

CABG with CPB: the Surgical Procedure

A. Anesthetic agents:

1. Induction: Thiopental, Etomidate
1. Narcotics: Fentanyl, Sufentanil, Alfentanil, Remifentanyl.
2. Inhalation agents: Isoflurane (most common), Halothane, Enflurane.
3. Sedatives: Midazolam before CPB, Propofol after CPB.
4. Neuromuscular blockade: Vecuronium, Doxacurium, Atracurium

B. Median sternotomy is performed to avoid entering pleural spaces.

The pericardium is opened. If grafting with internal thoracic artery (ITA), pleural cavity must be opened, which requires a pleural chest tube.

C. Pt placed on **cardiopulmonary bypass**: (see "CPB" on page 5)

1. Pump is primed with fluid (usually RL, but sometimes albumin).
The primer hemodilutes, which reduces blood viscosity and decreases the tendency to form microthrombi. Hct should be kept $> 25\%$.
2. Heparin 3 - 4 mg/kg (300-400 Units/kg) is given to achieve ACT > 400 . If history of HIT, then hirudin or lepirudin is given instead of Heparin.
3. Venous cannulas are placed in the vena cavae or right atrium.
4. Arterial cannulas are placed in the ascending aorta or femoral artery.
5. Roller pump is adjusted to maintain flow 2.0 - 2.4 L/min/m². Flow rate kept to minimum to minimize trauma to RBC's and platelets.
6. Best if perfusion time (pump time) is < 2.5 hrs.

D. The **left ventricle is vented** and aspirated with a cannula to prevent overdilatation of the chamber. Venting incurs risks: cerebral or coronary air embolism, postop bleeding from the site, platelet and red cell damage.

E. The **pulmonary artery is vented** to prevent blood return to the heart and warming of subendocardial surfaces.

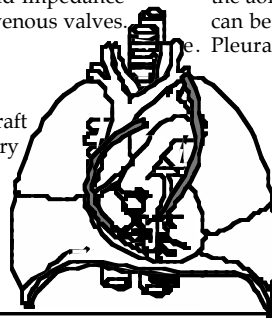
F. The heart is arrested

1. The aorta is cross-clamped.
2. Cold (4° - 6° C), hyperkalemic, crystalloid or blood cardioplegia is given antegrade into the aortic root and/or retrograde into the coronary sinus.
3. The pericardium may be filled with iced RL (4° C) to keep myocardial temp $< 15^{\circ}$ C. Continuous irrigation of the pericardium with cold NS may be performed. Hypothermic injury to the phrenic nerve can occur.
4. Body temp falls to 28° - 32° C in the OR, which \downarrow tissue O₂ demand.
5. Cardiac arrest is maintained for about 90 - 120 mins.

G. The vascular **jump grafts are harvested**:

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| 1. Saphenous vein graft (SVG) | 2. Internal Thoracic Artery (ITA) |
| a. Removed from thigh or lower extremity through multiple short incisions or one long one. | a. Arises from the subclavian artery. Often used as a pedicle graft (the distal end is anastomosed to the coronary artery) |
| b. Tributaries are ligated, the vein is irrigated to check for leaks. | b. Left ITA is used to graft the LAD. Right ITA for the Rt coronary artery |
| c. Manipulation is minimized to avoid vasospasm & thrombosis. | c. Sequential anastomoses of a single ITA can extend its use. |
| d. The veins are grafted to the coronary arteries in reversed position to avoid impedance to flow by the venous valves. | d. As a free graft, if anastomosed at the aorta, the posterior coronaries can be reached. |
| | e. Pleural chest tube will be needed. |

Saphenous vein graft to the right coronary artery



Internal thoracic artery graft to the left anterior descending coronary artery.