



Anesthesiology



The Journal of the American Society of Anesthesiologists, Inc.
American Society of Critical Care Anesthesiologists
Society for Obstetric Anesthesia and Perinatology



CONTENTS

- ◇ THIS MONTH IN ANESTHESIOLOGY 5A
- Effect of Inspired Oxygen Concentration on Formation of Atelectasis Studied
 Parents' Responses to Induction of Anesthesia in Their Children
 Cardiac Outcomes in Elderly Patients Receiving Epidural Analgesia
 Effects of Spinal Opioid Analgesia on Endogenous Analgesia in the Rat
- ◆ EDITORIAL VIEWS
-
- Will Xenon Be a Stranger or a Friend? The Cost, Benefit,
 and Future of Xenon Anesthesia 1
Takahisa Goto, Yoshinori Nakata, and Shigeho Morita
- The Alveolar Epithelium: Suspect or Innocent Bystander? 3
Michael A. Gropper and Jeanine Wiener-Kronish
- SPECIAL ANNOUNCEMENT
-
- Journal-sponsored Activities at the 2003 Annual Meeting:
 A Call for Abstracts 5
- CLINICAL INVESTIGATIONS
-
- ◆ Multicenter Randomized Comparison of the Efficacy and
 Safety of Xenon and Isoflurane in Patients Undergoing
 Elective Surgery 6
*Rolf Rossaint, Matthias Reyle-Hahn, Jochen Schulte am Esch, Jens Scholz,
 Philippe Scherpereel, Benoit Vallet, Francesco Giunta, Monica Del Turco,
 Wilhelm Erdmann, Rob Tenbrinck, Alfons F. Hammerle, and Peter Nagele,
 for the Xenon Study Group*
- This first randomized, controlled multicenter trial on the use of xenon as an
 inhalational anesthetic confirms, in a large group of patients, that xenon
 provides effective and safe anesthesia with the advantage of a more rapid
 recovery when compared with anesthesia using isoflurane-nitrous oxide.

- | | |
|---|--|
| ◇ | Refers to This Month in Anesthesiology |
| ◆ | Refers to Editorial Views |
| ⊕ | See Web Site enhancement |

CONTENTS



Effects of Recruitment Maneuver on Atelectasis in Anesthetized Children 14

Gerardo Tusman, Stephan H. Böhm, Alejandro Tempra, Fernando Melkun, Eduardo García, Elsie Turchetto, Paul G. H. Mulder, and Burkhard Lachmann

In this randomized, controlled study in anesthetized children, patients treated with the combination of lung recruitment maneuver and positive end-expiratory pressure showed less atelectasis than those treated with or without positive end-expiratory pressure alone.

Laryngoscopic Intubation: Learning and Performance 23

Julian T. Mulcaster, Joanna Mills, Orlando R. Hung, Kirk MacQuarrie, J. Adam Law, Saul Pytka, David Imrie, and Chris Field

This study attempts to determine the number of successful laryngoscopic endotracheal intubation exposures required during training to assure competent performance. The authors' model predicts that a trainee has a 90% probability of performing a "good" intubation after 47 trial attempts.

◇ Optimal Oxygen Concentration during Induction of General Anesthesia 28

Lennart Edmark, Kamelia Kostova-Aherdan, Mats Enlund, and Göran Hedenstierna

A routine induction of general anesthesia in adults using 80% oxygen instead of 100% caused minimal atelectasis, but the time margin before unacceptable desaturation occurs was significantly shortened.

Differential Effects of Propofol and Sevoflurane on Heart Rate Variability 34

Noriaki Kanaya, Naoyuki Hirata, Saori Kurosawa, Masayasu Nakayama, and Akiyoshi Namiki

Rapid induction of anesthesia with propofol reduces cardiac parasympathetic tone depending on the depth of hypnosis. Conversely, sevoflurane has little or no effect on cardiac parasympathetic tone.

Developmental Changes of Laryngeal Dimensions in Unparalyzed, Sedated Children 41

Ronald S. Litman, Eric E. Weissend, Dean Shibata, and Per-Lennart Westesson

The authors measured laryngeal dimensions in children aged 2 months-13 years and determined the relationships between these dimensions at the vocal cords, sub-vocal cord level, and cricoid cartilage level during development.

CONTENTS



Difference in Risk Factors for Postoperative Nausea and Vomiting 46

Michaela Stadler, Françoise Bardiau, Laurence Seidel, Adelin Albert, and Jean G. Boogaerts

Some of the risk factors associated with postoperative nausea did not influence vomiting.

Hypothermia and the Approximate Entropy of the Electroencephalogram 53

Warren J. Levy, Enrique Pantin, Sachin Mehta, and Michael McGarvey

A dose-dependent relationship between temperature and the electroencephalogram is developed using approximate entropy to quantify electroencephalogram activity.

◇ Parental Presence during Induction of Anesthesia: Physiological Effects on Parents 58

Zeev N. Kain, Alison A. Caldwell-Andrews, Linda C. Mayes, Shu-Ming Wang, Dawn M. Krivutza, and Megan E. LoDolce

Parental presence during induction of anesthesia is associated with minimal parental physiological stress manifestations.

Performance of Target-controlled Sufentanil Infusion in Obese Patients 65

Gregory Slepchenko, Nicolas Simon, Bernard Goubaux, Jean-Claude Levron, Jean-Pierre Le Moing, and Marc Raucoles-Aimé

The application of a sufentanil pharmacokinetic set derived from a normal-weight population to morbidly obese patients induces an overestimation of the sufentanil concentration directly proportional to the degree of the obesity. However, this inaccuracy (approximately 20%) is acceptable for clinical use of sufentanil in combination with propofol.

■ LABORATORY INVESTIGATIONS

◆ Halogenated Anesthetics Reduce Interleukin-1 β -induced Cytokine Secretion by Rat Alveolar Type II Cells in Primary Culture 74

Olivier Giraud, Serge Mollieux, Corinne Rolland, Véronique Leçon-Malas, Jean-Marie Desmots, Michel Aubier, and Monique Dehoux

Halogenated anesthetics (1 minimum alveolar concentration for 4 h) reduce the interleukin-1 β -induced secretion of interleukin-6, macrophage inflammatory protein-2, and macrophage inflammatory protein-1 secretion by rat alveolar epithelial type II cells.

CONTENTS



Systemic Inflammation Leads to Resistance to Atracurium without Increasing Membrane Expression of Acetylcholine Receptors 82

Heidrun Fink, Peter Lippa, Barbara Mayer, Hilkea Rosenbrock, Jochen Metzger, J. A. Jeevendra Martyn, and Manfred Blobner

Resistance to the neuromuscular effects of atracurium seen during a short-lasting systemic inflammation is related to an increased drug binding to α_1 -acid glycoprotein and not to an increase in the membrane expression of nicotinic acetylcholine receptors.

Isoflurane Pretreatment Inhibits Lipopolysaccharide-induced Inflammation in Rats 89

Roman V. Plachinta, John K. Hayes, Lisa A. Cerilli, and George F. Rich

Pretreatment with 30 min of isoflurane attenuates the detrimental changes in systemic blood pressure, endothelium-dependent vasodilation, and endothelial pathology associated with lipopolysaccharide-induced inflammation in rats.

Hemodynamic and Cardiac Electrophysiologic Effects of Lidocaine-Bupivacaine Mixture in Anesthetized and Ventilated Piglets 96

Jean-Yves Lefrant, Laurent Muller, Jean E. de La Coussaye, Laurent Lalourcey, Jacques Ripart, Pascale A. Peray, Xavier Mazoit, Michel Dauzat, Antoine Sassine, and Jean-Jacques Eledjam

In anesthetized piglets, the alteration of ventricular conduction parameters are greater with 4 mg/kg bupivacaine than with 16 mg/kg lidocaine-4 mg/kg bupivacaine mixture, whereas the alterations of hemodynamic parameters remain similar to those induced by 4 mg/kg bupivacaine.

Inhibitory Effects of Etomidate and Ketamine on Adenosine Triphosphate-Sensitive Potassium Channel Relaxation in Canine Pulmonary Artery 104

Ju-Tae Sohn and Paul A. Murray

Etomidate, but not ketamine, attenuates adenosine triphosphate-sensitive K^+ (K^+_{ATP})-mediated pulmonary vasorelaxation *via* an endothelium-dependent inhibitory effect on vasodilator metabolites of the cyclooxygenase pathway. Both anesthetics attenuate K^+_{ATP} -mediated pulmonary vasorelaxation *via* a direct effect on pulmonary vascular smooth muscle.

CONTENTS



Isoflurane Sensitizes the Cardiac Sarcolemmal Adenosine Triphosphate-Sensitive Potassium Channel to Pinacidil 114

Susanne Gassmayr, Anna Stadnicka, Akihiro Suzuki, Wai-Meng Kwok, and Zeljko J. Bosnjak

Isoflurane sensitizes the cardiac sarcolemmal adenosine triphosphate-sensitive potassium channel to pinacidil. The sensitization effect is abolished by theophylline and wortmannin, suggesting a possible contribution of the adenosine and phospholipid signaling pathways to this effect by isoflurane.

Ketamine Differentially Blocks Sensory Afferent Synaptic Transmission in Medial Nucleus Tractus Solitarius (mNTS) 121

Young-Ho Jin, Timothy W. Bailey, Mark W. Doyle, Bai-yan Li, Kyoung S. K. Chang, John H. Schild, David Mendelowitz, and Michael C. Andresen

Ketamine more potently inhibits afferent glutamatergic synaptic transmission at second-order nucleus tractus solitarius neurons that are capsaicin-sensitive than those that are capsaicin resistant. The results suggest that presynaptic and postsynaptic actions are responsible for differential ketamine actions along these C-type and A-type afferent pathways.

Pharmacokinetic-Pharmacodynamic Modeling of Rocuronium in Case of a Decreased Number of Acetylcholine Receptors: A Study in Myasthenic Pigs 133

Ann De Haes, Johannes H. Proost, Mark H. De Baets, Maurice H. W. Stassen, Martin C. Houwertjes, and J. Mark K. H. Wierda

A new animal model for myasthenia gravis was developed, and a pharmacokinetic-pharmacodynamic modeling study was carried out in myasthenic pigs. A pharmacokinetic-pharmacodynamic model that takes the number of unbound receptors into account was applied and compared to the link model proposed by Sheiner.

■ PAIN AND REGIONAL ANESTHESIA

Continuous Interscalene Analgesia with Ropivacaine 2 mg/ml after Major Shoulder Surgery 143

Georgios EkatoDRAMIS, Alain Borgeat, Gunilla Huledal, Lennart Jeppsson, Lars Westman, and Jan Sjövall

A 48-h continuous interscalene infusion of 6 or 9 ml/h ropivacaine, 2 mg/ml (0.2%), after an initial interscalene block of 30 ml ropivacaine, 7.5 mg/ml (0.75%), provided satisfactory postoperative pain relief after major shoulder surgery and was well tolerated. Plasma concentrations of unbound ropivacaine and unbound 2.6-pipecoloxylidide added together remained well below threshold levels for systemic central nervous toxicity.



CONTENTS

Effects of Preemptive Analgesia on Pain and Cytokine Production in the Postoperative Period 151

Benzion Beilin, Hanna Bessler, Eduard Mayburd, Genady Smirnov, Arie Dekel, Israel Yardeni, and Yehuda Shavit

This study examined the effects of preemptive analgesia continued with patient-controlled epidural analgesia on cytokine production and on pain sensitivity in the postoperative period. Preemptive analgesia resulted in attenuated production of proinflammatory cytokines, known mediators of hyperalgesia, and in reduced pain in the postoperative period.

◇ Preoperative Cardiac Events in Elderly Patients with Hip Fracture Randomized to Epidural or Conventional Analgesia 156

Idit Matot, Arieh Oppenheim-Eden, Ruand Ratrot, Julia Baranova, Elyad Davidson, Sharon Eylon, Amos Peyser, and Meir Liebergall

Compared with conventional analgesia, early administration of continuous epidural analgesia is associated with a lower incidence of preoperative adverse cardiac events in elderly patients with hip fracture who have or are at risk for coronary artery disease.

Comparison of Povidone Iodine and DuraPrep, an Iodophor-in-Isopropyl Alcohol Solution, for Skin Disinfection Prior to Epidural Catheter Insertion in Parturients 164

David J. Birnbach, Warner Meadows, Deborah J. Stein, Odessa Murray, Daniel M. Thys, and Emilia M. Sordillo

The authors evaluated a newly marketed skin disinfectant solution, DuraPrep, which contains an iodophor in isopropyl alcohol, in comparison to povidone iodine solution for back disinfection prior to epidural analgesia. DuraPrep was associated with a longer duration of disinfection, decreased incidence of bacterial regrowth at the site of disinfection, and a decreased incidence of colonization of the epidural catheter.

Transient Up-regulation of Spinal Cyclooxygenase-2 and Neuronal Nitric Oxide Synthase following Surgical Inflammation 170

Sharron Dolan, James G. Kelly, Marie Huan, and Andrea M. Nolan

Cyclooxygenase-2 and neuronal nitric oxide synthase pathways are up-regulated transiently following surgical inflammation. These enzymes may provide a target pathway for the management of postoperative hypersensitivity and pain.

CONTENTS



On the Mechanism by Which Epinephrine Potentiates Lidocaine's Peripheral Nerve Block 181

Catherine J. Sinnott, Lawrence P. Cogswell III, Anthony Johnson, and Gary R. Strichartz

Through a combination of neurobehavioral and neurochemical assays, the changes produced by epinephrine in functional blockade and in neural content of lidocaine were compared. Potentiation of analgesia and prolongation of block by epinephrine can be explained by an enhancement of lidocaine entry into the slowly emptying "effector compartment" of the nerve shortly after injection rather than by a reduction in the rate of clearance of drug from the nerve.

Comparison of the Visceral Antinociceptive Effects of Spinally Administered MPV-2426 (Fadolmidine) and Clonidine in the Rat 189

Antti Pertovaara and Jaakko Kalmari

Spinal administration of MPV-2426 (fadolmidine), a selective α_2 -adrenoceptor agonist, induced visceral antinociception in rats with as well as without inflammation of the colon.

◇ Modulation of Peripheral Endogenous Opioid Analgesia by Central Afferent Blockade 195

Thomas K. Schmitt, Shaaban A. Mousa, Alexander Brack, Diego K. Schmidt, Heike L. Rittner, Martin Welte, Michael Schäfer, and Christoph Stein

Effective central inhibition of pain entails a reduced recruitment of opioid-containing immune cells to injured sites.

Intrathecal Lidocaine Reverses Tactile Allodynia Caused by Nerve Injuries and Potentiates the Antiallodynic Effect of the COX Inhibitor Ketorolac 203

Weiya Ma, Wei Du, and James C. Eisenach

Intrathecal lidocaine (100–300 μ g) alleviated tactile allodynia in two neuropathic pain rat models: partial sciatic nerve ligation and selective spinal nerve ligation. Moreover, prior intrathecal lidocaine also potentiated the antiallodynic effect induced by a nonselective cyclooxygenase inhibitor, ketorolac, in spinal nerve ligation rats. Our data suggest that intrathecal lidocaine possibly suppressed the hyperexcitability of the dorsal horn neurons and likely interacted with eicosanoid systems in the spinal dorsal horn.



CONTENTS

Loss of T-type Calcium Current in Sensory Neurons of Rats with Neuropathic Pain 209

J. Bruce McCallum, Wai-Meng Kwok, Michelle Mynlieff, Zeljko J. Bosnjak, and Quinn H. Hogan

This study characterizes the effect of neuropathic injury on low-voltage-activated calcium currents by pharmacological and electrophysiological isolation from high-voltage-activated calcium currents. Loss of these currents significantly reduces total calcium current and increases neuronal excitability, possibly by reducing calcium-activated potassium currents and thereby degrading adaptation to nociceptive signaling.

Spinal Nitric Oxide Contributes to the Analgesic Effect of Intrathecal [D-Pen²,D-Pen⁵]-Enkephalin in Normal and Diabetic Rats 217

Shao-Rui Chen and Hui-Lin Pan

Intrathecal injection of a δ -opioid receptor agonist, [D-Pen²,D-Pen⁵]-enkephalin, dose-dependently produced an analgesic effect in normal rats and a rat model of diabetic neuropathic pain. Furthermore, intrathecal treatment with a neuronal nitric oxide synthase inhibitor or a specific nitric oxide scavenger diminished the analgesic effect of intrathecal [D-Pen²,D-Pen⁵]-enkephalin in both normal and diabetic rats.

Fentanyl Decreases Ca²⁺ Currents in a Population of Capsaicin-responsive Sensory Neurons 223

Thomas S. McDowell

Using capsaicin to identify heat-sensitive nociceptive neurons in *in vitro* cultures of rat sensory neurons, the authors show that the μ -opioid agonist fentanyl had no effect on high-voltage-activated Ca²⁺ currents expressed by nonnociceptive sensory neurons, supporting the clinical finding that opioids have little effect on sensations unrelated to pain. Capsaicin-responsive neurons, on the other hand, could be separated into two populations, one expressing fast-inactivating, opioid-sensitive Ca²⁺ currents, the other expressing slowly inactivating, opioid-insensitive Ca²⁺ currents.

■ ECONOMICS

Estimating Times of Surgeries with Two Component Procedures: Comparison of the Lognormal and Normal Models 232

David P. Strum, Jerrold H. May, Allan R. Sampson, Luis G. Vargas, and William E. Spangler

The lognormal model is superior to the normal model for estimating dual-procedure surgery times.

CONTENTS



■ REVIEW ARTICLE

Perioperative Hearing Impairment 241

Juraj Sprung, Denis L. Bourke, Michael G. Contreras, Mary Ellen Warner, and James Findlay

Hearing impairment can occur after general or spinal anesthesia. The etiology is related to the anesthetic technique as well as the surgical procedure and is the major determinant of the prognosis.

■ CLASSIC PAPERS REVISITED

⊕ Conscious Volunteers Developed Hypoxemia and Pulmonary Collapse When Breathing Air and Oxygen at Reduced Lung Volume 258

John F. Nunn

This article is a revisiting of original material published as: Nunn JF, Coleman AJ, Sachithanandan T, Bergman NA, Laws JW: Hypoxaemia and atelectasis produced by forced expiration. *Br J Anaesth* 1965; 37:3-12.

■ CASE REPORTS

Late Onset of Cortical Blindness in a Patient with Severe Preeclampsia Related to Retained Placental Fragments 261

Didier Delefosse, Emmanuel Samain, Annick Helias, Jean-Marc Regimbeau, Bruno Deval, Eviane Farah, and Jean Marty

The Use of WuScope Fiberoptic Laryngoscopy for Tracheal Intubation in Complex Clinical Situations 263

Juraj Sprung, Toby Weingarten, and John Dilger

Hemodynamic Instability and Delayed Emergence from General Anesthesia Associated with Inadvertent Intrathecal Baclofen Overdose 265

Michael A. Lyew, Christina Mondy, Susan Eagle, and Sandra E. Chernich

Selective Lobar Bronchial Blockade following Contralateral Pneumonectomy 268

Ju-Mei Ng and Philip M. Hartigan

Convulsions and Refractory Ventricular Fibrillation after Intrathecal Injection of a Massive Dose of Tranexamic Acid 270

Huei-Ming Yeh, Hon-Ping Lau, Pei-Lin Lin, Wei-Zen Sun, and Martin S. Mok

Continued on page 28A



CONTENTS

<p>Open Chest Tension Pneumothorax during Lung Volume Reduction Surgery <i>via</i> Sternotomy</p> <p><i>Matt Schlossberg, Patrick Ross, and Mark A. Gerhardt</i></p>	272
<p>■ LABORATORY REPORT</p> <hr style="border: 0.5px solid red;"/>	
<p>Repeated or Prolonged Isoflurane Exposure Reduces Mitochondrial Oxidizing Effects</p> <p><i>Shinji Kohro, Quinn H. Hogan, Yuri Nakae, Michiaki Yamakage, and Zeljko J. Bosnjak</i></p>	275
<p>■ CORRESPONDENCE</p> <hr style="border: 0.5px solid red;"/>	
<p>Does Pancuronium Cause Prolonged Postoperative Intubation in Cardiac Patients?</p> <p><i>Victor C. Baum</i></p>	279
<p>In Reply <i>Glenn S. Murphy, Joseph W. Szokol, Jeffery S. Vender, and Jesse H. Marymont</i></p>	279
<p>Preemptive Analgesia: What Do We Do Now?</p> <p><i>Allan Gottschalk and E. Andrew Ochroch,</i></p>	280
<p>In Reply <i>Steen Møiniche, Henrik Kehlet, and Jørgen B. Dahl</i></p>	281
<p>Myocardial Ischemic Preconditioning Decreases Postischemic Oxygen Free Radical Production</p> <p><i>Yaacov Gozal and Benjamin Drenger</i></p>	281
<p>In Reply <i>Jost Müllenheim and Wolfgang Schlack</i></p>	282
<p>Bispectral Index and Mitochondrial Myopathies</p> <p><i>Gregory C. Allen</i></p>	282
<p>In Reply <i>Philip G. Morgan, Charles L. Hoppel and Margaret M. Sedensky</i></p>	283
<p>■ REVIEWS OF EDUCATIONAL MATERIAL</p>	284
<p>■ REPORT OF SCIENTIFIC MEETING</p>	286

CONTENTS

**■ ANNOUNCEMENT****Announcement and Call for Abstracts: Annual Journal Symposium****287****INSTRUCTIONS FOR AUTHORS**

The Instructions for Authors are published in the January and July issues. They may be found on page 288 of this issue and at www.anesthesiology.org

WEB SITE ANNOUNCEMENT

Full-text articles are now available on-line at www.anesthesiology.org

ANESAV is a code word ("coden") used by the Chemical Abstract Service to identify the journal.

Manuscripts for publication, correspondence relating to editorial management, and letters to the editor should be mailed to Michael M. Todd, M.D., Anesthesiology Editorial Office, Department of Anesthesia, The University of Iowa, 6546 John Colloton Pavilion, 200 Hawkins Drive, Iowa City, Iowa 52242-1009. Books, educational material, and scientific meeting reports should be mailed to James C. Eisenach, M.D., Department of Anesthesia, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, North Carolina 27157-1009. All articles are accepted for publication with the understanding that they are contributed exclusively to this Journal and become the property of the American Society of Anesthesiologists, Inc. Statements or opinions expressed in the Journal reflect the views of the author(s) and do not represent official policy of the American Society of Anesthesiologists unless so stated. For details and recommendations concerning the preparation of manuscripts see *GUIDE FOR AUTHORS*, which appears in the January and July issues. Advertising and related correspondence should be addressed to Advertising Manager, *ANESTHESIOLOGY*, Lippincott Williams & Wilkins, 530 Walnut Street, Philadelphia, Pennsylvania 19106. Publication of an advertisement in *ANESTHESIOLOGY* does not constitute endorsement by the Society or Lippincott Williams & Wilkins, Inc. of the product or service described therein or of any representations made by the advertiser with respect to the product or service.