients will be operated on again at 10 years, and up to 25% at 20-year after original operation [2]. The vast majority of these CABG patients had greater saphenous vein (GSV) harvested at their primary operation. In addition, a certain percent of our patients have in the past undergone traditional peripheral vascular surgery utilizing the GSV for conduit or various surgical procedures for the elimination of varicose veins. All the aforementioned situations lead to an increased number of patients that are conduit poor and require alternative conduits outside the usual GSV. Because of these pre-existing conditions, our group is occasionally forced to harvest the lesser saphenous vein (LSV) to use as conduit for revascularization. The LSV begins behind the lateral malleolus; it is closely associated with the sural nerve, courses up the posterior calf, and then crosses it to reach the middle of the back of the leg. Running directly upwards, it perforates the deep fascia in the lower part of the popliteal fossa and typically drains into the popliteal vein, between the heads of the gastrocnemius muscle.

Little is known about the LSV (short or small saphenous vein) for ‘long-term’ patency when used for revascularization. A review by Jacob et al. [3] of 347 papers found only nine that discussed ‘long-term’ patency, and all were individual studies of <40 patients. We also performed a systematic literature search for a previously described method to utilize the supine position to safely harvest the vein. Most involved elaborate methods in which an assistant held the leg while it was harvested by a surgeon, or the leg was suspended mechanically, or the patient was placed in the prone position first, which would increase the overall operative time in an already difficult procedure. Endoscopic vein harvest (EVH) of the lesser saphenous vein has
been described previously, but the patient was placed in the prone position for the harvest, and the initial incision was too distal, thus requiring a further incision more proximal to complete the harvest [4]. Our group adopted EVH in 1999, and we have seen the benefits of this procedure as previously described [5–8]. We will describe a method that can be used to safely and efficiently harvest the lesser saphenous vein, utilizing EVH in the supine position without disrupting the flow of the CABG procedure.

MATERIALS AND METHODS

Following a preoperative evaluation of known limited GSV, as well as inadequate palmar arch flow to harvest a radial artery, we will utilize a Bard Site-Rite (Salt Lake City, UT, USA) to evaluate the LSV [6]. All patients receive either 2 g cefazolin or 1 g vancomycin hydrochloride (Vancocin) preoperatively depending upon allergies. With the patient in the supine position, the legs are placed on an Allen Medical Frogger Pad (Acton, MA, USA). The patient is prepped with CareFusion’s Chloraprep (Leawood, KS, USA), and the legs are circumferentially prepped and placed on a sterile drape. We then abduct and externally rotate the hip with moderate flexion on the knee. The foot is then secured to the bed to hold this position with pads and tape. The draping is then completed with a Kimberly Clark CVARTS® unidrape (Roswell, GA, USA; Fig. 1). A 2-cm incision is made between the lateral and medial heads of the gastrocnemius muscle, with dissection carried out to visualize the LSV (Fig. 2). None of the 16 patients required any additional incisions other than the aforementioned. We then utilize the Sorin Group USA (Arvada, CO, USA) EVH system, outfitted with a Karl-Storz 30°/5 mm endoscope (Tuttlingen, Germany), and 5 l/min of filtered direct CO2 flow (no insufflator) to form a tunnel distally staying ‘posterior’ to the vein with a dissector (Video 1). We then rotate the scope and dissector device proximally and use them to dissect ‘under the heads’ of the gastrocnemius muscle until it dives too deep into the popliteal fossa. Bipolar electrocautery at 20 Watts energy is then used via the Sorin device to control the side branches as we work both proximally and distally again, with the retractor device that is part of the Sorin EVH kit (Video 2). Of note, great care is taken to visualize and protect the sural nerve at all times from incision to closure. Once the branches have been divided, an Ethicon TTS endoloop or Ethicon EZ-10...
(Somerville, NJ, USA) was utilized to ligate both proximally and distally, a non ‘stab and grab’ method. The vein is then cut with the said EVH system and removed. The vein is then distended with heparinized (APP Pharmaceuticals) saline in routine fashion with 4–0 silk suture ligatures for the branches. Wound closure includes thorough irrigation with antibiotic solution (cefazolin 1 g or bacitracin 50 000 U/l), closure in layers with monofilament suture and skin closure with monofilament suture. EVH wounds are closed at the time of patient removal from cardiopulmonary bypass and after the administration of protamine.

RESULTS AND DISCUSSIONS

Our group is a high-volume, multi-center group that in the past 36 months has performed EVH of the lesser saphenous vein on 16 patients, on either one or both legs, to obtain adequate conduit for revascularization. During this time frame, our group performed 2863 CABG ± valve procedures; thus <1% required harvest of the LSV by this new method. Of the 16 patients, only 2 patient's veins were felt to be unacceptable for final use after removal based on overall diameter once distended. These 2 patients had no preoperative evaluation of the LSV, but were done out of necessity at the time of CABG due to other previous poor conduit.

To offer insight into why we have chosen to harvest the LSV in this manner, we present photographic evidence of the harvest that we feel we can do safely and efficiently. A redo, redo CABG (third time) in a 73-year old diabetic male with ‘non-patent’ palmar arch flow bilaterally. One remaining left thigh piece of GSV was available and harvested with EVH and used for a posterior descending branch off the right coronary artery. This was all remaining GSV that was left from two previous operations. The left internal mammary artery that had been previously used was still patent. The right LSV was then harvested and used for three separate graft sites, with one graft utilizing a natural Y for two of the three distal anastomoses from the one LSV harvested. Specifically, the sequential graft was to the Ramus Intermediate and Obtuse Marginal #1, the remainder was used to bypass a diagonal branch off the left anterior descending (Figs 3 and 4). Another case involved first operative CABG in a morbidly obese, insulin-dependent diabetic male, with previous bilateral GSV stripping and unusable radial arteries secondary to a ‘non-patent’ palmar arch flow. Bilateral EVH of the LSV was performed with both veins used, one for a right posterior descending and the other for a circumflex obtuse marginal along with left internal mammary artery for the left anterior descending (Figs 5 and 6). Our most recent patient underwent elective CABG and additional vein mapping per radiology, which gave us a preoperative choice.
of which LSV to harvest. This diabetic female with a history of Chronic Obstructive Pulmonary Disease had previously had bilateral vein stripping and in addition had bilateral incomplete palmar arch flow per Doppler evaluation. We were able to EVH the LSV in 29 min per the Society of Thoracic Surgeons (STS) protocol. In this patient, separate vein grafts were placed to the diagonal and obtuse margin vessels. A left internal mammary artery was placed to the left anterior descending artery as well. To date, there have been no infections or neurological complications immediately postoperatively, or during the follow-up at the office in any of our patients in whom this technique was adopted.

**CONCLUSION**

While our group does not prefer the LSV as a primary conduit, occasionally we are forced to use it. With the technique described, we do not take extra overall operative time or disrupt the flow of the operation and feel that we can use this conduit with confidence when we have no other reasonable options.

**SUPPLEMENTARY MATERIAL**

Supplementary material is available at ICVTS online.

**Conflict of interest:** No financial compensation or any other forms of support has been received from Sorin or Ethicon.

**REFERENCES**