Anesthesiology

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

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2005 JOURNAL/SOAP SPECIAL SESSION

◇ Heart Rate Variability–guided Prophylactic Treatment of Severe Hypotension after Subarachnoid Block for Elective Cesarean Delivery **635**

Robert Hanss, Berthold Bein, Helga Francksen, Wiebke Scherkl, Martin Bauer, Volker Doerges, Markus Steinfath, Jens Scholz, and Peter H. Tonner

Patients scheduled to undergo elective cesarean delivery during subarachnoid block were randomly assigned to a control group or a prophylactic treatment group guided by low-to-high frequency ratio of heart rate variability. In control patients, baseline low-to-high frequency ratio was highly correlated to severity of hypotension after spinal anesthesia. Patients with increased low-to-high frequency before subarachnoid block were prophylactically treated with either vasopressor or colloid infusion. In these patients, the incidence of hypotension was significantly reduced.

◇ β_2-Adrenoceptor Genotype Affects Vasopressor Requirements during Spinal Anesthesia for Cesarean Delivery **644**

Richard M. Smiley, Jean-Louis Blouin, Maria Negron, and Ruth Landau

Women who were homozygous for Gly16 or Glu 27 of the β_2 adrenoceptor required less vasopressor to maintain blood pressure after spinal anesthesia for cesarean delivery than women with other genotypes of the receptor.

Uterine Cervical Afferents in Thoracolumbar Dorsal Root Ganglia Express Transient Receptor Potential Vanilloid Type 1 Channel and Calcitonin Gene–related Peptide, but Not P2X3 Receptor and Somatostatin **651**

Chuanyao Tong, Dawn Conklin, Brittany B. Clyne, Jennifer D. Stanislaus, and James C. Eisenach

Uterine cervical afferents in the hypogastric nerve, which likely transmit the pain of cervical dilation, express the heat-sensitive and mechanosensitive channel transient receptor potential vanilloid type 1 and the excitatory neuropeptide calcitonin gene–related peptide. Surprisingly, these afferents, unlike somatic or colonic visceral C fibers, do not express the adenosine triphosphate–responsive receptor P2X3 or contain the inhibitory neuropeptide somatostatin, indicating a unique phenotype.

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◆ Prognosis Value of Plasma S100B Protein Levels after Subarachnoid Aneurysmal Hemorrhage **658**

Nicolas Weiss, Paola Sanchez-Peña, Sabine Roche, Jean L. Beaudeux, Chantal Colonne, Pierre Coriat, and Louis Puybasset

The time course of S100B is significantly increased in patients with subarachnoid aneurysmal hemorrhage and high World Federation of Neurological Surgeons and Fisher scores and in patients undergoing surgery *versus* coiling. The mean daily S100B value measured over 8 days is an independent prognostic tool for 6-month outcome in these patients (cutoff of 0.4 μg/l).

◆ Reversal of Rocuronium-induced Neuromuscular Block by the Selective Relaxant Binding Agent Sugammadex: A Dose-finding and Safety Study **667**

Iben F. Sorgenfrei, Kathrine Norrild, Per Bo Larsen, Jakob Stensballe, Doris Østergaard, Martine E. Prins, and Jørgen Viby-Mogensen

At doses of 2.0 mg/kg or greater, sugammadex (Org 25969) safely reversed 0.6 mg/kg rocuronium–induced neuromuscular block in a dose-dependent manner. Sugammadex enhanced renal excretion of rocuronium and was excreted unchanged by the kidneys.

◇ Atlantoaxial Subluxation in Different Intraoperative Head Positions in Patients with Rheumatoid Arthritis **675**

Daisaku Tokunaga, Hitoshi Hase, Yasuo Mikami, Tatsuya Hojo, Kazuya Ikoma, Yoichiro Hatta, Masashi Ishida, Daniel I. Sessler, Toshiki Mizobe, and Toshikazu Kubo

This study investigated head position during general anesthesia for the patients with rheumatoid arthritis and atlantoaxial subluxation. The results showed that protrusion position using a flat pillow and a donut-shaped pillow during general anesthesia reduced anterior atlantodental intervals.

Preoperative Evaluation of Extension Capacity of the Occipitoatlantoaxial Complex in Patients with Rheumatoid Arthritis: Comparison between the Bellhouse Test and a New Method, Hyomental Distance Ratio **680**

Ichiro Takenaka, Tamao Iwagaki, Kazuyoshi Aoyama, Hiroshi Ishimura, and Tatsuo Kadoya

This study evaluated the accuracy of the Bellhouse test and a new method, the hyomental distance ratio, in identifying rheumatoid patients with a reduced extension capacity of the occipitoatlantoaxial complex. The Bellhouse test was not clinically reliable, whereas the ratio was a good predictor of the extension capacity.

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Titration of Propofol for Anesthetic Induction and Maintenance Guided by the Bispectral Index: Closed-loop *versus* Manual Control: A Prospective, Randomized, Multicenter Study **686**

Ngai Liu, Thierry Chazot, Antoine Genty, Alain Landais, Aymeric Restoux, Kathleen McGee, Pierre-Antoine Laloë, Bernard Trillat, Luc Barvais, and Marc Fischler

This study demonstrates that a closed-loop system is clinically feasible, reliable, and safe throughout anesthesia, when compared with a manual titration of propofol guided by the Bispectral Index.

A New Equal Area Method to Calculate and Represent Physiologic, Anatomical, and Alveolar Dead Spaces **696**

Yongquan Tang, Martin J. Turner, and A. Barry Baker

This study introduces a new graphical method for the calculation and representation of physiologic dead space. This method uses the same principle and methodology as the Fowler equal area method, which is commonly used for the estimation of anatomical dead space.

An Evaluation of Transcutaneous Carbon Dioxide Partial Pressure Monitoring during Apnea Testing in Brain-dead Patients **701**

Benoît Vivien, Frédéric Marmion, Sabine Roche, Catherine Devilliers, Olivier Langeron, Pierre Coriat, and Bruno Riou

During the apnea test in brain-dead patients, a transcutaneous carbon dioxide partial pressure of 60 mmHg has a predictive positive value of 100% in predicting that the target threshold of arterial carbon dioxide partial pressure of 60 mmHg has been reached. This may allow a significant reduction in the duration of the apnea test and consecutively limit occurrence of complications such as hypoxemia and hypotension.

Spectral Entropy as a Measure of Hypnosis in Children **708**

Jaakko G. M. Klockars, Arja Hiller, Seppo Ranta, Pia Talja, Mark J. van Gils, and Tomi Taivainen

Spectral Entropy may be a useful tool for measuring the level of hypnosis in anesthetized children and seems to perform as well as Bispectral Index. In infants, the clinical usefulness of both these electroencephalogram-derived methods must be evaluated in further controlled studies.

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◆ Reversal of Profound Rocuronium Neuromuscular Blockade by Sugammadex in Anesthetized Rhesus Monkeys **718**

Hans D. de Boer, Jan van Egmond, Francien van de Pol, Anton Bom, and Leo H. D. J. Booij

Reversal of neuromuscular blockade can be accomplished by chemical encapsulation of rocuronium by sugammadex, a synthetic γ-cyclodextrin derivative. Sugammadex can rapidly reverse profound neuromuscular blockade induced by rocuronium in anesthetized rhesus monkeys.

◆ Activation and Inhibition of Human Muscular and Neuronal Nicotinic Acetylcholine Receptors by Succinylcholine **724**

Malin Jonsson, Michael Dabrowski, David A. Gurley, Olof Larsson, Edwin C. Johnson, Bertil B. Fredholm, and Lars I. Eriksson

Succinylcholine does not inhibit the presynaptic $\alpha 3\beta 2$ nicotinic autoreceptor expressed in *Xenopus* oocytes at clinically relevant concentrations, which provides a possible mechanistic explanation for the lack of tetanic fade in succinylcholine-induced neuromuscular blockade. Cardiovascular side effects of succinylcholine are not mediated *via* direct activation of the ganglionic $\alpha 3\beta 4$ subtype because succinylcholine does not activate the neuronal nicotinic acetylcholine receptors.

Comparison of Arginine Vasopressin, Terlipressin, or Epinephrine to Correct Hypotension in a Model of Anaphylactic Shock in Anesthetized Brown Norway Rats **734**

Pascale Dewachter, Valérie Jouan-Hureaux, Isabelle Lartaud, Gaëlle Bello, Nicole de Talancé, Dan Longrois, and Paul Michel Mertes

Anaphylactic shock in ovalbumin-sensitized anesthetized rats as compared with a model of nicardipine-induced arterial hypotension of similar magnitude was characterized by significantly lower concentrations of endogenous plasma endogenous arginine vasopressin. Exogenous arginine vasopressin and epinephrine had comparable effects on mean arterial pressure and heart rate values, whereas terlipressin was ineffective. For lower doses, no differences were observed for skeletal muscle tissue oxygen partial pressure values between arginine vasopressin and epinephrine, whereas terlipressin resulted in a faster decrease.

The Well-being Model: A New Drug Interaction Model for Positive and Negative Effects **742**

Eleonora Zanderigo, Valentina Sartori, Gorazd Sveticic, Thomas Bouillon, Peter Schumacher, Manfred Morari, and Michele Curatolo

The authors present a method to study drug interactions considering both positive and negative effects.

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Halothane differentially inhibits β_1 versus β_2 adrenergic receptor activation of guanosine nucleotide exchange at the α subunit of the stimulatory heterotrimeric G protein.

Propofol Inhibits Phosphorylation of *N*-methyl-D-aspartate Receptor NR1 Subunits in Neurons **763**

Seth Kingston, Limin Mao, Lu Yang, Anish Arora, Eugene E. Fibuch, and John Q. Wang

At clinically relevant concentrations, the general anesthetic propofol inhibits *N*-methyl-D-aspartate receptor phosphorylation in neurons.

◇ Xenon Impairs Neurocognitive and Histologic Outcome after Cardiopulmonary Bypass Combined with Cerebral Air Embolism in Rats **770**

Bettina Jungwirth, M. Lucia Gordan, Manfred Blobner, Wolfgang Schmehl, Eberhard F. Kochs, and G. Burkhard Mackensen

Xenon impairs fine motor, cognitive, and histologic outcome after cardiopulmonary bypass combined with cerebral air embolism in rats. Potential neuroprotective properties of xenon as recently revealed in a model of cardiopulmonary bypass in rats may have been offset by the effects of xenon on cerebral air embolism.

Isoflurane, but Not Sevoflurane, Increases Transendothelial Albumin Permeability in the Isolated Rat Lung: Role for Enhanced Phosphorylation of Caveolin-1 **777**

Guochang Hu, David E. Schwartz, Ayesha N. Shajahan, David J. Visintine, M. Ramez Salem, George J. Crystal, Ronald F. Albrecht, Stephen M. Vogel, and Richard D. Minshall

Isoflurane, but not sevoflurane, increased pulmonary endothelial albumin permeability through enhancement of caveolae-mediated albumin transport. This may be related to enhanced phosphorylation of caveolin-1.

Discontinuous Monitoring of Propofol Concentrations in Expired Alveolar Gas and in Arterial and Venous Plasma during Artificial Ventilation **786**

Martin Grossherr, Andreas Hengstenberg, Torsten Meier, Leif Dibbelt, Klaus Gerlach, and Hartmut Gehring

Propofol can be detected and quantified in expired alveolar gas by gas chromatography–mass spectrometry. The relation between propofol concentrations measured in expired alveolar gas and in mixed venous and arterial plasma is demonstrated in three goats and three pigs.

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Intravenous Anesthetics Inhibit Capacitative Calcium Entry in Pulmonary Venous Smooth Muscle Cells **791**

Sachiko Shimizu, Xueqin Ding, and Paul A. Murray

Intravenous anesthetics attenuate capacitative calcium entry *via* tyrosine kinase–dependent and –independent pathways in pulmonary venous smooth muscle cells.

PAIN AND REGIONAL ANESTHESIA

Propofol Increases Presynaptic Inhibition of Ia Afferents in the Intact Human Spinal Cord **798**

Jan H. Baars, Falk von Dincklage, Josephine Reiche, and Benno Rehberg

Propofol decreases heteronymous Ia facilitation from quadriceps femoris afferents to soleus motoneurons, which demonstrates an enhanced presynaptic inhibition in humans.

Bupivacaine Inhibits Activation of Neuronal Spinal Extracellular Receptor–activated Kinase through Selective Effects on Ionotropic Receptors **805**

Fumi Yanagidate and Gary R. Strichartz

Bupivacaine suppresses the activation of spinal extracellular receptor–activated kinase by the selective inhibition of inotropic receptors, with little effect on this kinase's activation by G protein–coupled receptors for glutamate, bradykinin, or substance P or on activation by direct chemical stimulators of protein kinase A or protein kinase C. Because extracellular receptor–activated kinase is a signal transduction enzyme acting on many posttranslational and genomic pathways, this effect implies broad actions of neuraxial bupivacaine *via* a postsynaptic mechanism on spinal pain pathways.

Subpopulation of Dorsal Horn Neurons Displays Enhanced *N*-methyl-D-aspartate Receptor Function after Chronic Morphine Exposure **815**

Min Zhao and Daisy Therese Joo

Electrophysiologic studies identified a subpopulation of small-capacitance, tonic firing dorsal horn neurons that, after chronic treatment with morphine, show an increase in *N*-methyl-D-aspartate current that is attenuated by cotreatment with either an *N*-methyl-D-aspartate or a μ-opioid receptor antagonist. Enhanced release of physiologic Mg^{2+} block from *N*-methyl-D-aspartate receptors after high-concentration but not low-concentration morphine exposure in these sensory spinal neurons may underlie the development of hyperalgesia or of tolerance to chronic opioid administration.

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Predicting Patient Nonappearance for Surgery as a Scheduling Strategy to Optimize Operating Room Utilization in a Veterans' Administration Hospital **826**

Marc D. Basson, Timothy W. Butler, and Harish Verma

The probability of patient nonappearance for surgery may be predicted by rates of preoperative noncompliance with other healthcare encounters. Such data can be used to guide operating room scheduling, placing patients unlikely to appear at the end of the day to improve operating room utilization and reduce overtime.

REVIEW ARTICLE

Analgesic Treatment after Laparoscopic Cholecystectomy: A Critical Assessment of the Evidence **835**

Thue Bisgaard

The complexity of pain after laparoscopic cholecystectomy suggests that effective treatment of postoperative pain should be multimodal. Current evidence supports use of a combined analgesic regimen comprising dexamethasone, incisional local anesthetics, nonsteroidal antiinflammatory drugs (or cyclooxygenase-2 inhibitors), and short-acting opioids when needed.

SPECIAL ARTICLES

Practice Advisory for Intraoperative Awareness and Brain Function Monitoring: A Report by the American Society of Anesthesiologists Task Force on Intraoperative Awareness **847**

The American Society of Anesthesiologists Task Force on Intraoperative Awareness presents a practice advisory to identify risk factors that may be associated with intraoperative awareness, provide decision tools that may enable the clinician to reduce the frequency of unintended intraoperative awareness, stimulate the pursuit and evaluation of strategies that may prevent or reduce the frequency of intraoperative awareness, and provide guidance for the intraoperative use of brain function monitors as they relate to intraoperative awareness.

CME Gerard W. Ostheimer "What's New in Obstetric Anesthesia" Lecture **865**

Brenda A. Bucklin

In 2004, there were significant contributions to the literature in the areas of obstetric anesthesia and obstetrics.

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Perineural Infusion of Local Anesthetics **872**

André P. Boezaart

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Copper Kettle Revisited **881**

Lucien E. Morris

This article is a revisiting of original material published as: Morris LE: A new vaporizer for liquid anesthetic agents. ANESTHESIOLOGY 1952; 13:587–93.

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