



Coronary Artery Bypass Grafts in a Patient with Previous Left Pneumonectomy

Nadine Kawkabani^{1,*}, Rula Darwish¹, Bassem Ayyache², Marianne Alam², Bassam Abu Khalil²

¹Department of Cardiac Surgery Anesthesia, St Georges Hospital-University Medical Center, Beirut, Lebanon

²Department of Cardiothoracic Surgery, St Georges Hospital-University Medical Center, Beirut, Lebanon

Email address:

nadine_kaoukabani@yahoo.com (N. Kawkabani)

*Corresponding author

To cite this article:

Nadine Kawkabani, Rula Darwish, Bassem Ayyache, Marianne Alam, Bassam Abu Khalil. Coronary Artery Bypass Grafts in a Patient with Previous Left Pneumonectomy. *International Journal of Cardiovascular and Thoracic Surgery*. Vol. 2, No. 3, 2016, pp. 12-14.

doi: 10.11648/j.ijcts.20160203.11

Received: July 29, 2016; Accepted: September 1, 2016; Published: September 18, 2016

Abstract: We describe in this case report a coronary artery bypass grafting in a patient with previous left pneumonectomy using a new surgical technique that contributed, in addition to the implementation of many recommendations suggested in the literature, to an excellent outcome.

Keywords: Coronary Artery Bypasses Grafting, Previous Left Pneumonectomy, New Surgical Approach, Prior Recommendations

1. Case Report

A 65 years old male was admitted to our institution for coronary artery bypass grafting (CABG). He was a known diabetic on oral medications, ex- smoker and had a history of insertion of two coronary stents 5 years ago. He was also operated for a left upper lobectomy 6 years earlier followed by a left completion pneumonectomy for bronchial squamous cell carcinoma 2 years ago.

He was admitted for an acute coronary syndrome. A cardiac catheterism revealed severe distal left main calcification and stenosis, severe mid right coronary artery in stent restenosis. A cardiac echography revealed normal left ventricular function with an ejection fraction of 74% and an impaired relaxation pattern. Pulmonary function tests were not done preoperatively due to his unstable state but a test done 6 months previously revealed a FEV1 of 65% and a FVC of 72% of the predicted values.

The laboratory results revealed a low hematocrit of 31%, the remaining values were normal. Arterial blood gases showed a pO₂ of 116 mmHg, a pCO₂ of 38 mmHg and a PH of 7.42.

A chest CT scan showed marked shift of the mediastinum to the left hemithorax (fig 1).



Figure 1. Preoperative computed tomography of the chest showing a left displacement of the heart and the great vessels and a compensatory hyperinflation of the right lung.

Our patient was prepared by hydrocortisone 250 mg the evening prior to surgery and on call to the operating room (OR). He was premedicated with robinul 0.2 mg administered intra muscularly on call to OR.

Upon arrival to the operating theatre the patient was calm

and stable. Two peripheral intra venous lines and a right radial artery cannula were inserted. He was preoxygenated with 100% oxygen, induced with thiopentone (3.5 mg/kg), sufentanyl (0.6 microg/kg) midazolam (0.09 mg/kg). The neuromuscular blockade was achieved with cisatracurium (0.2 mg/kg). The trachea was intubated using a cuffed endotracheal tube of 8.5 mm internal diameter. The patient was put on the ventilator with the following parameters: Tidal volume: 500 ml, respiratory rate: 14 breaths /min. The maximal airway pressure generated was inferior to 20 cm H₂O.

A central line and a Swan Ganz were inserted through the left internal jugular without complications.

Maintenance of anesthesia was achieved by an infusion of midazolam (3 mg/hr), sufentanyl (50 microg/kg) and cisatracurium (12 mg/hr).

All hemodynamic parameters were within normal range throughout the procedure, the oxygen saturation was above 99%, end tidal CO₂ ranged between 30-32 mmHg and the arterial gases were normal (pO₂ above 300 mmHg and pCO₂ ranging between 32 and 41 mmHg). A cell saver was used and blood glucose was monitored and controlled by a continuous infusion of insulin. Also a prophylactic dose of antibiotic was administered intravenously prior to skin incision (zinnacef 1.5 g).



Figure 2. Post operative picture showing the incision site below the (left) nipple and carried over across the sternum.

After induction, a Foley catheter and a rectal probe were inserted and then the patient was positioned supine with an elevation of the left side of the chest using two pillows. He was prepped and draped. A left lateral thoracotomy was performed after opening the skin below the nipple and by entering the 5th intercostal space. The incision was carried over across the sternum horizontally in order to expose the aorta and the right atrium that were shifted laterally to the left side (of the sternum) by at least 10 cm. Severe adhesions were encountered and released. Opening the sternum allowed

visualization and a relatively easy cannulation of these structures. After cannulae insertion, the cardiopulmonary bypass was initiated. Three savenous vein grafts were used to bypass the left anterior descending artery, the right coronary artery and the obtuse marginal (OM) artery. To note that the exposure of the OM was difficult due to the lateral displacement (shift) of the heart. After completion of the grafts the cardiopulmonary bypass was successfully discontinued. The chest was closed in the usual fashion. All hemodynamic and respiratory parameters were normal. The patient was transferred to the coronary surgery unit (CSU). The postoperative course was uneventful. Extubation was done in the evening. The patient was discharged five days after surgery (fig. 2)

2. Discussion

With improvement of life expectancy, the number of patients subjected to both cardiac and pulmonary interventions is increasing. Nevertheless there is a paucity of data in the literature on this matter.

While reviewing the literature we encountered very few articles discussing cases of patients undergoing cardiac surgery following pulmonary operations.

Medalion et al published in 1996, 27 patients who underwent both thoracic then cardiac procedures (81% underwent CABG and 19% valve surgery). The mortality and the morbidity rates were respectively 7% and 18%. The most important complications were the difficulty to expose the circumflex artery, pneumothorax and post pericardiotomy syndrome [1].

Diab et al reported in 2001 seven cases of CABG. The mortality rate was 14%. The postoperative complications occurred in 43% of the cases. They were mostly due to respiratory failure and pneumothorax [2].

Stohler et al published in 2007 a review that included 15 patients already reported in previous papers and 4 patients done in their unit. CABG was done in 75% of the cases and valve surgery in 20%. A combined surgery was performed in 5% of the patients. In this review the 30 days mortality rate was 16% while the morbidity rate reached 50%. Again the most common complications were respiratory failure 25% and pneumothorax 10% [3].

A review done by Fragkidid et al in 2012 studied data from 1996 till may 2011. It included 29 patients who underwent 30 surgeries. CABG was performed in 70% and valve surgery in 23% of the cases. Combined procedures were done in two patients (7%).

Median sternotomy was done in 80% of the cases. Left thoracotomy was done in patients with previous left pneumonectomy in 20% of the cases.

Post operative complications were observed in 37% of the cases. They were mostly due to respiratory failure (17%), atrial fibrillation (13%) and pneumothorax (10%). The 30 days mortality rate was 13% [4].

No data concerning long term prognosis are available.

The above review articles recommended the following:

Admit the patients prior to surgery for intensive preoperative respiratory physiotherapy [5, 6], do a CT chest to assess distortion of the intrathoracic anatomy, achieve a proper staging by a PET scan preferably [4], insert the percutaneous catheters on the side of the prior pneumonectomy, open the sternum –If sternotomy is used– very carefully in order to avoid injuries to the hyper inflated lung [7], release adhesions that are usually present in the posterior surface of the heart [7], consider revascularization and valvular surgeries via a left thoracotomy especially in patients who underwent previously a left pneumonectomy [8] keeping in mind that a difficult cannulation of the aorta and the atrium may be encountered [9] and considering the use of the axillary artery and the femoral vein sites whenever a median sternotomy is a concern [10].

On the other hand, the use of the internal mammary is debatable. In fact The ITA may be problematic since It may be difficult to be harvested, not reach the target vessel if it is on the side of the intact lung, harm the phrenic nerve, and precipitate respiratory failure due to pain [4, 9, 11].

Stohler et al favored its use while Bernet et al suggested harvesting skeletonized ITA using a LIMA fissure technique [12]. To note that in 8 patients in whom an ITA was used 2 complications occurred of which one was fatal.

Finally some authors advice positioning the surgeon on the left side of the patient in order to facilitate cannulation and surgery [13].

In our case, most of these recommendations and remarks were taken into consideration. Our patient received corticoids in the evening prior to procedure and on call to the OR. A chest CT scan was done and was scrupulously studied in order to assess the shift of all the structures due to prior left pneumonectomy.

During the procedure, precautions were applied in order to avoid injuries to the hyperinflated lung: the central line was inserted in the left internal jugular, respiratory parameters were adjusted to keep an airway pressure below 20 cm H₂O throughout the procedure.

The opening was done via a left thoracotomy in the 5th intercostal space and taken horizontally across the sternum. This allowed a better view and a smooth cannulation of the aorta and the right atrium since they were severely displaced to the left side

The ITA was not harvested because of the above mentioned possible complications.

Neither respiratory adverse events nor surgical complications were encountered during and after the intervention. Early ambulation post operatively was also very beneficial. The patient was discharged five after surgery.

3. Conclusion

CABG following a left pneumonectomy can be performed even though it carries a high risk of mortality and morbidity.

Surgery through a left thoracotomy in the 5th intercostal space with a horizontal opening across the sternum allowed the procedure to be done in the usual fashion by cannulating the ascending aorta and the right atrium without increasing the complication rate. On the other hand, application of recommendations suggested previously by many authors contributed also to the excellent outcome.

References

- [1] Medalion B, Elami A, Milgalter E, Merin G. Open heart operation after pneumonectomy. *Ann Thorac Surg.* 1994; 58: 882-884.
- [2] Diab KA, Khatib MF, Obeid M, Jamaledine GW. Coronary artery bypass grafting after pneumonectomy. *Eur J Cardiothorac surg.* 2001; 19: 362-364.
- [3] Stolher JK, Blackstone E, Petterson G, Mihaljevic T. Coronary artery bypass graft and/or valvular operations following prior pneumonectomy: report of four new patients and review of the literature. *Chest.* 2007; 132: 295-301.
- [4] Fragkidid A, Dimitriou A and Dougenis D. Coronary artery bypass and/or valvular surgery in patients with previous pneumonectomy. *J Cardiothorac Surg.* 2012; 7: 110.
- [5] Hulzebos EH, Helders PJ, Favie NJ, De Brie RA, De la Riviere AB, Meetera NL. Preoperative intensive inspiratory muscle training to prevent postoperative pulmonary complications in high risk patients undergoing CABG surgery. A randomized clinical trial. *JAMA.* 2006; 15: 1851-1852.
- [6] Golbasi J, Turkay C, Sahson N, Oz N, Akbulut E, Gulmez H, Bayezid O. Coronary artery bupass grafting after pneumonectomy. *Eur J cardio Thorac Surg.* 2001; 19: 362-364.
- [7] Doyle RL. Assessing and modifying the risk of postoperative pulmonary complications. *Chest.* 1999; 115: 778-818.
- [8] Ushijima T, kikushi Y, ikeda C, takata M, Yamamoto Y and watanebe G. Totally arterial off pump coronary artery bypass grafting after pneumonectomy. *Annals of Thoracic and cardiovascular surgery.* 2011; 17: 320-322.
- [9] Zhao BQ, Chen KK and Song JP. Coronary artery bypass grafting after pneumonectomy. *texas Heart institute journal.* 2008; 35: 470-471.
- [10] Stamou S, Murphy MC, kouchoukos NT. Aortic valve replacement and coronary artery bypass via left anterior thoracotomy after previous left pneumonectomy. *J Thorac Cardio Vasc Surg.* 2010; 140: 719-720.
- [11] Reutter S, liakopoulos O, Chai YH, Wahlers T, Wittwer T. Coronary surgery following prior pneumonectomy-A challenging clinical scenario with excellent results. *Advances in lung cancer.* 2013; 2: 19-20.
- [12] Bernet FH, Reineke DC, Grapoo T, Zerkowski HR. OPCAB surgery after right pnunonectomy. *J Card surg.* 2006; 21: 92-93.
- [13] Ghodtkar SV, Aerra V, Mediratta N. Cardiac sugery in patients with previous pneumonectomy. *J Cardiothorac Surg.* 2008; 3: 1.