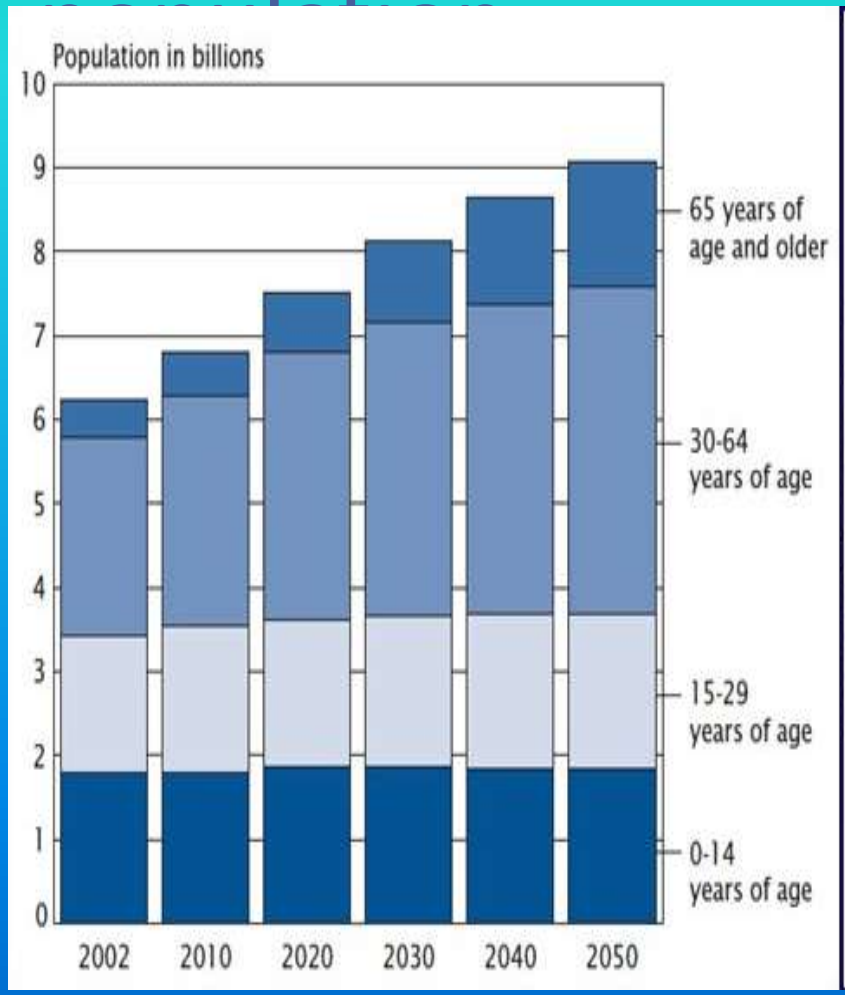
REGIONAL ANAESTHESIA FOR ELDERLY PATIENT

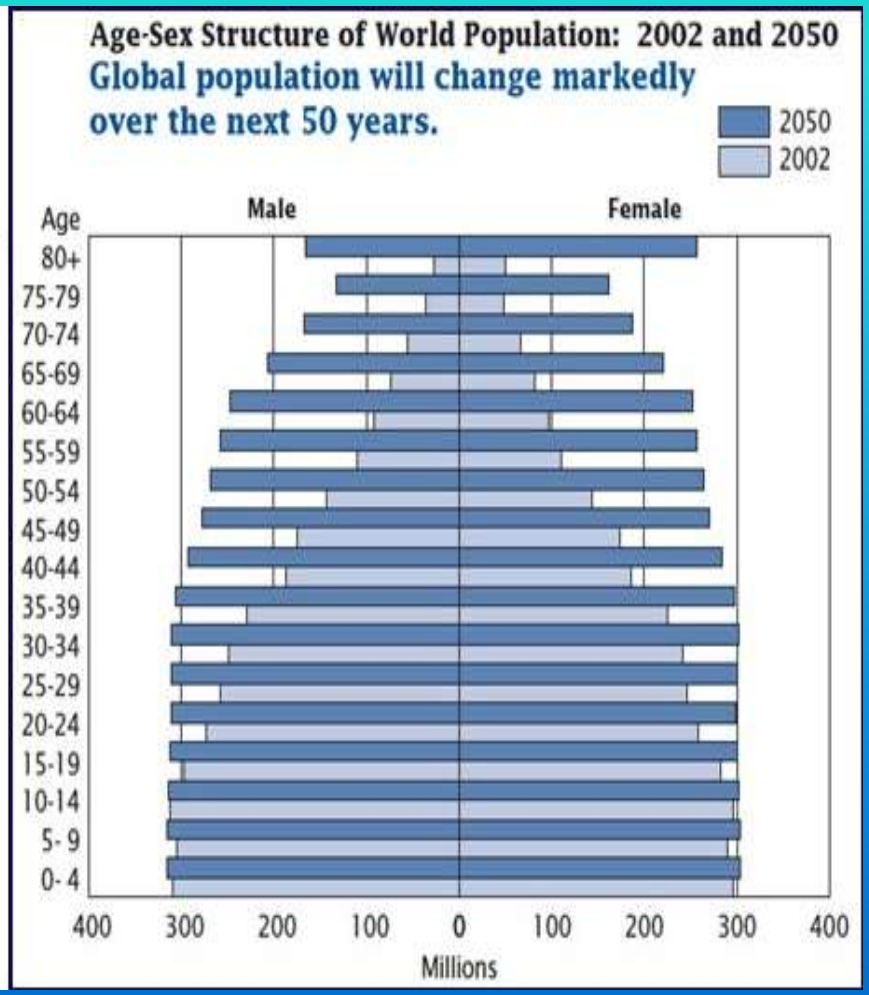
V British – Ukraine symposium

Andrii Strokan . National Academy of Postgraduate Education named Shupika P.L.
Hospital “Feofania”, Kyiv, Ukraine


Rembrandt
1606 - 1669

The increase in the global elderly





Source: Global Population Aging in the 21st Century and Its Economic Implications. Congressional Budget Office, 2005. http://www.cbo.gov/ftpdocs/69xx/doc6952/12-12-Global.pdf

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 resurses are delivered to the elderly patients

Regional Anaesthesia for the Edlderly - 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 technigue
  - Sedation
  - Hypothermia
- Postoperative pain
- Postoperative delirium
- Peripheral nerve blocks

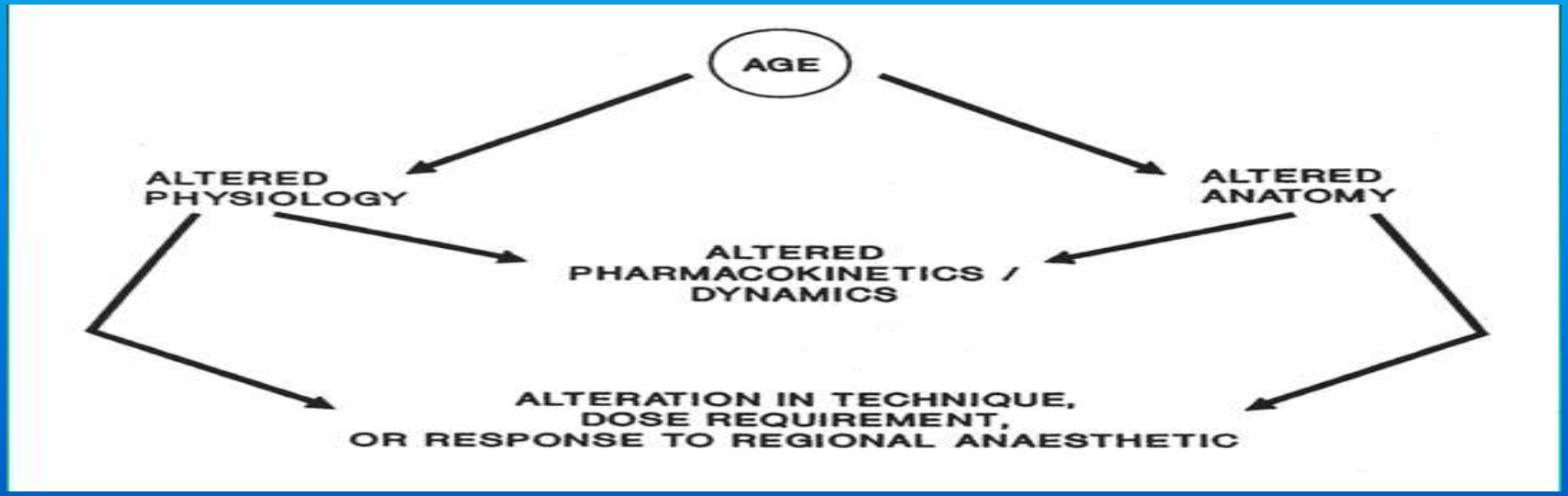
Pharmacology of local Anaesthetics in the older patients

- CNS decreased neuron density

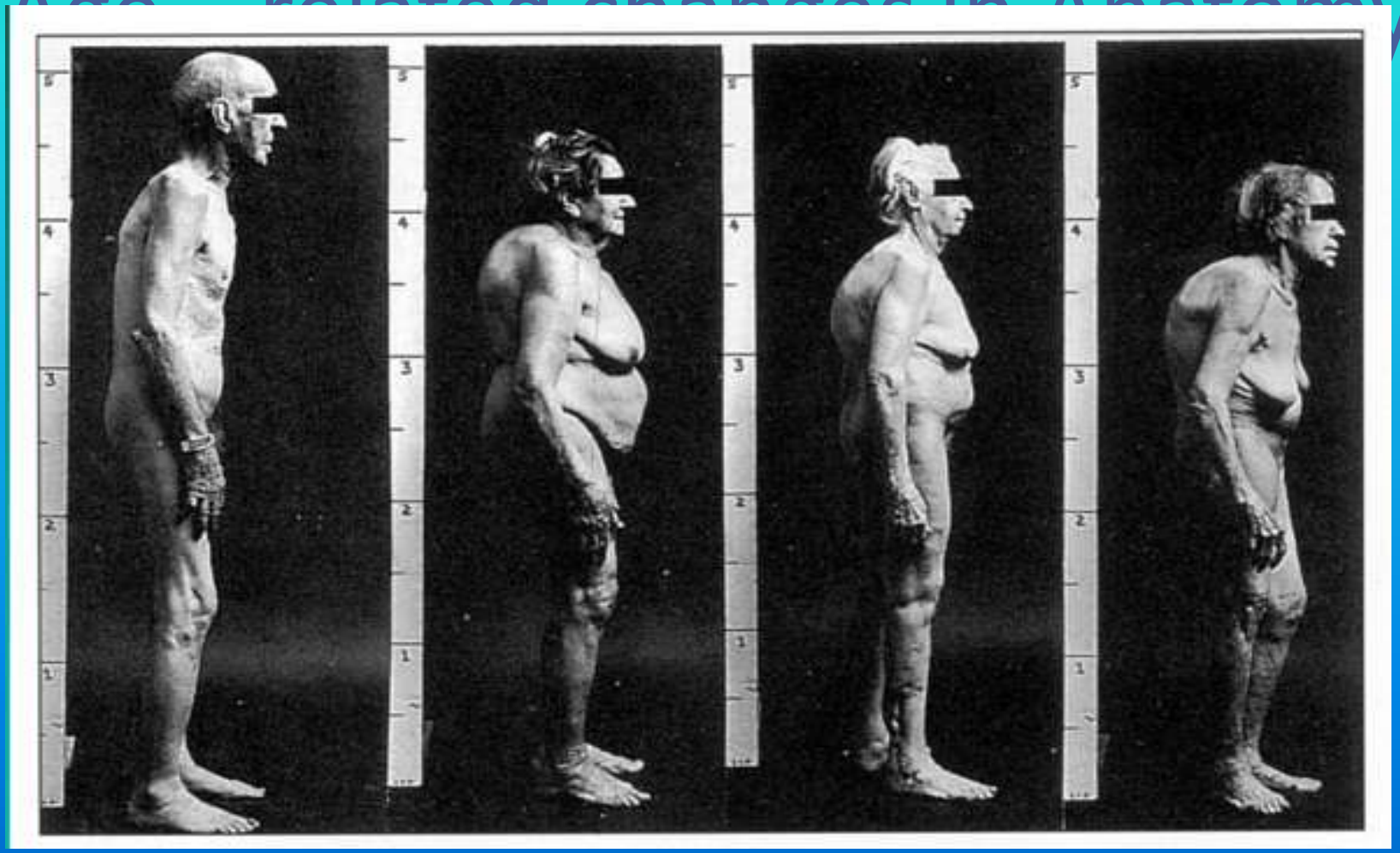
  decreased number and diameter of myelinated fibers

  deterioration of myelin sheats

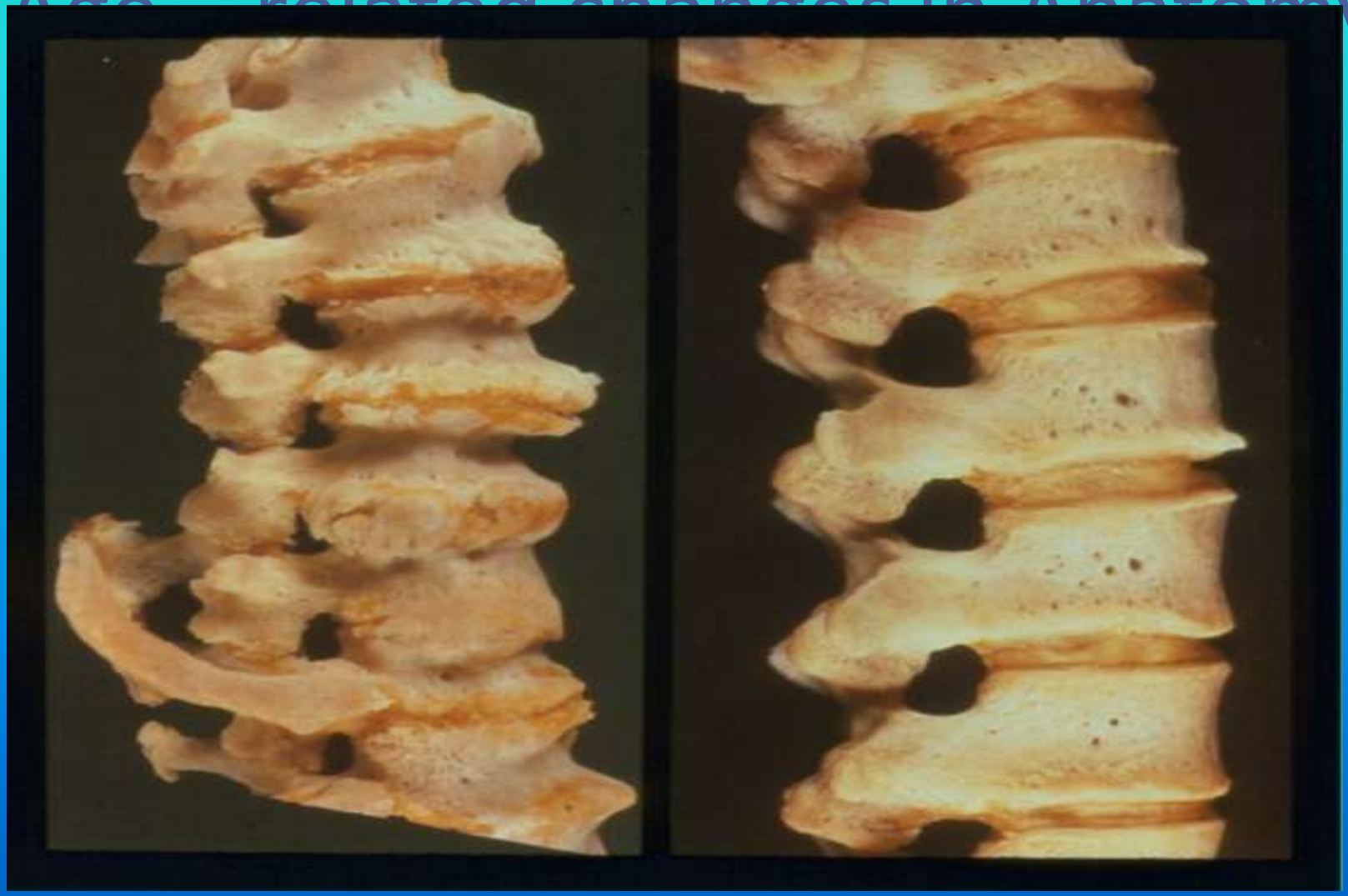
  incresed permeability
- SPINE changes in the configuration of spinal curvatures



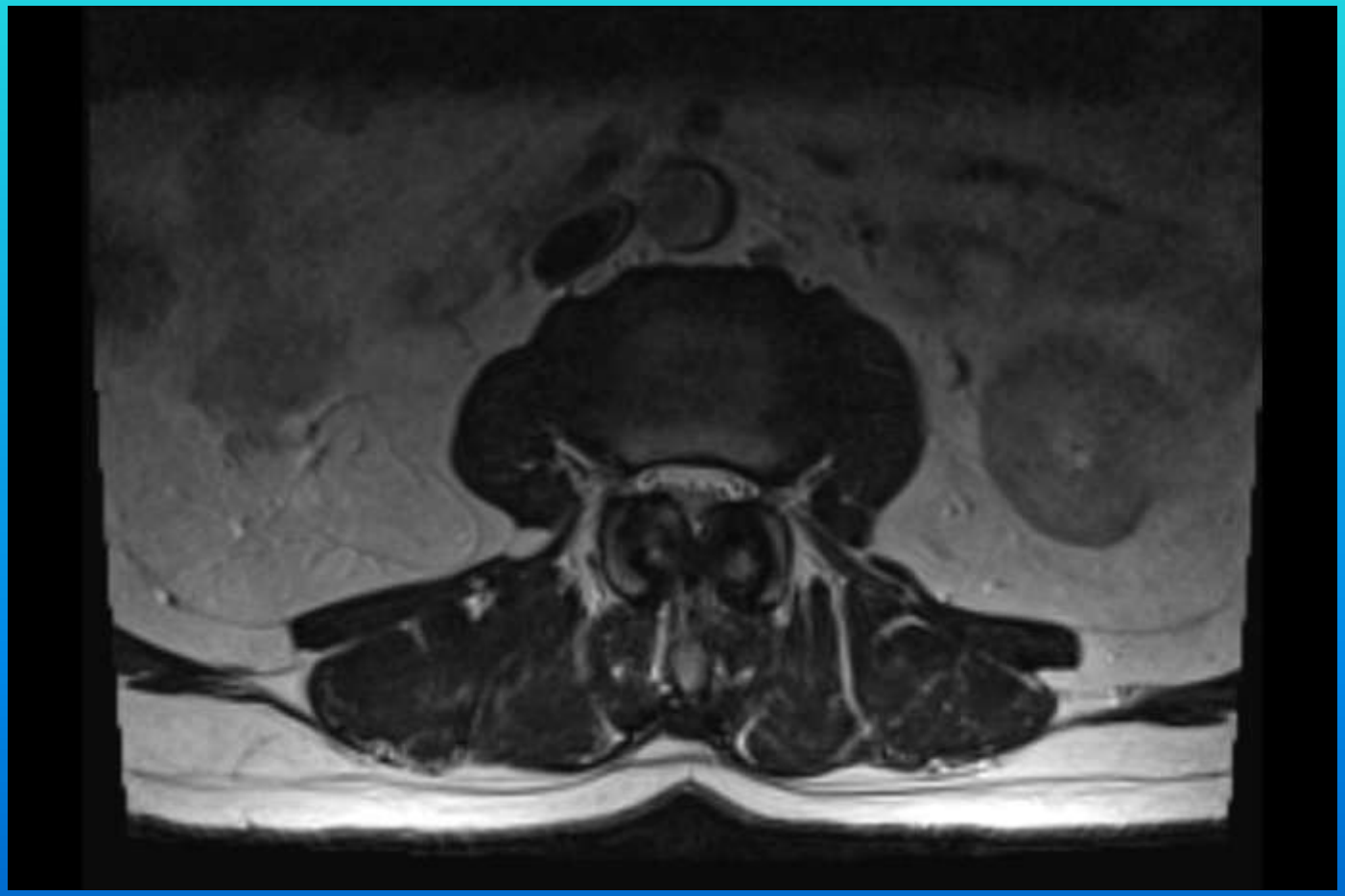
Age – related changes in Anatomy



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

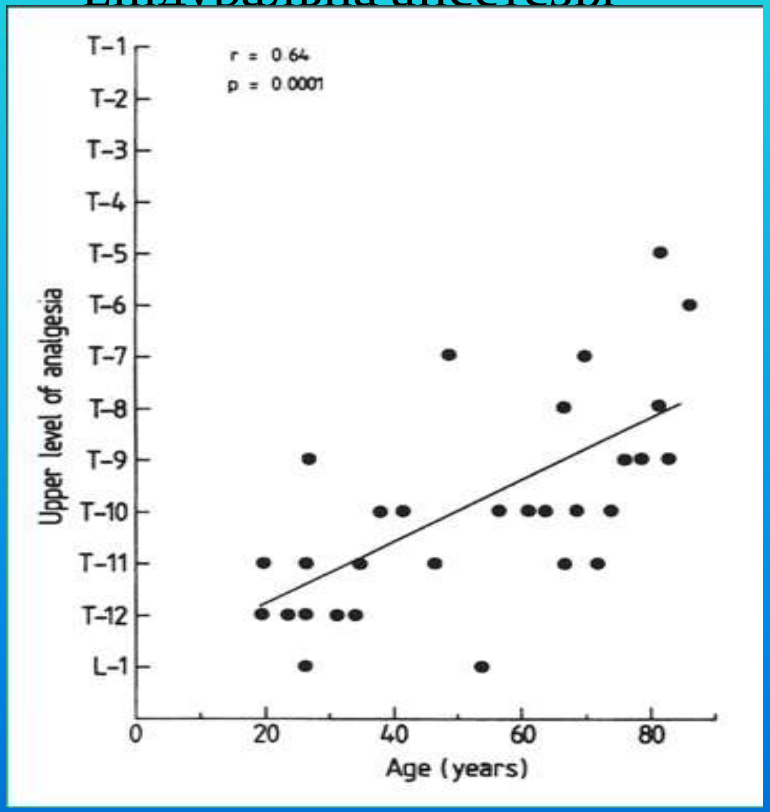
- decline in baroreceptor reflex
- decline in thermoregulation

Factors which may modify the Pharmacokinetics of Local Anesthetics in the elderly

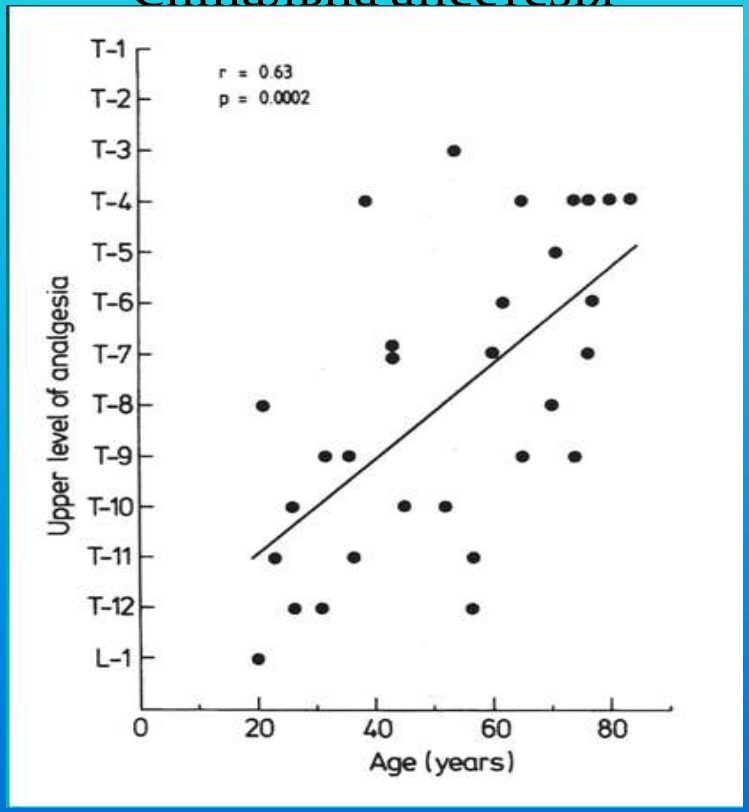
Factors	Possible Effects
• Increased body fat	Greater volume of distribution of lipophilic local anesthetics
• Decline hepatic blood flow	Decrease in clearance of local anesthetics with high hepatic extraction ratio
• Decline hepatic mass (fewer functioning cells)	Decrease in clearance of local anesthetics with low hepatic extraction ratio

Pharmacology of Local Anesthetics in the older patients (Veering et al.)

- Епідуральна анестезія



- Спінальна анестезія

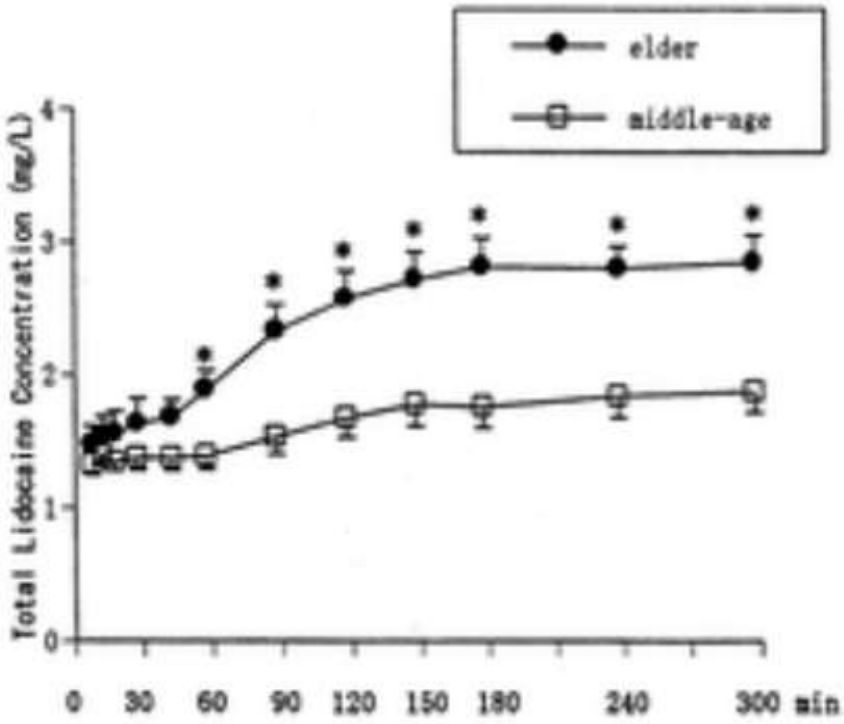


Free Lidocaine Concentrations During Continuous Epidural Anesthesia in Geriatric Patients

Reg Anesth Pain Med 2003;28:215-20

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



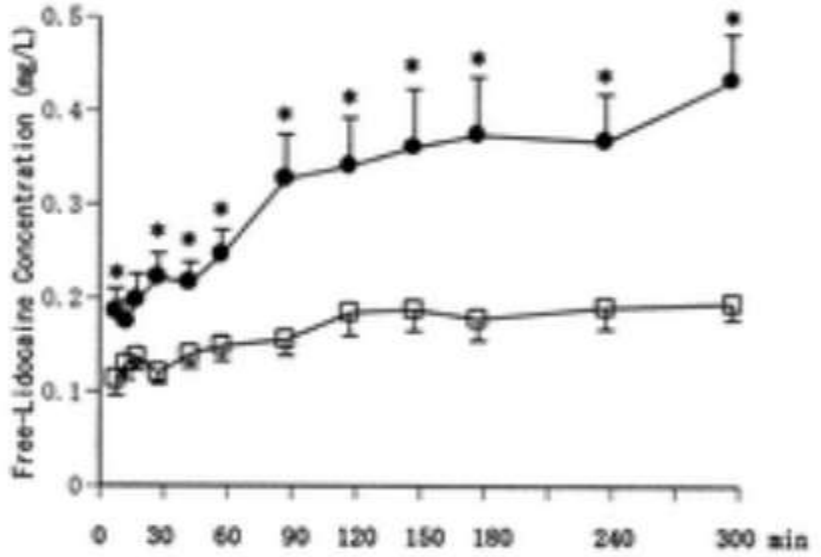
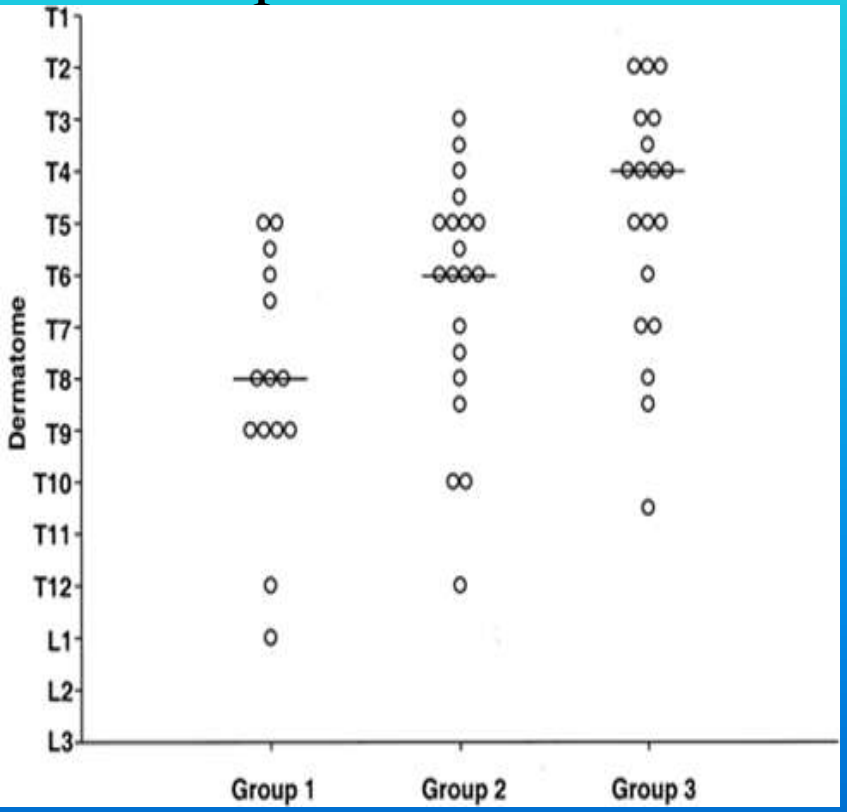


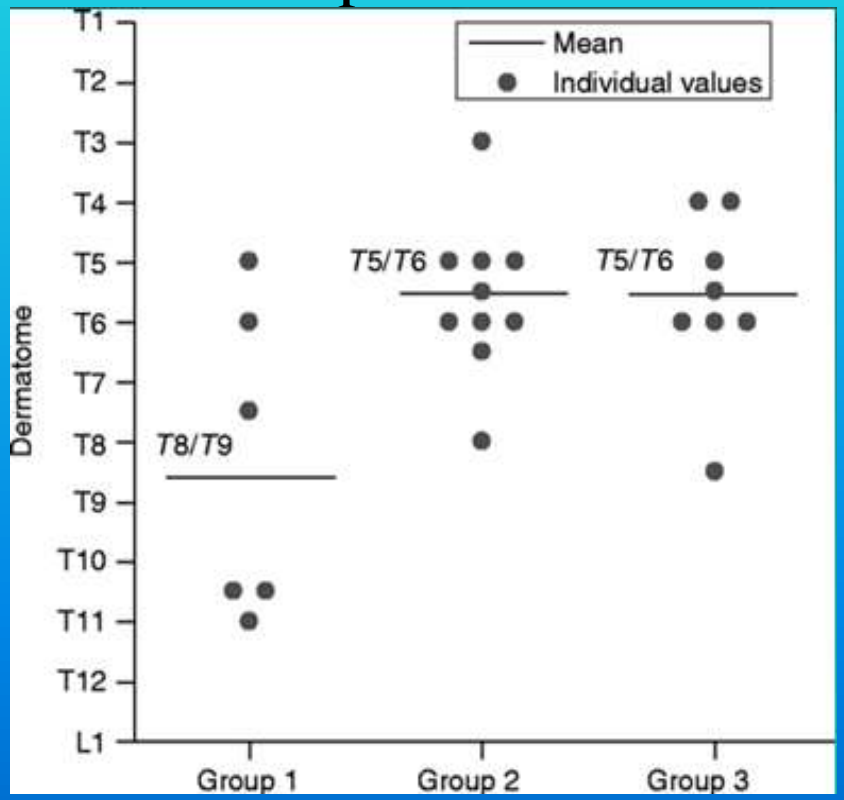
Fig 1. Mean plasma concentrations of total (top) and free (bottom) lidocaine following lidocaine administered epidurally to elderly (●) or middle-aged (□) male patients. *$P < .05$, compared with the middle-aged group. Bars represent standard errors.

Pharmacology of Local Anesthetics in the older patients (Simon et al.)

- Ropivacaine

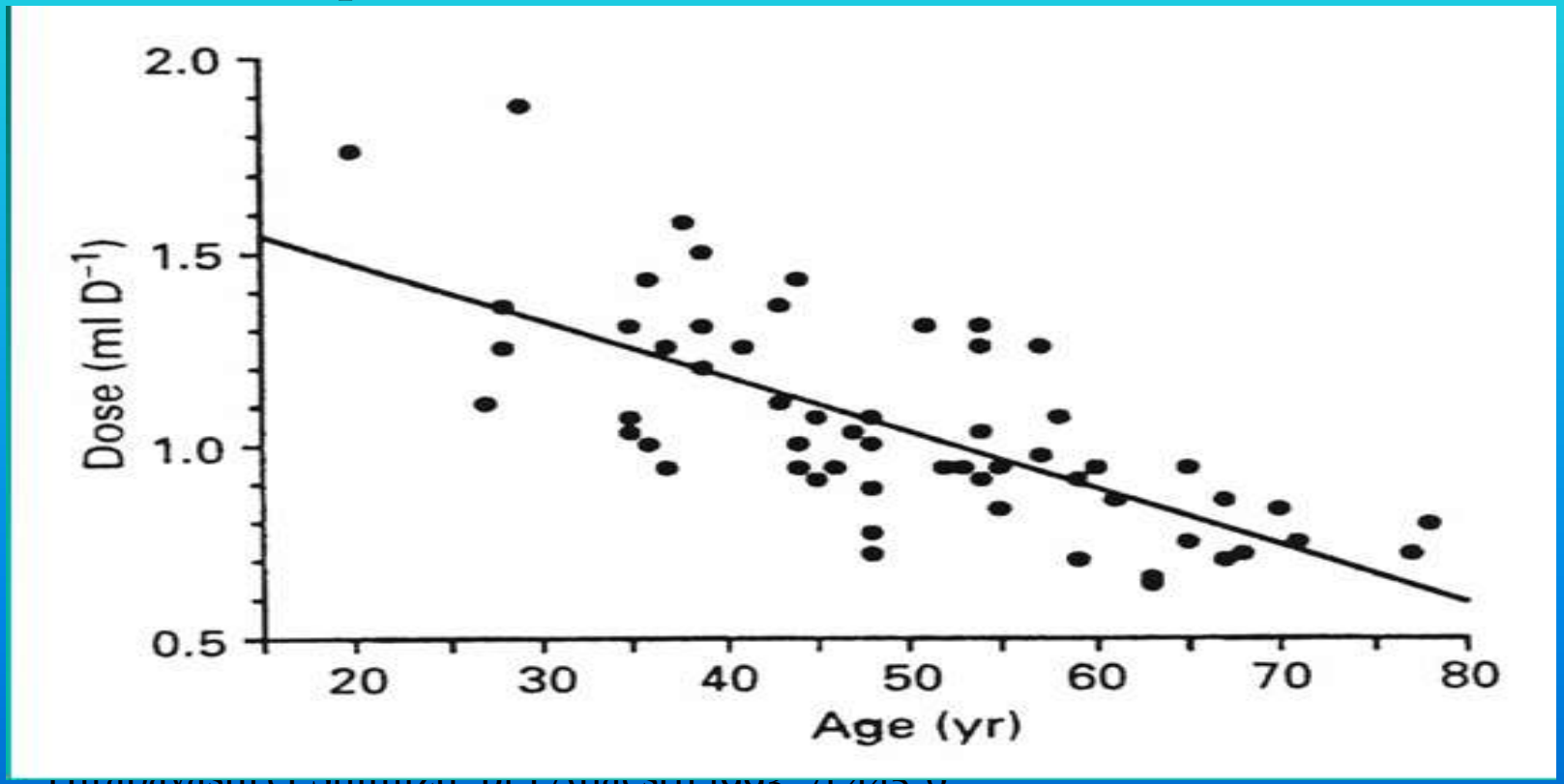


- Levobupivacaine



Pharmacology of Local Anesthetics in the older patients

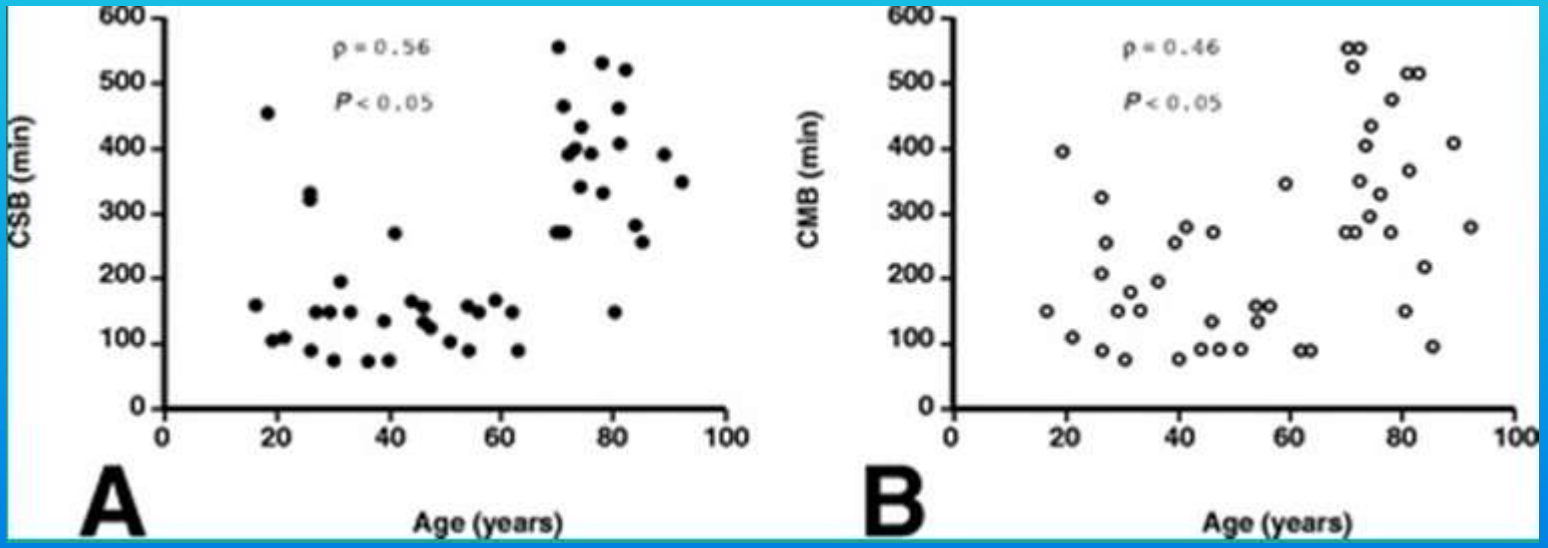
- Thoracic Epidural Anaesthesia



Hirabayashi et Shimizu. Br J Anaesth 1993; 71:445-6

Pharmacology of Local Anesthetics in the older patients

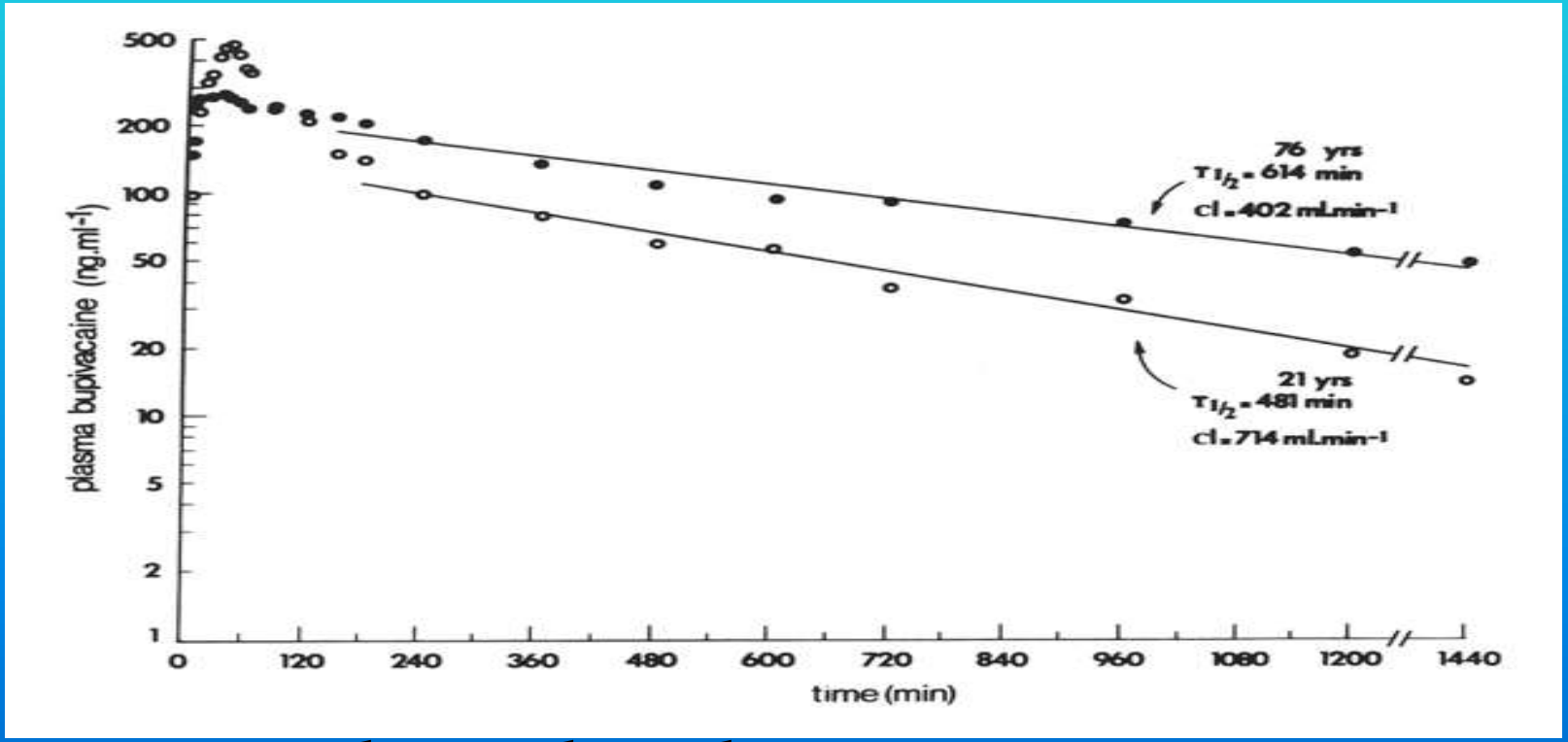
- Peripheral Nerve Blockade



Pagueron X et al. Anaesthesiology 2002; 92:1330-4

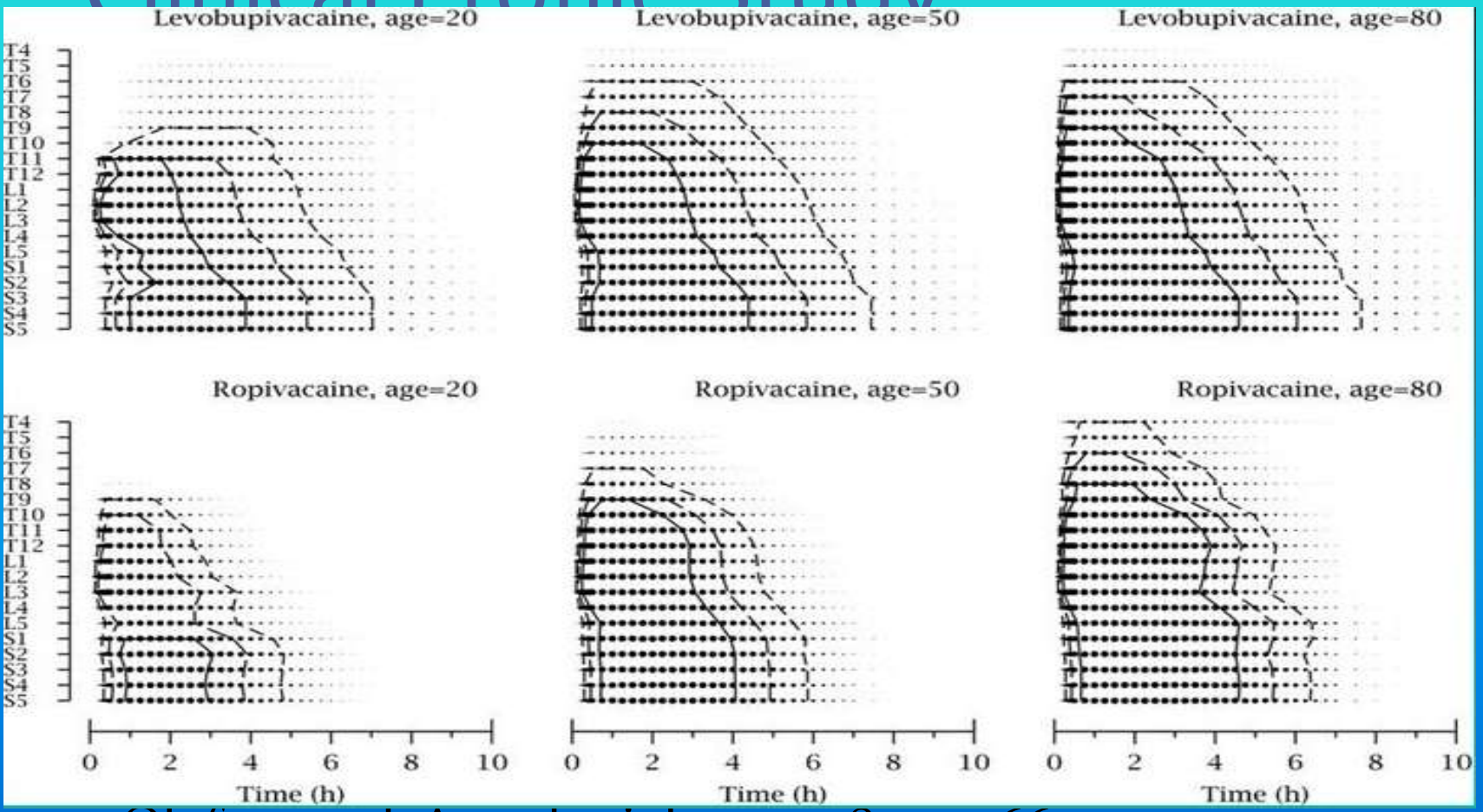
Pharmacology of Local Anesthetics in the older patients

- Effects of age



Veering et al. Anesth Analg 1987; 66: 589-93.

Combined Pharmacokinetics – Clinical Profile Study



Olofsen et al. Anesthesiology 2008; 109: 664-7.

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

Sandby –Thomas M. Anaesthesia 2008;63:250-58

- Survey from 218 hospitals:Anaestesia 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., Anaesthesioilogy 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

  Butterworth J., Reg Anesth Pain Med 1998

Spinal Anaesthesia for geriatric Patient

- Prevention and Treatment of Hypotension

1. Pharmacological interventions
   - Volume
   - Vasopressors

2. Modifications of he technigue
   - 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 prehidratation

  Chan W.S., Anaesthesia 1997

- Initially, ά agonists for patients with hypotension and mixed ά and β for patients with both hypotension and bradycardia

  Liu SS., Anesthesiology 2001

Crystalloid/Colloid Versus Crystalloid Intravascular Volume Admi nistration Before Spinal Anaesthesia in Elderly Patients: The Influence on CO and SV

Riesmeier A et al: Anesth & Analg 2009;108:650-54

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

G1: NaCL 500 ml, G 2: NaCl 500ml + HES 500 ml (6% 130/0,4),

G 3: No volume

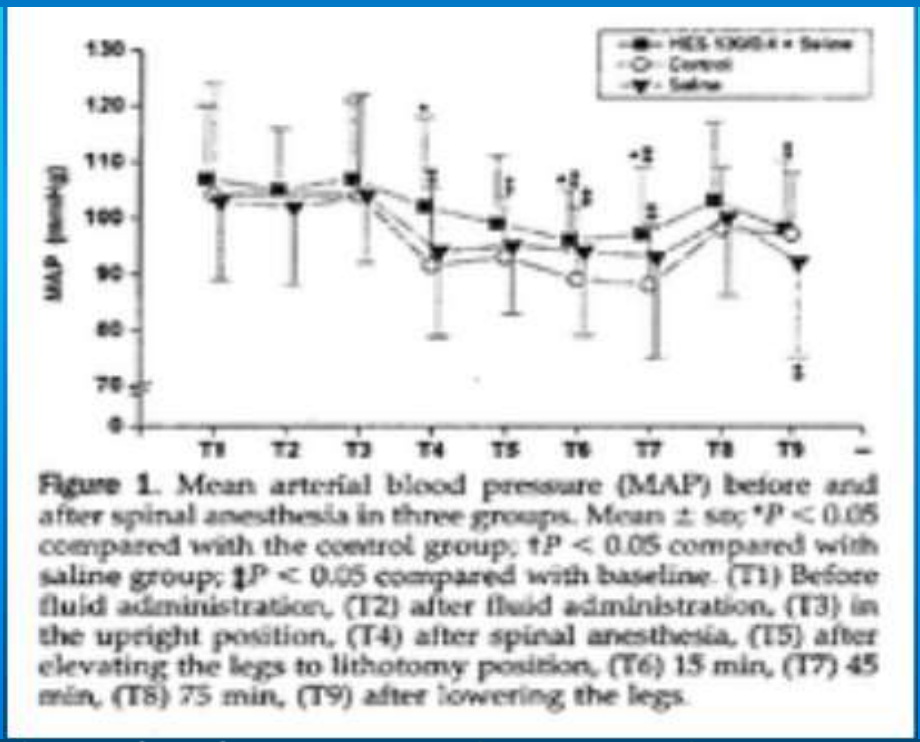


Figure 1. Mean arterial blood pressure (MAP) before and after spinal anesthesia in three groups. Mean ± SD; *$P < 0.05$ compared with the control group; †$P < 0.05$ compared with saline group; ‡$P < 0.05$ compared with baseline. (T1) Before fluid administration, (T2) after fluid administration, (T3)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

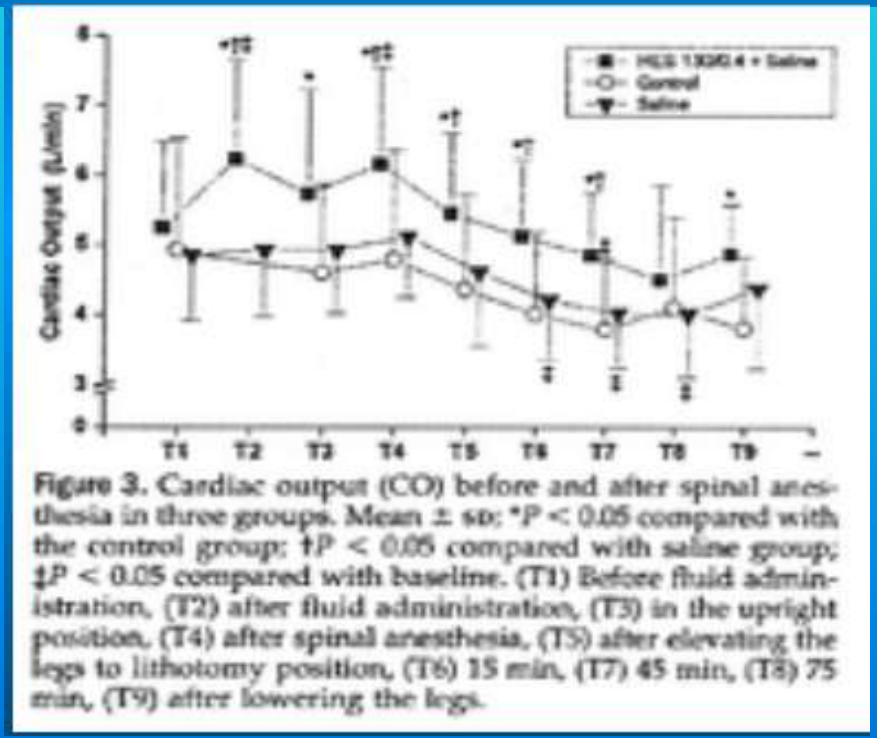


Figure 3. Cardiac output (CO) before and after spinal anesthesia in three groups. Mean ± SD; *$P < 0.05$ compared with the control group; †$P < 0.05$ compared with saline group; ‡$P < 0.05$ compared with baseline. (T1) Before fluid administration, (T2) after fluid administration, (T3) in the upright position, (T4) after spinal anesthesia, (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

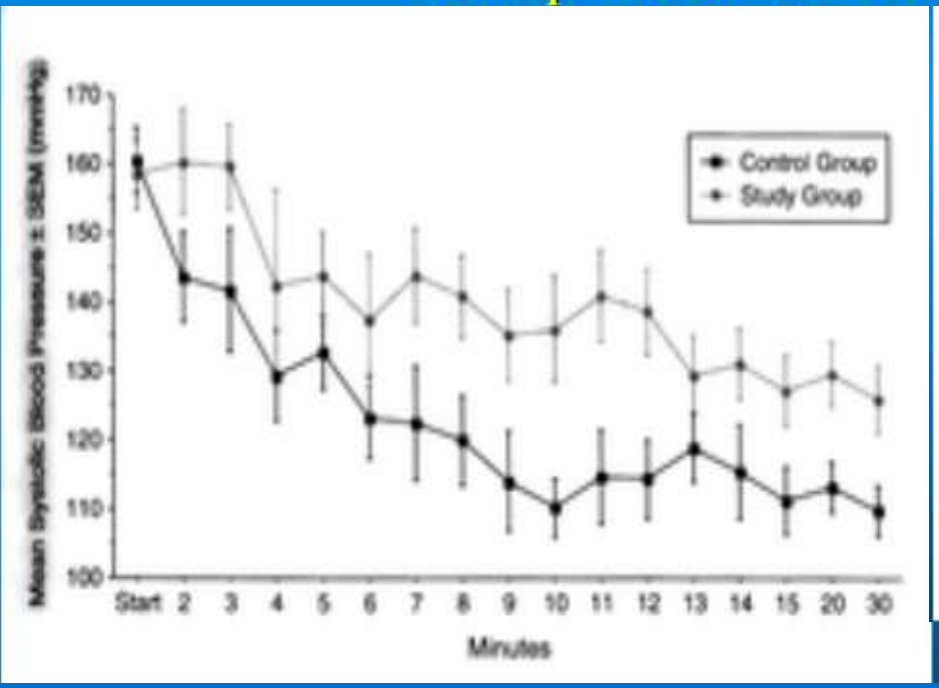
Hypotension not influenced by volume administration

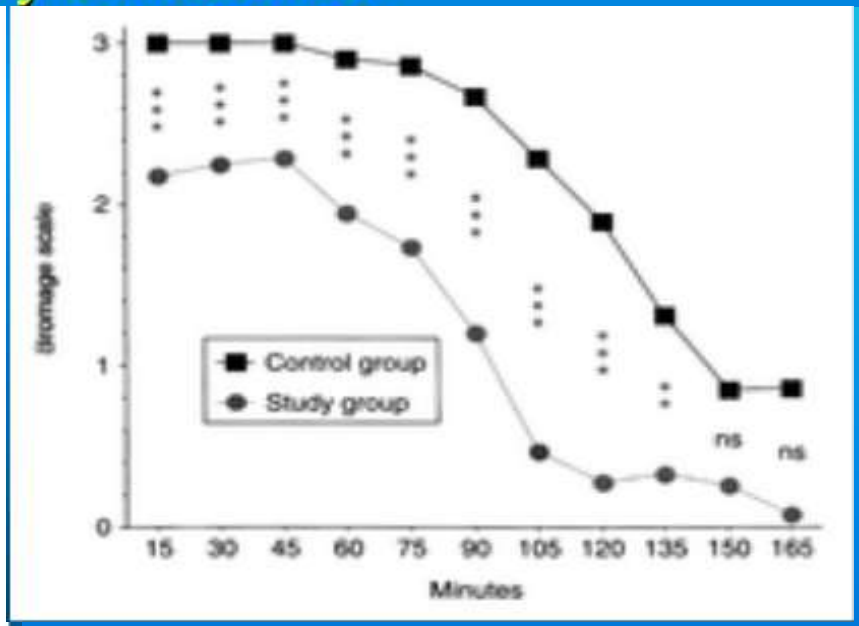
Low-dose Bupivacaine with Sufentanil Prevents Hypotension After Spinal Anaesthesia for Hip Repair in Elderly Patients

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 anaesthesth Pain Med 2000

- Mimimal haemodynamic changes in elderly patients with hip fracture

Khatouf M. An Fr Anesth Reanim 2005

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

- Fanelli G., Acta Anaesthesiol Scand 1988

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 freguent 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

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

Anesthesiology 2004; 101:950–9

Severe Neurological Complications after Central Neuraxial Blockades in Sweden 1990–1999

Vibeke Moen, M.D.,* Nils Dahlgren, M.D., Ph.D.,† Lars Irestedt, M.D., Ph.D.‡

- *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)

Spinal Haematoma After Neuraxial Blockades

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

Table 8. Cases and Incidences of Spinal Hematoma

	Epidural Blockade Including CSE				Spinal Blockade			
	Patients (× 1000)		Cases and Incidence		Patients (× 1000)		Cases and Incidence	
	M	F	M	F	M	F	M	F
Knee arthroplasty	9	18	1 [0–6] 1:9 000	5* [2–12] 1:3 600	7	14	–	–
Hip arthroplasty	14	29	–	1 [0–6] 1:29 000	27	56	–	–
Hip fracture	–	–	–		38	111	–	5† [2–12] 1:22 000
Obstetric pain relief during labor	–	200	–	1 [0–6] 1:200 000	–	–	–	–
Cesarean sections	–	5	–	–	–	50	–	1 [0–6] 1:50 000
Subtotal (M/F)	275		8 (1/7)		303		6 (0/6)	
General population (M/F)	175		17 (7/10) [10–27] 1:10 300		957		2 (1/1) [0–7] 1:480 000	
Total (M/F)	450		25 (8/17)		1 260		8 (1/7)	

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

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

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 Hypothermia in Geriatric

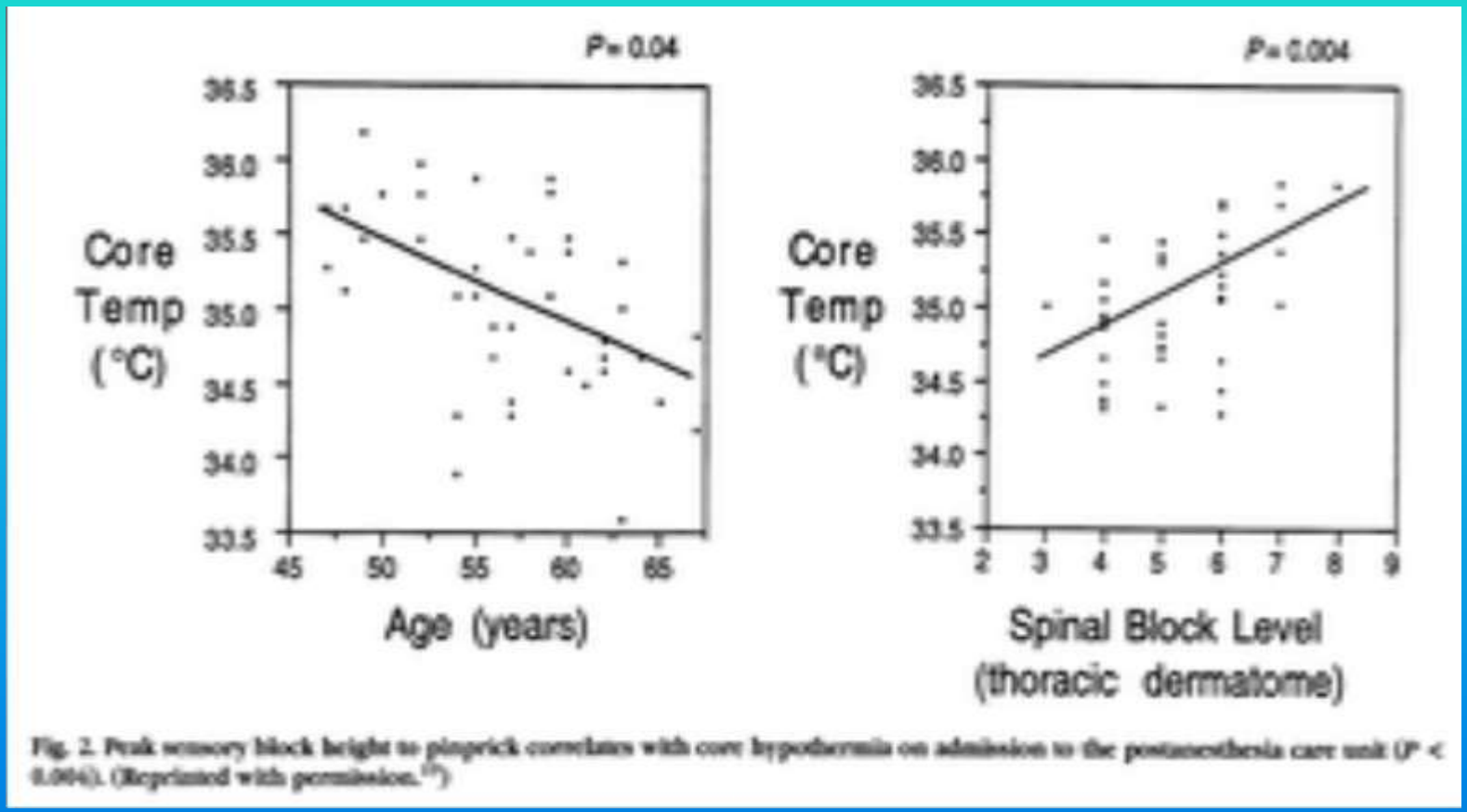


Fig. 2. Peak sensory block height to pinprick correlates with core hypothermia on admission to the postanesthesia care unit ($P < 0.004$). (Reprinted with permission.[17])

Kurz A. Anesth Analg 1993. Leslie K. Anesthesiology 1996

Relationship Between Pain and Opioid Analgesics on the Development of Delirium Following Hip Fracture

R. Sean Morrison,[1] Jay Magaziner,[2] Marvin Gilbert,[3] Kenneth J. Koval,[4] Mary Ann McLaughlin,[1] Gretchen Orosz,[1] Elton Strauss,[3] and Albert L. Siu[5]

J of Gerontology 2003;58:76-81

- *Incidence of delirium = 16 % (87/541)*
- *Prospective study, 4 New York hospitals, n = 541*
- *Risk factors:*

– cognitive impairment	*RR 3.6*
– abnormal BP	*RR 2.3*
– heart failure	*RR 2.9*
– < 10 mg morphine (vs. more)	*RR 5.4*
– meperidine (vs. other opioids)	*RR 2.4*
– severe pain (in cognitively intact patients)	*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 technigues 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

Anaesthesia, 2005, 60, pages 1189–1202 doi:10.1111/j.1365-2044.2005.04382.x

REVIEW ARTICLE

A procedure-specific systematic review and consensus recommendations for analgesia after total hip replacement

H. B. J. Fischer[1] and C. J. P. Simanski[2] on behalf of the PROSPECT working group

- 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 reguested

REVIEW ARTICLE

A procedure-specific systematic review and consensus recommendations for postoperative analgesia following total knee arthroplasty

H. B. J. Fischer,[1] C. J. P. Simanski,[2] C. Sharp,[3] F. Bonnet,[4] F. Camu,[5] E. A. M. Neugebauer,[6] N. Rawal,[7] G. P. Joshi,[8] S. A. Schug[9] and H. Kehlet[10]

- 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 breakthrought pain (Grade A)

Cooling and compression technigues (Grade B)

Does Continuous Peripheral Nerve Block Provide Superior Pain Control to Opioids? A Meta-Analysis

Jeffrey M. Richman, MD*, Spencer S. Liu, MD‡, Genevieve Courpas, BA*, Robert Wong, MD*, Andrew J. Rowlingson, BA*, John McGready, MS†, Seth R. Cohen, BS§, and Christopher L. Wu, MD*

Anesth Analg 2006;102:248-57

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