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# Saphenous vein harvesting with endoscopy versus no-touch technique: short-term results

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ORIGINAL STUDY

# Saphenous vein harvesting with endoscopy versus no-touch technique: Short-term results

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## Abstract

*Objective*: **'No-touch' (NT) saphenous vein harvesting maintains vasa vasorum, resulting in less medial ischemic affection, which leads to improved short-term and long-term patency. However, it may also be associated with a higher rate of wound complications. Endovascular vein harvesting (EVH) has a low rate of wound complications but also a tendency toward a lower patency rate. The aim was to compare wound complications and short-term symptomatic relief, which could be an indication of functioning grafts.**

*Patients and methods*: **During a 2-year period (2018−2019), in a nonrandomized prospective study, we monitored patients after coronary artery bypass graft for recurrence of ischemic symptoms and wound complication rates in 100 patients who received either NT (53 patients) or endo-vein (47 patients).**

*Results*: **The recurrence symptom rate for both groups was similar: five (9.4%) of 53 patients of the NT patients versus four (8.1%) of 47 of the EVH patients. Among these patients, there was complete symptomatic relief by medical treatment in all except two patients in EVH group who underwent catheterization, where graft occlusion of OM and diagonal arteries was seen in one patient and the other showed graft occlusion of the diagonal artery. Operative time for harvesting the vein in EVH was significantly longer in EVH (60 ± 30 min) versus NT (30 ± 10 min). A comparison between a more experienced and a less experienced harvesting surgeon revealed no difference in the operative time. Harvest-site complications were significantly higher with the NT harvest: 19% of the NT patients, of them one patient required vacuum-assisted wound closure, versus 2% of the endo-vein patients. The rate of reopening for bleeding was significantly higher with the NT harvest (three patients) versus zero patient in EVH group.**

*Conclusion*: **These results suggest that NT vein harvesting may be associated with better symptomatic relief postoperatively, which might be an indication of improved graft patency, but methods should be developed to lower wound complication rates and pedicle hemostasis.**

*Keywords:* Endoscopic vein harvesting, No-touch saphenous vein harvesting, Saphenous vein patency, Wound complications

## 1. Introduction

The idea of endovascular vein harvesting (EVH) dates back to 2000, but it was not introduced to Egypt till 2013, and the idea of no-touch (NT) harvesting did not gain popularity except in the past 3 years after publishing data proving midterm and long-term patency superiority versus the conventional open technique. The major concerns to the use of the saphenous vein for coronary bypass surgery are poor patency and harvest-site complications. The novel NT method of vein harvest seems to significantly improve vein graft quality but is done with an open technique, which can lead to harvest-site complications. Alternatively, endovascular harvesting of saphenous veins nearly eliminates harvest-site complications; however, there is a reasonable concern that it is associated with enough conduit damage to impair patency [1]. These opposing forces tug the surgeon in opposite directions. Should the surgeon

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try to improve patency or dismiss patency concerns and reduce leg complications? To explore this dilemma, we have compared the vein graft patency rate at symptom-directed assessment of vein grafts harvested with either the NT or the endovascular technique. We have also assessed leg complications and possible methods to minimize them.

## 2. Patients and methods

During the 2-year period of 2018 and 2019, data of 100 patients who had a coronary artery bypass with a saphenous vein as a conduit were collected.

In this nonrandomized study, the decision to determine which method for harvesting the vein was dependent on availability of the endoscopic instruments; otherwise, NT was routinely performed as it is the preferred technique for the surgeon.

### *2.1. Inclusion criteria*

Any patient planned for conventional multivessel coronary artery bypass graft (CABG) was included in the study.

### *2.2. Exclusion criteria*

The following were the exclusion criteria:

(1) Patients with EF less than 40.
(2) Redo patients.
(3) Patients with hemodynamic instability.

### *2.3. Patients*

The baseline characteristics of patients in the NT and endo-vein groups were similar.

We had three patients with peripheral vascular disease, for whom we decided to do EVH.

### *2.4. Surgical technique*

#### *2.4.1. Endovascular vein harvesting group*

Patients of EVH group underwent a preoperative ultrasound mapping of the greater saphenous vein in the operation room. Veins were harvested from the leg with larger diameter and fewer bifurcations and side branches. Endoscopic vein harvesting was performed by a surgeon with greater than 5 years of experience. Harvesting was accomplished with a routine technique (Vasoview Hemopro; MAQUET Corp., Wayne, New Jersey, USA). Venous branches were divided with bipolar electrocautery at a setting of 30 W.

#### *2.4.2. No-touch group*

Among patients undergoing NT, the incision extended from the ankle to the groin, if necessary. In the presence of significant peripheral vascular disease, we did not use such technique. In general, a long section of vein was needed because the intention was to construct individual end-to-side grafts, with few sequential grafts. Harvesting was done by a surgeon with 1 year of experience in this technique but had more than 15 years of experience in open heart surgery. The course of the vein was identified by looking through the less-dense perivascular tissue when viewed anteriorly or posteriorly. An attempt was made to keep 5 mm of perivascular tissue around the lateral and medial sides of the vein. Initially, all dissections were performed with scissors, with identification and tying of the branches greater than 5 mm from the vein, followed by cutting through the pedicle with electrocautery with 40 J power. The veins were then gently flushed with heparinized blood and then further tested with infusion of heparinized blood at systemic pressure from an aortic cannula. Any sites of bleeding were clipped. Grafts were left slightly long, with the perivascular tissue helping to prevent kinking. Great care was taken to ensure that the grafts did not flip and twist when the heart was lifted up. The incisions were closed in layers with running sutures. The patients were encouraged to use compression stockings after discharge, but compliance was poor.

In both methods, we had to spend on an average of 20 min to prepare the vein and check side branches before starting CPB.

The patients were followed up routinely by cardiologists 2 months postoperatively.

## 3. Results

The characteristics of the patients in the study from 2018 to 2019 are listed in Fig. 1. There were no differences in preoperative characteristics of age, sex, presence of diabetes, history of smoking, or ejection fraction.

As for peripheral vascular disease, we had three patients in the whole study, and we decided to do EVH for them.

### *3.1. Operative data*

Operative data were comparable regarding bypass and cross-clamp times, as well as grafts performed. The percentage of patients who were discharged on postoperative statins (all of those without a statin contraindication) was similar between the two groups. There was no perioperative

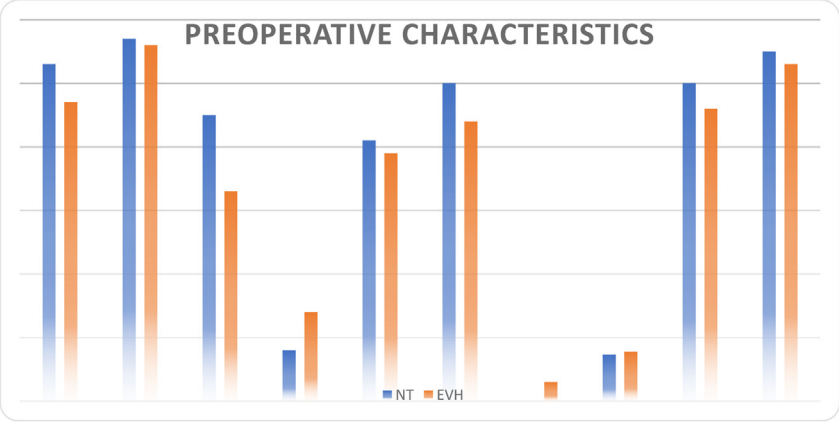


*Fig. 1. Preoperative patient characteristics.*

mortality in either group. However, the time needed for vein harvesting was much longer in the EVH group. A comparison between a more experienced and a less experienced harvester revealed no difference in operative time (Fig. 2).

### 3.2. Postoperative data

We compared postoperative reopening for bleeding and wound complications. Complications were divided into two groups, either minor or major.

Mild-to-moderate cellulitis requiring oral antibiotics, small degrees of superficial wound separation, postoperative neuralgia, and edema were considered minor events.

Cellulitis requiring intravenous antibiotics, application of vacuum-assisted wound closure, or readmission was considered a major leg complication.

Harvest site complications were significantly higher with the NT harvest: 19% of the NT patients, where one patient required vacuum-assisted wound closure, versus 2% of the endo-vein patients. The rate of reopening for bleeding was significantly higher with the NT (three patients) versus EVH group (zero patient) (Fig. 3).

### 3.3. Post-discharge symptoms recurrence

The recurrence symptom rate for both groups was similar: five (9.4%) patients of 53 of the NT patients versus four (8.1%) of 47 of the EVH patients. Of these patients, complete symptomatic relief by medical treatment was seen in all except two patients in EVH group who underwent catheterization, where graft occlusion of OM and diagonal arteries was seen in one patient and the other showed graft occlusion of the diagonal artery (Fig. 4).

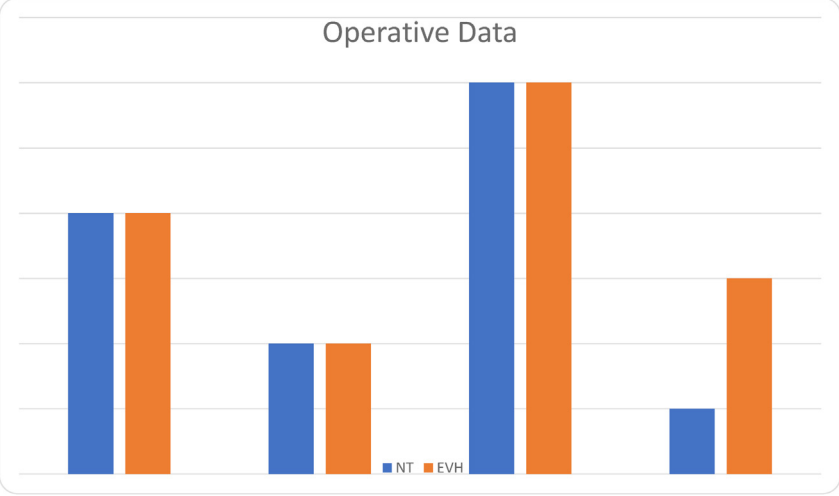


*Fig. 2. Operative data.*

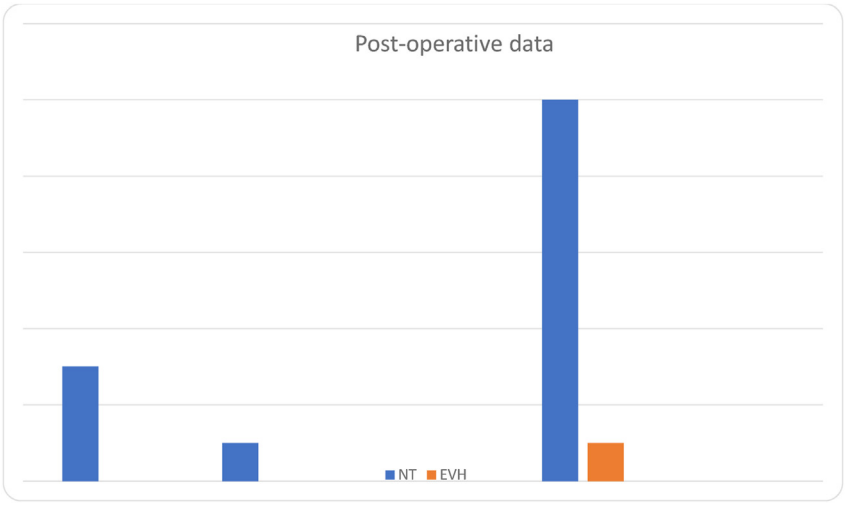


*Fig. 3. Postoperative data.*

## 4. Discussion

Only a small percentage of patients were recatheterized. Definitive conclusions on the difference in patency between endo-vein and NT grafts cannot be made with our study. Our study group of recatheterized patients is not large enough to support a multivariate analysis. Most importantly, an assessment of all patients, including asymptomatic patients, is necessary. However, from a clinical perspective, the approach of examining only symptomatic patients has some strength. The data are available for review. All patients are not exposed to the slight risk for either re-catheterization or computed tomographic scanning. Furthermore, the patients who were recatheterized had clinical issues that were confronted by the cardiologist and the surgeon early after surgery. These early patency issues have to be addressed. An improvement in early patency might keep patients and cardiologists from losing faith in a surgical procedure in which a large percentage of vein conduits are occluded. Of course, the best antidote to these postoperative clinical problems is perfect patency, which might be more possible with multiarterial grafting, but for a variety of reasons, more aggressive arterial grafting is done in a relatively small percentage of cases.

There are two major ways to optimize the results of saphenous vein grafting: improve patency and decrease harvest-site complications. The first approach is to alter the remodeling of the arterialized saphenous vein with different methods, such as

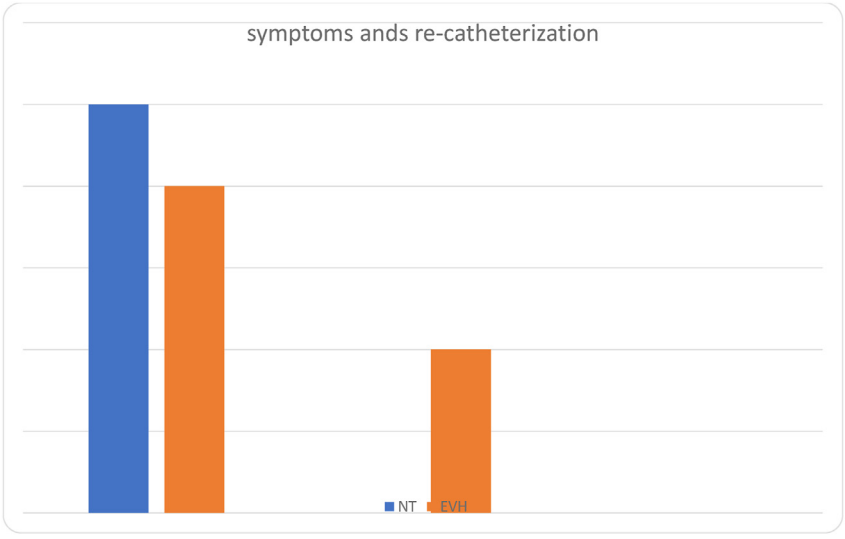


*Fig. 4. Recurrence of symptoms and re-catheterization.*

the NT technique or gene therapy, and the second approach is to decrease harvest morbidity with an endoscopic vein harvest. In this study, we have compared the graft patency on symptom-directed observation of veins harvested with the two different methods. We have shown that in patients with symptoms, the NT technique has an excellent graft patency, significantly superior to endoscopic vein conduits shortly after CABG. However, this improvement comes at a cost, with the methods used in this study, of a marked increase in harvest-site morbidity.

Dr Souza's group has accumulated an impressive amount of evidence documenting the benefits of preserving the vasa vasorum of the saphenous vein. There is a significant improvement in graft patency at short-term (1.4 years) [2] and long-term (8.5 years) [3] follow-up, a resistance to atherosclerosis [4], and even improved ventricular function at 15 years. The retained perivascular tissue prevents mechanical kinking and better preserves endothelial covering and function, even if the veins are subjected to the well-known detrimental effects of distension [5]. Possibly most important, the group has documented that the vasa vasorum directly drains into the vein lumen [6]. This anatomy permits retrograde perfusion of oxygenated blood through the vasa vasorum upon arterialization, which results in an excellent blood supply to the outer one third of the media. This may reduce vein smooth muscle cell loss and subsequent replacement with fibrous tissue, as previously described [7]. Thus, the vein graft is not necessarily obliged to become a fibrous tube, subjected to enhanced lipid deposition, with poor long-term results. To date, only the Swedish group has used the NT technique to preserve the vasa vasorum. Our results add limited but some additional evidence that this technique is potentially valuable.

Early reports on endoscopic saphenous vein harvest suggested that the saphenous vein was of similar quality to a conventional harvest [8] and caused lower postoperative morbidity [9,10]. Patency rates were also shown to be similar [11–13]. However, more recent reports have documented worrisome structural damage induced by endoscopic harvesting [14], with the best results requiring a considerable amount of operator experience [15]. In three more recent studies in which postoperative vein graft patency was evaluated with cardiac catheterization, there was a consistent, significantly lower patency with endo-vein harvest, sometimes associated with worse clinical outcomes [16–18]. These observations have led England's National Institute for Health and Clinical Excellence to recommend the use of endoscopically harvested veins only with special arrangements for clinical governance, consent, and audit or research [19]. The potential trade-off of patency for lower morbidity is a real concern [1].

The National Institute for Health and Clinical Excellence recommendation is controversial and has not changed the approach in the United States. Some support for the equality of patency with endo-vein grafts is the clinical observation on large cohort studies [20] of a similar mortality compared with patients who underwent open harvest [21,22]. If such a large number of patients can be operated on with no difference in mortality during the midterm, why not avoid the open vein harvest morbidity? However, differences in mortality might be seen only after a longer period, similar to the proven survival benefits of bilateral internal mammary arteries [23]. Vein graft occlusions do not increase mortality early after surgery, probably because many grafts are placed into strategically less important vessels. A recent study of post-CABG patients with a documented vein graft stenosis showed a similar mortality or myocardial infarction rate but a higher repeated revascularization rate in patients with occluded rather than patent vein grafts [24]. Thus, repeated revascularization is the metric that coincides with graft patency, and graft patency may be related to mortality only during the long term. If the patency of the NT vein grafts is superior to the open harvest, there might be an even greater clinical downside to endo-vein harvest techniques during the long term.

It is clear from these data that a less-invasive method of NT harvest would be helpful. Endoscopic harvest is associated with minimal harvest-site complications and increased patient satisfaction; the technique of NT harvest that we used resulted in a disappointing number of wound complications. In a sequential manner, several different strategies for NT harvest were tried: cold dissection with ligation of branches, minimizing the size of the pedicle especially in patients with normal BMI, and frequent dressing on the leg wounds. The wound complication rate reported here is higher than that found with Dr Souza's group; different patient demographics are a likely explanation or perhaps a greater length of vein acquired because of the avoidance of sequential grafting. Although this was a small, nonrandomized study and any observations are not definitive, there was no apparent clinical advantage with any of these techniques that were tried to reduce harvest-site complications.

Many patients gladly choose the option of NT harvest when presented with the patency versus harvest-site dilemma and also for financial issues, but a method must be developed to reduce

complications so that more patients might enjoy the benefits of the NT technique.

### 4.1. Conclusion

These results suggest that NT vein harvesting may be associated with better symptomatic relief post-operatively, which might be an indication of improved graft patency, but methods should be developed to lower wound complication rates and pedicle hemostasis.

## Ethical approval statement

The institutional committee's ethical criteria were followed during all proceedings. The Ethics Committee approved the study.

## Conflicts of interest

None declared.

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