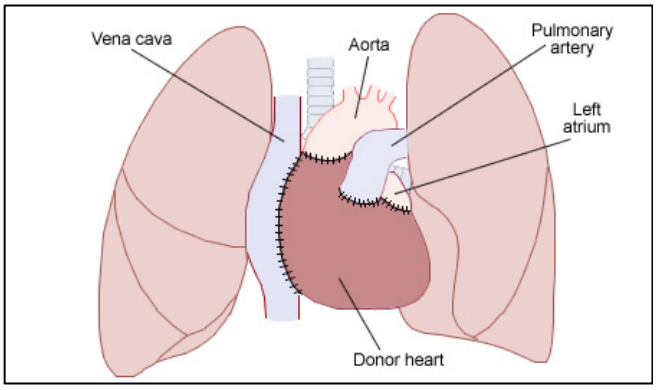
# Heart Transplant Physiology

**Anesthetic Pearls:** The Anesthetic Implications and Management of the Transplanted Heart

- Hallmark of the transplanted heart is denervation which leads to unresponsive to any interventions mediated through the recipient's autonomic nervous system
- Baseline resting heart rate of transplant recipients will be relatively high owing to absence of vagal tone
- Cardiac impulse formation and conduction are normal owing to the retention of native / donor cardiac SA and AV nodal tissue
- Metabolic regulation of coronary blood flow is preserved
- Majority of patients receiving Cyclosporine suffer from HTN and early coronary atherosclerosis
- Stress-induced increases in CO are due to increases in stroke volume therefore maintenance of preload is crucial to ensure adequate cardiovascular response to physiologic stressors such as anesthesia



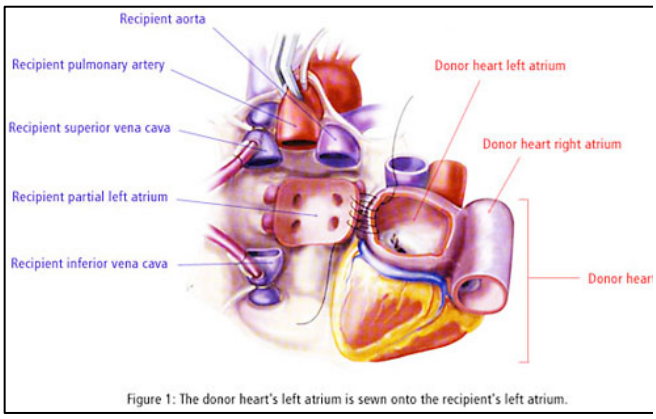



Figure 1: The donor heart's left atrium is sewn onto the recipient's left atrium.

**Drug Effects on the Denervated Heart**

**I. Anesthetic Drugs**

1. Pancuronium – no increase of HR
2. Neostigmine & Edrophonium – may decrease HR (peripheral [non-cardiac] cholinergic properties remain intact)
3. Fentanyl – no decrease of HR secondary to vagotonic effects
4. Demerol – no increase of HR secondary to vagolytic effects

**II. Cardiac Drugs**

1. Isoproterenol – potent intropic & chronotropic effects (may have an exaggerated effect)
2. Digoxin – the initial vagotonic effect is absent (inotropic); chronic decrease of AV nodal conduction is retained as with the innervated myocardium
3. Atropine & Glycopyrrolate – no increase of HR (peripheral vagolytic properties remain intact)
4. Ephedrine – has decreased effect (only direct effect remains intact)

**Interesting fact**:

Newer evidence suggests that the transplanted heart has partial restoration of sympathetic innervation after 3-5 years. The regenerated / regrown innervation is associated with improved responses of heart rate and contractile function to exercise. These results support the functional importance of re-innervation in transplanted hearts. Care must be taken to adequately check the patient for responsiveness of cardiac sympathetic medications.