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School of Nurse Anesthesia
Case Review/ Analysis
Abdominal Aortic Aneurysm

“AAA”

Incidence
Mortality
Rupture
Objectives

• Analyze the preoperative evaluation of a patient undergoing a two-staged surgery:
  – Arterial Ilio-Renal Bypass
  – Endovascular Abdominal Aortic Aneurysm Repair

• Describe anesthetic implications of several comorbidities: Glaucoma, Chronic Obstructive Pulmonary Disease, Alcoholic Cardiomyopathy, Chronic Renal Insufficiency.

• Describe the surgical and anesthetic considerations of both these surgeries.
2- Staged Surgery

Ilio-Renal bypass

4 days later

Endovascular AAA Repair

Complexity

Anatomy

Time

- Surgical
- Anesthesia
Indication for Surgery

- **7.7 x 8 cm** AAA extending into the right common iliac artery

- **Congenital anomaly**
Aneurysm

iliac arteries

AORTA

K

K
Question

• What is the difference between a “true” and “false” aneurysm?
**True:** bounded by the complete vessel wall

**False:** (pseudoaneurysm) localized dissection (tear) in the inner wall of the artery

**Dissection**: separation between the intima and media layer (1)

- A *false* lumen for blood flow is created

**Intramural hematoma** is considered a precursor to dissection and is medically treated the same (1)
Classification (anatomical)

Berry
Fusiform
Dissecting
Saccular

Richard E. Klabunde
www.cvphysiology.com
## Classification of Arterial Aneurysm by Cause

<table>
<thead>
<tr>
<th>Congenital</th>
<th>Mechanical</th>
<th>Inflammatory</th>
<th>Infectious</th>
<th>Degenerative</th>
<th>Anastomosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ehlers-Danlos Syndrome</td>
<td>Post-stenotic</td>
<td>Takayasu</td>
<td>Bacterial</td>
<td>Nonspecific</td>
<td>Post-arteriotomy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marfan Syndrome</td>
<td>AV fistula associated</td>
<td>Behcet</td>
<td>Fungal</td>
<td>Sclerotic arteries</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td>Kawasaki</td>
<td>Spirochetal</td>
<td></td>
<td>Dysplastic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microvascular disorders</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Table: Nagelhout & Plaus, 2010, p. 539)
Physical Exam

- Screening by palpation followed by ultrasound decreases mortality --
  - Especially in male smokers > 65 years old (2)
  - Male to female ratio = 9:1 (3)

Size of the aneurysm is the MOST important determining factor for rupture! (3)
Physical Exam

• Periumbilical or abdominal mass with expansile pulsations **3 cm or wider** suggests AAA (2)
  – Sensitivity to palpation increases as the size increases (2)

• > **4 cm** usually palpable = Rupture 15 X’s more likely (2)

• > **5 cm** rupture and mortality dramatically increases (3)

• > **5.5 cm** surgical intervention recommended (5, p. 530)
Risk Factors

**Smoking** is the strongest independent risk factor. (3)
- 90% of people who develop AAA have history of smoking (3)

**Hypertension** is present in 60% of patients with aneurysmal lesions. (5)

**Genetics** may also contribute to the predisposition for development. (5)

**Obesity** is not an independent risk factor but may mask signs and symptoms until complications arise. (5)
Pathogenesis

**Atherosclerosis** – thought to be the primary cause of AAA’s in more than 90% of patients. (5)

- This theory has been challenged

- Some speculate aneurysmal development may be the result from **proteolysis of elastin and collagen within the vessel wall.** (5)

- Inflammation and Immune responses (5)
Pathogenesis

- Inflammation
- Degradation of elastin and collagen
- Thrombus formation
- Weakening of the arterial wall
- Distending forces (3, p. 301-310)
Pathogenesis

Tension = Pressure \times \text{Radius}

As aneurysm grows \rightarrow tension increases
Medical History
Medical history

• Arthritis
• Gastroesophageal Reflux Disease (GERD)
• Glaucoma
• Severe Chronic Obstructive Pulmonary Disease (COPD)
• Alcoholic Cardiomyopathy
• Hyperlipidemia
• Hypertension
• Congenital Anomaly
• Chronic Renal Insufficiency (CRI)
Medical History
1.) Glaucoma
2.) COPD
3.) CMO
4.) CRI

Glaucoma
Glaucoma

Intraocular pressure
10 – 21.7 mmHg

> 22 mmHg  Abnormal

Primary open (simple) angle
- Chronic
- MOST common
- Resistance to outflow

Closed angle
- Acute
- 1/10 as common
- Obstruction to outflow

RISK = optic nerve ischemia
- Blindness

GOAL = minimize ↑ IOP
Glaucoma – **Key Points**

- Maintain eye drops
- Avoid venous congestion and overhydration \(^{(1)}\)
- Avoid hypotensive episodes \(^{(1)}\)
  - Prone to retinal vascular thrombosis

**Scopolamine** – do **not** use in glaucoma \(^{(1)}\)
  - **Greatest** mydriatic effect
Medical History
1.) Glaucoma
2.) **COPD**
3.) CMO
4.) CRI
COPD

**Emphysema**

- Enlargement of air spaces

**Bronchitis**

- Excessive mucus production
- Hypertrophy of mucus glands
  - "Reid Index" (13)
# COPD – Features

<table>
<thead>
<tr>
<th>Emphysema (type A) → Pink Puffer</th>
<th>Bronchitis (type B) → Blue Bloater</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ dyspnea over years</td>
<td>↑ dyspnea over years</td>
</tr>
<tr>
<td>Little/no cough</td>
<td>Frequent cough with sputum</td>
</tr>
<tr>
<td>Marked chest overexpansion</td>
<td>Moderate or no ↑ chest volume</td>
</tr>
<tr>
<td>No cyanosis</td>
<td>Cyanosis</td>
</tr>
<tr>
<td>Quiet breath sounds</td>
<td>Rales, rhonchi</td>
</tr>
<tr>
<td>Normal JVP</td>
<td>May have raised JVP</td>
</tr>
<tr>
<td>No peripheral edema</td>
<td>May have peripheral edema</td>
</tr>
<tr>
<td>Slight depressed arterial PO₂</td>
<td>Very low PO₂</td>
</tr>
<tr>
<td>Arterial PCO₂ normal</td>
<td>↑ PCO₂</td>
</tr>
</tbody>
</table>

(Table: West, 2008, p. 61)

**Cor Pulmonale = COMMON** (13)
COPD

• Functional loss of pulmonary capillaries = (5)

- Occurs gradually
- Right ventricle compensation occurs

Longstanding COPD: Suspect pulmonary artery hypertension & chronic cor pulmonale
- Especially if PaO₂ < 60 mmHg
- HYPOXIA = **most** potent stimulus for pulmonary vasoconstriction
COPD

Is clinical status optimized?

Quit smoking

Screen for impending exacerbations
- Consider: ABX, bronchodilators, postpone

Neuraxial anesthesia planned →
Sensory anesthesia *above T6 not* recommended (5)

Room Air SpO₂, ABG, Electrolytes

PFT’s ? Invasive Monitoring ?
COPD

Preoxygenation
Bronchodilators
Inhaled anesthetics may not reverse airflow obstruction, in contrast with asthmatic patients.
Avoid Nitrous
ABG monitoring
Ventilate to Normalize pH
**COPD**

**Extubation Concerns:**
- Bronchospasm
- Deep extubation = risk of inadequate ventilation & CO$_2$ retention

**Adequate Analgesia:**
- Careful use of narcotics
- Epidural = reduction in systemic narcotic requirements
- Tolerate respiratory regimen
Medical History
1.) Glaucoma
2.) COPD
3.) CMO
4.) CRI

Cardiomyopathy
Ejection Fraction
(EF)
Cardiomyopathy

• What exactly is an “Ejection Fraction”?
  – Normal EF Range = 60-70%

• EF = \((EDV-ESV) / EDV\) (x 100)

• EF < 50% = moderate reduction
• EF < 30% = poor function
Cardiomyopathy

Hypertrophic

Dilated

Restrictive
Dilated Cardiomyopathy

**Nonischemic**: Chemo Agents, Drug Abuse, **Alcohol**, Peripartum

(12, p. 348)
Alcoholic Cardiomyopathy

• **Proposed Mechanisms:** (10)
  - Nutritional deficiencies
  - Secondary exposures
  - Other comorbidities

• Most evidence in literature = **Direct toxic result** of ethanol or its metabolites (10)

• **Prognosis:** Abstinence (10)
Cardiomyopathy

• **Presentation** of CMO Patients:  (12)

  – History of CHF/CAD
  – **Medications**: furosemide, ACE inhibitors, digoxin, beta blocker
  – Cardiomegaly on CXR
  – ICD/Biventricular pacer (EF < 30%)
  – Conduction defects on EKG
Cardiomyopathy

• **Profound hypotension caused by:** (12)
  - ↓ myocardial contractility
  - ↓ in HR
  - Vasodilation
  - Dehydration contributes

• High risk for ventricular arrhythmias
• ACE inhibitors + diuretics = hypotension
• Correct electrolytes
• Optimize Hemoglobin: Major determinants of oxygen carrying capacity are **hemoglobin** & **cardiac output**
• **Inotropes** - (resistant to usual doses)
**Figure 2.** Effects of acute left ventricular failure (loss of inotropy) on left ventricular pressure-volume loop. Heart rate unchanged.

http://www.cvphysiology.com/Cardiac%20Function/CF024.htm
Medical History
1.) Glaucoma
2.) COPD
3.) CMO
4.) CRI
Chronic Kidney Disease

- **End Stage Renal Disease (ESRD)**
  - Fatal renal dysfunction **without** renal replacement therapy (1)

- **Chronic Renal Insufficiency (CRI)** (1,5)
  - Only 10-40% of nephrons functioning adequately
  - Radiocontrast exposure

- **Decreased Renal Reserve**
  - Loss of nephron function **without** symptoms
Glomerular Filtration Rate (GFR)

- **Best measure of overall kidney function** (11, p. 861)

- **Varies with:** age, sex, body size
Glomerular Filtration Rate

**Young healthy adults = 120-130**

### Chronic Kidney Disease - Stages

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>GFR (ml/min/1.73 m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kidney Damage with Normal or ↑ GFR</td>
<td>&gt;90</td>
</tr>
<tr>
<td>2</td>
<td>Mild ↓ GFR</td>
<td>60-89</td>
</tr>
<tr>
<td>3</td>
<td>Moderate ↓ GFR</td>
<td>30-59</td>
</tr>
<tr>
<td>4</td>
<td>Severe ↓ GFR</td>
<td>15-29</td>
</tr>
<tr>
<td>5</td>
<td>Kidney Failure</td>
<td>&lt;15 or Dialysis</td>
</tr>
</tbody>
</table>

Adapted from Am J Kidney Dis 2002; 39 (2, Suppl. 1), S46-S75
**Chronic Kidney Disease**

- **Anesthesia:** (1,p. 1356)
  - **Direct** anesthetic effects usually not harmful
  - **Indirect** effects that worsen renal dysfunction
    - Hypovolemia
    - Shock
    - Nephrotoxin exposure
    - Other renal vasoconstrictive states

- NO comparative studies demonstrating superior renal protection or improved renal outcomes with general versus regional anesthesia. (1)
Chronic Kidney Disease

- Critical Goal in Renal Insufficiency = Sustain Blood Volume
Preoperative Evaluation
Surgical history

• No major surgery
• Cardiac catheterization = No significant coronary artery disease
# Preop Eval

<table>
<thead>
<tr>
<th>Medications</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuterol</td>
<td>Beta – 2 agonist</td>
</tr>
<tr>
<td>Spiriva</td>
<td>Anticholinergic (Bronchodilator)</td>
</tr>
<tr>
<td>Xalatan (latanoprost)</td>
<td>Prostaglandin agonist</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>ACE Inhibitor</td>
</tr>
<tr>
<td>Coreg</td>
<td>Beta &amp; Alpha Blocker</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Cyclo-oxygenase Inhibitor</td>
</tr>
<tr>
<td>Prilosec</td>
<td>Proton Pump Inhibitor</td>
</tr>
</tbody>
</table>
# Preop Eval

<table>
<thead>
<tr>
<th>Labs</th>
<th>Value</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>H&amp;H</td>
<td>16 / 48</td>
<td>(14-18 g/dL) (42%-52%)</td>
</tr>
<tr>
<td>BUN/Cr</td>
<td>24/ 1.6</td>
<td>(8-20 mg/dL) (0.2-1.5 mg/dL)</td>
</tr>
<tr>
<td>INR</td>
<td>0.95</td>
<td>1</td>
</tr>
<tr>
<td>Platelets</td>
<td>86,000</td>
<td>130,000 – 370,000 mm³</td>
</tr>
<tr>
<td>K</td>
<td>4.3</td>
<td>3.8 – 5.5 mEq/L</td>
</tr>
<tr>
<td>Na</td>
<td>140</td>
<td>135 – 145 mEq/L</td>
</tr>
<tr>
<td>Ca</td>
<td>9</td>
<td>4.5 – 5.5 mEq/L</td>
</tr>
<tr>
<td>Cl</td>
<td>104</td>
<td>100 – 108 mEq/L</td>
</tr>
<tr>
<td>Glucose</td>
<td>102</td>
<td>70-100 mg/dL</td>
</tr>
<tr>
<td>CO₂</td>
<td>30</td>
<td>24 -29 mEq/L</td>
</tr>
<tr>
<td>GFR</td>
<td>45</td>
<td>ml/min/1.73m²</td>
</tr>
</tbody>
</table>
Preop Eval

<table>
<thead>
<tr>
<th>BMI</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-29.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>30-34.9</td>
<td>Moderate obesity</td>
</tr>
<tr>
<td>35-39.9</td>
<td>Severe obesity</td>
</tr>
<tr>
<td>40 or greater</td>
<td>Morbidly obese</td>
</tr>
</tbody>
</table>

ASA Classification = 3

“Severe systemic disturbance that limits activity”

(1, p. 395)
## Preop Eval

<table>
<thead>
<tr>
<th>Baseline Vital Signs</th>
<th>Fluid Calculations</th>
<th>Fluid Requirments (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>72</strong> &lt;br&gt; <strong>108/77</strong> &lt;br&gt; <strong>18</strong> &lt;br&gt; 89% room air &lt;br&gt; <strong>98.6</strong></td>
<td><strong>Maintenance</strong> &lt;br&gt; • 125 ml/h &lt;br&gt; <strong>Deficit</strong> &lt;br&gt; • 1500 ml &lt;br&gt; <strong>3rd space losses</strong> &lt;br&gt; • 700 ml/h</td>
<td><strong>1st hour = 1500</strong> &lt;br&gt; <strong>2nd hour = 1200</strong> &lt;br&gt; <strong>3rd hour = 1200</strong> &lt;br&gt; <strong>4th hour = 800</strong> &lt;br&gt; <strong>TOTAL = 4700</strong> &lt;br&gt; + Blood loss &amp; Urine Replacement</td>
</tr>
</tbody>
</table>
Preop Eval

• Anticipated difficult airway from assessment? **NO**

• **Bowel prep** (NPO)
• T & C 2 units PRBCs (available in room)
• Right radial A-Line
• PIV’s x 3 (16g, 18g, 20g)
Preop

• **Prior to Placement of Epidural:**
  – 1000 mL Lactated Ringer’s Infused
  – Versed 2 mg, Oxygen

• **Epidural placed in T9-10 interspace:**
  – Test dose Negative
  – 100 mcg fentanyl given via epidural
Ilio-Renal Bypass Graft
# Ilio-Renal Bypass Graft

<table>
<thead>
<tr>
<th>Arrival to OR</th>
<th>Induction</th>
<th>Intubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP = 86/48</td>
<td><strong>SBP ↑ 105</strong></td>
<td>Grade I view of glottis 8.5 ETT @ 24 cm</td>
</tr>
<tr>
<td>HR = 60</td>
<td>Phenylephrine</td>
<td>OG</td>
</tr>
<tr>
<td></td>
<td>• 200 mcg</td>
<td>Esophageal temp probe</td>
</tr>
<tr>
<td></td>
<td>Fentanyl</td>
<td><strong>Albuterol</strong></td>
</tr>
<tr>
<td></td>
<td>• 50 mcg</td>
<td>Pressure Control Ventilation (PCV)</td>
</tr>
<tr>
<td></td>
<td>Propofol</td>
<td>• PIP = 21</td>
</tr>
<tr>
<td></td>
<td>• 100mg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Norcuron</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 10 mg</td>
<td></td>
</tr>
<tr>
<td>Additional liter crystalloid infused</td>
<td>Hemodynamically Stable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ABX</td>
<td></td>
</tr>
<tr>
<td>Total = 2 L</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- ABX
- Grade I view of glottis
- ETT @ 24 cm
- Pressure Control Ventilation (PCV)
Right - Lateral
### Ilio-Renal Bypass Graft

#### Maintenance
- **Isoflurane**
- **PCV:** TV 515-715 ml
- **SpO₂** 98%, **FiO₂** 0.80
- **Norcuron**
- **Heparin** 5000 units
- **Phenylephrine**
- **Ephedrine**
  - Maintain SBP > 100 mmHg
- **Protamine** 25 mg

#### Epidural
- **Fentanyl** 100 mcg
- **Marcaine** 0.25%
  - Total = 9 ml
Ilio-Renal Bypass Graft

• Emergence

Extubate ??
Emergence

• COPD diagnosis = twice as likely to have postoperative pulmonary complications (9)

• Risk factors that ↑ risk: (8,9)
  – Preop sepsis
  – Emergency operations
  – > 60 years old
  – Smoking history
  – Comorbid diseases (ASA III or greater)
  – Chronic bronchitis
  – Obesity
  – Type of surgery (abdominal/ thoracic)
  – Prolonged surgery > 3-4 hours
## Ilio-Renal Bypass Graft

<table>
<thead>
<tr>
<th>Emergence</th>
<th>Extubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemodynamically Stable</td>
<td>Adequate signs of reversal</td>
</tr>
<tr>
<td>Reversal</td>
<td>Extubated without difficulty</td>
</tr>
<tr>
<td>Neostigmine</td>
<td>10 L NRB Mask</td>
</tr>
<tr>
<td>Robinul</td>
<td>Transported to PACU</td>
</tr>
</tbody>
</table>

Yerger 62
Ilio-Renal Bypass Graft

<table>
<thead>
<tr>
<th>PACU</th>
<th>Intake/ Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR = 89 NSR</td>
<td>Crystalloid = 6400 ml</td>
</tr>
<tr>
<td>BP = 112/52</td>
<td>Cell Saver = 225 ml</td>
</tr>
<tr>
<td>Normothermic</td>
<td>Urine Output = 835 ml</td>
</tr>
<tr>
<td>SpO₂ = 99% NRB</td>
<td>EBL = 1300 ml</td>
</tr>
<tr>
<td>Changed to NC</td>
<td></td>
</tr>
<tr>
<td>Awake, appropriate</td>
<td></td>
</tr>
<tr>
<td>Strength strong</td>
<td></td>
</tr>
<tr>
<td>Respirations regular &amp; unlabored</td>
<td></td>
</tr>
<tr>
<td>No pain</td>
<td></td>
</tr>
</tbody>
</table>
Postop Day 1

• **Fluid Challenges**
  Maintain SBP 100–120 mmHg
  HR = 80 NSR

• 95% on 3L NC – 18 bpm

• **Ileus**
  – Nauseous
  – Abdomen distended
  – NG placed

• **Epidural intact**

<table>
<thead>
<tr>
<th>Lab</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H&amp;H</td>
<td>11.6 / 35</td>
</tr>
<tr>
<td>Platelets</td>
<td>↓ 61,000</td>
</tr>
<tr>
<td>Bun/ Cr</td>
<td>21 / 1.1</td>
</tr>
</tbody>
</table>
Postop Day 4

Endovascular Abdominal Aortic Aneurysm Repair (EVAR)

http://www.uchospitals.edu/specialties/vascular-surgery/aaa-repair.html#P26_3350
Open Versus EVAR

**Open Repair**
- Transperitoneal
- Retroperitoneal

♦ **Aorta Crossclamped**
- Hemodynamic Instability

**Endovascular**
- Cut down femoral arteries

**Guide Wire:** Iliac Artery

**Fluoroscopy**

Pictures: http://www.uchospitals.edu/specialties/vascular-surgery/aaa-repair.html#P26_3350
**EVAR**

**Advantages:**  (6,7)

- Improved hemodynamic stability

Embolic issues
Blood loss
Stress response
Renal dysfunction
Postop pain
Incidence of spinal cord ischemia  (1)
EVAR

- **Patient Eligibility:**
  - Shape of aneurysm
  - Feasibility of femoral or iliac arteries
  - Compensate for vascular exclusion of the aortic branches that will not be supplied once the stent graft is in place
    - Hypogastric
    - Inferior mesenteric
    - Artery of Adamkiewicz

Postop ??
- Lactic acidosis
- Diffuse abdominal/pelvic pain
EVAR – Case Card (4)

- **General/ Epidural/ Spinal/ Local with sedation**
- **Supine**  
  **Time**: 1-3 hours  
  **Aortogram**
- **14-16 g IV x 2**  
  **A-line**  
  **Kefzol**
- **PRBC’s available**  
  **EBL**: Minimal
- **Pain**: 3-4  
  **Mortality**: 2-3%
- **Induction**: Standard
- **Emergence**: Extubation desirable
- **ICU**: x 1 day
- **Prior to catheter manipulation**: Heparin 50-100 units/kg
- **Stent deployment**: ↓ MAP 50-60 mmHg
EVAR

• **Goals for Intraoperative Management:**
  
  – Hemodynamic Stability
  – Analgesia
  – Anxiolysis
  
  – Preparation for rapid conversion to open technique
EVAR

• **Intraop Concerns:**

  – **Regional**: *Sympathectomy* = Anticipate ↓ BP
  
  – Cardiac Ischemia
  
  – **Cerebrovascular Disease**: BP 10-15% baseline
  
  – **Hemorrhage**: Persistent drops in BP or Hct out of proportion to EBL
  
  – Protamine
EVAR

• Potential postoperative complications: (1, p. 545)
  – Graft & Deployment (Endoleaks)
  – Radiologic implications
    • Contrast injection
      – Renal Insufficiency
  – Systemic
    • Cardiac Morbidity
    • Pulmonary Insufficiency
    • Renal Insufficiency
Endoleak

• **4 Types** (1, p. 546)
  - Type I
  - **Type II:** Branch leak
  - Type III
  - Type IV

Imagen: http://www.ajronline.org/content/192/4/W178/F2.expansion.html
Endoleak

http://www.uptodate.com/contents/image?imageKey=CARD%2F3263&topicKey=SURG%2F8185
Medical History

- Arthritis
- GERD
- Glaucoma
- COPD
- Cardiomyopathy
- Hyperlipidemia
- Hypertension
- Chronic Renal Insufficiency

Ilio-Renal Bypass Surgery
- Large incision
- Ileus
- Respiratory insufficiency
- Epidural catheter
EVAR – Preop

<table>
<thead>
<tr>
<th></th>
<th>POD #1</th>
<th>POD #4 (preop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H&amp;H</td>
<td>11.6 / 35</td>
<td>10.9 / 31.9</td>
</tr>
<tr>
<td>Na</td>
<td>140</td>
<td>139</td>
</tr>
<tr>
<td>K</td>
<td>3.9</td>
<td>4.2</td>
</tr>
<tr>
<td>BUN/ Cr</td>
<td>21 / 1.1</td>
<td>18 / 0.9</td>
</tr>
<tr>
<td>Platelet</td>
<td>61,000</td>
<td>81,000</td>
</tr>
</tbody>
</table>

Assessment

**Epidural** → Fentanyl 5mcg/mL + Ropivacaine 0.1% (6 mL/hour)

**NG**
**EVAR**

<table>
<thead>
<tr>
<th>Arrival to OR</th>
<th>Induction</th>
<th>Intubation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BP = 138/70 (A-line)</strong></td>
<td><strong>Fentanyl</strong>&lt;br&gt;- 50 mcg</td>
<td><strong>8.0 ETT @ 23 cm</strong></td>
</tr>
<tr>
<td><strong>HR = 86</strong></td>
<td><strong>Propofol</strong>&lt;br&gt;- 100 mg</td>
<td><strong>NG</strong>&lt;br&gt;<strong>Esophageal temp probe</strong></td>
</tr>
<tr>
<td><strong>SpO₂ = 93% on 4L NC</strong></td>
<td><strong>Zemuron</strong>&lt;br&gt;- 50 mg</td>
<td><strong>Pressure Control Ventilation (PCV)</strong>&lt;br&gt;- <strong>PIP = 26</strong></td>
</tr>
<tr>
<td>Hemodynamically Stable</td>
<td>ABX</td>
<td></td>
</tr>
<tr>
<td>Epidural</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>Epidural</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>Desflurane</td>
<td>Same Infusion</td>
<td></td>
</tr>
<tr>
<td><strong>PCV:</strong> TV 550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SpO₂ 98-100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FiO₂ 0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zemuron</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heparin 10,000 units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phenylephrine gtt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Maintain SBP 110-120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HR 60-90 bpm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protamine 50 mg</td>
<td></td>
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</tr>
</tbody>
</table>
### Intake/ Output

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalloid</td>
<td>1900 ml</td>
</tr>
<tr>
<td>Cell Saver</td>
<td>225 ml</td>
</tr>
<tr>
<td>Urine Output</td>
<td>1125 ml</td>
</tr>
<tr>
<td>EBL</td>
<td>550 ml</td>
</tr>
</tbody>
</table>
EVAR

• Emergence

Extubate ??
<table>
<thead>
<tr>
<th>Emergence</th>
<th>Extubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemodynamically Stable</td>
<td>Adequate signs of reversal</td>
</tr>
<tr>
<td>Reversal</td>
<td>Extubated to 10 L NRB Mask</td>
</tr>
<tr>
<td>Neostigmine</td>
<td>• Immediate ↓ SpO₂</td>
</tr>
<tr>
<td>Robinul</td>
<td>• Poor Inspiratory Effort/ Weak</td>
</tr>
<tr>
<td></td>
<td>PPV from Mask = ↑ SpO₂</td>
</tr>
<tr>
<td></td>
<td>Transported to PACU on NRB 100%</td>
</tr>
</tbody>
</table>
EVAR

<table>
<thead>
<tr>
<th>PACU Vital Signs</th>
<th>Airway</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR = 108</td>
<td>SpO₂ ↓</td>
</tr>
<tr>
<td>BP = 131/62</td>
<td>Weak Inspiratory Effort</td>
</tr>
<tr>
<td>Normothermic</td>
<td>Lethargic</td>
</tr>
<tr>
<td>SpO₂ = low 90’s</td>
<td>Bipap applied</td>
</tr>
<tr>
<td>SpO₂ ↓</td>
<td>• Result = ↑ SpO₂ 95%</td>
</tr>
<tr>
<td>Weak/ Poor Inspiratory Effort</td>
<td>Reintubated</td>
</tr>
<tr>
<td></td>
<td>Transferred to ICU</td>
</tr>
</tbody>
</table>
POD #1

<table>
<thead>
<tr>
<th>LAB</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>6.8</td>
</tr>
<tr>
<td>H&amp;H</td>
<td>10.3 / 30.6</td>
</tr>
<tr>
<td>Platelets</td>
<td>74,000</td>
</tr>
<tr>
<td>Na/ K</td>
<td>138 / 4.4</td>
</tr>
<tr>
<td>Bun/Cr</td>
<td>20 / 1</td>
</tr>
</tbody>
</table>

Pt extubated early  →  Did well on nasal cannula
Epidural DC’d  →  Pain management = IV PCA
NG removed
OOB, eating

Transferred to floor
References

References marked with an asterisk indicate studies included in the reference book.


References


Thank you