Welcome to the eighth issue of Anaesthesia and Pain Management Research Review.

CPAP during pre-oxygenation and reduced FiO₂ during emergence from anaesthesia improve oxygenation in obese patients undergoing laparoscopy, according to Swedish research. Distinguishing between emergence delirium and pain is difficult in preschool children after general anaesthesia, but one of the papers that we include in this issue details how this problem may be overcome by using validated paediatric observational scales in the early postoperative phase. An Internet-delivered CBT programme reported promising results for adolescents with chronic pain and their parents. This could be an effective intervention for patients who are unable to access specialised psychological treatment for pain. Would group assessments be a viable alternative to conventional individual assessment for adults with chronic non-cancer pain? An Australian investigation reports that the group assessment format reduced wait-times and delivered comparable outcomes amongst the patients, who were assessed at a hospital multidisciplinary pain service.

Research Review is ten! The first ever issues of Research Review were delivered to inboxes in February 2006. Fast forward ten years and we now publish 48 regular reviews to which there are over 160,000 subscriptions. We’re grateful to each and every one of you for your support and are looking forward to even bigger and better things over the coming years.

Kind regards,
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Preserved oxygenation in obese patients receiving protective ventilation during laparoscopic surgery

Authors: Edmark L et al.

Summary: Obese patients undergoing laparoscopic surgery were assigned either to a study group, which used CPAP 10 cmH₂O during pre-oxygenation and induction of anaesthesia (median BMI 41.9; n=20), or to a control group (no CPAP; median BMI 38.1; n=20). During anaesthesia, all patients were ventilated in volume-controlled mode with an FiO₂ of 0.4 and a positive end-expiratory pressure of 10 cmH₂O. During emergence, before extubation, all controls received an FiO₂ of 100%, whereas the intervention group received an FiO₂ of 100% or 31%. Before pre-oxygenation, both groups had a median estimated venous admixture (EVA) of ~8%. During anaesthesia after intubation, the median EVA was 8.2% in the intervention group and 13.2% in the control group (p=0.048); after CO₂ pneumopertoneum, median EVA values were 8.4% and 9.9%, respectively (p>0.05). One hour postoperatively, oxygenation had deteriorated in patients given an FiO₂ of 100% during emergence but not in those given an FiO₂ of 31%.

Comment (JB): Most anaesthetists’ anxiety levels rise as the beeps emitted by the pulse oximeter become boops during the induction or emergence when anaesthetising obese patients. We have various tricks to prevent that unwelcome descending scale. The availability of ventilators capable of delivering good quality CPAP has created the option of using CPAP during pre-oxygenation and emergence rather than the traditional bag and mask technique. While every patient may not tolerate the slight increase in airway pressure, and the need to maintain a tight seal with the facemask, the improved gas exchange and lung mechanics make this a valuable and now viable option.

Despite being quite a small study (N=40) the authors have demonstrated a reduction in estimated venous admixture (as a surrogate measure of low V/Q units and shunt) when CPAP was used during pre-oxygenation. Using estimated venous admixture allowed the authors to look past the reassuringly high PaO₂ and SpO₂ to obtain a view of gas exchange efficiency. Possibly the most intriguing finding was the improvement in gas exchange, found 1 hour postoperatively, in the subgroup of patients receiving an FiO₂ of 31% during emergence compared to the subgroup receiving the usual 100%. As the authors note, there is plenty of scope for further work in this area to try to define the optimum CPAP and FiO₂ levels. The findings of this study add to the growing body of evidence that using a very high FiO₂, even for short periods, is not completely benign. In the detail of this paper there are some gems for those interested in the applied aspects of respiratory physiology.


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Abbreviations used in this issue

- CBT = cognitive-behavioural therapy
- CPAP = continuous positive airway pressure
- ETT = endotracheal tube
- FiO₂ = fraction of inspiratory oxygen
- PONV = postoperative nausea and vomiting
- QOL = quality of life
- RCT = randomised clinical trial
- RR = relative risk
- SMD = standardised mean difference
- TT = tracheal tube
- VAS = visual analogue scale

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Emergence delirium or pain after anaesthesia—how to distinguish between the two in young children: a retrospective analysis of observational studies

Authors: Sornaining M et al.

Summary: Data were retrospectively analysed from 3 observational studies involving young children given general anaesthesia for elective adenotonsillectomy, sub-umbilical surgery, or MRI scanning. Upon awakening and at 5, 10 and 15 min after anaesthesia, the 512 study participants were assessed by the Face, Legs, Activity, Cry, Consolability Scale, the Children’s Hospital Eastern Ontario Pain Scale, the Children’s and Infants’ Postoperative Pain Scale, or the Paediatric Anaesthesia Emergence Delirium (PAED) scale, for a total of 2048 evaluations. Most children (60%) displayed at least one episode of emergence delirium and/or pain. Almost 15% of children demonstrated both emergence delirium and pain. Children with emergence delirium showed ‘no eye contact’ and ‘no awareness of surroundings’. Children with pain displayed ‘abnormal facial expression’, ‘crying’, and ‘inconsolability’.

Comment (JB): Despite the abundance of acronyms (PAED, CHOP, CHEOP, FLACC, e-PONV, ED) this paper is both readable and clinically useful. Early postoperative negative behaviours (e-PONV) in children are generally secondary to pain, to emergence delirium, or to both problems simultaneously. The trouble is determining which is which. As well as the absence of eye contact and the lack of awareness of surroundings, the other thing that set emergence delirium apart was its time course. It almost always occurred early, resolved within 15min, and did not recur once the delirium had subsided. Another important negative finding was the lack of correlation between emergence delirium and pain. The two problems basically occurred independently of each other. The clinical application of this study is nicely summed up in the flow chart (Fig 3, p382).


Abstract

Cuffed versus uncuffed endotracheal tubes in children: a meta-analysis

Authors: Shi F et al.

Summary: This meta-analysis included 2 RCTs and 2 prospective cohort studies in which children received either cuffed ETTs; n=1979) or uncuffed ETTs (n=1803). The primary outcome was the incidence of postextubation stridor; secondary outcomes were the TT exchange rate, need for re-intubation, and duration of tracheal intubation. Cuffed ETTs did not significantly increase the incidence of postextubation stridor (RR 0.88; CI 0.67, 1.16; p=0.36) and reduced the need for TT exchanges (RR 0.07; CI 0.05, 0.10; p<0.0001). The need for re-intubation following planned extubations and duration of tracheal intubation did not differ significantly between cuffed ETTs and uncuffed ETTs.

Comment (JB): My take on this meta-analysis is that mucosal injury rates, as measured by postextubation stridor, are probably not much influenced by whether the tube has a cuff or not. In contrast, the requirement for ETT exchange, typically to try a different size, is much more common if an uncuffed tube is used during paediatric anaesthesia. The widespread adoption of low-pressure, high-volume cuffed ETTs is likely to be driven by practical issues rather than absolute certainty around a safety benefit. The absence of a leak when using a cuffed tube combined with sophisticated ventilators means that low-flow anaesthesia can be administered, concurrently pollution in theatre is reduced, and ventilation is more accurately monitored. The combination of these practical benefits may mean that the associated savings offset the added cost of a cuffed ETT. If you are going to read this article it is worth digging up the Litman and Maxwell editorial on the same subject from 2013 (Anesthesiology 2013;118(3):500-1).


Abstract

References: 1. www.pharmac.govt.nz/HMLOnline. 2. Simdax® Data Sheet 2010. Please Review the full Data Sheet at www.medsafe.govt.nz before prescribing Simdax®. Simdax® (levosimendan) 2.5mg/mL injection concentrate. Approved indications: Simdax® is indicated for the short-term treatment of acutely decompensated chronic heart failure (ADHF) in situations where conventional therapy is not sufficient, and in cases where isotropic support is considered appropriate. Dosage & Administration: Only for single IV use in hospital. Dose and duration of treatment should be individualised according to the patient’s clinical condition and response. Contraindications, precautions & side effects; Tapered use of Simdax® or to any of the excipients. Severe hypotension and tachycardia. Significant mechanical obstructing affecting ventricular filling or outflow or both. Severe renal impairment (creatinine clearance <30 mL/min) and severe hepatic impairment. History of Torsades de Pointes. Use with caution in patients with ischaemic cardiovascular disease, concurrent anaemia, tachycardia, atrial fibrillation, arrhythmias, coronary ischaemia and long QTc interval. Possible side effects are tachycardia, hypotension, headache, atrial fibrillation, ventricular extrasystoles and fibrillation, Simdax® is a prescription medicine available on the HML, Aspen Pharmacare c/o Healthcare Logistics, Auckland, NZ. www.aspensharma.co.nz; TAPS PP6661-15JU.

For more information, please go to http://www.medsafe.govt.nz/
Neuraxial vs general anaesthesia: total hip and total knee arthroplasty: a systematic review of comparative-effectiveness research

Authors: Johnson RL et al.

Summary: This investigation into patient-important perioperative outcomes in neuraxial (spinal or epidural) and general anaesthesia for elective total hip arthroplasty or total knee arthroplasty included 29 studies involving 10,488 patients. Compared with general anaesthesia, neuraxial anaesthesia was associated with a significantly shorter hospital stay (weighted mean difference −0.40 days; 95% CI −0.76, −0.03; p=0.03; 12 studies). In those studies that used chemical antithrombotic prophylaxis in patient-care protocols, no statistically significant differences were found between neuraxial and general anaesthesia for mortality, surgical duration, surgical site or chest infections, nerve palsies, PONV, or thromboembolic disease. In subgroup analyses, there were no statistically significant interactions based on risk of bias, type of surgery, or type of neuraxial anaesthesia.

Comment (JB): Before committing the time to read a novel written by an unknown author have you ever read the novel’s description, skimmed the first page to get a sense of the style of writing, then flicked to the last couple of pages to check out the ending? It is tempting to treat meta-analyses in much the same way. It is often the ending, or conclusions, that are the least inspiring aspect of a meta-analysis. In this case just under half a day shorter hospital stay if spinal or epidural is used versus general anaesthesia, followed by the near ubiquitous statement; further investigations are needed. However, it is not the conclusions that make this paper valuable. The authors have provided a well-written and succinct account of the available research and positioned their paper among the plethora of other evidenced-based reviews on the same comparison – neuraxial versus general anaesthesia – and found that good quality neuraxial anaesthesia is no better or worse than general anaesthesia for hip or knee total arthroplasty. They provide some direction for future researchers, suggesting that we should be looking carefully at the level of sedation given during neuraxial anaesthesia, taking a more multidimensional approach to the patients’ experience of anaesthesia, and continuing measurement until 3 months after surgery. In my own practice the orthopaedic surgeons prefer not to give chemical DVT prophylaxis so in theory neuraxial anaesthesia should have an advantage with lower rates of venous thrombosis and pulmonary embolus.


The contribution of the anaesthetist to risk-adjusted mortality after cardiac surgery

Authors: Papachristof O et al.

Summary: These researchers analysed data from 110,69 cardiac surgical procedures conducted in 10 UK centres between April 2002 and March 2012, which included 127 consultant surgeons and 190 consultant anaesthetists. The primary outcome was in-hospital death up to 3 months postoperatively. Using the EuroSCORE risk scoring model to calculate risk-adjusted mortality, revealed that patient risk accounted for 80.75% of the variation for in-hospital mortality. Surgeons had a moderate impact (intra-class correlation coefficient 4.00% for mortality), while anaesthetists had negligible impact (0.25%). There was no significant effect of anaesthetist volume above 10 cases per year.

Comment (JB): This study is particularly relevant to New Zealand as there is an active debate occurring here regarding the ethics and wisdom of publishing outcome data based on individual surgeons and anaesthetists. The ‘for’ argument is supported by the requirement to make relevant information available to each patient so that they can make reasoned decisions about their own healthcare and the potential value of an ‘external view’ of performance data in order to allow poor operators to be identified. The ‘against’ is largely based around the difficulties in making sure that the data compares apples with apples (i.e. are the patient risk scoring systems, like the EuroSCORE used in this study, reliable enough, and used well enough, to remove biases associated with different surgical patient populations)?, concerns about the influence of publishing outcome data on a surgeon’s willingness to offer a high-risk patient an operation, on the decision of institutions to report poor outcomes or to manipulate patient risk data, and the assignment of responsibility for outcome on the individual clinicians rather than the whole peri-operative and intra-operative team.

Controversies aside it is somewhat reassuring to see that only 0.25% of the total variability in outcome was linked to the specific anaesthetist. Even this low figure may have overestimated the real anaesthesia contribution as the anaesthetist with the ‘worst’ results worked with the surgeon with the ‘worst’ results and it is very difficult to totally account for interdependencies. This observation reinforces the need to consider teams as well as individuals. The paper’s discussion included some interesting comparisons between UK and US cardiac surgical outcome by surgeon figures. In the UK environment, cardiac surgical services are highly concentrated in a relatively small number of institutions, much like New Zealand.


The effect of bodily illusions on clinical pain

Authors: Boesch E et al.

Summary: This was a systematic review and meta-analysis of 20 studies consisting of 21 experiments comparing the effects of bodily illusions with controls on pain; the presence of selection bias and lack of binding resulted in an overall high degree of bias. There was consistent evidence for decreases in pain associated with illusions of the existence of a body part (myoelectric/Sauerbruch prosthesis versus cosmetic/no prosthesis; SMD −1.84 [95% CI −2.67, −1.00]) and 4–6 weeks of mirror therapy (−1.11 [−1.66, −0.56]). Bodily resizing illusions were associated with consistent evidence of pain modulation in the hypothesised direction. No effect was seen for single sessions of mirror therapy or for incongruent movement illusions, with the exception of incongruent movement illusions –1.84 [95% CI −2.67, −1.00] and 4–6 weeks of mirror therapy (−1.11 [−1.66, −0.56]). Bodily resizing illusions were associated with consistent evidence of pain modulation in the hypothesised direction. No effect was seen for single sessions of mirror therapy or for incongruent movement illusions, with the exception of incongruent movement illusions significantly increasing the likelihood of experiencing pain. The findings for virtual walking illusions were conflicting in comparisons with active and inactive controls. There was no evidence of an effect for resizing and embodiment illusions, with the exception of incongruent movement illusions significantly increasing the likelihood of experiencing pain.

Comment (JB): This was an interesting and important review. The authors have included a good selection of article types and generally avoided meta-regression. It is particularly helpful to have two different outcomes stated (pain and fear of pain) – the former has a direct impact on the patient and the latter is a key outcome for the patient and healthcare professional. There was a clear indication that there was a trend towards pain reduction with increasing illusion duration and intervention repetition. The authors have included a solid discussion that is well supported by the quantitative analysis. It was also reassuring to see the authors having a clear bias towards research that used the methodology and instrument to measure pain. This study is relevant to New Zealand given our high prevalence of chronic pain conditions and the potential to manipulate pain perception using illusions, with potential benefits on clinical pain.


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Internet-delivered cognitive-behavioral treatment for adolescents with chronic pain and their parents

Authors: Palermo TM et al.

Summary: Adolescents with mixed chronic pain conditions and their parents were randomised to internet-delivered CBT (n=138) or internet-delivered education (n=135). Compared with the education group, CBT was associated with a significantly greater reduction in activity limitations at 6 months (primary outcome; p=0.03), improvements in sleep quality (p=0.04), reduced parent miscarried helping (p=0.007) and protective behaviours (p=0.001) and greater treatment satisfaction (p<0.05); CBT was also associated with benefits for exploratory outcomes of parent-perceived impact (i.e., depression, anxiety, self-blame about their adolescent’s pain, and parent behavioural responses to pain).

Comment (GL): I am one of these old stooges who believe that children should spend less time in front of devices and more time interacting with real humans. Thus, I was sceptical of this paper after reading the title. Having read the full article and seen the sample image of the software, I confess it does look pretty cool. Certainly, both the adolescents and parents thought that it was an acceptable form of management. I liked the separate component directed to the parents and the positive outcomes that this gave rise to. Having said that, most of the significant differences in outcome measures between the CBT and control groups were modest, and I would have liked to have seen a more formal comparison to in-person CBT to have a clearer idea of its benefit. It is certainly a promising tool for adolescents with chronic pain in many parts of NZ where there is little to no access to appropriate psychological support.


Assessment of adults experiencing chronic non-cancer pain

Authors: Smith N et al.

Summary: Adults attending an Australian tertiary hospital multidisciplinary pain service were randomised to group assessments focusing on supported self-assessment (n=72) or individual assessment (n=90) after undergoing education and orientation; follow-up data were available at 3 months for 57 and 72 participants from the respective arms. There was no significant difference between the group and individual assessment arms for pain intensity, pain interference, self-efficacy, psychological distress, healthcare utilisation beyond the pain service, participant satisfaction or implementation of self-management strategies. Median waiting times were reduced in the group versus individual satisfaction or implementation of self-management strategies.

Comment (GL): I found the concept of a group-based assessment quite fascinating. I am sure that there are also a few clinicians who would quiver at the thought of patients self-identifying medical and psychological concerns. However, this quite novel approach seems to be a cost- and time-effective strategy for multidisciplinary assessment, and one that patients find perfectly acceptable. In fact, from looking at some of the outcome measures that changed following the assessment (but prior to any clinic appointment), it may have been a nice little intervention in itself. I suspect a few pain clinics around the world with long waiting lists will be contacting the authors for more details on the practicalities of the group assessment process.


A systematic review and meta-analysis of the prevalence of chronic widespread pain in the general population

Authors: Mansfield KE et al.

Summary: This systematic review and meta-analysis included 24 papers reporting data on the prevalence of chronic widespread pain in adults, variations in prevalence by age, sex and geographical location, and criteria used for its definition. Prevalence estimates for chronic widespread pain were 0–24%, but most were 10–15%. The random-effects pooled prevalence was 10.6%, but this increased to 11.8% when only studies at low risk of bias were considered, although heterogeneity remained high. Women aged ≥40 years had a higher prevalence. Only limited evidence of geographical variation and cultural differences was seen.

Comment (GL): I do like a good meta-analysis. Although epidemiology is not my favourite thing, this was a well-conducted review that included a good number of studies, several of which were high quality. There wasn’t too much surprising in the findings regarding the influence of gender and age on the prevalence statistics, but I found the overall prevalence of chronic widespread pain to be surprisingly high. Given that the overall chronic pain prevalence in most Western countries is 15–20%, it means that about half or more of these have widespread pain. That’s food for thought.


Treatment of myofascial pain syndrome with lidocaine injection and physical therapy, alone or in combination

Authors: Lugo LH et al.

Summary: These researchers randomised 127 patients with shoulder girdle myofascial pain syndrome lasting >6 weeks and a VAS pain score >40mm to receive physical therapy, lidocaine injections into trigger points or both. Per protocol analyses revealed that compared with physical therapy and lidocaine alone, VAS score at 1 month (primary outcome) was not significantly different in the combination group (40.8 vs. 37.8 and 44.2mm, respectively [p values 0.560 and 0.545]). None of the secondary outcomes assessed (i.e. VAS score at 3 months and hand-mouth manoeuvre, QOL and depressive symptoms at 1 and 3 months) differed among the groups, except for significantly higher 1- and 3-month right upper limb hand-back manoeuvre scores in both groups that included physical therapy compared with lidocaine injections alone (p<0.016).

Comment (GL): A recent article in a highly respected rheumatology journal described both myofascial pain syndrome and trigger points as “inventions that have no scientific basis”. No mincing words there; it is certainly a controversial topic. This study was a well-designed RCT, but I could see no rationale for combining the two therapies, which may be related to the lack of neurophysiology content in the discussion. Bizarrely, there was no within-group comparison of how the outcome measures changed over time. So, although we know that there were no real differences among the groups at any of the baseline and postintervention periods, there is no statistical analysis of how effective the interventions were. It leaves me a bit all none-the-wiser on the idea of trigger points and the neurobiology of ‘deactivation’.


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