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# Influence of the caliber in Endoscopic Saphenous Vein Harvesting during Coronary Artery Bypass Grafting☆

Ibrahim M. Yassin [a, b, *], Farouk M. Oueida [b], Azza A. Zidan [c, d], Mustafa AlRefaei [e], Khaled A. Eskandar [b]

[a] Department of Cardiothoracic Surgery, Faculty of Medicine, Tanta University, Tanta, Egypt
[b] Department of Cardiac Surgery, Saud Al-Babtain Cardiac Center (SBCC), Dammam, Saudi Arabia
[c] Department of Nuclear Medicine and Radio-Isotopes, Cairo University, Cairo, Egypt
[d] Department of Nuclear Medicine, SBCC, Dammam, Saudi Arabia
[e] Department of Cardiology, SBCC, Dammam, Saudi Arabia

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ABSTRACT

*Background:* The required high degree of technical expertise is much more with the small caliber saphenous vein (SV) grafts using Endoscopic Saphenous Vein Harvesting (ESVH) during CABG Surgery and the patency may be affected. We thought to compare these small caliber vein grafted patients (GroupI) regarding their operative difficulties and mid-term graft patency with a controlled normal caliber grafted patients (groupII).

*Methods:* Retrospective data collection was from June 2013 to June 2016 in a consecutive order after exclusion of the first 50 patients done in our center. A cutoff point of 3 mm diameter of the SV was identified. GroupI (<3 mm) (34patients) was compared to GroupII (>3 mm) (100patients). ESVH procedure time and SV characteristics were compared between the groups and the incidence of perioperative myocardial infarction as well as the Myocardial Perfusion Imaging (MPI) for the mid-term patency rate. Patients who had been commented as having clinical varicosity and those who refused the (MPI) evaluation during the follow up period were excluded.

*Results:* Significant difference in the number of side branches and repaired small avulsed branches (GroupI vs. GroupII)($11.7 \pm 4.8$ vs. $9.7 \pm 3.4$) ($P < 0.01$) and ($5.7 \pm 1.7$ vs. $1.7 \pm 0.9$) ($p = 0.001$) respectively. SV harvested required a longer time (min.) for total preparation ($54.5 \pm 14.8$ vs. $39.9 \pm 13.9$ min) ($p < 0.001$) whereas the time required for endoscopy did not differ. The overall incidence of peri-operative myocardial infarction was (2.2%) with no significance between both groups. Normal/Mild ischemia in the territory of the venous graft (s) occurred in (88.2% vs. 91%) after a follow up period of ($15.3 \pm 7.9$ m) that was non significant.

*Conclusions:* ESVH is feasible regardless the SV caliber with good mid-term patency rate in CABG patients. Small caliber SV needs longer time and more experience to be ready for usage but its quality can be better. The possibility of scoring the SV is difficult to be completely achieved except in the Operating Theater.

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* Corresponding author. Department of Cardiothoracic Surgery, Faculty of medicine, Tanta University, Tanta, Egypt.
*E-mail addresses:* yassinimkh@yahoo.com (I.M. Yassin), foueida@yahoo.com (F.M. Oueida).

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## 1. Introduction

Although the Internal Mammary Arteries (IMAs) are generally accepted now as having a superior long-term graft patency rate, the long saphenous vein (SV) is still the first second optional conduit in multi-vessel Coronary Artery Bypass Grafting (CABG) Surgery owing to its length, and ease of harvesting [1,2].

Endoscopic Saphenous Vein Harvesting (ESVH) using a video endoscope was first used and reported in 1996 by Lumsden and associates [3] and since then was it was recognized as a useful technique for reducing postoperative wound scar and complications [4,5].

This technique has gained popularity over time owing to its less wound complications, better postoperative pain and cosmetic outcome in comparison to the traditional methods. However, the long term conduit patency is still questionable. Many reports came positive and in favor of it [1,2,6] and others came negative [7,8] and against in both the clinical [9,10] and the histological aspects [11].

It is well known in the field of vascular surgery that the venous graft failure or occlusion can occur due to numerous factors and conduit quality [12,13]. Graft diameter [14] is apparently one of the most interesting and important factors in this field.

In a recent meta-analysis, it was shown that the learning curve of the practitioners can make a great difference in the quality of the endoscopically harvested conduit [15]. This will affect the long term outcome after CABG surgery [8,16]. However, few studies have investigated the influence of SV caliber on the technical difficulty and outcome of ESVH.

We thought to evaluate the influence of SV diameter which is one of the most important challenging factors in the technical difficulty of its endoscopic harvesting on the subsequent quality of the graft, the resultant patency of the ESVH, and to possibly add something new to our institutional guidelines for the use of the procedure through review of literature.

## 2. Patients and Methods

Retrospective data were collected from June 2013, where we started our ESVH program in Saud al-Babtin Cardiac Center (SBCC), Dammam, KSA, to June 2016 in a consecutive order from the Medical Records and Data base informations. Research Committee approval was obtained for the study and the patients consents were part of the medical records. Exclusion included the first 50 patients done in our center to assure the standard technical level of the surgeons harvesting the veins, any patient has been commented as having clinical varicosity or tortiousity and those who refused the Myocardial Perfusion Imaging (MPI) evaluation during the follow up period. A cutoff point of 3 mm diameter of the SV was identified in the patient selection. (GroupI) (<3 mm) (34patients) was compared to (GroupII) (>3 mm) (100patients). Intra-operative ultrasound localization of the SV and marking of its site just below and above the knee joint after induction of anesthesia was done specially if theSV was not seen or palpated clinically.

Our routine with triple-vessel coronary artery disease was harvesting skeletonized IMAs and always for the left coronary territory and the ESVH usually to one of the obtuse marginals, postero-lateral branches or posterior descending artery (PDA).

An Endoscopic Vessel Harvesting System, Vasoview Hemopro 2, (*MAQUET GmbH & Co. KG, Rastatt, Germany*) was used in all of our patients. A team work of our surgical technicians underwent training prior to clinical usage. Corner stones of the system are the bipolar diathermy as well as the Gaseous insufflation (carbon dioxide) and an endoscope system. In addition to this, the disposable components are trocar, dissector and harvester. After exposure of the initial segment of the SV via a 2-cm vertical skin incision below the knee or in the thigh above the knee, according to the length required, good handling of equipment was planned and starting with insertion of the trocar through the incision overlying the vein in order to prevent CO leakage. Second step is careful vein dissection using the endoscope incorporating the 2dissector via the trocar along the tract of the vein and advanced to the groin up or to the medial malleolus below with the aid of insufflation by CO, which is blown from the tip of the 2dissector. Injury to the adventitia which protects the vasa vasorum of the vein and stress on the vein can lead to intimal damage. So, dissecting the vein with surrounding fat during ESVH is essential in reduction of the number of avulsions to small tributaries and vessel trauma which can cause endothelial disruption. This will subsequently lead to diminished release of nitric oxide and results in smooth muscle cell proliferation and intimal hyperplasia. Once the vein had been completely exposed, the dissector was removed and the harvester was inserted in its place to start the third and most important step which is branch isolation. Any traction on the vein branch can lead to intraluminal tears at the base and intimal injury, platelet adherence, release of mitogenic proteins, smooth muscle cell proliferation and subsequent intimal hyperplasia. The harvester has a bipolar diathermy arm and a V-keeper arm so that side branches of the LSV can be cut with one hand. To maintain a clear view, the harvester has a wiper for the endoscope that can be used over the time needed for the procedure. When the SV was totally mobilized, it was divided and ligated proximally via another 5-mm skin incision at the groin and removed from the leg. Finally, SV side branches were ligated with 5/0 silk. Avulsed side branches were secured with