INTRODUCTION
Beyond "Marcaine Spinals" vs GA
Perioperative physicians/providers
Patient’s perceptions and preferences (Shevde, 1991, 800 pts)
- 70% General anesthesia
- 20% Local
- 10% “Spinal”/Epidural
Patient Satisfaction > 90% after CNB
Significant Benefits with Reg Anes

REGIONAL ANALGESIA-
IMPROVEMENT IN OUTCOME
- Decreased-
  - GA side effects/ complications
  - Opiate Side Effects
  - Blood Loss, DVT
  - LOS, Hosp Cost
  - Ileus, constipation, N/V
  - Stress Response
  - Chronic Pain
  - MI, ischemia
  - Pulmonary Complications
  - POCD, POD?
- Improved-
  - OR Efficiency
  - PACU Recovery and rehab
  - Post-op Analgesia
  - Patient Satisfaction
  - Surgeon Satisfaction

GOALS FOR CNB
IN AMBULATORY PATIENTS
- Intraoperative Efficiency
- Postoperative Recovery
- Local Anesthetic and Dose
- Spinal
- Epidural
- Anesthesia Technique
- GA vs CNB
- Spinal vs Epidural

DISCLOSURE:
I have no disclosures to report regarding financial incentives or gains from pharmaceutical companies or manufacturers.
ACT (Anesthesia Controlled Time)
- I: In OR – Turn Over To Surgeon (TOTS)
  - preoxygenation/ Induction/ Airway Management
- II: Dressing On – Out of OR
  - emergence/ Extubation/ LMA Removal
Spinals -
- quick block time (ave 7min) and onset time
- can be comparable to GA (ACT I)

Epidurals -
- placement of catheter in block room (initiate low dosing in block room)
- consider alkalinate solution
- consider fast onset agent
- CP: sets up 8min faster than Lido
- consider CSE (if in OR and/or uncertain surgical duration)
- consider dose thru needle technique (if in OR)

Both techniques eliminate emergence/extubation time (ACTII)

EFFICIENCY INTRAOP

SPINAL RECOVERY

DOSE-RESPONSE

<table>
<thead>
<tr>
<th>Surg Type</th>
<th>Drug</th>
<th>Dose mg</th>
<th>Baricity</th>
<th>Motor Blk</th>
<th>Time</th>
<th>Disch</th>
<th>Author</th>
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<tr>
<td>Knee Scope</td>
<td>Bupiv</td>
<td>5</td>
<td>Hyper</td>
<td>181*</td>
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DURATION WITH HYPERBARIC BUPIVACAINE
LIU, 1996

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Duration</th>
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<tbody>
<tr>
<td>Duration of Surgical Anesthesia</td>
<td>Umbilicus: 5 min/mg</td>
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<tr>
<td></td>
<td>Knee: 13 min/mg</td>
</tr>
<tr>
<td></td>
<td>Ankle: 15 min/mg</td>
</tr>
<tr>
<td>Achievement of Discharge Criteria</td>
<td>21 min/mg</td>
</tr>
</tbody>
</table>

SPINAL CHLOROPROCAINE - IDEAL AGENT?

History:
- 1951: 1st SAB w/ chloroprocaine; 214 pt series in 1952
- 1980: Neurotoxicity case series (8); due to sod bisulfite/low pH
- 1987: Low back pain concerns. Due to EDTA.
- 1996: New PF/antioxidant free CP:
  - No known neurotoxicity
  - not FDA approved for SAB use; “off-label”
  - (nor is isobaric bupiv or lidocaine, fentanyl)
  - Use only preparations in “brown vials”:
    - Bedford Labs, generic CP
    - Astra Zeneca, “Nesacaine-MPF”; pH= 2.7-4.0
  - (Avoid Abbott, clear vial, with sodium bisulfate)

30-60mg dose range (40mg most common)
- 40-50mg: 45-70min
- 60mg: 60-90min

<< duration compared to lidocaine

< duration compared to bupivacaine

> duration CP vs lidocaine: 104 vs 134min for d/c criteria

SPINALS:
CP 40MG
LIDO 40MG
BUPIV 7.5MG
(ALL ISOBARIC)

SPINAL CHLOROPROCAINE

Kouri, 2004; Yoos, 2005; Casati, 2007
ADJUNCTS (NON-OPIOID) WITH SPINALS/EPIDURALS

EPINEPHRINE:
• 20-50% > in duration (esp lid and tetracaine)
• Greater effect on Time to Discharge than blk duration
• Poor Recovery Profile (Urmey, 1996)
• added 8 min to Time to Ambulation
• added 106 min to Time to Discharge
• Recommendation: Avoid

EPINEPHRINE:
• Dose: 15-30ug
• Even 15ug > motor/sens duration
• High Cost in U.S.
• 10ml SD vial (1000ug)
• Europe has low dose vials
• High dose (1-2mcg/kg): hypotension, bradycardia, sedation
• Recommendation: Avoid

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Rapidly Metabolized t1/2 = 25sec
*“no significant plasma concentration”
More “titratable” due to short duration
Rapid Recovery
• Ready for discharge one hour earlier compared to lido (Neal)
• Lidocaine may double discharge time comp to CP
• < time to void

2 CHLOROPROCAINE-EPIDURAL ADVANTAGES

84 Knee Arthroscopy (Spinal vs GA vs SAB)
• Spinal:
  • Lidocaine 50mg
  • GA/LMA: Propofol/N20/Fentanyl
  • Similar discharge times (120 min) and pt sat

Spinal:
• < PACU pain
• > backache (35 vs 13%)
• GA:
  • > Sore throat, drowsiness, pain
  < Costs w/ RA:
  • 2x to < pacu time, ns briefly
  • Consider spinal early in day

Spinal:
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• > backache (35 vs 13%)
• GA:
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  < Costs w/ RA:
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  • Consider spinal early in day

48 Knee Arthroscopy (Epidural vs GA vs SAB)
• Epidural, 2CP
• GA/LMA, Prop/N20/Fentanyl
• Spinal, Procaine 75/Fent 20mcg
• All IA Bupiv
• All IV Toradol

Upshot: CLE and GA:
• Similar discharge times (92 vs 104min)
• Spinal:
  • Interpret due to procaine use
  • Slower recovery, 146min
  • > nausea and pruritis

Epidural Washout:
• 10-20ml of N.S. in pacu
• Recovered 48min sooner (Lido/epi)
• Malchow, anecdotal: appears helpful


EFFICIENCY OF EPI DURAL VS GA

EFFICIENCY OF SPINAL VS GA

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EFFICIENCY OF EPI DURAL VS GA

EFFICIENCY OF SPINAL VS GA

Wong, 2001; Williams, 2005

Malchow, Randall, MD

Outpatient Spinals and Epidurals

Malchow, Randall, MD

Outpatient Spinals and Epidurals
**EFFICIENCY OF EPIDURAL VS SPINAL**

**63 Knee Arthroscopy**
- 30 Epidural:
  - 2CP-3% x 15ml
- 33 Spinal:
  - Lido 25mg
  - Fentanyl 20 mcg
  - Dextrose

- Similar failure rate (10%) Similar Discharge Times (152 vs 142 m)
- Similar satisfaction scores (>90%)"}

**Nashville Surg Ctr:**
- Epidural-CP quicker recover than Spinal-L

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**II. SUCCESS RATES:**

<table>
<thead>
<tr>
<th>Surg Type</th>
<th>Bari- city</th>
<th>Dose</th>
<th>Adjunct</th>
<th>Failure Rate</th>
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**REASONS FOR CNB FAILURE**

- Poor patient selection
- Needle/orifice not in space
- Lengthy surgery
- Inexperienced surgeons
- Slow onset
- Abnormal injections
- Inadequate / low dose
- Cyst formation in interspinous ligaments
- Tourniquet pain
- Unilateral blocks
- Maldistribution of local anesthetics (caudal aperture of pencil-pt needles)
- Maintenace of posn 10-15min (block room)

---

**LIDOCAINE SPINALS DOSE-SUCCESS**

- 40MG LOWEST SUCCESSFUL DOSE W/O ADJUNCTS

<table>
<thead>
<tr>
<th>Surg Type</th>
<th>Bari- city</th>
<th>Dose</th>
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<th>Failure Rate</th>
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<td>Clon 15</td>
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<td>SSA</td>
<td>Dobrydnjon</td>
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</tr>
<tr>
<td>Hernia Hyper</td>
<td>6</td>
<td>Fent 25</td>
<td>5%</td>
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<td>Gupta</td>
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</table>

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**BUPIVACAINE SPINAL DOSE-SUCCESS**

- 7.5MG DOSE LOWEST SUCCESSFUL DOSE W/O ADJUNCTS

- Alternative to CP or Lido spinal (knee scope, IHR)
- with “low dose, low volume, low flow”
- Local Anesthetic: usually hyperbaric bupivacaine (4-6mg)
- Ipsilateral side down
- Pencil point needle, aperture towards ipsilateral side, slow injection (1-2min)

- Maintenance of posn 10-15min (block room)
- Results in < motor and sensory duration on contralateral side (Fig)
- Quicker Recovery home readiness 15min < than GA
- > pt sat than GA
- < Urinary retention

---

**CONSIDER SELECTIVE SPINAL ANESTHESIA?**

Enk, 1998
Valanne, 2001
Dobrydnjon, 2004
Capelleri, 2005
Mulrooney, 2005
Malchow, Randall, MD
BARICITY CHOICE

Hyperbaric: sacral roots or extensive spread important
Isobaric: > duration; LE/groin/GU surgery
Hypobaric: jack-knife posn (lido 20-40)
Spread: also depend on dose and direction of orifice

PERI-RECTAL CASES- “SADDLE” BLOCKS

For Jack-Knife Cases:
- Use Reverse T-burg for needle placement, then use T-burg for hypobaric LA (Lido 20-40mg)
(or sitting pos’n for placement with hyperbaric, then wait 10 min)
For Lithotomy- Perirectal cases:
- Consider Saddle block hyperbaric, low dose LA (Lido 20-30mg or Bupiv 3-5mg)

MEPIVACAINE SPINAL FOR OUTPT KNEE SURGERY

Knee Scopes:
- M-30mg + F10 vs M-40mg

Ropivacaine
- 50% spinal potency compared to bupiv or levobupiv
- same recovery profile as bupivacaine (> 3hr disch times)
- (1 study of volunteers demonstrated 14min/mg for Time of Discharge)
- No advantage over bupiv

Levobupivacaine
- similar potency to bupiv
- same recovery profile as bupivacaine (> 3 hr disch times)
- (1 study w/ hypobaric LB-4 or 5mg w/ Fent 10ug = 90 and 132min Time of Discharge for knee scopes)
- No advantage over bupiv

OTHER SPINAL LOCAL ANESTHETICS

Procaine
- Older drug, short acting
- 10% solution; 60-100mg
- prolonged discharge
- increased n/v, pruritis
- Recommendation: Avoid

Procaine: Forster, 2011; Kallio, 2006; O'Donnell, 2008; DeSantiago, 2009; DeSantiago, 2011

Synergistic effect with local anesthetics
Increased intensity/quality of block
Critical with low dose spinal
Pruritis: 30-100%
- Dose dependent
Recovery:
- No effect on motor block, nausea
- No effect on time to void, discharge

Spinal Doses
- Fentanyl 10-25mcg
- Sufentanil 2.5-5.0mcg

Epidural Doses
- Fentanyl 3-5mcg/ml
- 0.5-1 mcg/kg/hr (impts)
- Sufentanil 0.5mcg/ml
NSC: we avoid opiates

OTHER SPINAL AGENTS

Articaine: Forster, 2011; Kallio, 2006; O'Donnell, 2008; Bachmann, 2012
Prilocaine: Forster, 2011; Hendricks, 2009; Campano, 2010; Black, 2011

SPINAL/EPIDURAL OPIOIDS

Malchow, Randall, MD
Outpatient Spinals and Epidurals
SUCCESS - SPINALS

90-95% average
- NSC: 92%
Higher failure rate with pencil point needles
Select drug, dose, adjunct, baricity for each procedure, surgeon
Higher success than epidural s/p lumbar fusion
Ensures sacral coverage more reliably
Consider 22gu quincke for patients > 50 yo
Opioid critical at low doses

SUCCESS - EPIDURALS

85-90% average
- NSC: 91.5%
Block Room important
Place Epidural at Epicenter of incision
Confirmation of Epidural Space
- 30% false positive rate with LOR
- 10% false positive rate with ease of cath advancement p LOR
Avoid catheter advancement beyond 5cm
Consider use of CP, quicker onset (NSC CP 94%)
Consider opiate adjunct for synergy/quality

HYPOTENSION AND BRADYCARDIA

Hypotension Bradycardia Cardiac Arrest

HYPOTENSION AND BRADYCARDIA VS BLOCK HEIGHT

HYPOTENSION AND BRADYCARDIA VS AGE

Note: Hypotension < common with low dose Spinals

Overall average cardiac arrest rate = 1:1500; highest for any technique
Upshot: Judicious IVF’s, treat early w/ atropine, pressors
NSC: 1 Severe Bezold-Jarisch Reflex, 5 sec asystole 40min after lido 40mg resolved w/ glyco; no sequela

SPINAL CARDIAC ARREST
III. MINIMIZING COMPLICATIONS (POST-OPERATIVE)

Early
- N/V
- Urinary Retention (POUR)

Late
- PDPH
- Backache
- Transient Radicular Irritation

NAUSEA AND VOMITING

PNB: < 5%
Epidural: 3-9%
  - NSC: Nausea 1%, Vomiting 0%
Spinal: 12-18%
  - NSC: Nausea 10%, Vomiting 3%
GA: 13-32%

Mechanism: unopposed vagal activity
Epinephrine associated with incr. N/V
Lipophylic opioids do not significantly incr. N/V
Avoid opiates if possible (use of multimodal, pnb if appropriate)
Antiemetics prn

POUR: SPINALS AND EPIDURALS

SPINALS:
3-35% Incidence overall
- Depends on dose, adjuncts
- 3-4% for CP, lidocaine
- NSC: No POUR
Urge to void disappears immediately
Causes:
- overdistension of bladder/bladder neck edema (ie > 600ml)
- urinary sphincter spasm
  (pain/anxiety)
- bed confinement
- epinephrine: incr. time to void by 11min

EPI DURALS:
Low incidence 1%
- Similar to GA for CP, Lidocaine
- NSC: No POUR
Time to void (Kopacz, 1990):
- CP: 211 min
- Lido: 235 min
- Mepiv: 308 min

Spinal anes blocks both afferent and efferent innervation to bladder fn

URINARY TRACT NEUROANATOMY

POUR: SPINALS AND EPIDURALS

Consider epidural (esp CP)
for higher risk pts (IHR)
Avoid excess IVFs
  • < 1000 ml if possible
  • Early use of ephedrine prn

Consider SSA
Local Anesthetics:
  • Short acting LA-spinals
  • Low dose bupiv

Adjuncts:
  • Avoid epinephrine, clonidine
  • Lipophylic opiates, esp w/ low dose bupiv acceptable
  • Limit opiate dose
Low threshold for catheterization (see algorithm)
Encourage sitting/walking asap

URINARY RETENTION-SPINAL
KAMPHUIS, 1998

Lasts until regression to S3

Consider epidural (esp CP)
for higher risk pts (IHR)
Avoid excess IVFs
  • < 1000 ml if possible
  • Early use of ephedrine prn

Consider SSA
Local Anesthetics:
  • Short acting LA-spinals
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URINARY RETENTION PREVENTION
POUR ALGORITHM:

**HIGH RISK GROUP:** 5% POUR w/ GA
- Hernia, Pelvic, Perirectal
- > 70 yo
- H/o POUR, BPH

**LOW RISK GROUP:**
- No epinephrine or clonidine, bupiv < 7.5 or short acting agents (CP, Lido)
- If not high risk group

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action</th>
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</thead>
<tbody>
<tr>
<td>Not Voided w/i 60 min</td>
<td>Check BUS</td>
</tr>
<tr>
<td>BUS &gt; 600ml</td>
<td>In/out cath, then Discharge or further suts</td>
</tr>
<tr>
<td>BUS &lt; 600ml</td>
<td>Wait add'l 60min and repeat</td>
</tr>
</tbody>
</table>

Low Risk: Discharge w/ low risk pts or BUS < 400ml; Instruct to return to ER w/i 8 hrs if no void

ESTIMATING BLADDER VOLUME:

Curvilinear Probe

Prolate Ellipsoid Equation

\[ \text{Vol} = \text{length} \times \text{width} \times \text{height} \times 0.52 \]

\[ = (9.77 \times 11.6 \times 15.2) \times 0.52 = 895 \text{ ml} \]

LATE COMPLICATIONS: POST-DURAL PUNCTURE HEADACHE

**Factors**
- Age, needle, guage, bevel orientation
- Pencil-point important for younger patients
- 27gu/30gu offer little advantage

**Equivalent risk:** SAB vs CLE vs CSE
- 1-2% ave incidence w/ pencil pt needles
- NSC: SAB: 2.1%, Epid: 2.1%
- CLE and wet-tap (4%): bevel parallel 30% incidence vs bevel perpendicular 75%

LATE COMPLICATIONS: BACK PAIN

**Flawed studies- lack of random, smll studies**
- Phillips, 1969: 10,440 pts w/ 5% lidocaine
- 40-100mg dose, mainly obstetrics
- 0.3% “TRI” type symptoms
- Wong, 1999: 0% incidence in C/S pts
- Malchow, NSC series:
  - No reports of TNS
  - Neg emg, ncv, ssep studies
  - >40 years before 1st case report
  - Back pain: common regardless of anesthesia
  - Position probably more impnt issue (Lith)

If present, “transient” w/o deficits
- neg emg, ncv, ssep studies
- >40 years before 1st case report
- Back pain: common regardless of anesthesia
- Position probably more impnt issue (Lith)
- If concerned, discuss w/ pt and use lido < 60mg

TRANSIENT NEUROLOGICAL SYNDROME
TRANSIENT RADICULAR IRRITATION
POST-SPINAL MUSCULOSKELETAL SYNDROME

**Description:**
- Dysesthasias to buttocks, LE’s, 1-4 days, w/ sml PE

**Incidence:**
- lido:
  - 70-100mg: 16-80%
  - <60mg: 1-3%
  - NSC: 0.5%
- mepiv: 16-30%
- bupiv: 3-13%
- CP: rare

**Epinephrine:**
- animal studies: > sens deficits comp to plain
- little reason to add to lidocaine

**Increased Incidence:**
- Obesity, lith posn, outputs
- No significant role:
  - Glucose
  - Concentration of LA
  - Baricity
  - Dose
  - Age

**Reasons to consider continued Lidocaine use**
**IV. HIGH PATIENT/SURGEON SATISFACTION**

**Dependent on:**
- Efficiency
- High Success Rate
- Low Complication Rate

If these 3 conditions met, Goal IV will be achieved as well.

**Jankowski, LPB vs spinal vs GA for knee scope. AA, 2003**

- Techniques:
  - GA - Prop/Fent/LMA
  - SAB - B6, F15
  - LPB - M1.5% w/ epi
- GA had lowest pt satisfaction scores and higher postop pain
- SAB and LPB similar

**NSC Pat Satisfaction for both Epidural/Spinals:**
- V.G.-Excellent: 97%
- Good: 3%
- Poor/Fair: 0%

**SELECT REFERENCES:**
- Casati et al. Spinal Anesthesia with Lidocaine or Pres Free 2-Chloroprocaine for Outpatient Knee Arthroscopy. A&A. 2007; 104: 59-64.