Coronary artery bypass surgery has been used for treatment of coronary artery disease with growing acceptance of the long-term durability, which contrasts with the higher requirements for reintervention after percutaneous therapies. However there were several clinical concerns such as inflammatory response, cardioplegic arrest, stroke and high morbidity/mortality in critically ill patients occurring during conventional on-pump coronary artery bypass grafting (ONCAB). Some of these causes from cardiopulmonary bypass. Cardiopulmonary bypass is associated with an acute phase reaction of protease cascades, leucocyte, and platelet activation that result in tissue injury. This is largely manifest as subclinical organ dysfunction that produces a clinical effect in those patients that generate an excessive inflammatory response or in those with limited functional reserve. The contribution of myocardial ischemia/reperfusion, secondary to aortic cross-clamping, and cardioplegic arrest, to the systemic inflammatory response and wider organ dysfunction is concerned. Off-pump coronary artery bypass grafting (OPCAB) developed to alleviate and minimize these.

The numbers of OPCAB patients and surgeons who performed OPCAB are increasing over the years with clinical evidences of improvement of outcomes. However, there were also negative studies that did not demonstrate the benefit of OPCAB. Several problems raised in these studies. General limitations of the randomized controlled trial include study design, patient selection, and inadequate sample size. For example, a prospective randomized study detecting statistically significant differences in 30-day mortality (2.9% ONCAB versus 2.4% OPCAB) requires the randomization of 15598 patients in each treatment group (α = 0.05, power = 0.8). Meta-analysis is a useful tool for formal summarizing the available information and creating hypotheses that may be tested in future trials. However limitations are flawed methods of each study, publication bias, variation of concomitant treatments (co-interventions) and heterogeneity of studies. The other common factor is surgical experience. OPCAB is a new technique and it requires a lot of practices to be able to do an efficient coronary anastomosis in all areas of the left ventricle.

In addition to the cardiopulmonary bypass, the quality of conduits for coronary bypass surgery also determines the clinical outcome and more important long-term survival after coronary bypass surgery. The traditional conduits are left internal thoracic artery (LITA) and saphenous vein graft (SVG). Kaplan–Meier (K-M) estimates of patency suggest that about 85–92% of LITA grafts are patent at 15 years. Unfortunately K-M estimates of patency of saphenous vein at 10 and 20 years are only 60% and 20% respectively. Because of growing evidences of benefits of arterial grafts, the right internal thoracic artery (RITA), right gastroepiploic artery (RGEA) and radial artery (RA) have been investigated and used more frequent. There was a survival benefit and a lower reintervention rate in favour of bilateral over single ITA grafting in a wide range of patients that continued into the third decade after
surgery. The radial artery graft gained popularity in the past 15 years since it is easily harvested and handle during the surgery. There were several studies confirmed its suitability and also excellent early results. There were two randomized trials regarding the RA patency namely “the radial artery patency and clinical outcomes (RAPCO) trial” and “the radial artery patency study (RAPS) trial”. RAPCO demonstrated that there are no clinical or angiographic differences between RA and free RITA or the SV graft at 5 years follow up. RAPS found the failure rate of RA was 8.2% versus failure rate of SVG 13.6% (p = 0.009). They concluded that the RA was superior to the SV. However if the seven RA conduits which had the “string-sign” were considered failures, instead of patent, the results were almost identical. The trials need to be followed for another 5 years, since the vein graft disease are rapidly progressed after 5 years of grafting. For RGEA, two large studies of about 1000 cases have indicated 5-year patencies of 62% and 86%. A current review indicated RGEA performance was similar to that of the SV. Low-grade stenosis of the target coronary artery proximally or competitive flow is a major cause of early RA and RGEA graft failure.

Between Jan 2005 and June 2010, 764 patients underwent isolated OPCAB at the Bangkok Heart Hospital. All arterial OPCAB was used in 566 patients (74%). LITA, RITA, RGEA, left RA and right RA were used in 97.3% (551/566), 17.2% (99/566), 21% (119/566), 85.7% (485/566) and 25.8% (146/566), respectively. Male was 83.7% (474/566). Mean age was 60.9±10.3 yrs. 67.5% (382/566) had hypertension and 42.2% (239/566) had diabetes. 35.3% (200/566) had significant left main coronary artery disease. Mean preoperative LVEF was 56.9±13.4 %. Average number of grafts was 4.1±1.4. The clinical outcomes were improved even high risk patients The 30-day mortality was 0% and there was no perioperative myocardial infarction, reoperation for bleeding, deep sternal wound infection and stroke in the year 2010 (Society of Thoracic Surgeons score: mean 1.3 ±1.2, median 0.85 and European system for cardiac operative risk evaluation score: mean 2.4±2.0%, median 1.4%).

The presentation addresses clinical review of OPCAB and factors contributing to improved outcomes of commonly used conduits, as well as clinical experience at the Bangkok Heart Hospital.

References


