

## OPCAB SURGERY IN GERIATRIC PATIENTS: EVIDENCE OF BENEFITS?

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### Objectives:

1. Review of the evidence-based outcomes in OPCAB surgery: low-risk and high-risk patients
2. To discuss the evidence of benefits of OPCAB surgery in elderly patients.

More than a decade after its reintroduction into mainstream surgery, off-pump bypass surgery continues to be hotly debated. Performing off-pump coronary artery bypass grafting on the beating heart without the use of cardiopulmonary bypass or cardioplegia (OPCAB) has a number of purported advantages over conventional CABG (CCAB) with the use of the cardiopulmonary bypass pump on the still heart. The main advantages claimed for OPCAB include: reductions in risk of death, stroke, myocardial infarction, arrhythmias, renal insufficiency, and neurocognitive dysfunction. However, randomized trials comparing OPCAB versus CCAB have produced varied results, and none of them individually has proven that OPCAB reduces the risk of death, stroke, or myocardial infarction when compared to CCAB. Impact on neurocognitive dysfunction has been especially heterogeneous, with some trials suggesting benefit and others suggesting no impact over the short and long term.

Since single studies have individually provided insufficient power to rule out the possibility that important differences may exist for outcomes such as death, myocardial infarction and stroke, comprehensive meta-analyses have been performed in order to appropriately synthesize all existing data to increase the power and precision of outcomes measured. A recent meta-analysis of 37 randomized trials comparing OPCAB with CCAB found no significant difference in death, stroke, and myocardial infarction (Cheng 2005). Cognitive dysfunction was improved over the short term, but not over longer term follow-up and was heterogeneous across trials. An updated meta-analysis suggests that stroke may be significantly reduced, while death and myocardial infarction remain not significantly improved with OPCAB versus CCAB (Puskas 2005).

The elderly patient population is one of the fastest growing populations groups worldwide. As life expectancy lengthens, there is a commensurate increase in the number of septuagenarians and octogenarians presenting for coronary artery bypass surgery for the symptomatic relief of angina or dyspnea. Age has traditionally been recognized as an independent predictor of mortality in patients undergoing CABG. Along with increasing age, a number of comorbidities also increasingly manifest in this patient population over time (diabetes, renal insufficiency, pulmonary disease, cerebrovascular disease, atheromatous aorta), each of which may also be independently associated with mortality in CABG. Despite the increasing complexity and baseline risk of elderly patients undergoing CABG, mortality has been decreasing over time for this patient population (Maganti 2009; McKellar 2008). It

has been suggested that improved operative techniques, including use of OPCAB may be contributing to this improved survival. (Bergsland 1997) However, the evidence for the contribution of OPCAB to improvements over time should be examined directly to determine which outcomes are improved, and whether there are age thresholds beyond which OPCAB may be too risky.

Since randomized trials usually exclude the oldest patients (to date, the mean age in randomized trials of OPCAB vs. CCAB has been 61 years of age, with relatively few diseased vessels), we recently performed a comprehensive meta-analysis of all studies, whether randomized or observational, comparing OPCAB versus CCAB in elderly patients over age 65 years. A total of 22 studies met the inclusion criteria, including 1 randomized trial and 21 non-randomized studies that enrolled 6795 patients. Since most trials were non-randomized and retrospective, careful analysis of patient characteristics was undertaken to identify any baseline characteristic imbalances. Metaregression was performed to explore the impact of baseline differences on outcome estimates. All clinically relevant outcomes and resource related outcomes were analyzed.

Systematic review and meta-analysis of these studies showed that patients undergoing OPCAB were on average older than patients undergoing CCAB (+0.45 years), but had significantly fewer grafts performed (-0.57 graft). Despite these differences, OPCAB significantly reduced the risk of death within 30 days by 40%. Cumulative mortality at 1 to 3 years' follow up was also reduced by 51% for OPCAB compared with CCAB in elderly patients. The risk of stroke was reduced by 58%, myocardial infarction by 37%, atrial fibrillation by 22%, low cardiac output syndrome by 46%, prolonged ventilation by 38% and renal insufficiency by 44%. Wound infections, need for intra-aortic balloon pump, and reexploration for bleeding were not significantly different for OPCAB versus CCAB. Concerns about longevity of grafts for OPCAB versus CCAB were not borne out by differences in reintervention rates, and risk of angina recurrence was similar between groups at 1 to 3 year follow-up. Unfortunately, neurocognitive dysfunction was not significantly reduced with OPCAB versus CCAB, and was poorly reported in the clinical trials.

Metaregression showed that the survival benefit of OPCAB over CCAB increased with increasing age, and was strongest for octogenarians. Similarly, the benefit of OPCAB over CCAB for reduction in stroke risk was highest in octogenarians. Metaregression confirmed the consistency of benefits of other outcomes with increasing age, and showed that the lower number of grafts in the OPCAB group was not related to estimates of benefit. Nevertheless, too few trials reported angina recurrence to test the association between eventual recurrence of angina and number of grafts performed. A number of resource related outcomes were significantly improved with OPCAB versus CCAB in elderly populations, including ventilation time reduction by 12 minutes, ICU length of stay reduction by 0.4 days, hospital stay reduction by 2 days.

Overall, current evidence suggests that elderly patients benefit significantly from an off-pump approach to coronary artery bypass surgery. Clinically relevant reductions in risk of the most devastating complications of surgery, including death, stroke, atrial fibrillation, respiratory failure and renal insufficiency, are achieved with preferential use of OPCAB instead of CCAB. Unfortunately,

neurocognitive decline has not been proven to be ameliorated with OPCAB. Future studies are encouraged to determine methods to mitigate neurocognitive decline.

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