Anaesthetic Management of Geriatric Hip Fracture Patients

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Sha Tin, N T,
Hong Kong
Pope John Paul II walked with President Ronald Reagan in 1987
Alzheimer's disease: 1994
Hip fracture 2001

Hip fracture: 29 April 1994
Discharged: 27 May 1994
Anaesthetic Management of Hip Fracture Patients

• Timing of Surgery
• Preop optimization of medical conditions
  – chronic, acute
• Peri-op pain management
• Prevention of complications
  – UTI, chest infection, dehydration, pressure sores, DVT
• Anaesthetic techniques
  – SA, Combined Spinal-Epidural
• Postop pain management
  – rehabilitation
Management of Hip Fracture

Timing of surgical repair:
Double-blinding NOT feasible
Timing of Surgery

- prospective cohort study of 1206 matching cases
- early (<24 hr) vs late (>24 hr) surgery
  - not associated with improved function or mortality at 6 months
  - associated fewer days of severe pain (−0.22 days)
  - shorter LOS (−1.94 days)
  - probably major complications
- patients with hip fracture who are medically stable should receive early surgery when possible.

Benefits of early surgery vs optimization of underlying medical conditions
Preoperative status and risk of complications in patients with hip fracture.

McLaughlin MA, Orosz GM, Magaziner J, Hannan EL, McGinn T, Morrison RS, Hochman T, Koval K, Gilbert M, Siu AL.

• prospective review of 804 patients with hip fracture in 1997-98
• in-hospital mortality 0.8%
• postop complications 7%
  – cardiopulmonary (5.8%), thromboembolic (1.8%), infectious (1.6%), misc (1.2%), and hematologic (0.4%)
• physical or lab findings on admission
  – minor abnormalities 34%
  – major abnormalities 23%
<table>
<thead>
<tr>
<th>Condition</th>
<th>Minor Abnormalities*</th>
<th>Major Abnormalities†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure (BP)</td>
<td>Systolic BP ≥181; diastolic BP ≥111</td>
<td>Systolic BP ≤90</td>
</tr>
<tr>
<td>Rate and rhythm</td>
<td>Atrial fibrillation (AF) or supraventricular tachycardia (SVT) 101-120; sinus tachycardia ≥121; or heart rate (hr) 46-50 bpm</td>
<td>AF or SVT ≥121; Ventricular tachycardia (VT); 3rd degree heart block or hr ≤ 45 bpm</td>
</tr>
<tr>
<td>Infection/pneumonia</td>
<td>Temperature (T) ≥ 38.5°C; clinical diagnosis of pneumonia; or infiltrate on chest x-ray (CXR)</td>
<td>T &lt;35°C; T ≥ 38.5°C with clinical diagnosis of pneumonia or infiltrate on CXR</td>
</tr>
<tr>
<td>Chest pain</td>
<td>Chest pain but normal electrocardiogram (EKG)</td>
<td>Any new myocardial infarction (MI) on EKG; or chest pain with abnormal EKG pulmonary edema on CXR; or CHF on CXR with dyspnea and/or abnormal exam</td>
</tr>
<tr>
<td>Congestive heart failure (CHF)</td>
<td>Dyspnea or pulmonary rales or S3 but a normal CXR; or CHF on CXR with a normal exam and no dyspnea</td>
<td>Pulse oximetry &lt; 90%; pO2 &lt; 60 mm Hg; or pCO2 ≥55 mmHg</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>46 mmHg &lt; pCO2 &lt; 55 mmHg</td>
<td>&gt;1.6</td>
</tr>
<tr>
<td>International normalized ratio (INR)</td>
<td>1.4-1.6</td>
<td>Na ≤ 125 or &gt;155 mEq/L; K &lt; 2.5 or &gt;6.1 mEq/L; or HCO3 &lt;18 or &gt;36 mEq/L</td>
</tr>
<tr>
<td>Electrolytes</td>
<td>Sodium (Na) = 126-128 or 151-155 mEq/L; Potassium (K) = 2.5-2.9 or 5.6-6.0 mEq/L; or Bicarbonate (HCO3) = 18-19 or 35-36 mEq/L</td>
<td>&gt;600 mg/dL</td>
</tr>
<tr>
<td>Glucose</td>
<td>451-600 mg/dL</td>
<td>BUN &gt;50 mg/dL; or Creatinine ≥ 2.6 mg/dL without h/o ESRD</td>
</tr>
<tr>
<td>BUN/creatinine</td>
<td>BUN 41-50 mg/dL; or Creatinine 2.1-2.5 mg/dL without h/o ESRD</td>
<td>Hgb ≤ 7.5 g/dL</td>
</tr>
<tr>
<td>Anemia</td>
<td>Hemoglobin (Hgb) 7.6-8 g/dL</td>
<td></td>
</tr>
</tbody>
</table>

* Minor = mildly abnormal but less likely to require correction prior to surgery
† Major = markedly abnormal and more likely to require correction prior to surgery
|| Abnormal EKG defined as ST depressions or elevations
Postop Complications: Odds (CI)

> 1 major abnormality:
  on admission 4.83 (1.89-12.35)
  uncorrected before surgery 12.16 (3.85-38.40)
> 1 minor abnormality 0.96 (0.44-2.11)
In older adults with hip fracture:

- potentially reversible abnormalities in lab and physical exam occurred frequently and they significantly increased risks of postop complications
- major clinical abnormalities should be corrected prior to surgery
- patients with minor abnormalities may proceed to surgery with attention to these medical problems perioperatively.

Optimization of Medical Conditions

• Surgery can proceed with optimization in progress:
  – Anaemia: Hb < 10
  – Hypovolaemia
  – Uncontrolled hypertension
  – Unstable DM

Adapted from Parker MJ. New development in hip fracture treatment. *Trauma* 2003; 5:43-9
Optimization of Medical Conditions

• Surgery needs to be postponed until fully optimized:
  – severe electrolyte imbalance or acute renal failure
  – acute coronary syndrome
  – congestive cardiac failure
  – rapid AF or other correctable arrhythmia
  – severe chest infection / exacerbation of COAD

Adapted from Parker MJ. New development in hip fracture treatment. *Trauma* 2003; 5:43-9
Harmful Effects of Pain

I will cry if trampled
Harmful Effects of Pain in Older Patients

- **Immobility**
  - resp complications, pressure sores, poor hydration and nutrition

- **Stress Response**
  - cardiovascular complications, protein breakdown, glucose intolerance, electrolyte disturbances

- **Neuropsychiatric**
  - sleep disturbances, delirium, depression, chronic pain
The impact of post-operative pain on outcomes following hip fracture

R. Sean Morrison\textsuperscript{a,*}, Jay Magaziner\textsuperscript{b}, Mary Ann McLaughlin\textsuperscript{c}, Gretchen Orosz\textsuperscript{a}, Stacey B. Silberzweig\textsuperscript{a}, Kenneth J. Koval\textsuperscript{d}, Albert L. Siu\textsuperscript{c}

… improved pain control may decrease length of stay, enhance functional recovery, and improve long-term functional outcomes.
Periop Pain Management in Older Patients

• Pain assessment
• Multimodal analgesia
• Regional analgesic techniques
Pain Management

• Pain assessment tools
  – avoid undertreatment or overtreatment

Behavoural Pain Assessment Scale: score pain using facial appearance, muscle tone, restlessness, vocalization, consolability (scale 0-1-2 x 5 parameters)
Pain Management

Multimodal Analgesia Attacks Different Points Along the Pain Pathway

- Opioids
- $\alpha_2$-Agonists
- Centrally acting analgesics
- Anti-inflammatory agents (COX-2 specific inhibitors, nonspecific NSAIDs)

- Local anesthetics
- Opioids
- $\alpha_2$-Agonists
- Anti-inflammatory agents (COX-2 specific inhibitors, nonspecific NSAIDs)

Ascending Input
Spinothalamic Tract
Dorsal root Ganglion
Peripheral nerve
Peripheral Nociceptors

Trauma

Descending Modulation

Multiple analgesic modalities: $\uparrow$ efficacy and $\downarrow$ complications
Analgesic Ladder

• Paracetamol
  – effective and fewer side effects

• NSAIDs
  – side effects: GI bleeding, renal failure

• Opioids
  – carefully titrated and supervised
  – pethidine and propoxyphene: may increase delirium
Pain Management Plan

- Paracetamol 500 mg q6h PO
  - (unless liver disease or severe renal impairment with serum creatinine >200 µmol/L)
- Tramadol 50 mg q6h PO
- For breakthrough pain, morphine 5-10 mg q4h IM PRN
- Severe uncontrolled pain: femoral nerve block
Nerve Blocks for Hip Fractures

- reduced need for systemic analgesics
  - 40-80% reduction
- better pain relief
  - 95% vs 50%
- potential for
  - less postoperative confusion
  - earlier mobilisation
  - reduction of respiratory infection

Femoral Nerve Block
Femoral Nerve Block

Short-bevel or Tuohy needle inserted:
- lateral to femoral artery
- below inguinal ligament
  (at level of groin crease)
“Loss of resistance” x2:
- fascia lata
- fascia iliaca
20-30 ml of LA
Three-in-One or Fascia Iliacus Compartment Block

Single injection
  large vol (30-40 ml) of LA
  with distal compression
will block all three major branches of lumbar plexus:
1: lat cut n of thigh
2: femoral n
3: obturator n
Fascia Iliaca Compartment Blockade for Acute Pain Control in Hip Fracture Patients

A Randomized, Placebo-controlled Trial

Nicolai B. Foss, M.D.,* Billy B. Kristensen, M.D.,† Morten Bundgaard, M.D.,‡ Mikkel Bak, M.D.,† Christian Heiring, M.D.,‡ Christina Virkelyst, M.D.,‡ Sine Hougaard, M.D.,‡ Henrik Kehlet, M.D., Ph.D.§

- double-blind, randomized, placebo-controlled trial
- 48 patients
- single shot
  - FICB 40 ml 1% mepivacaine with adren or morphine 0.1 mg/kg IMI
- rescue morphine 2.5 mg IV when pain score > 5
**Conclusion:** Pain relief was superior at all times and at all measurements in the FICB group. The study supports the use of FICB in acute management of hip fracture pain because it is an effective, easily learned procedure that also may reduce opioid side effects in this fragile, elderly group of patients.
3-in-1 Block for Hip Fracture


Which Anaesthetic Technique?

Wanna pay extra for the painkiller or get the free one?
Spinal Anaesthesia

- Spinal Cord
- Spinal Fluid
- Anesthetic solution injected into spinal fluid
## Anaesthesia for Hip Fracture Surgery:
### Summary of Evidence

<table>
<thead>
<tr>
<th>Outcome</th>
<th>SA vs GA</th>
<th>RR/Difference</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mo mortality</td>
<td>SA</td>
<td>0.69</td>
<td>0.5-0.95</td>
</tr>
<tr>
<td>3 mo mortality</td>
<td>Same</td>
<td>0.92</td>
<td>0.71-1.21</td>
</tr>
<tr>
<td>DVT</td>
<td>SA</td>
<td>0.64</td>
<td>0.48-0.96</td>
</tr>
<tr>
<td>Blood loss</td>
<td>SA</td>
<td>85 ml</td>
<td>9-162 ml</td>
</tr>
<tr>
<td>Postop Confusion</td>
<td>SA</td>
<td>0.5</td>
<td>0.26-0.95</td>
</tr>
</tbody>
</table>

Contra-Indications for SA

• Absolute
  – raised ICP: medulla coning
  – coagulopathy: epidural haematoma
  – local infection at puncture site: meningitis
  – fixed cardiac output state (eg severe mitral or aortic stenosis): CVS collapse
Contra-Indications for SA

• Relative
  – systemic sepsis
  – hypovolaemia
  – neurologic diseases
  – uncooperative patient
# SA and Anticoagulants

**Drugs:**
- Aspirin and NSAIDs: not contraindicated
- Unfractionated heparin: 2-4 hr
- LMW heparin: 12 hr
- Warfarin: INR < 1.5
- Clopidogrel: 7 days
- Abciximab: 2 days

**How long to wait:**
- Aspirin and NSAIDs: not contraindicated
- Unfractionated heparin: 2-4 hr
- LMW heparin: 12 hr
- Warfarin: INR < 1.5
- Clopidogrel: 7 days
- Abciximab: 2 days
Combined Spinal-Epidural Anaesthesia

Single Space Combined Spinal Epidural Technique: dural puncture with long spinal needle after locating epidural space
## SA Vs CSE

<table>
<thead>
<tr>
<th>Spinal Anaesthesia</th>
<th>Combined Spinal-Epidural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Shot</td>
<td>Single shot then continuous</td>
</tr>
<tr>
<td>Duration: 2 hr</td>
<td>Duration: indefinite</td>
</tr>
<tr>
<td>High spinal: unavoidable</td>
<td>High spinal: avoidable</td>
</tr>
<tr>
<td>Postop analgesia: +</td>
<td>Postop analgesia: ++++</td>
</tr>
<tr>
<td>Technical complexity +</td>
<td>Technical complexity +++</td>
</tr>
</tbody>
</table>
postop epidural analgesia
Effect of Postoperative Epidural Analgesia on Rehabilitation and Pain after Hip Fracture Surgery

A Randomized, Double-blind, Placebo-controlled Trial

Nicolai Bang Foss, M.D.,* Morten Tange Kristensen, P.T.,† Billy Bjarne Kristensen, M.D.,‡ Pia Søe Jensen, R.N.,§ Henrik Kehlet, M.D., Ph.D.¶
• double-blind randomized placebo controlled trial
• 55 elderly patients with hip fractures
• surgery under epidural anaesthesia
• postop epidural infusion: 2 groups
  – 4 ml/hr 0.125% bupivacaine with morphine 50 μg/ml or saline
• nurse-controlled analgesia: iv morphine
• oral paracetamol 1 g 6 hourly and rofecoxib 25 mg once daily
• postop multimodal fast-track rehabilitation regimen
Pain on supine to sitting transfer

Postoperative NCA morphine consumption

Epidural

Placebo
Time spend out of bed

Hours

Epidural

Placebo

Day 1
p = 0.65

Day 2
p = 0.12

Day 3
p = 0.06

Day 4
p = 0.68

Day 4
p = 0.86
<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>28</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Time in PACU, min</td>
<td>85 (33.8)</td>
<td>120 (97.5)</td>
<td>0.007</td>
</tr>
<tr>
<td>Postoperative transfusions, n</td>
<td>1 (2)</td>
<td>2 (3)</td>
<td>0.15</td>
</tr>
<tr>
<td>Postoperative coloids</td>
<td>0 (500)</td>
<td>0 (200)</td>
<td>0.09</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>3</td>
<td>3</td>
<td>0.96</td>
</tr>
<tr>
<td>Deep venous thrombosis</td>
<td>0</td>
<td>2</td>
<td>0.14</td>
</tr>
<tr>
<td>Pulmonary embolus</td>
<td>1</td>
<td>0</td>
<td>0.33</td>
</tr>
<tr>
<td>Cardiac complication</td>
<td>1</td>
<td>1</td>
<td>0.98</td>
</tr>
<tr>
<td>S-creatinine &gt; 200, mm</td>
<td>1</td>
<td>1</td>
<td>0.98</td>
</tr>
<tr>
<td>Surgical wound infection</td>
<td>0</td>
<td>2</td>
<td>0.14</td>
</tr>
<tr>
<td>Patients with at least one major medical complication</td>
<td>6</td>
<td>8</td>
<td>0.49</td>
</tr>
<tr>
<td>Maximum decrease in MMSE score</td>
<td>0.5 (3.75)</td>
<td>1.0 (3.25)</td>
<td>0.85</td>
</tr>
<tr>
<td>Total duration of hospital stay (preoperative and postoperative)</td>
<td>11 (12)</td>
<td>13 (13)</td>
<td>0.78</td>
</tr>
<tr>
<td>30-Day mortality</td>
<td>1</td>
<td>1</td>
<td>0.98</td>
</tr>
</tbody>
</table>
• postop epidural analgesia after hip fracture provides superior pain control during dynamic exercise
• however, superior analgesia did not translate into enhanced rehabilitation (unlike patients after elective joint replacement surgery)
• ? postop pain NOT a limiting factor on rehabilitation in frail elderly patients after acute surgery for hip fracture

Any thoughts?
Summary and Thoughts

Older patients with hip fracture

• Preoperative assessment and workup
  – surgery as early as possible
  – optimization of medical conditions

• Pain management
  – pain assessment, multimodal analgesics, nerve blocks: particularly before surgery
  – decreases complications of immobility, stress response and neuropsychiatric

• Anaesthetic technique
  – SA offers advantages: short term mortality, DVT, blood loss, mental changes