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Original article

Internal mammary harvesting causes pulmonary dysfunction – Myth versus fact

Faisal Mourad*, Ihab Ali [1]

Department of Cardiothoracic Surgery, Ain Shams University, Egypt

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Abstract

Objectives: The lack of consistent data on the effect internal mammary harvesting on pulmonary functions has triggered the research group to answer the question using a prospective case control study.

Methods: This is a prospective study of 90 patients undergoing elective coronary artery bypass grafting operations (CABG), in the Cardiothoracic Surgery departments at Basildon University Hospitals, UK & Ain Shams University hospitals between September 2009 till November 2015 (51 & 39 patients respectively). The patients were divided into 3 groups based on the operative technique:

Group I: The saphenous vein grafts (SVG) were used for CABG operation (30 patients).

Group II: The left internal mammary artery (LIMA) graft was used only or with saphenous vein grafts for CABG operations and the pleura was left intentionally intact (30 patients).

Group III: The LIMA graft was used only or with saphenous vein grafts for CABG operations and the pleura was opened (30 patients).

Results: When the 3 groups were compared together, it was found that, the mean values of Slow vital capacity (SVC), Forced vital capacity (FVC), and Forced expiratory volume in first second (FEV_1) of group I were: 58.750 ± 10.325, 57.993 ± 6.425, and 61.914 ± 8.912 respectively and those of group II were: 40.901 ± 5.361, 39.355 ± 5.278, and 43.242 ± 9.126 and group III are 31.779 ± 6.99, 32.602 ± 4.731 and 34.638 ± 5.799 respectively, with $P < 0.001$ denoting a highly significant decrease in group III over group II & group I respectively.

Conclusion: CABG has a profound effect on pulmonary functions. The saphenous vein group showed the least reduction pulmonary functions followed by those LIMA patients with intact pleura.

Keywords: Internal mammary artery; Pulmonary complications; Pulmonary function test

* Corresponding author. Cardiothoracic Academy, Ain Shams University, Abbasya Square, Cairo, Egypt. Tel.: +20 1277772778 (mobile).
E-mail addresses: faisalmourad@hotmail.com (F. Mourad), drihababdelrazek@hotmail.com (I. Ali).

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[1] Cardiothoracic Academy, Ain Shams University, Abbasya Square, Cairo, Egypt. Tel.: +20 1279410660 (mobile).

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1. Introduction

Coronary artery bypass grafting (CABG) has become one of the most common operations and an important therapeutic modality in the treatment of ischemic heart disease. Pulmonary complications have been described in many studies following CABG [1–3]. One of the major pulmonary problems post CABG is reduction in lung volumes which can be attributed to atelectasis, pleural effusions and phrenic palsy following internal mammary artery (IMA) harvesting. Other studies on the other hand, have found that IMA harvesting with or without opening the pleura has no effect on post op pulmonary complications [4]. Taking into consideration the paucity and inconsistency of the available data with regards to harvesting of the IMA and the development of pulmonary complications, the research team aimed to study the effect of IMA harvesting in coronary artery bypass grafting operation on pulmonary function and arterial blood gases taking a cohort of patients who had CABG with SVG only as a control group.

2. Patients and method

This work is a prospective study of 90 patients of coronary artery disease, undergoing elective coronary artery bypass grafting operations (CABG), in the Cardio-Thoracic Surgery department, Basildon university hospitals, UK & Ain Shams University hospitals between September 2009 till November 2015 (51 & 39 patients respectively).

The patients were divided into 3 groups based on the operative technique:

Group I: In which, SVGs were used for CABG operation (30 patients).

Group II: In which, LIMA graft was used only or with SVGs for CABG operations and pleura was intentionally left intact (30 patients).

Group III: In which, LIMA graft was used only or with SVGs for CABG operations and the pleura was opened (30 patients).

A) Preoperative laboratory investigations: were done to assess the condition of the patient before surgery. These laboratory investigations included: complete blood picture (CBC), blood cholesterol, blood sugar, liver and kidney function tests, and coagulation profile.

B) Pulmonary function tests: were done for all patients

- Preoperative
- Three weeks after the operation

These pulmonary function tests included

1. Slow vital capacity (SVC)
2. Forced vital capacity (FVC)
3. Forced expiratory volume in first second (FEV_1).
4. Ratio between FEV_1 and FVC.

These 4 functions were done for all patients using spirometry.

C) Arterial blood gases: Pre and post-operative arterial blood samples were withdrawn to assess partial pressure of O_2 in arterial blood (PaO_2), partial pressure of CO_2 in arterial blood ($PaCO_2$) and O_2 saturation percent (O_2 sat%).

We aimed to observe the effects of mammary graft harvesting on respiratory complications, therefore, any concomitant disease that could affect the results became an exclusion criterion. Patients with chronic obstructive pulmonary disease (COPD) or skeletal abnormalities that caused pulmonary restriction were excluded from the study. Patients over 75 years of age were also not enrolled.

The choice of not harvesting IMA in patients who had veins only, was the consultant preference.

Patients in which SVGs were used for CABG operation and had one or both of the pleurae accidentally opened were excluded.