The LMA Supreme™ is an effective device for maintenance of the airway.

**Design/Objective:** This prospective study was carried out to analyze the ease of insertion, the laryngeal fit, and airway complications by measuring the oropharyngeal leak pressure (OLP) of the Laryngeal Mask Airway Supreme™ (LMA). The LMA Supreme was launched in March 2007, with a design superior to its counterparts and with an esophageal tube access to prevent aspiration and create a distinction between the respiratory and gastrointestinal tract. It has a larger precurved cuff for optimal positioning, a double reinforcement of the tip to prevent kinking, and epiglottis fins to prevent the epiglottis from folding over.

**Methods:** After ethical approval, 100 women were recruited for this prospective study. The LMA Supreme size 4 was used. Exclusion criteria were a difficult airway, ASA 4/5, and <18 years of age. Anesthesia was induced and maintained with standard protocols. The LMA Supreme was inserted and the cuff pressure was equalized to 60 cm of H$_2$O. The LMA Supreme was positioned so that there was no air leak. A leak test was done by noting bubbling through the drain tube. Attempts at successful intubation were noted. The drain tube was inserted and the oropharyngeal leak pressure was noted at the start and end of the procedure. The optimal position of the LMA Supreme was assessed by fiberoptic bronchoscopy.

**Results:** 94% of patients had insertions at the first attempt. Air leak was detected in 13 patients and needed readjustment of the LMA Supreme. A nasogastric tube was placed in all at the first attempt. All LMA Supremes on fibrescope were optimally placed. The mean cuff volume to achieve 60 cm of H$_2$O was 18.4 mL, with an OLP of 28.1 cm of H$_2$O. The only adverse effect seen was narrowing of the vocal cords in 11 patients though no intervention was required. Trauma was seen in 9 patients and only 8 patients experienced a mild sore throat. Demographics were comparable, with 10 patients having a body mass index of >35 kg/m$^2$.

**Conclusions:** LMA ProSeal™ successful insertion was reported as 87% by Brimacombe, while we had 96% to 98% (similar to Ferson’s study). It failed in 1 patient who was short and needed size 3, but showed suitability in the obese adult women. The drain tube feature helps for correct alignment, therefore proving better than classic. The mean OLP (28) approved the manufacturers design for a larger cuff. The only limitation was exclusively in the women where the OLP limit was 35 cm of H$_2$O compared to other studies of 40 cm of H$_2$O, and that the patients were followed-up for only 2 hours postoperatively and the incidence of sore throat after that was not considered. It was concluded that the LMA Supreme was easy to insert, maintain, and has minimal complications.

**Reviewer’s Comments:** The LMA Supreme is a superior device with gastric vent and minimal complications and should be used for routine cases more frequently. (Reviewer-Sunita Goel, MD).

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Keywords: LMA Supreme™

Print Tag: Refer to original journal article
The addition of ephedrine to propofol offsets both pain and hypotension associated with induction.

**Background:** One of the most commonly used induction agents after thiopentone sodium is propofol. The most common side effect of propofol is hypotension and pain on injection at the site. The pain on injection has been countered by the addition of lidocaine and has been documented in many studies for its effectiveness. 

**Objective:** To study the effect of the addition of ephedrine to counterbalance the hypotensive effect of propofol.

**Methods:** After ethical committee approval and informed consent, patients were recruited. Exclusion criteria were patients <16 years of age, pregnant and unstable patients, and patients on monoamine oxidase inhibitors or alpha blockers. Patients were randomized into 3 groups. Group L patients received 10 mg lidocaine per 20 mL of propofol. Group E15 received 15 mg of ephedrine plus 0.5 mL of sterile water per 20 mL propofol, and Group E30 received 30 mg of ephedrine per 20 mL propofol. Patients received fentanyl prior to induction with propofol. Data recorded included patient weight, dose of fentanyl, total dose of propofol, pain on injection (mild or marked), heart rate, noninvasive blood pressure, and end tidal volatile agent.

**Results:** Of the 172 patients recruited, 156 patients were analyzed. Demographic data were comparable between all 3 groups. In group L, 6 patients required rescue drug for hypotension, while none of the patients in the ephedrine groups required rescue drug. No significant difference in frequency of pain upon injection was noted in any of 3 groups. 

**Discussion:** We have seen that lidocaine reduces injection pain from 80% to 40%. The theory suggested behind this is a decrease in the pH of the emulsion making it unionized. Various studies have been done with an admixture of ephedrine to propofol showing a decrease in pain from 86% to 35%. In this study, fairly standard anesthesia practice was followed, and neither high-risk nor ASA III and IV patients were included.

**Conclusions:** Admixture of ephedrine is as effective as lidocaine for reducing injection pain as well as adding the benefit of offsetting the hypotensive effects of propofol. 

**Reviewer's Comments:** This is an interesting study that shows that the addition of ephedrine offsets the side effects of propofol on hypotension and injection pain, thus avoiding the use of lidocaine; it makes interesting use in daily practice. (Reviewer-Sunita Goel, MD).

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Keywords: Propofol Side Effects

Print Tag: Refer to original journal article
Predictors of DTI in Patients With High BMI

High Body Mass Index Is a Weak Predictor for Difficult and Failed Tracheal Intubation: A Cohort Study of 91,332 Consecutive Patients Scheduled for Direct Laryngoscopy Registered in the Danish Anesthesia Database.

Lundstrøm L, Møller AM, et al:
Anesthesiology 2009; 110 (February): 266-274

BMI and obesity are weak predictors of difficult tracheal intubation.

**Background:** Difficult intubation is one of the most dreaded complications during anesthesia care and can result in severe morbidity and mortality. Obesity and difficult tracheal intubation (DTI) are correlated; the numerous studies conducted have been controversial.

**Design/Objective:** This retrospective study was conducted to evaluate body mass index (BMI) as the sole factor, barring any other variables, in DTI.

**Methods:** After ethical committee approval, data were collected from all of the departments of anesthesia in Denmark (14 in 2005 and 25 in 2006-2007). Patients having regional anesthesia, sedation, or fiberoptic intubation were excluded from the study. Of the 327,650 patients studied, a total of 91,332 were included. Parameters studied were DTI score, age, gender, priority of surgery, weight, height, body mass index (BMI), ASA classification, use of neuromuscular blocking agents (NMBA), history of DTI, emergency or elective surgery, and Mallampati criteria.

**Results:** The overall incidence of DTI was 5.2%. In relation to DTI, weight and height were statistically significant, but when they were replaced with BMI only, weight as an independent factor was significant. Even though weight was included as a measure of calculation for BMI, there was no significant correlation between the risk factors for DTI.

**Conclusions:** In this study, 5.2% patients overall had a DTI. A Mallampati score of III and IV and a previous history of DTI were highly significant as far as DTI was concerned. The actual impact of obesity on DTI had a weak correlation. In this study, BMI or obesity was of relatively low significance in causing difficult intubation. However, it has been seen that in obesity, the deposition of fat in the lateral pharyngeal walls anatomically causes difficult intubation. This study has some limitations. It did not measure the thyromental distance, mouth opening, neck movements and prognathism, which are indicators for DTI. Therefore, the authors concluded that BMI, though a better indicator than weight for DTI, is not an absolute risk factor and predictor for a DTI.

**Reviewer's Comments:** This study brings out an interesting concept that obesity, BMI, and DTI are not synonymous, and there are various other factors that need to be considered in predicting a difficult intubation. (Reviewer-Sunita Goel, MD).

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Keywords: Obesity

Print Tag: Refer to original journal article
Can We Predict Hypotension With Spinal Block?

Is It Possible to Predict Hypotension During Onset of Spinal Anesthesia in Elderly Patients?

Meyhoff CS, Haarmak C, et al:

J Clin Anesth 2009; 21 (February): 23-29

Near infrared spectroscopy has high specificity for hypotension.

Background: Spinal anesthesia is often associated with hypotension, which may be due to decreased sympathetic activity. This is often more pronounced in the elderly depending upon the level of block.

Objective: To test the sensitivity and specificity of various indicators like heart rate (HR), systemic vascular resistance index (SVRI), heart rate variability (HRV), baroreceptor sensitivity (BRS), blood pressure variability (BPV) and cerebral oxygen saturation (ScO₂), to predict hypotension in the elderly during the onset of spinal anesthesia.

Participants/Methods: 32 patients ≥60 years old, ASA physical status I, II and III, and scheduled for elective surgery under spinal anesthesia were included in this study. Any patients with diabetes or sinus arrhythmias and on concurrent medication were excluded from the study. Spinal was given with bupivacaine 5 mg/mL with or without dextrose at L3/4 or L4/5 space with a 25- or 27-gauge needle. Rescue drug (ephedrine 5 mg IV, saline 0.9%) was given if systolic blood pressure was <90 mm Hg. An arterial line was placed in all patients, which also allowed cardiac output (CO) measurement from the waveform. Baseline blood pressure (BP) and BP readings after spinal were recorded. HR was similarly recorded as was BPV. Near infrared spectroscopy was used to record ScO₂.

Results: 32 patients were studied; 21 developed hypotension and 8 were excluded from the study. The hemodynamic changes had no correlation to demographics, dose of bupivacaine, patient position, or epidural catheter use. CO decreased 8%, and mean arterial pressure (MAP) decreased 27%. Patients with am HR >90 bpm at baseline and a ScO₂ decrease of 5% had a significant decrease in MAP.

Conclusions: In this study, hypotension was seen in 21 of 32 patients. ScO₂ had high sensitivity and specificity, but lacked a time relation to the development of hypotension. Baseline HR >90 bpm had high specificity, but low sensitivity. These hemodynamic changes were accurately recorded with the LiDCO™ plus monitor, and were completely reliable, which was the highlight of this study. Standardizing HRV was difficult due to many cofactors. This study concluded that the factors that had high specificity and sensitivity were near infrared spectroscopy and BPV, which could predict hypotension.

Reviewer's Comments: This is an interesting article, although difficult to execute in day-to-day practice. Near infrared spectroscopy has high specificity for hypotension. One question is whether the changes in infrared spectroscopy resulted due to hypotension. (Reviewer-Sunita Goel, MD).

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Keywords: Hypotension

Print Tag: Refer to original journal article
The majority of paresthesias elicited during spinal needle placement are associated with entry into the subarachnoid space.

**Objective/Design:** The purpose of this prospective, clinical, observational study was to determine how frequently the occurrence of a paresthesia during subarachnoid block coincided with the spinal needle being in the intrathecal space.

**Participants:** Participants were adult patients >18 years of age who were to have a spinal anesthetic after consultation with their scheduled anesthesiologist.

**Methods:** Patients were instructed prior to the beginning of the subarachnoid block to communicate if any pain or unpleasant sensations were felt during block placement. A paresthesia in this study was defined as "an electric, shooting or burning sensation, or pain felt in the leg, buttocks, or perineum." If the patient experienced a paresthesia, spinal needle advancement stopped, the stylet was removed, and the patient checked for the return of spinal fluid. If spinal fluid returned via the needle, injection of the local anesthetic was done. If no spinal fluid was obtained, the spinal needle was repositioned and redirected until cerebrospinal fluid (CSF) was obtained. All spinal needles used were pencil-point type, being either 25-gauge Whitacre or 22-gauge Gertie Marx. The choice of patient position during block placement, the choice of local anesthetic, and the choice of preoperative sedation was left to the discretion of the anesthesiologist performing the block. All study patients had successful subarachnoid block. Postoperative follow-up was accomplished by a visit during the patient's in-hospital stay or via telephone contact if patients underwent ambulatory surgery.

**Results:** 103 patients were included for data analysis. Approximately 14% experienced a paresthesia during spinal needle placement. Of the patients experiencing paresthesias, 87% had CSF return when the stylet was removed at the report of the paresthesia. No patient experienced pain on injection of the local anesthetic dose. At postoperative follow-up, no patients, whether experiencing a paresthesia or not, reported any neurologic symptoms.

**Conclusions:** The majority of paresthesias elicited corresponded with the free flow of CSF. The authors concluded that the occurrence of a paresthesia during subarachnoid block indicates entry into the subarachnoid space and subsequent contact with the structures of the cauda equina.

**Reviewer's Comments:** It is interesting that such a high percentage of paresthesias were associated with the positive return of CSF. It is instinctive for just about anyone to rapidly withdraw the spinal needle if a patient complains of a paresthesia, and many believe you should not inject at the location where a paresthesia was elicited. However, as this study illustrates, there were no patients who complained of neurologic symptoms at follow-up. I believe the next time I elicit a paresthesia during subarachnoid block, I will certainly stop and check for CSF return. It can obviously save another pass for no reason. (Reviewer-Michelle L. Schlunt, MD).

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Keywords: Spinal Anesthesia

Print Tag: Refer to original journal article
The use of epidural clonidine following spine surgery provides superior analgesia without an associated increase in side effects.

Objective: To determine the analgesic potential of epidural clonidine when used for postoperative pain control following elective spine surgery.

Participants: Adult patients scheduled for elective lumbar decompression or discectomy surgery were included, and patients with long-term opioid use and chronic pain issues were excluded.

Methods: All patients received premedication with paracetamol, ibuprofen, and ranitidine. A standardized general anesthetic induction with propofol, fentanyl, and atracurium followed by maintenance with isoflurane in an oxygen/nitrous oxide mixture was performed. Following surgical decompression or discectomy, an epidural catheter was placed under direct vision by the surgeon. Patients were randomized to receive either epidural clonidine or saline as part of their postoperative pain management. After placement of the epidural catheter, an initial bolus of clonidine (1.5 μg/kg) or saline in a 5 mL total volume was administered. The clonidine group received a postoperative infusion (5 μg/mL) at 5 mL/hour, while the placebo group received a saline infusion at the same rate. All patients also had IV morphine available via patient-controlled analgesia at bedside. The primary end point evaluated for in this study was total morphine consumption over the 36-hour study period. Secondary end points assessed included pain scores, heart rate and blood pressure, urinary retention, and nausea and vomiting.

Results: The total morphine consumption in the clonidine group was significantly less than in the placebo group. Pain scores were also lower in the clonidine group, most notably during the first 6 hours postoperative. No patient in either group had excessive sedation. Nausea and vomiting had a significantly lower incidence in the clonidine group; however, there was no difference in the incidence of urinary retention. Heart rate was approximately 11% to 17% lower in the clonidine group, accompanied by an 8% to 12% lower arterial blood pressure compared to the placebo group.

Conclusions: The authors concluded that the use of epidural clonidine as a postoperative infusion following simple spine surgery provided superior pain relief compared with a placebo saline infusion. There was an approximate 43% reduction in IV morphine use.

Reviewer’s Comments: The use of epidural clonidine for postoperative pain management after spine surgery may be the better choice, as it will not cause any motor blockade that could mask new neurologic signs following surgery. At our institution, we routinely use a combination of epidural morphine and bupivacaine following scoliosis surgery. We have recently had 1 patient who developed a new neurologic deficit 2 days postoperative, which unfortunately was attributed to the epidural solution causing a time delay in surgical intervention. The use of epidural clonidine would certainly avoid this misinterpretation. (Reviewer-Michelle L. Schlunt, MD).

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Keywords: Epidural
The anterior approach to sciatic nerve blockade using ultrasound guidance and nerve stimulation can be performed as quickly as the posterior subgluteal approach.

**Design/Objective:** This clinical study compared and evaluated the use of the ultrasound-guided anterior approach versus the posterior (subgluteal) approach to the sciatic nerve in patients undergoing knee surgery.

**Participants:** Adult ASA I and II patients undergoing knee surgery, such as replacement or meniscal repair.

**Methods:** Patients enrolled into the study were randomized to either the anterior approach or the subgluteal approach to the sciatic nerve. All patients also underwent femoral and lateral femoral cutaneous blockade. Peripheral nerve blockade was performed under fentanyl and/or midazolam premedication. Both anterior and subgluteal approaches utilized a combination technique of ultrasound guidance and nerve stimulation. For the anterior approach, patients were supine with the lower extremity to be blocked positioned with flexion of the hip and knee and external rotation. Ultrasound guidance of a 100-mm stimulating needle was used. Nerve stimulation was incorporated as the needle approached the sciatic nerve until plantar flexion or dorsiflexion was elicited at or below 0.7 milliamps. Upon appropriate stimulation, 20 mL of 1.5% mepivacaine with 1:400,000 epinephrine was incrementally injected seeking circumferential spread around the nerve. The same dosage was used for patients undergoing the posterior or subgluteal approach. Patients received sedation with fentanyl or propofol during surgery. Any patient whose sciatic nerve could not be visualized or who required general anesthesia for surgery completion was excluded. Data collected included needle depth to nerve, time to complete sciatic nerve blockade, time to complete all blocks, and onset of sensory and motor blockade.

**Results:** A total of 94 patients completed the study. The sciatic nerve via the anterior approach was at a significantly deeper depth. Both approaches required similar times to completion, but total time to complete all blocks was significantly shorter with the anterior approach. The anterior approach blocked the posterior femoral cutaneous nerve significantly less often, but this appeared to have no significant effect on intraoperative patient complaints of knee or tourniquet pain. Otherwise, no other substantial differences were noted between the 2 approaches.

**Conclusions:** The anterior approach to sciatic nerve blockade could be performed as easily as the posterior subgluteal approach, and it required less time to complete all blocks involved when the anterior approach was utilized.

**Reviewer’s Comments:** I will have to give the anterior approach another try. I hesitate to perform this approach because of the greater depth involved with needle placement, which I thought would be more uncomfortable for the patient. It does become quite cumbersome though turning the patient after the femoral block is complete. The anterior approach would save time involved with turning the patient, as well as back strain. (Reviewer-Michelle L. Schlunt, MD).

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Keywords: Sciatic Nerve Block

Print Tag: Refer to original journal article
US May Be Useful in Confirming Pediatric Endotracheal Intubation

Airway Management in Children: Ultrasonography Assessment of Tracheal Intubation in Real Time?
Marciniak B, Fayoux P, et al:

Anesth Analg 2009; 108 (February): 461-465

Ultrasoundography may be useful in confirming pediatric intubation when auscultation and capnography are unreliable.

**Background:** The gold standard in confirming endotracheal intubation in children is direct visualization of the endotracheal tube passage through the glottic opening. Current methods used for secondary verification are auscultation and capnography. These methods require positive pressure ventilation, which can be detrimental in the event of esophageal intubation in a patient with a full stomach. Additional limitations may arise in small children and in patients with abnormal baseline pulmonary status.

**Objective:** To assess the usefulness of ultrasound (US) in pediatric endotracheal intubation.

**Participants/Methods:** The study included 30 children with normal airways and ASA physical status I or II. General anesthesia was induced with inhaled sevoflurane in 50% oxygen mixture with nitrous oxide supplemented with propofol for laryngoscopy and intubation. US images were obtained with the Sonosite Titan using a 5- to 10-MHz probe placed transversally in the neck area. Prior to intubation, the vocal cords appeared as paired hyperechoic linear structures that moved with swallowing and respiration. During intubation, the anatomic changes were recorded. Auscultation and capnography were used to verify correct placement. The ultrasound was positioned perpendicular to the clavicles and movement of the chest wall visceral-parietal pleural interface (VPPI) were obtained. Successful US visualization of tracheal intubation was defined as changes in the glottic plane during tube passage. The time required to confirm intubation was recorded.

**Results:** Tracheal rings were identified in all children easily in <1 cm depth. Vocal cords were also identified by movement during spontaneous or positive pressure ventilation prior to intubation. Passage of the tube was evidenced by the widening of the vocal cords at the base of the glottis. The tube appeared as a posterior shadow to the tracheal rings, but was not always directly visualized. The esophagus was never visible, and 1 esophageal intubation was recognized by seeing the tube in the left paratracheal place. US confirmation of correct intubation was obtained in <5 seconds by the bright interface of the VPPI during ventilation.

**Conclusions:** Auscultation and capnography, the standard techniques used to confirm correct intubation, are not 100% reliable. Light transmission is not suitable for 4.5-mm tubes. Previous studies on US verification of correct intubation reported that experience in US was required. This technique may be useful in situations where capnography or auscultation is not reliable, such as in cardiac arrest, difficult intubation, or airway trauma.

**Reviewer's Comments:** This study is a part of growing research efforts to determine the role of bedside ultrasonography in endotracheal tube verification. US of the airway may have a role in situations where other techniques are unreliable, such as in cardiac arrest or acute bronchospasm as well as for secondary verification. In addition, acquiring familiarity with neck ultrasonography may help us recognize abnormal airway anatomy prior to intubation. (Reviewer-Ioanna Apostolidou, MD).

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Keywords: Endotracheal Intubation

Print Tag: Refer to original journal article
Alveolar Recruitment in Bariatric Surgery

Alveolar Recruitment and Arterial Desflurane Concentration During Bariatric Surgery.
Sprung J, Whalen FX, et al:

Alveolar recruitment improves oxygenation, but does not affect the rate of increase or decrease of desflurane blood concentration.

**Background:** Almost all patients develop atelectasis during induction of general anesthesia. The amount of atelectasis is greater in obese patients. Atelectasis causes intrapulmonary shunting, which reduces the rate of increase of inhaled anesthetic concentration in the blood.

**Objective:** To assess the effect of lung recruitment on the rate of increase and decrease of arterial desflurane partial pressure in obese patients as compared to a control group.

**Participants/Methods:** 20 patients undergoing open bariatric surgery were randomized into 2 groups: the control group received standard mechanical ventilation with 4 cm H₂O positive end-expiratory pressure (PEEP) and the lung recruitment group received a series of recruitment maneuver (RM) followed by 12 cm H₂O PEEP. More specifically, the RM involved sequential increases in PEEP in 3 steps: from baseline at 4 cm H₂O, 3 breaths with 10 cm H₂O with 15 cm H₂O, and 10 breaths at 20 cm H₂O (or maximal peak airway pressure of 50 cm H₂O). Anesthetic management was with general anesthesia and thoracic epidural analgesia. An arterial line was placed after tracheal intubation, and 6% desflurane was initiated while propofol infusion was weaned off. Lung mechanics, cardiac index, end-tidal and inspired desflurane concentration every 2 minutes, and serial arterial blood samples to measure blood concentration of desflurane were recorded.

**Results:** 8 patients were in the RM group and 9 patients were in the control group; baseline characteristics were similar between groups. Cardiac index was lower in the RM group. The RM group had a higher ratio of arterial to inspired partial pressure of oxygen and dynamic compliance throughout the operation compared to the control group. The rate of increase of alveolar desflurane concentration did not differ between groups. There was a trend toward more rapid increase in blood desflurane concentration during the first 30 minutes. Desflurane concentration 0.7 mM (millimolar) or 4.2% was achieved in 15.9 and 9.3 minutes in the control and RM groups, respectively. During emergence, elimination of desflurane from the blood and the rate of decrease in alveolar desflurane concentration did not differ between groups. There were no differences in the time to eye opening, in oxygenation, or in efficiency of ventilation in the recovery room.

**Conclusions:** The RM used to reduce atelectasis and intrapulmonary shunt did not significantly affect the rate of increase or elimination of desflurane during general anesthesia in obese patients. Intraoperative oxygenation was improved with the RM. The authors acknowledged the potential limitations of the study due to the small sample size of the 2 study groups.

**Reviewer's Comments:** Several points can be generalized from this study. Intraoperative hypoxemia may occur in obese patients and can be prevented or treated with the use of a simple technique, the RM. Furthermore, induction and emergence time using desflurane is not affected by decreasing atelectasis with the RM. (Reviewer-Ioanna Apostolidou, MD).

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Keywords: Desflurane & Alveolar Recruitment

Print Tag: Refer to original journal article
Objective: To determine whether the number of packed red blood cells (PRBC) transfused in the first 24 hours after admission in trauma patients is an independent predictor for acute respiratory distress syndrome (ARDS).

Design/Methods: This was a retrospective examination of data from a large prospective multicenter trauma study in order to evaluate the relationship between the number of units of PRBCs and fresh frozen plasma (FFP) transfused during the first 24 hours after admission and the development of ARDS.

Results: Of the 14,070 patients in the database, 521 (4.6%) developed ARDS; of these, 331 patients (64%) had received PRBC. Independent predictors for developing ARDS, besides injury severity, thoracic injury, pneumonia, and polytrauma were the administration of >5 units of FFP or PRBCs. There was also a dose-dependent relationship between the number of transfused units and the development of ARDS. That is, each additional unit of PRBCs transfused increased the risk of developing ARDS by 6%.

Conclusions: Reducing the amount of PRBCs transfused by even 1 unit in the first 24 hours after trauma is an effective measure to lower the incidence of ARDS.

Reviewer's Comments: Although early PRBC and FFP transfusions are a life-saving therapy in trauma patients, it is becoming increasingly apparent that receiving >5 units is a significant risk factor for developing ARDS and that each additional unit of PRBC increases the risk by 6%. These results provide a strong impetus for surgeons and anesthesia care practitioners to work together to institute a variety of measures, strategies, and guidelines for reducing blood loss and minimizing transfusions in trauma patients. While the goal should be to transfuse to the lowest hemoglobin level needed for a successful recovery, the dilemma is that what constitutes a safe, minimal hemoglobin level is difficult to establish for each patient. Although the minimal threshold for safe levels of hemoglobin has been revised downward to levels approaching 7 g/dL, the clinician needs to use goal-directed parameters that assure that global oxygen delivery is adequate. For example, achieving a superior vena cava blood oxygenation saturation of 70% has been recommended as a possible marker of adequate oxygen delivery. (Reviewer-Douglas E. Koehntop, MD).

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Keywords: Acute Respiratory Distress Syndrome

Print Tag: Refer to original journal article
Acceptable Provider Activity During Maintenance Phase of Anesthesia

Effects of Intraoperative Reading on Vigilance and Workload During Anesthesia Care in an Academic Medical Center.

Slagle JM, Weinger MB:

Anesthesiology 2009; 110 (February): 275-283

Reading by the anesthesia provider during the maintenance phase of anesthesia may diminish boredom and, therefore, not decrease vigilance.

**Background:** There are periods of time when administering anesthesia when there are few manual tasks to do. Many anesthesia providers read during these periods. However, whether reading will cause the anesthesia provider to miss important clinical changes is unknown.

**Objective:** To determine whether reading during the maintenance phase of anesthesia diminishes the vigilance of the anesthesia provider.

**Design:** Prospective, nonrandomized study by a trained observer of anesthesia providers doing tasks during routine cases.

**Participants:** 172 patients receiving routine general anesthesia for surgeries lasting between 0.75 and 6 hours and their anesthesia providers were studied by a trained observer.

**Methods:** The vigilance of anesthesia providers was measured by their time to respond to illumination of a red alarm light that turned on randomly between 7- and 15-minute intervals generated by a computer software program called the vigilance latency. The observers also noted the tasks the anesthesia providers were doing at the time, including reading.

**Results:** There were no differences in the time to respond to the alarm light among the reading and nonreading groups (approximately 27 seconds in both groups). Within the group where reading occurred, there were no differences in the vigilance latency during the time period where reading occurred and when it did not (<30 seconds each). However, the observer reported both workload values and participant reported workload values were significantly less during the reading periods than when reading did not occur.

**Conclusions:** Reading by anesthesia personnel did not result in a diminished performance in a test of vigilance. One reason perhaps is that the provider who did read while administering anesthesia did so during periods of low activity.

**Reviewer’s Comments:** I believe the degree of vigilance is very provider-dependent, and does not depend on whether providers are reading during slack periods. This study provides evidence that performance on a test of vigilance is not impaired if providers are allowed to read. This study also demonstrates that providers who read in the operating room do so more often during low workload periods. (Reviewer-David S. Beebe, MD).

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Keywords: Reading

Print Tag: Refer to original journal article
Outcomes Associated With FTCA for Cardiac Surgery

*Fast-Track Anesthesia and Cardiac Surgery: A Retrospective Cohort Study of 7989 Patients.*

Svircevic V, Nierich AP, et al:

Anesth Analg 2009; 108 (March): 727-733

There is no difference in the frequency of hospital mortality or other major complications between patients receiving fast-track cardiac anesthesia and patients undergoing conventional cardiac anesthesia.

**Objective:** To compare the incidence of mortality, myocardial infarction (MI), stroke, and renal failure between patients for cardiac surgery undergoing fast-track cardiac anesthesia (FTCA) and historical controls undergoing conventional cardiac anesthesia (CCA).

**Design/Participants:** Retrospective clinical study involving 4020 adult patients undergoing CCA and 3969 patients undergoing FTCA for elective cardiac surgery at a single institution.

**Methods:** CCA patients were premedicated with midazolam 15 mg orally, followed by induction of general anesthesia using sufentanil 2 to 4 μg/kg, midazolam 0.05 to 0.1 mg/kg and pancuronium 0.1 mg/kg. Anesthesia was maintained utilizing sufentanil 0.5 to 2.0 μg/kg per hour and midazolam 0.1 mg/kg per hour. FTCA patients used midazolam 7.5 mg orally as premedication. Induction of anesthesia was achieved with remifentanil 1 to 3 μg/kg, propofol 1 to 2 mg/kg and pancuronium 0.1 mg/kg. Anesthesia was maintained with remifentanil 5 to 10 μg/kg per hour and propofol 1 to 4 mg/kg per hour or sevoflurane 0.5 to 1.5 end tidal. Morphine 0.1 to 0.2 mg/kg was given on completion of the surgery. Primary outcome was the incidence of mortality during hospitalization. Secondary outcomes included acute myocardial infarction (MI), stroke, renal failure, duration of mechanical ventilation, as well as hospitalization and ICU stay.

**Results:** The FTCA group included more patients with hypertension, diabetes, renal failure, poor left ventricular ejection fraction (LVEF), and fewer patients taking cardiovascular drugs preoperatively. The FTCA group had median cardiopulmonary bypass (CPB) duration of 99 minutes versus 90 minutes in the CCA group ($P<0.001$). There was no difference in the incidence of the in-hospital mortality, MI, stroke, and renal dysfunction between the study groups. The FTCA group had a significantly shorter duration of mechanical ventilation ($P=0.001$), and a longer duration of ICU ($P=0.001$) and hospital ($P=0.001$) stay compared to the CCA group.

**Conclusions:** The study showed no evidence of increased risk of adverse outcomes in patients undergoing FTCA compared to CCA for cardiac surgery.

**Reviewer’s Comments:** The biggest and obvious limitation of the study is its retrospective design. The study did not find an explanation as to why, despite earlier extubation, FTCA patients did not have a shorter ICU stay and why FTCA patients were discharged from the hospital later than the CCA patients. (Reviewer-K. George Bojanov, MD).

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Keywords: Fast Track Anesthesia

Print Tag: Refer to original journal article
Objective: To investigate respiratory variable changes, including the functional residual capacity (FRC), during reduction of invasive mechanical ventilation (MV) after uncomplicated cardiac surgery.

Design/Participants: Prospective, clinical study involving 10 adult cardiac surgical patients.

Methods: Patients were studied during the first 6 hours after their surgery. All had standard open heart surgery with cardiopulmonary bypass and were ventilated with biphasic positive airway pressure (BIPAP). Airway pressures were adjusted to a tidal volume of 6 to 8 mL/kg and an inspiration-to-expiration ratio of 1:1. Respiratory rate was adjusted to normocapnia. At the beginning of the measurements, patients were ventilated with BIPAP and positive end-expiratory pressure (PEEP) of 10 millibar (mbar) (BIPAP10). Thirty minutes later, PEEP and the upper pressure limit were reduced by 3 mbar (BIPAP7). After resuming of spontaneous ventilation, ventilation was switched to continuous positive airway pressure/pressure support ventilation using the BIPAP lower pressure limit as the CPAP value and the upper pressure limit as augmentation. Respiratory variables were recorded (CPAP 7_1) at that point and at 30 minutes later (CPAP 7_2). FRC by oxygen washout, dynamic compliance, tidal volume, and arterial blood gases was obtained during all study time points.

Results: Mean FRC decreased over time; differences were significant compared to BIPAP10 at all of the time points. Arterial partial oxygen pressure (PaO₂) and fraction of inspired oxygen (FIO₂) (PF ratio) decreased, with significant differences between BIPAP10 and CPAP 7_1 and BIPAP10 and CPAP 7_2. Arterial partial carbon dioxide pressure (PaCO₂) did not change significantly over time (P =0.221).

Conclusions: FRC decreases during weaning from MV. The reduction of the FRC can be partially explained by alveolar de-recruitment or a decrease of the alveolar distension.

Reviewer’s Comments: This study has several obvious limitations like small sample size and lack of a control group. One has to bear in mind that the study was conducted using cardiac patients with relatively healthy lungs. Further studies are needed to assess the effects of weaning from invasive MV on patients with acute or chronic lung disease. (Reviewer-K. George Bojanov, MD).
Target-controlled infusion of remifentanil reduces propofol requirements and causes less apnea and respiratory depression.

**Objective**: To test the hypothesis that target-controlled infusion (TCI) of remifentanil would result in fewer respiratory effects and is a safer and more reliable technique for co-administration of propofol and remifentanil in spontaneously breathing patients.

**Design/Participants**: Prospective, randomized, double-blind, clinical study that included 60 adult patients, with ASA physical status I and II and scheduled for elective colonoscopy.

**Methods**: Patients were divided in 3 study groups. Two groups received remifentanil, 1 group with manually controlled infusion (MCI R group; n=19) and the other with TCI (TCI R group; n=20). A third group received placebo (normal saline [NS]; n=21) and was subdivided to NS via MCI (n=11) and NS via TCI (n=10). Two minutes after starting remifentanil/placebo, propofol infusion was begun using plasma-controlled TCI, at an initial target concentration of 4 μg/mL in all groups. Propofol infusion was adjusted to a deep sedation while maintaining spontaneous ventilation without assistance. Variables followed included: Bispectral Index (BIS) signal, noninvasive arterial blood pressure, heart rate, end tidal carbon dioxide, respiratory rate, and oxygen saturation.

**Results**: Study groups were similar with respect to demographic characteristics. Time to loss of consciousness (LOC) and BIS at LOC were similar between all groups. There was no difference in vital signs or recovery variables among groups. Significantly more patients in the placebo group moved and experienced cough and hiccups interfering with the examination. TCI R resulted in a decrease in propofol requirements and a decrease in the incidence of hypopnea and apnea compared to MCI R (P <0.05).

**Conclusions**: Administration of remifentanil via TCI during spontaneous ventilation results in a decrease in propofol requirements and in a lower incidence in apnea compared to remifentanil administered via MCI.

**Reviewer's Comments**: TCI infusion systems use mathematical modelling for computation of drug doses, resulting in predicted (not true) drug concentrations, which differ from the MCI infusion systems and are a function of the pharmacokinetic-dynamic models used. (Reviewer-K. George Bojanov, MD).

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**Keywords**: Remifentanil

**Print Tag**: Refer to original journal article
Infrared Thermometer Can Indicate Successful Nerve Blockade

The Efficacy of Skin Temperature for Block Assessment After Infraclavicular Brachial Plexus Block.

Minville V, Gendre A, et al:
Anesth Analg 2009; 108 (March): 1034-1036

Skin temperature measurement by infrared thermometry is an early predictor of block success or failure over a specific nerve distribution.

Objective: To investigate whether an infrared thermometer can be used for prediction of infraclavicular brachial plexus block success, defined as complete sensory block.

Design/Participants: Prospective, observational study, involving 30 consecutive adult patients undergoing upper limb surgery under infraclavicular block.

Methods: All blocks were performed using a nerve stimulator and an insulated needle; lidocaine 1.5 % with 1:400,000 epinephrine was used in all cases. The insertion site was 1 cm caudally of the clavicle and 1 cm medially of the coracoid process. The needle was inserted at an angle of 45° to the skin aiming at the cranial margin of the axillary fossa. Ten mL of the local anesthetic was injected on stimulation of the musculocutaneous nerve, after which the needle was withdrawn 1 to 2 cm and redirected medially and posteriorly in order to elicit a distal hand motor stimulation. Thirty more mL of the local anesthetic solution was injected. Variables followed during the study included block time, sensory block onset, and skin temperature. Sensory block onset and skin temperature were evaluated every 5 minutes for 30 minutes, distant from joints and subcutaneous veins, and in distribution areas of the radial, ulnar, median, and the musculocutaneous nerves, bilaterally. Skin temperatures measurements were performed using a noncontact infrared temperature probe.

Results: 120 nerves were anesthetized. Total block time was 6 ± 4 minutes, and the onset time was 12 ± 6 minutes. Redirection of the stimulating needle after musculocutaneous nerve blockage resulted in radial nerve stimulation in 40% of cases, ulnar nerve stimulation in 30%, and median nerve in 30%. The overall block success rate was 83%. Complete block was achieved at 30 minutes when skin temperature increased in a specific sensory territory ≥1°C over baseline at 5 and 10 minutes.

Conclusions: Assessing skin temperature with an infrared thermometer is an inexpensive and reliable early indicator of successful nerve blockade.

Reviewer's Comments: While this study showed that there are reliable and predictable increases in skin temperature with successful block when performing infraclavicular blocks, there are studies on lower extremity blocks and skin temperature showing that skin temperature changes after femoral block were minimal and occurred later than the onset of the block. (Reviewer-K. George Bojanov, MD).

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Keywords: Block Assessment

Print Tag: Refer to original journal article
The described method for obturator nerve blockade locates it close to the obturator canal, theoretically increasing the success rate of blocking the 2 branches of the nerve.

**Objective:** To investigate a new and more proximal approach for ultrasonic-guided obturator nerve block.  
**Design/Participants:** Prospective study that included cadaveric, sonoanatomical, and clinical parts.  
**Methods:** The anatomical study included dissections on 16 cadavers in order to reveal the obturator nerve, major surrounding tissues, assess sonographic landmarks, and develop ultrasound views to be used further as a reference in the clinical part of the study. During the volunteer study conducted on 8 volunteers, ultrasonographic identification of the obturator nerve and surrounding structures were obtained and measurements established. The clinical part of the study used the above information for ultrasound-guided obturator nerve blocks in 15 adults from the institutional pain management center. The distances between the needle tip and the medial border of the femoral artery, the needle insertion point and the pubic tubercle, and the skin to the needle tip were recorded. Ten mL 0.5% bupivacaine were used for injection. Motor and sensory blocks were assessed.  
**Results:** The cadaver study defined a triangular area, in which the obturator nerve could be visualized, with boundaries consisting of: superiorly (superior pubic ramus); anteriorly (posterior aspect of the pectineous); and posteriorly (the anterior aspect of the external obturator muscle). In the volunteer study, the mean established values of the obturator nerve to femoral vein and obturator nerve to pubic tubercle were 12.9 ± 2.9 mm and 19.9 ± 2.6 mm, respectively. No statistical difference was found between right and left measurements and gender. Nerve depths of the obturator nerve, its anterior branch and posterior branch were 32.4, 28.2, and 39.2 mm, respectively. The obturator nerve block was successful in all clinical study patients. Obturator nerve sensory areas were variable and had no cutaneous distribution in 20% of the patients. Femoral artery (needle tip distance), needle depth, pubic tubercle (needle insertion points, horizontal and vertical) were 18.5 ± 2.4 mm, 48.3 ± 10.4 mm, 18.8 ± 2.0 mm, and 21.1 ± 2.9 mm, respectively. **Conclusion:** The obturator nerve block landmarks established in the study can be used successfully in patients for obturator nerve block with ultrasound guidance.  
**Reviewer's Comments:** A limitation of the study is the lack of a control group. Vascular punctures were frequent, despite the fact that vascular structures were easily identified when imaged with ultrasound. (Reviewer-K. George Bojanov, MD).
No reduction in time to eye opening or propofol use is found in patients where the CSM is used.

**Background:** Anaesthesia management is difficult in obese patients due to the fact that IV infusion rates are based on the corrected body weight (CBW).

**Objective:** To investigate the effect of the depth of anaesthesia with the cerebral state monitor (CSM) on the recovery time in obese patients.

**Design:** Randomized, clinical study.

**Participants:** 38 patients undergoing an abdominal hysterectomy with a body mass index (BMI) ≥30 kg/m² were included in this study.

**Methods:** All patients received dexamethasone 4 mg, paracetamol 1 g, and diclofenac 50 mg before anaesthesia. The CSM was applied as well as standard monitoring, and anaesthesia induction was performed with propofol, remifentanil, and rocuronium. After intubation of the trachea, patients were randomized to the CSM group or to the control group. The cerebral state index (CSI) value was blinded to the anaesthetist by an opaque sticker. The CSI value was adjusted to maintain CSI between 40 and 60 in the CSM group. At the end of wound closure, propofol and remifentanil were terminated, and the CSI value was blinded to an observer who recorded the time to eye opening and verbal commands. No physical stimulation was allowed. Patients were observed 24 hours for adverse reactions and were asked whether they recalled any episodes in the operating room. The average CSI value for each patient was calculated. A correlation analysis was used to assess the relationship between the optimal propofol infusion rate and the anthropometric variables.

**Results:** 36 patients were analyzed. No reduction in time to eye opening or propofol use was found between the 2 groups. Remifentanil consumptions were higher in the control group ($P = 0.04$).

**Conclusions:** No reduction in time to eye opening and propofol use was found between the CSM group and the control group.

**Reviewer's Comments:** The remifentanil concentration should have been held constant in both groups to be able to compare the propofol consumption and time to eye opening between the 2 groups. (Reviewer-Olga Plattner, MD).

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Keywords: Obese Patients

Print Tag: Refer to original journal article
Successful tracheal intubation with the Airtraq™ requires the glottic opening to be centered in view and the inter-arytenoid cleft to be medially below the horizontal line in the center of the view.

**Background:** The Airtraq™ laryngoscope is a new, single use device that improves the ease of intubation.

**Objective:** To evaluate the success rate of intubation by analyzing the position of the glottic view and the inter-arytenoid cleft position.

**Design:** Retrospective analysis of videos recorded in the operating theatre during airway management.

**Participants:** Morbidly obese patients and gynecologic patients were included in the study.

**Methods:** All patients received neuromuscular blockade, and senior anaesthetists provided anaesthesia. The procedure was recorded, and the films were transferred to a computer for image analysis. Fifty recordings of patients requiring >1 attempt for tracheal intubation were analyzed. On each image, the outline of the glottic opening and the exact position of the inter-arytenoid cleft were traced. All traces of successful and failed intubation were superimposed to identify the glottic opening and the exact position of the inter-arytenoid cleft.

**Results:** 109 recordings were analyzed, with a total of 59 failures and 50 successes. Successful tracheal intubation required the glottic opening to be centred in view and the inter-arytenoid cleft to be medially below the horizontal line in the center of the view. By using the down-back-up maneuver and the alignment of the head and neck, the glottic opening and the inter-arytenoid cleft position changed and improved the view and successful intubation.

**Conclusions:** Successful tracheal intubation required the glottic opening to be centered in view and the inter-arytenoid cleft medially below the horizontal line to be in the center of the view.

**Reviewer’s Comments:** Using the Airtraq laryngoscope requires the glottic opening to be centred in view, otherwise the advancement of the tube might be so difficult that it results in a failed intubation. (Reviewer-Olga Plattner, MD).

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Keywords: Airway Management

Print Tag: Refer to original journal article
There are no significant differences in the ProSeal™ LMA insertion conditions between ketamine 0.5 mg/kg and alfentanil 0.5 μg.

**Background:** During insertion of the ProSeal™ laryngeal mask airway (PLMA), undesirable responses such as coughing, gagging, laryngospasm, and movement may occur.

**Objective:** To evaluate the effect of ketamine and alfentanil on insertion conditions of the PLMA.

**Design:** Double-blinded, randomized, clinical study.

**Participants:** 80 children between 3 and 132 months old and undergoing minor surgery were included.

**Methods:** EMLA® cream was applied 1 hour before surgery to the back of both hands, and premedication with midazolam 0.5 mg/kg was nasally administered. After an IV line was established, IV fluids were administered and monitoring was established. Children were randomly assigned to either alfentanil 20 μg/kg or ketamine 0.5 mg/kg. Following the administration of the study drug, 4 mg/kg propofol was administered over 10 seconds. 90 seconds later, the PLMA was inserted by an experienced anesthetist who was unaware of the group the child was assigned to. A maximum of 4 attempts were allowed before an alternative device was used. Further anesthesia management was maintained with sevoflurane in nitrous and oxygen. Pain on propofol injection (4-grade scale), the conditions for the PLMA insertion, vital signs, and complications were recorded. Differences between the groups were evaluated using an independent sample t-test and Mann-Whitney U-test. A P < 0.05 was considered significant.

**Results:** 80 patients were analyzed. No significant differences in insertion conditions were found between the 2 groups. Hemodynamic stability was equal in both groups, although the ketamine group showed higher pulse and blood pressure rates.

**Conclusions:** There were no significant differences in the PLMA insertion conditions between the 2 groups.

**Reviewer's Comments:** Due to the apnea condition that is induced with the application of opioids, ketamine might be an alternative. However, increased secretions and emergence reactions are the side effects of ketamine. I prefer the use of opioids because before their application, manual ventilation is successfully applied and I prefer an apneic child during PLMA insertion, which increases the insertion rate of the LMA. (Reviewer-Olga Plattner, MD).

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Keywords: LMA Insertion Conditions

Print Tag: Refer to original journal article
Propofol-Remifentanil Anesthesia--Effect of Ketamine on BIS Values

Ketamine Has No Effect on Bispectral Index During Stable Propofol-Remifentanil Anaesthesia.

Faraoni D, Salengros J-C, et al:


Under stable remifentanil and propofol anaesthesia, a single bolus of ketamine 0.2 mg/kg has no influence on the BIS value over a 15-minute period of time.

**Background:** Ketamine reduces the postoperative morphine requirements in the first 24 hours after surgery.

**Objective:** To evaluate the effect of low-dose ketamine administered over 5 minutes on bispectral index (BIS) values during stable propofol and remifentanil anaesthesia.

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

**Participants:** 30 patients undergoing gynecologic or digestive laparoscopic surgery were included. After monitoring, anesthesia was induced with propofol and remifentanil. Intubation was facilitated with rocuronium 0.6 mg/kg. Propofol and remifentanil were titrated to maintain a bispectral index value of approximately. After 5 minutes of steady state, patients received randomly either 0.2 mg/kg ketamine or the same volume of saline over a 5-minute period. The BIS values were recorded from before the beginning of drug administration until the end of the study period of 15 minutes in the absence of any surgical stimulation. Statistical analysis was performed by the two-way analysis of variance for repeated measures testing differences between the 2 groups. \( P < 0.05 \) was considered significant.

**Results:** 30 patients were analyzed. The baseline value for the BIS was 37 for the ketamine group versus 39 for the placebo group of patients. The highest BIS value during the 15 minutes of recording was 41.5 for the ketamine group versus 40.1 for the placebo group. BIS values did not differ significantly between the 2 groups.

**Conclusions:** Under stable remifentanil and propofol anaesthesia, a single bolus of ketamine 0.2 mg/kg had no influence on the BIS value over a 15-minute period of time.

**Reviewer's Comments:** There are many studies showing that ketamine does reduce the postoperative morphine consumption. Also, the study drug was applied under no surgical stimulus in a very small concentration; this explains this result. (Reviewer-Olga Plattner, MD).

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Keywords: Bispectral Index

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