REGIONAL ANAESTHESIA FOR ELDERLY PATIENT

V British – Ukraine symposium
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The increase in the global elderly population

Perioperative Management of the Elderly

- Elderly as a fastest growing population segment
  
  Increased life expectancy (economics, politics, Life style)
  
  Improved medical care.

- Increased number of surgeries, increased complexity & greater risk of perioperative morbidity and mortality
  
  High incidence of coexisting diseases
  
  Poor tolerance of complications
  
  Increased need for emergency surgery

- Nearly half of the total health care resources are delivered to the elderly patients
Regional Anaesthesia for the Elderly - Objectives

- Pathophysiological changes during ageing process
- Pharmacokinetics and pharmacodynamics of LA
- Neuraxial blockades Spinal/Epidural
  - Neurological complications
  - Prevention and treatment of hypotension
  - Modifications of the technique
- Sedation
  - Hypothermia
- Postoperative pain
- Postoperative delirium
- Peripheral nerve blocks
Pharmacology of local Anaesthetics in the older patients

- CNS decreased neuron density
decreased number and diameter of myelinated fibers
deterioration of myelin sheats
increased permeability
- SPINE changes in the configuration of spinal curvatures
Age-related changes in Anatomy
Age-related changes in Anatomy
Age – related changes in Anatomy
Pharmacology of Local Anaesthetics in the older patients

Age - related changes in Physiology

CNS

• slowing conduction velocity of peripheral nerves (moto nerves)
• decreased production CSF

• decline in baroreceptor reflex
• decline in thermoregulation
Factors which may modify the Pharmacokinetics of Local Anesthetics in the elderly

<table>
<thead>
<tr>
<th>Factors</th>
<th>Possible Effects</th>
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<tbody>
<tr>
<td>Increased body fat</td>
<td>Greater volume of distribution of lipophilic local anesthetics</td>
</tr>
<tr>
<td>Decline hepatic blood flow</td>
<td>Decrease in clearance of local anesthetics with high hepatic extraction ratio</td>
</tr>
<tr>
<td>Decline hepatic mass</td>
<td>Decrease in clearance of local anesthetics with low hepatic extraction ratio</td>
</tr>
<tr>
<td>(fewer functioning cells)</td>
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</table>
Pharmacology of Local Anesthetics in the older patients (Veering et al.)

- Spinal anesthesia
- Epidural anesthesia
Free Lidocaine Concentrations During Continuous Epidural Anesthesia in Geriatric Patients

Taeko Fukuda, M.D., Yoshihiro Kakiuchi, Ph.D., Masayuki Miyabe, M.D., Shinichi Kihara, M.D., Yukinao Kohda, Ph.D., and Hidenori Toyooka, M.D.

Cont. TEA + GA in middle-aged (41±9 yr, n=7) and elderly (72±2 yr=7) male patients. Initial dose 3+7ml 1,5 % Lido+Epi followed by 5 ml Lido 1,5% /h

Fig 1. Mean plasma concentrations of total (top) and free (bottom) lidocaine following lidocaine administered epidurally to elderly (●) or middle-aged (□) male patients. *P < .05, compared with the middle-aged group. Bars represent standard errors.
Pharmacology of Local Anesthetics in the older patients (Simon et al.)

- Ropivacaine
- Levobupivacaine
Pharmacology of Local Anesthetics in the older patients

- Thoracic Epidural Anaesthesia

Pharmacology of Local Anesthetics in the older patients

- Peripheral Nerve Blockade

Pagueron X et al. Anaesthesiology 2002; 92:1330-4
Pharmacology of Local Anesthetics in the older patients

- Effects of age

Combined Pharmacokinetics – Clinical Profile Study

Pharmacology of Local Anesthetics in the older patients

- Epidural anesthesia
  - no effect of age on systemic absorption kinetics of bupivacaine
  - ↓fraction during initial absorption of ropivacaine
- Spinal Anesthesia
  - faster absorption of bupivacaine

- Clearances
  - Bupivacaine, lidocaine and ropivacaine decreased with age

Infusion rates on top-up doses may be need to be adjusted
A national survey into the peri – operative anaesthetic management of patients presenting correction of a fractured neck of femur


- Survey from 218 hospitals: Anaesthesia for femur fracture?
  - Regional anaesthesia 75,8% (95,5% spinal anaesthesia)
  - General anaesthesia & regional block 14,4 %
  - General anaesthesia 9,8%
Hypotension During Spinal Anaesthesia

- Elderly more susceptible to hypotension than the young with similar block levels
  Carpenter RL., Anaesthesiology 1992
- Severity of hypotension more related to the cardiovascular status than to the extent of block.
  Large interindividual variations!
  Pitkanen M., Br J Anesth 1984
- Primary mechanism of hypotension in the elderly with cardiac disease (EF < 50%) is decrease in SVR (up to 26%).
  Small changes in CO.
  Rooke GA., Anesth Analg 1997
Spinal Anaesthesia for geriatric Patient

- Prevention and Treatment of Hypotension
  1. Pharmacological interventions
     Volume
     Vasopressors
  2. Modifications of the technique
     Small – dose spinal with or without adjuvants
     Unilateral spinal
     Continuous spinal
Treatment of Hypotension During Spinal Anaesthesia

- Prophylactic administration of vasopressors may be more effective than prehydration.
  
  Chan W.S., Anaesthesia 1997

- Initially, $\alpha$ agonists for patients with hypotension and mixed $\alpha$ and $\beta$ for patients with both hypotension and bradycardia.
  
  Liu SS., Anesthesiology 2001
Crystallloid/Colloid Versus Crystallloid Intravascular Volume Administration Before Spinal Anaesthesia in Elderly Patients: The Influence on CO and SV


RCT, n=60, TURP in SA (15 mg, 0.5% Bupivacaine hyperbaric), CO (Bioimpedance)

G1: NaCL 500 ml, G 2: NaCl 500ml + HES 500 ml (6% 130/0,4),
G 3: No volume

**Figure 1.** Mean arterial blood pressure (MAP) before and after spinal anaesthesia in three groups. Mean ± so; *P < 0.05 compared with the control group; †P < 0.05 compared with saline group; ‡P < 0.05 compared with baseline. (T1) Before fluid administration, (T2) after fluid administration, (T3) in the upright position, (T4) after spinal anaesthesia, (T5) after elevating the legs to lithotomy position, (T6) 15 min, (T7) 45 min, (T8) 75 min, (T9) after lowering the legs.

**Figure 3.** Cardiac output (CO) before and after spinal anaesthesia in three groups. Mean ± so; *P < 0.05 compared with the control group; †P < 0.05 compared with saline group; ‡P < 0.05 compared with baseline. (T1) Before fluid administration, (T2) after fluid administration, (T3) in the upright position, (T4) after spinal anaesthesia, (T5) after elevating the legs to lithotomy position, (T6) 15 min, (T7) 45 min, (T8) 75 min, (T9) after lowering the legs.

**Conclusion:** NaCL+HES prevent CO & SV - decrease after SA
Hypotension not influenced by volume administration
Low-dose Bupivacaine with Sufentanil Prevents Hypotension After Spinal Anaesthesia for Hip Repair in Elderly Patients

Olofsson C: Acta Anaesthesiol Scand 2004;48:1240-4

RCT, n=50

Hyperbaric bupivacaine 7,5mg + sufentanil 5mcg
vs hyperbaric bupivacaine 15 mg
Comparable sensory block levels
Unilateral spinal anaesthesia for geriatric patient

- Lateral position, “pencil - point” needle, low dose, slow injection
- Hyperbaric bupivacaine provides a more unilateral block than isobaric

Kuusniemi KS. Reg anaesthessth Pain Med 2000

- Minimal haemodynamic changes in elderly patients with hip fracture

Khatouf M. An Fr Anesth Reanim 2005

- Sciatic/femoral and unilateral spinal, both provide adequate anaesthesia with minimal cardiovascular effects in the spinal group

Spinal Anaesthesia for geriatric patient

- Sevoflurane GA unilateral SA in elderly patients undergoing orthopedic surgery
  
  Casati A et al; E J Anaesth 2003

Results: Hypotension 40% more frequent in sevo group
- Less intraoperative bleeding in spinal group
- Time for PACU discharge shorter in spinal group
- Postoperative pain relief better controlled in spinal group
Incremental (Continuous) Spinal Anaesthesia with Large-Bore Catheters for Hip Surgery in the Elderly

**IMPORTANT:** Administration of 0.5% isobaric bupivacain (Markain) NOT REGISTERED in Ukraine for Spinal anesthesia

- Using small titrated doses of 0.5 – 2 ml, 0.5% isobaric bupivacaine, CSA is a safe and efficient method which provides better haemodynamic stability than single-dose SA in elderly patients.

Döhler S, Anesthesiol Reanimat 1999
Sutter PA, Anaesthesia, 1998
Favarel JF, Anesth Analg 1996
Labaille T, Reg Anesth 1999,
Jöhr M Anästhesist 1988

Gielen MJM, Acta Anaesth Belg 1999
Denny NM, B J Anaesth 1998
Klimscha W, Anesth Analg 1993
Van Gessel E, Anesth Analg 1991
Neuraxial blocks reduce mortality and morbidity

141 randomised trials, n = 9559, up to 1996   Rogers A, BMJ 2000

- **Overall mortality reduced 1/3** † (103/4871 vs 144/4688)
  
  Reduction of DVT 44 %, PE 50 %, pneumonia 39 %, resp.
  depression 59 %, transfusion requirements 50 %

- **Reductions in myocardial infarction and renal failure**

  Mortality did not differ by:
  - surgical procedures
  - type of block (epidural, spinal)
  - block vs. GA + block

- **Benefits due to use of RA rather than avoidance of GA**
  †death within 30 days of randomisation

Meta - analysis not focused on elderly or high risk patients
Are Complications After CNB's Really Rare?

Old, frequently cited studies have shown very low incidence of serious neurologic complications.

Vandam LD, JAMA 1954, Dripps RD, JAMA 1960 (10,098 cases)
Lund PC, Acta Anaesthesiol Scand 1962 (10,000)
Phillips OC, Anesthesiology 1969 (10,440 cases)
Moore DC, Anesth Analg 1978 (11,080 cases)
Are Elderly at Increased Risk for Neurological Damage after Neuraxial Anaesthesia?

- Decreased mobility of neural structures caused by inflammation, adhesion or scarring can lead to higher incidence of paresthesia (20 % vs 9 %)

  Tetzlaff JE, Reg Anesth 1998; 23:560-63

- Decreased distance between conus medullaris and Tuffier’s line could increase the risk of neurological injury during spinal block (MRI study in 690 patients)

  Kim JT, Anesthesiology 2003; 99:1359-63
Total about 1,260,000 spinals, 450,000 epidurals

Severe neurological complications = 127, permanent neurological damage = 85

Incidence after spinal = 1:20-30,000, epidural = 1:25,000 (obstetric) 1:3,600 remaining procedures

Osteoporosis with spinal stenosis - previously neglected risk factor

More common in women (increased prevalence of hip fractures, vertebral deformities, narrow spinal canal)
Table 8. Cases and Incidences of Spinal Hematoma

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Epidural Blockade Including CSE</th>
<th>Spinal Blockade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Patients (x 1000)</td>
<td>Cases and Incidence</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>Knee arthroplasty</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Hip arthroplasty</td>
<td>14</td>
<td>29</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Obstetric pain relief during labor</td>
<td>-</td>
<td>200</td>
</tr>
<tr>
<td>Cesarean sections</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Subtotal (M/F)</td>
<td>275</td>
<td>8 (1/7)</td>
</tr>
<tr>
<td>General population (M/F)</td>
<td>175</td>
<td>17 (7/10)</td>
</tr>
<tr>
<td>Total (M/F)</td>
<td>450</td>
<td>25 (8/17)</td>
</tr>
</tbody>
</table>
# Severe Neurological Complications after Central Neuraxial Blockades in Sweden 1990-1999

Moen V et al. Anesthesiology 2004; 101:950-59

## Table 5. Spinal Hematoma, Spinal Stenosis, and Cauda Equina Syndrome Related to Age

<table>
<thead>
<tr>
<th></th>
<th>≤50</th>
<th>50-59</th>
<th>60-69</th>
<th>70-79</th>
<th>≥80</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinal hematoma</td>
<td>4 (1/3)*</td>
<td>4 (3/1)</td>
<td>4 (2/2)</td>
<td>11 (3/8)</td>
<td>10 (0/10)</td>
<td>33 (9/24)</td>
</tr>
<tr>
<td>Paraparesis and spinal stenosis</td>
<td>1 (0/1)†</td>
<td>1 (0/1)‡</td>
<td>-</td>
<td>1 (1/0)</td>
<td>1 (1/0)</td>
<td>4 (2/2)</td>
</tr>
<tr>
<td>Cauda equina syndrome, all cases</td>
<td>8 (4/4)</td>
<td>8 (7/1)</td>
<td>3 (2/1)</td>
<td>7 (2/5)</td>
<td>6 (3/3)</td>
<td>32 (18/14)</td>
</tr>
<tr>
<td>Pre-existing spinal stenosis</td>
<td>-</td>
<td>-</td>
<td>2 (1/1)</td>
<td>5 (0/5)</td>
<td>2 (1/1)</td>
<td>9 (2/7)</td>
</tr>
<tr>
<td><strong>Local anesthetic neuronal toxicity</strong></td>
<td>8 (4/4)</td>
<td>8 (7/1)</td>
<td>1 (1/0)</td>
<td>2 (2/0)</td>
<td>4 (2/2)</td>
<td>23 (16/7)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13</td>
<td>13</td>
<td>7</td>
<td>19</td>
<td>17</td>
<td>69</td>
</tr>
</tbody>
</table>

The number of males/females is in parentheses. The number of spinal hematoma and cauda equina syndrome in patients with coexisting spinal stenosis increase with age. When local anesthetic neuronal toxicity is considered the cause of damage, the cauda equina syndrome does not show the same increase with age.

* Including two obstetric patients with the syndrome of hemolysis, elevated liver enzymes, and low platelets. † Patient with corrected heart disease, fiberoptic intubation warranted by severe neck disorder. Epidural blockade placed under general anesthesia. ‡ Patient with severe rheumatism, previously operated for spinal stenosis, epidural blockade performed under general anesthesia.
Increased risk of Hypotermia in Geriatric Patients

Incidence of delirium = 16% (87/541)

Prospective study, 4 New York hospitals, n = 541

Risk factors:
- cognitive impairment
- abnormal BP
- heart failure
- < 10 mg morphine (vs. more)
- meperidine (vs. other opioids)
- severe pain (in cognitively intact patients)

RR 3.6
RR 2.3
RR 2.9
RR 5.4
RR 2.4
RR 9.0

Cognitively intact patients with undertreated pain were nine times more likely to develop delirium than patients whose pain was adequately treated.
Peripheral nerve Blocks For Surgery and Analgesia in Geriatric Patients

- Neuroaxial anaesthesia is good for Surgery and safe? Peripheral nerve blocks even more so!
- Few techniques have been selectively studied in the elderly
- Few studies have compared block characteristics in young and elderly patients
- Few studies on lower extremity blocks in the elderly
Upper Extremity Blocks for the Elderly

Paqueron X, Anesthesiology 2002

Prospective study in 47 pats.

Old group 77 years (72-81)
Young group 39 years (27-46)

Mid humeral block with ropivacaine 0.75 %, 4x5ml

Prolonged duration of sensory and motor block of brachial plexus nerves in the elderly compared with the younger: 2.5 hours vs. 6.5 hours
Recommended
- General anaesthesia with continuous nerve block postoperatively
- Spinal anaesthesia wit LA + opioid
- Step down approach using:
  - Paracetamol, conventional NSAID strong or weak opioid as requested
• Recommended (grade A)

• Femoral nerve block (combined with GA or SA pre/ intra - operative)

• Spinal Block with morphine intrathecal
  + Paracetamol (Grade B)
  NSAID/Cox 2 inhibitors (Grade A)
  Strong opioids IV for breakthrough pain (Grade A)
  Cooling and compression techniques (Grade B)
19 RCT’s (11 double-blind)

- Better analgesia for all time periods at 24, 48 and 72 h and all catheters
- Reduction in opioid use
- Lower incidence of PONV (21% vs. 49%), sedation (27% vs. 52%), and pruritus (10 vs. 27%) with PNB’s
- Improved patient satisfaction (4 RCT’s only)

"CPNB analgesia, regardless of catheter location, provided superior postoperative analgesia and fewer opioid-related side effects when compared with opioid analgesia"
Why are PNB’s Good for Geriatric Patients?

- Quality of anaesthesia comparable to neuraxial blocks
- Haemodynamic stability (postganglionic, unilateral sympathetic block)
- Reduced use of opioids when combined with GA
- Fewer concerns regarding coagulation and infection problems
- Early mobilisation
- Continuous techniques – opioid-free possible (less PONV and confusion)
Conclusions