Motor and cognitive development is delayed in children who have cardiac surgery in early infancy.

**Background:** Surgery for congenital heart disease (CHD) in infancy is associated with brain injury and neurodevelopmental deficits in up to 50% of the infants who have had cardiac surgery. Younger infants are more vulnerable to the effects of cardiopulmonary bypass and changes in perfusion/oxygenation, and they undergo more complex procedures.

**Objective:** To examine the published literature related to motor and cognitive development in infants who had heart surgery during the first 6 months of life.

**Design:** Meta-analysis and literature review.

**Methods:** The literature search resulted in 327 randomized or prospective observation studies from 1988 to 2008 including 65 reviews. Two independent investigators retrieved pertinent cognitive and motor outcome data, which were divided by age into 3 groups: early development (1 to <3 years); preschool age (3 to 5 years); and school age (>5 to 17 years). Cognitive and motor outcomes were assessed using the Bayley Scales of Infant Development. The latest neurological evaluation was used for the specific age group. Studies with the same outcome were combined, and a weighted estimate of mean outcome was reported. Heterogeneity between studies was assessed, and possible causes of heterogeneity were explored.

**Results:** 25 articles included and described data on 8 cohorts in multiple publications. For children 1 year of age, the average cognitive score (Mental Development Index) was 90.3 (95% CI, 88.9 to 91.6), which is about 1 SD of the test mean, and the motor score (Psychomotor Development Index) was 78.1 (95% CI, 76.4 to 79.7), which is about 2 SD of the test mean. There were only few studies on preschool and school-age children; therefore, the analysis was limited.

**Conclusions:** Children that had CHD surgery at <1 year of age are at risk of cognitive and motor development deficits. The etiology of these deficits is multifactorial. Vulnerability of white matter to injury during the first months of life, as well as the complexity of surgical techniques, may be contributing factors. The predictive value of the testing scores has been questioned, and early delays do not always predict later problems.

**Reviewer’s Comments:** CHD surgery during infancy leaves children with intellectual, cognitive, and developmental limitations. The nature of these conditions is multifactorial and is not very well understood. Underlying preoperative defect, intraoperative insults, and later environmental factors may play a role in their pathogenesis. The validity of current tests to diagnose these conditions and predict future problems is also limited by the great variability of the tests during early stages of life and the nonlinear patterns of development. (Reviewer-Ioanna Apostolidou, MD).
**Background:** The Pediatric Perioperative Cardiac Arrest (POCA) Registry was established in 1994 and includes data from 373 cases reported through 2005. Thirty-four percent (127 cases) of the children in the registry had congenital or acquired heart disease (HD); this is the largest sample of anesthesia-related cardiac arrest data in children with known HD.

**Objective:** To compare children with and without HD in terms of factors and outcomes associated with perioperative cardiac arrest.

**Design:** Retrospective analysis of data on causes and outcomes related to anesthesia-related cardiac arrest in children with (n=127) and without (n=245) HD. Data relevant to this analysis was unavailable for 1 patient in the registry.

**Methods:** Data were abstracted from standardized forms submitted to the registry. Data included patient demographics, medical status, surgical procedure, anesthesia parameters, antecedent events, and details of resuscitation. The analysis assessed the contribution of these variables to cardiac arrest as well as outcome. Analyses compared patients with and without congenital HD.

**Results:** The analysis identified several significant differences between patients with and without HD. Cardiac arrest occurred at a significantly younger age in patients with HD than in those without; 47% and 70% of arrests occurred in children <6 months and <2 years of age, respectively. Patients with HD were generally sicker (92% ASA III to IV vs 62%; $P <0.01$) and more likely to have a cardiovascular cause for their arrest (50% vs 38%; $P =0.03$) than those without HD. Almost half of the patients with HD (48%) experienced the cardiac arrest during the surgical phase of the anesthesia compared to 36% and 16% who arrested pre- or postsurgically, respectively. Those with HD had higher mortality rates (33% vs 23%; $P =0.048$), but this difference disappeared when rates were adjusted for ASA status. The majority of cardiac arrests in patients with HD occurred in general operating rooms (54%) as compared to cardiac operating rooms (26%) or catheterization laboratories (26%). At the time of cardiac arrest, >50% of the patients with HD (59%) had unrepaired defects, and 26% had palliated lesions. Among those with HD, the most common lesions were single ventricle (19%) and left-to-right shunting (18%).

**Conclusions:** Among children who experienced anesthesia-related cardiac arrest, those with HD were significantly sicker and less likely to survive. Increased risks in this population appear to be related largely to underlying cardiac pathophysiology than to factors related to surgical or anesthetic parameters.

**Reviewer's Comments:** Children with congenital HD should be in the most optimal state prior to elective surgery. We should have a low threshold for cancellation of their surgery when in doubt about their status. (Reviewer-Ioanna Apostolidou, MD).

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Keywords: Heart Disease, Anesthesia, Cardiac Arrest, Children

Print Tag: Refer to original journal article
Severe hyperglycemia is associated with adverse outcomes in the intraoperative and postoperative settings.

**Background:** It has been well established that hyperglycemia during the perioperative period increases the risk of morbidity and mortality after cardiac surgery. Most studies that have investigated the impact of hyperglycemia have focused on glucose concentrations postoperatively. Little is known about how dysregulated glucose during surgery impacts outcome.

**Objective:** To compare the relative contribution of intraoperative versus postoperative glucose levels on adverse outcomes in cardiac surgery.

**Design:** Retrospective analysis of prospectively collected data.

**Methods:** Data were collected on 4,302 patients who had cardiac surgery between October 3, 2005, and May 31, 2007. Data were collected on several measures of postsurgical in-hospital adverse events, including all-cause mortality, overall morbidity, prolonged intubation, infection, and cardiac, neurologic, and renal morbidity. Time-weighted glucose concentrations based on arterial blood glass analysis were calculated from intraoperative glucose concentrations (collected every 49 minutes) and during the first 24 hours after surgery (collected every 203 minutes). A mean of $7.0 \pm 2.3$ and $10.1 \pm 2.3$ samples were included from the intra- and postoperative periods, respectively. A coefficient of variation (ratio of mean to SD glucose level) was determined for each patient as a measure of glucose variability. Insulin treatment followed hospital protocol to achieve target blood glucose concentrations of 70 to 150 mg/dL for the intraoperative period.

**Results:** Severe hyperglycemia was associated with significantly increased risk in both the intraoperative and postoperative settings. In the intraoperative setting, patients with glucose >200 mg/dL had 90% and 50% greater risk of mortality and morbidity, respectively. Postoperatively, there was a 10-fold increase in mortality and a 3-fold increase in morbidity for patients with severe hyperglycemia. Risks were significantly lower for patients with mild hyperglycemia (140 to 170 mg/dL glucose), but those with normoglycemia were at similar risk for morbidity and mortality as were those with severe hyperglycemia. With respect to the variability of glucose levels, only postoperative variability significantly increased risk for morbidity and mortality.

**Conclusions:** The authors concluded that intraoperative mild hyperglycemia (140 to 170 mg/dL) is associated with better outcomes compared to severe hyperglycemia or normoglycemia. The incidence of hypoglycemia was rare and was not associated with adverse outcome.

**Reviewer’s Comments:** The American Association of Clinical Endocrinologists and the American Diabetes Association’s consensus statement on inpatient glycemic control of the critically ill patient recommends a glucose range of 140 to 180 mg/dL for critically ill patients. Intravenous insulin infusions are the preferred method for achieving and maintaining glycemic control, using validated insulin infusion protocols and with frequent glucose monitoring to minimize the occurrence of hypoglycemia. (Reviewer-Ioanna Apostolidou, MD).

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Keywords: Intraoperative Hyperglycemia, Cardiac Surgery, Glucose Level, Morbidity, Mortality

Print Tag: Refer to original journal article
Dexmedetomidine is a safe and effective sedative for MAC cases.

**Background:** Dexmedetomidine (DEX) is a central α-receptor agonist that produces sedation without respiratory depression, is analgesic-sparing, and sympatholytic; all of these factors make it a suitable alternative for use during monitored anesthesia care (MAC). However, its safety and efficacy as a primary sedative have not been studied in nonintubated patients during MAC.

**Design:** Prospective, randomized, double-blind, Phase III, multicenter trial.

**Methods:** Subjects included patients scheduled for a surgical procedure with MAC who were ≤18 years of age, ASA physical status I to IV, and required a local anesthetic block. Exclusion criteria were related to the presence of unstable heart disease and recent exposure to certain anesthetic and analgesic agents. Patients were randomized to the DEX 0.5-µg/kg load arm, the DEX 1-µg/kg load arm, or to saline placebo in a 2:2:1 ratio; administration was over a 10-minute period. Maintenance infusion was begun at a rate of 0.6 µg/kg per hour. Assessments for sedation began 15 minutes after the start of the maintenance infusion, and where necessary, midazolam was administered until the Observer's Assessment of Alertness/Sedation Scale (OAA/S) score was ≤4. All patients were given a local anesthetic block prior to the procedure plus rescue midazolam and/or fentanyl if needed. Ratings of ease of intraoperative sedation, respiratory and hemodynamic stability, patient cooperation, and patient anxiety were rated by the anesthesiologist after the patient was transferred to the PACU. Patients rated satisfaction with their anesthesia 24 hours after surgery.

**Results:** 134 patients were in the DEX 0.5-µg/kg arm, 129 were in the DEX 1-µg/kg arm, and 63 were in the placebo arm. Almost all patients in the placebo group required rescue midazolam as compared to approximately 50% of patients in the DEX groups. Also, significantly fewer patients in the DEX groups required additional drugs for sedation compared to the placebo group. A similar pattern of results was obtained with regard to the need for rescue fentanyl for pain, with significantly more patients in the placebo group requiring fentanyl (88.9% vs 42.6% and 59%) and requiring higher doses than in the DEX groups. Sedation was significantly easier to achieve and maintain in the DEX groups, and patient satisfaction was higher. In terms of safety, DEX was associated with a significantly lower rate of respiratory depression and with mild to moderate protocol-defined (30% change from baseline) bradycardia and hypotension.

**Conclusions:** Dexmedetomidine is a safe and effective agent for MAC in patients undergoing a range of surgical procedures. Use of DEX was associated with lower rates of respiratory depression and reduced need for and doses of rescue midazolam and fentanyl.

**Reviewer's Comments:** Dexmedetomidine provides cooperative sedation. It has a slower onset and offset of sedation compared with propofol. The most notable adverse effects are hypotension and bradycardia.

(Reviewer-Ioanna Apostolidou, MD)

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Keywords: Monitored Anesthesia Care, Dexmedetomidine, Safety, Efficacy

Print Tag: Refer to original journal article
**Emergence Agitation in Children -- What Do We Know? What Can We Do?**

*Pharmacological Prevention of Sevoflurane- and Desflurane-Related Emergence Agitation in Children: A Meta-Analysis of Published Studies.*

Dahmani S, Stany I, et al:

*Br J Anaesth 2010; 104 (January): 216-223*

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**Midazolam does not prevent emergence agitation in children.**

**Background:** The incidence of emergence agitation (EA) in children is higher after sevoflurane and desflurane anesthesia. Although EA typically resolves on its own, it is nevertheless a potentially serious complication of anesthesia. Efforts to use pharmacological agents to prevent EA have produced varied results, and their efficacy for this purpose remains a matter of debate.

**Objective:** To conduct a meta-analysis of available studies on the efficacy of various pharmacologic prophylaxis strategies for reducing the risk of EA.

**Design:** Meta-analysis of studies from 3 different databases.

**Methods:** Articles were analyzed separately by 2 independent senior anesthesiologists. In order to be considered for inclusion in the analysis, studies had to be randomized controlled trials with double-blind drug administration, include the use of sevoflurane or desflurane anesthesia according to standard protocols, have both prophylactic intervention and control groups, and use standard definitions of EA or its component symptoms as end points. Data abstracted from each study included patient age, type of surgery, premedication dose and timing, and specifics regarding the dose, timing and route of administration of the prophylactic agents as well as other agents used during the course of anesthesia. Each of these variables was explored with respect to its impact on the percent of patients experiencing agitation in intervention versus control groups. Each potential prophylactic agent was examined by group without respect to specific routes of administration, timing, etc and also in separate analyses by dosing parameter.

**Results:** A total of 324 articles were identified, of which 37 met the criteria and were included in the analysis. The final sample included 1169 patients in the intervention group and 1477 in the control group. The potential prophylactic agents examined were midazolam, ketamine, propofol, fentanyl, α₂-adrenergic agonists, 5HT₃ antagonists, preoperative analgesia, caudal analgesia, and preoperative local anesthesia. There was no protective effect of either midazolam or 5HT₃ antagonists on the incidence of EA. Propofol, when given either continuously or as a bolus dose at the end of the procedure, had an overall protective effect on EA (OR, 0.21; 95% CI, 0.16, 0.28) as did ketamine (OR, 0.28; 95% CI, 0.13, 0.60), intranasal fentanyl (OR, 0.31; 95% CI, 0.18, 0.56), and α₂-adrenergic agonists (OR, 0.23; 95% CI, 0.17, 0.33). Preoperative analgesia also had a protective effect against EA (OR, 0.15; 95% CI, 0.07, 0.34).

**Conclusions:** Midazolam, although an ideal premedication, is not effective in preventing EA. In contrast, propofol, ketamine, fentanyl, and preoperative analgesia are effective in this setting.

**Reviewer's Comments:** EA is not always related to pain. The agents listed above prevent EA by mechanisms other than pain relief. Surprisingly, midazolam did not prevent EA according to this meta-analysis. (Reviewer-Ioanna Apostolidou, MD).

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Keywords: Sevoflurane, Desflurane, Emergence Agitation, Children

Print Tag: Refer to original journal article
Delayed dantrolene administration and every 2° increase in temperature increases the risk of complications from MH.

**Background:** Malignant hyperthermia (MH) is triggered in genetically susceptible individuals by exposure to volatile anesthetics and/or certain muscle relaxants. Very little is known about clinical factors associated with increased risk of cardiac morbidity and mortality during episodes of MH.

**Objective:** To evaluate epidemiologic data on MH using the North American MH Registry database. Data collected between January 1, 1987, and December 31, 2006, were studied to look for factors associated with presentation, treatment, and complications related to cases of MH.

**Design:** Retrospective analysis of episodes of MH included in the North American MH Registry database.

**Methods:** Adverse metabolic and/or musculoskeletal reactions to anesthesia (AMRA) reports submitted during the 19-year period were evaluated. To be included in the analysis, episodes had to have occurred in the United States or Canada. In addition, at least 1 anesthetic drug had to have been administered, and the episode had to have been rated by the clinical grading scale as "very likely" or "almost certain" to be related to MH.

**Results:** From 286 MH cases, 112 were graded as "very likely" and 174 cases as "almost certain" to have MH. The majority of patients were male (74.8%), and the median age of the sample was 22.0 years. Only 6.5% of cases had a family history of MH. Approximately 50.7% of patients had at least 2 prior unremarkable general anesthetics. In 24.1% of cases of MH, the associated procedure was an emergency. The most common early signs were hypercarbia, sinus tachycardia, or masseter spasm; temperature abnormality was among the first 3 signs in 63.5% of cases. The majority of patients (78.6%) experienced muscular abnormalities as well as respiratory acidosis, whereas <30% had evidence of metabolic acidosis. Only 22% of patients received no dantrolene treatment; for the remainder of the patients, the median total dose was 5.9 mg/kg. Analysis of data on complications showed that the risk of any complication increased 2.9 times for every 2° increase in temperature. Furthermore, every 30-minute delay in dantrolene administration was associated with an increased risk of 1.6. Among patients with temperatures <41.6°C, 21 had hematologic and/or neurologic complications.

**Conclusions:** The results of the analysis demonstrate that accurate monitoring of temperature can lead to earlier diagnosis of MH during administration of general anesthetics and earlier administration of dantrolene, both of which may significantly decrease associated morbidity.

**Reviewer’s Comments:** An interesting finding here is that 50% of the patients had uncomplicated anesthetics before. The caffeine halothane contracture test has 97% sensitivity but only 80% specificity for the diagnosis of MH. A negative genetic test does not rule out MH. (Reviewer-Ioanna Apostolidou, MD).
HSH infusion may be useful in reducing the total fluid load and improving cardiac performance in the early postoperative period of cardiac surgery.

**Background:** Perioperative cardiac dysfunction is common after cardiac surgery and has many contributing factors. Excess fluid loading with subsequent edema formation of cardiac muscle is one potential cause. Strategies to limit fluid accumulation and edema may improve postoperative cardiopulmonary function.

**Objective:** To confirm improved cardiopulmonary function by reducing fluid loading during open-heart surgery.

**Design:** Prospective, randomized, double-blinded study.

**Participants:** Patients were all undergoing on-pump elective coronary artery bypass graft (CABG) surgery. Patients were excluded if they were at extremes of age or body mass index (BMI), had reduced left ventricular ejection fraction (LVEF), renal failure, hypernatremia, or clopidogrel <5 days prior to surgery.

**Methods:** Patients underwent a standard general anesthetic, and tranexamic acid was used. Pulmonary artery and femoral arterial monitoring was used; calculations of intrathoracic blood volume (ITBV), extravascular lung water, and global end diastolic volume (GEDV) were performed using a thermodilution technique at several time points during surgery and the next day. Patients were randomized to receive either a continuous infusion of hydroxyethyl starch/hypertonic saline (HSH group) or lactated Ringer's solution (CT group). All patients received Ringer's solution in addition to the study solution. A standardized intraoperative and postoperative course was followed in all patients. Serum levels of a number of pro- and anti-inflammatory cytokines and electrolytes were also measured postoperatively. Thromboelastography (TEG®) was used to evaluate coagulation.

**Results:** Patients in both groups had similar demographics, bypass times, cross-clamp times, number of grafts, and estimated blood loss. Net fluid balance was evaluated at multiple time intervals, and in the first 6 hours in the ICU was significantly higher in the CT group. Diuresis was significantly higher in the HSH group during the first 24 hours. Hemodynamic variables were similar between the 2 groups, but the cardiac index was higher at 6 hours after surgery in the HSH group. Intrathoracic blood volume was higher in the CT group at 6 hours also. GEDV was higher in the HSH group at the 6 hour mark also. The PaO₂/FiO₂ ratio decreased in both groups but recovered more quickly in the HSH group but did not quite reach significant values. The serum sodium levels were higher in the HSH group but did not get higher than 150 mmol/L, and this difference normalized by the next morning. Inflammatory markers and TEG all changed compared to baseline, but there were no significant differences between the 2 groups. No difference in transfusion was noted between the 2 groups.

**Conclusions:** The authors conclude that HSH infusion caused a reduction in the total fluid load and an improvement of cardiac performance in the early postoperative period.

**Reviewer's Comments:** Reducing fluid load intraoperatively in a number of surgical procedures, particularly bowel surgery, is gaining greater acceptance in both the surgical and anesthesiology literature. (Reviewer-Allen Miranda, MD).

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Keywords: Hypertonic Saline, Hydroxyethyl Starch, CABG, Cardiac Function

Print Tag: Refer to original journal article
Noninvasive Ventilation -- In Whom Is It Effective?

Factors Associated With Noninvasive Ventilation Failure in Postoperative Acute Respiratory Insufficiency: An Observational Study.

Wallet F, Schoeffler M, et al:

Eur J Anaesthesiol 2010; 27 (March): 270-274

NIV may be of benefit postoperatively, but not in the setting of nosocomial pneumonia.

Background: Postoperative respiratory failure has many contributing factors. Noninvasive ventilation (NIV) has been extensively studied in the settings of acute respiratory failure (ARF) associated with exacerbations of chronic heart failure (CHF) and chronic obstructive pulmonary disease (COPD).

Objective: To determine the efficacy of NIV in postoperative patients with ARF and to determine the risk factors for failure of NIV, particularly the development of nosocomial pneumonia.

Design: Retrospective cohort study.

Participants: Adult patients admitted to the SICU who developed ARF >24 hours after surgery were included. Patients who were intubated before ICU admission or developed ARF during their ICU stay were excluded.

Methods: ARF was defined as respiratory distress with dyspnea and accompanying oxygen saturation ≤90% on high-flow oxygen or arterial hypoxemia ≤60 mm Hg, with or without hypercapnia. Patients underwent a variety of abdominal, thoracic, and orthopedic procedures. Nosocomial pneumonia was defined as the association of clinical signs of infection with chest x-ray and laboratory evidence of infection. A cardiac cause of ARF was defined as the presence of elevated left ventricular diastolic pressure by echocardiography. NIV was performed using continuous positive airway pressure (CPAP) when the patients were not hypercapnic or acidotic, and noninvasive positive pressure ventilation (NPPV) was performed if the patients were hypercapnic or acidemic. A simplified acute physiology score (SAPS) 2 was recorded; various demographic and physiological parameters and arterial blood gas (ABG) measurements were performed. If NIV failed, the duration of NIV before endotracheal intubation occurred was recorded.

Results: Patients were generally older, but there were no significant differences between intubated and nonintubated patients in terms of age, gender, or comorbidities. Slightly >50% of the patients did not require endotracheal intubation. Patients who required intubation were sicker as demonstrated by their SAPS score. ABG analysis was similar between the 2 groups with the exception of a significantly lower PaO2/FiO2 ratio 1 hour after the initiation of NIV in the group that required intubation. Approximately one-third received CPAP and two-thirds received NPPV. The development of nosocomial pneumonia was a significant risk factor for failure of NIV. The average time until intubation was required was approximately 24 hours. Survivors tended to require intubation for less time than nonsurvivors. Successful NIV was associated with reduced ICU stay and mortality.

Conclusions: NIV can be tried in surgical patients with ARF, but if nosocomial pneumonia is present, the failure rate is high, and delayed intubation may play a role in increased mortality.

Reviewer's Comments: The use of NIV for indications other than acute exacerbations of CHF and COPD is growing, and although this study is retrospective, it may help to refine the perioperative use of this modality. (Reviewer-Allen Miranda, MD).

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Keywords: Acute Respiratory Failure, Noninvasive Ventilation, Nosocomial Pneumonia

Print Tag: Refer to original journal article
Dosing of propofol for induction may be more effective based on actual, rather than adjusted, body weight in the morbidly obese.

**Background:** Induction of anesthesia in the morbidly obese patient usually centers on airway concerns, positioning, and associated comorbid conditions. The induction drugs are often less a focus despite the fact that there are few studies that specifically examine the effect of morbid obesity on drug requirements for induction.

**Objective:** To evaluate the efficacy and safety of 350 mg versus 200 mg of propofol for induction of anesthesia in morbidly obese patients undergoing bariatric surgery. The authors chose 350 mg based on the fact that the median weight in their bariatric clinic is 140 kg, and 2.5 mg/kg is a commonly used induction dose.

**Design:** Prospective, blinded, randomized study.

**Participants:** 20 morbidly obese ASA II or III adult patients undergoing bariatric surgery were included. The patients also had to have normal renal and hepatic function. Weight ranged from 98 to 167 kg, and all patients had a body mass index (BMI) >35 kg/m2.

**Methods:** All patients had routine monitors plus an arterial line and a bispectral index (BIS) electrode placed for the induction of anesthesia. The induction dose was given over 60 seconds via a TIVA pump. Anesthesia was maintained with propofol, atracurium, and remifentanil. If induction was felt to be inadequate, a second bolus dose of 100 mg of propofol could be given. Hemodynamic parameters were recorded. Patients were instructed to count at the beginning of the induction injection. The induction time was defined as the interval from the start of injection until the patient quit counting. Ease of laryngoscopy was also recorded.

**Results:** Predictably, BIS values decreased in all patients but were lower in the group that received the higher dose of propofol between 2.5 and 5 minutes after injection. Induction time was not significantly different between the 2 groups, however. Hemodynamic profiles demonstrated a trend toward a higher systolic blood pressure in the lower dose group in the first 10 minutes after induction. Only 1 patient in the 350-mg group had a systolic blood pressure <60 mm Hg. Quality of laryngoscopy was equivalent. All of the patients in the 350-mg group had an adequate induction, but 2 individuals in the 200-mg group required an additional bolus of propofol. Almost two-thirds of the patients in the lower dose group had blood pressures that were considered high and possibly harmful.

**Conclusions:** The authors conclude that 200 mg of propofol in un-premedicated morbidly obese patients is inadequate in terms of efficacy of induction. They suggest that a dose cap of 350 mg seems more appropriate with further studies being needed using weight-based dosing without a dose cap.

**Reviewer’s Comments:** The effective blood volume and volume of distribution of many drugs, not just anesthesia induction drugs, in the morbidly obese is a topic that needs continued research. (Reviewer-Allen Miranda, MD).

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Keywords: Propofol, Morbid Obesity, Induction

Print Tag: Refer to original journal article
Beware of Uterine Rupture in Women Undergoing VBAC

Frequent Epidural Dosing As a Marker for Impending Uterine Rupture in Patients Who Attempt Vaginal Birth After Cesarean Delivery.

Cahill AG, Odibo AO, et al:


Repeated dosing of an epidural may be a signal for the occurrence of uterine rupture in women undergoing VBAC.

Background: Vaginal birth after cesarean (VBAC) delivery is one option for delivery. Epidural use in these patients typically follows traditional indications for epidural placement. Despite the best placed epidural, some epidurals require repeated bolus dosing in order to maintain adequate analgesia. Most of the time, this has to do with the "mysteries" of the epidural space, but frequent re-dosing can be a harbinger of something more ominous.

Objective: To estimate the association between epidural dosing and the risk of uterine rupture in women who attempt VBAC.

Design: Nested, case-control study within a retrospective cohort.

Participants: Over 25,000 women who attempted VBAC with epidural analgesia.

Methods: Retrospective review from a multicenter study attempting to define risk factors for uterine rupture in women attempting VBAC. Uterine rupture was defined as full thickness uterine disruption with associated signs and symptoms. The authors intentionally excluded women with "uterine windows" or scar separation. Time-to-event analysis was used to estimate the association between the number of epidural bolus doses and the risk of uterine rupture.

Results: >50% of the study group attempted VBAC. Approximately 1% of the women who attempted VBAC had a uterine disruption. A group of women who did not have uterine rupture were randomly chosen as a control group. An epidural was used for analgesia in almost two-thirds of the women in both groups. The number of epidural boluses ranged from 1 to 16, with an average number of 3. Women who experienced a uterine rupture received more epidural doses on average than women who did not have a uterine disruption. Interestingly, on average, this meant approximately 1 more bolus dose than the group without disruption. In the analysis of timing, the risk of rupture increased when the boluses were given in the last 90 minutes of labor. Other factors that helped predict uterine rupture included >1 previous cesarean section and use of oxytocin. Even with these factors controlled for, frequent epidural bolus dosing remained a risk factor.

Conclusions: The authors conclude that clinical suspicion for uterine rupture should be high in women who require frequent epidural dosing during a VBAC trial.

Reviewer's Comments: While most women who require occasional boluses to maintain adequate analgesia will not have a uterine disruption, it behooves us to keep this potential disastrous complication in mind as we attend to women attempting VBAC. (Reviewer-Allen Miranda, MD).

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Keywords: Epidural, VBAC, Uterine Rupture

Print Tag: Refer to original journal article
Intraoperative wound infiltration of the subcutaneous tissue improves analgesia as a component of high-volume local infiltration analgesia in total knee arthroplasty.

**Background:** Postoperative pain management in knee arthroplasty has improved with systemic analgesics, continuous peripheral nerve blocks and high-volume local infiltration analgesia.

**Objective:** To evaluate the analgesic efficacy of local anaesthetic administration to the subcutaneous tissue.

**Design:** A double-blinded, randomized, prospective clinical study.

**Participants:** 16 patients having total bilateral knee arthroplasty.

**Methods:** All patients received infiltration with ropivacaine (2 mg/mL) with epinephrine (10 µg/mL) in the deep tissues in both knees and were randomized to receive an additional 50 mL ropivacaine, 2 mg/mL in one knee, and 50 mL of 0.9% saline in the opposite knee. Twenty-four hours postoperatively, ropivacaine or saline was injected through a 15-cm multihole catheter placed in the subcutaneous tissues of the wound. All patients were operated on while under spinal anaesthesia and sedation. Both knees were operated on with a standard parapatellar approach in a bloodless field. Both knees were infiltrated with 300 mg ropivacaine and epinephrine in a total volume of 150 mL in a special way. As mentioned above, one knee received 50 mL without epinephrine subcutaneously before wound closure, and the other knee received 50 mL 0.9% saline. Postoperative pain medication was standardized. The patient-controlled anesthesia (PCA) pump was removed before the 24-hour injection of ropivacaine 20 mL (5 mg/mL) or saline (according to the randomization and intraoperative approach) through the catheters in the subcutaneous tissue. Postoperative pain was assessed using a visual analog scale (VAS) at rest, upon 45° flexion of the knee, and with the leg straight and 45° elevated. Pain was recorded every hour for the first 6 hours, at 24 hours before the injection, and after the subcutaneous injection every 30 minutes for 3 hours. The amount of PCA morphine was registered as well as the hospital stay. Differences between the groups were performed using Wilcoxon Signed Ranks test. A \( P < 0.05 \) was considered significant.

**Results:** VAS scores were significantly lower in the ropivacaine infiltrated knee from 2 to 6 hours postoperatively at rest, at flexion, and when the leg was straight. At 24 hours, there was no difference.

**Conclusions:** Intraoperative wound infiltration of the subcutaneous tissue improves analgesia as a component of the high-volume local infiltration analgesia in total knee arthroplasty, while the 24-hour postoperative application subcutaneously did not show analgesia improvement.

**Reviewer's Comments:** For local infiltration in arthroplasty, the catheter should be placed in tissues other than the subcutaneous area. The technique is simple, but the risk of toxicity to the chondrocytes might be a limiting factor to this simple but effective technique. (Reviewer-Olga Plattner, MD).

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Keywords: Knee Arthroplasty, Analgesia, Local Anesthetic Wound Infiltration

Print Tag: Refer to original journal article
Perioperative use of lidocaine and magnesium improves pain control and decreases opioid consumption in patients having laparoscopic cholecystectomy.

Background: The use of N-methyl-D-aspartate (NMDA) antagonists before surgical incision reduces hyperalgesia.

Objective: To evaluate the analgesic, antihyperalgesic, and anti-inflammatory effect of magnesium and lidocaine after laparoscopic cholecystectomy (LC).

Design: Double-blind, prospective, randomized study.

Participants: 120 patients having elective LC.

Methods: Patients were assigned to 1 of the following 3 groups: (1) Group M (magnesium) received an IV bolus dose of 50 mg/kg magnesium sulphate followed by an infusion of 25 mg/kg per hour; (2) Group L (lidocaine) received an IV bolus of 2 mg/kg lidocaine followed by an infusion of 2 mg/kg per hour; and (3) Group P (saline) received the bolus and infusion with saline. General anesthesia was performed according to the protocol. The intraabdominal pressure was limited to 14 mm Hg, and at the end of surgery, the carbon dioxide was carefully evacuated by manual compression of the abdomen, and the neuromuscular blockade was antagonized. Blood samples were drawn before administration of the study drugs, at the end of the infusion and 2 hours later to measure the plasma concentration of magnesium and lidocaine. All patients stayed in the PACU for 2 hours before transfer to the ward. Pain was evaluated with a visual analog scale (VAS) score (0 to 10) at 0, 2, 6, 12, 18, and 24 hours postoperatively. The patient-controlled anesthesia (PCA) settings were a demand dose of 1 mg of morphine IV and a lockout of 10 minutes. The time for the first request and the total morphine consumption were recorded up to 24 hours postoperatively. All other vital parameters and the sedation level were recorded every 6 hours. The total morphine consumption was the primary outcome. One-way analysis of variance was used to compare quantitative parameters, while Fischer’s exact test was used to compare qualitative parameters.

Results: 120 patients were analyzed. The mean time to the first morphine request was similar among the groups. The lidocaine and magnesium group had lower morphine consumption than the placebo group at 2 hours and at 24 hours ($P<0.0001$). The lidocaine group had lower morphine consumptions at 2 hours and lower abdominal VAS scores compared with the magnesium group.

Conclusions: The perioperative use of lidocaine and magnesium improved pain control and opioid consumption in patients having LC.

Reviewer’s Comments: The lidocaine and magnesium dosages seem high for a healthy person to me, and I wonder that no side effects (eg, bradycardia, hypotension, prolonged muscle paralysis) occurred intraoperatively or at the end of surgery. Also, the fact that they both were effective between 2 and 24 hours suggests that there is a mode of action that may be preemptive in nature. (Reviewer-Olga Plattner, MD).

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Keywords: Lidocaine, Magnesium, Pain Problems, Laparoscopic Cholecystectomy

Print Tag: Refer to original journal article
ANS Descriptors Detect Stimulation of Nociceptive System

Autonomic Nervous System State: The Effect of General Anaesthesia and Bilateral Tonsillectomy After Unilateral Infiltration of Lidocaine.

Paloeimo MPJ, Sahanne S, Uutela KH:

Br J Anaesth 2010; 104 (May): 587-595

HR, PPI, ANSS, SPI, ANSSI, PPGA, and RE–SE detect autonomic responses to nociceptive stimuli.

Background: Monitoring and measurement of patient responses in relation to a variety of nociception–antinociception (NAN) imbalances during general anaesthesia is of great interest.

Objective: To evaluate autonomic responses during laryngoscopy and intubation and to see whether there is an effect on tonsillectomy after treatment with lidocaine when compared to blocking 1 tonsil only during the same anesthetic.

Design: Randomized, blinded, clinical prospective study.

Participants: 12 patients having bilateral tonsillectomy.

Methods: Anaesthesia was standardized. The electrocardiogram (ECG) and monitoring sensors were attached according to the manufacturer’s guidelines. A temperature sensor was placed on the tip of the left middle finger, and a pulse oximeter sensor was placed on the tip of the left thumb. A noninvasive arterial blood pressure (NABP) cuff was placed on the right upper arm. The IV line was inserted in the left hand. A laptop computer running a special data collecting software program registered all the monitored variables via a serial cable from the S5 Anaesthesia Monitor. The following parameters were collected for the description of the autonomic nervous system (ANS). State entropy (SE) and response entropy (RE) were used for detection of the frontal mimic muscle activation. Peak-to-peak pulse intervals (PPIs) were displayed on the x-axis, and the pulse amplitude was displayed on the y-axis. The autonomic nervous system state (ANSS) was calculated as the product of PPI and pulse plethysmographic amplitude (PPGA), which is the area of the square on the display. Changes in either parameter affect the ANSS value. The data were expressed as medians (ranges). The first null-hypothesis (H₀), that anaesthesia was not associated with a change in finger temperatures and PPGA, was tested on data during induction and emergence using the Mann–Whitney U-test. The second H₀, that laryngoscopy and tracheal intubation did not cause a change in stress-related parameters (heart rate [HR], PPI, PPGA, ANSS, ANSS index [ANSSI], and the Surgical Pleth Index [SPI]), was tested with Friedman’s repeated measures analysis of variance. The third H₀, which was that the same autonomic signs did not differ during operations on lidocaine- and saline-treated tonsils, was tested with the Mann–Whitney U-test; P <0.05 was considered significant.

Results: All H₀s were rejected in this study.

Conclusions: All of the ANS descriptors (HR, PPGA, ANSSI, PPI, ANSS, RE–SE, and SPI) detected stimulation of the nociceptive system during laryngoscopy and tracheal intubation and could differentiate the effect of lidocaine infiltration from saline.

Reviewer’s Comments: The IV fluid infusion should have been placed on the opposite arm and not on the left hand where the finger temperature and the pulse oximeter were placed. The infusion fluid influences temperature and other calculations. (Reviewer-Olga Plattner, MD).

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Keywords: Monitoring, Stress, Otolaryngological Surgery

Print Tag: Refer to original journal article
The minimal local analgesic concentration of ropivacaine for caudal anesthesia in female patients is 31% more than in male patients.

**Objective:** To evaluate the difference in the minimal local analgesic concentration (MLAC) of ropivacaine for caudal anesthesia in men and women using Dixon's up-and-down method.

**Design/Participants:** Prospective clinical study involving 70 ASA I patients undergoing elective hemorrhoidectomy or anal fistulotomy with caudal anesthesia.

**Methods:** Caudal blocks were performed in the prone position using a loss of resistance to air technique and using 20 mL ropivacaine diluted with saline to a desired concentration. The first patient received ropivacaine 0.2%, after which the concentration was determined by the analgesic response of the previous patient according to Dixon's up-and-down sequential method. Analgesia response was judged by a response to skin incision and by the laxity of the anal sphincter. The effectiveness of the caudal anesthesia was determined at 5-minute intervals for 20 minutes after the caudal block. Effective analgesia resulted in a decrease of 0.025% in the ropivacaine concentration, while ineffective analgesia triggered an increase of 0.025% in the ropivacaine concentration.

**Results:** 10 patients (5 from each group) were excluded because of vascular puncture during the block, leaving 30 patients in each group. No differences were found between the 2 study groups in the onset of sensory and motor block or operating time. Using Dixon and Massey's formula, the MLAC of ropivacaine for caudal anesthesia was 0.296% in male patients and 0.389% in female patients ($P <0.01$).

**Conclusions:** The study showed that ropivacaine MLAC in female patients was 31% more than in male patients.

**Reviewer’s Comments:** Studies indicate that there are gender differences with respect to response to drugs and noxious stimuli, with female patients being more sensitive to stimulation and requiring greater amount of drugs than men. Those differences are complex and may possibly result from both physical and hormonal differences. The one criticism of the study is that the authors did not standardize female participants with respect to their menstrual cycle. (Reviewer-K. George Bojanov, MD).

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Keywords: Gender, Analgesic Concentration, Ropivacaine, Caudal Anesthesia, Anorectal Surgery

Print Tag: Refer to original journal article
Do Lipid Emulsions Reverse Bupivacaine-Induced Cardiac Toxicity?

Reversal of Bupivacaine-Induced Cardiac Electrophysiologic Changes by Two Lipid Emulsions in Anesthetized and Mechanically Ventilated Piglets.

Candela D, Louart G, et al:
Anesth Analg 2010; 110 (May): 1473-1479

Long-chain triglyceride and long-chain/medium-chain triglyceride mixture emulsions reverse the prolongation of cardiac conduction intervals caused by bupivacaine toxicity.

Objective: To test the effect of 2 types of lipid emulsions – long-chain triglycerides (LCT) and a mixture of LCT/medium-chain triglycerides (MCT) – to reverse the intracardiac electrophysiologic effects of 4 mg/kg bupivacaine.

Design: Prospective, randomized, animal study on 26 anesthetized, mechanically ventilated piglets.

Methods: Piglets were randomized to 1 of 3 study groups. Control group piglets received isotonic saline. The LCT group received LCT lipid emulsion, and the LCT/MCT group received a mixture of LCT/MCT lipid emulsion. Bupivacaine 4 mg/kg was given IV over a 30-second period to all animals. Thirty seconds after the end of bupivacaine administration, piglets received 1.5 mL/kg over 1 minute, followed by an infusion of 0.25 mL/kg per minute of the designated group solution until the end of the experiment. Followed variables included intraventricular pressure, central venous pressure, cardiac cycle length (RR), PQ interval, atrial-His interval (AH), His-ventricle interval (HV), mean aortic pressure (MAoP), left ventricular end-diastolic pressure (LVEDP), maximal first derivative of left ventricular pressure (LVdP/dt_max), and cardiac output (CO). Arterial blood gas analysis and plasma concentration of bupivacaine were measured in all piglets.

Results: Plasma concentrations of bupivacaine were similar in all groups and were >2 μg/mL. Bupivacaine induced a decrease in LVdP/dt_max and an increase in LVEDP, without a change in MAoP in all groups. After 3 minutes, bupivacaine induced lengthening of the HV, QRS, AH, and PQ intervals, without a significant alteration in RR and JT intervals. There were no other electrophysiologic or hemodynamic differences among groups. Lipid emulsions reversed the impairments of the HV, QRS, AH, and PQ intervals. LCT/MCT emulsion, but not LCT emulsion, reversed the decrease in LVdP/dt_max.

Conclusions: Infusions of LCT and LCT/MCT lipid emulsions rapidly reverse the lengthening of atrioventricular and intraventricular conduction variables, caused by IV administration of 4 mg/kg bupivacaine.

Reviewer’s Comments: The study suggests that accidental bupivacaine toxicity with cardiac conduction lengthening can be effectively treated with an infusion of either of the studied lipid emulsions dosed at 1.5 mL/kg over 1 minute. Lipid infusion does not obviate common sense and the need for cardiopulmonary resuscitation, oxygenation, and securing the airway when needed. (Reviewer-K. George Bojanov, MD).

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Keywords: Bupivacaine-Induced Cardiac Toxicity, Piglets, Lipid Emulsions

Print Tag: Refer to original journal article
Why Is Postpartum Hemorrhage on the Rise?

The Epidemiology of Postpartum Hemorrhage in a Large, Nationwide Sample of Deliveries.


There is an increasing incidence of postpartum hemorrhage caused primarily by an increase in the rate of uterine atony.

Objective: To determine trends in postpartum hemorrhage (PPH) in the United States and to evaluate risk factors, incidence, and outcomes.

Design/Participants: Retrospective database study analyzing 876,641 hospital admissions derived from the Nationwide Inpatient Sample (NIS), an Agency for Healthcare Research and Quality-maintained database.

Methods: To create a representative sample of hospitalizations in the United States, hospitals in the database were selected based on geographic region, ownership, location, teaching status, and number of inpatient beds. Temporal trends in the incidence of the PPH from 1995 to 2004 were included and analyzed, including the incidence of PPH and the rate of each of the PPH subtypes for each year. Identified were potential PPH complications, in-hospital mortality, length of hospital stay, and discharge location and facility.

Results: The NIS database included 876,641 hospital admissions for delivery and 25,654 cases of PPH, for a rate of 2.93%. Uterine atony accounted for 79% of the total cases of PPH. Further analysis revealed an overall rate of PPH increase of 27.5% from 1995 to 2004, primarily caused by an increase in the uterine atony cases. The rates of PPH from other causes such as retained placenta and coagulopathy remained stable during the study period. Logistic regression analysis identified the following independent risk factors for PPH associated with transfusion: age <20 and ≥40 years, cesarean delivery with or without labor, hypertensive disease of pregnancy, polyhydramnios, chorioamnionitis, multiple gestation, retained placenta, and antepartum hemorrhage. PPH was associated with 19.1% in-hospital mortality, 29.3% renal failure, 24.6% acute respiratory failure, 16.5% prolonged mechanical ventilation, and 11.7% coagulopathy post-delivery.

Conclusions: PPH is increasing in frequency in the United States and is caused primarily by uterine atony.

Reviewer’s Comments: There are various limitations in the study, most deriving from its retrospective design. An interesting identified trend was that rates of PPH from atony were highest in the quartile of hospitals with the lowest delivery volume. I wonder if there was a correlation between uterine atony and body mass index? (Reviewer-K. George Bojanov, MD).

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Keywords: Postpartum Hemorrhage, Epidemiology, Nationwide Sample, Delivery

Print Tag: Refer to original journal article
A single US-guided injection posterior to the axillary artery, combined with a musculocutaneous nerve block, is as effective as injecting the median, ulnar, radial, and the musculocutaneous nerves separately.

**Objective:** To compare the efficiency of an ultrasound (US)-guided 2-injection technique and a nerve stimulation-guided 4-injection technique of axillary brachial plexus block.

**Design/Participants:** Prospective, randomized, double-blind clinical study, including 120 adult patients scheduled for upper extremity surgery.

**Methods:** Patients were randomized to 1 of 2 study groups: a 2-injection technique group (n=56) and a 4-injection technique group (n=58). With the 2-injection technique, the median, ulnar, and radial nerves were anesthetized via a single injection of a local anesthetic posterior to the axillary artery. The musculocutaneous nerve was anesthetized separately in its route through the coracobrachialis using US guidance and a peripheral nerve stimulator. With the 4-injection technique, US guidance and a nerve stimulator were used to identify and inject all 4 nerves separately. The primary outcome was block success rate. Secondary outcomes included time to block accomplishment, time to motor and sensory block, and adverse events.

**Results:** Patient demographics, clinical characteristics, and types of surgical procedures were similar across the 2 study groups. The time to perform the 2-injection block was less than the time to perform the 4-injection block ($P=0.002$). No differences in success rates were found between the 2- and 4-injection techniques. No difference was found between the study groups in terms of the percentage of patients having achieved a complete block at 30 minutes. One patient from the 4-injection group complained of paresthesia in the area of the axilla, persisting for 2 years after the procedure.

**Conclusions:** A US-guided 2-injection technique around the axillary artery combined with peripheral musculocutaneous nerve block is as effective as a 4-injection technique and is more time efficient.

**Reviewer’s Comments:** One minor limitation of the study is that the 2-injection technique was not strictly a 2-injection technique and allowed redirection for desired spread of the local anesthetic. Further investigation will be required to evaluate and compare safety of the 2 axillary blockade techniques. (Reviewer-K. George Bojanov, MD).

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Keywords: Ultrasound-Guided Axillary Brachial Plexus Block, Injections

Print Tag: Refer to original journal article
Protocol Reduces Respiratory Complications Post-Adenotonsillectomy in OSA Children

An Anesthetic Management Protocol to Decrease Respiratory Complications After Adenotonsillectomy in Children With Severe Sleep Apnea.

Raghavendran S, Bagry H, et al:
Anesth Analg 2010; 110 (April): 1093-1101

Inclusion of dexamethasone and a reduction in opioid administration to children with profound recurrent hypoxia reduces the incidence of respiratory medical interventions by >50%.

**Objective:** To evaluate a clinical management protocol geared toward decreasing respiratory complications after adenotonsillectomy in children with severe obstructive sleep apnea (OSA).

**Design/Participants:** Retrospective review and comparison with historic data including medical records of 292 children who underwent adenotonsillectomy between 2002 and 2006.

**Methods:** OSA was diagnosed by oximetry and assigning a McGill Oximetry Score (MOS) of 2, 3, or 4, based on at least 3 desaturations of <90%, 85%, and 80%, respectively. Inconclusive readings were further studied with polysomnography. Parents completed a questionnaire including questions about breathing during sleep, OSA observed by parents, snoring, and a sleep log. Primary outcome was major respiratory medical intervention (MMI) with a focus on children assigned MOS4. Old institution guidelines from 2001-2002 included admission of children with OSA into a pediatric intensive care unit postoperatively, a reduction of IV morphine administration, and oral codeine on regular basis. The revised guidelines from 2002-2006 included administration of IV morphine only for a complaint of pain in children assigned MOS4 and IV dexamethasone and atropine, both after anesthesia induction.

**Results:** 97 of the children had MOS4 assigned to them. Fourteen MMIs were required in 11 of the 97 children with MOS4 from 2002-2006, compared to 8 of the 27 children with MOS4 from the 2001-2002 historic data. The incidence of MMI decreased from 29.6% in 2001-2002 to 11.3% in 2002-2006. The calculated absolute risk reduction was 18.3%. Forty-one percent of the MOS4 children group required administration of oxygen, and the majority (55%) faced delayed discharge. The only clinically important difference in anesthetic management between the 2 time periods was an increase in dexamethasone usage; 54% of children who received dexamethasone were discharged on postoperative day 1.

**Conclusions:** The risk for MMI was lower in the MOS4 group if these children were managed with the 2002-2006 guidelines.

**Reviewer's Comments:** The only study limitation is its retrospective design. Otherwise, the study is a step in the right direction in establishing safe guidelines in treating children with severe OSA. For clarification, atropine inclusion in the new recommendations is based on enhancement of genioglossus muscle function by muscarinic blockade. (Reviewer-K. George Bojanov, MD).

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Keywords: Anesthetic Management, Respiratory Complications, Adenotonsillectomy, OSA

Print Tag: Refer to original journal article
Parental presence in the PACU does not affect the crying behavior of children during their PACU stay.

**Objective:** To determine whether the presence of a parent in the postanesthesia care unit (PACU) affects crying behavior in the PACU and behavior change 2 weeks postoperatively.

**Design/Participants:** Prospective, randomized, controlled, clinical study including 300 children, ASA I and II, scheduled for elective outpatient surgery with an anticipated PACU stay of >10 minutes.

**Methods:** Children were randomly assigned to 1 of 2 groups: parent present (n=150) or parent absent (n=150). Parents in both groups were prepared for presence in the PACU on the day of surgery. Children underwent a wide range of procedures, with anesthetic management left to the discretion of each attending anesthesiologist. In the PACU, patients were managed according to institutional practice guidelines. For patients in the parent present group, parents were sent for shortly after PACU arrival. Only 1 parent was allowed at the bedside in the PACU and was allowed to stay throughout the child's time in the PACU. Variables followed included preoperative child anxiety, premedication, type of induction, parental presence at induction, intraoperative course, postoperative pain, children's behavior in the PACU, duration of PACU stay, and telephone interview for behavior evaluation 12 to 14 days postoperatively.

**Results:** Groups were similar in age, ASA physical status, attendance at preoperative tour, previous hospitalizations, previous surgery, stay at home parent, the presence of a parent at induction, and preoperative behavior scores. No significant difference was found between the group for time spent in the PACU and postoperative behavior score. Multiple regression identified the following significant factors: age <5 years and higher Child's Hospital of Eastern Ontario Pain Scale score at 15 minutes after arrival in day surgery as predictive for longer crying in the PACU after eye opening. Parental presence and painful procedures were not predictive of crying in PACU. At 2 weeks, negative behavior change was found in 45.8% of the parent absent group and in 29.3% of the parent present group. Logistic regression identified age <5 years and being in the absent parent group as predictors of negative behavior change at 2 weeks postoperatively.

**Conclusions:** Parental presence in the PACU makes no difference in crying behavior in the PACU, but is associated with a decrease in negative behavior changes at 2 weeks postoperatively.

**Reviewer's Comments:** Interesting study. It probably would have been helpful if the investigators measured parent’s anxiety and its effect on children’s behavior in the PACU. (Reviewer-K. George Bojanov, MD).

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Keywords: Parental Presence, PACU, Postoperative Behavior

Print Tag: Refer to original journal article
Is Prophylactic Antiemetic Efficacy of Ramosetron Better Than Ondansetron?

Comparison of the Prophylactic Anti-Emetic Efficacy of Ramosetron and Ondansetron in Patients at High-Risk for Postoperative Nausea and Vomiting After Total Knee Replacement.

Hahm TS, Ko JS, et al:

Anaesthesia 2010; 65 (May): 500-504

Ramosetron is more effective than ondansetron in preventing PONV in high-risk patients undergoing total knee replacement.

**Background:** 5-HT₃ antagonists are known to be effective for the prevention of postoperative nausea and vomiting (PONV). Ramosetron is a newly developed 5-HT₃ antagonist and is reported to be more potent and longer lasting.

**Objective:** To compare the effects of ondansetron and ramosetron in patients at high risk for PONV (females, nonsmokers, and/or those using postoperative opioids).

**Design:** Randomized, prospective, clinical study.

**Participants:** 84 patients with risk factors for PONV undergoing unilateral total knee replacement.

**Methods:** Patients were randomly assigned to either ramosetron 0.3 mg or ondansetron 4 mg. A spinal anesthesia with 8 to 10 mg bupivacaine was injected at L3/4 or L4/5, and an epidural catheter was placed at L3/4 or L4/5. Patients were sedated with a target controlled infusion of propofol at 0.5 to 2.0 μg/mL. Thirty minutes before the end of the operation, 10 mL ropivacaine 0.2% was administered via epidural catheter, and either ramosetron or ondansetron was administered. The patient-controlled epidural analgesia (PCEA) regimen consisted of 0.2% ropivacaine plus hydromorphone 8 μg/mL. The PCEA device was programmed to deliver a 4 mL/hour background infusion with a 3 mL bolus and a lock-out of 10 minutes. Patients received 50 mg pethidine if pain was >5 cm on the visual analog scale at rest. Nausea and vomiting, rescue antiemetic drug use, and the amount of PCEA infusion and rescue pethidine were monitored at the end of surgery and at 2 hours, 2 to 6 hours, 6 to 24 hours, and 24 to 48 hours. A complete response was defined as no PONV and no need for a rescue antiemetic drug. If ≥2 episodes of PONV occurred during the study period, a rescue antiemetic (metoclopramide 10 mg) was given IV. The primary outcome was the incidence of nausea during the study period. For statistical analysis, the student’s t-test or the Mann-Whitney rank sum test was used. P <0.05 was considered significant.

**Results:** More patients in the ramosetron group had complete response (no PONV and no rescue medication) between 2 and 48 hours compared to the ondansetron group.

**Conclusions:** Ramosetron was more effective than ondansetron in preventing PONV in high-risk patients undergoing total knee replacement.

**Reviewer’s Comments:** PONV includes patients with motion sickness since they have a high incidence of PONV; however, they were excluded in this trial, which is a real limitation of the study. (Reviewer-Olga Plattner, MD).

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Keywords: Postoperative Nausea, Vomiting, Ramosetron, Ondansetron

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