Aortic Dissection
Causes of Death

- Rupture aorta 33.3%
- Unspecified 33.3%
- Neurological deficit 13.9%
- Visceral ischemia/kidney failure 11.5%
- Cardiac tamponade 7.9%

(Circulation 2002;105:200-6)
Medical Management

- Detailed medical Hx and complete physical examination
- Intravenous line, blood sample (CK, TnT(I), myoglobin, WBC, D-dimer, Hct, LDH)
- ECG: documentation of ischemia
- HR and BP monitoring
- Pain relief (morphine)
- ↓SBP using β–blockers, additional vasodilator in patient with sever HT
- Transfer to intensive care unit
Medical Management

• Pain relief and calming
  – Morphine sulphate

• Decrease shearing force and BP
  – Betablocker: HR ~ 60 bpm
  – Calcium channel blocker in COPD patient

• Decrease BP in severe hypertension
  – Addition of vasodilator: Sodium nitroprusside
    keep BP as low as possible (100-120 mmHg)
Surgical Therapy of Acute Type A Aortic Dissection

• Emergency surgery to avoid tamponade/aortic rupture

• Valve-preserve surgery
  – Tubular graft *if* normal sized aortic root and no pathological changes of valve cusps

• Replacement of aorta and aortic valve (composite graft) *if* ectatic proximal aorta and/or pathological changes of valve/aortic wall
Indications for Surgery in Type B Aortic Dissection

- Persistent, recurrent chest pain
- Early aortic expansion
- Aortic rupture
- Periaortic hematoma
- Mediastinal hematoma
- Peripheral ischemic complications
Cardiac Tamponade
Pericardiocentasis
CCU Equipment

- Intravenous (IV) Infusion Bag
- Infusion Pump
- Mechanical Ventilator
- Heart Monitor
- Nasogastric Tube
- IV Catheter
- Electrodes
General intensive care unit
Equipment

• Monitoring equipment
  – Non-invasive:
    • Blood pressure, EKG (Telemetry system), Pulse oximetry, Capnometer
  – Invasive
    • Arterial BP monitoring
    • CVP via central line
    • PA catheter – PAP, PCWP

• Life support and emergency resuscitation
  – Ventilator
  – Infusion-pump device
  – Emergency cart containing resuscitation equipment including defibrillator, airway intubation devices, bag/mask, medication box
  – Central line
General intensive care unit Equipment

• Diagnostic equipment
  – Mobile X-ray Unit
  – Portable echo
  – Portable clinical lab device

• Disposable equipment
  – Arterial and central venous lines
  – Swan-Ganz (PA) catheters
  – Chest and endotracheal tubes
  – GI an NG tubes
  – Monitoring electrodes
ECG Monitoring (Telemetry)
ECG Monitoring
Continuous intraarterial blood pressure
CCU equipment

- IABP (Intra-aortic balloon pump)
- Swan-Ganz (PA) catheter
- Defibrillator
- Temporary pacemaker
- Echocardiography (portable)
IABP (Intra-aortic Balloon Pump)
IABP Catheter Placement
Principles of Counterpulsation

**Diastole:**
- IAB Inflation
- Increase coronary perfusion
- Enhance pulsatile coronary artery flow

**Systole:**
- IAB Deflation
- Decrease cardiac work
- Decrease myocardial oxygen consumption
- Increase cardiac output
Principle of Counterpulsation
Indication for IABP

• Acute myocardial infarction with
  – Cardiogenic shock
  – Refractory angina
  – Mechanical complication e.g.. VSD, acute MR from rupture papillary muscle
• Refractory unstable angina
• Ischemic related intractable ventricular arrhythmias
Indication for IABP(2)

- Bridge to cardiac transplantation
- Prophylaxis or support to intervention in high risk patient
- Cardiac support for high risk patient before cardiac surgery
- Support in severe CAD patients for non-cardiac surgery
Contraindication

- Aortic regurgitation
- Abdominal aortic aneurysm or dissection
- Uncontrolled bleeding
- Severe bilateral peripheral vascular disease
- Bilateral femoral popliteal bypass graft of PVD
- Uncontrolled sepsis
Invasive Hemodynamic Monitoring in CCU

Pulmonary Artery Catheter
(Swan-Ganz Catheter)
Functions of PA Catheter

- Allows for continuous bedside monitoring of the following:
  - Vascular tone, myocardial contractility, and fluid balance can be correctly assessed and managed.
  - Measures Pulmonary Artery Pressures, CVP, and allows for hemodynamic calculated values.
  - Measures Cardiac Output. (Thermodilution)
  - SvO2 monitoring (Fiber optic)
  - Fluid administration.
Markings on catheter.
1. Each thin line = 10 cm.
2. Each thick line = 50 cm.
Description of PA Catheter

*Ports/lumens.*

**CVP** Proximal (pressure line - injectate port for CO) - **BLUE**

**PA** Distal (Pressure line hook up) - **Yellow**

Extra port - usually - **Clear**

Thermistor – **Red Cap**
Continuous Cardiac Output and SVO₂ monitoring
Indications for PA catheter

• The pulmonary artery catheter is indicated in patients whose cardiopulmonary pressures, flows, and circulating volume require precise, intensive management.
  • MI - cardiogenic shock - CHF
  • Shock - all types
  • Valvular dysfunction
  • Preoperative, Intraoperative, and Postoperative Monitoring
  • ARDS, Burns, Trauma, Renal Failure
Access site
Internal jugular or Subclavian vein
Using the Swan-Ganz catheter to diagnose type of shock

<table>
<thead>
<tr>
<th>Condition</th>
<th>HR</th>
<th>MAP</th>
<th>CO/CI</th>
<th>CVP/RAP</th>
<th>PAP/PAWP</th>
<th>Notes</th>
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<td>Left ventricular failure</td>
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<tr>
<td>Cardiogenic pulmonary edema</td>
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<td>PAWP &gt; 25mmHg</td>
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<td>PAWP &gt; 5mmHg by</td>
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<td>giant ‘V’ waves on PAWP trace</td>
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<tr>
<td>Acute mitral regurgitation</td>
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<td>giant ‘V’ waves on PAWP trace</td>
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<tr>
<td>Cardiac tamponade</td>
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<td>PAD/PAWP equalised</td>
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<td>Right ventricular failure</td>
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<td>PAP &lt; N PAWP</td>
<td>RVEDV</td>
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<tr>
<td>Cardiogenic shock</td>
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<td>O2 extraction + SVR</td>
</tr>
<tr>
<td>Septic shock</td>
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<td>O2 extraction + SVR</td>
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</tbody>
</table>
Defibrillators

• Automated External Defibrillators (AED)
• **Manual Defibrillators**  
  – New models : may have AED mode
Electrode Placement

• Paddles or Pads
  – Well-separated paddles/pads
  – Bare chest (may need to remove hair by shaving or briskly removing of an adhesive pad; may need to wipe out water or sweat)
Electrode Placement

• Paddles or Pads
  – No paste or gel smeared on the chest between paddles
  – Not place on top of a transdermal medical patch
  – Not place over or close to device generator (eg. Permanent pacemaker, AICD)
Electrodes Placement

Standard Paddles Placement
Self adhesive pads Placement
A-P Electrode Placement

Antero-posterior Placement
Defibrillator

• Defibrillation (asynchronous)
• Cardioversion (synchronous)
• Transcutaneous pacing
• Bedside monitoring
  – ECG
  – Pulse oxymeter
Defibrillation: Shockable Arrhythmia

VT: Ventricular Tachycardia (Monomorphic)

VT: Ventricular Tachycardia (Polymorphic)

VF: Ventricular Fibrillation
Synchronized Cardioversion

• Shock delivery that is timed (synchronized) with the QRS complex
  – Avoid shock during the relative refractory period which can cause VF

• Indicated in Unstable tachyarrhythmia associated with
  – Organized QRS complex AND perfusion rhythm (pulse)

• Recommended in Supraventricular tachycardia (SVT), Atrial fibrillation (AF), Atrial flutter, or hemodynamic stable monomorphic VT
Synchronized Cardioversion

- Not used in treatment of
  - VF
  - Pulseless VT
  - Unstable polymorphic VT
  \( \rightarrow \text{No use in sudden cardiac arrest} \) \( \leftarrow \)

- Not effective in
  - Junctional tachycardia, ectopic or multifocal atrial tachycardia, sinus tachycardia
Pacemaker

• Permanent Pacemaker
  – Single chamber, Dual chamber, Bi-V pacemaker, etc.

• Temporary Pacemaker \( \rightarrow \) usually used in CCU/ ICU/ Emergency room
  – Transcutaneous
  – Transvenous
Transcutaneous Temporary Pacing

- Pacer (Defibrillator with pacer mode)
- Adhesive pads (on chest wall)
Transvenous Pacing

- External Pacer
- Transvenous pacing wire

![Image of an external pacer]

![Diagram of a transvenous pacing wire]

- Quick release luer activated valve
- Lace-free compliant balloon
- Atraumatic tip
- Depth markings
- Shredded (USA) or Unshredded (non-USA)
Common Access Sites

• Transvenous lead
  – Internal Jugular vein
  – Subclavian/Axillary vein
  – Femoral vein

• Epicardial lead (usually for post open heart surgery)

• Emergency pacing - transcutaneous
Indication for transvenous temporary pacemaker

1. **BRADYCARDIA**
   - Heart rate <60 bpm and inadequate for clinical condition

2. 
   - Maintain patent airway; assist breathing as needed
   - Give oxygen
   - Monitor ECG (identify rhythm), blood pressure, oximetry
   - Establish IV access

3. **Signs or symptoms of poor perfusion caused by the bradycardia?**
   (e.g., acute altered mental status, ongoing chest pain, hypotension or other signs of shock)

4. **Observe/Monitor**
   - Adequate Perfusion
   - Poor Perfusion

   **Adequate Perfusion**
   - Prepare for transcutaneous pacing; use without delay for high-degree block (type II second-degree block or third-degree AV block)
   - Consider atropine 0.5 mg IV while awaiting pacer. May repeat to a total dose of 3 mg. If ineffective, begin pacing
   - Consider epinephrine (2 to 10 μg/min) or dopamine (2 to 10 μg/kg per minute) infusion while awaiting pacer or if pacing ineffective

   **Poor Perfusion**
   - Prepare for transvenous pacing
   - Treat contributing causes
   - Consider expert consultation
Portable Echocardiography
Echocardiogram
Echocardiogram