

Letters to the Editor

Visual Analog Scale Scores for Labor Pain

To the Editor:

I read with interest the article by Ludington and Dexter (1) describing the use of a "total pain score" for analysis of analgesic modalities in labor. The concept of a total pain score for labor should not be interpreted by readers as a valid or even a useful measure of analgesia. Readers should be aware that the total pain score has never been used in contemporary obstetric analgesia trials, has never been validated for this purpose, and may represent a remarkable oversimplification of the labor process. This concept should not have been proposed as a valid technique in a medical intelligence article, but rather presented as a hypothesis that needs further study and verification. To ascribe one single total pain score for an entire labor would present extreme difficulties to researchers seeking to assess subtle but important differences among drugs and/or techniques. Obtaining total pain scores by multiplying retrospective visual analog scale (VAS) measurements by duration of labor has no basis in either physiology or any commonly used current research paradigm. Can you realistically compare squeezing your head tightly in a vice for 10 min to squeezing it lightly for 8 h and assume that the experience is the same because the time-weighted average VAS scores were similar?

Moreover, the authors claim that VAS scores are true ratios. They claim that a score of 6 is twice as severe as a score of 3, and that the magnitude of difference between a score of 2 and 3 is the same as between 7 and 8, for example. Although this may be true in a purely mathematical sense only (and the authors should have acknowledged this limitation), it is hardly true in reality; in fact, it even defies common sense.

Certainly no one would claim that a baby with an Apgar score of 6 is exactly twice as healthy as one with a score of 3. These are all ordinal, not interval, data. Parametric statistics may be used with robustness to analyze ordinal data, as shown by Dexter and Chestnut (2). However, the underlying numbers must still be recognized as ordered, not interval. Mathematical analysis notwithstanding, interpreting VAS data during labor as pure linear continuous data simply makes no physiological sense and represents a gross oversimplification of the complex factors associated with measurement of labor pain. To ascribe one single total pain score to an entire labor is equally inappropriate.

William Camann, MD
Department of Anesthesia
Brigham and Women's Hospital
Boston, MA 02115

References

1. Ludington E, Dexter F. Statistical analysis of total labor pain using the visual analog scale and application to studies of analgesic effectiveness during childbirth. *Anesth Analg* 1998;87:723-7.
2. Dexter F, Chestnut DH. Analysis of statistical tests to compare visual analogue scale measurements among groups. *Anesthesiology* 1995;82:896-902.

In Response:

I agree that "to ascribe one single total pain score for an entire labor would present...difficulties to researchers seeking to assess subtle...differences among drugs and/or techniques." However, our article considered not the evaluation of new drugs or therapies, but rather statistical methodologies to measure their cost-effectiveness as labor analgesics. Consideration of both the magnitude and duration of pain (total pain) relief provided by a drug or therapy is necessary to perform a cost-effectiveness analysis. Additional studies are required to assess patients' relative valuations for different magnitudes and durations of pain.

The visual analog scale is a vertical or horizontal line, usually 10 cm in length, with descriptive words such as "no pain" and "worst pain imaginable" written at the end points. The patient marks the line at the point that they consider represents the amount of pain they are experiencing at that moment. The psychometric basis for the visual analog scale relates to power functions relating (i) the subjective magnitude of pain to the true magnitude of the pain stimulus and (ii) the subjective magnitude of linear distance to the true distance along a line. In contrast, the Apgar score assigns numerical values to nonoverlapping clinical categories. The two are different from a psychometric perspective.

Franklin Dexter, MD, PhD
Department of Anesthesia
University of Iowa
Iowa City, IA 52242

Repeated Use of the Cuffed Oropharyngeal Airway in an Infant for Radiation Therapy

To the Editor:

We recently encountered a 6-mo-old girl diagnosed with rhabdomyosarcoma of the left mandible, requiring general anesthesia to receive twice-daily radiation therapy for 6 wk. This required an atraumatic airway management technique that provided an effective airway during a propofol general anesthetic. Because of anticipated irritation—if not mucosal friability—secondary to the radiation dose, we sought to avoid using endotracheal intubation of the laryngeal mask airway. To address our concerns, and with the parent's consent, a small cuffed oropharyngeal airway (COPA; 6 cm) custom-made with a larger bite block (Figure 1 inset) to provide a consistent open jaw angle for consistent, precise delivery of radiation dose, was provided (Mallinckrodt Medical, Inc., St. Louis, MO). The COPA also allowed administration of oxygen and monitoring of end-tidal CO₂.

Although we encountered no significant complications during the 49 anesthetics performed using this technique, it was necessary, at times, to reposition the device or to use a tongue depressor to ensure proper positioning of the COPA cuff. These manipulations were

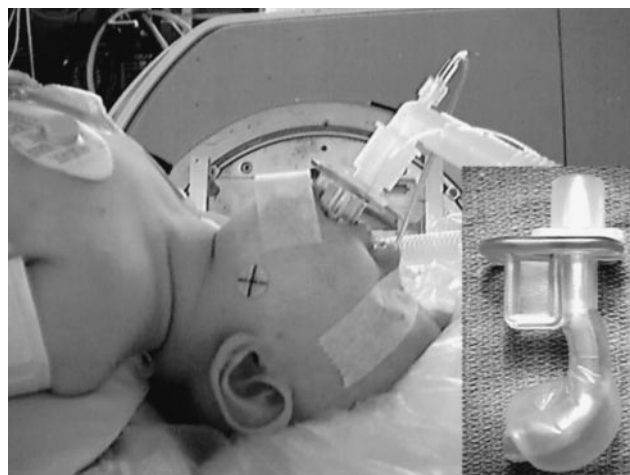


Figure 1. A custom-made cuffed oropharyngeal airway used in an infant.

considered to be related, at least in part, to the additional bite block limiting the movement of the tongue on inflation of the cuff. During the course of therapy, there was increasing external cheek redness and some buccal mucosal inflammation most likely related to the radiation, not the use of the airway itself.

Although the COPA has been used successfully in adults and in older children (5-12 yr old) (1,2), this is the first report of its use in an infant. The COPA performed well in this patient, who was anesthetized with a propofol bolus, followed by an infusion with spontaneous ventilation, and provided a stable airway for remote monitoring during the radiation dose. Based on our experience with the COPA and on previous experience with older children, the COPA is a practical and safe alternative for airway management in this setting.

Robert S. Greenberg, MD

Departments of Anesthesia and Critical Care Medicine & Pediatrics
Johns Hopkins Medical Institutions
Baltimore, MD 21287

Cheryl B. Prichard

Keith J. Jacquin

Research and Development
Anesthesia and Respiratory Devices
Mallinckrodt, Inc.
St. Louis, MO 63134

References

- Greenberg RS, Brimacombe J, Berry A, et al. A randomized controlled trial comparing the cuffed oropharyngeal airway and the laryngeal mask airway in spontaneously breathing anesthetized adults. *Anesthesiology* 1998;88:970-7.
- Greenberg RS, Maxwell LG, Zahurak M, Yaster M. Initial experience using the COPA in children 5-12 years old. Presented at the Society for Pediatric Anesthesia. February 1998.

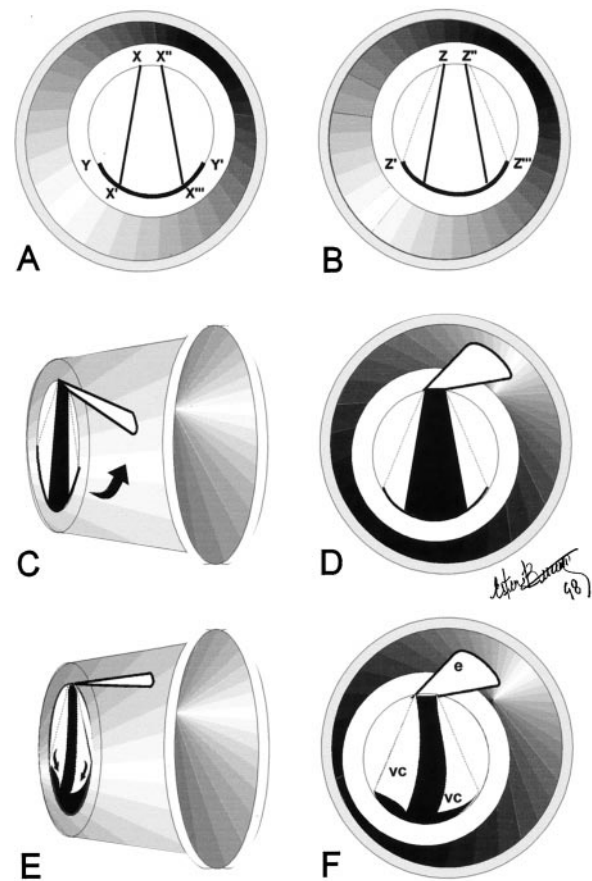


Figure 1. Schematic design of the different phases of the construction of the glottis simulator. A, View of the base of the plastic cup with cuts $x - x'$, $x'' - x'''$ and $y - y'$. B, View of the bottom of the plastic cup with the indentures (scored lines) $z - z'$ and $z'' - z'''$. C, Lateral view of the plastic cup. The arrow indicates the folding maneuver of the "epiglottis." D, Lateral view of the plastic cup with the final positioning of the "epiglottis." E, Upper view of the plastic cup with the maneuvers to make the "vocal cords" malleable. F, Upper view of the plastic cup with the final form of the glottis simulator. e = "epiglottis" and vc = vocal cord.

Glottis Simulator

To the Editor:

The complexity of endotracheal intubation is often mentioned in the literature (1-3). Moreover, the Carlens double-lumen tube (4) is troublesome to pass beyond the glottis during intubation because of carinal hook. At this stage, the tube is rotated so as not to damage the vocal cords. Although superior polyvinyl chloride tubes are available, the "hooked tubes" are still used.

After the patient is anesthetized and paralyzed, the double-lumen tube is inserted into the trachea using a rigid laryngoscope. The tube is held such that the tip of the bronchial lumen faces anteriorly. . . With the Carlens—left sided—or White—right sided—tubes, as the tip of the bronchial lumen passes the vocal cords, the tube is rotated 180° to bring the carinal hook passes anteriorly to negotiate the vocal cords. After the carinal hook passes beyond the vocal cords, the Carlens tube is rotated 90° to the right, whereas the White tube is rotated 90° to the left, in order to have the bronchial lumen face the intended bronchus. Once the double-lumen tube is placed in the trachea, the tracheal cuff is inflated. Mechanical ventilation is then begun with tidal volume of 10 ml/kg and a rate of 8 breaths/min. The bronchofiberscope is then used to evaluate the bronchial tree and the position of the double-lumen tube (5).

Unfortunately, there is no simulator to teach such maneuvers by using three-dimensional visualization. To decrease such difficulties, a glottis simulator was developed to help in the training of tube rotation maneuvers.

A disposable plastic coffee cup (50 mL) was used to make the simulator. At the base of plastic cup, on the external side, three cuts and two indentures were made with the sharp point of a disposable 30 × 1.5-mm needle. Two of the cuts are straight and symmetrical: $x - x'$, $x'' - x'''$; the other cut is semicircular $y - y'$, as shown in Figure 1A.

The two straight indentures (scored lines), $z - z'$ and $z'' - z'''$, are also symmetrical, as indicated in Figure 1B.

Figure 1 C-E shows the folding maneuvers to simulate the anatomical structures, as follows. Figure 1C shows the "epiglottis," located in the central part of the bottom of the cup and delimited by the three cuts $x - x'$, $x'' - x'''$ and $y - y'$. The "epiglottis" must be pressed and inverted toward the interior of the plastic cup, folding in to the level of its vertex, as indicated by the curved arrow. Figure 1D illustrates how the "epiglottis" must be positioned. The lateral delimitation of the two "vocal cords" are established by the respective indentures (scored lines) $z - z'$ and $z'' - z'''$. These must be folded at the level of the indentures, flexed several times to become pliable, and bent toward the outside of the cup, as demonstrated in Figure 1E. The plastic cup must be internally greased with lidocaine spray to facilitate the sliding over its surface.

Roberto de Menezes Lyra, MSc
LAMSPE Serviço de Cirurgia Torácica
04049-901 São Paulo, Brazil

References

- Fridrich P, Frass M, Krenn CG, et al. The Upsherscope in routine and difficult airway management: a randomized, controlled clinical trial. *Anesth Analg* 1997;85:1377-81.
- Mallampati SR, Gatt SP, Gugino LD, et al. A clinical sign to predict difficult tracheal intubation: a prospective study. *Can J Anaesth* 1985;32:429-34.
- Adnet F, Borron SW, Racine SX, et al. The Intubation Difficulty Scale (IDS): proposal and evaluation of a new score characterizing the complexity of endotracheal intubation. *Anesthesiology* 1997;87:1290-7.

4. Carless E. A new flexible double-lumen catheter for bronchospirometry. *J Thorac Surg* 1949;18:742-6.
5. Ovassapian A. Conduct of anesthesia. In: Shields TW, ed. *General thoracic surgery*. 4th ed. Baltimore: Williams & Wilkins, 1994:307-23.

Massive Intraoperative Pulmonary Embolism: With Succinylcholine or Not?

To the Editor:

I read the article by Greilich et al. (1) with great interest. To implicate succinylcholine fasciculation (in the absence of any manipulation) for propagation of a thrombus from the left popliteal vein to the pulmonary arteries is questionable. In that case report, the patient's existing disorders (other than acute cholecystitis), bullous pemphigoid and systemic lupus erythematosus (SLE) and accompanying cardiovascular and pulmonary disorders were not evaluated preoperatively and not discussed.

SLE can affect most parts of the cardiovascular system, and several autopsy series have shown a high incidence (50%-81%) of cardiac abnormalities. Several pulmonary manifestations, such as pneumonitis, pulmonary vascular disease, and pulmonary embolism, can accompany SLE. Kwong et al. (2) observed that asymptomatic thrombosis of the superior vena cava and silent pulmonary emboli are part of the disease spectrum of SLE with antiphospholipid syndrome. A high-resolution chest computed tomographic can detect pulmonary involvement in SLE, despite a normal chest radiograph (3). Although the chest radiograph was normal, the patient's age and medical history suggest that she could have had cardiac and pulmonary abnormalities due to SLE. Hypotension, tachypnea, and hypocarbia support these symptoms. Because the thrombus was not detected preoperatively in the left popliteal vein, "propagation of a deep venous thrombus to the pulmonary artery associated with the administration of succinylcholine" could not be said. A thrombus located in the right atrium or vena cava could have been dislodged and propagated to the pulmonary arteries during external cardiac massage without any contribution from succinylcholine.

In addition, there are questions regarding the time it took to administer 4 L of lactated Ringer's solution and whether central venous pressure was monitored during that period. Administering 4 L of lactated Ringer's solution preoperatively without monitoring central venous pressure could have led to congestive cardiac failure and pulmonary abnormalities or it could have enhanced any existing disorder. This could be the cause of the unwanted events.

Meral Kanbak, MD

*Hacettepe University
Faculty of Medicine
Department of Anesthesiology and Reanimation
Ankara 06100, Turkey*

References

1. Greilich PE, Randle DW, Froelich EG, Yee LL. Massive intraoperative pulmonary embolism coincident with the administration of succinylcholine. *Anesth Analg* 1998;87:491-3.
2. Kwong T, Leonidas JC, Ilowite NT. Asymptomatic superior vena cava thrombosis and pulmonary embolism in an adolescent with SLE and antiphospholipid antibodies. *Clin Exp Rheumatol* 1994;12:215-7.
3. Fenlon HM, Doran M, Sant SM, Breatnach E. High-resolution chest CT in systemic lupus erythematosus. *AJR Am J Roentgenol* 1996;166:301-7.

Are Vasopressors Beneficial After Cranial Trauma?

To the Editor:

We appreciate the editorial by Bedell and Prough (1) written in response to our article on the use of phenylephrine-induced hypertension after closed head trauma (CHT) in rats (2).

The background section of the editorial cites six references on the use of induced hypertension or cerebral perfusion pressure (CPP) ≥ 70 mm Hg after head injury (3-8). The study of Rosner et al. (7) is

provided as an example of a report of improved clinical outcome when CPP is maintained ≥ 70 mm Hg after head injury. The studies of Bouma et al. (5) and Unterberg et al. (8) are provided as examples of the failure of induced hypertension or maintenance of CPP > 60 mm Hg to decrease intracranial pressure or improve jugular venous saturation or cerebral tissue oxygen pressure in head-injured patients. We question whether the data of Rosner et al. (7) support the conclusion that vasopressor treatment improves clinical outcome after head injury.

Rosner et al. (7) treated 158 patients with Glasgow Coma Scale (GCS) scores ≤ 7 with vascular volume expansion, cerebrospinal fluid drainage via ventriculostomy, systemic vasopressor (phenylephrine or norepinephrine), and mannitol to maintain CPP ≥ 70 mm Hg. Their conclusion that this management strategy improves clinical outcome was based on better death rates, survival versus death or vegetative state, or favorable versus unfavorable outcome classifications than in other reported series. Thus, an obvious limitation of the study is that it was not controlled, blinded, or randomized. To assess the role of vasopressors on outcome, patients were classified into two groups: those requiring vasopressors ($n = 63$) and those not requiring vasopressors ($n = 95$). Patients requiring vasopressors had lower GCS scores on admission (4.7 ± 1.3 vs 5.4 ± 1.2), but survivors had similar GCS scores (4.3 ± 0.9 vs 4.5 ± 0.7). Based on these data, Rosner et al. (7) concluded that the results of using vasopressors in this population was dramatic (i.e., beneficial). We believe that there are two issues regarding these data deserving of comment. First, because the groups receiving and not receiving vasopressors had different GCS scores before treatment, the two groups are not matched and may be uncomparable. The study of Marion et al. (9) illustrates that when pretreatment GCS scores are ≤ 7 , the difference between 4 and 5 significantly influences the effectiveness of the treatment. Specifically, in their study on the use of hypothermia in head injury, Marion et al. (9) reported that patients with initial GCS scores of 3 or 4 did not benefit from hypothermia, whereas those with GCS scores of 5-7 did. Second, the data of Rosner et al. (7) also revealed that the mortality rate of patients receiving vasopressors was higher than those not receiving vasopressors (47% vs 18%). These latter results seem to argue for the opposite conclusion from that stated by Rosner et al. (7).

As regards the final three paragraphs of the editorial, we agree that our article on the use of phenylephrine-induced hypertension after CHT in rats examined only one level of induced hypertension at one time period after one degree of severity of CHT. We further agree that studies of other levels of induced hypertension at other time periods after other degrees of severity of CHT would provide additional information.

Daniel Talmor, MD

*Leonid Roytblat, MD
Yoram Shapira MD, PhD
Division of Anesthesiology
Soroka Medical Center
Faculty of Health Science
Ben Gurion University of the Negev
Beer-Sheva, Israel*

Alan A. Artru, MD

*Department of Anesthesiology
University of Washington School of Medicine
Seattle, WA 98195*

We failed to obtain a response from Dr. Bedell.

References

1. Bedell EA, Prough DS. Should induced hypertension be beneficial after traumatic brain injury? *Anesth Analg* 1998;87:751-3.
2. Talmor D, Roytblat L, Artru AA, et al. Phenylephrine-induced hypertension does not improve outcome following closed head trauma in rats. *Anesth Analg* 1998;87:574-8.
3. Rosner MJ, Coley IB. Cerebral perfusion pressure, intracranial pressure, and head elevation. *J Neurosurg* 1986;65:636-41.
4. Rosner MJ, Daughton S. Cerebral perfusion pressure management in head injury. *J Trauma* 1990;30:933-40.
5. Bouma GJ, Muizelaar JP, Bandoh K, Marmarou A. Blood pressure and intracranial pressure-volume dynamics in severe head injury: relationship with cerebral blood flow. *J Neurosurg* 1992;77:15-9.

6. Chestnut RM, Marshall LF, Klauber MR, et al. The role of secondary brain injury in determining outcome from severe head injury. *J Trauma* 1993;34:216-22.
7. Rosner MJ, Rosner SD, Johnson AH. Cerebral perfusion pressure: management protocol and clinical results. *J Neurosurg* 1995;83:949-62.
8. Unterberg AW, Kiening KL, Härtl R, et al. Multimodal monitoring in patients with head injury: elevation of the effects of treatment on cerebral oxygenation. *J Trauma* 1997;42:S32-7.
9. Marion DW, Penrod LE, Kelsey SF, et al. Treatment of traumatic brain injury with moderate hypothermia. *N Engl J Med* 1997;336:540-6.

Takes a Lickin' and Keeps on Tickin'

To the Editor:

While setting up for a general anesthetic, I noticed that a laryngoscope bulb was functional but partially dislodged (Figure 1). Closer inspection revealed that the bulb was fractured at the base and was only held by two wires. I removed the laryngoscope from service because of concern over the possibility of bulb aspiration.

Seven years later, while cleaning the scrubs, rolls of tape, pens, etc., out of my hospital locker, I rediscovered this laryngoscope blade and handle. Two fresh batteries in the handle were all that was necessary to produce the picture shown in Figure 1.

Dennis B. Hall, MD

Department of Anesthesiology
UMDNJ/Robert Wood Johnson Medical School
Robert Wood Johnson University Hospital at Hamilton
Hamilton, NJ 08690



Figure 1. Miller 3 laryngoscope blade with functional bulb fractured at the base.

Recommended Exposure Limits for Desflurane and Isoflurane

To the Editor:

In their recent study of exposure of postoperative nurses to anesthetic gases, Sessler and Badgwell (1) note that in the postanesthesia care unit under study, anesthetic gas concentrations often exceeded National Institute of Occupational Safety and Health (NIOSH)-recommended exposure limits (REL). For this investigation, the concentrations of desflurane and isoflurane were assessed in the breathing space of postoperative nurses, and the proportion of time in which measured levels exceeded the NIOSH REL for volatile anesthetics was reported. The authors state that the NIOSH REL for volatile anesthetics of 2 ppm might be questioned. I agree that the NIOSH exposure limit is not applicable to desflurane and isoflurane.

The NIOSH criteria document published in 1977 (2) states that "no worker is exposed at concentrations greater than 2 ppm of any halogenated agent, based on the weight of the agent collected from a 45-liter air sample by charcoal absorption over a sampling period not to exceed one hour." The NIOSH document then explains that "the agents that shall be controlled include chloroform, trichloroethylene, halothane, methoxyflurane, enflurane, and fluroxene." Isoflurane and desflurane, the volatile anesthetics used in the current study, were not considered by NIOSH because they were not in clinical use in 1977. Isoflurane and desflurane have different chemical structures, have different potencies, are metabolized to different compounds, and have a lower fraction of absorbed anesthetic recovered as metabolites than the volatile anesthetics considered by NIOSH. Therefore, it is unlikely that the REL published by NIOSH in 1977 would apply to isoflurane and desflurane. Additionally, there have been no laboratory studies or epidemiologic surveys in humans from which information could be used to propose REL for personnel with occupational exposure to isoflurane or desflurane. This suggests that future work should be directed toward establishing REL for the volatile anesthetics currently used in clinical practice (isoflurane, desflurane, sevoflurane), rather than relying on outdated proposed criteria from NIOSH.

Sessler and Badgwell have documented levels of exposure in one postanesthesia care unit with specific levels of room ventilation and fresh air exchanges. Whether this degree of exposure to isoflurane or desflurane is associated with any adverse health effects is unknown.

Arnold J. Berry, MD, MPH

Department of Anesthesiology
Emory University School of Medicine
Atlanta, GA 30322

References

1. Sessler DI, Badgwell JM. Exposure of postoperative nurses to exhaled anesthetic gases. *Anesth Analg* 1998;87:1083-8.
2. NIOSH. Criteria for a recommended standard: occupational exposure to anesthetic gases and vapors. Cincinnati, OH: United States Department of Health, Education, and Welfare, 1977.

In Response:

Berry questions whether the National Institute of Occupational Safety and Health (NIOSH)-recommended exposure limits for isoflurane and desflurane are appropriate. This is an issue we addressed in our article (1).

The 2-ppm ceiling for volatile anesthetics was indeed established before isoflurane and desflurane became available (2); this limit is nonetheless applicable. It is also worth remembering that NIOSH does not consider these maximal acceptable concentrations to be optimal or even demonstrably "safe." Instead, they constitute practically obtainable levels of environmental toxins that NIOSH considers hazardous and for which no safe levels have been defined. These leads to their explicit statement: "NIOSH is unable to identify a safe level of exposure for waste anesthetic gases. Therefore, it recommends that the risk be minimized by reducing exposures to the greatest extent possible."

Berry points out that "isoflurane and desflurane have different potencies [and] are metabolized to different compounds" than the anesthetics considered by NIOSH. However, there is no basis for assuming that toxicity scales with potency. It is, in fact, unlikely because anesthetic toxicity is presumably mediated by mechanisms other than the ones that modulate anesthetic action. Of course, the concentrations we observed were fully reported in our article. Readers are thus free to compare these values with whatever exposure limits they might consider appropriate.

It is obvious that "future work should be directed toward establishing recommended exposure limits for the volatile anesthetics currently in use." This is especially true because, as Berry concedes, no laboratory studies or epidemiologic surveys have evaluated the toxicity associated with occupational exposure to these commonly used drug. Before embarking on such large and expensive epidemiological investigations, however, it seems reasonable to first evaluate exposure levels in various settings. Our study does so—and

identifies nontrivial nitrous oxide, isoflurane, and desflurane concentrations in one postanesthetic care unit.

Daniel I. Sessler, MD

Department of Anesthesia
University of California—San Francisco
San Francisco, CA 94143

Ludwig Boltzmann Institute for Clinical Anesthesia and Intensive Care
Outcomes Research™ Group
Department of Anesthesia and General Intensive Care
University of Vienna
Vienna, Austria

References

1. Sessler DJ, Badgwell JM. Exposure of postoperative nurses to exhaled anesthetic gases. *Anesth Analg* 1998;87:1083-8.
2. NIOSH. Criteria for a recommended standard: occupational exposure to anesthetic gases and vapors. Cincinnati, OH: United States Department of Health, Education, and Welfare, 1977.

Arterialization of the Dorsum Vein on the Hand

To the Editor:

We report unusual arterialization of the hand vein in a patient who underwent surgery for a superior vermian arteriovenous malformation (AVM).

Craniotomy was planned in a 38-kg, 27-yr-old, ASA physical status II patient for excision of an AVM. The patient had thromboses of major veins in left cubital fossae due to medications during a previous hospitalization. Peripheral venous lines were started with 16-gauge cannulae on the left dorsum of the hand and at the left ankle, and patency was checked. A 20-gauge cannula was inserted for intraarterial blood pressure measurement, and a triple-lumen cannula was inserted in the right internal jugular vein. General anesthesia was induced with fentanyl (3 $\mu\text{g}/\text{kg}$), followed by thiopentone sodium (4 mg/kg) through a vein on the hand. During the thiopentone injection, the patient complained of a severe burning pain in the hand. The thiopentone was stopped, and lidocaine was injected through the same vein. The remaining drugs were given through the triple-lumen cannula, and induction and tracheal intubation were completed. When back-flow of blood was noticed in the hand line, the mean pressure was measured at 49 mm Hg. Simultaneous mean central venous and systemic blood pressure were 4 and 112 mm Hg. Blood gas analysis of the sample from hand vein showed pH 7.17, Pco_2 31.0 mm Hg, TCO_2 12 mmol/L, Po_2 98 mm Hg, and Sao_2 90% at a fraction of inspired oxygen of 0.4. After removal of the cannula, there was no bleeding or hematoma formation at the puncture site, and no external pressure was used. The patient's recovery was uneventful.

This arterialization of the vein might be explained by the presence of new arteriovenous channels or existing channels in the hand opening up after fentanyl injection. Arterialization of capillaries, new arteriolar growth, and arcade formation due to sustained wall stress because of distal flow obstruction in the vein have been reported (1).

Whether the presence of venous thrombosis downstream warrants caution against the use of a proximal prominent vein for IV infusion needs to be investigated further.

Rajiv Lakhota, MD
Chandra Kant Pandey, MD
Prabhat Tewari, MD

Department of Anaesthesia
Sanjay Gandhi Post Graduate Institute of Medical Sciences
Lucknow 226014, India

Reference

1. Price RJ, Skalak TC. A circumferential stress-growth rule predicts arcade arteriole formation in a network model. *Microcirculation* 1995;2:41-51.

Difficult Airway Management with Balloon Inflation

To the Editor:

Forceful, 3-cm anterior elevation (AE) with a conventional curved blade 4 and optimal external laryngeal manipulation (1) resulted in failure to expose the posterior commissure of glottis in two anesthetized patients with anterior larynx. The first attempt at endotracheal intubation failed in both patients.

Preoperatively, the airway of Patient 1 was evaluated as Mallampati class 4 (2,3) with limited neck extension (20°). Patient 2 presented for resection of cervical tumor causing left anterior laryngeal displacement (thyroid prominence palpable 3 cm left-to-midline).

The second endotracheal intubation attempt was successful because we used a modified Macintosh blade (MMB) 4 carrying two 10 Foley catheters (Fig. 1). In Patient 1, the MMB was advanced deep into vallecula, right catheter-balloon inflation with 2 mL of air exposed the arytenoids, and MMB-AE of 1.5 cm revealed the posterior half of glottis. In Patient 2, the MMB tip was placed above the displaced epiglottis, left catheter balloon inflation with 2 mL of air exposed the posterior half of glottis, and MMB-AE of 0.5 cm revealed the entire laryngeal aperture.

We conclude that adequate contact between balloon upper surface and structures connected to the epiglottis (base of tongue and hyoid bone) was established by balloon inflation. Consequently,



Figure 1. The modified Macintosh blade 4. Two 10 Foley catheters are firmly attached on the concave surface of this blade. The right catheter balloon is inflated with 2 mL of air.

lifting of the epiglottis by MMB-AE and exposure of the glottis were facilitated.

Spyros D. Mentzelopoulos, MD, DEAA(P1)
Marina V. Tsitsika, MD
Evangelia A. Karamichali, MD, PhD
*Department of Anesthesia
Evangelismos General Hospital
Athens, Greece*

References

1. Benumof JL, Cooper SD. Quantitative improvement in laryngoscopic view by optimal external laryngeal manipulation. *J Clin Anesth* 1996;8:136-40.
2. Mallampati SR, Gatt SP, Gugino LD, et al. A clinical sign to predict difficult tracheal intubation: a prospective study. *Can J Anaesth* 1985;32:429-34.
3. Samsom GLT, Young JRB. Difficult tracheal intubation: a retrospective study. *Anaesthesia* 1987;42:487-90.

Midfemoral Block: A New Lateral Approach to the Sciatic Nerve

To the Editor:

A new lateral approach to the sciatic nerve is described as the midfemoral block. The surface landmarks are the palpable greater trochanter (GT), the great axis of the femur palpated. A line is drawn from the posterior margin of greater trochanter toward the knee, parallel to the femur. The puncture site is situated on this line at the middle of the thigh. At this point, in contrast to the popliteal fossa, the sciatic nerve is not yet divided, and is reached at 3-8 cm of depth. The procedure is conveniently performed while the patient is in the supine position with the limb raised on a pillow. The operator places one hand on the limb to move to zero rotation and exposes the line. With the other hand, the operator inserts a stimulating needle perpendicularly to the skin (Figure 1). The needle is advanced toward the sciatic nerve until evoking foot movements. The mean duration of complete sciatic blockade was 14 h after the administration of 20-30 mL of 0.5% adrenalinated bupivacaine. The midfemoral sciatic was combined with femoral block in 50 patients after total knee replacements and in 10 for foot surgeries. The combined blocks were performed with one pack of Plexus Mini-set® (Pajunk, Geisingen, Germany).

C. Pham Dang, MD
*Service d'Anesthésie-Réanimation Chirurgicale
Hôtel-Dieu
44093 Nantes cedex 1, France*

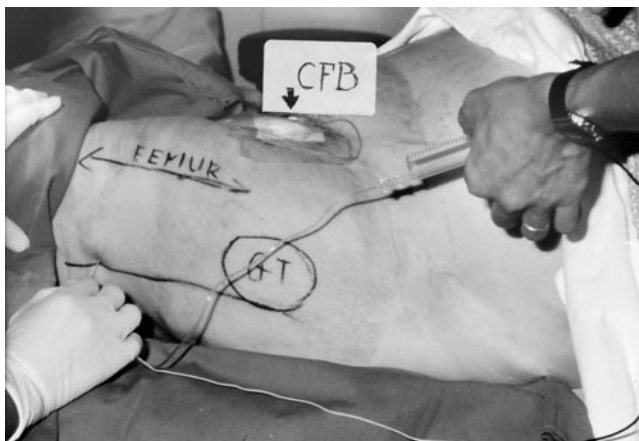


Figure 1. The midfemoral sciatic block is proceeding with the stimulating needle inserted on the line, perpendicularly to the skin. The line was drawn from the posterior margin of the greater trochanter (GT), down to the knee, parallel to the great axis of the femur. Note the continuous femoral block (CFB) previously achieved and dressed.

Assessment of Renal Effects of Sevoflurane in Elderly Patients Using Urinary Markers

To the Editor:

Although sevoflurane anesthesia has been shown not to cause nephrotoxicity in adults with normal renal function, its effect in patients with impaired renal function or in the elderly has not been thoroughly investigated. Recently, urinary albumin has gained attention as a marker of postanesthetic renal injury in surgical patients (1), but there is no agreement on how the results of studies should be interpreted. At our institution, we have investigated the effects of inhaled anesthetics on renal function in elderly patients. We present the data of our study, in which urinary albumin, α_1 microglobulin (MG), β_2 MG, and *N*-acetyl- β -D-glucosaminidase (NAG) were used as markers of renal injury in elderly patients anesthetized with sevoflurane.

Thirteen patients aged ≥ 70 yr undergoing gastrectomy were randomly assigned to receive either sevoflurane anesthesia ($n = 7$; mean age 77.6 yr) or isoflurane anesthesia ($n = 6$; mean age 78.5 yr). We used routine anesthetic techniques for our institution in this study, i.e., local epidural anesthesia combined with inhaled anesthesia (3 L/min air, 2 L/min oxygen, and either sevoflurane or isoflurane). A urine sample was collected via a catheter before anesthesia, and cumulative urine samples were then collected during and after anesthesia (immediately before surgery; 2 h after the start of surgery; at the end of surgery; and 3 h and Days 1, 3, and 7 after anesthesia).

There were no significant differences in patient demographics. The mean minimum alveolar anesthetic concentration-hour was 5.1 for the sevoflurane group and 3.7 for the isoflurane group. The mean urinary albumin excretion was 65.0 mg/g creatinine (gCr) and 44.4 mg/gCr before anesthesia, which significantly increased to 147.9 mg/gCr and 196.9 mg/gCr 2 h after the start of surgery, sustained similar values 3 h after anesthesia, and returned to close to the preanesthetic values on Postanesthesia Day 1 in the sevoflurane group and the isoflurane group, respectively. No significant difference was found between the two groups, and the increase in urinary albumin excretion indicated that transient glomerular injury occurred with both anesthetics. The mean urinary α_1 and β_2 MG levels were 9.3 mg/gCr and 0.81 mg/gCr in the sevoflurane group and 7.4 mg/gCr and 0.70 mg/gCr in the isoflurane group before anesthesia, showed a gradual but significant increase in both groups during anesthesia, and reached 31.4 mg/gCr and 6.20 mg/gCr in the sevoflurane group and 44.1 mg/gCr and 10.9 mg/gCr in the isoflurane group by 3 h after anesthesia. The values of α_1 and β_2 MG then temporally dropped on Postanesthesia Day 1, but they increased again on Day 3 in both groups and decreased again on Day 7 (cause unknown). The mean urinary NAG also began to increase during anesthesia to significantly higher levels than the preanesthetic values (18.9 mg/gCr in the sevoflurane group and 16.9 mg/gCr in the isoflurane group), reached a peak 3 h after anesthesia (40.6 mg/gCr in the sevoflurane group and 35.7 mg/gCr in the isoflurane group), but returned to almost the preanesthetic values on Postanesthesia Day 1. The changes in the urinary enzyme levels indicated the presence of transient renal tubular injury in both groups.

In conclusion, using urinary markers, we found that sevoflurane and isoflurane anesthesia in combination with epidural anesthesia resulted in similar degrees of mild, transient, glomerular, and tubular functional impairment in elderly surgical patients undergoing gastrectomy.

Kokichi Hase, MD
Kazuko Meguro, MD
Takako Nakamura, MD
*Department of Anesthesiology
Tokyo Metropolitan Geriatric Hospital
Tokyo 173-0015, Japan*

Reference

1. Mazze RI, Jamison RL. Low-flow (1 l/min) sevoflurane. Is it safe? *Anesthesiology* 1997;86:1225-7.

Fat Embolism and Neurological Dysfunction

To the Editor:

The recent case report of delayed neurological deficits after total hip arthroplasty by Ozelsel et al. (1) was instructive. Their experience is strikingly similar to the delayed onset of coma hours after traumatic injury (2,3). They suggest that the "gradual development of cerebral edema" or "release of free-fatty acids and glycerin from the fat cells" may have been responsible for the delay in clinical presentation. There is little evidence that embolic fat, by itself, causes a primary, delayed "toxic effect on brain cells." Even when embolic fat persists for 72 h, there is no evidence of an inflammatory cellular reaction (4). The delayed presentation is more likely due to the time required for transpulmonary passage of emboli (5) and resulting perivascular edema (3).

An important clinical point is illustrated by Case 2. The authors report that an early computed tomographic scan showed no intracranial lesion, whereas characteristic lesions were noted on the magnetic resonance imaging (2,3). The investigation of altered consciousness in the perioperative period cannot exclude fat microembolism without using magnetic resonance imaging. The widespread, hyperintense spots are especially prominent on T₂-weighted images and are predominantly distributed in the subcortical white matter of the cerebral hemispheres (2,3). Their case emphasizes that patients who fail to awaken or who have neuropsychiatric dysfunction after orthopedic or trauma surgery should be investigated with magnetic resonance imaging when cerebral fat embolism is suspected.

Robert J. Byrick, MD, FRCPC
*Department of Anaesthesia
University of Toronto
Toronto, Ontario M5B 1W8, Canada*

References

1. Ozelsel TJP, Hein T, Marcel RJ, et al. Delayed neurological deficit after total hip arthroplasty. *Anesth Analg* 1998;87:1209-10.
2. Yoshida A, Okada Y, Nagata Y, et al. Assessment of cerebral fat embolism by magnetic resonance imaging in the acute stage. *J Trauma* 1996;40:437-40.
3. Satoh H, Kurisu K, Ohtani M, Arita K, et al. Cerebral fat embolism studied by magnetic resonance imaging, transcranial Doppler sonography and single photon emission computer tomography: case report. *J Trauma* 1997;43:345-8.
4. Schemitsch EH, Turchin DC, Anderson GI, et al. Pulmonary and systemic fat embolization after medullary canal pressurization: a hemodynamic and histologic investigation in the dog. *J Trauma* 1998;45:738-42.
5. Byrick RJ, Mullen JB, Mazer CD, Guest CB. Transpulmonary systemic fat embolism: studies in mongrel dogs after cemented arthroplasty. *Am J Respir Crit Care Med* 1994;150:1416-22.

In Response:

Dr. Byrick's comments are well received. The importance of magnetic resonance imaging in determining the cause of a neurological deficit after orthopedic surgery is also important in differentiating microembolic events from hypotensive or hypoxic-induced pathology. The latter produces lesions in watershed areas of the brain, as opposed to the subcortical white matter of the cerebral hemispheres, as described by Dr. Byrick. This can have considerable medicolegal and outcome significance.

During major bilateral joint replacement procedures, in which a significant embolic load may be expected, using the transesophageal echocardiogram intraoperatively may detect whether a large embolic shower occurs (1). If this is seen, then perhaps consideration may be given not to performing surgery on the second side.

The investigative work of Dr. Byrick in the animal laboratory on the transpulmonary passage of fat emboli has directly led to an

understanding of how fat microemboli can reach the brain in patients with no intracardiac shunts (2). With supportive care, these patients may survive, as the fat emboli may slowly pass through the brain circulation as they did the pulmonary circulation, perhaps as demonstrated by the second patient in our report (3).

Michael A. E. Ramsay, MD
*Department of Anesthesiology and Pain Management
Baylor University Medical Center
Dallas, TX 75246*

References

1. Murphy P, Edelist G, Byrick RJ, et al. Relationship of fat embolism to haemodynamic and echocardiographic changes during cemented arthroplasty. *Can J Anaesth* 1997;44:1293-300.
2. Byrick RJ, Mullen JB, Mazer CD, Guest CB. Transpulmonary systemic fat embolism: studies in mongrel dogs after cemented arthroplasty. *Am J Respir Crit Care Med* 1994;69:822-32.
3. Ozelsel TJ, Hein HAT, Marcel RJ, et al. Delayed neurological deficit after total hip arthroplasty. *Anesth Analg* 1998;87:1209-10.

Rediscovering the Obvious

To the Editor:

Garry et al. (1) have simply rediscovered the obvious. In 1994, I described (2) pressure injection suction ventilation (PISV). A single 2.5-mm inner diameter lumen ventilating stylet was used for both inspiration and suction. Instead of manually controlling the timing, a microprocessor servo-regulated the cycle according to continuously measured distal trachea pressure. Frequency, minute ventilation, peak inflation pressure, and end-expiratory pressure could be adjusted.

In a lung model, we achieved a maximal minute ventilation of 12.9 L/min, and in an animal model with complete airway obstruction, we demonstrated stable oxygenation (mean Pao₂ 603 ± 47 mm Hg) and ventilation (mean Paco₂ 19 ± 3 mm Hg).

We envisaged using PISV both during airway emergencies and in situations in which near complete obstruction might be anticipated (as during surgery for laryngeal papillomas). Although directly addressing the concern about using jet ventilation in the presence of airway obstruction, the potential value of PISV has not been appreciated, and (not surprisingly) episodes of life threatening barotrauma associated with jet ventilation recur unabated. I therefore wish Garry et al. good luck in further developing this mode of ventilation.

Anthony Schapera
Bishop, CA 93515

References

1. Garry B, Woo P, Perrault DF, et al. Jet ventilation in upper airway obstruction: description and model lung testing of a new jetting device. *Anesth Analg* 1998;87:915-20.
2. Schapera A, Bainton CR, Kraemer R, et al. A pressurized injection/suction system for ventilation in the presence of complete airway obstruction. *Crit Care Med* 1994;22:326-33.

In Response:

We congratulate Dr. Schapera and thank him for bringing his work (1) to our attention. Although there are similarities in our respective efforts, there are also significant differences.

Three major factors motivated our initial efforts in 1993. (a) Our realization that percutaneous jet ventilation was often ineffective and could be hazardous even with only moderate degrees of upper airway obstruction, particularly on commencement of laryngoscopy and surgical manipulation. Insertion of a tracheoscope or bronchoscope was intermittently required to facilitate exhalation in such patients. (b) An increasing number of patients in our practice required surgical correction of airway stenosis, and many preferred to avoid tracheostomy if possible. (c) New plastic surgical procedures on the larynx emerged, such as laser and fibrin glue "welding" of mucosal grafts, to correct posterior glottic erosion associated with prolonged endotracheal intubation. In such procedures, an endotracheal tube interferes with visibility, and sub- or supraglottic jet ventilation causes the graft to flap in the gas currents.

To avoid tracheotomy, particularly in the latter situation, we designed, made, and tested a number of devices. These were initially designed to facilitate passive gas flow in expiration using Heliox (Mallinckrodt-Puritan-Bennett, Marlborough, MA) as the jetting gas. The jetting cannula was either outside the tube or proximally placed to allow maximal diameter for gas flow in expiration. We had limited success with this design, but the "twin tube" system inspired the use of active expiration as well as inspiration and allowed packing to be placed distal to the operative field, thereby allowing unhindered surgery.

In contrast to Dr. Schapera's design, our total laryngeal bypass device (TLBD) uses manual jetting because the constantly changing size of the laryngeal aperture during surgery requires breath-by-breath adjustment of the expiratory time and suction strength. The TLBD is placed percutaneously in the trachea, in contrast to Dr. Schapera's device, which is placed through the larynx. The TLBD allows airway pressure sensing without requiring a second catheter, as is used in Dr. Schapera's device. The latter sensor catheter requires a second tracheal puncture and placement at some distance from the jet tip to ensure accurate pressure measurement. The "whip" effect of jetting on such a catheter can lead to mucosal damage. The TLBD uses suction throughout respiration, in contrast to the suction cycling of Dr. Schapera's device. Because it allows fully monitored ventilation and uses a simple design, the TLBD has allowed us to successfully proceed with its use in the operating room. We now have institutional approval for ongoing clinical studies with the TLBD and hope to publish our results later this year.

We again thank Dr. Schapera for his letter and agree that episodes of life-threatening barotrauma do occur because of lack of awareness and inappropriate ventilating equipment. His reference to injection/suction ventilation as "obvious" is overly self-effacing, as both his and our (2) devices only appeared recently, after years of experience with jet ventilation. If our literature searches had discovered his work, it would have expedited our efforts and led to earlier clinical studies with our TLBD.

Brendan Garry, MB BCH, FFARCSI
Department of Anesthesia
New England Medical Center
Boston, MA 02111

References

1. Schapera A, Bainton CR, Kraemer R, Lee K. A pressurized injection/suction system for ventilation in the presence of complete airway obstruction. *Crit Care Med* 1994;22:2:326-33.
2. Garry B, Woo P, Perrault DF Jr, et al. Jet ventilation in upper airway obstruction: description and model lung testing of a new jetting device. *Anesth Analg* 1998;87:915-20.

False Comfort from a Pulse Oximeter

To the Editor:

The steady beep of a pulse oximeter with an indicated saturation of 100% is normally quite reassuring. It was not so reassuring to find exactly this, along with a perfect "arterial" waveform, when the pulse oximeter probe was hanging from an IV pole and not attached to a patient.

Our operating rooms are equipped with the Arkive automated record keeping system (Arkive Information Systems, Inc., San Diego, CA). This system uses a plasma display touch screen. When a pulse oximeter probe (Nellcor I-20 [Hayward, CA] attached to a Hewlett Packard Model 54 monitor [Palo Alto, CA]) is placed several inches from this screen (Fig. 1), a normal appearing waveform with a rate of 120 is generated, and the saturation is indicated as 100% (Fig. 2).

In this case, the patient was not yet in the operating room, and it was obvious that an artifact must have been responsible for the trace seen on the screen. This phenomenon was easily reproduced. It is not difficult to envision a scenario in which other operating room



Figure 1.

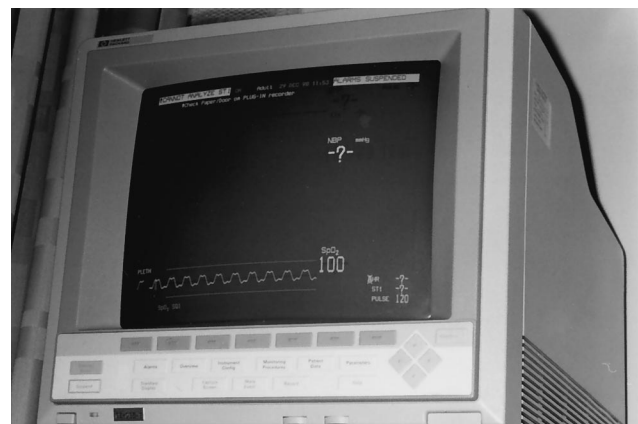


Figure 2.

personnel assist with the placement of monitors before induction and the anesthesiologist is not aware that the reassuring beep of the pulse oximeter is a false comfort. This is yet another reminder to be ever vigilant.

David R. Lindsay, MD
Department of Anesthesiology
Duke University Medical Center
Durham, NC 27710

Use of the Laryngeal Mask Before Tracheal Intubation in a Patient with a Cancerous Nose

To the Editor:

We report a new indication for the laryngeal mask airway.

A 61-year-old man (weight 60 kg) with adenocarcinoma of the nose was scheduled for resection of the tumor and skin flap to the region. The tumor had penetrated the nose skin and was prone to bleeding if pressure was applied. Surgeons requested us not to apply a face mask during the induction of anesthesia to avoid spreading of cancerous exudate to the airway.

Preoperatively, there were no pathological changes to the oropharynx. No difficulty in tracheal intubation or in insertion of the laryngeal mask was predicted. In the operating room, while oxygen was given by "open drop" method, lidocaine 50 mg was injected IV. Anesthesia was induced by propofol 3.3 mg/kg and maintained by continuous infusion of propofol, starting with the rate of $10 \text{ mg} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$. Immediately after the induction of anesthesia, thrusting the jaw forward did not cause body movements, indicating that the depth of anesthesia was adequate for insertion of the laryngeal mask (1). The laryngeal mask was inserted without difficulty. While adequate ventilation via the laryngeal mask was being obtained, vecuronium 8 mg

was given. A few minutes later, the mask was removed, and the trachea was intubated using a laryngoscope. During this procedure, arterial oxygen hemoglobin saturation remained $>98\%$, and there was no bleeding from the lesion. Both anesthesia and operation proceeded uneventfully.

It is possible to insert the laryngeal mask without airway complications immediately after the induction of anesthesia using propofol (1,2); thus, interruption of ventilation of the lungs is usually <1 min. Therefore, if application of a face mask is undesirable during the induction of anesthesia—for example, in a patient with pathological changes to the tissues around the mouth—the laryngeal mask allows adequate ventilation until a muscle relaxant takes its effect and the trachea is intubated.

Takashi Asai, MD, PhD

Sachiko Johmura, MD

Koh Shingu, MD

Department of Anesthesiology

Kansai Medical University

Moriguchi City, Osaka 570-8507, Japan

References

1. Drage MP, Nunez J, Vaughan RS, Asai T. Jaw thrusting as a clinical test to assess the adequate depth of anaesthesia for insertion of the laryngeal mask. *Anaesthesia* 1996;51:1167-70.
2. Brown GW, Patel N, Ellis FR. Comparison of propofol and thiopentone for laryngeal mask insertion. *Anaesthesia* 1991;46:771-2.