Prospects of Off-Pump Coronary Bypass Surgery – An Unsettled Issue

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Key words: off-pump coronary artery bypass grafting, cardiopulmonary bypass, intracoronary shunts

In this month’s edition of IMAJ, Lev-Ran and colleagues report the results of off-pump coronary artery bypass grafting with 1,000 consecutive patients [1]. It is an important article demonstrating new trends in coronary bypass surgery.

Historically, cardiopulmonary bypass and cardioplegic arrest of the heart brought relative technical ease to cardiac surgery by providing a bloodless still surgical field while performing coronary anastomosis. This is indeed an important adjunct in guaranteeing safe and stable hemodynamics. There is no question that coronary bypass surgery during the last three decades of the 20th century demonstrated phenomenal success with outstanding early and late results in alleviating cardiac symptoms as well as prolonging life. It is estimated that in recent years approximately 1,000,000 CABG procedures are performed annually in the western world [2].

However, the use of cardiopulmonary bypass entails a host of accompanying problems. It induces a whole-body inflammatory response that is capable of causing significant morbidity [3]. Implicit in the technique of CPB is a non-pulsatile flow state that may also contribute to end-organ dysfunction. Employing CPB requires aortic cannulation and cross-clamping, which may lead to atheromatous embolization and organ damage, especially cerebral stroke and cognitive dysfunction.

In view of the above-mentioned potential complications of CPB, it is no surprise that during the early 1990s techniques of coronary bypass surgery without CPB, which were originally described at the inception of coronary bypass surgery, were revitalized and received tremendous momentum. The development of effective stabilizers and intracoronary shunts accelerated the popularity of off-pump coronary bypass surgery. It is currently estimated that 25% of all procedures in the United States and Europe are performed off-pump [4].

The goals set by off-pump coronary bypass surgery protagonists are to achieve: a) good early results (mortality, perioperative myocardial infarction) and late results (long-term graft patency, cardiac event-free survival rate, life expectancy) comparable to those of conventional CABG surgery; and b) better outcomes in high risk patients due to the inherent morbidities attributed to the use of CPB.

Today, after more than 10 years of accumulated experience with off-pump CABG surgery, what lessons can be learned from reviewing the literature?

- Although off-pump CABG is more demanding, early results are comparable to those of standard CABG (mortality, perioperative myocardial infarction) [5–7].
- Long-term results are not yet fully established. However, early patency rates of grafts seem to be matching those of standard surgery. These issues have yet to be clarified [8].
- The high expectations of improved outcome by avoiding CPB complications failed to materialize. Most importantly is the severe problem of perioperative stroke. To date, randomized studies have failed to demonstrate an advantage of off-pump surgery [9,10]. However, a retrospective STS database analysis including 118,440 patients did demonstrate a stroke benefit for off-pump CABG compared with on-pump (1.25% vs. 1.99%, P < 0.001) [7].

While the question of cognitive dysfunction is still hotly debated, there is no conclusive evidence that off-pump CABG surgery is beneficial [5,6]. Nonetheless, some clear advantages should be mentioned. One is blood utilization, with most series showing significantly reduced utilization of blood products [9,10]; another is shorter extubation time and reduced hospital stay [6,9,11,12].

In the new era of evidence-based medicine, we need solid evidence proving the advantage of off-pump CABG surgery in order to convert all CABG surgery into this modality. This might explain why off-pump CABG surgery has not gained universal acceptance and has not become the standard of practicing CABG surgery. It is hoped that future publications will settle this much debated issue. Nevertheless, it can be stated unequivocally that in clinical scenarios such as elderly patients with severe calcified aorta, or patients with significant chronic renal failure, off-pump CABG is the modality of choice.

The current article by Lev-Ran and colleagues [1] is an important contribution to the documented experience concerning off-pump surgery. It is the largest experience in Israel. However, this study could have elucidated the subject and increased our knowledge considerably more had they employed a better methodology. It is
not clear how the selection process to off/pump surgery was made. It would have been more informative to compare the results of the off-pump patient group with those of their standard on-pump patients. Nevertheless, despite these shortcomings, it is an important contribution to one of the most important and disputed fields in modern cardiac surgery.

References

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