

Update on Rural Obstetric Anesthesia

June 15, 2011

Syllabus for Roanne Preston

Topics:

1. Labour Analgesia – PCEA (0815h)
2. What's the right dose of oxytocin in C/S (1025h)
3. Preventing hypotension during spinal anesthesia (1040h)
4. Postop pain and chronic pain (1055h)

The Science behind PCEA for Labour Analgesia

PCEA for labour analgesia has been clearly shown to be superior to a continuous infusion from the perspectives of patient satisfaction and efficacy. Despite using smaller doses of local anesthetic overall, pain scores are lower, motor block can be minimized and the individual titratability means women can receive just what she requires for labour analgesia.

The science behind the success is the spread of local anesthetic achieved from using a bolus rather than continuous infusion. Bolus provides better spread, over a segmental area, with less uptake by adjacent tissues and blood vessels prior to reaching the target sites – neural tissue in the exiting spinal nerve roots and the spinal cord.

PCEA can be used with or without a background infusion. The background infusion provides benefit by reducing the number of anesthesia interventions needed, although contributes to motor block over several hours depending upon the local anesthetic solution used. The ideal “recipe” is unknown, but evidence suggests:

1. Use dilute local anesthetic: 0.1% or less – many places use 0.625% bupivacaine successfully
2. A background infusion will decrease the number of calls for anesthesia intervention
3. A background infusion over 6-8 hours will contribute to motor block if bupivacaine is used
4. The background infusion should be set at 1/3 the hourly use of local anesthetic
5. Larger PCEA dose with longer lockout interval provides better analgesia than smaller PCEA dose with shorter lockout interval. So a PCEA bolus of 8-12 mL may be optimal for the standard sized woman
6. If CSE is used to initiate the epidural, smaller PCEA doses are needed
7. The bolus effect is beneficial to maintaining good analgesia and should be used

The most recent advances involve PCEA pumps that have been modified to provide a mandatory regular bolus every 30 or 60 minutes in lieu of a background infusion. The mandatory bolus in combination with a PCEA button provides superior analgesia to continuous infusion + PCEA, with less drug consumption, which we hope equates to less motor block and better second stage pushing power.

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Oxytocin Use at Cesarean Section

Anesthesiologists have noted the side effects from oxytocin bolus given shortly after delivery of the neonate at cesarean; side effects such as hypotension, flushing, ST segment changes and arrhythmias, but research into the effective dose of oxytocin did not really become important until after the death of a woman in the UK. The Confidential Enquiries into Maternal Mortality 2001 report recommended a change in practice following this death, and stated that 10 unit IV bolus dose was dangerous and recommended the maximum dose be 5 units.

In 2010, the Institute for Safe Medication Practice identified oxytocin as a high alert drug, both for intrapartum and postpartum use.

A survey on oxytocin use by anaesthetists in the UK published in 2003 showed a significant change in practice from the time of the CEMACH publication when 75% of respondents were using 10 unit rapid IV bolus, to late 2002 when only 15% were still using that large a dose. In Germany, a survey published in 2009 revealed that over 30% of anesthesiologists were still giving 10 unit or larger boluses of oxytocin at cesarean, despite the large amount of literature published in good quality journals on the dangers of oxytocin bolus and the data on effective dosing to produce effective uterine contraction.

The Evidence:

1. ED90 oxytocin bolus at elective cesarean = 0.32 IU (95%CI 0.18-0.52) (Carvalho 2004)
2. ED90 oxytocin bolus at cesarean in the woman with an oxytocin-flogged uterus = 2.99 IU (2.32-3.67) (Balki 2006)
3. ED90 oxytocin infusion at elective cesarean (no bolus) = 0.29 IU/min which translates to 15 U in 1L run over 1 hour (George 2010)
4. Comparison of 0,0.5,1,5 unit IV bolus at elective cesarean – no difference in uterine tone (Butwick 2010)

- Oxytocin bolus for women at risk of PPH: 5 U bolus given over 30 seconds no different in outcomes (blood loss, need for additional uterotonics) as compared to 40 U in 500mL over 30 minutes in women at risk for atony at elective CS (King 2010)

Additional evidence is showing that the human uterus likely has a limit of response to oxytocin, after which increased amounts of oxytocin may result in decreased uterine response. Also, emerging evidence shows that the next best uterotonic agent to use in the woman who has had prolonged augmented labour and is not responsive to oxytocin, is the ergotamine class of drugs (Balki)

For those needing a standard, safe approach, read the editorial by Tsen and Balki in IJOA 2010. They have proposed a Rule of 3's to guide oxytocin use by the anesthesiologist:

Table 1 Oxytocin protocol for cesarean delivery: "Rule of threes"

3 IU oxytocin intravenous loading dose* (administered no faster than 15 seconds ¹²)
3 min assessment intervals. If inadequate uterine tone, give 3-IU oxytocin intravenous rescue dose.
3 total doses of oxytocin (Initial Load + 2 Rescue Doses)
3 IU oxytocin intravenous maintenance dose (3 IU/L at 100 mL/h)
3 Pharmacologic options (e.g. ergonovine, carboprost and misoprostol) if inadequate uterine tone persists

* An initial dose of 3 IU oxytocin is sufficient for effective uterine contractions for both non-laboring^{12,21} and laboring²³ women. Preferably this dose should be administered in the form of a rapid infusion, rather than a bolus. Maintenance oxytocin infusion can be administered for up to 8 h following delivery.

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Preventing Hypotension from Spinal Anesthesia for Cesarean

Scope of the problem:

- 80% of women will experience hypotension, defined as >20% drop in SBP, following spinal anesthesia induction for cesarean delivery
- this hypotension is associated with both maternal and neonatal adverse effects:
 - maternal nausea and vomiting
 - maternal bradycardia
 - fetal acidosis

The recommendation is to keep maternal blood pressure at 100% of her baseline from time of spinal anesthesia onset to delivery of the neonate

Prevention and Treatment strategies:

- fluid preload – only colloid has been shown to have some efficacy, reducing the incidence to 35-40%. Crystalloid, even large amounts, as preload or coload is remarkably useless
- reduce local anesthetic dose – significant dose reductions do result in a lower incidence of hypotension, at the cost of reduced surgical comfort and reduced surgical time. If you have fast surgeons, can safely reduce dose to bupivacaine 9mg IT in the average sized parturient. Other strategies including using a CSE with lower IT dosing and then if needed provide epidural top-up
- wrap legs with Esmarch bandages pre-spinal (TED stockings do not work, need thigh-high, well wrapped legs)
- vasopressors
 - prophylactic bolus dosing can lead to significant hypertension and arrhythmias
 - phenylephrine has been shown to be the superior agent as compared to ephedrine both in terms of efficacy and safety for the neonate
 - ephedrine is associated with poorer cord blood gases – reflective of both the fact that hypotension is often prolonged when using ephedrine to treat hypotension, and the fact that ephedrine has been shown recently to cause metabolic effects in the fetus/neonate
 - optimal management of spinal hypotension is with a vasopressor infusion: phenylephrine alone or with ephedrine, in combination with judicious fluid coload

- fixed rate phenylephrine infusions, in other words just starting the infusion and letting it run without alteration, is not the best strategy as you will either end up with hypotension as you started too low, or hypertension (and significant bradycardia potentially) if you start too high
- phenylephrine infusions greater than 50mcg/min are associated with decreased cardiac output in the mother and with hypertension
- the ED95 of bolus phenylephrine has been estimated to be 147 mcg by Carvalho (Toronto), most practicing obstetric anesthesiologists believe this to be a dangerously high dose; the use of rescue atropine will be significant and swings in maternal blood pressure impressive. Effect on uterine blood flow unknown – not recommended therapy
- practically speaking, an infusion of phenylephrine is much less labour intensive (other than initial pump set-up) and produces much smoother hemodynamics than providing frequent small boluses, based upon blood pressure. One is always chasing the hypotension with this method, no matter how good you think you are at predicting what the next BP will be!

Evidence-based recommended approach:

1. Phenylephrine infusion started at 50 mcg/min as soon as spinal anesthesia has been initiated and adjusted to keep maternal blood pressure at 100% of her baseline.
 - a. This usually means titrating down by 5-10 mcg/min until off – usually around time of delivery (a 20mL syringe of vasopressor is all that is needed in the pump)
 - b. 20% of women will not need the infusion and this is usually quickly apparent as blood pressure will rise, and can titrate the infusion to off rapidly
 - c. If hypotension occurs, options are to increase the infusion (preferable) or give a bolus of vasopressor:
 - i. If HR still >70, then phenylephrine 50 mcg
 - ii. If HR<70, ephedrine 5 mg
 - d. If bradycardia happens:
 - i. HR<60, turn infusion down
 - ii. HR<50, consider turning the infusion off or giving anticholinergic (glycopyrrolate or atropine)
 - e. If hypotension and bradycardia, be very cautious of giving a bolus dose of phenylephrine and atropine as will often get significant hypertension and tachycardia with headache, palpitations etc
2. A combination infusion of phenylephrine and ephedrine is also very effective, and eliminates the need for atropine rescue for bradycardia. It has been studied and showed to be no better than phenylephrine alone, but in practice, try using it in women who enter the OR with HR<75. Mixture that is effective:
 - a. Phenylephrine 50mcg/mL

- b. Ephedrine 2 mg/mL
- c. In a 100mL bag of NS, add phenylephrine 10mg/mL 0.5 mL and ephedrine 200 mg (4 vials)
- 3. Crystalloid coload of 10 mL/kg started, especially if fasting interval is long
- 4. Crystalloid bolus if persistent hypotension – this is most likely a reflection of low cardiac output, as per the studies using LidCoPlus and other non-invasive cardiac output monitors

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Managing Postoperative CS Pain

The incidence of chronic pain post cesarean is about 10% at one year. This problem has not been recognized in the literature until recently, and for a previously completely healthy population of young(ish) women, is of concern as chronic pain has a significant societal cost.

Risk factors for chronic pain post cesarean are:

1. Younger
2. Anxious, depressed, poor coping skills
3. Severe acute postoperative pain, preoperative pain
4. Poor fetal outcome

Research into predicting those at risk for increased pain and chronic pain post cesarean has just started and a practical tool will hopefully be forthcoming –either short questionnaire and/or physical pain sensitivity tool that is easy to administer.

Effective post cesarean analgesia is good for the following reasons:

1. Improves sleep and functional ability including interaction with newborn
2. Improves breastfeeding success
3. Improves mobility and reduces DVT risk
4. Decreases persistent and chronic post cesarean pain

Effective post cesarean analgesia can be achieved fairly simply and very safely with the following elements:

1. Neuraxial morphine (intrathecal dose 50-200 mcg, epidural dose 3mg)
2. Neuraxial lipophilic opioid (fentanyl 10 mcg or sufentanil 2-3 mcg)
3. Acetaminophen at scheduled intervals for the first 48h
4. NSAID at scheduled intervals for the first 48h
5. Breakthrough oral opioid – not codeine!
6. For women who are unable to have neuraxial morphine, consider the following:
 - a. TAP block bilaterally
 - b. IV PCA opioid for the first 24-48h with a standard plan for conversion to oral opioid
7. For women at increased risk of significant postoperative pain, consider adding:
 - a. An additional dose of neuraxial morphine, i.e. epidural catheter left in situ at 12-18 hrs after the first dose
 - b. PCEA with local anesthetic/lipid-soluble opioid mixture for 24-48h
 - c. Neuraxial adjuvants such as clonidine
 - d. TAP block bilaterally
 - e. Preoperative gabapentin
 - f. Local wound infiltration with continuous catheter and peritoneal spraying of local
8. For women who had a GA:
 - a. TAP block bilaterally
 - b. Small dose of ketamine (10mg) at end of the case
 - c. Loading dose of long-acting opioid intraoperatively

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