Post-caesarean delivery hypoxia after spinal anaesthesia: which patients will benefit from intrathecal morphine?

A prospective study of post-caesarean delivery hypoxia after spinal anaesthesia with intrathecal morphine 150 μg

Authors: Ladha KS et al.

Summary: This study in 721 patients undergoing caesarean delivery under spinal anaesthesia examined the incidence, timing and risk factors for hypoxia after intrathecal morphine 150 μg for post-caesarean anaesthesia. In total, 169 (23%) women had ≥1 mild (<90%) desaturation event, 91 (13%) had ≥2 mild desaturations, and 26 (4%) experienced a severe (<85%) desaturation event. The median time to the first mild desaturation event was 7.4 hours and time to the first severe desaturation was 12.0 hours. Patients screening positive for sleep apnoea had higher odds of mild desaturation (OR 2.31 95% CI 1.40-3.79; p = 0.001), as did obese patients (OR 1.80; 95% CI 1.05-3.09; p = 0.033).

Comment: (Anthony Baird) Intrathecal morphine is commonly used in spinals for caesarean delivery, but has a number of potential side effects, the most concerning being delayed respiratory depression. This study was performed to identify the incidence of hypoxia following intrathecal morphine for caesarean delivery, and to identify the patient characteristics that make hypoxia in this population more common. The study was performed at a single centre in Japan on any women having a caesarean delivery during daylight hours. All included patients received spinal anaesthesia with 2.4 mL 0.5% hyperbaric bupivacaine, 10 μg fentanyl and 150 μg morphine. Additional pain relief was achieved with IV paracetamol, NSAIDs, or opioids if required. Monitoring was performed on the ward and any desaturation classified as mild (<90%) or severe (<85%), if lasting more than 30 seconds. There was no protocolised management of desaturation. Demographic information and a Berlin questionnaire were also collected on all patients. Of the 721 patients included in the study (out of 838), 23% experienced one mild desaturation, 13% experienced more than one mild desaturation and 4% experienced a severe desaturation. Desaturation was more common in obese patients with a positive Berlin Questionnaire. This study was a well-designed prospective study that was able to identify that intrathecal morphine causes a higher than previously thought incidence of hypoxia following caesarean delivery, as measured by desaturation. It also successfully identified predictive factors. It suffers from a lack of generalisability and may have benefited from a standardised management of hypoxia in the study. However, it will allow clinicians to better decide which patients will benefit from intrathecal morphine for caesarean delivery.


Abstract

Intra-operative anaphylaxis: proceed with surgery or not after resuscitation?

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The effect of neuromuscular blockade on the efficiency of facemask ventilation in patients difficult to facemask ventilate: a prospective trial

Authors: Soltész S et al.

Summary: Facemask ventilation of the lungs is an important rescue intervention in a can’t-intubate-can’t-oxygenate (CICO) scenario. This study examined the effect of neuromuscular blockade on expiratory tidal volumes in 113 patients with ≥3 predictors of mask ventilation difficulty receiving complete neuromuscular blockade (rocuronium 0.6 mg·kg⁻¹) and ventilation via a ‘two-handed-jaw-thrust’ facemask held with two hands and a pressure-controlled mechanical ventilation mode. Median tidal volume increased by 48% from 350 mL to 517 mL after (30 seconds) rocuronium administration (p < 0.001) and to 600 mL (p < 0.001) after the onset of complete neuromuscular block (a 71% increase from baseline values; p = 0.003). No decrease in the tidal volume during the measurements was observed. This included 27 (23.8%) patients with a score of ≥4 on the Warters scale, a group of ‘difficult to mask-ventilate’ patients. Initial tidal volumes were lower in patients who were difficult to mask-ventilate compared with those where ventilation was considered easy. The majority of patients required higher inspiratory pressures to reach the desired tidal volumes, with a mean pressure for all patients of 16.5 cmH₂O, volumes, with a mean pressure for all patients of 16.5 cmH₂O. Pressures in the ‘difficult to ventilate’ subgroup were 19.0 cmH₂O versus 15.5 cmH₂O in the ‘easy to ventilate’ group. Obese patients (BMI >40 kg·m⁻²) also required higher inspiratory pressures. Mean oxygen saturation increased from 97.5% to 99.2% 30 seconds after the administration of the muscle relaxant.

Comment: (André van Zundert) Airway management, airway patency and maintenance of oxygenation are fundamental skills for anaesthetists, which starts with adequate pre-oxygenation with a facemask during induction of anaesthesia. Especially if the anaesthetist is confronted with a difficult tracheal intubation (which may be difficult to predict), it is important to ensure adequate oxygenation until the patient’s airway is secured. A variety of options are offered to realise this goal, from ‘classical apropriate oxygenation with bag-mask ventilation’ to the recently introduced ‘continuous positive airway pressure and gaseous exchange through flow-dependent deadspace flushing and transnasal humidified rapid-insufflation ventilator exchange (THRIVE)’. Soltész S et al. have to be complimented with this nicely performed study, demonstrating that neuromuscular blockade not only facilitates tracheal intubation, but also improves mask ventilation during the initiation of anaesthesia with a potentially clinically relevant increase in tidal volume by a median of 250 mL (70%). No cases with a decrease in the tidal volume during the measurements were observed in this study, which included patients with ≥3 risk factors for difficult facemask ventilation. Administering neuromuscular blockers is therefore to be considered an advantage rather than a hindrance in cases of an unrecognised difficult bag-mask ventilation. Other options exist: a) returning the patient to spontaneous ventilation (not very practical); b) tracheal intubation (best option, but muscle relaxation may not be optimal, potentially leading to trauma of the airways); c) placement of supraglottic airway device (to buy time); and d) an emergency invasive front-of-neck airway access. Early use of a neuromuscular blocker should be considered as a therapeutic option that improves facemask ventilation. Two options are on offer: short versus long-acting drugs.

Reference: Anaesthesia 2017;72(12):1484-90

The association between obesity and disability in survivors of joint surgery: analysis of the health and retirement study

Authors: Gaulton TG et al.

Summary/Comment: (Leah Purcell) Obesity is a worldwide epidemic with prevalence exceeding 25% in developed countries. This population is at higher risk of arthritis and consequently the need for joint surgery. The obese patient is at higher risk of post-operative morbidity. This study examines obesity as a risk factor for increased dependence in activities of daily living (ADLs) following joint surgery. Data was utilised from the University of Michigan Health and Retirement Study, a longitudinal study of over 20,000 adults in the USA since 1992. Data was obtained from 3746 patients who had joint surgery for arthritis between 2004-2014. Obesity was defined as self-reported BMI ≥30 kg·m⁻². Disability was assessed as difficulty across six ADLs including bathing, dressing, walking, toileting, eating and getting in and out of bed. Primary outcome was an increase in level of dependence in one or more ADLs following joint surgery. 1229 patients were excluded of the 3746 for non-reported BMI, low BMI (<18.5 kg·m⁻²), repeat surgery or complete ADL dependence. Of the remaining 2510 respondents (median age 69 years, 65.5% female, 66.6% joint replacement), 1140 (45.3%) were obese. Obese patients were more likely to have joint replacement surgery than non-obese. They were also younger, had lower median total adjusted wealth, fewer years of education and a higher incidence of co-morbidities. New or increased ADL dependence was identified in 557 patients (22.1%) across the whole cohort with a statistically significant incidence in the obese population (25.4% vs 19.4%; p < 0.001) on univariate analysis. This was confirmed on adjusted multivariate analysis with an OR of 1.55 (95%CI 1.09-1.69; p = 0.007). Secondary analysis of patients having increased dependence in lower limb ADLs also showed a statistically significant increase. Patients having hip replacement had a higher level of dependence than those having knee surgery (26.8% vs 20.5%; p = 0.02). This study has confirmed the hypothesis that obesity is a risk factor for increased dependence following joint surgery for arthritis and will aid future surgical decision-making, health economic analysis and informed patient consent.


Abstract

References

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Association between handover of anesthesia care and adverse postoperative outcomes among patients undergoing major surgery

Authors: Jones PM et al.

Summary/Comment: (Angela Tognolini) Handover is important for the safe transfer of patient care, and may be temporary or complete. It may occur due to other commitments, illness, or fatigue, and is assumed to be ‘care neutral’. This study reports that complete handover of the intraoperative care of patients between anaesthetists increases the risk of adverse postoperative outcomes. A retrospective cohort study was conducted over a 6-year period (2009-2015) in Ontario, Canada. Adult patients (≥18 years) undergoing major surgery (>2 hours and requiring >1-night stay) were included, and covered a broad range of specialties from neuro, cardiac, vascular, abdominal, and urologic surgery. Of the 313,066 patients, 5941 (1.9%) underwent surgery with complete handover of anesthesia care. Handover versus no handover was associated with a higher composite risk (primary outcome) of all-cause death, hospital readmission or major postoperative complication within 30 days of surgery (44% vs 29%). After adjustment (length and type of surgery, elective/emergency, patient comorbidities, anaesthetist experience), complete handovers were associated with an increased risk of the primary outcome (adjusted risk difference [ARD] 6.9%, 95% CI 4.5-9.9; p < 0.001) and an increase in all-cause death (ARD 1.2%, 95% CI 0.5-2.0; p = 0.002), and major complications (ARD 5.8%, 95% CI 3.6-7.9; p < 0.001) within 30 days. Handovers were also associated with an increase in ICU admissions and longer hospital lengths of stay, but not with hospital readmission (ARD 1.2%, 95% CI 0.3-2.7). Factors such as the timing, manner, content or methods of handover were not examined. Investigation of these factors, limiting unnecessary complete handovers as well as improving the anesthesia handover process, such as standardised guidelines and checklists that improve communication and information transfer, may reduce risk and improve patient safety.

Reference: JAMA. 2018;319(2):143-53

Cost-effectiveness analysis of intraoperative cell salvage for obstetric hemorrhage

Authors: Lim G et al.

Summary: This study examined the cost-effectiveness of cell salvage strategies in obstetric hemorrhage from a societal perspective (threshold $100,000 per quality-adjusted life-year; QALY) over a lifetime using Markov decision analysis modeling based on three strategies: a) for all caesarean deliveries (IOCS-ALL); b) for only those deliveries at high risk of hemorrhage (IOCS-HR); and c) for those where salvage was not used (IOCS-NO) expressed as QALY. Abnormal placationation, previous caesarean and chorioamnionitis were some known risks included in the “high-risk” group. Other risks were excluded, for example prolonged labour, instrumental vaginal delivery and obesity. Cell salvage for high risk of hemorrhage was cost-effective (incremental cost-effectiveness ratio $34,881 per QALY). Routine cell salvage for all caesarean deliveries was not cost-effective ($415,488 per QALY). Results were insensitive to variation of other model parameters. Probabilistic-sensitivity analysis indicated a >85% likelihood that cell salvage in high risk for hemorrhage is favourable for the $100,000 per QALY threshold. The study outcome suggests cell salvage is most cost-effective if used for those at high risk of bleeding and concludes that cell salvage is economically reasonable for cases at high risk of hemorrhage and not reasonable if provided routinely.

Comment: (Michelle Roets) We commend the authors on an excellent analysis. The evaluation of cost related to intraoperative cell salvage and allogeneic blood transfusion is very complicated and often receives more critique than applause. Direct cost may easily be measurable for both these modalities; however, when indirect and downstream costs are included for different institutions and across countries, the challenge becomes significant. The study examines a particular group of patients where a “high risk” of bleeding is expected; however, obstetric hemorrhage can be very unpredictable. Those with “high-risk” pregnancies, for example placenta praevia, often require no allogeneic blood transfusion, if carefully managed. On the other hand those predicted “low-risk” cases often hemorrhage unexpectedly and can therefore not be excluded from such an analysis. We agree that there may be other operative strategies in obstetrics worth modelling, in terms of cost-effectiveness of cell salvage. If lost blood is captured only as QALY. Abnormal placentation, previous caesarean and chorioamnionitis were some known risks included in the “high-risk” group. Other risks were excluded, for example prolonged labour, instrumental vaginal delivery and obesity. Cell salvage for high risk of hemorrhage was cost-effective (incremental cost-effectiveness ratio $34,881 per QALY). Routine cell salvage for all caesarean deliveries was not cost-effective ($415,488 per QALY). Results were insensitive to variation of other model parameters. Probabilistic-sensitivity analysis indicated a >85% likelihood that cell salvage in high risk for hemorrhage is favourable for the $100,000 per QALY threshold. The study outcome suggests cell salvage is most cost-effective if used for those at high risk of bleeding and concludes that cell salvage is economically reasonable for cases at high risk of hemorrhage and not reasonable if provided routinely.

Reference: Anesthesiology 2018;128(2):328-37

The impact of neuraxial clonidine on postoperative analgesia and perioperative adverse effects in women having elective caesarean section – a systematic review and meta-analysis

Authors: Allen TK et al.

Summary: This meta-analysis included 18 studies to examine the effect of perioperative neuraxial clonidine on postoperative analgesia in women undergoing caesarean section under neuraxial anaesthesia. Neuraxial clonidine reduced 24-hour morphine use by an average 72 mg (95% CI 11.4 to -3.0 mg) and prolonged the mean period to first analgesic request by 135 min (95% CI 102-168 min) versus placebo. Neuraxial clonidine also increased intraoperative hypotension (OR 2.85; 95% CI 1.36-5.96) and intraoperative sedation (OR 2.36; 95% CI 1.02-5.46), but reduced intraoperative analgesic supplementation (OR 0.22; 95% CI:0.08-0.66) and had no negative effect on neonatal umbilical artery pH or Apgar scores.

Comment: (Courtney Roche) Clonidine is an effective analgesic adjunct that reduces opioid requirements when administered via the neuraxial route, though efficacy and risks in the obstetric surgical population remain less clear. Allen et al. conducted a thorough systematic review of the literature from the past 50 years, analysing 18 RCTs comparing neuraxial clonidine-containing regimens with those without clonidine in women undergoing elective caesarean sections. Primary endpoints were either post-operative IV morphine-equivalent analgesic requirements at 24 hours or time to first analgesic request. Adverse maternal and fetal effects were examined where data was available. A prior subgroup analyses were performed on trials of exclusively epidural and intrathecal administration, and trials including long-acting opioids. Clonidine groups demonstrated a statistically significant reduced 24-hour analgesic requirement (25.4 vs 32.6 mg), and increased mean time to first analgesic request by 135 minutes (95% CI 102 to 168 minutes) with no significant dose-related effect. Risks of intraoperative hypotension and sedation were significantly increased with clonidine administration, but showed no significant difference in adverse neonatal outcomes. Findings on adverse effects such as nausea, vomiting and respiratory depression were inconclusive. While the review was well-conducted, the quality and small study populations of eligible RCTs limited the validity and applicability of findings. Modest positive effects were likely overestimated by variable risks of bias, including selective outcome reporting, and publication bias. Significant clinical and methodological heterogeneity was evident, particularly in studies of epidural clonidine use. While neuraxial clonidine may have some efficacy in obstetric surgery with little effect on neonates, many questions around maternal adverse effects and optimal clonidine dosing remain unanswered.

Reference: Br J Anaesth. 2018;120(2):228-40
Ultrasound-guided dynamic needle tip positioning technique versus palpation technique for radial arterial cannulation in adult surgical patients: A randomized controlled trial

Authors: Kiberenge RK et al.

Summary: This randomised controlled study examined the success rate of a modified ultrasound technique for vascular cannulation (dynamic needle tip positioning; n = 132) versus palpation technique (n = 128) for radial artery cannulation in 260 adult surgical patients. The first-pass success rate for dynamic needle tip positioning was 83% versus 48% for palpation (RR 2.5; 95% CI 1.7-3.6; p < 0.001); overall 5-minute success rate was 89% versus 65% (RR 2.4; 95% CI 1.2-1.6; p < 0.001). Number of skin punctures was higher in the palpation group (p = 0.001). Median cannulation times did not differ between groups (81.5 versus 76 seconds).

Comment: (Peter Iu) This article has shown that ultrasound-guided vascular access for arterial line is superior to palpation technique. The operators ranged from residents with less than 1 year anaesthetic experience to consultants. The ultrasound group had 83% first pass success versus 48% and 89% overall 5 minute success rate versus 65% in the palpation group. Their method of dynamic needle tip positioning is widely taught in ultrasound workshops around the world. This method ensures the echogenic material within the artery is the tip and not the shaft of the needle. The standard short axis technique can give false positive signal or failure to put both needle tip and cannula within the vessel before catheter advancement. It is important to teach ultrasound-guided vascular access during anaesthetic training because of the increased availability of ultrasound machines and also because its effectiveness in putting an arterial line where radial pulse is not palpable, e.g., trauma or hypotension. It is essential to highlight the use of sterile equipment in the accompanying images and importantly the needle did not go through the ultrasound gel (even though one can assume it is sterile), the gel that is on the patient’s skin in Figure 3 is beyond the skin puncture point. I agree with the article that ultrasound-guided vascular access should become standard practice.
Consequences of proceeding with surgery after resuscitation from intra-operative anaphylaxis

Authors: Sadleir PHM et al.

Summary: This retrospective case control study from Western Australia was conducted to determine whether recovery outcomes after proven acute hypersensitivity reactions (n = 223; Société Française d’Anesthésie et de Réanimation [SFAR] grade 1 or 2 [25%], grade 3 [56%], grade 4 [17%]) were affected by continuing (n = 104) versus abandoning (n = 119) the planned surgical procedure. The major hypersensitivity-related complication rate was zero for grade 1 and 2 reactions, 4.7% for grade 3 and 12.8% for grade 4. There was no difference in the frequency of major hypersensitivity-related complications between patients in whom surgery was completed versus abandoned. In patients admitted to the ICU, continuation of surgery was not associated with an increased duration of mechanical ventilation.

Comment: (Nadia Koehler Vargas) These authors performed a retrospective case controlled review of patient outcomes with regards to completion of surgery after anaphylaxis in Western Australia between 2005 and 2014, extracting the case details from their state-wide database for acute hypersensitivity reactions. The majority were ASA 1 and 2 patients having elective surgery of which 43.5% needed ICU admission for ventilation (14.2% within that group were ventilated for longer than 24 hrs). In almost half of all the cases (46.6%) surgery was completed; of note is that even in patients with severe hypersensitivity reactions (grade 3 SFAR, n =128) 42.1% still went on to have their procedure. There was no difference between the two groups (surgery abandoned/surgery completed) with regards to time on ventilator, IV adrenaline given intraoperatively or mast cell tryptase levels. All major anaphylaxis-related sequelae occurred in patients with severe (grade 3 and 4) hypersensitivity reactions (4.6%), but there was no difference between patients who had their surgery completed and the ones where it was abandoned. Designed as a cohort study comparing only patients with the same grade of hypersensitivity reaction to each other, this eliminated potential pre-selection bias of well patients naturally proceeding with surgery, but reduced the numbers within the different cohorts. Their conclusion to proceed with surgery once the patient is stabilised and to carefully consider it even in severe reactions (particularly if urgent or already commenced) cautioning that a second anaesthetic would sometimes put the patient even more at risk, is valid, as an RCT would never be feasible in anaphylaxis.


Abstract

Conclusions of time on ventilation, IV adrenaline, mast cell tryptase levels, and major anaphylaxis-related sequelae were similar in patients who had their surgery completed versus abandoned. In patients admitted to the ICU, continuation of surgery was not associated with an increased duration of mechanical ventilation.

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