REGIONAL ANESTHESIA
FOR CESAREAN SECTION

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INCIDENCE

- CS rate exceeds 24% in US
- 3-12% maternal deaths related to anesthesia
- Anesthesia sixth leading cause of maternal mortality
- Risk of maternal death 16.7 times greater with GETA
- Majority of anesthesia deaths result from failed intubation, failed ventilation and oxygenation and/or pulmonary aspiration
- Associated factors include obesity, hypertensive disorders and emergently performed procedures
- GETA should be used only when absolutely necessary
INCIDENCE

- 1992 Hawkins Study-17% CS under GETA
- 1992 UCSD-7.6 % CS under GETA
- Brigham and Women:
  - 1990-7.2% under GETA
  - 1995-3.6% under GETA
- Now concern about limited experience of GETA for CS due to inadequate numbers
ASPIRATION

- Incidence: 1:700
- 3 times greater than for patients receiving GETA for nonobstetric surgery
- Aspiration also possible under regional anesthesia
- Aspiration prophylaxis mandatory in these patients
AORTOCAVAL COMPRESSION

- Results from: Decreased venous return by compression of inferior vena cava
- Increased uterine venous pressure from obstruction of uterine venous drainage decreasing uterine artery perfusion pressure
- Compression of aorta or common iliac artery resulting in decreased uterine artery pressure
- Prevention: Left lateral tilt/placement of wedge under buttock
- Adequacy can be assessed by monitoring BP or SaO2 of lower extremity
PRELOADING

- 15-20 ml/kg of balanced salt solution, most effective if given within 30-min of induction
- Incidence of hypotension by preloading decreased from 71% to 55% in one study
- Not only decreased hypotension but also improved placental perfusion
- No glucose containing solution for preloading - can lead to neonatal hypoglycemia during second hr of life due to longer half life of insulin secreted secondary to fetal hyperglycemia
PRELOADING

- Large volumes of crystalloids may exacerbate postpartum decrease of colloid osmotic pressure
- Use caution in patients with preeclampsia or cardiovascular disease
- Other countries: Some use dextran or hespan for preloading
- Stays in circulation longer
- Expensive
- Alters blood rheology and platelet function
- Dextran-Small but definite risk of anaphylaxis
HYPOTENSION

- Treat by preloading, left lateral tilt, vasopressors and O₂
- Maintenance of normal BP during regional results in better umbilical cord blood gases and acid base balance
- Laboratory evidence in animals suggest ephedrine better than phenylephrine for uteroplacental perfusion
- One review of controlled trials of phenylephrine vs. ephedrine found increased umbilical artery pH with phenylephrine with no difference in true fetal acidosis (pH<7.2)
- Another study found increased incidence of fetal acidosis with ephedrine
- Some would administer prophylactic ephedrine 25-50 mg IM or 10-15 mg IV before spinal.
MONITORING

- Standard ASA monitors unless invasive monitors indicated
- EKG: Studies report as much as 25-60% ST depression in lateral leads in these patients
- Common after delivery of infant
- Could be due to acute hypervolemia, tachycardia, venous air embolism, coronary vasospasm, vasopressor administration and/or amniotic fluid embolism
- Mostly benign, no wall motion abnormality or elevated enzymes
- Possibly rate related transient subendocardial ischemia
- Baseline maternal heart rate may be predictive of hypotension in patients receiving spinal anesthesia
HIGH OR TOTAL SPINAL

- May result from unintentional intrathecal injection of epidural dose through epidural catheter or extensive rostral spread of subarachnoid block
- Incidence of high spinal: 1:50,000 from epidural dose
- May also result from subarachnoid or epiarachnoid placement of epidural catheter
- Presents as complete sensory and motor blockade, hypotension, bradycardia, unconsciousness, loss of protective reflexes and respiratory arrest
- Medical management includes endotracheal intubation, IPPV with 100% O₂, fluids, vasopressors (ephedrine, epinephrine), left uterine tilt, lifting up of the legs to facilitate venous return, emergency CS in some instances
LOCAL ANESTHETIC TOXICITY

- Results from accidental injection of local anesthetic into epidural vein or from overdosage
- Convulsions, unconsciousness, arrhythmias (polymorphic ventricular tachycardia), cardiovascular collapse
- Treatment similar as total spinal but more potent cardiac stimulation with epinephrine as well as chest compressions and defibrillation may be required
- Resuscitation difficult if bupivacaine local anesthetic due to enhanced cardiovascular toxicity during pregnancy
- Rule out intravenous injection by test dose (epinephrine/isoproterenol) and by negative aspiration for incremental dosing of epidural
- 0.75% bupivacaine preparation withdrawn from market
FAILED SPINAL

- Incidence: 1%; can result from either of the following:
  - Omission of local anesthetic from drug mixture
  - Administration of inadequate dose
  - Placement of drug in space other than subarachnoid space
  - Pooling of hyperbaric drug in the sacral region (maldistribution)-sacral analgesia
  - Injection in dural root sleeve
  - A low potency lot
  - One can consider performing second spinal if delivery not urgent
  - Look for evidence of sacral blockade before performing second spinal
Failed Epidural

- Incidence 2-6%; can result from either of the following:
  - Catheter may not be in epidural space in the first place/
  - Displacement of the catheter from the epidural space
  - Malposition of the catheter
  - Anatomic barriers to diffusion of local anesthetic in epidural space
  - Administration of inadequate concentration/volume of local anesthetic
FAILED EPIDURAL

- **Options:**
  - Second epidural—be cautious about local anesthetic toxicity
  - GETA
  - Spinal: two issues to be considered
  - Spinal needle will encounter local anesthetic from epidural space
  - Expect high spinal due to decompression of intrathecal sac
  - Therefore, reduce dose for subarachnoid block
PERSISTENT NEUROLOGIC DEFICIT

- Rare these days
- Previous reports due to unintentional subarachnoid injection of large dose of 2-chloroprocaine
- Antioxidant sodium metabisulfite and low pH of previously marketed solutions may have been responsible
- Current Preparation-Higher pH, no antioxidant or preservative
- Cauda Equina Syndrome: Reports after continuous spinal with hyperbaric lidocaine
- Spinal microcatheters for continuous spinal withdrawn by FDA in 1992 following six cases of Cauda Equina Syndrome, probably resulted from maldistribution of 5% lidocaine in sacral region.
SPINAL ANESTHESIA

- Advantages: Rapid onset, dense block, negligible risk of maternal or fetal local anesthetic toxicity
- Disadvantages: Rapid onset → rapid sympathetic blockade, abrupt severe hypotension
- Dosage range of local anesthetics for spinal:
  - 7.5-15 mg bupivacaine
  - 60-75 mg lidocaine
  - 7-10 mg tetracaine
  - 10-25 mg ropivacaine
  - 100-150 mg procaine
SPINAL ANESTHESIA

- Procaine: duration 30-60 min
- Lidocaine: Rapid onset, duration 45-75 min
- Hyperbaric lidocaine-TNS, dilute 5% lidocaine with CSF or saline
- Tetracaine: Onset 5-10 min, duration 120-180 min, prolonged sensory block than motor block
- Bupivacaine: Duration intermediate between tetracaine and lidocaine, duration of sensory and motor block about same
- Etidocaine: More pronounced motor block
SPINAL ANESTHESIA

- Levobupivacaine: Efficacy probably similar to racemic bupivacaine, dose same as bupivacaine for spinals
- Epinephrine: Prolongs duration of tetracaine block by 30-50%
- Controversy regarding lidocaine or bupivacaine spinal
- You may use fixed dose or variable dose of local anesthetic for spinal according to height and weight
- Some use fixed dose of 12 mg bupivacaine (in 8.75% dextrose) for majority of patients for CS
- Intrathecal meperidine: 80-100 mg as sole anesthetic for CS, analgesia lasts up to 6 hrs
EPIDURAL ANESTHESIA

- Incremental dosing
- Total dose can be titrated to desired sensory level
- Allows maternal cardiovascular system to compensate for occurrence of sympathetic blockade
- Decreased risk of severe maternal hypotension or reduced placental perfusion
- Anesthetic of choice in preeclampsia or cardiovascular disease
- Less intense motor blockade than spinal: advantageous for patients with multiple gestation, macrosomia or pulmonary disease
- Lower extremity pump may remain intact decreasing risk of thromboembolism
- Anesthesia can be extended for prolonged surgery
EPIDURAL ANESTHESIA

- Slow onset
- Higher failure rate
- Unintentional dural tap: 1:200-1:500 in experienced hands
- PDPH: 50-85% with 16 or 18-G Touhy’s needle
- Risk of maternal local anesthetic toxicity
- Risk of subarachnoid or intravascular migration of catheter
- Drugs for epidural: 3% 2-chloroprocaine, 1.5-2% lidocaine epinephrine, 0.5% bupivacaine, 0.5% ropivacaine (less motor block, similar concentrations less cardiotoxic than bupivacaine)
EPIDURAL ANESTHESIA

- Duration: 40-50 min for chloroprocaine, 75-100 min for lidocaine with epinephrine, 120-180 min for bupivacaine or ropivacaine
- Chloroprocaine requires continuous infusion or repeated dosing
- Blocks μ and Ω receptors—duramorph less effective
- Addition of bicarbonate to lidocaine hydrochloride (1 mEq to 10 ml)—hastens onset
- Onset of alkalinized lidocaine similar to chloroprocaine
- Alkalinized lidocaine activity similar to lidocaine hydrocarbonate available in some other countries
COMBINED SPINAL-EPIDURAL

- First described in 1981 by Brownridge for CS
- Rapid onset and ability to prolong blockade if necessary
- Initially-two interspace technique in early eighties
- Later on needle through needle technique
- Eldor modification: small separate conduit for spinal needle with epidural needle
- Espocan needle: Different exit points for epidural catheter and spinal needle through epidural needle
- Intrathecal placement of catheter rare; one case report of unintentional intrathecal catheter placement
- Distance from tip of Tuohy to wall of postdural sac: 3 -15 mm
- Protrusion of spinal needle beyond tip of epidural: 10-16 mm
LOCAL INFILTRATION

- Primary anesthetic technique if no anesthesia personnel available or patient in extremis
- One would need approx. 100 ml of 0.5% lidocaine
- Bonica described six steps for local infiltration
- Infiltration from umbilicus to symphysis pubis
- Intracutaneous, subcutaneous, intrarectus, parietal peritoneum, visceral peritoneum, paracervical
POSTOPERATIVE ANALGESIA

- Intrathecal preservative free morphine:
  - Dose 0.1-0.25 mg, onset 30 min, peak effect 45-60 min, duration 12-24 hrs
  - Advantageous for parturients concerned about excretion of opioids in breast milk
- Epidural preservative free morphine: Dose 2-4 mg, onset 45-60 min, peak effect 60-120 min, duration 12-24 hrs
- DepoDur: Liposomal extended release preparation, dose 10-15 mg, duration approx. 48 hours.
- Decreased side effects (delayed respiratory depression, pruritus and nausea and vomiting) with lower doses
SUGGESTED READING

Juneau, Alaska

07/25/2004
Jasper National Park, Canada

![Image of bears in a forested area](image-url)