Comparative Study of Harvest-Site Complications Following Coronary Artery Bypass Grafting between the Radial Artery and the Saphenous Vein in the same Patient

Thesis

Submitted for the Partial Fulfillment of the
Master Degree (M.Sc.) in
General Surgery

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2007

بسم الله الرحمن الرحيم

ACKNOWLEDGEMENT

"First and foremost thanks to 'GOD' the most kind, beneficial and merciful"

I would like to express my sincere appreciation and performed thanks to Prof. Dr. ***Khaled Mohamed El-Hendawy,*** *Professor of General Surgery, Faculty of Medicine, Cairo University, for his great effort, productive guidance, and valuable instructions.*

I would like to extend my deepest thanks and feelings of respect and gratitude to my mentor Prof. Dr. ***Ehab El-Shihy,*** *Professor of Cardiothoracic Surgery, Faculty of Medicine, Cairo University, for his tremendous assistance and innovative ideas and for his scientific support.*

I would like also to express my deep gratitude to Prof. Dr. ***Ahmed Kamal El-Din El-Batanony,*** *Assistant Professor of General Surgery, Faculty of Medicine, Cairo University, for his close supervision, valuable guidance, and continuous encouragement in performing this work.*

A word of appreciation is also due to Dr. ***Mohamed Sewielem,*** *Lecturer of Cardiothoracic Surgery, Faculty of Medicine, Cairo University, for his continuous support and invaluable effort. He helped me immensely during the preparation of this work.*

Finally, most thanks to my Father, Mother and my Wife, who supported me during preparation of this work.

Tarek Mohamed Kandeel
May 2007

To my parents who are always there for me

To my beloved wife and kids,

who give me unwavering support,

inspiration and love

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ABBREVIATIONS

CABG	:	Coronary artery bypass grafting
COPD	:	Chronic obstructive pulmonary disease
CPB	:	Cardiopulmonary bypass
DP	:	Dorsalis pedis
EF	:	Ejection fraction
ERH	:	Endoscopic radial artery harvesting
GSV	:	Great saphenous vein
IABP	:	Intra-aortic balloon pump
IEA	:	Inferior epigastric artery
IMA	:	Internal mammary artery
LABCN	:	Lateral antebrachial cutaneous nerves
LAD	:	Left anterior descending artery
NW3	:	Mobile wad of 3
PVD	:	Peripheral vascular disease
RA	:	Radial artery
RGEA	:	Right gastro-epiploic artery
RIMA	:	Right internal mammary artery
SA	:	Splenic artery
SRN	:	Superficial branch of radial nerve
SV	:	Saphenous vein
SVG	:	Saphenous vein graft
TAR	:	Total arterial revascularization
TP	:	Tibialis posterior
UA	:	Ulnar artery
VG	:	Verapamil-nitroglycerine solution

ABSTRACT

Background: A number of reports have been published concerning the advantages of using arterial conduits in coronary artery bypass grafting (CABG) instead of saphenous vein grafts. The use of the radial artery has currently become more popular. However, postoperative complications related to graft harvesting such as injury of sensory nerves or wound infections have also been reported, which may significantly affect the patients' quality of life. **Patient and Method:** In this study, 100 patients with coronary artery disease underwent isolated CABG surgery, using SVG concomitantly with RA graft as bypass conduits. We assessed the post harvest site complications regarding pain, numbness, also the incidences of harvest-site hematoma, ecchymosis and infection were also compared between both the arms and legs where the grafts were harvested. **Results:** Numbness of the harvest site was indicated in 33.3% (radial artery) and 26.2% (saphenous vein), respectively. Hematoma was found in 6.1% and 4%, respectively. On the other hand, the incidence of pain and wound infection were significantly lower in the radial artery sites (pain: 3% vs 24.2%; infection 2% vs 12%). **Conclusion:** Our experience suggests that the use of the radial artery is safe and also demonstrates a lower incidence of harvest-site complications, than saphenous vein harvesting in patients where both vessels are used.

Keywords:

Radial artery graft
Saphenous vein graft
Harvest-site complications

INTRODUCTION AND AIM OF THE WORK

INTRODUCTION

Coronary artery bypass grafting (CABG) is one of the procedures with the highest impact in the history of medicine. No other operation has led to more lives prolonged and been better characterized with respect to its short- and long-term outcomes **(Ruel et al., 2005)**.

A variety of conduit options are now available to the surgeon for CABG surgery. The most commonly used conduits include the left internal mammary artery (LIMA) and greater saphenous vein. Total arterial revascularization (TAR) may be facilitated by additional harvest of the right internal mammary artery (RIMA), radial artery, or right gastro-epiploic artery **(Filsoufi et al., 2004)**.

Greater saphenous vein continues to be the primary conduit for coronary artery bypass grafting in conjunction with a pedicled left internal mammary artery, however, saphenous vein harvesting, though a relatively minor part of coronary artery bypass operation, can cause complications that may dominate the early and late postoperative course **(Lavee et al., 1989)**.

At present more and more surgeons are using the radial artery as a graft for coronary bypass. The statistics until now show that the patency of radial grafts exceeds that of the venous grafts used up to the present **(Galajda et al., 2002)**.

Although radial artery removal is safe depending on adequate collateral arterial supply, some surgeons are still concerned about it because of ischaemia and poor neurologic outcome risks at donor forearm and hand. In the literature, few complications of radial artery harvesting such as severe ischaemia of hand and infection harvesting site are reported. Nevertheless, neurologic complications of radial artery harvesting are reported as a rare surgical complication resulting from direct radial nerve damage during surgery.

Aim of the Work:

The aim of this study to assess the early outcome in terms of complications associated with radial artery harvest site, in comparison to using saphenous vein, patients harvested for both vessels.

REVIEW OF LITERATURE

CORONARY ARTERY BYPASS CONDUITS
HISTORICAL BACKGROUND AND CORONARY STATUS

Coronary artery bypass grafting (CABG) surgery is still a major intervention in the treatment of patients with coronary heart disease.

The history of coronary bypass surgery began in 1910 when **Alex Carrel** hypothesized that angina pectoris could be treated with an indirect anastomosis between the descending aorta and the left coronary artery: using a preserved carotid artery, he attempted this procedure on a dog, but was unsuccessful due to ventricular fibrillation in the animal **(Carrel, 1910)**.

Sabiston of Duke University applied this innovative technique to the clinical arena 52 years later in 1962 when he attempted the first coronary artery bypass, utilizing the greater saphenous vein. The patient died 2 days later as a result of cerebrovascular accident attributed to a thrombus formed at the saphenous vein to aortic anastomosis **(Sabiston, 1974)**.

In 1964 at Baylor College of Medicine, **Garrett** performed the first successful saphenous vein-coronary artery bypass procedure on a 42-year-old man. The patient returned 7 years later with an angiogram which revealed that the vessel had remained open and functional **(Garrett et al., 1973)**.

In 1966, while physicians were experimenting with bypass procedures involving the saphenous vein, **Kolessov**, a Russian surgeon, performed the first successful coronary artery bypass using the internal mammary artery (IMA). By the middle of the year, he had performed 6 of these operations **(Kolessov, 1967)**.

In **1967, Favaloro** successfully reconstructed the right coronary artery by interposing a segment of SV and later on he started using SV graft direct from the aorta to the coronary arteries. Afterwards, significant progress occurred when Favaloro and his group were able to perform double bypass, emergency revascularization and even combined operation **(Favaloro, 1968)**. Until 1970 they had performed 1.086 CABG in 951 patients with an overall mortality of 4.2%.

By late 1968, **Green** became the first American surgeon to repeatedly use the IMA as his primary bypass conduit. He successfully implanted internal mammary to coronary artery anastomosis in 165 patients during the next 3 years. However, the short-term follow-up of the IMA and saphenous vein graft (SVG) was not dramatically different **(Green, 1972)**. With the greater clinical difficulty of using the IMA as well as concerns about its flow capacity, many surgeons continued to use the SVG as their primary conduit of choice.

The great saphenous vein continued to be the conduit of choice for more than 20 years. It is easily harvested, has a diameter similar to that of the coronary arteries, is generally available in large quantities, and has a better flow than the internal mammary artery **(Flemma et al., 1975)**.