MEDICAL CHANNEL

Original Article

A LITTLE EXTRA EFFORT FOR BETTER CLINICAL OUTCOME AFTER CORONARY ARTERY BYPASS GRAFTING. THE IMPACT OF PRESERVATION OF PLEURAL INTEGRITY

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ABSTRACT

Objectives: The objective of this study was to evaluate the impact of preservation of pleural integrity during coronary artery bypass grafting (CABG) on clinical outcome.

Study Design: Retrospective Study

Methods: This study was conducted at department of cardiothoracic surgery, Liaquat National Hospital & Medical College, Karachi from the period of July 2010 to June 2014. A total of 140 patients were identified, who underwent elective coronary artery bypass grafting at our hospital. These patients were distributed in two groups with matching patient demographics, anaesthetic and Surgical management. In Group A (n=70) the Left internal thoracic artery (LITA) was harvested with pleurotomy (opening of pleura) and in Group B (n=70) without pleurotomy.

Results: Post operative blood loss was significantly higher within first 12 hours in group A than group B. There was no significant difference in post operative haemoglobin was noted. There were 2 patients from group A and one patient from group B required re exploration for bleeding. Patients of group A were found to require more blood products than those of group B. That concerned not only packed red blood cells, but also platelets and fresh frozen plasma. The incidence of pleural effusions and atelectasis was significantly higher in group A versus group B on 5th day of operation. The time spent in the ICU was significantly longer for those of group A than group B, although ventilatory support time and overall time of hospital stay did not differ statistically significant among the groups. There was no mortality in either group. One patient in group A suffered from stroke and one patient in group B had impaired renal function resolved without renal replacement therapy. This did not reach statistical significance.

Conclusion: We conclude that the preservation of pleural integrity, whenever possible, can decrease postoperative complications of CABG. This may be an important factor for patients who are at increased risk of postoperative respiratory problems.

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INTRODUCTION

Coronary artery bypass graft (CABG) surgery is one of the most common surgical procedures performed in the United States today and remains the most common surgical procedure performed by cardiac surgeons. It is estimated that more than 800,000 coronary artery bypass graft surgeries are performed worldwide per year [1]. The left internal thoracic artery (LITA) serves as a gold standard, as the graft of choice for myocardial revascularization in coronary artery surgery due to its anatomical availability, superior graft patency, decreased cardiac events and increased short term and long term survival [2,3,4]. The conventional method of LITA harvesting technique with pleurotomy has been linked with higher incidence of post operative blood loss, pain and pleuropulmonary complications [5, 6,7].

The objective of this study was to evaluate the impact of preservation of plural integrity during coronary artery bypass grafting (CABG) on clinical outcome such as post operative blood loss, transfusion requirements, length of ICU and hospital stay and pleuropulmonary complications such as pleural effusion and atelectasis by comparing two different techniques of LITA harvesting.

METHODOLOGY

This study was conducted retrospectively at department of cardiothoracic surgery, Liaquat National Hospital & Medical College, Karachi from the period of July 2010 to June 2014. A total of 140 patients were identified, who underwent elective coronary artery bypass grafting at our hospital. The patients were distributed in two groups with matching baseline variable. In Group A (n=70) the Left Internal thoracic artery (LITA) was harvested with pleurotomy (opening of pleura) and in Group B (n=70) without pleurotomy.

All patients underwent elective and isolated coronary artery bypass grafting and in all patients antiplatelet therapy was withdrawn 4±1 days before operation. The Exclusion criteria were Re-do operations, emergency cases, LVEF <30%, acute or chronic pulmonary lung disease, coagulopathy, stroke, chronic or acute kidney disease and chest wall deformities. All patients were operated by same surgical team with same pre, per and post operative protocol with the only exception of LITA harvesting technique that is with or without pleurotomy. On termination of bypass and administration of protamine, activated clotting time was maintained less than 140 seconds.

In ICU, chest tube drainage was monitored hourly for 24 to 36 hours depending on amount or type of drainage. The transfusion of packed red cells, platelates and fresh frozen plasma was according to standard ICU protocol and was documented. Chest X ray was done immediately on arrival in ICU and on 2nd, 3rd and 5th day. CXR was specially monitored and documented for any degree of atelectesis and pleural effusion.

The data was analyzed using SPSS v20 softaware and was displayed as mean and standard deviation. The student t Test and Chi-squared tests were applied for univariate analysis. A p value of less than 0.05 was considered statistically significant.

RESULTS

There were no significant difference between two groups in regard to demographic data, base line [Table1] and operative variables [Table2].

TABLE 01
BASELINE VARIABLES / DEMOGRAPHICS

Variables	Group A	Group B	P Value
No. of Patients	70	70	N S
Gender M/ F	49 /21	55 / 15	N S
Mean Age (Year)	58 + 5.9	57 + 4.8	N S
Mean LV EF (%)	46 + 3.1	46.8 + 4.7	N S
3VD	93%	89%	N S
Pre Op MI	35%	32%	N S
Stable Angina	42%	50%	N S
Unstable Angina	23%	18%	N S
BMI	28.1 + 4.7	28.7 + 5.5	N S
Smoker	58%	61%	N S
Diabetes	84%	81%	N S

NS = Not Significant, **LVEF** = Left Ventricle Ejection Fraction, **3VD** = Three Vessel Coronary Artery Disease, **MI** = Myocardial Infarction, **BMI** = Body Mass Index.

TABLE 02
OPERATIVE VARIABLES

Number of Grafts	3.0 + 0.75	3.1 + 50
Number of LITA	70 (100%)	70 (100%)
Number of SVG	1.68 + 0.7	1.7 + 0.7
Cross Clamp Time (min)	60.8 + 14.2	59.2 + 18.3
CPB Time (min)	97.7 + 21.3	94.8 + 23.8

LITA = Left Internal Thoracic Artery, **SVG** = Saphenous Vein Graft, **CPB** = Cardio Pulmonary Bypass

TABLE 03
POST OP OUTCOME

Variables	Group A	Group B	P Value
Blood Loss (ml)	608 + 58	470 + 48	< 0.001
Post Op Hemoglobin (mg%)	13.9 + 1.4	14.2 + 1.7	N S
Packed RBC (U)	0.94 + 1.4	0.5 + 0.9	< 0.001
Fresh Frozen Plasma (U)	4.6 + 1.5	2.4 + 1.1	< 0.001
Platelet (U)	4.8 + 1.2	2.2 + 1.7	< 0.001
Re Operation for Bleeding	1.4%	0.7%	N S
Ventilator Support Time (hr)	8.2	7.8	N S
Atelactasis	42.1%	20.0%	< 0.001
Pleural Effusion	52.6%	23.6%	< 0.001
ICU Stay (days)	1.6 + 1.0	1.4 + 0.6	< 0.001
Hospital Stay (days)	9.3 + 4.4	8.9 + 4.2	N S

Post operative blood loss was significantly higher within first 12 hours in group A than group B (A,608±58mls;B,470±48mls;p=0.027). There was no significant difference in post operative haemoglobin was noted. There were 2 patients from group A and one patient from group B required re exploration for bleeding. Patients of group A were found to require more blood products than those of group B. That concerned not only packed red blood cells, but also platelets and fresh frozen plasma. Packed red blood cells (u.) A, 0.94 ±1.4; B, 0.5 ±0.9, $p < 0.001$, Fresh frozen plasma (u.) A, 0.6 ±1.5; B, 0.4 ±1.1, $p < 0.001$, platelets (u.) A, 0.3 ±1.5; B, 0.1 ±0.8, $P < 0.001$. The incidence of pleural effusions was significantly higher in group A versus group B on 5th day of operation (A, 52.6%; B, 23.6%; $p = 0.002$). Atelectasis (A, 42.1%; B, 20.0%; $p = 0.015$) was seen more often in group A than in group B.

The time spent in the ICU was significantly longer for those of group A, 1.5 ±1.0 than group B, 1.3 ±0.6, with $p < 0.001$, although ventilatory support time and overall time of hospital stay did not differ statistically significantly among the groups [Table 3].

There was no mortality in either group. One patient in group A suffered from stroke and one patient in group B had impaired renal function resolved without renal replacement therapy. This did not reach statistical significance.

DISCUSSION

Coronary artery bypass graft (CABG) surgery remains the most common surgical procedure performed by cardiac surgeons worldwide and the left internal thoracic artery (LITA) serves as a gold standard, as the graft of choice for myocardial revascularization in coronary artery surgery due to its anatomical availability, superior graft patency, decreased cardiac events and increased short term and long term survival. The conventional method of LITA harvesting technique with pleurotomy has been widely used as preferred technique due to ease of procedure, better visualization, better lay of LITA – LAD graft with reduced chances of cardiac temponade and pericardial effusion. Boylan et al. [8] and Peng et al. [9] compared the outcome in CABG patient with or without LITA and showed better outcome in patients in whom saphanous vein was used instead of LITA without pleurotomy in regard to post operative blood loss, pain and pleuropulmonary complications. In our study we have also showed that opening of the pleural cavity during LITA harvest is associated with more pronounced blood loss, a drop in postoperative hemoglobin and higher rates of reoperation for bleeding. In our opinion insertion of even the softest chest tube into the pleural cavity might have the ability to

cause mechanical irritation and consequently fluid secretion, which adds to the total drainage capacity. The pleural tube is also found to cause deterioration of pulmonary function and is associated with greater postoperative pain and higher need for opioid analgesia in the ICU [10]. There was a tendency in group A to require longer ICU stay. This, as we believe, has a multi factorial explanation; not only postoperative bleeding but also pulmonary function deficits were key factors in this setting. In contrast to other reports, we did not find a significant difference in overall hospital stay [10,11].

The limitation of our study was, as it was designed as a retrospective study, therefore we could not evaluate the lung function test and scoring for pain but there is plenty of data available to draw inference in this regard. Pulmonary complications in patients submitted to on-pump surgical revascularization are well documented. Taggart et al. attributed those complications to a systemic inflammatory response, which is well described in patients in whom cardiopulmonary bypass was used [12]. Drugs usually considered in the anesthetic protocol such as pancuronium or opioid analgesics have a negative influence on peri operative ventilation by reducing the diaphragm and respiratory muscle tone, and later by reducing chest compliance, and respiratory motor brain stem function. On the other hand, harvesting the LITA is by itself linked to worse pulmonary functioning after coronary surgery [13,14,15,16]. Opening of the pleural cavity is associated with higher rates of pleural effusion and atelectasis as it is also shown in our study and this fact alone should be linked to worse pulmonary status [17]. Cohen and associates [18] demonstrated significantly more postoperative pain in patients undergoing ITA harvesting and reported that age, smoking, and sex had no effect on postoperative pain[19,20].

CONCLUSION

Our study showed that preservation of pleural integrity during IMA harvesting decreases postoperative bleeding, transfusion requirements, ICU stay, pleural effusion, and atelectasis. From these results, we can conclude that the preservation of pleural integrity, whenever possible, can decrease these postoperative complications of CABG. This may be an important factor for patients who are at increased risk of postoperative respiratory problems such as patients with chronic pulmonary disease, or with concomitant disease that may adversely affect postoperative respiratory function.

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