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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 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 K$_{\text{ATP}}$ channels in β 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 sevofrulane 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 K$_{\text{ATP}}$
channels in β islet cells. Nicorandil, a K$_{\text{ATP}}$ channel opener, produced no significant effects on
glucose metabolism under both sevoflurane and propofol anesthesia.

CONCLUSIONS: Insulin secretion regulated by K$_{\text{ATP}}$ channels in β islet cells is involved,
at least in part, in the different effects of sevoflurane and propofol on glucose metabolism.

综述：麻醉中的闭合回路系统：闭合回路式的液体管理和血流动力学最佳化可否实现？

Review Article: Closed-Loop Systems in Anesthesia: Is There a Potential for Closed-Loop
Fluid Management and Hemodynamic Optimization?

Joseph Rinehart, MD*, Ngai Liu, MD, PhD†, Brenton Alexander, MS* and Maxime Cannesson,
MD, PhD*

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Closed-loop (automated) controllers are encountered in all aspects of modern life in applications
ranging from air-conditioning to spaceflight. Although these systems are virtually ubiquitous,
they are infrequently used in anesthesiology because of the complexity of physiologic systems
and the difficulty in obtaining reliable and valid feedback data from the patient. Despite these
challenges, closed-loop systems are being increasingly studied and improved for medical use.
Two recent developments have made fluid administration a candidate for closed-loop control.
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, MBCh, 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, $I^2 = 0\%$, $P = 0.73$); including the retracted studies added a further 14 deaths and the relative risk was 0.92 (95% confidence interval 0.63–1.34, $I^2 = 0\%$, $P = 0.95$). 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.

**Focused Review: Simulation in Obstetric Anesthesia**

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Anesth Analg January 2012 114:186-190;

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.

简报：超声引导下腘窝坐骨神经阻滞时向胫腓神经分叉处头向和尾向注射的效果比较：一项前瞻性随机研究

**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

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Anesth Analg January 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 until injection of local anesthetic for 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.

背景：对于超声引导下腘窝坐骨神经阻滞局麻药注射的最佳位置仍存在争议。

方法：患者随机分为两组：A组患者在胫腓神经分叉处头向围绕坐骨神经注射 25 毫升 0.75％罗哌卡因（N=51），B组在分叉处的尾向注射同样的局麻药（N= 51）。每 5 分钟评估感觉和运动阻滞直至注射局麻药后 30 分钟。

结果：完全的感觉阻滞和手术麻醉成功率方面，B 组显著优于 A 组（P <0.0001）。

结论：尾向技术提供了更好的手术麻醉。

（孙晓琼 译 陈杰 校）

**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.

特别文章：恶性高热患者从 ASC 转移到接收医院过程中的指南

**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.

肝硬化大鼠异丙酚 ED50 和恢复时间变化
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‡
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Anesth Analg January 2012 114:117-121

背景: 终末期肝病患者对全身麻醉的敏感性增加。在这项研究中，我们试图在肝硬化的大鼠模型身上，对异丙酚灵敏度进行了量化并作为肝病肝功能程度的评估。
方法: 对3个研究小组分别注射6、9或12周的四氯化碳，并诱发出肝病。对照组和四氯化碳组一样注射了相同时间表的生理盐水。第二个控制组（相比较）在饮用9周含巴比妥和10%酒精的水后，用苯巴比妥治疗一周。肝功能是由肝功能试验和肝脏组织学病理评分进行评估的。
结果: 逐渐恶化的肝硬化依据组织学标准，脾亢、肝体比值、肝功能试验进行长期四氯化碳治疗有关。主要的结果是轻度肝病（脂肪变性或纤维化）与对丙泊酚敏感性增加无关，但是丙泊酚负荷剂量和输注后，对于有严重肝纤维化的大鼠，恢复时间显著增加。
结论: 轻度肝病并不显著影响丙泊酚的敏感性，和临床观察相似，但终末期肝病（纤维化）显著延长丙泊酚输注后的恢复时间。这项研究中所使用的累进型肝病的模型，对严格的研究麻醉剂敏感性作为肝细胞纤维化肝病的肝功能程度的研究是有所帮助的。
（侯文婷译 薛张纲校）

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.

The Epidemiology of Upper Airway Injury in Patients Undergoing Major Surgical Procedures
May Hua, MD; Joanne Brady, SM; and Guohua Li, MD, DrPH
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BACKGROUND: Airway injury is a potentially serious and costly adverse event of anesthesia care. The epidemiologic characteristics of airway injury have not been well documented.

METHODS: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) is a multicenter, prospective, outcome-oriented database for patients undergoing major surgical procedures. Using the NSQIP data for the years 2005 to 2008, we examined the incidence of, and risk factors for, airway injury.

RESULTS: Of the 563,190 patients studied, 1202 (0.2%) sustained airway injury. The most common airway injury was lip laceration/hematoma (61.4%), followed by tooth injury (26.1%), tongue laceration (5.7%), pharyngeal laceration (4.7%), and laryngeal laceration (2.1%). Multivariable logistic modeling revealed an increased risk of airway injury in patients with Mallampati class III (adjusted odds ratio [OR], 1.69; 99% confidence interval [CI], 1.36–2.11, relative to patients with Mallampati classes I and II) or class IV (adjusted OR, 2.6; 99% CI,
1.52–4.02), and in patients aged 80 years or older (adjusted OR, 1.50; 99% CI, 1.02–2.19, relative to patients aged 40 to 49 years).

**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.

使用神经轴索分娩镇痛在种族和民族间的差异

Racial and ethnic disparities in neuraxial labor analgesia.

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**摘要**：对于疼痛的治疗在种族和民族间的差异已有记录，证据证实这种差异也存在于神经轴索分娩镇痛中。本研究的目的是在即将分娩的西班牙、非裔美国和高加索妇女中，分析使用及预期使用神经轴索分娩镇痛在种族或民族间的差异，并从社会统计学、临床、决策方面评估这些妇女实际和希望使用神经轴索分娩镇痛的预测因素。

**方法**：在大城市教学医院中即将分娩的妇女都会被面对面访视来确定可能影响分娩镇痛选择的个人因素。在分娩后，分娩镇痛的方式被记录。记录下的主要方式是神经轴索分娩镇痛。多变量逻辑回归模型被建立来检验是否不同种族和民族与使用神经轴索分娩镇痛、预期使用神经轴索分娩镇痛或产时决定使用神经轴索分娩镇痛显著相关。

**结果**：种族和民族与实际或预期使用神经轴索分娩镇痛间单变量相关。但是在产时决定使用神经轴索分娩镇痛与种族和民族不相关。在控制混杂因素后，实际使用神经轴索分娩镇痛与种族和民族没有保持显著性差异（调整后的优势率：西班牙对比高加索妇女 0.66，95% 置信区间：0.24 到 1.80；非裔美洲对比高加索妇女 0.93，95% 置信区间：0.31 到 2.77）。相对而言，甚至是控制混杂因素后，西班牙妇女仍比高加索妇女较少愿意使用神经轴索分娩镇痛（调整后的优势率 0.40，95% 置信区间：0.20 到 0.82）。

**结论**：在控制混杂因素后，西班牙妇女仍比其他种族和民族妇女较少愿意使用神经轴索分娩镇痛；但是实际使用情况在各组间类似。

（任云译 薛张纲校）

**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.

右美托嘧啶静作用对儿童心血管的影响。
Cardiovascular effects of dexmedetomidine sedation in children.
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背景：右美托嘧啶会影响成人心率、平均动脉压、心输出量、每搏输出量、全身血管阻力指数。在该项研究中我们努力去探寻是否右美托嘧啶在儿童身上也会有相似的作用。

方法：在儿童行影像学检查的同时静脉给药右美托嘧啶，观察其血流动力学的变化。一组有8名儿童接受2mcg/kg 的冲击剂量，于10分钟内完成检查。第2组有9名儿童除接受冲击剂量外，还在需要时静脉接受1mcg/kg 的剂量，检查时间超过10分钟。我们使用一个持续无创心输出量监测仪器来监测心输出量、每搏输出量、全身血管阻力指数。我们分别在10分钟、20分钟、离开（患者离开时 Aldrete 评分需 ≥9）时监测血流动力学的改变，并将其与基础值比较。

结果：我们从第1组与第2组的实验中获得数据。在第1组，心率和心输出量都降低了。其他的血流动力学变量没有改变;在复苏期间所有的血流动力学变量都会恢复到基础值。在第2组中，心率和心输出量在复苏期间保持降低。另外，在复苏期每搏输出量降低，全身血管阻力指数升高。在两组中平均动脉压并没有明显改变。

结论：右美托嘧啶能降低儿童的心率，有累积作用。对儿童来说经过长时间的检查，在复苏期间其心率和心输出量都会保持降低，同时伴每搏输出量有降低和全身血管阻力指数有上升。

（翁梅琳译 薛张纲校）

BACKGROUND: Dexmedetomidine (DEX) affects heart rate (HR), mean arterial blood pressure, cardiac index (CI), stroke index (SI), and systemic vascular resistance index (SVRI) in
adults. In this study we sought to determine whether similar effects occur in children undergoing DEX sedation.

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/m(2); 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/m(2); respectively) at recovery. In addition, SI was decreased (8.01 [1.71 to 14.31] mL/m(2)) and SVRI was increased (776.0 [271.9 to 1280.4] dynes-sec/cm(5)/m(2)) 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 μ-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 μg·kg⁻¹·min⁻¹), 30 minutes (0.1, 1, and 10 μg·kg⁻¹·min⁻¹), or 120 minutes (0.1, 1, 3, and 10 μg·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.

综述：超声引导下闭孔神经阻滞: 平面内短轴技术

Brief reports: ultrasound-guided obturator nerve block: a proximal interfascial technique.
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背景：在这些报道中，我描述并评估了短轴超声（US）引导下平面内注射局麻药至耻骨肌的闭孔神经阻滞技术。

方法：超声探头倾斜寻找直至前耻骨支可见来识别和定位耻骨肌。在这个平面局麻药在平面内注射至耻骨肌和闭孔神经之间。

结果：识别注射点的时间是 4 秒 (95% 置信区间，3-5 秒)。运动阻滞起效的中位数时间是 4 分钟 (95% 置信区间，3-5 分钟)。所有病人 (100%) 的闭孔神经的前支都被成功阻滞。
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

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背景：我们对单次注射肉毒杆菌毒素不仅在局部，而且远处影响肌肉功能、生化特性和阿曲库铵的药效动力学这一假设进行了验证。

方法：我们对麻醉后大鼠（n=26）一侧胫骨肌注射肉毒杆菌毒素（2.5U）。另一侧未注射的胫骨肌用作观察肉毒杆菌毒素的远处影响。对照组大鼠（n=25）注射生理盐水。注射后0、4和16天分别评估胫骨肌的神经肌肉功能、药理学及乙酰胆碱受体（nAChRs）的表达，并同时与盐水注射组进行比较。

结果：第4天时，肉毒杆菌毒素造成注射侧的胫骨肌完全瘫痪，同时对侧表现为绝对肌颤搐张力的下降（1.8 N [1.6; 1.9]比3.0 N [2.8; 3.1]，牛顿，P < 0.05）。第16天时，仅在注射侧的胫骨肌上出现肌力减退，表现为绝对肌颤搐强度的下降（0.6 N [0.6, 0.7]比3.4 N [3.1, 3.7]，P < 0.05）。注射侧的胫骨肌在第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）时均质量降低。第16天时远离注射点的部位出现了变化，此时我们观察到临近的腓肠肌和比目鱼肌也出现了萎缩。标准化到胫骨肌质量后，我们观察到与对照组相比，注射毒素对侧的胫骨肌特有的颤搐张力（张力/克肌肉）在第4天时下降，注射毒素侧的下降则出现在第16天。第16天时，我们发现注射毒素侧的胫骨肌对阿曲库铵的敏感性增加，其证据是阿曲库铵ED_{50}的降低（0.28 mg/kg [0.13, 0.33]比0.72 mg/kg [0.63, 0.82]，P < 0.05）以及输注速率的降低（38 μL/kg/min [32, 43]比135 μL/kg/min [126, 144]，P < 0.05），同时达到基础（绝对）肌颤搐张力。
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)。注射毒素对侧胫骨肌阿曲库铵的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与对照组相比，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)。

结论：肉毒杆菌毒素在局部和远处均能对肌肉产生作用。特有的肌颤搐张力减弱提示肌肉萎缩不能单独解释肌肉功能的变化；神经肌肉传导同样遭到了破坏。注射毒素侧的肌肉对阿曲库铵的敏感性增强，尽管nAChRs上调，这似乎是肉毒杆菌毒素特有的变化。

（刘伍 译 马皓琳 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.

通过 I-gel™ 声门上通气道与 Fastrach™ 喉罩行气管插管的比较：一项随机对照试验
Tracheal Intubation Through the I-gel™ Supraglottic Airway Versus the LMA Fastrach™: A Randomized Controlled Trial

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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.

**伤口连续输注罗哌卡因与硬膜外注射吗啡用于剖宫产术后镇痛的比较：一项随机对照试验**

**Ropivacaine Continuous Wound Infusion Versus Epidural Morphine for Postoperative Analgesia After Cesarean Delivery: A Randomized Controlled Trial**

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**背景：**在手术伤口输注局部麻醉药在术后疼痛的多模式管理中很有帮助。我们假设剖宫产术后在伤口输注局麻药比硬膜外注射吗啡镇痛的镇痛效果更好。

**方法：**本项评估者设计的随机试验纳入对象为拟择期行剖宫产术的足月妊娠健康妇女。患者随机分组接受镇痛，通过置于手术筋膜下的多孔导管输注罗哌卡因（5mL/h，2mg/mL），或硬膜外间断注射吗啡（2mg/12h）镇痛。两种镇痛方案均持续 48 小时。主要指标是术后 24 小时静息状态的疼痛，根据口头疼痛等级评分（0-10级）。疼痛强度、解救的镇痛药消耗量和副作用分别在剖宫产术后 2、6、24 和 48 小时由一名不知分组情况的观察人员进行评估。出院后 3 个月，评估患者满意度、残余疼痛、手术伤口并发症。

**结果：**58 名妇女参加了本项试验。24 小时的静息口头疼痛等级评分的中位数，在连续输注组为 0（四分位数间距：0-0），在硬膜外吗啡组为 3（四分位数间距：2-3；95%可信区间差异：1-3 单位，\( P < 0.001 \))。2、6、48 小时的静息疼痛评分中位数和 2、6、24 小时运动疼痛评分中位数，连续伤口输注也低于硬膜外吗啡组(\( P < 0.001 \))。伤口输注组的心、呕吐、瘙痒和尿潴留的发生率明显更低，且肠功能恢复时间较短。在此 48 小时随访评价过程中，仅与镇痛方案相关的护士访视次数的中位数，在连续伤口输注组为 1（四分位数间距：1-2），在硬膜外吗啡组为 8（四分位数间距 7-10）（差异的 95%可信区间：6-8 次访视；\( P < 0.001 \)）。

**结论：**在剖宫产术后 48 小时连续伤口输注罗哌卡因，与硬膜外吗啡镇痛相比，可产生更好的镇痛效果，副作用发生率更低，护理需求更少，住院时间更短。

（陈彬彬译 马皓琳 李士通校）

**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 预处理通过细胞外信号调节激酶/促分裂原活化蛋白激酶（ERK/MARK）通路保护小猪脑缺氧/缺血性损伤后的脑血管自身调节功能

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

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低血压和高碳酸血症的脑血管自身调节的保护作用。salvinorin A 预处理组动物脑脊液中pERK/ERK 比值明显增加，且能被 U0126 抑制。
结论：在小猪模型中，Salvinorin A 预处理通过 ERK 通路保护缺氧/缺血后软脑膜血管对低血压和高碳酸血症的自身调节功能。
（江继宏 译 马皓琳 李士通 校）
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-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-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.

下腹部手术病人在超声引导下行腹直肌鞘阻滞后血浆罗哌卡因浓度
Plasma Ropivacaine Concentrations After Ultrasound-Guided Rectus Sheath Block in Patients Undergoing Lower Abdominal Surgery
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腹直肌鞘阻滞可以为正中切口的病人提供术后镇痛。但是关于此阻滞中局部麻醉药的药代动力学的相关信息较少。在这项研究中，我们详细描述了此阻滞后罗哌卡因浓度的时间过程。39 名择期行下腹部手术的病人被分成 3 组接受不同浓度的罗哌卡因腹直肌鞘阻滞。血浆峰浓度呈剂量依赖性，达到血浆峰浓度的时间没有明显差别。现有数据同时提示罗哌卡因腹直肌鞘阻滞后与其他间隔阻滞相比表现为较慢的吸收动力学。
（张怡译 马皓琳 李士通校）
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.