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Review Article

Off-pump coronary artery bypass grafting in India



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ABSTRACT

Off-pump Coronary Artery Bypass Grafting (OPCAB) is the latest innovation in cardiac surgery. However OPCAB is not adopted universally. Even there have been suggestions of abandoning OPCAB in a special report. In India, OPCAB has been successfully adopted across the board. There are various evidences which favor OPCAB and are discussed in this review. The purpose of this review is to put forward the perspective of the OPCAB surgeons of our country and critically look at the suggestion of abandoning OPCAB.

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1. Introduction

Off-pump coronary artery bypass grafting (OPCAB) continues to flourish in India. There are concerns about the long-term results of this procedure and this has led to poor acceptance of this technique in North America. In North America it peaked to 25% and there has been a steady decline after that. There have been suggestions that OPCAB should be abandoned as it made surgeons lose their focus as regards to surgical revascularization.¹

We, surgeons of India, continue to evolve the technique of OPCAB. Many of us had adopted this technique after starting practice with on pump coronary artery bypass grafting (ONCAB). Newer generations of surgeons have successfully adopted this technique right from the beginning of their career. In a country with limited resources and very poor health insurance cover, it is commendable and praiseworthy that surgeons have successfully innovated the technique of

OPCAB which reduces the cost of CABG. This suits the need of the underprivileged population of the country suffering from an epidemic of coronary artery disease. However our colleagues from privileged parts of the world have been reluctant to adopt this technique.

The purpose of this review is to put forward the perspective of the OPCAB surgeons of our country and critically look at the suggestion of abandoning OPCAB.

2. OPCAB and conversion to ONCAB

Rate of OPCAB conversion to ONCAB is inversely proportional to the surgeons experience and OPCAB volume in a center. One can argue that many of these conversions are attributable to the panic reaction of inexperienced surgeons. We reported that near zero OPCAB conversion to ONCAB in unselected consecutive patients can be achieved by following a standardized protocol for hemodynamic stability and by judicious

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use of intra-aortic balloon pump (IABP) rather than ONCAB.² Similar protocol is reported from other parts of India.³ Surgeons in our country including the author are routinely performing OPCAB with MI <24 h, critical left main disease, poor left ventricular ejection fraction, dilated heart, ischemic mitral regurgitation and reoperative CABG. It is universal practice in India to use IABP for hemodynamic compromise refractory to inotropic therapy. Conversion is reserved for intractable ventricular arrhythmia refractory to IABP, medical therapy, multiple shocks and corrections of precipitating factors, if any. Moreover there are no studies of timely use of inotropic therapy and IABP on rate of conversion of OPCAB to ONCAB.

Majority of the surgeons practicing OPCABs have not converted to ONCAB for years.⁴ Similar results have been reported by our younger colleagues who have learned OPCAB from us. This shows that very low rate of OPCAB conversion can be easily achieved by change of mindset. OPCAB conversion is history and cannot be used as a point against OPCAB.

3. OPCAB and graft patency

Randomized controlled studies BHACAS⁵ and SMART⁶ have conclusively proven that OPCAB and ONCAB have similar graft patency. Multicenter CORONARY⁷ showed similar result at 1 year in spite of high OPCAB to ONCAB conversion rate (7.9%). This results are not duplicated in ROOBY trial⁸ which has 12.4% OPCAB conversion rate. Such high conversion rate proves the inexperience of the OPCAB surgeon and this explains the lower graft patency.

Graft patency is dependent on many factors. Surgeon dependent factors will be how gently the conduit is handled and harvested, anastomosis technique and various other technical factors. All these will not vary for a particular surgeon because his basic technique will remain the same in both OPCAB and ONCAB. SMART⁶ has conclusively proven that when performed by the same surgeon there were no differences in the long term graft patency. If OPCAB was inferior, it would have been reflected in the SMART trial. But in a very biased review,¹ it was concluded that OPCAB by an expert did not demonstrate superiority of OPCAB. It will be pertinent to argue, if one surgeon in the United States has been able to achieve OPCAB results comparable to ONCAB then why is the rest of the community not following? Is it inability to retrain or relearn? Majority of the OPCAB surgeons in India did observe very few OPCAB in their training period. But they have been able to retrain themselves in this technique. It may be argued it is the technique and experience of the surgeon that determines graft patency rather than OPCAB or ONCAB. So inferior graft patency rate cannot be a valid argument against OPCAB.

4. OPCAB and complete revascularization

There are concerns about complete revascularization during OPCAB. It is noted in SMART⁶ trial that complete revascularization is possible during OPCAB. Earlier

revascularization of posterolateral and inferior vessels used to be considered difficult. But with refinement of the technique these vessels are routinely grafted during OPCAB. Actually, grafting these vessels are easier during OPCAB as no assistance is required to retract the heart like in ONCAB.

We have reported average of 4.18 grafts per patient and 71.1% patients received 4 or more grafts.² The author had successfully performed upto 9 grafts in a patient with diffuse coronary artery disease. We feel that in absence of the stress of increasing aortic cross clamp time or cardiopulmonary bypass time, complete revascularization is performed more often than not. This is particularly true in patients with small vessels and diffuse coronary artery disease. We sometimes even have to cut across severely diseased segment and perform a long anastomosis using on-lay patch technique. The methodology of this is well documented in literature³ but still has been ignored by our colleagues from United States. It is common sense that a long anastomosis will increase the cardiopulmonary bypass and clamp time and deter surgeons from performing complete revascularization. With off-pump my personal threshold for sequentially grafting the LAD has become low—for distal LAD disease we are using sequential LIMA to graft mid and distal LAD while the ONCAB surgeons are inclined to leave the distal LAD disease to medical management.

Same argument will hold for deep intra-myocardial coronary artery and small sized coronary vessel. If a deep intra-myocardial vessel is not visible easily, during ONCAB one will be inclined not to graft that vessel. But during OPCAB we can search the vessel and if required relook at the angiography in the middle of the surgery. This luxury is not available during ONCAB. Innovative techniques⁹ reported from our country to tackle intra-myocardial arteries are often ignored by our western colleagues. The author feels that marsupialization can be performed during OPCAB as there is no stress of increasing pump time.

However the rare cases of intracavitary coronary artery cannot be grafted during OPCAB. So presence of intracavitary coronary artery is a contraindication to OPCAB.

Diffuse CAD is prevalent in our part of the world particularly in young patients.³ The spectrum of diffuse CAD which we have to treat frequently in our part of the world will often be labeled inoperable elsewhere. Various innovative techniques have been developed like on-lay patch plasty of distal disease which is routinely practiced by many OPCAB surgeons. Performing comparable revascularization during ONCAB will result in longer bypass and ischemic time. Coronary endarterectomy can be easily performed if required, during OPCAB. Fig. 1 shows a specimen removed from LAD of a very young patient with excellent early result (Fig. 2 and Fig. 3). It is not infrequent to find a patient who requires multiple endarterectomies to be performed (Fig. 4) and it has been found out it is easier to perform coronary endarterectomy during OPCAB.

Lateral wall revascularization difficulty during OPCAB is history. We are routinely revascularizing lateral wall vessels without any hemodynamic instability. Even ramus intermedius near AV groove can be easily grafted. Patients with dilated heart and poor ventricle benefit most from OPCAB and these are routinely performed in our country.

Re-operative CABG is not a contraindication to OPCAB even in presence of low EF. This is adopted universally by the

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