

The Short Saphenous Vein: A Viable Alternative Conduit for Coronary Artery Bypass Grafts Harvested Using a Novel Technical Approach

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INTRODUCTION

A wide variety of vascular conduits including the Internal Mammary Artery (IMA), Radial Artery (RA) and the Long Saphenous Vein (LSV), are available to the Cardiac Surgeon performing Coronary Artery Bypass Graft procedures. These have demonstrated various successes over the years in both long-term patency and overall survival rates. However, situations whereby previous stripping of the LSV has rendered this conduit unavailable coupled with the need for several grafts has resulted in the search for an alternative option.

This case report demonstrates the use of the Short Saphenous Vein (SSV) as a successful alternative conduit for use in such situations. In addition, we describe a novel technique for harvesting this vessel when bilateral SSVs are utilised.

CASE REPORT

A 74-year-old man who had previously undergone bilateral varicose vein stripping was referred with significant exertional angina and a positive treadmill at low workload. Coronary angiography revealed severe triple vessel disease.

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ABSTRACT

A multitude of vascular conduits are available to the Cardiac Surgeon performing Coronary Artery Bypass Graft operations. The Internal Mammary Artery, Radial Artery (RA), and the Long Saphenous Vein (LSV) have proven to be excellent conduits, especially in the current era of statin usage. However, previous stripping or varicosities of the LSV and calcification of the RA, coupled with the need for multiple vessel grafting, requires an alternative candidate. We describe a novel harvesting technique for bilateral simultaneous Short Saphenous Vein harvest and propose this, often forgotten vein, as a viable alternative conduit.

Key words: Coronary artery bypass graft, coronary artery bypass graft, saphenous vein

Preoperatively, he had a positive Allen's test on his non-dominant hand.

Venous mapping of the LSV and SSV revealed a left SSV, 35 cm in length (diameter 3.8–5.9 mm), with no discernible LSV, and a 36 cm right SSV (diameter 3.8–4.4 mm), with a varicosed LSV, extending from below the knee to the mid-calf level. Samples of the harvested SSV were sent for histology, which revealed a relatively normal architecture, with no evidence of vasculitis, thrombus, or other features detrimental to its use as a conduit.

In this unique situation, the patient was initially positioned on his left-lateral side on the operating table, thus allowing easy simultaneous access to both posterior leg compartments, and therefore, to both SSVs [Figures 1 and 2]. This novel position allowed for two members of the surgical team to operate at the same time, thus minimizing the duration of anesthesia as well as the overall operative time. An incision and subsequent dissection was performed along the ultrasound-marked vein positions similar to when harvesting the LSV.

Once the veins were harvested and deemed to be macroscopically suitable both in terms of length and quality, the wounds were closed in layers in the standard manner. The patient was turned to the supine position, and the operation was continued in the normal fashion. The



Figure 1: Patient positioning in the left lateral position (an actor was used in place of the patient in this picture)

left In IMA was utilized on the left anterior descending (LAD) artery and the SSV grafts were utilized on the remaining vessels.

Postoperatively, the patient was seen in the clinic over a period of three months, within which he did not exhibit any complication with his leg wounds.

DISCUSSION

Cardiovascular disease is widely regarded as the leading cause of mortality^[1] in developed countries, with the number of Coronary Artery Bypass Graft operations on the increase in certain parts of the UK.^[2]

Such operations have proved hugely successful in alleviating the symptoms as well as preventing premature deaths from myocardial infarction. However, these operations come with their own risks and the surgeon often faces difficult decisions regarding the optimal conduit to be used for the procedures, taking into consideration factors such as, age, pre-existing disease, past medical history, as well as the number of Coronary Artery Bypass Grafts (CABGs) to be performed.

Current trends highlight the success of the Internal Mammary (Thoracic) Artery (IMA) as the favored 'gold-standard' primary choice, because of its excellent patency results at ten years compared to other grafts.^[3] In addition, authors have highlighted improved survival when bilateral IMA are used.^[4] Galbut *et al.* demonstrated patency results of 87% at five years^[5] for bilateral IMA conduits, supporting evidence by Lytle *et al.* who showed bilateral patency results of 89% at two years^[6] for the same vessels.

RA conduit has demonstrated variable successes since its introduction by Carpentier and colleagues back in 1973.^[7] Initially disregarded as unsuitable due to a high degree of occlusion compared to LSV grafts utilized in the same procedure,^[8] it was brought back to prominence by Acar *et al.*



Figure 2: Patient positioning allowing two members of the surgical team to operate simultaneously

after a review of the data, using coronary angiography, suggested excellent patency results over a 10-year period.^[9] Many studies have since revealed a five-year patency for the RA conduit, being similar to the IMA.^[10,11] Many, however, feel that the use of the RA conduit is only suitable for high grade lesions (>70% stenosis),^[10,12-14] due to the increased propensity for the vessel to undergo rapid arteriosclerosis when instituted in less occluded vessels, although the mechanism for this is unknown. It should be noted that the increased failure rate for the RA conduit is not solely due to accelerated arteriosclerosis, but to early spasm of this muscular artery. Although, the authors provide strong evidence supporting the RA conduit, others appear more sceptical,^[14,15] and await further angiographic data, which demonstrate the efficacy of the RA conduit over both vein grafts and the IMA, over the longer term (>5 years).^[15,16]

Arterial conduits have, on the whole, proved successful when compared with venous grafts. Multiple studies have highlighted the increased patency of the Left Internal Mammary Artery (LIMA)^[3,17] and RA^[10,13] over the LSV. Shah *et al.*, however, doubted the use of the RA conduit over the LSV as a second-graft source.^[18] In their study, following an angiographic analysis of symptomatic patients post-CABG, they demonstrated that the patency of the LSV graft was 90.6% compared to 88.8% for the RA. Knot *et al.*,^[14] with their study looking at 398 RA anastomoses, also point out that in patients presenting with recurrent signs and symptoms of ischemia post-CABG, RA grafts demonstrate a significant occlusion rate compared to other conduits, especially the LSV grafts. They propose caution with the use of this conduit, and suggest the bilateral IMA as an alternative for long-term angiographic patency.

The SSV has had very little mention with regard to its potential use as a conduit in CABG procedures, although its use in other vascular procedures has demonstrated its potential. Chang *et al.*,^[19] highlight a patency rate of 77% after two years in a study that looked at the harvest of

91 SSV harvests, of which 18 were utilized for coronary artery bypass procedures. They highlight that preoperative utilization of duplex scanning, in order to map the veins, correlates ‘excellently with the actual anatomy found at operation.’ It would appear that the use of a lesser (short) saphenous vein was considered as the alternative when the IMA or the LSV had already been utilized, back in the late 1970s and early 1980s. Both Salerno *et al.*^[20] and Raess *et al.*^[21] describe the SSV as a viable alternative, although further long-term angiographic data on the vessels is lacking.

In 1993, Chang *et al.*^[22] provided data from a study utilizing the lesser saphenous vein (SSV) over a four-year period. They obtained 34 SSVs from 23 patients (two of whom had only this venous conduit available), using previously marked venous-duplex sites, and compared the perioperative mortality and morbidity with a control group of 25 patients undergoing LSV harvest. Although no significant difference in operative mortality or morbidity was observed, this study was severely limited, in that the end-points, that we have now come to rely on for conduit patency, were not employed, i.e. no postoperative angiographic evaluation or long-term results of patency of such vessels have been shown.

With regard to the operative technique for harvesting the SSV, a few different techniques exist. The more usual approach would be to have the hip flexed by an assistant, or alternatively, the patient would be prone for harvest and then turned supine once the harvest has been completed. Lamphere *et al.* describe a neat little trick whereby the legs are elevated using a Thompson self-retaining retractor to about 45 degrees or more and the short saphenous vein harvested from below.^[23]

Our patient had severe triple vessel disease. As per the evidence in the literature, the left IMA was utilized for the LAD, with the SSV for the remaining anastomotic sites. Our patient was limited in terms of conduits available, because of previous bilateral varicose vein stripping. As no firm data is available, the patency of such vessels remains in question. One should be aware of the bulk of evidence pointing to increased atherosclerotic change in vein-grafts compared to arterial conduits — there is no obvious difference likely with the SSV. However, in individuals requiring multivessel bypass and limited conduits, the SSV should be borne in mind. It is easily accessible, a large length is often available and, if the patency of such vessels is similar to that of LSV, they can prove extremely useful in CABG procedures.

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