# Anaesthesia for coronary artery bypass: should it differ off-pump and on-pump?

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The advent of suction myocardial stabilizers has caused a resurgence in off-pump coronary artery bypass (OPCAB). It may avoid end-organ injury associated with cardiopulmonary bypass, e.g. stroke, neuropsychological and renal dysfunction. Both low- and high-risk patients have improved outcomes with OPCAB (Moshkovitz et al, 1995; Nierich et al, 1999; Arom et al, 2000).

With conventional surgery global myocardial ischaemia is caused by aortic cross clamping and cardioplegic arrest which is managed by decreasing myocardial oxygen demand. In OPCAB normothermic regional ischaemia is managed by minimizing the area of ischaemia by maintaining adequate perfusion pressure.

## ADVANTAGES OF OPCAB

The advantages of OPCAB are decreased postoperative ventilation and hospital stay (Abu-Omar and Taggart, 2002); decreased transfusion requirements and incidence of coagulopathies; reduced incidence of systemic inflammatory response syndrome; fewer arrhythmias, neurological and renal sequelae; decreased cardiac enzymes and lower inotrope requirement suggesting less perioperative ischaemia.

## DISADVANTAGES OF OPCAB

Technical difficulties can reduce graft patency so experienced surgical input is required. The long-term efficacy and safety with respect to graft patency and morbidity has yet to be evaluated.

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## GOALS OF ANAESTHESIA

The main aims of anaesthesia for OPCAB are to maintain cardiovascular stability, maximize myocardial protection and to achieve early extubation and ambulation. The need to maintain haemodynamic stability and sinus rhythm are the main problems. These require a high level of communication between surgeon and anaesthetist to indicate displacement of the heart, occlusion or shunting of coronary arteries, use of inotropes and vasopressors, rhythm disturbances and wall motion abnormalities. Continuous observation and treatment of haemodynamic and rhythm disturbances are essential.

## CONDUCT OF ANAESTHESIA

Anaesthetic management requires a technique geared towards early extubation (Moshkovitz et al, 1995). Opioid premedication and long-acting neuromuscular blockers should be avoided. Continuous infusions of opioids, total intravenous anaesthetic techniques and avoidance of volatile anaesthetic agents help shorten recovery time.

The dose of heparin, target activated clotting time (ACT) and reversal of anticoagulation are not uniformly agreed, although an ACT > 300 seconds is recommended. Maintaining normothermia is essential but difficult as much of the patient is exposed during surgery.

Myocardial oxygen consumption can be decreased by afterload reduction and avoiding tachycardia. Myocardial oxygen delivery can be increased by ensuring adequate mean arterial pressure (MAP). Increasing preload with fluid is usually necessary, trendelenburg positioning helps maintain MAP when the heart is lifted. Alpha agonists such as phenylephrine increase afterload without markedly increasing myocardial oxygen consumption.

Grafting the left anterior descending artery first may improve cardiac output before displacement of the heart to graft the circumflex and right coronary arteries. Intra-coronary shunts can maintain distal coronary perfusion.

## MONITORING DURING OPCAB

Displacement of the heart may affect the electrocardiogram, pulmonary artery pressure and central venous pressure.

There is debate about the best way to monitor cardiac output: pulmonary artery catheters, mixed venous oxygen saturations, continuous pulse contour cardiac output monitors and transoesophageal echocardiography (TOE) are all used. Heart displacement affects TOE image quality and orientation, but it is important for identifying regional wall motion abnormalities and therefore graft patency, and assessing global ventricular function.

## CONCLUSION

The anaesthetic technique should be modified for OPCAB. A team approach is essential for a successful outcome. HM

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