New Hypoglycemic Agents Require Perioperative Precautions

New Hypoglycemic Agents: A Special Presentation.
Ioanna Apostolidou, MD:

-Special Presentation

The newer noninsulin hypoglycemic agents (exenatide, liraglutide, sitagliptin, pramlintide) should be withheld on the day of surgery. During surgery, use aspiration precautions because some of these drugs slow gastric emptying.

Background: New noninsulin hypoglycemic agents, the incretin and amylin groups, are available to treat patients with type 2 diabetes and inadequate glucose control with the regular routinely used agents, namely metformin or sulfonylurea. Incretin therapies are based on the release of intestinal peptides (glucagon-like peptide 1) in the presence of glucose in the gut which stimulates insulin secretion. The incretin family of drugs includes exenatide, liraglutide, and sitagliptin. They reduce appetite, gastric emptying, and glucagon levels, while increasing insulin biosynthesis, insulin secretion, and proliferation of pancreatic cells. Adverse events include nausea, vomiting, diarrhea, and risk for hypoglycemia when combined with sulfonylurea but not with metformin. Exenatide is given subcutaneously and has a half-life of 1.0 to 2.5 hours. Sitagliptin is given orally and has a 12-hour half-life. Amylin is a small peptide hormone produced by the pancreatic β-cells along with insulin after a meal. Pramlintide (Symlin®), an analog of amylin, improves glucose control and reduces HbA1c levels. Nausea is the most common side effect. At this point, recommendations on how to handle these drugs in the perioperative period are based on theoretical risks derived from their mechanisms. These are: withhold the day of surgery to avoid hypoglycemia, monitor for hypoglycemia, use aspiration precautions because of the slowing gastric emptying effect, and take precautions to prevent postoperative nausea and vomiting. In the event that the patients take any of these drugs on the day of surgery, they should be monitored closely for hypoglycemia and delayed stomach emptying precautions during induction and awakening. Insulin should be used to control hyperglycemia intraoperatively. (Reviewer-).

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Keywords: Type 2 Diabetes, Noninsulin Hypoglycemic Agents, Perioperative Precautions

Print Tag: Refer to original journal article
GES Ameliorates Intractable Nausea, Vomiting

Gastric Electrical Stimulation in Intractable Nausea and Vomiting: Assessment of Predictive Factors of Favorable Outcomes.

Gourcerol G, Chaput U, et al:


After 6 months of gastric electrical stimulation, improvements were seen in all symptoms of vomiting, nausea, bloating, regurgitation, abdominal pain, and appetite, but not BMI or gastric emptying.

Background: Gastric electrical stimulation (GES) is a relatively new concept developed in the last decade to relieve symptoms of gastroparesis. It involves high frequency with short-duration pulses through 2 electrodes in the greater curvature of the stomach. Objective: To determine the preoperative symptoms improved by treatment with GES.

Design: Prospective study.

Methods: 33 patients were assessed who were having severe vomiting or nausea for >1 year but who were not receiving ongoing medical treatment associated with the vomiting or nausea. The electrodes were implanted laparoscopically in the smooth muscle of the greater curvature of the stomach, and the stimulator was in the subcutaneous tissue of the abdominal wall in the left iliac fossa. The gastric quality of life (QOL) score was assessed from 0 to 4, and it was recorded at baseline and at 6 months after treatment. The improvement in body mass index (BMI) was recorded.

Results: All symptoms of vomiting, nausea, bloating, regurgitation, abdominal pain, and appetite improved during the 6 months of GES treatment. No significant improvement was seen in BMI, and gastric emptying was not increased. QOL scores showed improvements in 24 patients and no change in 9 patients, although no patient had any worsening of symptoms. Conclusions/Discussion: GES has shown effective results in the last decade to ameliorate vomiting and nausea due to gastroparesis. In this study, most patients had altered appetites due to the severity of nausea. Therefore, those patients who had only nausea and vomiting had more improved appetites than did patients who had abdominal pain. Patients with previous gastric surgery had a poor response, while diabetic gastroparesis responded beautifully. Although the exact mechanism of GES is controversial, it has shown greatest benefits in cases of severe vomiting and nausea and in patients with altered appetite.

Reviewer’s Comments: This is a controversial study because the exact mechanism of action of GES is yet to be fully understood. Although GES has shown beneficial results in intractable nausea and vomiting, its use needs further study. Also, this is an invasive mode of therapy. (Reviewer-Sunita Goel, MD).

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Keywords: Gastric Electrical Stimulation, Intractable Nausea and Vomiting

Print Tag: Refer to original journal article
Clonidine Prolongs Analgesia in Plexus Blocks

Clonidine as an Adjuvant to Local Anesthetics for Peripheral Nerve and Plexus Blocks: A Meta-Analysis of Randomized Trials.

Popping DM, Elia N, et al:

Anesthesiology 2009; 111 (August): 406-415

Clonidine prolongs analgesia, motor block, and sensory block from doses of 90 to 150 µg. When epidurals do not have the desired effect, the addition of clonidine works like magic!

**Objective:** Clonidine is a centrally acting antihypertensive and is a very versatile drug with additional properties of analgesia, sedation, antishivering, and antianxiety effects. The dose in regional blocks is still unclear.

**Methods:** This study examined 20 trials published from 1992 to 2006 that evaluated patients who received clonidine and local anesthetics as a single shot for plexus blocks. The exclusion criteria consisted of general anesthesia, continuous block, or Bier block, and age <18 years of age.

**Results:** Of the 1054 patients studied, 573 received clonidine and were considered in this study. All patients received a single shot of clonidine with local anesthetics. Fifteen studies had plexus blocks, and 5 had nerve blocks. Clonidine increased the duration of postoperative analgesia significantly, in doses ranging from 90 to 150 µg. Clonidine shortened the time to onset of sensory block. The time to onset of motor block was also shortened at doses of 150 µg in all trials. Block failure occurred when a sedative or analgesic was required in addition to the block. However, this was not statistically significant. Side effects included hypotension, bradycardia, and sedation at maximum doses of 300 µg. **Discussion:** Clonidine effectively increases the duration of sensory and motor blockade. Clonidine, when added with a local anesthetic in plexus blocks, decreases the tourniquet pain and increases analgesic duration. The analgesia was prolonged by 2 hours, irrespective of whether a long- or intermediate-acting local anesthetic was used. Clonidine was systemically absorbed and was associated with signs of hypotension, bradycardia, and sedation. This is dose-related, and most of these side effects were seen at clonidine doses of 300 µg (a high dose). This meta-analysis was conducted in patients without general anesthesia, so the effect of other drugs to prolong analgesia was not taken into account. Most patients received 150 µg in all studies, so exact dose responsiveness for benefit or harm could not be identified. **Conclusion:** The use of clonidine without general anesthesia prolongs analgesia by 2 hours.

**Reviewer's Comments:** The results of this interesting study show that clonidine prolongs analgesia, motor block, and sensory block at doses ranging from 90 to 150 µg, and it can be used effectively in blocks. When epidurals do not have the desired effect, the addition of clonidine works like magic! (Reviewer-Sunita Goel, MD).

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Keywords: Clonidine, Plexus Blocks

Print Tag: Refer to original journal article
During surgery, there are big discrepancies in cardiac output measurement as determined by transesophageal echocardiography and the FloTrac/Vigileo™ (FTV) method, irrespective of clinical conditions.

**Background:** Thermodilution cardiac output (CO) obtained through right heart catheterization is the standard method of measuring CO in surgical patients, but it is associated with higher patient risk. The FloTrac/Vigileo™ (FTV) method is a newer semi-invasive technique that uses the arterial pressure waveform analysis to derive CO.

**Objective:** To compare the agreement in CO measurements between the FTV and transesophageal echocardiography (TEE) methods at different hemodynamic settings.

**Participants:** 10 ASA I-II patients scheduled to undergo laparoscopic colorectal surgery who had no contraindications to TEE.

**Methods:** All patients underwent standardized endotracheal anesthesia with fentanyl, thiopental, and vecuronium for induction, and isoflurane, N₂O, and vecuronium for maintenance. Fentanyl boluses (1 to 2 µg/kg) were given to maintain mean blood pressure and heart rate within 20% of basal values. A radial 20-gauge cannula was inserted and connected to a hemodynamic monitor, and an FTV system for pulse wave analysis was used to determine CO ($CO_{PWA}$). This method uses arterial resistance, compliance, and pulsatility calculations. TEE CO ($CO_{TEE}$) was measured by multiplying the cross-sectional area of the left ventricular outflow track with the velocity time integral of the aortic blood flow. Measurements were obtained after intubation, 5 minutes after lithotomy position, 5 minutes after pneumoperitoneum, every 30 minutes, each time the mean arterial blood pressure decreased below 20% of basal values, during colonic anastomosis in steep Trendelenburg position, and at the end of surgery.

**Results:** 5 men and 5 women participated (mean age, 59 years). Of the 88 measurements compared, the $CO_{TEE}$ values ranged from 3.23 to 12 L/minute (mean, 6.21 ±1.85 L/minute), and the $CO_{PWA}$ values ranged from 2.9 to 8.5 L/minute (mean, 4.84 ±1.14 L/minute). Bias (mean difference between the 2 measurements) was 1.17, and 95% of this difference was between 2.02 and 4.37. The mean percentage error between all $CO_{TEE}$ and $CO_{PWA}$ measurements was 40% (range, 27%-50%), while a 30% error was acceptable for the new method. The lowest error was found at 5 minutes after pneumoperitoneum, and the highest error was after intubation.

**Conclusions:** During laparoscopic colon surgery, significant differences were observed between CO measurements made with TEE and FTV, irrespective of the surgical and anesthesia conditions.

**Reviewer's Comments:** Thermodilution CO is considered the gold standard in anesthesia practice, but its use is limited due to the pulmonary artery catheter risks. This study confirms the discrepancies between the newer less-invasive methods and TEE measurements of CO. Therefore, clinical decision making cannot rely on a CO measurement alone, regardless of the technique used. (Reviewer-Ioanna Apostolidou, MD).

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Keywords: Cardiac Output, Pulse Contour Analysis, Echocardiography

Print Tag: Refer to original journal article
Objective: To evaluate the associations between perioperative peripheral nerve injuries (PNI) and patient characteristics, anesthetic techniques, and surgical specialty.

Design: Retrospective cohort study.

Methods: Perioperative PNIs were defined as a new sensory or motor deficit in any patient after anesthesia (within 48 hours and not related to surgery). PNIs were identified by reviewing 3 databases from 1997 to 2007: quality assurance reports, closed claims, and institution-wide billing code databases. An agreement of 2 of 3 review panel members was necessary to include a case of PNI. PNIs were classified by the location and the nature of injury. Statistical analysis computed hazard ratios (HR) with 95% CI.

Results: From 380,680 anesthetic cases, 112 PNIs were identified (frequency, 0.03%). The mean patient age was 46 years (range, 13-86 years), and 54% of PNIs involved males. Hypertension (HR, 2.2), tobacco use (HR, 2.1), and diabetes (HR, 2.4) were associated with PNIs, while ASA status, coronary artery disease, and renal disease were not. General (HR 2.8) and epidural anesthesia (HR 4.1) were also associated with PNI, while spinal, peripheral nerve blocks, and monitored anesthesia care were not. Neurosurgery (HR 2.7), cardiac surgery (HR 2.6), general surgery (HR 2.0), and orthopedic surgery (HR 2.0) were the surgical specialties related to PNI. Of the PNIs reported, 65 were in the upper extremities, 45 were in the lower extremities, and 2 were in both the upper and lower extremities. Most injuries (59%) were only sensory, 14% were only motor, and the rest were mixed conditions. Motor deficits were more frequent in the closed claims database as compared to the quality assurance database.

Conclusions: This is the first study to associate hypertension to PNIs. Diabetes and tobacco are related to PNI, as seen in previous studies. Hypertension predisposes the nerve to injury by affecting blood flow. The authors acknowledge several limitations of their study.

Reviewer's Comments: This study provides new findings on PNI while simultaneously confirming results from previous studies. It is accompanied by a concise but to-the-point editorial by Prielipp and Warner (pages 464-466). They emphasized that small vessel disease (in conditions such as diabetes), tobacco use, and hypertension are most likely the predisposing factors. They pointed out the double-crush phenomenon (a nerve is susceptible to other injuries if impaired at one location). In conclusion, it appears that asymptomatic preexisting nerve pathologies become unveiled during the perioperative period and present as perioperative neuropathies. (Reviewer-Ioanna Apostolidou, MD).

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Keywords: Peripheral Nerve Injuries, Anesthesia, Risk Factors

Print Tag: Refer to original journal article
A quality improvement initiative can successfully reduce the incidence of corneal injuries during anesthesia and surgery. Risk factors include surgery around the head and neck, Graves disease with exophthalmos, and a lower ASA status.

**Background:** Corneal injuries during anesthesia can result from trauma to the eye directly from the anesthesia provider or surgeon or from drying of the eye if the lid is not taped shut.

**Objective:** To determine if a performance improvement and educational initiative reduce the incidence of corneal abrasions after surgery and to determine what patient or provider factors affect the incidence of corneal abrasion after surgery.

**Design:** Prospective observational study.

**Participants:** Adult patients who sustained corneal injury during nonophthalmological surgery.

**Methods:** The incidence of corneal abrasion was compared before, during, and after the performance improvement initiative. Risk factors for corneal abrasions were determined by comparing those patients who sustained corneal abrasions to controls. The authors initially recorded the incidence of corneal abrasions following surgery during a 5-month baseline period. During the next 6 months (initiation period), all patients suspected of having a corneal injury following surgery were examined by an ophthalmologist, and the providers were notified of the injury by e-mail. During the next 10 months, a quality improvement and education initiative was undertaken, consisting of lectures on how to properly tape the eyes and the potential risk factors for corneal injuries. Finally, there was a 15-month follow-up period after the educational period was completed. The incidence of corneal abrasions was compared among the time periods. Patient characteristics of those sustaining corneal abrasions compared to controls were determined using logistic regression analysis.

**Results:** The incidence of corneal injury declined significantly from a baseline value of 1.51 per 1000 patients to 0.79 per 1000 patients during the educational period, and it remained low (0.47 per 1000 patients) in the follow-up period. Risk factors for corneal abrasion included surgery around the head and neck, Graves disease with exophthalmos, a lower ASA status, and having a student nurse anesthetist as the primary anesthetic provider. **Conclusions:** A quality improvement initiative can result in a sustained reduction in corneal injuries.

**Reviewer's Comments:** This interesting study showed some benefit beyond the initial educational period. The education likely will have to be repeated at regular intervals, however. The increased incidence of corneal injuries with student nurse anesthetists who rotate frequently and likely never went through the educational initiative suggests that the incidence may revert to the earlier period without a sustained effort by all anesthesia providers. (Reviewer-David S. Beebe, MD).

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Keywords: Corneal Abrasion, Quality Improvement

Print Tag: Refer to original journal article
Because tracheal intubation of trauma patients often fails in the field, alternative airway management methods not requiring tracheal intubation should be readily available for paramedics.

**Background:** Trauma patients may require airway management before they arrive in the emergency department (ED). Airway management is usually provided by paramedics prior to arriving in the ED.

**Objective:** To determine how many tracheal intubations failed when performed by paramedics in the field when managing trauma patients.

**Design:** Prospective observational study.

**Participants:** Trauma patients who had airway management by tracheal intubation attempted by paramedics in the field from August 2003 to June of 2006.

**Methods:** Anesthesiologists assessed the airways of the patients on arrival at the trauma bay at the Ryder Trauma Center in Miami, Florida. Failed intubation was defined as the inability to tracheally intubate the patient after 2 attempts in the field requiring transport to the ED with bag-mask ventilation, a laryngeal mask airway (LMA®), and Combitube® or a cricothyroidotomy. An intubation was also noted as failed if the esophagus had been intubated and the patient transported to the ED.

**Results:** Of the 203 patients intubated in the field during this study, 140 (69%) were successfully tracheally intubated in the field. Of the 63 failed intubations, 38 had alternative airway management (Combitube, n=28; LMA, n=6; cricothyroidotomy, n=4). The other 25 patients had unrecognized esophageal intubations. All of these patients were successfully tracheally intubated in the ED. Of the patients who had tracheal intubation attempted in the field, 64% eventually died. The mortality was slightly higher in the group where tracheal intubation was unsuccessful (71%) than in the group where it was successful (60%), but these differences were not statistically significant.

**Conclusions:** Tracheal intubation fails in a large number of trauma patients when it is attempted by paramedics in the field.

**Reviewer's Comments:** I think this study demonstrates that, perhaps, tracheal intubation should not be attempted by paramedics in the field. Particularly disturbing was the number of patients who arrived to the ED with esophageal intubations. Alternative airway management techniques that do not require visualization, such as the Combitube, may be more appropriate for trauma care in the field. Because tracheal intubation often fails, these alternative techniques should be available regardless of whether tracheal intubation is attempted. (Reviewer-David S. Beebe, MD).

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Keywords: Tracheal Intubation, Paramedics, Trauma Patients

Print Tag: Refer to original journal article
The cerebral tissue oxygenation index is a noninvasive monitor of the oxygen delivery/demand balance in brain tissue. It is affected by oxygen saturation, end-tidal CO$_2$, mean blood pressure, and cerebral blood flow.

**Background:** The NIRO 300 spectrometer is a device that utilizes spatially resolved spectroscopy to determine cerebral tissue oxygenation index (TOI) as a measure of the balance between oxygen delivery and demand in brain tissue. The number obtained is expressed as a percentage value. TOI is affected by arterial, capillary, and venous blood ratio. It is further affected by oxygen saturation, blood volume, cerebral blood flow, and other variables.

**Objective:** To study the effects of isocapneic hyperoxia and hypoxemia and normoxic hypercapnea and hypocapnea.

**Methods:** 15 healthy volunteers were enrolled. The following parameters were monitored: TOI, mean arterial blood pressure, heart rate, blood flow velocity in the right middle cerebral artery, inspired oxygen fraction, and end-tidal carbon dioxide. Nitrogen mixed with inspired gases was used to induce hypoxemia, and 100% oxygen was used to induce hyperoxia. Hyperventilation was used to decrease end-tidal carbon dioxide by 1.5 kPa, and the addition of 6% carbon dioxide was used to induce hypercapnea. Changes in TOI were followed.

**Results:** Changes in oxygen saturation, end-tidal carbon dioxide, cerebral blood volume, and mean arterial blood pressure affected TOI significantly. Changes in heart rate and flow velocity in the right middle cerebral artery were not affecting TOI significantly. **Conclusions:** Factors that affect TOI are oxygen saturation, end-tidal carbon dioxide, mean arterial pressure, and cerebral blood volume. When evaluating changes in TOI, we need to take these factors in consideration.

**Reviewer’s Comments:** The technology that allows measurement of the balance between oxygen delivery and demand using spectroscopy is gaining clinical acceptance. The underlying technology and factors that can affect the reading, however, need to be understood to make the correct conclusions based on the monitor readings. Beside the factors that were studied in the present study, I would like to point out that the device monitors regional blood flow limited to the area under the probe. I would further like to emphasize that the number obtained reflects balance between oxygenated and deoxygenated hemoglobin in arterial, capillary, and venous blood with the assumption that arterial/venous ratio is 1:3. (Reviewer-Mojca Remskar Konia, MD).

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Keywords: Cerebral Tissue Oxygenation, End-Tidal Carbon Dioxide

Print Tag: Refer to original journal article
Airway length can be predicted by measuring the length from upper incisors to manubriosternal joint with the head in a fully extended position. However, this technique has not been tested in neonates.

**Background:** Incorrect position of the endotracheal tube (ET) can lead to collapse of the nonventilated lung, barotrauma, vocal cord injury, and extubation. Therefore, placing the ET correctly is important.

**Objective:** To compare the length from the upper incisor to the manubriosternal joint (MSJ) in the fully extended position versus the incisor-carina length in a neutral position.

**Methods:** 100 adults and 50 children were enrolled. Patients were anesthetized with propofol and rocuronium. Full extension was achieved by manually extending the neck as much as possible. Upper-incisor-to-MSJ distance was measured by a commercially available compass. The head was then positioned in a neutral position and the distance from incisors to carina was measured through the ET with a bronchoscope.

**Results:** The correlation between incisor-MSJ extension distance and incisor-carina neutral distance was significant in adults ($P<0.001$, $r^2=0.88$) and children ($P<0.001$, $r^2=0.98$).

**Conclusions:** The distance measured between upper incisors and the MSJ can serve as a good predictor of airway length. It can be easily measured by a ruler or by straightened ET.

**Reviewer’s Comments:** The correct position of the breathing tube is important and may be difficult, especially in small children. The present study introduces a new, easily measured external distance as a good predictor of airway length in adults and children. Neonates were not studied due to nonavailability of a neonatal bronchoscope. Therefore, the conclusions of this study cannot be extended to this most difficult population. A major limitation of this technique is the required ability of the patient to fully extend the head. The study has also not determined the interindividual variability of MSJ position in relation to carina. (Reviewer-Mojca Remskar Konia, MD).

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Keywords: Airway Length Assessment

Print Tag: Refer to original journal article
A slow carrier fluid infusion rate, absence of drug priming, and larger volumes and lengths of tubing will increase onset and offset delays in pediatric central line infusion systems.

**Objective:** To evaluate drug delivery profiles of a pediatric central line infusion system.

**Methods:** An 8-cm 4-F double-lumen central venous catheter was attached to a Y-piece adapter. Methylene blue (MB) and normal saline, both in 60-mL syringes, were delivered via pressure tubing from a dual-channel syringe pump. Initially, the whole system was primed only with saline. The infusion of carrier solution was set at low (1.5 mL/hour) and at high flow rates (11.5 mL/hour) to imitate conditions in a 3-kg neonate. MB, the model drug, was delivered at 0.5 mL/hour. In the second set of experiments, the Y-piece was primed to the Y spot with MB. The onset and offset times of the system were tested by spectrophotometrically measuring MB concentrations in the samples collected at the tip of the central venous line. Start-up syringe pump characteristics were also evaluated by measuring the volume of the solution delivered by the syringe pump after activation.

**Results:** With saline-only priming and the carrier solution rate of 1.5 mL/hour, MB was first detectable at the tip of the catheter after 15 minutes. Half of the steady state was achieved after 23 minutes and steady state was achieved at 40 minutes. By priming the drug limb of the Y-piece with MB, the t\(_{50}\) was reduced to 12.7 minutes and steady state was reached after 20 minutes. If the carrier fluid infusion rate was increased to 11.5 mL/hour, half of steady state was achieved after 15.7 minutes and in 5.2 minutes if the Y-piece was primed with MB. The offset t\(_{50}\) was 11.6 minutes if carrier fluid was running at 1.5 mL/hour and 3 minutes if running at 11.5 mL/hour. If the pump was restarted 1 minute after purging, the start-up delay was 1.3 minutes, and if restarted 10 minutes after purging, the delay was 4.8 minutes.

**Conclusions:** In a pediatric patient, onset and offset delays of infusions need to be anticipated. We can decrease the delays by increasing the carrier solution rate, by priming the tubing as far as we can with the drug, and by choosing small diameter and short tubing.

**Reviewer's Comments:** The present article very nicely shows different factors that affect the delays and describes actions that will shorten the delays as much as possible. It is impressive to see that the delay to the steady state with slow infusion rates can be well over 30 minutes. The authors further point out the innate syringe pump start-up delay, which depends on the time between pump purging and start of infusion. (Reviewer-Mojca Remskar Konia, MD).

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Keywords: Pediatric Drug Delivery, Central Venous Line, Time Delay

Print Tag: Refer to original journal article
How Do You Perform a Caudal Block?

A Survey of Pediatric Caudal Extradural Anesthesia Practice.
Menzies R, Congreve K, et al:
Paediatr Anaesth 2009; 19 (September): 829-836

The two most commonly used local anesthetics for pediatric caudal blockade are bupivacaine and levobupivacaine in Great Britain and Ireland.

**Objective:** To determine current practice techniques for performing a pediatric caudal block.
**Design:** This study utilized an online survey.
**Participants:** Members of the Association of Paediatric Anaesthetists of Great Britain and Ireland were invited to respond to an online survey.
**Methods:** An e-mail was sent to 600 members inviting their response to the online survey. The survey was intended to collect information regarding the practitioner's experience, choice of technique for performing caudal blockade, drugs utilized for the caudal block, and the usage of continuous caudal catheters. A total of 366 responses (64% response rate) were analyzed for the final data collection.

**Results:** Most pediatric anesthetists who responded had >5 years of experience. Approximately two-thirds of these anesthetists performed ≤10 caudal blocks per month. Most practitioners favored the use a 22-gauge cannula for performing caudal blockade. The respondents overwhelmingly denied being concerned with the risk of implantation of dermoid tissue into the caudal space. Confirmation of accurately locating the caudal space was mainly clinically related to either the “pop” or “give” felt by the needle when entering into the caudal space combined with ease of cannula advancement and subsequent ease of local anesthetic injection. Very few responded that ultrasound was utilized to confirm accurate placement. The 2 most commonly used local anesthetics were bupivacaine and levobupivacaine, with clonidine and ketamine being the 2 most commonly used additives for enhancing blockade. Of the respondents, approximately 40% used a continuous caudal catheter technique. A continuous technique was used mainly for children aged <2 years. With regards to aseptic technique during placement, 75% of anesthetists used gloves, and only 10% used a gown, gloves and mask for a single-shot technique. For those placing a continuous catheter, 91% used a sterile gown, gloves, and mask.

**Conclusions:** The survey responses provided practitioners a look at current practices employed when performing a pediatric single-shot caudal block or continuous catheter technique.

**Reviewer's Comments:** Caudal blockade is an important skill for all anesthesiologists to acquire during residency. Its use has been repeatedly shown to decrease opioid requirements, both intraoperatively and postoperatively. This survey provides useful information to all who perform caudal blocks by giving a view at what others are doing. I believe surveys such as this help to increase patient safety by providing information as to what is commonly done by other anesthesiologists outside of your own practice. These surveys also help to ensure that you are not doing something completely deviant from what is considered normal acceptable practice. (Reviewer-Michelle L. Schlunt, MD).

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Keywords: Pediatric Caudal Block, Extradural

Print Tag: Refer to original journal article
In adults, the triangle of Petit is located further posterior than initially described. This may pose a problem when attempting to perform the block in the supine position.

**Background:** The transversus abdominis plane lies between the internal oblique muscle and the transversus abdominis muscle of the abdominal wall. The lumbar triangle of Petit has been described as an optimal location when performing a transversus abdominis block.

**Objective:** To delineate the location of the lumbar triangle of Petit using anatomic landmarks.

**Participants:** 26 cadavers (age range, 72-102 years).

**Methods:** All cadavers were initially placed in the prone position to obtain linear measurements. The triangle of Petit is formed laterally by the latissimus dorsi muscle, anteriorly by the external oblique muscle, with the triangle base being the iliac crest. The measurements taken included the lengths of the 3 sides of the triangle, distance from the midaxillary point at the iliac crest to the lateral and medial sides of the triangle, and the distance between the anterior superior iliac spine to the posterior superior iliac spine. In 24 of the 26 cadavers, the position of the triangle was measured on the skin from the midaxillary line to the middle of the triangle. Three of the cadavers were also utilized in the supine position to examine the path of the iliohypogastric and ilioinguinal nerves in relation to the triangle of Petit.

**Results:** There were no significant gender differences in any of the measurements. There was a large variation in the distance measured over the skin from the midaxillary line at the iliac crest to the center of the triangle. In the 3 cadavers that underwent dissection to view the pathway of the iliohypogastric and ilioinguinal nerves, all 3 demonstrated that the nerves did not enter the transversus abdominis plane until lateral to the lumbar triangle of Petit. However, at the midaxillary line, the nerves had an unvarying course and were not branched significantly.

**Conclusions:** The triangle of Petit was positioned much further posterior than previously suggested in adults, and this may pose a problem when attempting to perform the block in the supine position. Due to the great variation in distance to the triangle from the midaxillary point, as well as the large variation in shape and size of the triangle, there is a large amount of difficulty in locating the triangle of Petit.

**Reviewer's Comments:** There have been a number of complications described with this block, including intraperitoneal injection, splenic puncture, and renal puncture. The use of ultrasound to identify the different fascial planes and to visualize real-time injection of local anesthetic can hopefully help to more accurately locate the proper injection site. (Reviewer-Michelle L. Schlunt, MD).

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Keywords: Transversus Abdominis Plane Block, Triangle of Petit

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Dobutamine Increases Blood Flow to Anastomosed Flap

The Effect of Dobutamine on Blood Flow of Free Tissue Transfer Flaps During Head and Neck Reconstructive Surgery.

Scholz A, Pugh S, et al:
Anaesthesia 2009; 64 (October): 1089-1093

Dobutamine infused at 4 and 6 µg/kg per minute exerts a significant effect on both mean flow and maximum free flow of tissue transfer flaps during reconstructive surgery.

**Background:** To prevent vascular occlusion in free tissue transfer surgery surgical technique, maintenance of normothermia, mild hypervolemia, and reduced blood viscosity are the mainstays.

**Objective:** Dobutamine, in various dose regimens (unlike other inotropic agents that have vasoconstrictor properties), may increase blood flow in the anastomosed arteries of the tissue flaps.

**Design:** A prospective, blinded clinical study.

**Participants:** 20 patients having a free tissue transfer flap during head and neck reconstructive surgery.

**Methods:** Orofacial tumor resection patients undergoing reconstructive surgery (radial forearm or a fibula free flap) were recruited. Anesthesia was standardized and administered by the same anesthetist. A PiCCO® catheter (measures cardiac output [CO]) was used, and the femoral artery and the subclavian vein were the sites for the hemodynamic measurements. CO, CI, MAP, HR, CVP, SVR, SVRI, ITBVI, SVV were recorded prior to the study measurement period. Fluids were provided to ensure a central venous pressure of 5 to 15 cm H2O, an intrathoracic blood volume index between 800 and 1100 mL, a stroke volume variation <10%, a urine output of 0.5 to 1.0 mL/kg per hour, and hemoglobin of 80 to 100g/L. Core temperature was maintained above 36.0°C. The flow in the anastomosed donor artery was measured with the Butterfly Flowmeter®. Dobutamine, at rates of 2, 4, and 6 µg/kg per minute, was infused according to a predefined, computer-generated random sequence for a 10-minute period. Simultaneous baseline hemodynamic measurements were taken. The procedure was undertaken during a natural, though artificially prolonged, break in the operation. After surgery, the patient was transferred to the ICU. Each patient received 3 different rates of dobutamine infusion in a random order. The Friedman test was used to test the different dobutamine concentrations on the blood flow.

**Results:** 18 patients were analyzed. There was a significant effect with dobutamine doses of 4 and 6 µg/kg per minute on both mean flow and maximum free flap flow. With the increasing dose, HR, CI, and SBP increased significantly.

**Conclusions:** Flap perfusion might be increased with dobutamine infusions of 4 to 6 µg/kg per minute.

**Reviewer's Comments:** The surgeons are always concerned about flap blood flow during reconstructive plastic surgery. Dobutamine appears to be ideally suited for this. The increase of the CO depends on the preexisting vascular and cardiac status, as well as the effect of patients’ medications on their hemodynamic status. (Reviewer-Olga Plattner, MD).

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Keywords: Dobutamine, Head Neck Surgery Flaps

Print Tag: Refer to original journal article
Reduction of haste results in a decreased incidence of unsafe actions when compared to classical rapid-sequence induction in infants.

Background: A controlled rapid-sequence induction (RSI) technique became increasingly accepted by many pediatric anesthetists and professional bodies. The technique consists of pre-oxygenation, rapid induction of adequate hypnosis and profound muscle paralysis using a nondepolarizing muscle relaxant, gentle mask ventilation with a maximum airway pressure of 12 cm H₂O, laryngoscopy, and intubation.

Objective: To evaluate the effect of RSI-controlled versus RSI-classic on unsafe actions and stress for the provider.

Design: Controlled, randomized, simulator-based study.

Participants: 30 trainees and specialists in anesthesiology.

Methods: There were 2 protocols. The RSI-classic (thiopentone 7 mg/kg, suxamethonium 2 mg/kg) or RSI-controlled (thiopentone 7 mg/kg, rocuronium 0.6 mg/kg). Intubation was performed 60 seconds after suxamethonium versus 120 seconds after rocuronium. Candidates in the RSI-classic group were allowed to modify their technique and begin with mask ventilation if they believed it to be indicated. In the RSI-controlled group, the practitioners provided gentle ventilation until establishing nondepolarizer blockade. The SimBaby™ was 4 weeks old, weighed 4 kg, and had pyloric stenosis. An intravenous line and nasogastric tube were in situ, and all vital parameters were programmed as well as recovery from hypoxemia. Unsafe actions were recorded, including SpO₂ <90%, forced mask ventilation with P_Airway >20 cm H₂O, prolonged intubation attempt <30 seconds, or failed intubations. Each provider’s salivary cortisol and α-amylase at certain time points, continuous ergospirometry, and a brief post-trial questionnaire were evaluated. Analysis was performed with SPSS Version 14. In the first step, the dependent variables were regressed to the individual baseline values of each candidate to control the absolute high of measures. In the second step, the experience of each candidate was included. In the third step of the regression analysis, the RSI technique was included.

Results: 30 candidates were analyzed. They had a median experience of 8.0 years. The stress was induced in all candidates in the course of all scenarios, which lasted between 4 and 7 minutes. Cortisol and α-amylase peaked at 10 or 20 minutes after the start of the scenario. Hypoxemia always occurred during RSI-classic, which resulted in forced mask ventilation with airway pressures <20 mbar. Failed intubations did not differ between the groups.

Conclusions: Reduction of haste and a reduced incidence of unsafe actions were noted in the RSI-controlled group compared to the RSI-classic group.

Reviewer’s Comments: The simulator-based studies have their limitations, but overall, they are good for practice and establishing new guidelines to reduce stress and increase patient safety. (Reviewer: Olga Plattner, MD).

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Keywords: Rapid-Sequence Induction
Hyperthermic intraperitoneal chemotherapy with cisplatin combined with high levels of magnesium might have lead to intraoperative ventricular tachycardia.

**Background:** Tumor resection and hyperthermic intraperitoneal chemotherapy (HIPEC) is used for the treatment of peritoneal mesothelioma, pseudomyxoma peritonei, ovarian carcinoma, and selected gastrointestinal carcinomas that spread into the peritoneum. **Case Report:** A 66-year-old patient underwent operation for ovarian cancer followed by chemotherapy. Six months later, the tumor spread into the peritoneum, and HIPEC was planned. The patient was on treatment for hypertension and depression. The patient underwent ileocecal resection with ileo-ascendostomy (anastomosis between ileum and ascending colon), segmental ileum resection, splenectomy, deep anterior resection of the rectum, resection of the bladder tumor, omentectomy, and peritoneal cytoreductive surgery. Ten hours after the beginning of the operation, cisplatin in saline was perfused intra-abdominally at a temperature of 43°C. Fifty minutes after the start of the infusion, pulseless ventricular tachycardia developed. Although magnesium glutamate and amiodarone were administered, they had no effect on the episodes of pulseless ventricular tachycardia. Postoperatively, magnesium was 0.64 mmol/L and the ECG showed QT prolongation. At 31 days after operation, the patient was discharged from the hospital with a sinus rhythm. **Discussion:** The patient was on olanzapine, fluoxetine, and verapamil, which all have arrhythmic effects at high plasma levels. All of these drugs, including cisplatin, are >90% bound on protein. Hypoproteinemia might have increased the plasma levels, leading to ventricular tachycardia. **Conclusions:** Cisplatin combined with high levels of magnesium might have lead to ventricular tachycardia. **Reviewer's Comments:** Cisplatin is known to exert direct toxicity on the myocardial cells. As soon as the intraperitoneal fluid was drained, the arrhythmia dissipated. Therefore, in this case, the toxic effect might have been due to the toxic dosage. (Reviewer-Olga Plattner, MD).

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Keywords: Intraperitoneal Chemotherapy

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Effectively Reduce PONV With Ramosetron, Ondansetron

Comparison of Ramosetron With Ondansetron for Prevention of Postoperative Nausea and Vomiting in Patients Undergoing Gynaecological Surgery.

Kim SI, Kim SC, et al:

Br J Anaesth 2009; 103 (October): 549-553

Ramosetron 0.3 mg and ondansetron 8 mg are effective in decreasing the incidence of postoperative nausea and vomiting in high-risk female patients. Ramosetron appears to be more effective.

Background: Postoperative nausea and vomiting (PONV) are common and distressing postoperative complications. To date, 5-HT₃ receptor antagonists have been very potent in preventing PONV. Ramosetron, a new 5-HT₃ receptor antagonist with a longer duration of action, has been successfully introduced for prevention of PONV after chemotherapy.

Objective: To compare the efficacy of ramosetron with that of ondansetron in gynecological patients.

Design: A blinded, placebo-controlled, randomized, prospective clinical study.

Participants: 162 healthy females undergoing gynecological operations.

Methods: Patients were randomly assigned to receive ramosetron 0.3 mg IV, ondansetron 8 mg IV, or saline. The drugs were administered 30 minutes before the end of surgery. Both premedication and anesthesia management were standardized. Induction was with propofol, fentanyl, and rocuronium; the patient was maintained with sevoflurane in nitrous oxide and oxygen. Pain was treated with patient-controlled fentanyl boli. Both PONV (incidence and severity) and need for rescue medication were evaluated for 24 hours after surgery. Vomiting was defined as either vomiting or retching. The intensity of nausea was assessed using a 100-mm visual analogue scale (VAS). Nausea VAS scores >50 or vomiting were treated with rescue medication on request (initial drug, metoclopramide 10 mg; second drug, ondansetron 4 mg). Adverse effects were evaluated and recorded, and patients were also asked to rate their overall satisfaction on a 3-point scale. A P value <0.05 was considered statistically significant.

Results: The incidence of nausea was significantly lower in the ramosetron and ondansetron groups compared with the placebo group (P<0.05). The incidence of vomiting was 17% in the ramosetron group, 20% in the ondansetron group, and 44% in the placebo group during the 24 hours after surgery. The request for rescue antiemetics was 15% with ramosetron, 30% with ondansetron, and 41% with placebo during the 24 hours after surgery (P<0.05).

Conclusions: Ramosetron 0.3 mg and ondansetron 8 mg are effective in decreasing the incidence of PONV in high-risk female patients. The need for rescue antiemetics is higher in patients treated with ondansetron 8 mg than with ramosetron 0.3 mg.

Reviewer's Comments: Both 5-HT₃ receptor antagonists were compared by their known optimal doses because their equipotent doses were unknown. Further studies are needed to investigate the equipotent doses of ondansetron and ramosetron. (Reviewer-Olga Plattner, MD).

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Keywords: Antiemetics, Postoperative Nausea & Vomiting

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Compared with the LMA-UniqueTM disposable laryngeal mask, the i-gelTM mask seems to have a better seal and, due to the fiberoptic control, a better score of the vocal cords position.

Background: There are many disposable laryngeal masks (LMA) on the market. The new i-gelTM mask has no inflatable cuff.

Objective: To compare the clinical efficacy between the i-gel and the LMA-UniqueTM (LMA-U).

Participants: 80 patients undergoing minor gynecological surgery.

Methods: Anesthetic management was performed according to the protocol (propofol, remifentanil), and monitoring included the bispectral index. According to the randomization, patients received either a size 4 i-gel or a size 4 LMA-U. Both devices were lubricated before insertion. The cuff of the LMA-U was initially inflated with 20 mL of air. Correct insertion was assessed. Successful placement of the i-gel was verified by advancement of a gastric catheter followed by aspiration of gastric fluid. An experienced anesthesiologist inserted all devices. Insertion time was recorded. Airway leak pressure was determined by adjusting the expiratory valve of the breathing circle to 40 cm H\textsubscript{2}O and recording the pressure when the equilibrium was reached. Fiberoptic position of the mask was checked and graded as 1 to 4 (4: only vocal cords; 1: vocal cord not seen, but function adequate). After completion of the study, the anesthesiologist gave a statement of the handling. At 18 to 24 hours after surgery, the patients were interviewed regarding sore throat, hoarseness and dysphagia.

Results: Among the 80 patients included in the study, a successful airway on first attempt was achieved in 36 patients in the i-gel group compared to 34 in the LMA-U group. There was 1 failure in the LMA-U group. Insertion time was comparable for the 2 groups. The airway leak pressure was significantly higher with the i-gel (29 cm H\textsubscript{2}O) than with the LMA-U (22 cm H\textsubscript{2}O with 40 mL air in the cuff). The fiberoptic control of the position was significantly better in the i-gel group compared to the LMA-U group, and the overall subjective assessment was 36 (excellent) for i-gel and 32 for LMA-U.

Conclusions: Both devices are simple to use and effective for establishing an airway. However, the i-gel mask seems to have a better seal and, due to the fiberoptic control, a better score of the vocal cord position.

Reviewer's Comments: The i-gel mask is easy to use and has a very good seal. However, selecting the correct size is very important and usually, if there is a leak the airway, the length is not adequate and the next size should be tried. (Reviewer-Olga Plattner, MD).

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Keywords: Laryngeal Masks, Disposable, Comparison

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Remifentanil and magnesium sulfate show similar surgical and hemodynamic conditions during middle ear surgery, but postoperative pain and recovery was better with magnesium.

**Background:** Controlled hypotension for middle ear surgery is helpful to achieve a bloodless operative field. Magnesium has been investigated for controlled hypotension in various studies. Its efficacy during middle ear surgery and comparison with remifentanil for controlled hypotension has not yet been performed.  
**Objective:** To compare the efficacy of magnesium sulfate versus remifentanil for achieving controlled hypotension during middle ear surgery.  
**Methods:** Patients undergoing middle ear surgery were randomly assigned to either remifentanil (R-group) or magnesium sulfate (M-group). The R-group received remifentanil at doses of 4 ng/mL during induction and then 3 to 4 ng/mL during the operation. The M-group received magnesium sulphate as an IV bolus of 50 mg/kg and then 15 mg/kg per hour by continuous infusion. Mean arterial pressure (MAP), heart rate, and bispectral index (BIS) were recorded before induction, after intubation, at 5, 15, 30, 60, 90, and 120 minutes thereafter, and before and after extubation. Hypertension or hypotension <20% of the baseline value were treated according to the BIS. Fentanyl 1 µg/kg was given if the BIS was not between 40 to 60, while ephedrine and atropine were given if BIS was 40 to 60. Surgical conditions were assessed for bleeding using a 5-point scale. In the recovery room, pain and postoperative nausea and vomiting (PONV) were assessed with a 100-mm visual analogue scale (VAS) and treated. At a VAS of 30, ketorolac was given for pain control or metoclopramide was given to treat PONV.  
**Results:** The R-group showed higher MAP and heart rates after extubation than did the M-group. Epinephrine was used in 15 patients in the R-group and in 12 patients in the M-group. Surgical conditions were comparable. PONV and postoperative pain were significantly lower in the M-group.  
**Conclusions:** Remifentanil and magnesium sulfate showed similar surgical and hemodynamic conditions during middle ear surgery, but postoperative pain and recovery were much better in the magnesium group.  
**Reviewer's Comments:** Hypotensive agents have many side effects and, therefore, magnesium sulfate is preferable. For middle ear surgery, sevoflurane anesthesia is not as desirable because of PONV, which might have been reduced by other drugs. (Reviewer-Olga Plattner, MD).

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Keywords: Middle Ear Surgery, Controlled Hypotension

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Low antithrombin levels can modify the effect of fondaparinux as measured by Heptest®. Assessing antithrombin levels during treatment with fondaparinux may identify patients with inadequate response.

**Objective:** To determine if low antithrombin levels affect the anticoagulation activity of fondaparinux measured by Heptest®.

**Design:** Prospective study including use of residual citrated plasma left over from routine clinical diagnostics.

**Methods:** All samples were grouped according to the antithrombin level determined by a routine chromogenic assay. The low antithrombin group consisted of 22 plasma samples with antithrombin levels <60%. The normal range group consisted of 25 plasma samples with normal antithrombin levels. Plasma (950 µL) was mixed with (1) 50 µL buffer in sample A, (2) 25 µL buffer and 25 µL antithrombin concentrate in sample B, and (3) 50 µL antithrombin concentrate in sample C. Ten concentrations of fondaparinux were mixed with the prepared plasma samples, and clotting time was studied using Heptest or Heptest-HI assay. The Heptest consists of adding factor Xa to the citrated plasma sample, followed by calcium, phospholipids, and factor V. Heptest-HI is a modified version of the assay optimized for high heparin concentration.

**Results:** Increasing fondaparinux concentrations resulted in increasing clotting time. Heptest clotting time was shorter at any given fondaparinux concentration in the antithrombin-deficient samples. The dose response of fondaparinux correlated with the antithrombin concentration. In the low range of fondaparinux concentration, addition of antithrombin concentrate resulted in a prolongation of the clotting time at higher antithrombin levels. In the high range of fondaparinux concentrations, depending on the available antithrombin concentrations, a “ceiling effect” was observed, indicating saturation of the antithrombin binding sites.

**Conclusion:** Assessing antithrombin levels during treatment with fondaparinux may identify patients with inadequate response who might benefit from treatment with antithrombin or fondaparinux dose adjustment.

**Reviewer’s Comments:** Fondaparinux is a synthetic heparin-like pentasaccharide with a half-life of 13 to 21 hours. It binds to antithrombin, causing changed inhibitory activity of antithrombin to factor Xa. Both aPTT and ACT are not affected by fondaparinux, which effect can be determined by factor Xa assay. (Reviewer-Krasimir George Bojanov, MD).
The upper lip bite test is more likely to predict an easy intubation than are other difficult intubation prediction tests.

**Objective:** To compare the upper lip bite test (ULBT) to sternomental distance (SMD), thyromental distance (TMD), and interincisor distance (IID) in the preoperative assessment of airway and prediction of tracheal intubation ease.

**Design/Participants:** Prospective, clinical study, including 380 adult patients (ASA I) scheduled for elective surgical procedures requiring endotracheal intubation.

**Methods:** SMD was measured in the supine position with head fully extended and mouth closed. TMD was measured as the straight distance between the upper border of the thyroid cartilage and the bony point of the mentum. IID was measured with a fully opened mouth. The ULBT class was assigned according to the following criteria: class I, lower incisors can bite the upper lip above the vermilion line; class II, lower incisors can bite the upper lip below the vermilion; and class III, lower incisors cannot bite the upper lip. The Cormack-Lehane grading system was used to describe laryngoscopic views. Grades 1 and 2 were categorized as “easy intubations,” and Grades 3 and 4 were categorized as “difficult intubations.”

**Results:** Intubation was difficult in 19 patients (5%). Cutoff points for difficult intubation included Class III ULBT, ≤4.5 cm for IID, ≤6.5 cm for TMD, and ≤13 cm for SMD. The combination of ULBT with SMD had the highest sensitivity for predicting difficult intubation, while the highest specificity was the combination of ULBT with TMD.

**Conclusions:** ULBT has a high specificity and negative predictive value, making it a useful test for identifying easy intubations and laryngoscopy.

**Reviewer’s Comments:** Some of the advantages of ULBT are that it is easy to learn and perform, and it has a very high interobserver reliability, which is much better than the well-known Mallampati classification. (Reviewer-Krasimir George Bojanov, MD).

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Keywords: Preop Airway Assessment, Tracheal Intubation, Upper Lip Bite Test

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