

Off Pump Coronary Artery Bypass in patients with severe LV dysfunction. Is it really more challenging?

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Abstract

CABG (Coronary Artery Bypass Grafting) has been the treatment of choice for coronary artery disease for over 50 years and is the most common cardiac surgery procedure performed. Traditionally CABG was performed with the use of cardiopulmonary bypass and the use of cardioplegia to allow the surgeon to operate on a stable field. In the mid-1990s, interest emerged in performing CABG without the use of cardiopulmonary bypass - off pump CABG. This invited commentary focuses on sharing our experience with Low Ejection fraction off-pump CABG and why this approach could be beneficial to this patient population.

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CABG (Coronary Artery Bypass Grafting) has been the treatment of choice for coronary artery disease for over 50 years and is the most common cardiac surgery procedure performed¹. CABG has been shown to improve ischemic symptoms and prolong survival²⁻⁴.

Traditionally CABG was performed with the use of cardiopulmonary bypass and the use of cardioplegia to allow the surgeon to operate on a stable field. In the mid-1990s, interest emerged in performing CABG without the use of cardiopulmonary bypass off pump CABG. These efforts were done in order to reduce postoperative complications associated with the use of cardiopulmonary bypass, which included: systemic inflammatory response, cerebral dysfunction, and operative time⁵⁻¹³.

In a recent report by Ananthanarayanan et al. the team presented their experience with off pump CABG on a large cohort of patients with ischemic cardiomyopathy and severe left ventricular dysfunction¹⁴. In this study, they included 211 patients with severe LV dysfunction that underwent Off pump CABG and were able to identify some key points.

More importantly, they showed that preoperative EF is not a predictor of adverse outcomes; in fact, what is more important is the dimension of the left ventricle. The existing evidence in the literature on this subject is controversial, however this report points to the fact that dilated ventricles do worse compared to ventricles with low EF and otherwise normal dimensions.

Increased diameter of the LV indicates adverse ventricular remodeling and ventricular dilation with scarring. This is an irreversible state from which the heart will not recover regardless of revascularization. On the other hand, if the LV size is preserved, scar formation and adverse ventricular remodeling has not occurred yet and revascularization may be beneficial in the long run. In addition, dilated hearts are more prone to malignant arrhythmias and sudden cardiac death and this is especially true in patients with heart failure. Reports indicate that LV dilatation is better than EF to predict arrhythmias and sudden death^{15,16}.

As of now, amongst surgeons with solid operative experience, outcomes have shown to be similar between off-pump vs. on-pump CABG^{13,17}. There continues to be paucity in data on surgical strategies regarding how to perform Off pump CABG in patients with very low EF. Our group recently published a study in the Journal Of Cardiac Surgery on our approach.

Although cardiac surgeons sometimes shy away from performing off pump CABG in patients with low EF, that should not be the case. We believe that performing an Off pump CABG on a patient with low EF secondary to ischemic cardiomyopathy is technically easier and perhaps safer compared to a patient with active ischemia and normal EF.

The most important aspect of this is the heart's preconditioning to ischemia. A heart with active ischemia and normal EF is not preconditioned and may not tolerate manipulation well during off pump bypass surgery. These hearts can be very hyperdynamic and the walls move robustly so performing a distal anastomosis can be more challenging. In addition, the left anterior descending (LAD) coronary artery is way far to the left under the sternum and more manipulation is needed to perform the most critical anastomosis (LIMA-LAD).

On the other hand, when one performs Off pump CABG on a patient with low EF, it is often a technically easier operation. The heart is preconditioned to ischemia and is less "unpredictable". It usually tolerates more manipulation. Due to ventricular remodeling from chronic ischemia, the interventricular septum and LAD are often much closer to the right side towards the operating surgeon. The walls and heart are "quieter", and the distal anastomoses can be easier to perform; the myocardium is preconditioned to ischemia so there is more lie way in performing the operation.

We want to congratulate the authors for their interesting study and although we realize the challenge of performing Off pump CABG in patients with low EF in terms of long-term survival and outcomes, at the same time we would like to emphasize on the potential technical advantages that make this patient population a "good fit" for off pump coronary surgery.

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