Anesthesia for Total Hip and Knee Arthroplasty
• Typical approach
  – Describe anesthesia technique

• Rather
  – Describe issues with THA and TKA
  – How anesthesia can modify
## Issues

<table>
<thead>
<tr>
<th></th>
<th>Total Hip</th>
<th>Total Knee</th>
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<tbody>
<tr>
<td>Blood Loss</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Thromboembolism</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Pain</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Mortality</td>
<td>++</td>
<td>++</td>
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Total Hip

• Blood Loss
  - Typical intraop → 500 – 1000 mL
  - Postop → 200 – 500 mL

• Transfusion of homologous blood → 30 – 50% of patients


Epidural / Spinal / Lumbar Plexus Block

- Reduces blood loss by 30 – 50%

Hypotensive Anesthesia

- Reduces blood loss 30 – 50%

Hypotensive Epidural Anesthesia

- Blood loss 100 – 300 mL
- Transfusion of homologous blood 7%

Technique

- Extensive epidural
- Low dose epinephrine infusion (1–5 mcg/min)
- Mean arterial pressure $\rightarrow$ 40 – 50 mmHg

*Normal cardiac output*
98 year old female undergoing primary total hip replacement with hypotensive epidural anesthesia

- Mean arterial pressure was maintained at approximately 45 mmHg during surgery
- Preservation of heart rate and central venous pressure
- Total intraoperative blood loss was 150 mL
- Crystalloid administered was 1,400 mL.
Safe

• Elderly

• Hypertensive

• Ischemic heart disease

• 2000 patients → no in-hospital death
## Thromboembolism – THR

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<tr>
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<th>DVT Risk</th>
<th>PE</th>
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<tbody>
<tr>
<td>General anesthesia</td>
<td>20 – 30%</td>
<td>1 – 2%</td>
</tr>
<tr>
<td>Epidural / Spinal</td>
<td>30% reduction</td>
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Hypotensive Epidural Anesthesia

- DVT rate $\approx 11\%$

Intraoperative heparin
15 Units/kg
Selective Heparinization during Total Hip Arthroplasty

1. Prior to epidural injection
2. Following insertion of acetabular component
3. Following reaming of femur
4. Following relocation of hip
5. 30 min postop

2000 Patients

• Hypotensive epidural anesthesia
• Intraoperative heparin
• Boots
• DVT $\rightarrow$ 7%
• PE $\rightarrow$ 0.6%
• 85% ASA postop

Pain – THA

• Multiple options
• Narcotics
• Epidural analgesia
• Spinal opioids
• Lumbar plexus block
Analgesia

- L1-L4 inclusive
- Obturator + femoral (spares sciatic)
- Excellent analgesia – Single Shot
Mortality
Spinal/Epidural Anesthesia

- 30% decrease in mortality compared to general anesthesia
- 30-day mortality rate ≈ 0.2 – 0.5%

Hypotensive Epidural Anesthesia

- 4-fold reduction
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Total Knee Arthroplasty
Blood Loss

• Majority blood loss postoperatively due to intraoperative tourniquet

• Hypotensive anesthesia reduces blood loss

Blood Loss

• Tranexamic acid – 10 mg/kg after tourniquet deflation

• Cell Saver – Useful in bilateral total knee
Thromboembolism

• Epidural anesthesia reduces
  - Risk of DVT 20%
  - Risk of proximal thrombi 50%

Mechanism

• Probably enhancement of blood flow immediately following surgery
Epidural anesthesia + Pneumatic compression

- DVT rate is similar to LMWH
- Lower risk of bleeding
Pain – Total Knee Arthroplasty

• Narcotics alone – Inadequate

• Require local technique for optimal pain control
Options

- Femoral block  o
- Femoral catheter  x
- Femoral + Sciatic block  o
- Lumbar plexus + Sciatic block  o
- Epidural analgesia  x
- Epidural + Femoral block  x

x = Require a Pain Service
o = Can be used with IV PCA or oral narcotics
Rehabilitation

• Optimal pain control hastens rehabilitation
  - Range of motion
  - Milestones, e.g., walking, stairs
References


• Zawadsky M et al. The efficacy of femoral nerve block in conjunction with epidural analgesia for total knee arthroplasty; 2004; San Francisco, CA: American Academy of Orthopaedic Surgeons.*

*Hospital for Special Surgery*
Mortality

• Epidural anesthesia reduces perioperative mortality
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<td><strong>Total Knee</strong></td>
<td>0.44% (10/2252)</td>
<td>0.1% (6/5183)</td>
<td>0.08% (5/6384)</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td>0.39% (23/5874)</td>
<td>0.1% (14/13518)</td>
<td>0.06% (9/15221)</td>
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Conclusion

- Optimal anesthesia improves outcomes following THA and TKA.
- Requires skilled staff.
- Worth the effort.