

Appendix 1: Beating Heart CABG Anesthesia Protocol

Thorough Preoperative Evaluation Preanesthetic Preparation and Medication

1. All antianginal and antihypertensive medications continued till the morning of surgery with exception of angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs).
2. Control of diabetes mellitus is ensured.
3. Sedative premedication consists of oral diazepam the night before and about 2 hours prior to surgery.
4. Atenolol/metoprolol 25 to 50 mg orally, 2 hours prior to surgery is included unless contraindicated.

General Anesthesia Induction and Maintenance

1. Monitoring of EKG with 5 leads with simultaneous display of leads II and V₅ and automated ST segment analysis, pulse oximetry, and direct arterial blood pressure established.
2. Preoxygenation for 3 to 5 minutes ensured.
3. Anesthesia induced with intravenous fentanyl 3–5 mcg/kg, midazolam 0.05–0.1 mg/kg + intravenous propofol 0.5–1 mg/kg.
4. Muscle paralysis achieved with pancuronium or vecuronium and intubation performed.
5. Anesthesia maintained with O₂+air+ end-tidal isoflurane of 1%, fentanyl is used in a total dose of 10–15 mcg/kg for the entire procedure.
6. Hemodynamic responses titrated with intravenous nitroglycerin ± dobutamine or adrenaline infusion through central venous access.
7. Perioperative management tailored to achieve early extubation and fast-tracking.

Heparinization

Heparin in a dose of 300 units/kg administered. Repeated in a dose of 100 units/kg every hour till grafting completed. Activated clotting time (ACT) is maintained over 300 seconds. Reversal at the end of grafting with protamine 1–2 mg/kg.

Normothermia Maintained

1. Warm intravenous fluids.
2. Heating mattress underneath.
3. Bair Hugger.
4. Humidified airway.
5. Warm operation room (OR).

Monitoring Hemodynamic Stability

1. EKG: Simultaneous lead I, II, and V₅ with ST segment analysis.
2. Arterial pressure using invasive arterial catheter.
3. Central venous pressure.
4. Pulmonary artery (PA) catheter is used in patients with poor left ventricular function < EF 40% and transesophageal echo (TEE) is used to assess the mitral valve and confirm mechanism and grade of mitral regurgitation, if any.
5. Urine output with an indwelling catheter.

Maintaining Hemodynamic Stability

1. Nitroglycerin intravenously: titrated to desired effect. Proximal anastomosis on aorta performed with a systolic arterial pressure (SAP) of 80–90 mm Hg and the distal anastomosis performed with SAP of 110–120 mm Hg unless indicated otherwise. A gradual rise and fall in ambulatory blood pressure (ABP) to the desired level advocated rather than a rapid change to prevent overshoot hypotension or hypertension.
2. Phenylephrine intravenously: 1–2 µg/kg administered as boluses titrated to desired effect of SAP of 100–120 mm Hg during manipulation of the heart and distal grafting. Post-CABG, inotropes preferably noradrenaline, adrenaline used as needed to maintain a mean arterial pressure of 70 mm Hg and above. Postoperatively patients are electively ventilated for 2–4 hours till fully conscious, warm, not bleeding, and then extubated after a short trial of spontaneous respiration.