Table of Contents

January 2012

Ambulatory Anesthesiology

Special Article: 恶性高热患者从ASC转移到接收医院过程中的指南
(陆丽虹译 薛张纲校)

Special Article: Creation of a Guide for the Transfer of Care of the Malignant Hyperthermia Patient from Ambulatory Surgery Centers to Receiving Hospital Facilities

- Marilyn Green Larach,
- Sharon J. Hirshey Dirksen,
- Kumar G. Belani,
- Barbara W. Brandom,
- Keith M. Metz,
- Michael A. Policastro,
- Henry Rosenberg,
- Arnaldo Valedon,
- and Charles B. Watson


Anesthetic Pharmacology

單次注射肉毒桿菌毒素降低局部和遠處位元點神經傳遞的安全閾值
(刘伍译 马皓琳 李士通校)

A Single Injection of Botulinum Toxin Decreases the Margin of Safety of Neurotransmission at Local and Distant Sites

- Christiane G. Frick,
- Heidrun Fink,
- Manfred Blobner,
- and Jeevendra Martyn


ATP敏感钾通道參與七氟烷和丙泊酚對大鼠糖代謝的不同作用
(龚寅译 陈杰校)
The Involvement of Adenosine Triphosphate-Sensitive Potassium Channels in the Different Effects of Sevoflurane and Propofol on Glucose Metabolism in Fed Rats

  o Takayuki Kitamura,
  o Kanako Sato,
  o Gaku Kawamura,
  o and Yoshitsugu Yamada


肝硬化大鼠異丙酚 ED50 和恢復時間變化
(侯文婷譯 薛張綱校)

**ED**50 and Recovery Times After Propofol in Rats with Graded Cirrhosis

  o Zhenzhou Li,
  o Xuexin Chen,
  o Jinhai Meng,
  o Liqin Deng,
  o Hanxiang Ma,
  o Marie Csete,
  o and Lize Xiong

*Anesth Analg* January 2012 114:117-121; published ahead of print October 14, 2011

人體血清白蛋白中阿片類藥物的結合位點
(毛祖旻譯 馬皓琳 李士通校)

**Opioid Binding Sites in Human Serum Albumin**

  o Renlong Zhou,
  o Jose Manuel Perez-Aguilar,
  o Qingcheng Meng,
  o Jeffery G. Saven,
  o and Renyu Liu


**Technology, Computing, and Simulation**

綜述：麻醉中的閉合回路系統：閉合回路式的液體管理和血流動力學最佳化可否實現？
(丁佳譯 陳傑校)
Review Article: Closed-Loop Systems in Anesthesia: Is There a Potential for Closed-Loop Fluid Management and Hemodynamic Optimization?
   - Joseph Rinehart,
   - Ngai Liu,
   - Brenton Alexander,
   - and Maxime Cannesson

*Anesth Analg* January 2012 114:130-143; published ahead of print September 29, 2011

**Patient Safety**

行大手術患者上呼吸道損傷的流行病學
(黃劍譯 薛張綱校)
*The Epidemiology of Upper Airway Injury in Patients Undergoing Major Surgical Procedures*
   - May Hua,
   - Joanne Brady,
   - and Guohua Li


通過 I-gel™ 聲門上通氣道與 Fastrach™ 喉罩行氣管插管的比較：一項隨機對照試驗
(瞿亦楓譯 李士通 馬皓琳校)
*Tracheal Intubation Through the I-gel™ Supraglottic Airway Versus the LMA Fastrach™: A Randomized Controlled Trial*
   - Antoine Elie Halwagi,
   - Nathalie Massicotte,
   - Alexandre Lallo,
   - Alain Gauthier,
   - Daniel Boudreault,
   - Monique Ruel,
   - and François Girard


**Critical Care, Trauma, and Resuscitation**
6% 羧乙基澱粉 (130/0.4)用於重症患者的液體復蘇：一項最新系統性綜述和薈萃分析
(俞劼 譯 陳傑校)
Fluid Resuscitation with 6% Hydroxyethyl Starch (130/0.4) in Acutely Ill Patients: An Updated Systematic Review and Meta-Analysis
- David J. Gattas,
- Arina Dan,
- John Myburgh,
- Laurent Billot,
- Serigne Lo,
- Simon Finfer,
- and The CHEST Management Committee
Anesth Analg January 2012 114:159-169

Obstetric Anesthesiology

使用神經軸索分娩鎮痛在種族和民族間的差異
(任雲譯 薛張綱校)
Racial and Ethnic Disparities in Neuraxial Labor Analgesia
- Paloma Toledo,
- Jinglu Sun,
- William A. Grobman,
- Cynthia A. Wong,
- Joe Feinglass,
- and Romana Hasnain-Wynia

傷口連續輸注羅呱卡因與硬膜外注射嗎啡用於剖宮產術後鎮痛的比較：一項隨機對照試驗
(陳彬彬譯 馬皓琳 李士通校)
Ropivacaine Continuous Wound Infusion Versus Epidural Morphine for Postoperative Analgesia After Cesarean Delivery: A Randomized Controlled Trial
- Patricia O'Neill,
- Filipa Duarte,
- Isabel Ribeiro,
- Maria João Centeno,
- and João Moreira
Focused Review: Simulation in Obstetric Anesthesia

Stephen D. Pratt

Cardiovascular Effects of Dexmedetomidine Sedation in Children

Jackson Wong, Garry M. Steil, Michelle Curtis, Alexandra Papas, David Zurakowski, and Keira P. Mason

Salvinorin A Pretreatment Preserves Cerebrovascular Autoregulation After Brain Hypoxic/Ischemic Injury via Extracellular Signal-Regulated Kinase/Mitogen-Activated Protein Kinase in Piglets

Diansan Su, John Riley, William M. Armstead, and Renyu Liu
Analgesia

Pain Mechanisms

鞘內注射 Nav1.8 阻滯劑對辣椒素和外周缺血引起的機械痛敏和熱痛覺過敏在誘導期和維持期的不同效應
(滕淩雅譯 陳傑校)

The Differential Effect of Intrathecal Nav1.8 Blockers on the Induction and Maintenance of Capsaicin- and Peripheral Ischemia-Induced Mechanical Allodynia and Thermal Hyperalgesia

- Ji-Young Moon,
- Sunok Song,
- Seo-Yeon Yoon,
- Dae-Hyun Roh,
- Suk-Yun Kang,
- Ji-Ho Park,
- Alvin J. Beitz,
- and Jang-Hern Lee


靜脈注射瑞芬太尼導致短暫撤藥性痛覺超敏，與注射時間相關
(姚敏敏譯 薛張綱校)

Intravenous Infusion of Remifentanil Induces Transient Withdrawal Hyperalgesia Depending on Administration Duration in Rats

- Ryosuke Ishida,
- Tetsuro Nikai,
- Tatsuya Hashimoto,
- Toshiko Tsumori,
- and Yoji Saito


Regional Anesthesia

下腹部手術病人在超聲引導下行腹直肌鞘阻滯後血漿羅呱卡因濃度
(張怡譯 馬皓琳 李士通校)
Brief Report: Plasma Ropivacaine Concentrations After Ultrasound-Guided Rectus Sheath Block in Patients Undergoing Lower Abdominal Surgery

- Morito Wada,
- Masato Kitayama,
- Hiroshi Hashimoto,
- Tsuyoshi Kudo,
- Mihoko Kudo,
- Norikazu Takada,
- and Kazuyoshi Hirota

*Anesth Analg January 2012 114:230-232*

簡報：超聲引導下腸窩坐骨神經阻滯時向脛腓神經分叉處頭向和尾向注射的效果比較：
一項前瞻性隨機研究
（孫曉瓊譯 陳傑校）

Brief Report: A Comparison of an Injection Cephalad or Caudad to the Division of the Sciatic Nerve for Ultrasound-Guided Popliteal Block: A Prospective Randomized Study

- Geneviève Germain,
- Simon Lévesque,
- Nicolas Dion,
- Marie-Josée Nadeau,
- Dany Coté,
- Pierre C. Nicole,
- and Alexis F. Turgeon

*Anesth Analg January 2012 114:233-235; published ahead of print October 14, 2011*

綜述：超聲引導下閉孔神經阻滯：平面內短軸技術
（張玥琪譯 薛張綱校）

Brief Report: Ultrasound-Guided Obturator Nerve Block: A Proximal Interfascial Technique

- Ahmad Muhammad Taha

*Anesth Analg January 2012 114:236-239; published ahead of print October 24, 2011*

ATP 敏感鉀通道參與七氟烷和丙泊酚對大鼠糖代謝的不同作用

The Involvement of Adenosine Triphosphate-Sensitive Potassium Channels in the Different Effects of Sevoflurane and Propofol on Glucose Metabolism in Fed Rats

Takayuki Kitamura, MD, Kanako Sato, MD, Gaku Kawamura, MD and Yoshitsugu Yamada, MD, PhD
BACKGROUND: Recently, we reported marked differences in the effects of sevoflurane and propofol on glucose metabolism; glucose use is impaired by sevoflurane, but not by propofol. Opening of adenosine triphosphate-sensitive potassium channels (K_{ATP} channels) in β islet cells attenuates insulin secretion, while inhibition of K_{ATP} channels in β islet cells increases insulin secretion. It is reported that volatile anesthetics open K_{ATP} channels, whereas propofol inhibits K_{ATP} channels. In this study, we examined the effects of sevoflurane and propofol on glucose metabolism under normovolemic and hypovolemic conditions, focusing on insulin secretion.

METHODS: Anesthesia was induced with sevoflurane (3% in 1 L/min oxygen) in all rats. After surgical preparation, rats were assigned to 2 groups. Anesthesia was maintained with sevoflurane (2% in 1 L/min oxygen) in the 1st group, and with propofol (a bolus dose of 30 mg/kg followed by continuous infusion at a rate of 30 mg · kg^{-1} · h^{-1}) in the 2nd group. Each group was divided into 3 subgroups: rats without pretreatment, rats pretreated with glibenclamide, and rats pretreated with nicorandil. After a 30-minute stabilization period, we withdrew 15 mL/kg of
blood to induce hypovolemia. We evaluated glucose metabolism under both normovolemic and hypovolemic conditions by measuring blood glucose levels and plasma insulin levels.

**RESULTS:** Under both normovolemia and hypovolemia, glucose levels in rats anesthetized with sevoflurane were significantly higher than those in rats anesthetized with propofol, and insulin levels in rats anesthetized with sevoflurane were significantly lower than those in rats anesthetized with propofol. Glibenclamide, a $\text{K}_\text{ATP}$ channel inhibitor, significantly decreased glucose levels and significantly increased insulin levels under sevoflurane anesthesia, suggesting that sevoflurane decreases insulin secretion by opening $\text{K}_\text{ATP}$ channels in $\beta$ islet cells. Glibenclamide significantly decreased glucose levels and significantly increased insulin levels under propofol anesthesia as well; however, insulin levels in rats pretreated with glibenclamide under propofol anesthesia were much higher than those in rats pretreated with glibenclamide under sevoflurane anesthesia. Furthermore, insulin levels in rats without pretreatment under propofol anesthesia seemed to be equal to or higher than those in rats pretreated with glibenclamide under sevoflurane anesthesia. These results suggest that there are marked differences in the effects of sevoflurane and propofol on insulin secretion regulated by $\text{K}_\text{ATP}$ channels in $\beta$ islet cells. Nicorandil, a $\text{K}_\text{ATP}$ channel opener, produced no significant effects on glucose metabolism under both sevoflurane and propofol anesthesia.

**CONCLUSIONS:** Insulin secretion regulated by $\text{K}_\text{ATP}$ channels in $\beta$ islet cells is involved, at least in part, in the different effects of sevoflurane and propofol on glucose metabolism.
First, the further description and development of dynamic predictors of fluid responsiveness provides a strong parameter for use as a control variable to guide fluid administration. Second, rapid advances in noninvasive monitoring of cardiac output and other hemodynamic variables make goal-directed therapy applicable for a wide range of patients in a variety of clinical care settings. In this article, we review the history of closed-loop controllers in clinical care, discuss the current understanding and limitations of the dynamic predictors of fluid responsiveness, and examine how these variables might be incorporated into a closed-loop fluid administration system.

**Fluid Resuscitation with 6% Hydroxyethyl Starch (130/0.4) in Acutely Ill Patients: An Updated Systematic Review and Meta-Analysis**

David J. Gattas, MBBS, MMed, FCICM*†, Arina Dan, MBBS, FCICM*‡, John Myburgh, MBBCh, PhD, FCICM*∥, Laurent Billot, MSc, DEA, AStat¶, Serigne Lo, PhD, AStat¶, Simon Finfer, MBBS, FRCP, FRCA, FCICM,*# and The CHEST Management Committee

From the *Critical Care & Trauma Division, The George Institute for Global Health; †Royal Prince Alfred Hospital, University of Sydney; ‡Liverpool Hospital, Sydney; ∥St. George Hospital, Sydney; ¶The George Institute for Global Health; and #Royal North Shore Hospital, Sydney, Australia.

Anesth Analg January 2012 114:159-169

**BACKGROUND:** Recent research suggests that 6% hydroxyethyl starch (HES) 130/0.4 is one of the most frequently used resuscitation fluids worldwide. The retraction of studies evaluating its use necessitates a reevaluation of available evidence regarding its safety and efficacy.

**METHODS:** We performed a systematic review and meta-analysis of unretracted randomized controlled trials comparing the effects of 6% HES 130/0.4 with other colloid or crystalloid...
solutions on mortality, acute kidney injury/failure, and bleeding in acutely ill or perioperative patients. A sensitivity analysis including the data from retracted studies was also conducted.

**RESULTS:** Overall, 36 studies reporting 2149 participants met the inclusion criteria, of which 11 (n = 541) have been retracted. Of the remaining 25 studies, there was a high risk of bias in 17 studies; 19 studies (n = 1246) were conducted in perioperative patients and 6 (n = 362) in critically ill patients. Sixteen studies reported mortality: 104 deaths in 1184 participants. The relative risk of death was 0.95 (95% confidence interval 0.64–1.42, I² = 0%, P = 0.73); including the retracted studies added a further 14 deaths and the relative risk was 0.92 (95% confidence interval 0.63–1.34, I² = 0%, P = 0.95). The data reporting acute kidney injury, red blood cell transfusion, and bleeding were of insufficient quantity and quality and not amenable to meta-analysis.

**CONCLUSIONS:** Published studies are of poor quality and report too few events to reliably estimate the benefits or risks of administering 6% HES 130/0.4. This same conclusion is reached with or without the retracted studies. Given the widespread use of 6% HES 130/0.4, high-quality trials reporting a large number of events are urgently required.

熱點綜述：產科麻醉的模擬訓練

**Focused Review: Simulation in Obstetric Anesthesia**

Stephen D. Pratt, MD

From the Department of Anesthesia, Harvard Medical School, Beth Israel Deaconess Medical Center, Boston, Massachusetts.

Anesth Analg January 2012 114:186-190;

模擬訓練可以被用來教授技術，評價臨床醫生的操作水準，幫助評估監護環境的安全性，提高團隊合作意識。所有這些已成功應用於產科麻醉的模擬。硬膜外置管、插管失敗、失血量估計的類比裝置均可提高麻醉醫生操作的水準。可以對一個住院醫師在處理急診剖腹產中的表現進行測試和評估並考察其在同行中的水準。在分娩病房（現場訓練）進行急診模擬可以幫助確認和糾正潛在的安全隱患（潛在錯誤），並避免使病人受到隱患所造成的危害。最後，模擬訓練可以有效評估和培養團隊手段和行爲。然而現在還不清楚在模擬環境中學習到的技術如何轉化為臨床上更好的應對和護理，以及模擬是否可以提高病人的預後，需要更多的研究來幫助回答這些問題。

（範逸辰 譯 陳傑 校）

Simulation can be used to teach technical skills, to evaluate clinician performance, to help assess the safety of the environment of care, and to improve teamwork. Each of these has been successfully demonstrated in obstetric anesthesia simulation. Task simulators for epidural placement, failed intubation, and blood loss estimation seem to improve performance. Resident performance in an emergency cesarean delivery can be measured and assessed against his/her peers. Running simulated crises on a labor and delivery unit (in situ drills) can help to identify and correct potential safety concerns (latent errors) without exposing patients to the risks associated with these concerns. Finally, simulation can effectively assess and teach teamwork tools and behaviors. It is unclear, however, how well the lessons learned in the simulated environment translate into improved behaviors or better care in the clinical setting, or whether simulation improves patient outcomes. More research is needed to help answer these questions.
The Differential Effect of Intrathecal Nav1.8 Blockers on the Induction and Maintenance of Capsaicin- and Peripheral Ischemia-Induced Mechanical Allodynia and Thermal Hyperalgesia

Ji-Young Moon, DVM, BA*, Sunok Song, MD, PhD†, Seo-Yeon Yoon, DVM, PhD‡, Dae-Hyun Roh, DVM, PhD*, Suk-Yun Kang, MS*, Ji-Ho Park, PhD§, Alvin J. Beitz, PhD∥ and Jang-Hern Lee, DVM, PhD*

Author affiliations are provided at the end of the article.


BACKGROUND: It has been reported that the selective blockade of Nav1.8 sodium channels could be a possible target for the development of analgesics without unwanted side effects. However, the precise role of spinal Nav1.8 in the induction and maintenance of persistent pain, e.g., mechanical allodynia (MA) and thermal hyperalgesia (TH), is not clear. We designed this study to investigate whether spinal Nav1.8 contributes to capsaicin-induced and peripheral ischemia-induced MA and TH.

METHODS: The Nav1.8 blockers, A-803467 or ambroxol, were injected intrathecally either before or after intraplantar capsaicin injection. To evaluate capsaicin-induced neuronal activation in the spinal cord, we quantified the number of Fos-immunoreactive cells in the dorsal horn. In the thrombus-induced ischemic pain model, we determined the differential effect of A-803467 on the induction phase or maintenance phase of MA.

RESULTS: Intrathecal injection of A-803467 (10, 30, 100 nmol) or ambroxol (241, 724, 2410 nmol) before intraplantar injection of capsaicin dose dependently prevented the induction of both MA and TH. However, posttreatment with A-803467 (100 nmol) and ambroxol (2410 nmol) did
not reduce the MA that had already developed, but did significantly suppress capsaicin-induced TH. Moreover, the capsaicin-induced increase of spinal Fos-immunoreactive cells was significantly diminished by pretreatment, but not posttreatment with Nav1.8 blockers. In thrombus-induced ischemic pain rats, repetitive treatments of A-803467 during the induction period also prevented the development of MA, whereas A-803467 treatments during the maintenance period were ineffective in preventing or reducing MA.

CONCLUSIONS: These results demonstrate that spinal activation of Nav1.8 mediates the early induction of MA, but not the maintenance of MA. However, both the induction and maintenance of TH are modulated by the intrathecal injection of Nav1.8 blockers. These findings suggest that early treatment with a Nav1.8 blocker can be an important factor in the clinical management of chronic MA associated with inflammatory and ischemic pain.

Brief Report: A Comparison of an Injection Cephalad or Caudad to the Division of the Sciatic Nerve for Ultrasound-Guided Popliteal Block: A Prospective Randomized Study
Geneviève Germain, MD, Simon Lévesque, MD, Nicolas Dion, MD, Marie-Josée Nadeau, MD, Dany Coté, MD, Pierre C. Nicole, MD and Alexis F. Turgeon, MD, MSc From the Département d'Anesthésie-Réanimation and the Centre de Recherche FRSQ du CHA, Unité de Recherche en Traumatologie-Urgence–Soins Intensifs, Centre Hospitalier Affilié Universitaire de Québec, Hôpital de l'Enfant-Jésus, Université Laval, Québec, Canada.
Anesth Analg Januaty 2012 114:233-235

BACKGROUND: The optimal site for local anesthetic injection during ultrasound-guided sciatic popliteal block remains controversial.

METHODS: Patients were randomized to receive 25 mL ropivacaine 0.75% around the sciatic nerve cephalad to the peroneal-tibial division in group A (n = 51) or caudal to the division in group B (n = 51). The sensory and motor blocks were evaluated every 5 minutes up to 30 minutes.

RESULTS: Rates of complete sensory block and surgical anesthesia were superior in group B (P < 0.0001).

CONCLUSION: The caudad technique provided better surgical anesthesia.

Special Article: Creation of a Guide for the Transfer of Care of the Malignant Hyperthermia Patient from Ambulatory Surgery Centers to Receiving Hospital Facilities
Marilyn Green Larach, MD, FAAP*, Sharon J. Hirshey Dirksen, PhD†, Kumar G. Belani, MBBS, MS‡, Barbara W. Brandom, MD*§, Keith M. Metz, MD, JD, MSA ||, Michael A.
Clinical Problem: Volatile anesthetics and/or succinylcholine may trigger a potentially lethal malignant hyperthermia (MH) event requiring critical care crisis management. If the MH triggering anesthetic is given in an ambulatory surgical center (ASC), then the patient will need to be transferred to a receiving hospital. Before May 2010, there was no clinical guide regarding the development of a specific transfer plan for MH patients in an ASC.

Mechanism by which the statement was generated: A consensual process lasting 18 months among 13 representatives of the Malignant Hyperthermia Association of the United States, the Ambulatory Surgery Foundation, the Society for Ambulatory Anesthesia, the Society for Academic Emergency Medicine, and the National Association of Emergency Medical Technicians led to the creation of this guide.

Evidence for the statement: Most of the guide is based on the clinical experience and scientific expertise of the 13 representatives. The list of representatives appears in Appendix 1. The recommendation that IV dantrolene should be initiated pending transfer is also supported by clinical research demonstrating that the likelihood of significant MH complications doubles for every 30-minute delay in dantrolene administration (Anesth Analg 2010;110:498–507).
Statement: This guide includes a list of potential clinical problems and therapeutic interventions to assist each ASC in the development of its own unique MH transfer plan. Points to consider include receiving health care facility capabilities, indicators of patient stability and necessary report data, transport team considerations and capabilities, implementation of transfer decisions, and coordination of communication among the ASC, the receiving hospital, and the transport team. See Appendix 2 for the guide.

ED50 and Recovery Times After Propofol in Rats with Graded Cirrhosis.

Zhenzhou Li, MD *, Xuexin Chen, MD, PhD *, Jinhai Meng, MD, PhD *, Liqin Deng, MD *, Hanxiang Ma, MD, PhD *, Marie Csete, MD, PhD † and Lize Xiong, MD, PhD ‡

From the *Department of Anesthesiology, General Hospital of Ning Xia Medical University, Yin Chuan, China; †Department of Anesthesiology, University of California San Diego, San Diego, California; and ‡Department of Anesthesiology, Xi Jing Hospital, The Fourth Military University, Xi’an, China.

Anesth Analg January 2012 114:117-121

BACKGROUND: Patients with end-stage liver disease have increased sensitivity to general anesthetics. In this study, we sought to quantify sensitivity to propofol as a function of the degree of liver disease, in a rat model of cirrhosis.

METHODS: Liver disease was induced by carbon tetrachloride (CCl(4)) injections for 6, 9, or 12 weeks in 3 study groups. Control rats received saline injections on the same schedule as CCl(4)-injected rats. A second control (comparison) group was treated with phenobarbital for a week followed by 9 weeks of phenobarbital and 10% ethanol in drinking water. Liver function was assessed by liver function tests and pathologic scoring of liver histology.

RESULTS: Progressively worse cirrhosis was associated with longer CCl(4) treatment by histologic criteria, by hypersplenism, liver to body weight ratios, and liver function tests. The major findings were that mild liver disease (either steatosis or fibrosis) was not associated with increased propofol sensitivity, but recovery times after propofol bolus and propofol infusion were significantly increased in rats with more severe liver fibrosis.
CONCLUSION: Propofol sensitivity is not significantly affected in the setting of mild liver
disease, similar to clinical observations, but end-stage liver disease (fibrosis) is associated with
significantly prolonged time to recovery after propofol infusion. The progressive liver disease
model used in these studies is useful for rigorously studying anesthetic sensitivity as a function
of degree of hepatocellular-fibrotic liver disease.
CONCLUSIONS: The risk of airway injury for patients undergoing major surgical procedures is approximately 1 in 500. Patients with difficult airways as indicated by Mallampati classes III and IV are at significantly increased risk of sustaining airway injury during anesthesia for major surgical procedures.

使用神經軸索分娩鎮痛在種族和民族間的差異
Racial and ethnic disparities in neuraxial labor analgesia.
Paloma Toledo, MD, MPH*, Jinglu Sun, BA*, William A. Grobman, MD, MBA†‡, Cynthia A. Wong, MD*, Joe Feinglass, PhD†§ and Romana Hasnain-Wynia, PhD†§
From the *Department of Anesthesiology, †Center for Healthcare Equity/Institute for Healthcare Studies, ‡Department of Obstetrics and Gynecology, and §Division of General Internal Medicine, Northwestern University, Feinberg School of Medicine, Chicago, IL.

BACKGROUND: Racial and ethnic disparities in the treatment of pain have been well documented, and there is evidence of such disparities in neuraxial analgesia use. Our objectives of this study were to analyze racial/ethnic disparities in neuraxial analgesia use, as well as anticipated use, among laboring Hispanic, African-American, and Caucasian women, and to evaluate sociodemographic, clinical, and decision-making predictors of actual and anticipated neuraxial analgesia use among these women.

METHODS: Laboring women, in a large urban academic hospital, were interviewed using a face-to-face survey to determine individual factors that may influence choice of labor analgesia. After delivery, the type of labor analgesia used was recorded. The primary outcome was use of neuraxial analgesia. Multivariable logistic regression models were estimated to test the
likelihood that race and ethnicity were significantly associated with neuraxial analgesia use, anticipated neuraxial analgesia use, and the intrapartum decision to use neuraxial analgesia.

RESULTS: There was a univariate association between race/ethnicity and anticipated as well as actual use of neuraxial analgesia. However, there was no association between race/ethnicity and the intrapartum decision to use neuraxial analgesia. After controlling for confounders, the association between race/ethnicity and actual use of neuraxial analgesia no longer remained significant (adjusted odds ratio: Hispanic versus Caucasian women 0.66, 95% confidence interval [CI]: 0.24 to 1.80; African-American versus Caucasian women 0.93, 95% CI: 0.31 to 2.77). In contrast, Hispanic women were less likely than Caucasian women to anticipate using neuraxial analgesia even after controlling for confounders (adjusted odds ratio 0.40, 95% CI: 0.20 to 0.82).

CONCLUSIONS: After controlling for confounding variables, Hispanic women anticipated using neuraxial analgesia at a lower rate than other racial/ethnic groups; however, actual use was similar among groups.

右美托嘧啶鎮靜作用對兒童心血管的影響。
Cardiovascular effects of dexmedetomidine sedation in children.
Jackson Wong, MD*, Garry M. Steil, PhD*, Michelle Curtis, PNP†, Alexandra Papas, BS‡, David Zurakowski, PhD§ and Keira P. Mason, MD§
From the *Department of Medicine, Medicine Critical Care Program, Children's Hospital Boston and Harvard Medical School, Boston, MA, †Children's Hospital Boston, Boston, MA, ‡Children Hospital Boston and Harvard Medical School, Boston, MA, and §Department of Anesthesia, Children Hospital Boston and Harvard Medical School, Boston, MA.
METHODS: Hemodynamic changes in children were followed during IV DEX sedation for radiological procedures. One group of 8 patients (DEX-brief) received a bolus (2 mcg/kg bolus over 10 minutes) and completed the procedure within 10 minutes. The second group of 9 patients (DEX-prolong) received the bolus plus additional DEX as needed to maintain sedation for procedures lasting longer than 10 minutes (additional 1 mcg/kg/hr infusion with second bolus if needed). CI, SI, and SVRI were measured using a continuous noninvasive cardiac output monitor. Changes in hemodynamic variables at minutes 10, 20, and discharge (time at which patient achieved Aldrete Score ≥9) were compared to baseline by repeated measures ANOVA with effect sizes reported as mean [95% confidence interval].

RESULTS: Data were obtained during 8 DEX-brief and 9 DEX-prolong procedures. In DEX-brief, HR and CI decreased (18.9 [2.3 to 35.5] bpm and 0.74 [0.15 to 1.33] L/min/m², respectively) at T1. There was no change in any other hemodynamic variables and all hemodynamic variables returned to baseline at recovery. In DEX-prolong, both HR and CI remained decreased (24.0 [8.3 to 39.6] bpm, 1.51 [0.95 to 2.06] L/min/m²; respectively) at recovery. In addition, SI was decreased (8.01 [1.71 to 14.31] mL/m²) and SVRI was increased (776.0 [271.9 to 1280.4] dynes-sec/cm²/m²) at recovery in the DEX-prolong group. There were no significant changes in mean arterial blood pressure in either group.

CONCLUSION: DEX decreases CI in children and has a cumulative effect. For patients undergoing prolonged procedures HR and CI remained decreased at the time of discharge together with a decrease in SI and an increase in SVRI.
**BACKGROUND:** Recent studies suggest that remifentanil, similar to other $\mu$-opioid agonists, may induce hyperalgesia. We performed animal experiments to determine whether IV remifentanil infusion, the mode of administration used in clinical practice, induces hyperalgesia and the conditions in which this phenomenon occurs. We also determined whether remifentanil-induced hyperalgesia is related to extracellular signal-regulated protein kinase 1/2 (ERK1/2) phosphorylation.

**METHODS:** Remifentanil was administered through a catheter in the tail vein of male Sprague-Dawley rats for 10 minutes ($30 \mu$ g kg$^{-1}$ min$^{-1}$), 30 minutes ($0.1, 1, and 10 \mu$ g kg$^{-1}$ min$^{-1}$), or 120 minutes ($0.1, 1, 3, and 10 \mu$ g kg$^{-1}$ min$^{-1}$).

The von Frey test and a tail-flick test were performed, followed by ERK1/2 immunohistochemistry. We examined whether intrathecal preadministration of the mitogen-activated protein kinase inhibitor U0126 suppresses hyperalgesia.

**RESULTS:** Remifentanil had a dose-dependent antinociceptive effect that rapidly diminished. Ten- or 30-minute remifentanil infusion did not induce hyperalgesia. However, tail-flick latency and mechanical pain threshold after infusion termination were significantly lower in the 120-minute remifentanil administration group than those in the control group, regardless of dose. Hyperalgesia duration was no longer than 60 minutes. Significantly more phospho-ERK1/2-immunoreactive neurons in the superficial spinal dorsal horn were observed in the remifentanil 120-minute groups with hyperalgesia than in the 30-minute remifentanil groups without hyperalgesia, although U0126 did not suppress hyperalgesia.

**CONCLUSIONS:** IV remifentanil induces transient withdrawal hyperalgesia soon after its termination. This hyperalgesia is strongly associated with the duration of exposure to remifentanil. Contrary to our hypothesis, ERK1/2 by itself was not the essential factor involved in the induction of the hyperalgesia.
BACKGROUND: In this report, I describe and evaluate a proximal ultrasound (US)-guided obturator nerve block technique using an interfascial local anesthetic (LA) injection deep to the pectineus muscle.

METHODS: The pectineus muscle was identified and followed, while the US probe was tilted cranially until the superior pubic ramus was visualized. In this plane, LA was injected interfascially between the pectineus and obturator externus.

RESULTS: The median time required to identify the injection site was 4 seconds (95% confidence interval, 3-5 seconds). The median motor block onset was 4 minutes (95% confidence interval, 3-5 minutes). Both obturator nerve branches were blocked successfully in all patients (100%).

CONCLUSION: The US-guided obturator nerve block using interfascial LA injection inferior to the superior pubic ramus, between the pectineus and obturator externus muscles, was shown to be a simple and successful technique.

A Single Injection of Botulinum Toxin Decreases the Margin of Safety of Neurotransmission at Local and Distant Sites

Christiane G. Frick, MD*†, Heidrun Fink, MD‡, Manfred Blobner, MD‡ and Jeevendra Martyn, MD, FRCA, FCCM*†

From *Department of Anesthesia & Critical Care, Massachusetts General Hospital, Boston; †Shriners Hospital for Children, Harvard Medical School, Boston, Massachusetts; ‡Klinik fuer Anaesthesiologie, TU Muenchen, Munich, Germany.

Anesth Analg January 2012 114:102-109

背景：我們對單次注射肉毒桿菌毒素不僅在局部，而且遠處影響肌肉功能、生化特性和阿曲庫銨的藥效動力學這一假設進行了驗證。

方法：我們對麻醉後大鼠（n=26）一側脛骨肌注射肉毒桿菌毒素（2.5U）。另一側未注射的脛骨肌用作觀察肉毒桿菌毒素的遠處影響。對照組大鼠（n=25）注射生理鹽水。注射後0、4和16天分別評估脛骨肌的神經肌肉功能、藥理學及乙醯膽鹼受體（nAChRs）的表達，並同時與鹽水注射組進行比較。

結果：第4天時，肉毒桿菌毒素造成注射側的脛骨肌完全癱瘓，同時對側表現為絕對肌顫搐張力的下降（1.8 N [1.6; 1.9]比 3.0 N [2.8; 3.1], P < 0.05）。第16天時，僅在注射側的脛骨肌上出現肌力減退，表現為絕對肌顫搐張力的下降（0.6 N [0.6, 0.7]比 3.4 N [3.1, 3.7], P < 0.05）。注射側的脛骨肌在第4天（1.46 mg/g [1.43, 1.48]比 1.74 mg/g [1.72, 1.75], P < 0.05）和第16天（0.78 mg/g [0.76, 0.79] vs 1.73 mg/g [1.69, 1.77], P < 0.05）時均品質降低。第16天時遠離注射點的部位出現了變化，此時我們觀察到臨近的腓腸肌和比目魚肌也出現了萎縮。標準化到脛骨肌品質後，我們觀察到與對照組相比，注射毒素對側的脛骨肌特有的顫搐張力（張力/克肌肉）在第4天時下降，注射毒素側的下降則出現在第16天。第16天時，我們發現注射毒素側的脛骨肌對阿曲庫銨的敏感性增加，其證據是阿曲庫銨 ED₅₀的降低（0.23 mg/kg [0.13, 0.33]比 0.72 mg/kg [0.63, 0.82], P < 0.05）以及輸注速率的降低（38 μL/kg/min [32, 43]比 135 μL/kg/min [126, 144], P < 0.05），同時達到基礎（絕對）肌顫搐張力的下降。
力下降到 50% 稳态时所需的阿曲库铵血浆浓度也出现降低（0.5 μg/mL [0.4, 0.7] 比 4.5 μg/mL [3.8, 5.2], P < 0.05）。注射毒素侧的胫骨肌阿曲库铵的 ED50 与对照组相比在第 16 天时也出现了下降。注射毒素侧的胫骨肌 nAChRs 肴与时间配对的对照组相比，在第 4 天时增加至 123 fmol/mg [115, 131] 比 28 fmol/mg [25, 29] (P < 0.05), 第 16 天到 378 [341, 413] 比 27 fmol/mg [25, 29] (P < 0.05)。

结論：肉毒桿菌毒素在局部和遠處均能對肌肉產生作用。特有的肌顫搐張力減弱提示肌肉萎縮不能單獨解釋肌肉功能的變化，神經肌肉傳導同樣遭到了破壞。注射毒素側的肌肉對阿曲库铵的敏感性增強，儘管 nAChRs 上調，這似乎是肉毒桿菌毒素特有的變化。

（劉伍 譯 馬皓琳 李士通 校）

**BACKGROUND:** We tested the hypothesis that a single injection of botulinum toxin not only has local, but also distant effects on muscle function, biochemistry, and pharmacodynamics of atracurium.

**METHODS:** Botulinum toxin (2.5 U) was injected into the tibialis muscle of anesthetized rats (n = 26). The contralateral side with no injection served to study distant effects. Control animals (n = 25) received a saline injection. Neuromuscular function, pharmacology, and expression of acetylcholine receptors (nAChRs) were evaluated in the tibialis at 0, 4, and 16 days after injection and in comparison with saline-injected controls.

**RESULTS:** On day 4, botulinum toxin caused complete paralysis of the tibialis, while its contralateral side showed a decrease in absolute twitch tension (1.8 N [1.6; 1.9] vs 3.0 N [2.8; 3.1], Newton, P < 0.05). On day 16, muscle weakness was only present on the toxin-injected side where absolute twitch tension was decreased (0.6 N [0.6, 0.7] vs 3.4 N [3.1, 3.7], P < 0.05). Tibialis mass was decreased on the toxin-injected side at day 4 (1.46 mg/g [1.43, 1.48] vs 1.74 mg/g [1.72; 1.75], P < 0.05) and on day 16 (0.78 mg/g [0.76, 0.79] vs 1.73 mg/g [1.69; 1.77], P < 0.05). Effects distant from the site of injection were seen on day 16, when muscle atrophy was also present in the adjacent gastrocnemius and soleus muscles. Normalized to tibialis mass, specific twitch tension (tension/g muscle) was reduced on the contralateral side at day 4 and on the toxin-injected side at day 16 in relation to saline controls. At day 16, an increased sensitivity to atracurium was seen on the toxin-injected side, evidenced as a decreased ED50 (0.23 mg/kg [0.13, 0.33] vs 0.72 mg/kg [0.63, 0.82], P < 0.05) and a lower infusion rate (38 μL/kg/min [32, 43] vs 135 μL/kg/min [126, 144], P < 0.05), together with a reduced plasma concentration requirement of atracurium (0.5 μg/mL [0.4, 0.7] vs 4.5 μg/mL [3.8, 5.2], P < 0.05) to achieve a steady state 50% reduction in baseline (absolute) twitch tension. ED50 of atracurium was also decreased on the contralateral side at day 16 in relation to saline controls. The nAChRs in the tibialis were increased on the toxin-injected side to 123 fmol/mg [115, 131] vs 28 fmol/mg [25, 29] (P < 0.05) in time-matched saline-injected controls at day 4 and to 378 [341, 413] vs 27 fmol/mg [25, 29] (P < 0.05) at day 16.

**CONCLUSIONS:** Botulinum toxin has local and distant effects on muscle. The decrease in specific twitch tension indicates that the muscle atrophy alone cannot explain the functional changes; neuromuscular transmission is also impaired. An increased sensitivity to atracurium on the toxin-injected side, despite up-regulation of nAChRs, seems unique to botulinum toxin.
BACKGROUND: Human serum albumin (HSA) is an important carrier for opioids. However, the locations of the binding sites remain unclear. In the present study, we have characterized opioid–HSA interactions using multiple biochemical and biophysical techniques to reveal: (a) the location of the binding site(s); (b) whether naloxone shares the binding site with morphine; and (c) whether opioid agonists share their binding site(s) with general anesthetics.

METHODS: Elution chromatography to determine the global interactions and tryptophan intrinsic fluorescence to determine the localized interactions of opioids with HSA were used. Competition studies using isothermal titration calorimetry were used to determine the overlap of binding site(s) among opioid agonists, antagonists, and general anesthetics. An automatic docking calculation was used to predict the possible binding sites and to assess findings of the solution studies.

RESULTS: For elution chromatography with immobilized HSA, the retention times of naloxone, morphine, and fentanyl were prolonged but shorter than that of propofol. The inhibition of tryptophan fluorescence by naloxone was not affected by morphine or fentanyl. The calorimetric heat profiles of propofol and halothane interaction with HSA were changed significantly, but not equally by morphine, naloxone, or fentanyl. Consistent with direct binding studies, docking results demonstrated that opioids share sites with general anesthetics; a distinct binding site for naloxone was revealed near the sole tryptophan in HSA that is not shared with morphine.
CONCLUSIONS: The interaction of opioids with HSA is weak in comparison with propofol. Naloxone has a distinct binding site in HSA not shared with opioid agonists. Opioids share binding sites with general anesthetics in HSA.

Through I-gel™ Supraglottic Airway and Fastrach™ Mask Intubation: A Randomized Controlled Trial

Antoine Elie Halwagi, MD, B Pharm, Nathalie Massicotte, MD, FRCPC, Alexandre Lallo, MD, FRCPC, Alain Gauthier, MD, FRCPC, Daniel Boudreault, MD, FRCPC, Monique Ruel, RN and François Girard, MD, FRCPC
From the Department of Anesthesiology, Centre Hospitalier de l’Université de Montréal, Hôpital Notre-Dame, Montreal, Quebec, Canada.

BACKGROUND: The i-gel™ is a supraglottic airway device not requiring inflation of a cuff for lung ventilation. Its design allows for unobstructed passage of a tracheal tube and previous studies have demonstrated a favorable alignment with the glottic inlet. In this prospective randomized study, we compared the success rate of blind tracheal intubation using the i-gel and the laryngeal mask airway (LMA) Fastrach™.

METHODS: One hundred sixty patients requiring general anesthesia and airway management were randomized to tracheal intubation using the i-gel or the LMA Fastrach. After induction of general anesthesia, the allocated device was inserted and adequate lung ventilation was confirmed. Blind tracheal intubation was then attempted. First attempt and overall tracheal intubation success rates were evaluated and tracheal intubation times were measured.

RESULTS: Eighty patients were recruited in each study group. Successful tracheal intubation was obtained on the first attempt in 69% of patients with the i-gel and 74% of patients with the LMA Fastrach (95% confidence interval [CI] of difference, −9% to 19%, P = 0.60). The overall
intubation success rate was lower using the i-gel than it was using the LMA Fastrach (73% vs 91%, 95% CI of difference, 7% to 31%, \( P < 0.0001 \)).

**CONCLUSIONS:** On first attempts, successful blind tracheal intubation was obtained at comparable rates using the i-gel and the LMA Fastrach. However, when the first attempt was unsuccessful, subsequent attempts through the i-gel did not significantly increase tracheal intubation success rate. The LMA Fastrach yielded a higher overall intubation success rate.

---

**BACKGROUND:**

The infusion of local anesthetic in the surgical wound is helpful in the multimodal management of postoperative pain. We hypothesized that local anesthetic wound infusion after cesarean delivery would provide better pain control than epidural morphine analgesia.

**METHODS:**

Healthy, term women scheduled for elective cesarean delivery were included in this assessor-blinded, randomized study. Patients were randomly assigned to receive analgesia through a multiorifice wound catheter placed below the fascia and connected to a 5 mL/h ropivacaine 2 mg/mL infusion or an epidural bolus of morphine 2 mg every 12 hours. Both
analgesic regimens were continued for 48 hours. The primary outcome was pain at rest at 24 hours postoperatively using the verbal rating score for pain (0–10 scale). Pain intensity, rescue analgesia consumption, and side effects were assessed at 2, 6, 24, and 48 hours after cesarean delivery by an observer blinded to group allocation. Three months after discharge, patient satisfaction, residual pain, and surgical wound complications were assessed.

**RESULTS:** Fifty-eight women participated in the study. At 24 hours, the median rest verbal rating score for pain was 0 (interquartile range: 0–0) in the continuous infusion group and 3 in the epidural morphine group (interquartile range: 2–3; 95% confidence interval of difference: 1–3 units; \( P < 0.001 \)). The median scores of the 2-, 6-, and 48-hour pain assessments at rest were also lower in the continuous wound infusion group than in the epidural morphine group, and at 2, 6, and 24 hours with movement (\( P < 0.001 \)). The incidence of nausea, vomiting, pruritus, and urinary retention was significantly lower in the wound infusion group and time to recovery of bowel function was shorter. During the 48-hour follow-up evaluation, the median number of nurse visits attributed exclusively to the analgesic regimen was 1 (interquartile range: 1–2) in the continuous wound infusion group and 8 (interquartile range: 7–10) in the epidural morphine group (95% confidence interval of difference: 6–8 visits; \( P < 0.001 \)).

**CONCLUSIONS:** Continuous wound infusion with ropivacaine for 48 hours after cesarean delivery was associated with better analgesia, a lower incidence of side effects, less need for nursing care, and shorter duration of stay compared with epidural morphine analgesia.

---

**Salvinorin A 預處理通過細胞外信號調節激酶/促分裂原活化蛋白激酶（ERK/MARK）通路保護小豬腦缺氧/缺血性損傷後的腦血管自身調節功能**

Salvinorin A Pretreatment Preserves Cerebrovascular Autoregulation After Brain Hypoxic/Ischemic Injury via Extracellular Signal-Regulated Kinase/Mitogen-Activated Protein Kinase in Piglets

Diansan Su, MD, PhD, John Riley, BA, William M. Armstead, PhD and Renyu Liu, MD, PhD
From the Department of Anesthesiology and Critical Care, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA.
Anesth Analg January 2012 114:200-204

**背景:** 嬰兒先天性心臟病手術中的腦缺氧/缺血現象並非罕見，並且能引起餘生持久的嚴重神經殘疾。缺氧/缺血所致的腦血管功能障礙被認為是神經學損傷的重要原因，且尚未發現有藥物能夠預防。一般認為分裂原活化蛋白激酶(MAPK)，包括細胞外信號調節激酶(ERK)、c-Jun氨基末端激酶(JNK)以及p38在缺血預處理中起重要作。我們探究唯一的天然非阿片類κ受體激動劑salvinorin A預處理是否能通過MAPK途徑保護腦血管的自身調節作用。

**方法:** 在給予或不給予ERK上游蛋白激酶抑制劑U0126、JNK抑制劑sp600125或p38抑制劑sb203580的情況下，於缺氧和缺血前後，監測裝備有封閉的頭顱視窗的小豬軟腦膜動脈對低血壓和高碳酸血症的反應。salvinorin A處理組動物在缺氧/缺血前30 min給予salvinorin A (10 μg/kg IV)。在注射salvinorin A之前和注射後30 min收集腦脊液樣本用於檢測MAPK。採用重複測量方差分析法分析資料(n = 5)。

**結果:** 缺氧/缺血處理後，軟腦膜動脈對低血壓和高碳酸血症的舒張反應變得遲鈍，但是salvinorin A預處理組則得到保護。U0126而非sp600125和sb203580抵消salvinorin A對
BACKGROUND: Cerebral hypoxia/ischemia during infant congenital heart surgery is not uncommon and may induce devastating neurologic disabilities persistent over the lifespan. Hypoxia/ischemia-induced cerebrovascular dysfunction is thought to be an important contributor to neurological damage. No pharmacological agents have been found to prevent this. Mitogen activated protein kinase (MAPK), including extracellular signal regulated kinase (ERK), c-Jun-N-terminal kinase, and p38, is thought to contribute to ischemic preconditioning. We investigated whether pretreatment with salvinorin A, the only natural nonopioid κ receptor agonist, could preserve autoregulation of the pial artery via MAPK.

METHODS: The response of the pial artery to hypotension and hypercapnia was monitored in piglets equipped with a closed cranial window before and after hypoxia and ischemia in the presence or absence of U0126, an inhibitor for the protein kinase upstream of ERK, sp600125, an inhibitor of c-Jun-N-terminal kinase or sb203580, an inhibitor of p38. Salvinorin A (10 μg/kg IV) was administered 30 minutes before hypoxia/ischemia in salvinorin A-treated animals. Cerebrospinal fluid samples were collected before and 30 minutes after salvinorin A administration for the measurement of MAPK. Data \((n = 5)\) were analyzed by repeated-measures analysis of variance.

RESULTS: Pial artery dilation to hypercapnia and hypotension was blunted after hypoxia/ischemia but preserved well by pretreatment with salvinorin A. U0126, but not sp600125 or sb203580, abolished the preservative effects of salvinorin A on cerebral vascular autoregulation to hypotension and hypercapnia. The ratio of pERK/ERK in cerebrospinal fluid increased significantly in salvinorin A-treated animals, which was inhibited by U0126.

CONCLUSIONS: Salvinorin A pretreatment preserves autoregulation of the pial artery to hypotension and hypercapnia after hypoxia/ischemia via ERK in a piglet model.
A rectus sheath block can provide postoperative analgesia for midline incisions. However, information regarding the pharmacokinetics of local anesthetics used in this block is lacking. In this study, we detail the time course of ropivacaine concentrations after this block. Thirty-nine patients undergoing elective lower abdominal surgery were assigned to 3 groups receiving rectus sheath block with 20 mL of different concentrations of ropivacaine. Peak plasma concentrations were dose dependent, and there were no significant differences in the times to peak plasma concentrations. The present data also suggested a slower absorption kinetics profile for ropivacaine after rectus sheath block than other compartment blocks.