Spinal Anaesthesia for Caesarean Delivery

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Disclosures

National Institute for Health Research
How to Deliver an Evidence-Based Spinal Anaesthetic

• CSE vs. spinal
• Block height assessment
• Drugs
  – Bupivacaine
  – Diamorphine
  – Phenylephrine
• Colloid vs. crystalloid
• Co-load vs. pre-load
• Patient warming
• Study type; number

• Methodology

• Results

• Conclusion / Recommendation
SPINAL / CSE / EVE
Single-shot spinal anaesthesia, combined spinal-epidural and epidural volume extension for elective caesarean section: a randomized comparison.

Tyagi A, Girotra G, Kumar A, Kumar S, Sethis AK, Mohta

- RCT; n=60

- Either SSS, CSE, CSE (EVE) 0.5% hyperbaric bupivacaine 9 mg with fentanyl 10 mcg in sitting (EVE-5mls)

- Spinal
  - Faster onset to max block height (8 vs 10.5 min)

- Max block height / duration of sensory and motor block and the incidence of adverse effects

- Adequate analgesia in all patients

- EVE ED$_{95}$ = 7.5mLs

- Decision between SSS /CSE dependent on several factors
<table>
<thead>
<tr>
<th>Spinal</th>
<th>CSE</th>
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<tbody>
<tr>
<td>Speed of block</td>
<td>Long surgery</td>
</tr>
<tr>
<td>Cheaper kit</td>
<td>Surgical difficulty</td>
</tr>
<tr>
<td>Familiarity</td>
<td>Medical co-morbidity</td>
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<tr>
<td>Less trauma</td>
<td>Plan B for supplementation</td>
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</table>

1st section
Borderline platelet count

Obese
Difficult airway
Prev section
Abnormal placenta
Praevia
Twins
Trainee surgeon
Failed labour epidural
BLOCK HEIGHT
Levels of anaesthesia and intraoperative pain at caesarean section under regional block.
Russell IF

- Prospective study; n=220
- 70 epidural, 120 spinal
- Intraoperatively pain - block T5-T10
- No pain if block > T5
- Block to T5 to touch
- Still no gold standard re: modality
- Block to T5 = medico-legal standard
- 2 modality test + Bromage score
BUPIVACAINE ED_{95} DOSE
ED50 and ED95 of intrathecal hyperbaric bupivacaine coadministered with opioids for cesarean delivery.
Ginosar Y, Mirikatani E, Drover DR, Cohen SE, Riley ET.

- Double blind dose ranging study; n=42
- Bupivacaine 6-12mg
- IT fentanyl 10 mcg, morphine 200 mcg
- Logistic regression to calculate ED
- ED95 of IT bupivacaine success =
  - Induction (Bilat T6 block in 10 mins)
  - Operation (No supplemental epidural use)
- ED95 11.0 mg (induction) and 11.2 mg(operation)
- Time to effective block α 1/dose
- USE >2.24 mls 0.5% bupivacaine (If lower use CSE)
12 studies; meta-analysis

LD ≤ 8 mg bupivacaine, conventional >8 mg

LD:
- ↑ risk of intraoperative supplementation  
  [risk ratio (RR)=3.76, (95% CI=2.38-5.92)]
- ↓ hypotension (RR=0.78, 95% CI=0.65-0.93)
- ↓ nausea/vomiting (RR=0.71, 95% CI=0.55-0.93)

Intra-operative pain NNH=4
**Advantages**

<table>
<thead>
<tr>
<th>Maternal</th>
<th>Neonatal</th>
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<tr>
<td>Less hypotension</td>
<td>? uteroplacental perfusion</td>
</tr>
<tr>
<td>Less N+V</td>
<td>? Quicker (motor) recovery</td>
</tr>
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</table>

**Disadvantages**

<table>
<thead>
<tr>
<th>Slower onset</th>
<th>Shorter duration</th>
<th>Increased supplementation</th>
<th>? GA risk</th>
<th>? Litigation risk</th>
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</table>

What if epidural fails?
Less familiarity

Not “failure” if electively top-up after 45 min
DIAMORPHINE
Intrathecal diamorphine for analgesia after caesarean section. A dose finding study and assessment of side-effects.
Kelly MC, Carabine UA, Mirakhur RK

- RCT; n=80
- Diamorphine: 125 / 250 / 375 mcg / saline
- Higher dose of diamorphine:
  - ↓ pain at 2 and 6 hrs post op
  - ↑ time to first request of supplemental analgesia
  - **BUT** dose–related ↑ increased N+V and pruritus
- **N.B.** 300-400 mcg NICE (CG132, Nov 2011)
- Assess risk vs. benefit of pain / N+V / Itch
Phenylephrine – Bolus or Infusion?

• Spinal hypotension
  – peripheral vasodilatation
  – not usually associated with decrease in cardiac output
• I.V. fluids increase cardiac output, BUT do not always prevent hypotension
• Bolus used by the majority (50-100 mcg)
• Prophylactic administration:
  – higher incidence of hypertension and bradycardia
• Treatment after onset of hypotension:
  – Higher incidence and severity of maternal pre-delivery hypotension
• ? optimum regimen /dose
ED95 of phenylephrine to prevent spinal-induced hypotension and/or nausea at elective cesarean delivery.

Tanaka M, Balki M, Parkes RK, Carvalho JC.

- Double-blinded; n=50
- ED95 phenylephrine by intermittent bolus
- Up-down sequential allocation
  - 40-mcg dose, then 10-mcg changes
- An adequate response:
  - absence of hypotension (SBP <80% of baseline) and nausea
- Administration after spinal and if SBP < baseline
- ED95 of phenylephrine
  - > 122 mcg (Estimated = 159 mcg (95%CI 122–371 mcg)
- Consider using 100-150 mcg bolus to treat hypotension
A randomized controlled trial of variable rate phenylephrine infusion with rescue phenylephrine boluses versus rescue boluses alone on physician interventions during spinal anesthesia for elective cesarean delivery.

Siddik-Sayyid SM, Taha SK, Kanazi GE, Aouad MT.

• RCT; double blind; n=80
• Variable rate phenylephrine infusion
  – starting at 0.75 mcg/kg/min or saline infusion
  – Both groups had rescue phenyl boluses if needed
• ↓ clinician interventions
• ↓ hypotension (NNT=1.4)
• ↓ N+V (NNT=3)
• ↔ Neonatal outcomes
• Use variable phenylephrine infusion with rescue bolus to improve maternal symptoms and reduce workload
CRYSTALLOID VS. COLLOID
Colloids versus crystalloids in the prevention of hypotension induced by spinal anesthesia in elective cesarean section. A systematic review and meta-analysis.


- 11 RCTs; n=990
- ↓ hypotension associated with colloids
  RR [95% CI] 0.70 [0.53-0.92], P=0.01
- ↔ risk of intraoperative N+V
  RR [95% CI] 0.75 [0.41-1.38]; P=0.33
- Colloid reduces incidence of hypotension
- BUT pre-load vs co-load techniques?
Fluid and vasopressor management for Cesarean delivery under spinal anesthesia: continuing professional development.

Loubert C.

- Colloid
  - expensive
  - Anaphylaxis incidence = 0.06%
  - Coagulopathy
  - renal failure
  - pruritus
- Utilise a crystalloid co-load technique with phenylephrine infusion
PATIENT WARMING
The Effect of patient warming during Caesarean delivery on maternal and neonatal outcomes: a meta-analysis.

Sultan P, Habib AS, Cho Y, Carvalho B.

- Meta-analysis; 13 studies; n=789
- Warmed fluids / FAW:
  - ↓ max temp change
  - ↓ hypothermia (NNT=5)
  - ↓ shivering (NNT=7)
  - ↑ thermal comfort
  - Improved umbilical cord pH
- Unanswered questions:
  - Pre- vs intraoperative vs both?
  - Fluid vs forced air vs both?
- Warm patients with warmed fluid or forced air warming
Summary

• Spinal
  – quicker than CSE
  – $ED_{95} = 11.5$ mg ($2.3$ mls)
• CSE
  – surgical / medical co-morbidity
  – can use lower dose
• Diamorphine 300-400 mcg – pain vs. S/E
• Block to T5 with 2 modality test
• Variable rate phenylephrine infusion
• Crystalloid co-load
• Consider warming fluids
Questions
IDENTIFYING L3-L4
Spinal anaesthesia for caesarean section: an ultrasound comparison of two different landmark techniques.
Srinivasan KK, Deighan M, Crowley L, McKeating K.

- **RCT; n=110**
  - Group A = 45.5% @ L1-2
  - Group B = 7.3% @ L1-2

- ↔needle passes / attempts
  - block onset at 5/10/15 min
  - rescue analgesia

- **We are often higher than we think!**
PATIENT POSITION
Effects of sitting up for five minutes versus immediately lying down after spinal anesthesia for Cesarean delivery on fluid and ephedrine requirement; a randomized trial

El-Hakeem EE, Kaki AM, Almazrooa AA, Al-Mansouri NM, Alhashemi JA

• RCT; n=120
• Sitting up for five minutes vs. laying down immediately after block
  – ↓ intraoperative sensory block height,
  – ↓ ephedrine
  – ↓ fluid requirements, and
  – ↓ intraoperative nausea + vomiting
  – ↓ shortness of breath
  – ↔ systolic blood pressure or the success of the anesthetic.
  – But delayed postoperative motor recovery
A comparison of the lateral, oxford and sitting positions for performing combined spinal-epidural anaesthesia for elective Caesarean section

Rucklidge MWM, Paech MJ, Yentis SM

- RCT; n=100; 12.5 mg bupivacaine + 10 mcg fentanyl
- Lateral vs. oxford vs. sitting
- Oxford position left lateral position
  - 3 pillows supporting the head
  - inflated 3 L ‘Polyfusor’ bag under left shoulder (Fig. 1).
<table>
<thead>
<tr>
<th>Intrathecal bupivacaine dose</th>
<th>Onset time of block and modality tested</th>
<th>Hypotension or requirement for ephedrine</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5 mg + fentanyl CSE</td>
<td>LAT faster than (OX = SIT) Light touch</td>
<td>(LAT = OX) more than SIT</td>
<td>OX mor</td>
</tr>
<tr>
<td>10 mg CSE</td>
<td>LAT faster than SIT</td>
<td>LAT more than SIT</td>
<td>SIT mor</td>
</tr>
<tr>
<td>12.5 mg Spinal</td>
<td>LAT faster than SIT</td>
<td>LAT more than SIT</td>
<td>LAT = SI</td>
</tr>
<tr>
<td>12 mg + fentanyl CSE</td>
<td>LAT = SIT</td>
<td>SIT more than LAT</td>
<td>LAT = SI</td>
</tr>
<tr>
<td>12.5 mg + fentanyl Spinal</td>
<td>SIT faster than OX</td>
<td>SIT more than OX</td>
<td>SIT = OX</td>
</tr>
<tr>
<td>12.5 mg + fentanyl CSE</td>
<td>OX = SIT = LAT</td>
<td>(OX = SIT) more than LAT</td>
<td>OX = SI</td>
</tr>
</tbody>
</table>

eral vs. sitting position only.

on; OX = Oxford position; SIT = sitting position.
Use of hyperbaric versus isobaric bupivacaine for spinal anaesthesia for caesarean section.
Sia AT, Tan KH, Sng BL, Lim Y, Chan ES, Siddiqui

- Six studies; n=394
- Hyperbaric bupivacaine:
  - ↓ need conversion to GA (RR 0.17 (0.03, 0.94)
  - ↔ need for supplemental analgesics
  - ↓ time till sensory block to the T4 level
    (MD -1.06 minutes, 95% CI (-1.80 to -0.31)
- No other differences between groups
- Use hyperbaric bupivacaine if available