THORACIC ANALGESIA

A SMORGASBOARD OF TECHNIQUES

NEURAXIAL BLOCKADE
REGIONAL BLOCKADE
MULTI MODAL ANALGESIA
<table>
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<th>1990s</th>
<th>2015</th>
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<td>• wide incision thoracotomies</td>
<td>• A Thorascopic Revolution</td>
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<td>• TAT for pneumothorax</td>
<td>• Downsizing of Thoracotomy wounds</td>
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<td>• RIB Spreading</td>
<td>• Minimal rib spreading</td>
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Surgical placement of TPV catheter

Downsizing of surgical incisions
Thoracic analgesia in 2015

Multi modal analgesia commencing at premedication
Combined regional and IV rescue
transitioning to oral only analgesia over shorter time frames

- NMDA receptor antagonist addition SRI, NRI, COX Is
- Paravertebral block with infusion
- Intercostal nerve block with infusion
- PCA rescue
- Regular oral adjuvant medication - Paracetamol
Thoracic Epidural Analgesia

- **Benefits**
  - Excellent analgesia
  - Stable intraoperative haemodynamics and BP control
  - Good recovery of respiratory function post op
  - Decreased stress response with cardiac benefits, immune benefits and decreased risk of DVT

- **Limitations**
  - Postoperative hypotension.
  - Intensive surveillance
  - Nausea, vomiting, pruritis
  - Catheter migration and block failure
  - Nerve injury (1:257,000)
  - Epidural haematoma (1:150,000-168000)
  - Epidural abscess (1:145,000)
Cool facts

- Novis epidural insertion success rate 60%
- Generally 90% in experienced hands
- No difference in neurological injury in awake or anaesthetized patients (Horlocker)
- Adult spinal cords end at L1. In children up to 7 years at L3 therefore the caudal route is preferred over epidural for neuraxial blocks.
- Local anaesthetic agents, clonidine and narcotics all have positive analgesic effects when placed epidurally
- Ultrasound guidance is good for determining general needle direction, but not localizing the tip
PARAVERTEBRAL BLOCK
Thoracic Paravertebral Space

- First Rib
- Spinal Nerve (Ventral Ramus)
- Transverse Process
- Pleura
- Superior Costotransverse Ligament
- T1 Vertebra
- Dura Mater
- Spinous Process
Trapezius
Rhomboideus

Cephalad
Superior Costotransverse Ligament
Transverse Process

Caudad
Transverse Process
Paravertebral Space
Pleura
Thoracic Paravertebral Block facts

To establish a block

- To establish the block 0.5ml/kg
- Block Maintenance
- Adults 0.1ml/kg/hr
  and in children 0.2ml/kg/hr
- Addition of Clonidine 1ug/kg can improve quality and duration of analgesia. Narcotics have no enhancing affect with this block

Complications overall I 2.6-5%

- Success rates similar to thoracic epidurals (90%)
- Hypotension 4.6%
- Vascular puncture 3.8%
- Pleural puncture 1.1%
- Pneumothorax 0.5%
- Total spinal (if approach was very medial and dural cuff of spinal nerve was breached)
ADVANTAGES

• Easy to perform
• Often inserted by the surgeons under “thorascopic vision”
• 90% success rate
• No haemodynamic changes and better mobilization
• No urinary retention
• Minimal issues with haematoma and infection even if they do occur
• If the catheter is fed interpleurally then the block is less intense, greater volumes of LA are required and serum concentrations of LA are higher
INTERCOSTAL NERVE BLOCKS

ADVANTAGES

• Easy to perform and success rate high
• Catheters can be placed and infusions run

limitations

• Infusions often not that effective
• High incidence of intravascular injection
• Pneumothorax possible
• Damage to neurovascular bundle
Technique for ICNB

22 Gauge block needle with extension and syringe of local anaesthetic attached

Palpate the appropriate rib level and insert the needle down onto the rib

Then walk caudad off the inferior surface of that rib and then advance the needle tip 3mm

Aspirate for air and blood – exclude pleural breach and IV placement and inject the local anaesthetic 3-5ml per rib space required
Multi Modal Analgesia

IV and oral narcotics
Regional analgesia
Regular paracetamol
Other drugs to consider include
- NMDA receptor antagonists – Ketamine
- Gabapentanoids - Pregabalin, Gabapentin
- Alpha 2 antagonists clonidine and dexmedetomidine
- IV lignocaine infusions
- The Benzenoid Drugs Tramadol, Tapentadol
- COX Inhibitors/NSAIDs
Ketamine
(minimizes OIH and Opioid SE)

- In subanaesthetic doses noncompetitively blocks NMDA receptors
- Decrease in pain intensity up to 20%
- Reduction of opioid consumption by up to 50%
- Decrease in nausea and vomiting
- Timing of administration has not been shown to influence analgesic effect - ?if better though if the NMDA receptors are opened first therefore given intra and post operatively
- Administered with the narcotics in the PCA (eg. morphine 1mg plus ketamine 5mg boluses)

- Minimal side effects in anaesthetized patients.
- Psychomimetic effects more common in awake procedures.
Does adding ketamine to morphine patient-controlled analgesia safely improve post-thoracotomy pain?

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GABAPENTANOIDS

ACTIONS

• Prevents the release of excitatory neurotransmitters eg glutamate and substance P from primary afferent nerve endings and may prevent central sensitization.

• They have anxiolytic and sleep modulating properties

• As adjuvants have been shown to decrease opioid consumption, opioid side effects and pain intensity

Pregabalin and Gabapentin

• Pregabalin is the newer drug with 2-3 times greater potency than Gabapentin and better bioavailability

• With pregabalin 300mg and 600mg doses used with equal effect.

• With gabapentin 600mg doses in one study had a ceiling effect

• Side effects are sedation, dizziness and visual affects

• Doses should be decreased in the elderly and in those with impaired renal function.

• The dosing, timing and duration of both drugs given has been variable in a few studies. Appears that if used as an adjuvant confers analgesic advantage to patients
IV Lignocaine Infusions

- Follows multicompartment kinetics
- Steady-state concentrations reached after 3-4 hours
- Metabolized to active metabolites by the liver
- Plasma protein concentration, acid base status and factors that affect hepatic blood flow affect the concentration of free lignocaine
- Mode of action for analgesic effects thought to be a suppression of spontaneous impulses generated from injured nerve fibres and at the DRG. Acts via Na+ channel inhibition, NMDA and G protein coupled receptor inhibition.
- To date only found to be significant in reducing pain associated with ABDOMINAL SURGERY
- Dosage regimes include a Bolus dose of 100mg or 1.5-2mg/kg prior to surgical incision (30 mins ideal) and an infusion of 1.3-5mg/kg/hr intraoperatively and consideration given to continuing postoperatively for 24 hours
- The safety of IV lignocaine infusions in the perioperative setting has yet to be demonstrated.
Alpha 2 Adrenoreceptor agonists

Clonidine
- systemic clonidine decreases opioid dose
- Decreases pain intensity
- Side effects of hypotension and bradycardia

Dexmedetomidine
- 8 times more potent and specific at the alpha 2 receptor
- No data to suggest that analgesic affect lasts >48 hours
- No data on chronic pain
PARACETAMOL

• MECHANISM OF ACTION still not fully appreciated
• Analgesic action is most likely central and due to activation of descending serotonergic pathways
• Is similar to the COX2 inhibitors with PG synthesis inhibition (no effect on the inflammation of arthritis)
• Shown to be a great adjuvant to management of acute pain
Tramadol

- **mu opioid agonist**
- **NRI**
- **SRI**

  - Tramal 50mg 100mg
  - Avoid in patients with epilepsy
  - Avoid if on SSRIs
  - Has an active metabolite with u affinity.
  - Anti depressant effect

Tapentadol

- **mu opioid agonist**
- **NRI**

  - Nucynta 50mg, 75mg 100mg - 6 hrly
  - Analgesic efficacy similar to oxycodone
  - Fewer narcotic side effects
  - May have COX 2 actions to explain anti inflammatory effects
  - Antidepressant effect
Oxycodone

- Semi synthetic opioid
- Formulated with nsaids, paracetamol and Naloxone (Targin)
- 60% bioavailability and a half life of 2-4 hours.
- Significant anti depressant effects
Fast track to oral analgesia and faster discharge

Less invasive surgery

• Thorascopic lobectomy, wedge resection, pleurodesis, thorascopic assisted decortication

Multimodal analgesia

• Pre emptive premedication
• Regional analgesia and postop infusion
• Intraoperative adjuvant drugs ketamine, cox 2 inhibitor, paracetamol
• PCA narcotic/low dose ketamine bolus only
• Regular oral medications paracetamol, cox 2 inhibitors, ?other NSAID, ?tramadol, newer mixed oral narcotic analgesic Targin