Local and Regional Anaesthesia

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The Four Johns (Hunter):
(One of these things is not like the others)
Disclaimer:
Declare No Interest
The Plan:

• Central Neuraxial Techniques:
  – Recent trends
  – Agents (particularly opioids)

• Plexus and Nerve Blocks:
  – Ultrasound
  – Novel agents
  – Novel techniques

• Discussion:
  – Ask me difficult questions and plumb the depths of my ignorance
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Trends in Central Neuraxial Anaesthesia

• Fewer epidurals in general and orthopaedic surgical populations
• Ambulatory techniques
• Combined techniques
• Patient regulated devices
• Image-guided approaches
The Epidurosaurus
(News of its death greatly exaggerated)

- MASTER Trial – Published in *The Lancet* 2002¹
- Changes in surgical techniques - Minimally invasive (Maximally time-consuming) surgery
- Wider use of ‘multimodal’ analgesia regimes with published guidelines², COX2 inhibitors, parenteral paracetamol, remifentanil PCA, etc

¹Epidural anaesthesia and analgesia and outcome of major surgery: a randomised trial - Rigg et al *THE LANCET* Vol 359 • April 13, 2002
²Acute Pain Management: Scientific Evidence 2nd Ed 2005 - ANZCA and FPM
Ambulatory Central Neuraxial Techniques

WALKING
BY TO
SAY HI
Ambulatory Central Neuraxial Techniques

- Facilitated by lower dose LA, possibly newer LA’s, and lipophilic opioids¹
- Technique utilised in both epidural and spinal anaesthesia
- Promoted in both obstetric and general surgical practice
- Requires infrastructural support, ward staff education, etc

¹Labor analgesia: is there an ideal technique? – Wong C
[Editorial]
Combined Technique: The CSE

• Potential advantage of rapid onset but sustainable block
• Initially improvised technology
• Now many proprietary kits
• Alternative to continuous spinal anaesthesia using micro catheters
• No proven evidence for significant benefit over epidural in labour¹

¹Simmons SW, Cyna AM, Dennis AT, Hughes D. Combined spinal-epidural versus epidural analgesia in labour. Cochrane Database of Systematic Reviews 2007, Issue 3.
CSE Needles: 2000 Words of Pictures
The PCEA:
Consumerism Rules
PCEA: Pros and Cons

• Pros:
  – Titrated to patient need
  – Titrated against side effects
  – Minimal nursing intervention
  – Copes with variable nociception
  – Sense of control

• Cons:
  – Needs cooperation
    • Patient
    • Nurses
    • Surgeon
  – Protocol complexity
  – Technological demands
  – Error potential
Image Guided Central Neuraxial Blocks: X-Ray
Image Guided Central Neuraxial Blocks: U/S
Central Neuraxial Agents¹

- Local Anaesthetics
- Opioids
- Alpha-2 agonists
- Midazolam
- Neostigmine
- S-ketamine
- Conotoxins

¹Neuraxial Drug Administration: A Review of Treatment Options for Anaesthesia and Analgesia
Schug, Stephan A.; Saunders, David; Kurowski, Irina; Paech, Michael J.
*CNS Drugs*, Volume 20, Number 11, 2006, pp. 917-933(17)
Local Anaesthetics: Spinal

• Lignocaine rarely used in spinals – Reports of transient neurological symptoms\(^1\) and 6 cases of Cauda Equina Syndrome with 5% solution\(^2\)
• Bupivacaine plain or heavy remain preferred agents
• Ropivacaine, levobupivacaine, prilocaine, procaine or chlorprocaine are alternatives

\(^1\)Transient neurologic symptoms (TNS) following spinal anaesthesia with lidocaine versus other local anaesthetics. [update of Cochrane Database Syst Rev. 2005;(4)]
Zaric D. Pace NL.
*Cochrane Database of Systematic Reviews*

\(^2\)Cauda equina syndrome after spinal anaesthesia with hyperbaric 5% lignocaine: a review of six cases of cauda equina syndrome reported to the Swedish Pharmaceutical Insurance 1993-1997.
Loo CC. Irestedt L.
Local Anaesthetics: Epidural

- Lignocaine
  - Rapid onset and offset
  - Addition of adrenaline reduces systemic uptake, serves as intravascular marker
- Bupivacaine
  - Lipid soluble, potent, toxic, long duration
- Levobupivacaine
  - S-enantiomer of bupivacaine
  - Similar potency but lower toxicity than racemate
- Ropivacaine
  - S-enantiomer, one fewer CH2 group than bupivacaine
  - Possibly slightly lower potency than bupivacaine
  - Possibly wider motor / sensory separation than bupivacaine
  - Intrinsic mild vasoconstriction
Central Neuraxial Opioids

• **Lipophilic:**
  - Fentanyl
  - Sufentanil
  - *Buprenorphine*

• ‘Segmentalised’

• Relatively rapid systemic uptake

• Short half-life of effect

• Approximation of systemic, epidural and intrathecal doses

• **Lipophobic:**
  - Morphine
  - Hydromorphone

• Rostral spread in CSF

• Slow systemic uptake

• Long half-life of effect

• Order-of-magnitude differences between systemic, epidural and intrathecal doses
Alpha-2 Agonists

- Clonidine
- Dexmedetomidine
- Dexmedetomidine and clonidine both shown to prolong caudal epidural analgesia¹
- System morphine dose sparing seen with epidural clonidine after spinal surgery²


Midazolam

• Improved analgaesia but increased sedation with epidural midazolam¹

• Prolonged motor block but not extension of analgaesia intrathecally²

¹Effects of adding midazolam on the postoperative epidural analgesia with two different doses of bupivacaine.
Nishiyama T. Matsukawa T. Hanaoka K.

²Effects of intrathecal midazolam on postoperative analgesia when added to a bupivacaine-clonidine mixture.[see comment].
Boussofara M. Carles M. Raucoules-Aime M. Sellam MR. Horn JL.
In conclusion, the evolution of spinally delivered drugs and their safe use in our patients has been allowed thanks to observations and trials from preclinical animal models. The lesson from the intrathecal midazolam story clearly shows that to disregard the messages from preclinical trials may expose our patients to unnecessary risks. Therefore, because of the possible risk of neurotoxicity and the absence of significant analgesic benefit, it seems reasonable to no longer consider intrathecal midazolam as a spinal adjuvant for perioperative analgesia.

Patricia Lavand’homme, M.D., Ph.D.¹

¹Lessons from spinal midazolam: When misuse of messages from preclinical models exposes patients to unnecessary risks.[comment].
Lavand’homme P.
Regional Anesthesia & Pain Medicine. 31(6):489-91, 2006 Nov-Dec
Something Irrelevant: The Commode-dore
Plexus and Nerve Blocks

- Ultrasound
- Novel agents
- Novel techniques
Ultrasound
Ultrasound and Regional Anaesthesia

• Rapidly growing area
• Medline publications relating regional anaesthesia and ultrasound:
  – 1980-87: 2
  – 1988-95: 31
  – 1996-2004: 146

Why Ultrasound?

• See the nerves
• See the needles
• See the local anaesthetic
• See other structures:
  – Blood vessels
  – Bones
  – Lung
  – Fascial planes
Potentially:

- **Safer block**
  - Reduced needle trauma
  - Reduced intraneural and intravascular injections

- **More effective / reliable block**
  - Visualise spread of local anaesthetic

- **Better tolerated blocks**
  - Discomfort with nerve stimulator
  - Lower volume injections (Traditional technique of ‘volumetric correction for anatomical inaccuracy’)

- **New block options**
  - No / unreliable surface landmarks
  - Anaesthetised, paralysed patients
Ultrasound – The Evidence

• 10 articles in Cochrane database showing improved efficacy of block, prolonged duration of block or safety of blocks performed under ultrasound guidance (Catheter or single shot)
• No meta-analysis or systemic review published yet
• No level one evidence for wearing a parachute when jumping out of an aeroplane either
Some Ultrasound Blocks

• Brachial Plexus:
  – Interscalene
  – Supraclavicular
  – Infraclavicular
  – Axillary
• Lumbar Plexus
• Femoral Nerve
• Sciatic Nerve:
  – Infragluteal
  – Popliteal
• Epidural
Interscalene
Supraclavicular
Infraclavicular
Axillary
Lumbar Plexus
Femoral Nerve
Infragluteal Sciatic
Popliteal Sciatic
Epidural (Again)
Regional Anaesthesia on the Wonderful World-Wide Web

- www.nysora.com
- www.usra.ca
- www.lsora.co.uk
- nerveatlas.ucsf.edu/atlas
Agents in Regional Anaesthesia

- Major trend is declining use of racemic bupivacaine (toxicity)
- Declining use of lignocaine in many blocks (little post-operative analgesia, pain with offset, need to add adrenaline to reduce toxicity)
- Safer long-acting, high potency agents (ropivacaine and levo-bupivacaine)
- Addition of other agents (clonidine, fentanyl) to local anaesthetics in peripheral blocks
Future Agents?

• N-acyl tetracaine (Current US Patent)
• Liposomal preparations
  – ‘Bupisome’ (Current US Patent application)
  – Bupivacaine loaded into liposome by ion trapping (0.5%, 1%, 2% formulations)
  – 20 to 30 fold prolongation of bupivacaine effect¹

¹A Novel Liposomal Bupivacaine Formulation to Produce Ultralong-Acting Analgesia
Gilbert J. Grant, M.D., Yechezkel Barenholz, Ph.D., Elijah M. Bolotin, Ph.D., Mylarrao Bansinath, Ph.D., Herman Turndorf, M.D., Boris Piskoun, B.S., Elyad M. Davidson, M.D.
Anesthesiology 2004; 101:133–7
Novel Techniques

• Old blocks revisited – Supraclavicular brachial plexus block
• New blocks invented:
  – TAP block (Subcostal and ‘posterior’)
  – ‘Intermediate’ cervical plexus block
• Many old blocks re-invented:
  – Iliacus plane
  – Ilioinguinal / iliohypogastric
  – Deep cervical plexus block
Transversus Abdominal Plane (TAP) Block
TAP Block
TAP Block
Regional Anaesthesia Without Ultrasound

Your Problem Is Obvious
Questions?

• Some Answers:
  1. Yes
  2. No
  3. Maybe
  4. Buggered if I know
  5. All of the above