

INTERRUPTED VEIN HARVESTING TECHNIQUE WITH SKIN BRIDGES LEADS TO DECREASE INCIDENCE OF LEG WOUND INFECTION AS COMPARED TO OPEN LONG INCISION VEIN HARVESTING TECHNIQUE IN PATIENTS WITH CORONARY ARTERY BYPASS GRAFTING

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Objective: Open saphenous vein harvesting (OVH) with long incisions can be associated with wound complications like infection, incision pain, prolonged convalescence, and poor cosmetic results. Vein harvesting by multiple incisions with small skin bridges (interrupted) (IVH) method has been used for prevention of these problems. This study aims to compare the outcome of OVH versus IVH for coronary artery bypass grafting at the National Institute of Cardiovascular Diseases, Karachi.

Methods: We retrospectively analyzed data from 50 patients who underwent coronary artery bypass grafting procedures (CABG) performed at our institute during a 6-month period from 1st July 2011 to 31st December 2011. Each procedure included open vein harvesting technique (n=25) and interrupted vein harvesting technique (n=25). The primary outcome variable was the incidence of postoperative leg wound infection.

Results: Both groups were similar in terms of preoperative risk factors. After surgery, leg wound infections were significantly less frequent in the IVH

group (1/25, 4%) than in the OVH group (6/25, 24%). The most common organism involved in leg infections was *Staphylococcus aureus* (5/7, 71%) along with *Staphylococcus epidermidis* and *E.coli*. Open vein harvesting was the significant risk factor along with diabetes mellitus, obesity and peripheral vascular disease for leg wound infection.

Conclusion: We conclude that vein harvesting by interrupted method reduces leg wound infections, is safe and reliable, and should be the standard of care when venous conduits are planned for coronary artery bypass grafting and vascular procedures. Although the transition from OVH to IVH can be challenging in institutions, it can be successful if operators receive adequate training for the interrupted technique and are supported by surgeons and assisting staff.

Key words: Vein harvesting, wound infection, CABG.

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INTRODUCTION

Coronary-artery bypass grafting (CABG) is one of the most commonly performed surgical procedures and improves the clinical outcomes in

appropriately selected patients¹⁻². Despite increased use of an arterial conduit, the greater saphenous vein remains the conduit that is used most often in CABG¹. Traditionally, the saphenous vein is harvested under direct vision (open harvesting) with the help of linear incisions along the course of the vein. This approach is associated with discomfort and the risk of wound complications, including incision pain, prolonged convalescence, and poor cosmetic results, edema, hematoma, delayed healing, cellulitis, and wound

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dehiscence³⁻⁷. In this era of minimally invasive cardiac surgery, saphenous vein harvesting by minimally invasive methods is also becoming popular⁸⁻⁹. Open harvest technique of saphenous vein allows direct visualization and potentially reduces handling to minimize endothelial damage. In some centers, the saphenous vein is harvested utilizing an interrupted technique which involves multiple small incisions with small skin bridges. Apart from producing more cosmetically acceptable scars, there is a lower incidence of wound infection¹⁰. The main argument against the use of these methods is the inadequate exposure leading to excessive vein handling with compromise of the vein graft.

METHODS

Patient Selection: We retrospectively analyzed data from 1st July 2011 through 31st December 2011. Total number of patients who underwent CABG was 80. After excluding patients who did not meet the inclusion criteria total number became 50, out of which 25 patients were operated with full incision technique (OVH) and 25 patients with the skin bridge technique (IVH). Both groups were similar in terms of preoperative risk factors. In accordance with World Health Organization standards, patients were classified as obese if the body mass index exceeded 30 kg/m².

Average patient age was about 65 years with 66% (33/50) men and 34% (17/50) were women. Total number of diabetics was two in OVH group and three in IVH group, obesity was found in three patients of OVH group and five in IVH group, while number of smokers was five in OVH group and six in IVH group.

Leg Wound Complications: Leg wound complications were classified either as leg infections or as non infective wound healing disturbance. Postoperative leg infections, defined according to the National Center for Disease Control and Prevention standards, had to have at least one of the following features: purulent

drainage, isolated organisms from exudates or discharge that was sent for culture, at least one sign or symptom of infection (such as pain, tenderness, swelling, redness, or heat), spontaneous dehiscence, or abscess. In addition, the infection had to occur within 30 days of surgery. Leg wounds were evaluated by surgeons, physicians and intensive care unit nurses. The diagnosis of infection was made by a physician after discharge. No data were available on non infective wound healing disturbances, so our study was limited to leg infections only.

Exclusion criteria included, patients having a redo CABG or other surgical intervention at the time of bypass grafting, early postoperative deaths, not related to infection and having small size veins were excluded at the beginning from the study groups. Patients that we couldn't find proper follow up in their medical files also were excluded from the study.

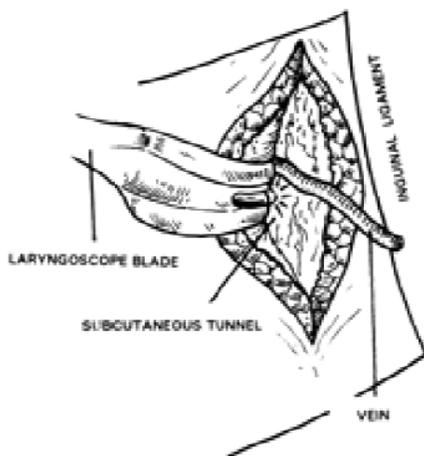
The OVH and IVH groups were similar in terms of preoperative risk factors, which are presented in Table I.

Table I. Patient demographic data from 50 coronary artery bypass grafting procedures performed with open (n=25) and interrupted (n=25) vein harvesting technique.

| Characteristics Number | OVH 25 | IVH 25 |
|--|---------------|--------------|
| Age (years) | 60.5 + - 10.5 | 61.5+ -10.5 |
| Sex | 16 (M) 9 (F) | 17(M) 8 (F) |
| Weight (kg) | 75.2+ -28.8 | 75.1+ - 28.3 |
| Hypertension (%) | 15 (60) | 16 (64) |
| D.M (%) | 2(8) | 3(12) |
| Obesity (BMI >30 kg/m ²) (%) | 3 (12) | 5 (20) |
| Peripheral vascular disease (%) | 2 (8) | 3 (12) |
| Smoking (%) | 5 (20) | 6 (24) |

The interrupted technique involved multiple small incisions along the course of the long saphenous vein starting at distal end of vein that is just anterior and above the medial malleolus. After initial identification of the SV, a plane of dissection along the anterior surface of the vein was

established usually 3-5 cm incision was given and a gap of 7-9 cm was left (interrupted segment). It was dissected free from surrounding tissues and its tributaries clipped on the patient's side and cut. The process was repeated until the desired length of the vein was harvested. The vein was divided distally using haemostate and silk tied. The vein was taken out through the incisions until the proximal segment was reached and its proximal patency was maintained while the vein was cannulated and prepared with heparinized blood. Further tributaries were ligated using titanium clips or 4-0 ethibond ties in the last vein were divided proximally using haemostate, and the divided end tied with silk. The incisions were closed with absorbable subcutaneous and subcuticular skin sutures. Closed-system drainage and crepe bandage wrappings were used in patients who were expected to have extended cardiopulmonary bypass times or who had excessive interrupted segment (tunnel) bleeding. The Open vein harvesting technique involved longitudinal incisions made over the course of the SV, starting at distal end of saphenous vein just above and anterior to medial malleolus. The length of the incision depended on the length of vein required. Once exposed, tributaries were clipped or ligated with 4-0 ethibond ties. The incisions were closed in layers, with absorbable subcutaneous and subcuticular skin sutures. Closed-system drainage and crepe bandage wrapping were used in some patients.



RESULTS

From July 1, 2011, through December 31, 2011, fifty patients who have required multivessel coronary artery bypass grafting have undergone OVH and IVH method. Average harvesting time for OHV was 28 minutes and ranged 25-30 minutes and for IVH group it was 42 minutes and ranged 40-45 minutes. An average of 3 (range, two to four) incisions was made per patient. Initial cases often required three to four incisions. The mean hospital stay was prolonged in OVH group (13 ± 12.5 days) as compare to IVH group (10.5 ± 9.0 days).

At 4 weeks with 100% follow-up only one patient (1/25, 4%) in the IVH group a 70-year-old steroid-dependent, obese, diabetic woman, had wound complication. in the OVH group (6/25, 24%) developed leg wound infection, which are presented in Table II. The most common organism involved in leg wound infection was *Staphylococcus aureus* (5/7, 71%) along with *Staphylococcus epidermidis* and *E.coli*. In IVH technique Postoperative pain, edema, and wound complications appear decreased and good cosmetic results while patient satisfaction has been immense.

Table II: incidence of leg wound infection in both groups.

| | OVH n=6/25 | | IVH n=1/25 | |
|-----------------|------------|-------------|------------|-------------|
| | Number | Infection % | Number | Infection % |
| Male | 4 | 25 % | 0 | 0 % |
| Female | 2 | 22% | 1 | 12.5 % |
| Diabetic | 1 | 50% | 1 | 33.5% |
| Obese | 2 | 66% | 1 | 20 % |

DISCUSION

Despite the proven benefits of IVH, many surgeons and centers continue OVH technique. This resistance to change has been attributed to various concerns about IVH, including potential vein-quality problems, increased technical difficulty, and longer harvesting times. We are

comparing in our study the risk, and incidence of leg wound infections between two vein harvesting techniques, the traditional single long incision, and IVH using multiple incisions with small skin bridges, reviewing the experience at our institute.

After CABG, leg wound complications at saphenous vein harvesting site account 3% to 30%¹¹. The transition from traditional OVH to IVH can be frustrating for everyone involved. Initially, the change may dramatically increase surgical time for IVH. The transition was especially challenging at our institute, because the surgical assistant harvested vein by IVH with some difficulty and more time taken as compare to OVH because they were accustomed to perform OVH frequently. Vein harvesting time depends on the individual surgical experience, the characteristics of patient and the size of vein. Although harvesting times may be longer with IVH, but the incisions are smaller and closure time is much shorter, resulting overall equal time in both procedures.

Vein Quality: While deciding whether to continue the IVH program at NICVD, the surgeons considered the effects that using IVH could have on various aspects of the coronary artery bypass procedure, including the quality of the harvested conduits. The main argument, against the use of this technique has been the risk of excessive vein handling and damage. This risk is a consequence of limited exposure and inadequate light within the interrupted segment. However the use of laryngoscope inside the interrupted segment provides good exposure and light within the operative field, the equipment used is reusable, inexpensive and readily available so by this method risk can be minimized. If IVH were to yield vein grafts of lower quality than those harvested with OVH, then maintaining the IVH program would not be worth the effort. However, with the passage of time and improved surgical skills in performing IVH, vein quality improved dramatically; consequently, more surgeons are willing to perform IVH on their patients. Currently, most surgeons are of the

opinion that IVH and OVH produce vein grafts of similar quality and that IVH is of great benefit to patients.

The result by Tran et al.¹² showed that saphenous vein tunneling (interrupted segment) is an attractive alternative to the open harvest technique in obtaining venous conduits for coronary artery bypass procedures, as they used a tunneling technique always during harvesting thigh saphenous vein, but the open harvest technique with long incision was preserved in nearly a third of veins harvested for lower leg veins. In our study, with open vein harvesting, we found that female, obese and diabetic patients significantly increase the incidence of leg wound complications.

CONCLUSION

In our study we conclude that vein harvesting using multiple incisions (IVH) with small skin bridges is a less invasive technique, gives superior cosmetic outcome and reduced wound complications as compare to traditional method of vein harvest (OVH). Female, obese and diabetic patients are more prone to develop leg wound infection. In this group of patients we need more meticulous and less invasive surgical techniques to be applied.

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