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**小肝细胞癌经皮射频消融术中麻醉方法对肿瘤复发的影响**

**The Effects of Anesthetic Technique on Cancer Recurrence in Percutaneous Radiofrequency Ablation of Small Hepatocellular Carcinoma**



Renchun Lai, MD\*, Zhenwei Peng, MD†, Dongtai Chen, MD\*, Xudong Wang, MD\*, Wei Xing, MD\*, Weian Zeng, PhD\* and Minshan Chen, PhD†

From the Departments of \*Anesthesiology and †Hepatobiliary Surgery, State Key Laboratory of Oncology in South China, Sun Yat-Sen University Cancer Center, Guangzhou, China

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**背景：**有回顾性研究报道称肿瘤的分型决定了区域麻醉是否利于肿瘤复发。我们研究了在小肝细胞癌（HCC）经皮射频消融术（RFA）中的麻醉方法和肿瘤复发之间的关系。

**方法：**我们回顾了1999年8月至2008年12月间接受经皮射频消融术治疗的小肝细胞癌患者的医疗记录。我们将接受硬膜外麻醉的患者与接受全麻的患者进行了比较。选择无瘤生存率和总生存率作为研究终点，用Kaplan-

Meier法进行评估，并用多变量Cox比例风险模型和有逆概率加权以调整倾向分数的转换模型来比较。

**结果：**硬膜外组与全麻组相比，使用Cox回归模型分析的无瘤生存率危害比为3.66（95%置信区间2.59–5.15； $P < 0.001$ ），用逆概率加权来调整倾向分数的分析为4.31（95%置信区间2.24–8.29； $P <$

0.001）。硬膜外组与全麻组相比，使用Cox回归模型分析的总生存率危害比为0.77（95%置信区间0.50–1.18； $P = 0.232$ ），在用逆概率加权来调整倾向分数的分析中为1.26（95%置信区间0.81–1.97； $P = 0.312$ ）。

**结论：**本回顾分析显示全麻下使用RFA治疗小HCC可以降低肿瘤复发的风险。未发现麻醉方法对总生存率有影响。需要进行前瞻性随机试验来评价这种关联。

（刘伍译 马皓琳 李士通校）

**BACKGROUND:** Retrospective studies report that the benefit of regional anesthesia on cancer recurrence may depend on the specific tumor type. We compared the association between anesthetic technique and cancer recurrence in patients undergoing percutaneous radiofrequency ablation (RFA) of small hepatocellular carcinoma (HCC).

**METHODS:** We retrospectively reviewed medical records of patients with small HCC treated with RFA between August 1999 and December 2008. Patients receiving epidural anesthesia were compared with a group given general anesthesia. The end points were recurrence-free survival and overall survival, which were assessed using the Kaplan-Meier technique and compared using a multivariate Cox proportional hazards regression model and an alternative model with inverse probability weights to adjust for propensity score.

**RESULTS:** The hazard ratio for recurrence-free survival in the epidural anesthesia group compared with the general anesthesia group was 3.66 (95% confidence interval [CI], 2.59–5.15;  $P < 0.001$ ) in the Cox regression model and 4.31 (95% CI, 2.24–8.29;  $P < 0.001$ ) in the analysis adjusted for propensity score with inverse probability weights. The hazard ratio for overall survival in the epidural anesthesia group compared with the general anesthesia group was 0.77 (95% CI, 0.50–1.18;  $P = 0.232$ ) in the Cox regression model and 1.26 (95% CI, 0.81–1.97;  $P = 0.312$ ) in the analysis adjusted for propensity score with inverse probability weights.

**CONCLUSIONS:** This retrospective analysis suggests that treatment of small HCC by RFA under general anesthesia is associated with reduced risk of cancer recurrence. No effect of anesthetic technique on overall survival is detected. Prospective, randomized trials to evaluate this association are warranted.

**在心脏毒性浓度下右旋、外消旋和左旋布比卡因立体结构与膜磷脂的特定相互作用**  
**R(+)-, Rac-, and S(-)-Bupivacaine Stereostructure-Specifically Interact with Membrane Lipids at Cardiotoxically Relevant Concentrations**

Hironori Tsuchiya, PhD\* and Maki Mizogami, MD, PhD†

From the \*Department of Dental Basic Education, and †Department of Anesthesiology, Asahi University School of Dentistry, Gifu, Japan.

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局部麻醉药的对映异构体与膜磷脂在临床相关浓度下相互作用是否不同仍然存有疑问。我们比较了布比卡因立体异构体对含有心磷脂和胆固醇的仿生膜的作用。布比卡因与仿生膜在心脏毒性浓度5 $\mu$ M相互作用，效力为左旋异构体<外消旋异构体<右旋异构体，与它们的心脏毒性排名一致。随着药物浓度减少，这些差异变得更大，也许能解释与先前所报道的布比卡因立体异构体毒性效力不一致的原因。与生物膜的相互作用理论可能对局部麻醉药毒性效应模式有部分贡献。

(瞿亦枫 译 马皓琳 李士通 校)

It remains questionable whether local anesthetics can interact with membrane lipids at clinically relevant concentrations to show the difference between enantiomers. We compared the effects of bupivacaine stereoisomers on biomimetic membranes containing cardiolipin and cholesterol. Bupivacaine interacted with the membranes at cardiotoxic 5  $\mu$ M with the potency being S(-)-enantiomer < racemate < R(+)-enantiomer, which agreed with the rank order of their cardiotoxicity. Such differences became greater with decreasing drug concentrations, possibly explaining the inconsistent cardiotoxic potencies of bupivacaine stereoisomers reported previously. The interactivity with biomembranes may in part contribute to the mode of toxic action of local anesthetics.

**中断和恢复载液流动对药品质量流率的影响：对一个死腔非常小的输液器的体外研究**  
**The Impact on Drug Mass Flow Rate of Interrupting and Resuming Carrier Fluid Flow: An In Vitro Study on a Very Low Dead-Space Volume Infusion Set**

Damien Lannoy, PhD\*†, Bertrand Decaudin, PhD\*†, Nicolas Simon, PhD\*†, Christine Barthelemy, PhD\*, Bertrand Debaene, PhD‡ and Pascal Odou, PhD\*†

From the \*Department of Biopharmacy, Galenic and Hospital Pharmacy, Université Lille Nord de France, Lille; †Department of Pharmacy, Lille University Hospital, Lille; and ‡Anesthesia and Intensive Care Department, University Hospital, Poitiers, France.

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**背景：**停止和恢复载液的流动，可能会导致药物质量流率潜在的具有危险性的瞬时波动。我们比较了两套输液装置，一套死腔很小，一套死腔稍大，在停止和恢复载液流动期间药物的运输情况。

**方法：**评估两个输液器，它们都具有抗反流阀，连接到血管导管上，死腔分别为6.185ml和0.071ml。两套实验方案：（1）载液流速为90ml/h,伴随去甲肾上腺素输注流速7ml/h，（2）载液流速350ml/h伴随去甲肾上腺素输注流速65 mL/h。两套实验方案中，载液停止并且半小时后重新开启。用紫外分光光度法测定流出的去

甲肾上腺素浓度。从实验的质量流率曲线下面积与理论的瞬时质量流率曲线下面积比计算流动变化效率。

**结果：**在两种流速条件下，两套输液器的流动变化效率在停止载液流动后10分钟和重新开启后10分钟的过程中有明显差别。主要的现象是停止载体流动后药物浓度突然下降和重新开启后药物浓度暂时性的突然升高。死腔很小的输液装置给药的变化明显比标准装置要小，即使在流速较高时。

**结论：**使用非常小死腔的输液装置减少了停止和恢复载液流动造成的给药波动。

（安光惠 译 马皓琳 李士通 校）

**BACKGROUND:** Stopping and resuming carrier fluid flow can lead to potentially dangerous transient disturbances in drug mass flow rate. We compared the impact of 2 infusion sets, one with very low dead-space volume and the other with greater dead-space volume, on the amount of drug delivered during stop-and-go carrier fluid flows.

**METHODS:** Two infusion sets, both with antireflux, connected to an angiocatheter and with dead-space volumes of 6.185 mL and 0.071 mL, respectively, were assessed. Two protocols were studied: carrier fluid flow of 90 mL/h associated with noradrenaline infused at 7 mL/h and carrier fluid flow of 350 mL/h with a noradrenaline infusion flow of 65 mL/h. During both protocols, the carrier fluid was stopped and resumed at the same rate 30 minutes later. Effluent noradrenaline concentration was measured using UV spectrophotometry. Flow change efficiency was calculated from the ratio of the area under the experimental mass flow rate curve to the area under the theoretical instantaneous mass flow rate curve.

**RESULTS:** For both flow rate conditions, flow change efficiency was significantly different for the 2 infusion sets during the 10-minute period after stopping carrier fluid flow and the 10-minute period after restarting it. The major phenomena were sudden decreases in drug delivery after stopping carrier flow and sudden, temporary increases when it was resumed. The very low dead-space volume infusion set resulted in significant reduction in changes in drug delivery compared with the standard set, even at high flow rates.

**CONCLUSION:** The use of a very low dead-space volume set attenuates disturbances in drug delivery caused by interrupting and resuming carrier fluid flow.

### 声门外通气道的发展：关于其历史、应用和成功实践技巧的综述

#### Evolution of the Extraglottic Airway: A Review of Its History, Applications, and Practical Tips for Success

Michael R. Hernandez, MD\*, P. Allan Klock Jr., MD\* and Adranik Ovassapian, MD\*†  
From the \*Department of Anesthesia and Critical Care, University of Chicago Hospitals, Chicago, IL. †Deceased.

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1981年，喉罩导气管的发展是声门外通气道（EGA）获得普及和认可的重要第一步。本综述中的术语“声门外”指不涉及喉的通气道，包括声门上方的通气道。虽然术语“声门外”较为宽泛，包括气管切开插管等通气道，但是术语“声门上”则不包括众多含声门下部件的装置，且对于现代装置的讨论而言范围过于狭窄。EGA在实践中应用广泛，现有多种装置以满足日渐扩大的应用需求。本综述旨在阐明新老EGA装置的当前状态，并举例说明各种装置的用途。特别强调特殊情况下EGA的应用，比如产科、儿科、院前和非传统的“手术室外”装置。探讨了EGA在处理困难气道中的作用。EGA装置可在无法进

行面罩通气和气管插管的情况下促进通气，因此拯救了无数生命。就传统而言，困难气道的处理取决于成功的气管插管。EGA则产生了一种示范性的转变，将处理困难气道的重点从气管插管转向通气和氧合。EGA装置已被证明是有用的气管插管辅助装置；尤其是EGA装置和光纤导芯的联合应用，是处理困难气道的有效方法。

虽然实用，EGA也确实存在缺点。比如，它们典型地对胃内容物返流误吸的保护作用不如套囊气管导管。尽管EGA设计上的改进已尝试解决这一问题，然而胃内容物吸入的风险持续存在。EGA套囊压力过高与潜在发病率的联系逐渐得到公认。EGA在临床实践中的广泛成功和采纳是气道管理和麻醉管理的重大改革。虽然EGA的作用已经充分确立，使用者仍须知道每种装置特有的长处与局限性，并且明白在一种新装置被研究透彻之前，所有的指导数据都是有限的。

（陈彬彬译 马皓琳 李士通校）

The development of the laryngeal mask airway in 1981 was an important first step toward widespread use and acceptance of the extraglottic airway (EGA). The term *extraglottic* is used in this review to encompass those airways that do not violate the larynx, in addition to those with a supraglottic position. Although the term *extraglottic* may be broad and include airways such as tracheostomy tubes, the term *supraglottic* does not describe a large number of devices with subglottic components and is too narrow for a discussion of modern devices. EGAs have flourished in practice, and now a wide variety of devices are available for an ever-expanding array of applications. In this review we attempt to clarify the current state of EGA devices new and old, and to illustrate their use in numerous settings. Particular attention is paid to the use of EGAs in special situations such as obstetric, pediatric, prehospital, and nontraditional “out of the operating room” settings. The role of the EGA in difficult airway management is discussed. EGA devices have saved countless lives because they facilitate ventilation when facemask ventilation and tracheal intubation were not possible. Traditionally, difficult airway management focused on successful tracheal intubation. The EGA has allowed a paradigm shift, changing the emphasis of difficult airway management from tracheal intubation to ventilation and oxygenation. EGA devices have proved to be useful adjuncts to tracheal intubation; in particular, the combination of EGA devices and fiberoptic guidance is a powerful technique for difficult airway management. Despite their utility, EGAs do have disadvantages. For example, they typically do not provide the same protection from pulmonary aspiration of regurgitated gastric material as a cuffed tracheal tube. The risk of aspiration of gastric contents persists despite advances in EGA design that have sought to address the issue. The association between excessive EGA cuff pressure and potential morbidity is becoming increasingly recognized. The widespread success and adoption of the EGA into clinical practice has revolutionized airway management and anesthetic care. Although the role of EGAs is well established, the user must know each device's particular strengths and limitations and understand that limited data are available for guidance until a new device has been well studied.

### 一项非甾体类抗炎药在小儿术后疼痛方面应用的荟萃分析

#### **A Meta-Analysis of the Use of Nonsteroidal Antiinflammatory Drugs for Pediatric Postoperative Pain**

Daphne Michelet, MD, Juliette Andreu-Gallien, MD, PhD, Tarik Bensalah, MD, Julie Hilly, MD, Chantal Wood, MD, Yves Nivoche, MD, PhD, Jean Mantz, MD, PhD and Souhayl Dahmani, MD, PhD

From the Department of Anesthesia, Intensive Care and Pain Management, Robert Debré University Hospital, Paris Diderot University, Paris Sorbonne Cité, Paris, France.  
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**背景：**阿片类药物在小儿术后应用的副作用已被广泛关注。已有研究显示非甾体类抗炎药能够有效地降低术后疼痛，然而，它们在阿片类药物用量的节约效应上仍存在争议。在这个荟萃分析中，我们研究了小儿术后应用非甾体类抗炎药对阿片类药物的节约效益。

**方法：**综合检索使用非甾体抗炎药和阿片类药物作为婴幼儿围手术期镇痛药物临床试验的文献。评价阿片类用量、疼痛程度、术后恶心、呕吐、尿潴留的发生情况。研究患者在麻醉后监护室和术后24小时的上述情况。结合每个试验的数据汇总后计算混合比值比（ORs）或标准化平均差（SMD）和95%置信区间。

**结果：**分析27个随机对照试验，围术期使用非甾体类抗炎药可以减少术后麻醉后监护室及24小时内阿片类药物的用量，（SMD 分别= -0.66 [-0.84, -0.48]和-0.83 [-1.11, -0.55]），降低在麻醉后监护室中的疼痛程度（SMD = -0.85 [-1.24, -0.47]），并减少术后24小时恶心呕吐情况（OR = 0.75 [0.57-

0.99]）。非甾体类抗炎药不能降低术后24小时疼痛程度（OR = 0.56 [0.26-1.2]）和麻醉后监护室内恶心呕吐的发生率（OR = 1.02 [0.73-

1.44]）。根据非甾体类抗炎药应用的时机（术中或术后）、手术的类型，或者合并使用对乙酰氨基酚进行亚组分析，除了发现术后24小时的疼痛程度和恶心呕吐的发生率分别受合用对乙酰氨基酚和手术的类型的影响，未显示这些因素对研究的预后有任何其他影响。

**结论：**本荟萃分析表明围术期使用非甾体类药物可以减少儿童术后阿片类的用量和恶心呕吐。

（许辛译 马皓琳 李士通校）

**BACKGROUND:** Opioid side effects are a great concern during the postoperative period in children. Nonsteroidal antiinflammatory drugs (NSAIDs) have been shown to effectively decrease postoperative pain, but their opioid-sparing effect is still controversial. In this present meta-analysis, we investigated the postoperative opioid-sparing effect of NSAIDs in children.

**METHODS:** A comprehensive literature search was conducted to identify clinical trials using NSAIDs and opioids as perioperative analgesic compounds in children and infants. Outcomes measured were opioid consumption, pain intensity, postoperative nausea and vomiting (PONV), and urinary retention. All outcomes were studied during postanesthesia care unit (PACU) stay and the first 24 postoperative hours. Data from each trial were combined to calculate the pooled odds ratios (ORs) or standardized mean difference (SMD) and their 95% confidence interval.

**RESULTS:** Twenty-seven randomized controlled studies were analyzed. Perioperative administration of NSAIDs decreased postoperative opioid requirement (both in the PACU and during the first 24 postoperative hours; SMD = -0.66 [-0.84, -0.48] and -0.83 [-1.11, -0.55], respectively), pain intensity in the PACU (SMD = -0.85 [-1.24, -0.47]), and PONV during the first 24 postoperative hours (OR = 0.75 [0.57-0.99]). NSAIDs did not decrease pain intensity during the first 24 postoperative hours (OR = 0.56 [0.26-1.2]) and PONV during PACU stay (OR = 1.02 [0.73-1.44]). Subgroup analysis according to the timing of NSAID administration (intraoperative versus postoperative), type of surgery, or coadministration of paracetamol did not show any influence of these factors on the studied outcomes except the reduction of pain intensity and the incidence of PONV during the first 24 postoperative hours, which were influenced by the coadministration of paracetamol and the type of surgery, respectively.

**CONCLUSION:** This meta-analysis shows that perioperative NSAID administration reduces opioid consumption and PONV during the postoperative period in children.

### 围术期单次剂量酮咯酸给药用于预防术后镇痛：一项对随机试验的荟萃分析

#### **Perioperative Single Dose Ketorolac to Prevent Postoperative Pain: A Meta-Analysis of Randomized Trials**

Gildasio S. De Oliveira Jr., MD, MSCI, Deepti Agarwal, MD and Honorio T. Benzon, MD  
From the Department of Anesthesiology, Northwestern University, Chicago, Illinois.  
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**背景：**应用非阿片类止痛药物的预防性镇痛方案被认为是改善术后疼痛同时最小化阿片类药物副作用的一种方法。酮咯酸是一种被频繁应用于术后镇痛的甾体类抗炎药。然而，对于全身性单次剂量酮咯酸给药用于预防术后疼痛的最佳给药剂量和途径尚未阐明。我们总结了一定数量的系统性综述来评估围术期单次剂量的酮咯酸给药用于术后镇痛的功

**方法：**我们遵循了PRISMA声明准则。我们进行了广泛搜索来鉴别评估单次剂量酮咯酸全身性给药用于术后镇痛和阿片类药物用量的随机对照试验。应用了随机效应模式进行荟萃分析。通过30毫克和60毫克剂量组的合并研究来评估酮咯酸的剂量效应。应用Egger回归来检测漏斗形曲线的不对称性。根据全身性给药途径(静脉给药比肌肉注射)和给药时间(切皮前比切皮后)的子群分析来评价是否存在异质性。

**结果：**本研究包含了有782个受试者的13项随机临床试验。联合效应的(95%可信区间)显示酮咯酸组与安慰剂组相比在早期静息疼痛方面有差异，加权均数差为-0.64 (-1.11到-0.18)，但是对于晚期静息疼痛没有差异，为-0.29 (-0.88 到 0.29) 总结分数(0-10量表)。60毫克组的阿片类药物用量减少，其静脉吗啡当量的均数(95%可信区间)为-1.64毫克(-2.90到-0.37

毫克)。通过肌肉注射给药与通过静脉给药相比，酮咯酸组与安慰剂组在减少阿片类药物用量的效应更明显，静脉吗啡当量的均数(95%可信区间)为-2.13毫克(-4.1到-0.21毫克)。60毫克组术后恶心呕吐发生率减少，比值比(95%可信区间)为0.49(0.29-0.81)。

**结论：**单次剂量全身性酮咯酸给药是多模式术后镇痛中的一种有效手段。应用酮咯酸改进术后镇痛还可以减少术后恶心呕吐的发生。60毫克剂量在术后镇痛方面有显著利益，但是缺乏现有证据表明30毫克剂量在术后镇痛方面有显著利益。

(张怡译 马皓琳 李士通校)

**BACKGROUND:** Preventive analgesia using non-opioid analgesic strategies is recognized as a pathway to improve postoperative pain control while minimizing opioid-related side effects. Ketorolac is a nonsteroidal antiinflammatory drug frequently used to treat postoperative pain. However, the optimal dose and route of administration for systemic single dose ketorolac to prevent postoperative pain is not well defined. We performed a quantitative systematic review to evaluate the efficacy of a single dose of perioperative ketorolac on postoperative analgesia.

**METHODS:** We followed the PRISMA statement guidelines. A wide search was performed to identify randomized controlled trials that evaluated the effects of a single dose of systemic ketorolac on postoperative pain and opioid consumption. Meta-analysis was performed using a random-effects model. Effects of ketorolac dose were evaluated by pooling studies into 30- and

60-mg dosage groups. Asymmetry of funnel plots was examined using Egger regression. The presence of heterogeneity was assessed by subgroup analysis according to the route of systemic administration (IV versus IM) and the time of drug administration (preincision versus postincision).

**RESULTS:** Thirteen randomized clinical trials with 782 subjects were included. The weighted mean difference (95% confidence interval [CI]) of combined effects showed a difference for ketorolac over placebo for early pain at rest of  $-0.64$  ( $-1.11$  to  $-0.18$ ) but not at late pain at rest,  $-0.29$  ( $-0.88$  to  $0.29$ ) summary point (0–10 scale). Opioid consumption was decreased by the 60-mg dose, with a mean (95% CI) IV morphine equivalent consumption of  $-1.64$  mg ( $-2.90$  to  $-0.37$  mg). The opioid-sparing effects of ketorolac compared with placebo were greater when the drug was administered IM compared with when the drug was administered IV, with a mean difference (95% CI) IV morphine equivalent consumption of  $-2.13$  mg ( $-4.1$  to  $-0.21$  mg). Postoperative nausea and vomiting were reduced by the 60-mg dose, with an odds ratio (95% CI) of  $0.49$  ( $0.29$ – $0.81$ ).

**CONCLUSIONS:** Single dose systemic ketorolac is an effective adjunct in multimodal regimens to reduce postoperative pain. Improved postoperative analgesia achieved with ketorolac was also accompanied by a reduction in postoperative nausea and vomiting. The 60-mg dose offers significant benefits but there is a lack of current evidence that the 30-mg dose offers significant benefits on postoperative pain outcomes.

### 蛛网膜下腔应用不含防腐剂的S(+)-氯胺酮对狗脊髓和脑膜的效果

#### The Effects of Subarachnoid Administration of Preservative-Free S(+)-Ketamine on Spinal Cord and Meninges in Dogs

Alfredo Cury Rojas, MD\*, Juliana Gaiotto Alves, MD\*, Rodrigo Moreira e Lima, PhD\*, Mariângela Esther Alencar Marques, PhD†, Guilherme Antônio Moreira de Barros, PhD\*, Fernanda Bono Fukushima, PhD\*, Norma Sueli Pinheiro Modolo, PhD\* and Eliana Marisa Ganem, PhD\*

From the \*Anesthesiology Department, and †Pathology Department, São Paulo State University–UNESP, Botucatu/SP, Brazil.

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**背景：** N-甲基-D-天冬氨酸受体拮抗剂氯胺酮及其对映异构体S(+)-

氯胺酮被注射到硬膜外腔和蛛网膜下腔来处理急性术后疼痛和缓解神经性疼痛综合征。在本研究中我们评估了在临床实践中单次常用剂量不含防腐剂的S(+)-氯胺酮对狗脊髓和脑膜的效果。

**方法：** 在麻醉下（静脉注射依托咪酯2 mg/kg和芬太尼0.005 mg/kg）16只狗（6到15 kg）随机接受腰段（L5/6）鞘内注射0.9%生理盐水（对照组）或S(+)-氯胺酮1 mg/kg<sup>-1</sup>（氯胺酮组）。所有剂量都按照1

mL容量注射10秒。相应的注射液浓度范围从0.6%到1.5%。在21天的临床观察后杀死动物；取出脊髓、马尾根和脑膜，用光学显微镜进行组织学检测。组织用来检测脱髓鞘（Masson三色），神经元死亡（苏木素和曙红）和星形胶质细胞活化（神经胶质原纤维酸性蛋白）。

**结果：** 在对照组或氯胺酮组的动物中，我们都没有发现脊髓组织或脑膜的临床和组织学改变。

**结论：**单剂量鞘内注射 $1\text{ mg/kg}^{-1}$ 无防腐剂的S(+)-氯胺酮在单个穿刺点蛛网膜下腔注射的浓度范围为6到15 mg/mL，在本实验模型中并未产生组织学改变。

(刘朝辉译，马皓琳，李士通校)

**BACKGROUND:** The *N*-methyl-D-aspartate receptor antagonist ketamine and its active enantiomer, S(+)-ketamine, have been injected in the epidural and subarachnoid spaces to treat acute postoperative pain and relieve neuropathic pain syndrome. In this study we evaluated the effects of a single dose of preservative-free S(+)-ketamine, in doses usually used in clinical practice, in the spinal cord and meninges of dogs.

**METHODS:** Under anesthesia (IV etomidate ( $2\text{ mg/kg}$ ) and fentanyl ( $0.005\text{ mg/kg}$ ), 16 dogs (6 to 15 kg) were randomized to receive a lumbar intrathecal injection (L5/6) of saline solution of 0.9% (control group) or S(+)-ketamine  $1\text{ mg/kg}^{-1}$  (ketamine group). All doses were administered in a volume of 1 mL over a 10-second interval. Accordingly, injection solution ranged from 0.6% to 1.5%. After 21 days of clinical observation, the animals were killed; spinal cord, cauda equina root, and meninges were removed for histological examination with light microscopy. Tissues were examined for demyelination (Masson trichrome), neuronal death (hematoxylin and eosin) and astrocyte activation (glial fibrillary acidic protein).

**RESULTS:** No clinical or histological alterations of spinal tissue or meninges were found in animals from either control or ketamine groups.

**CONCLUSION:** A single intrathecal injection of preservative-free S(+)-ketamine, at  $1\text{ mg/kg}^{-1}$  dosage, over a concentration range of 6 to 15 mg/mL injected in the subarachnoid space in a single puncture, did not produce histological alterations in this experimental model.

### 一种少见的臂丛解剖变异：单神经束变异

#### **A Rare Anatomical Variation of the Brachial Plexus: Single Cord Anomaly**

Anjali Aggarwal, MD\*, Daisy Sahni, PhD, MAMS\*, Harjeet Kaur, PhD, MAMS\*, Yatindra Kumar Batra, MD, MNAMS, FAMS† and Rakesh V. Sondekoppam, MD†

From the Departments of \*Anatomy and †Anaesthesia and Intensive Care, Postgraduate Institute of Medical Education and Research, Chandigarh, India.

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臂丛的解剖学变异对于区域麻醉及上肢手术操作可能有重要作用。虽然罕见，但在90名印度男性尸体的臂丛解剖中发现了4例臂丛的融合的单神经束。该4例均表现为与通常的从神经干分成股再合成各神经束的模式相背离。这些单神经束不是典型的围血管排列而是处于腋动脉的一侧。臂丛的融合的单神经束可能比先前所认为的要多，但对于神经阻滞的操作或成功的影响仍为未知。

(毛祖旻译 马皓琳 李士通校)

Anatomical variations of the brachial plexus may be important in regional anesthesia and upper limb procedures. A fused single cord of the brachial plexus, although considered rare, was discovered in 4 Indian male cadavers during the dissection of 90 brachial plexuses. All 4 cases demonstrated deviation from the usual pattern starting at the division of trunks continuing to the formation of cords. The location of these single cords was lateral to the axillary artery instead of the typical perivascular relationship. A fused single cord of brachial plexus might be more



common than previously thought. The impact on the performance or success of blockade remains unknown.

### 异丙酚对于高血糖导致的脐静脉内皮细胞功能紊乱有保护作用

#### Propofol Protects Against High Glucose-Induced Endothelial Dysfunction in Human Umbilical Vein Endothelial Cells

Minmin Zhu, MD, Jiawei Chen, MD, PhD, Zhiming Tan, MD, PhD and Jing Wang, MD

From the Department of Anaesthesiology, Fudan University Shanghai Cancer Centre, Shanghai; and Department of Oncology, Shanghai Medical College, Fudan University, Shanghai, People's Republic of China

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**背景：**高糖血症导致内皮细胞功能紊乱是通过使过氧亚硝酸盐介导的内皮型一氧化氮合酶解偶联起作用的。丙泊酚被报道能够改善高糖血症诱导的内皮细胞功能紊乱的情况。然而，它的作用机制至今不甚明了。我们推测丙泊酚可以通过减少过氧亚硝酸盐浓度，增加偶联的一氧化氮合成酶，从而改善高糖血症诱导的内皮细胞功能紊乱。

**方法：**人脐静脉内皮细胞在30mM浓度的葡萄糖培养基中培养三天后，再在不同浓度的丙泊酚（0.2,1,5及25um）中分别培养（0.5，1,2和4h）。在平行试验中，用5mM浓度的葡萄糖培养基中培养三天。通过测量分析硝酸还原酶来测量一氧化氮的产量，及铁细胞色素C及二氢乙啶荧光分析超氧阴离子的产生，那些对30mM血糖诱导组产生一氧化氮及超氧阴离子最大效应的治疗应用于今后的基础信号转导途径研究，而总蛋白NOS二聚体与单体的表达，

eNOS对丝氨酸1177的磷酸化，诱导型一氧化氮合成酶总蛋白，诱导型一氧化氮二聚体及单体合酶的表达，过氧亚硝酸阴离子和鸟苷三磷酸环化水解酶I 都是通过Western blot技术测定的。四氢生喋啶水平可通过液相色谱及光谱法测定的

**结果：**与5mM血糖组相比，30mM血糖组显著地减少60%的一氧化氮（ $P < 0.001$ ）及增加175%超氧化物歧化酶（ $P = 0.0026$ ）产生，

这俩组都能够被不同浓度的异丙酚抑制且呈时间相关性。同时在30mM血糖组中总eNOS蛋白表达增加，然而eNOS的二聚体与单体比（ $P = 0.0001$ ）及eNOS磷酸化（ $P < 0.001$ ）都减少。丙泊酚对30mM 血糖诱导组的eNOS蛋白表达没有影响反而恢复了eNOS二聚体与单体的比率及增加了eNOS磷酸化作用，在30mM血糖诱导组中超氧化物歧化酶积累作用会被eNOS抑制因子盐酸盐所抑制，而且与5mM血糖组治疗相比，30mM血糖组减少BH4的水平（ $P = 0.0001$ ），但增加过氧亚硝基阴离子的水平（ $P = 0.0003$ ），此效应能够被异丙酚逆转（分别为 $P = 0.0045$ ,  $P < 0.001$ ,  $P = 0.0001$  vs 30 mM 血糖组）

**结论：**丙泊酚有利于30mM的血糖对人脐静脉内皮细胞产生一氧化氮减少及超氧化物酶增加，其机制可能是抑制过氧亚硝酸盐介导BH<sub>4</sub>减少和恢复过氧亚硝酸盐介导一氧化氮合酶偶联

（邓利兵译 薛张纲校）

**BACKGROUND:** Hyperglycemia, via peroxynitrite-mediated endothelial nitric oxide synthase (eNOS) enzymatic uncoupling, induced endothelial dysfunction. Propofol has been reported to improve high glucose - induced endothelial dysfunction. However, its mechanisms of action remain unclear. We hypothesized that propofol could improve hyperglycemia-induced endothelial dysfunction by decreasing the peroxynitrite level and thus restoring eNOS coupling.

**METHODS:** At the end of 3 days of incubation in medium with 30 mM glucose, human umbilical vein endothelial cells were treated with different concentrations (0.2, 1, 5, and 25  $\mu$ M) of propofol for different times (0.5, 1, 2, and 4 hours). In parallel experiments, cells were cultured in 5 mM glucose for 3 days as a control. Nitric oxide (NO) production was measured with a nitrate reductase assay. Superoxide anion ( $O_2^-$ ) accumulation was measured with the reduction of ferricytochrome c and dihydroethidine fluorescence assay. The treatment that had maximal effect on 30 mM glucose - induced NO production and  $O_2^-$  accumulation was applied in the following studies to examine the underlying signaling pathways. eNOS total protein, eNOS dimer and monomer expression, eNOS phosphorylation at Ser<sup>1177</sup>, inducible NO synthase total protein, inducible NO synthase dimer and monomer expression, peroxynitrite, and guanosine triphosphate cyclohydrolase I expression were measured by Western blot. Tetrahydrobiopterin ( $BH_4$ ) level was measured with liquid chromatography - mass spectrometry.

**RESULTS:** Compared with 5 mM glucose treatment, 30 mM glucose significantly decreased NO production by 60% ( $P < 0.001$ ) and increased  $O_2^-$  accumulation by 175% ( $P = 0.0026$ ), which were both attenuated by propofol in a concentration- and time-dependent manner. Compared with 5 mM glucose treatment, total eNOS protein expression was increased by 30 mM glucose ( $P < 0.001$ ), whereas the ratio of eNOS dimer/monomer ( $P = 0.0001$ ) and eNOS phosphorylation ( $P < 0.001$ ) were decreased by 30 mM glucose. Propofol did not affect 30 mM glucose - induced total eNOS protein expression, but restored the ratio of eNOS dimer/monomer ( $P = 0.0005$ ) and increased eNOS phosphorylation ( $P < 0.001$ ). 30 mM glucose - induced  $O_2^-$  accumulation was inhibited by the eNOS inhibitor hydrochloride. Furthermore, compared with 5 mM glucose treatment, 30 mM glucose decreased the  $BH_4$  level ( $P = 0.0001$ ) and guanosine triphosphate cyclohydrolase I expression ( $P < 0.001$ ), whereas it increased peroxynitrite level ( $P = 0.0003$ ), which could all be reversed by propofol ( $P = 0.0045$ ,  $P < 0.001$ ,  $P = 0.0001$  vs 30 mM glucose treatment, respectively).

**CONCLUSIONS:** Propofol has beneficial effects on 30 mM glucose - induced NO reduction and  $O_2^-$  accumulation in human umbilical vein endothelial cells. This may be mediated through inhibiting peroxynitrite-mediated  $BH_4$  reduction, and restoring eNOS coupling.

### 非接触式心电检测系统的可靠性和准确性

#### The Reliability and Accuracy of a Noncontact Electrocardiograph System for Screening Purposes

Michael Czaplik, MD\*, Benjamin Eilebrecht†, Rafael Walocha, MD\*, Marian Walter, PhD†, Patrick Schauerte, MD‡, Steffen Leonhardt, MD, PhD† and Rolf Rossaint, MD\*

From the \*Department of Anesthesiology, University Hospital, RWTH Aachen, Aachen, Germany; †Philips Chair for Medical Information Technology, RWTH University Aachen, Aachen, Germany; ‡Department of Cardiology, University Hospital, RWTH Aachen, Aachen, Germany.

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**背景：**心电图（ECG）需要电极片接触到皮肤，并且经常必须脱掉衣服。对心电检测来说在普通的椅子中装入电容耦合式电极是一个合理的选择。我们针对在椅垫中嵌入电极的心电图进行了可靠性及准确性的评估。

**方法：**在一间麻醉诱导室，一间心内科门诊病房，和一间心内科日间病房，两位独立的临床医生就来自皮肤电极的心电记录和来自椅垫嵌入的电容耦合式电极的心电记录进行了对照。我们分析了数据来比较对于心律失常诊断的敏感性和特异性。

**结果：**心电记录结果来自于107位病人。电容耦合式电极对心率的测定是准确的，但是人为移动使得P波和T波的辨别不是非常可靠。对于体重较轻的病人，衣服中含有混合纤维的病人，以及衣着潮湿的病人，信号质量是很差的。

**结论：**用电容耦合式电极心电图来检测心率及一些心律失常是准确的。对于术前检测，在检查椅中嵌入电容耦合式电极是一种很有前景的手段。若想使电容耦合式电极取代皮肤电极，还必须改进人为因素造成的问题。

（方昕译 薛张纲校）

**BACKGROUND:** Electrocardiography (ECG) requires the application of electrodes to the skin and often necessitates undressing. Capacitively coupled electrodes embedded in a normal chair would be a rational alternative for ECG screening. We evaluated the reliability and accuracy of ECG electrodes imbedded in a chair cushion.

**METHODS:** Two independent clinicians compared ECG recordings obtained using skin electrodes with recordings obtained using capacitively coupled electrodes that were embedded in a chair cushion in an anesthesiology premedication room, a cardiology outpatient ward, and a cardiology day ward. We analyzed the data to compare the sensitivity and specificity for the diagnosis of cardiac arrhythmias.

**RESULTS:** ECG recordings were obtained from 107 patients. Heart rate was accurately measured using the capacitively coupled electrodes, but motion artifacts made the identification of P and T waves unreliable. Signal quality was poor for patients with low body weight, patients wearing clothing containing mixed fibers, and patients wearing sweaty shirts.

**CONCLUSIONS:** Heart rate was accurately measured, and some cardiac arrhythmias were correctly diagnosed using capacitive ECG electrodes. Capacitive electrodes embedded into an examination chair are a promising tool for preoperative screening. Improved artifact reduction algorithms are needed before capacitive electrodes will replace skin electrodes.

### 对全麻插管患者在导丝引导下鼻胃管置入：一项前瞻性随机对照研究

#### **Esophageal guidewire-assisted nasogastric tube insertion in anesthetized and intubated patients: a prospective randomized controlled study.**

Jyotirmay Kirtania, MD\*, Tapas Ghose, MD\*, Dibyendu Garai, MD\* and Shreyasi Ray, MD†  
From the \*School of Digestive and Liver Diseases, The Institute of Post-Graduate Medical Education and Research, Kolkata; and †Department of Anesthesiology, Medical College Hospital, Kolkata, India.

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**背景：**几乎所有进行腹部手术病人都有置入胃管（NGT）的指征，目的是为了术中和术后的胃肠减压以及术后的经胃管营养。胃管由非强化的聚合塑料材料制成，在置入的时候非常容易弯曲打卷。这往往造成我们盲插胃管或是用各种技术辅助置入胃管时的置管困难。我们假定对于全麻插管的患者置胃管时，相比于头部屈曲、侧颈部加压的置管手法，在喉部手动向前推进胃管的手法能够显著的提高一次置管成功率。

**方法：**我们将480位行全麻肌松的成年患者随机的分成了实验组：使用喉部手动向前推进手法置入带有导丝的鼻胃管（组1）和对照组：头部屈曲、侧颈部加压的置管手法置入鼻胃管（组2）。用胃管弯曲打卷率、操作相关的鼻出血和咽部出血率以及中度和严重并发症的发生率来评估首次和二次（和总体）置管成功率（和失败率）

**结果：**组1的首次置管成功率是99.2%，而组2仅有56.7%（ $P < 0.001$ ）。即首次置管失败率是组1的0.8%和组2的43.3%（ $P < 0.001$ ，首次置管失败率的绝对危险度下降（ARR）=42.5%，95%可信区间[CI]=36.0%-49.9%；需要治疗的病人数（NNT）=2.95% 可信区间=2-3；首次置管失败率的相对危险度下降（RRR）=98.1%，95%可信区间=92.3%-95.5%）。组1胃管置入的平均时间明显缩短（55秒对比组2的60秒）； $P < 0.001$ ，均数差的95%可信区间=3.2-

6.8秒。组1的胃管弯曲/打卷、出血、中度损伤事件发生率也显著降低。

**结论：**对于全麻插管患者，相比于对照组，使用喉部手动向前推进胃管的手法位置入有导丝引导的鼻胃管，其首次置管的成功率更高。这项技术相比传统置管技术也有助于降低操作相关损伤率和操作时间。

（郭晨跃译 薛张纲校）

**BACKGROUND:** Nasogastric tube (NGT) insertion is indicated almost routinely in patients undergoing abdominal surgery to decompress the stomach intraoperatively and postoperatively, and to allow postoperative tube feeding. NGTs are made of nonreinforced polymer plastic materials and are prone to kinking and coiling during insertion. This often poses difficulty in blind NGT placement or placement assisted by variously described techniques. We hypothesized that esophageal guidewire-assisted NGT insertion with manual forward laryngeal displacement can significantly improve the first-attempt success rate over the technique of head flexion and lateral neck pressure during its insertion in anesthetized and tracheally intubated patients.

**METHODS:** Four hundred eighty adult patients presenting for abdominal surgery under general anesthesia with neuromuscular relaxation were randomized to an experimental technique of esophageal guidewire with manual forward displacement of the larynx (group 1) or a control technique of head flexion and lateral neck pressure (group 2) for insertion of the NGT. The success rates (and failure rate) of the first and second attempts (and overall) were assessed along with the incidence of coiling and kinking of the NGT, procedure-related nasal bleeding and pharyngeal bleeding, and the incidence of moderate and life-threatening complications.

**RESULTS:** The first-attempt success rate was 99.2% in group 1 compared with 56.7% in group 2 ( $P < 0.001$ ). Thus, the first-attempt failure rate was 0.8% in group 1 compared with 43.3% in group 2 ( $P < 0.001$ , absolute risk reduction of first-attempt failure rate = 42.5%, 95% confidence interval [CI] = 36.0%-49.9%; numbers needed to treat = 2, 95% CI = 2-3; relative risk reduction of first-attempt failure rate = 98.1%, 95% CI = 92.3%-99.5%). The median time required to insert the NGT was significantly shorter in group 1 (55 vs 60 seconds);  $P < 0.001$ , 95% CI for the difference in means = 3.2 to 6.8 seconds. The incidences of kinking/coiling, bleeding, and moderate injuries were significantly lower in group 1.

**CONCLUSIONS:** Esophageal guidewire-assisted insertion with manual forward laryngeal displacement technique most frequently resulted in correct positioning of the NGT in anesthetized and tracheally intubated patients after the first attempt. This technique is also associated with a lower incidence of procedure-related injuries and is less time-consuming than conventional insertion techniques.

**研究对于腰麻下行剖宫产的产妇使用苯肾对产妇血流动力学影响以及其对产妇和胎儿结局的影响**

**a review of the impact of phenylephrine administration on maternal hemodynamics and maternal and neonatal outcomes in women undergoing cesarean delivery under spinal anesthesia.**

Ashraf S. Habib, MBBCh, MSc, MHS, FRCA

From the Department of Anesthesiology, Duke University Medical Center, Durham, North Carolina.

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对于腰麻下剖腹产患者，苯肾可以有效治疗由于腰麻导致的低血压。以往对于产妇，首选的血管收缩药为麻黄碱，而现在选用苯肾者逐渐增多。大量研究表明，苯肾可以改善胎儿的酸碱状态，预防性使用苯肾可以降低低血压的发生率，副作用也较小。该综述强调：相比麻黄碱，苯肾对产妇血流动力学（心律，血压，心排量）参数改善以及降低术中恶心呕吐的发生率更有效。除了预防性使用苯肾，该综述也讨论了对于已出现低血压后使用苯肾的效果。文章还比较了苯肾与麻黄素对子宫胎盘灌注、胎儿的酸碱状态、Apgar评分等结果的影响。同时也要讨论了苯肾的最适剂量。

（韩叙译 薛张纲校）

Phenylephrine is effective for the management of spinal anesthesia-induced hypotension in parturients undergoing cesarean delivery under spinal anesthesia. While ephedrine was previously considered the vasopressor of choice in obstetric patients, phenylephrine is increasingly being used. This is largely due to studies suggesting improved fetal acid-base status with the use of phenylephrine as well as the low incidence of hypotension and its related side effects with prophylactic phenylephrine regimens. This review highlights the effects of phenylephrine compared with ephedrine on maternal hemodynamics (arterial blood pressure, heart rate, and cardiac output), and occurrence of intraoperative nausea and vomiting. The impact of the administration of phenylephrine as a bolus for the treatment of established hypotension compared with its administration as a prophylactic infusion is discussed. This article also reviews the impact of phenylephrine compared with ephedrine on uteroplacental perfusion, and fetal outcomes such as neonatal acid-base status and Apgar scores. The optimum dosing regimen for phenylephrine administration is also discussed.

**后颅窝颅内手术后经静脉病人自控镇痛的功效：一项前瞻性，随机对照试验。**

**The efficacy of intravenous patient-controlled analgesia after intracranial surgery of the posterior fossa: a prospective, randomized controlled trial.**

Athir Morad, MD, Bradford Winters, MD, PhD, Robert Stevens, MD, Elizabeth White, RN, Jon Weingart, MD, Myron Yaster, MD and Allan Gottschalk, MD, PhD

From the Department of Anesthesiology and Critical Care Medicine, Johns Hopkins School of Medicine, Baltimore, Maryland.

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**背景：**后颅窝手术常常会产生强烈的术后疼痛。然而，这种疼痛因为人们担心使用阿片类药物可能会掩盖术后神经系统检查和/或产生高碳酸血症而很少得到治疗。在这项前瞻

性，随机对照试验中，我们试图确定静脉病人自控镇痛（PCA）与传统的经静脉护士按需管理（PRN）治疗相比是否能减少后颅窝神经外科手术术后疼痛。

**方法：**择期行后颅窝手术的80例患者（年龄范围，18-82岁），随机接受术后护士每30分钟按需经静脉给予芬太尼25至50微克或经PCA给予0.5微克/千克/剂量，一次极量为50微克，锁定时间为15分钟（4个剂量/小时）。我们测量疼痛（数值评定量表，0-

10），记录患者镇痛药使用情况，镇静状态（Ramsay镇静量表和格拉斯哥昏迷量表），呼吸情况，血流动力学状态，及每小时不良事件的发生情况。

**结果：**65例患者完成了研究。其中，31例患者接受静脉PCA镇痛，34例患者接受PRN镇痛。病人的人口统计资料两组间没有差异。PCA组患者休息时疼痛的报道较少，（平均[95%可信区间：3.7[3.0, 4.4]和5.2[4.5, 5.8]，P=

0.003），并比PRN组患者获得更多的芬太尼（平均95%的置信区间：54.8[42.1, 67.6]和29.9[24.2, 35.7]  $\mu\text{g/h}$ ，P=

0.002，）。两组在副作用方面无差异且均无镇痛治疗不良事件发生。

**结论：**静脉

PCA和PRN治疗相比能减少后颅窝手术后的疼痛。我们还需要更大规模的研究，以确定这个病患族群使用静脉PCA的安全性。

(贺盼译 薛张纲校)

**BACKGROUND:** Surgery of the posterior fossa often produces intense postoperative pain. However, this pain is infrequently treated because of concern that opioid administration may mask the postoperative neurologic examination and/or produce hypercarbia. In this prospective, randomized controlled trial, we sought to determine whether IV patient-controlled analgesia (PCA) would lead to reductions in postoperative pain after neurosurgical procedures of the posterior fossa compared with conventional IV nurse-administered as-needed (PRN) therapy.

**METHODS:** Eighty patients (age range, 18-82 years) undergoing elective posterior fossa surgery were randomized to receive postoperative IV fentanyl PRN 25 to 50  $\mu\text{g}$  every 30 minutes or via PCA 0.5  $\mu\text{g/kg/dose}$ , with a maximal dose limit of 50  $\mu\text{g}$ , and 15-minute lockout (4 doses/hour). We measured pain (Numerical Rating Scale, 0-10), analgesic use, sedation (Ramsay Sedation Scale and Glasgow Coma Scale), respiration, hemodynamics, and adverse events hourly.

**RESULTS:** Sixty-five patients completed the study. Thirty-one patients received IV PCA and 34 received PRN analgesia. Patient demographics did not differ between groups. Patients in the PCA group reported less pain at rest (mean [95% confidence interval]: 3.7 [3.0, 4.4] vs 5.2 [4.5, 5.8],  $P = 0.003$ ) and received more fentanyl (mean [95% confidence interval]: 54.8 [42.1, 67.6] vs 29.9 [24.2, 35.7]  $\mu\text{g/h}$ ,  $P = 0.002$ ) than those in the PRN group. There were no differences in side effects and no adverse events related to analgesic therapy.

**CONCLUSIONS:** IV PCA use resulted in reduction in postoperative pain compared with PRN analgesic therapy after surgery of the posterior fossa. Larger studies will be required to determine the safety of IV PCA in this patient population.

对辣椒素敏感的感觉神经元，催产素可以抑制细胞膜去极化导致的细胞内钙离子浓度增加：一种外周镇痛作用机制

**Oxytocin Inhibits the Membrane Depolarization-Induced Increase in Intracellular Calcium**

## **in Capsaicin Sensitive Sensory Neurons: A Peripheral Mechanism of Analgesic Action**

Shotaro Hobo, MD, Ken-ichiro Hayashida, DVM, PhD and James C. Eisenach, MD

From the Department of Anesthesiology, Wake Forest University School of Medicine, Winston-Salem, North Carolina.

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**背景:** 腰椎鞘内注射催产素在人类和大鼠会产生镇痛作用。经典理论是, 催产素受体结合G蛋白, 增加肌醇-3

磷酸的生产, 导致神经元兴奋。迄今大量的研究表明催产素在脊髓内作用于A-

氨基丁酸的中间神经元来产生镇痛作用。这样的说法或许会让我们产生疑问, 催产素是否也会通过调节高电压门控钙通道而影响初级感觉的传导, 如在大脑中的作用。

**方法:** 对成年大鼠背根神经节细胞进行急性分离和培养, 通过荧光显微镜观察指示细胞内钙在指示剂上的变化。对短暂存在的KCl膜外去极化的浓度进行了测定, 并对这些影响进行了药理学研究。同样也对神经结扎后受损的背根神经节细胞进行研究。

**结果:** 催产素对细胞内钙的膜去极化产生浓度依赖性抑制, 催产素比加压素受体的选择性拮抗剂的封锁效果更有效。催产素诱导抑制细胞辣椒素, 当内部钙的毒胡萝卜素的储存耗尽时。催产素产生类似的脊神经结扎动物细胞的抑制作用。

**结论:** 这些数据表明, 鞘内注射催产素部分是通过减少中枢伤害性感受器兴奋性神经递质释放来产生镇痛作用。

(胡晓清译 薛张纲校)

**BACKGROUND:** Lumbar intrathecal injection of oxytocin produces antinociception in rats and analgesia in humans. Classically, oxytocin receptors couple to stimulatory G proteins, increase inositol-3-phosphate production, and result in neuronal excitation. Most work to date has focused on a spinal site of oxytocin to excite  $\bar{A}$ -aminobutyric acid interneurons to produce analgesia. Here we ask whether oxytocin might also affect primary sensory afferents by modulating high voltage-gated calcium channels, such as it does in the brain.

**METHODS:** Dorsal root ganglion cells from adult rats were acutely dissociated and cultured, and changes in intracellular calcium determined by fluorescent microscopy using an indicator dye. The effects of oxytocin alone and in the presence of transient depolarization from increased extracellular KCl concentration were determined, and the pharmacology of these effects were studied. Cells from injured dorsal root ganglion cells after spinal nerve ligation were also studied.

**RESULTS:** Oxytocin produced a concentration-dependent inhibition of the increase in intracellular calcium from membrane depolarization, an effect blocked more efficiently by oxytocin- than vasopressin-receptor selective antagonists. Oxytocin-induced inhibition was present in cells responding to capsaicin, and when internal stores of calcium were depleted with thapsigargin. Oxytocin produced similar inhibition in cells from animals with spinal nerve ligation.

**CONCLUSIONS:** These data suggest that oxytocin produces antinociception after intrathecal delivery in part by reducing excitatory neurotransmitter release from the central terminals of nociceptors.

**相对于颈总动脉分叉平面的颈上神经节定位热图**

**Brief report: a heat map of superior cervical ganglion location relative to the common carotid artery bifurcation.**

Wisco JJ, Stark ME, Safir I, Rahman S.

Department of Pathology and Laboratory Medicine, Division of Integrative Anatomy, David Anesth Analg February 2012 114:462-465

**背景：**当星状神经节阻滞难以施行或属于其禁忌证时，寻找颈上神经节的确切解剖定位来进行局部神经阻滞是很困难的。

**方法：**我们对60例防腐尸体标本进行了颈上神经节部位的解剖。用多元回归分析的方法来确定是否尸体标本自身特性预示着颈上神经节与颈总动脉分叉处的距离以及颈上神经节的宽度及面积。这些回归的基础上，我们通过统计学方法用假色绘制了关于颈上神经节及颈总动脉分叉处的伪色统计热图。

**结果：**这种统计性模型可明显预示着颈上神经节-颈总动脉分叉处的距离 ( $P=0.01$ ) 和颈上神经节的大小 ( $P=0.02$ )。

**结论：**本研究发现颈总动脉分叉处对于神经阻滞中定位颈上神经节是一个很好的标志。  
(李丽红译 薛张纲校)

**BACKGROUND:** Determining the superior cervical ganglion's precise anatomical location for local anesthetic block, when stellate block is not feasible or is contraindicated, is difficult.

**METHODS:** We dissected the superior cervical ganglion in 60 embalmed cadaveric specimens. Multiple regressions determined whether subject characteristics predicted the distance between the superior cervical ganglion and common carotid artery bifurcation and the superior cervical ganglion dimensional width and area. Based on these regressions, we mapped the ganglion and common carotid artery bifurcation using a pseudocolor statistical heat map.

**RESULTS:** The statistical model significantly predicted the superior cervical ganglion–common carotid artery bifurcation distance ( $P = 0.01$ ), and the superior cervical ganglion dimensional width ( $P = 0.02$ ).

**CONCLUSION:** This study determined that the common carotid artery bifurcation is a good landmark for localizing the superior cervical ganglion for anesthetic block.

### 啮齿动物的代谢综合征模型中异氟烷和七氟烷最低肺泡有效浓度的测定

#### Determination of Minimum Alveolar Concentration for Isoflurane and Sevoflurane in a Rodent Model of Human Metabolic Syndrome

Dinesh Pal, PhD, Meredith E. Walton, BA, William J. Lipinski, MS, Lauren G. Koch, PhD, Ralph Lydic, PhD, Steve L. Britton, PhD and George A. Mashour, MD, PhD

From the Department of Anesthesiology, University of Michigan Medical School, Ann Arbor, Michigan. Dinesh Pal and Meredith E. Walton contributed equally to this study.

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**背景：**病态肥胖可影响吸入麻醉药的药代动力学和药效动力学作用，这可能导致给药不当。本研究假设肥胖显著影响异氟烷和七氟烷的最低肺泡有效浓度 (MAC)。为了检验这一假设，本研究通过对先天低需氧能力者 (LCR) 和高需氧能力者 (HCR) 建立啮齿动物的人体代谢综合征模型。LCR大鼠肥胖，表现与人体代谢综合征相同的特征，并表现出低强度耐力。相反，HCR大鼠具有较高的强度耐力，有更好的心血管功能和整体健康的特点。



**方法：**对雄性和雌性LCR (n = 10) 和HCR (n = 10) 大鼠行气管内插管，机械通气并以异氟醚或七氟醚维持麻醉。采用交叉法测定MAC；通过夹尾进行感觉刺激。在连续夹尾之前和之间存在一个30分钟的平衡期。双尾参数检验（非配对t检验）和非参数检验（Mann-Whitney检验）用于比较LCR和HCR大鼠之间的MAC。数据记录为平均值±标准差，并提供95%置信区间。P值<0.05被认为有统计学意义。

**结果：**

LCR大鼠的异氟醚MAC值 (1.52%±0.13%)，与之前报道正常大鼠异氟醚MAC值 (1.51%±0.12%) 相似。HCR大鼠的异氟醚MAC值 (1.90%±0.19%) 显著高于LCR大鼠 (1.52%±0.13%) (P = 0.0001)。LCR和HCR大鼠之间的七氟醚MAC值没有显著不同，并且与之前报道的正常大鼠的七氟醚MAC值 (2.4%±0.30%) 相似。性别对异氟醚或七氟醚的MAC值没有影响。

**结论：**通过对啮齿动物的代谢综合征模型MAC测量发现，肥胖以及相关的合并症不影响吸入麻醉药的需求。相反，高有氧能力与异氟醚较高的MAC有关，且可能是给药过少的一个危险因素。

(龚寅 译 陈杰 校)

**BACKGROUND:** Morbid obesity affects the pharmacokinetics and pharmacodynamics of anesthetics, which may result in inappropriate dosing. We hypothesized that obesity significantly alters the minimum alveolar concentration (MAC) for isoflurane and sevoflurane. To test this hypothesis, we used a rodent model of human metabolic syndrome developed through artificial selection for inherent low aerobic capacity runners (LCR) and high aerobic capacity runners (HCR). The LCR rats are obese, display phenotypes homologous to those characteristic of human metabolic syndrome, and exhibit low running endurance. In contrast, HCR rats have high running endurance and are characterized by improved cardiovascular performance and overall health.

**METHODS:** Male and female LCR (*n* = 10) and HCR (*n* = 10) rats were endotracheally intubated and maintained on mechanical ventilation with either isoflurane or sevoflurane. A bracketing design was used to determine MAC; sensory stimulation was induced by tail clamping. An equilibration period of 30 minutes was provided before and between the consecutive tail clamps. Two-tailed parametric (unpaired *t* test) and nonparametric (Mann–Whitney test) statistics were used for the comparison of MAC between LCR and HCR rats. The data are reported as mean ± SD along with the 95% confidence interval. A *P* value of <0.05 was considered statistically significant.

**RESULTS:** The MAC for isoflurane in LCR rats (1.52% ± 0.13%) was similar to previously reported isoflurane-MAC for normal rats (1.51% ± 0.12%). The HCR rats showed a significantly higher isoflurane-MAC (1.90% ± 0.19%) than did the LCR rats (1.52% ± 0.13%) (*P* = 0.0001). The MAC for sevoflurane was not significantly different between LCR and HCR rats and was similar to the previously published sevoflurane-MAC for normal rats (2.4% ± 0.30%). There was no influence of sex on the MAC of either isoflurane or sevoflurane.

**CONCLUSION:** Obesity and associated comorbidities do not affect anesthetic requirements as measured by MAC in a rodent model of metabolic syndrome. By contrast, high aerobic capacity is associated with a higher MAC for isoflurane and may be a risk factor for subtherapeutic dosing.

## 静脉补液可引起基于导电率的红细胞压积即时检验仪的系统偏倚

### Intravenous Fluids Cause Systemic Bias in a Conductivity-Based Point-of-Care Hematocrit Meter

Patrick Wu, BS\*, Timothy E. Morey, MD†, Neil S. Harris, MB, ChB, MD‡, Nikolaus Gravenstein, MD† and Mark J. Rice, MD†

From the \*Department of Anesthesiology, University of Virginia School of Medicine, Charlottesville, Virginia; and Departments of †Anesthesiology and ‡Pathology, University of Florida College of Medicine, Gainesville, Florida.

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#### 背景:

即时检验设备(POC)依靠测定全血的电导率来测量红细胞压积。本研究假设常用的静脉输液可独立改变血液导电率，并干扰红细胞压积的测定。

#### 方法:

用生理盐水、乳酸林格氏液、羟乙基淀粉、或血浆将人类全血稀释到预定的红细胞压积值。每次稀释都测量电导率和红细胞压积(i-STAT®法和spun法)。在另外的试验中测定异丙酚和肝素在这些变量上的影响。

#### 结果:

无论何种稀释液，导电率随着稀释量的增加而增加。导电率斜率大小从小到大依次为血浆，羟乙基淀粉，乳酸林格氏液和生理盐水。此外斜率各不相同(所有 $P < 0.0001$ )，而使用i-STAT法测得的94.2%红细胞压积值( $n = 211$  of 224)，较spun法更低。用血浆、生理盐水、乳酸林格氏液以及羟乙基淀粉稀释分别引起-2.7% (-6.9/1.4)、-4.6% (-7.3/-2.0)、-4.8% (-7.8/-1.7)以及-2.0% (-5.6/1.9)的偏倚(Bland-Altman协议限制)。对于输血界限为30%时的Cohen  $\kappa$ 协议值(第5-第95置信区间)为0.90(所有值，0.85-0.95)，0.25(红细胞压积<30%，0.02-0.48)以及0.21(红细胞压积18%-30%，0.01-0.42)。临床相关浓度的异丙酚和肝素对于导电率和红细胞压积影响很小。

#### 结论:

使用常用静脉补液进行血液稀释后，全血导电率的测量受到影响，且使用基于此原理的POC装置测得红细胞压积较spun法测得的数值更低。故当存在血液稀释时，应谨慎对待基于导电率的红细胞压积即时检验仪的结果。

(俞劫晶 译 陈杰 校)

**BACKGROUND:** Point-of-care (POC) devices measuring hematocrit rely on determination of electrical conductivity of whole blood. We hypothesized that some frequently administered IV fluids independently alter blood conductivity and confound hematocrit determination.

**METHODS:** Whole human blood was diluted to predetermined hematocrit values with normal saline, lactated Ringer solution, hetastarch, or plasma. Electrical conductivity and hematocrit (i-STAT® and spun methods) were measured at each dilution. In separate experiments, the effects of propofol and heparin were noted on these variables.

**RESULTS:** Greater dilution significantly increased conductivity irrespective of diluent type. The magnitude of the conductivity slopes increased in order for plasma, hetastarch, lactated Ringer solution, and normal saline dilution. Moreover, each slope varied from every other slope (all  $P < 0.0001$ ), and 94.2% of hematocrit values measured by i-STAT ( $n = 211$  of 224) were less than those for the spun method. Dilution with plasma, normal saline, lactated Ringer solution,

and hetastarch caused bias (Bland-Altman limits of agreement) of  $-2.7\%$  ( $-6.9/1.4$ ),  $-4.6\%$  ( $-7.3/-2.0$ ),  $-4.8\%$  ( $-7.8/-1.7$ ), and  $-2.0\%$  ( $-5.6/1.9$ ), respectively. The Cohen  $\kappa$  agreement values (5th–95th confidence interval) for a transfusion trigger of 30% were 0.90 (all values, 0.85–0.95), 0.25 (hematocrit  $<30\%$ , 0.02–0.48), and 0.21 (hematocrit 18%–30%, 0.01–0.42). Clinically relevant concentrations of propofol and heparin had minimal effects on electrical conductivity or hematocrit determination.

**CONCLUSIONS:** Dilution of blood with frequently used IV solutions affects whole blood conductivity determinations and thereby decreases hematocrits measured by a POC device relying on this method as compared with spun hematocrit. Conductivity-based hematocrit POC devices should be cautiously interpreted when hemodilution is present.

### 围术期吸入高氧在降低手术部位感染中的作用：Meta分析

#### The Role of Perioperative High Inspired Oxygen Therapy in Reducing Surgical Site Infection: A Meta-Analysis

Brandon Togioka, MD, Samuel Galvagno, DO, Shawn Sumida, MD, Jamie Murphy, MD, Jean-Pierre Ouanes, DO and Christopher Wu, MD

From the Department of Anesthesiology and Critical Care Medicine, The Johns Hopkins University, Baltimore, Maryland.

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**背景：**由于随机对照研究所报导的结果大相径庭，用高氧血症来预防外科手术部位感染其效果不明。这次系统性回顾的目的是决定围术期高氧血症是否能降低手术部位的感染。

**方法：**本研究使用National Library of Medicine's MEDLINE, Cochrane Collaboration's CENTRAL,和EMBASE

数据库进行数据搜索。所纳入的研究限于对成人进行的随机对照实验，内容明确包含了高氧和低氧或对照之间的比较以及对于围术期感染的评估。使用Cochrane Collaboration's RevMan 5.0.25版本 (Cochrane Collaboration, Oxford,

UK)得出主要结果（手术部位感染）的汇集估计相对危险度和其95%信任区间。通过随机效应模型计算相对危险度。

**结果：**此次研究分成7个试验，共纳入2728位病人，其中有1358位患者被随机分配至高氧血症组，另1370位患者至对照组。高氧血症组的汇集感染率为15.5%，而对照组为17.5%。高氧血症对于手术部位感染的优势比为0.85（95%可信区间：0.52，1.38）（ $P=0.51$ ），但是2个亚组分析（全身麻醉和结直肠手术）结果显示出了高氧疗法对于降低术后感染的益处。

**结论：**根据此次Meta分析，未发现围术期高氧疗法对预防手术部位感染有益。两亚组实验（全身麻醉和结直肠手术）出现了阳性结果即高氧血症降低术后感染。需要对这一结果作进一步的研究。

（范逸辰 译 陈杰 校）

**BACKGROUND:** The clinical role of hyperoxia for preventing surgical site infection remains uncertain because randomized controlled trials on this topic have reported disparate results. Our objective in this systematic review was to determine whether perioperative hyperoxia reduces surgical site infection.

**METHODS:** An electronic search was conducted using the National Library of Medicine's MEDLINE, Cochrane Collaboration's CENTRAL, and EMBASE databases. Included studies

consisted of randomized controlled trials in an adult population with a clearly defined comparison of high oxygen versus low oxygen or control, and with a documented assessment for perioperative infection. Pooled estimates for odds ratios (ORs) with 95% confidence intervals were obtained for our primary outcome (surgical site infection) using the Cochrane Collaboration's RevMan version 5.0.25 (Cochrane Collaboration, Oxford, UK). ORs were calculated using a random effects model.

**RESULTS:** The literature search ultimately yielded 7 trials, enrolling 2728 patients, that were included in the analysis. There were 1358 patients randomly assigned to hyperoxia and 1370 to control. The pooled infection rate in the hyperoxia group was 15.5% versus 17.5% in the control group. Hyperoxia resulted in an OR of 0.85 for surgical site infection (95% confidence interval: 0.52, 1.38) ( $P = 0.51$ ). However, 2 subgroup analyses (general anesthesia and colorectal surgery trials) showed a benefit for high inspired oxygen therapy of decreasing surgical site infection.

**CONCLUSIONS:** Perioperative high inspired oxygen therapy overall was not found to be beneficial for preventing surgical site infection based on this meta-analysis. The positive results of 2 subgroup analyses (general anesthesia and colorectal surgery trials) suggest a benefit for hyperoxia in decreasing surgical site infection. Additional studies are needed to further investigate this intervention.

#### 简报：胶体液对离体肾近端小管上皮细胞的影响

##### **Brief Report: The Effects of Colloid Solutions on Renal Proximal Tubular Cells In Vitro**

Winfried Neuhaus, PhD\*†, Martin A. Schick, MD\*, Raphael R. Bruno\*, Bianca Schneider\*, Carola Y. Förster, PhD, Prof.\*‡, Norbert Roewer, MD, Prof.\* and Christian Wunder, MD, Prof.\*  
From the \*Department of Anaesthesia and Critical Care, University Hospital Würzburg, Würzburg, Germany; †Department of Medicinal Chemistry, University of Vienna, Vienna, Austria; and ‡Comprehensive Heart Failure Center (CHFC) Würzburg, University Hospital Würzburg, Würzburg, Germany.

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肾功能衰竭是危重病人常见的并发症。胶体，如羟乙基淀粉（HES）、明胶或白蛋白等常用于血容量的复苏，但越来越多报导认为脓毒症患者应用胶体可引起肾毒性的副作用。因此，本实验研究胶体（HES130/0.4，

Voluven®）、明胶（Gelafundin®）、人血白蛋白和晶体液（Sterofundin®

ISO）对人肾小管细胞（HK-2）活力的影响。使用胶体液（0.1%–

4%）和相同容量的晶体液（Sterofundin® ISO）培养HK-

2细胞。21小时后，EZ4U法（染料XTT法）测量HK-

2细胞的活力。应用HES130/0.4可使细胞活力呈现浓度依赖性下降（0.5%HES时 $86.80\% \pm 10.79\%$ ，4%HES时下降为 $24.02\% \pm$

$4.27\%$ ）。人血白蛋白（>1.25%）及明胶（>1%）也呈现对HK-

2细胞的不良影响。有趣的是，相对于氯化钠对照组，低浓度人血白蛋白和晶体液Sterofundin ISO有细胞保护作用。综上所述，高浓度的人工和天然胶体对事先无炎症刺激的HK-

2细胞呈现有害的影响，HES130/0.4呈现出的有害影响最大，而晶体Sterofundin

ISO对细胞有保护作用。

（滕凌雅 译 陈杰 校）

Renal failure is a common complication of critically ill patients. Colloids such as hydroxyethyl starch (HES), gelatin, or albumin are regularly used for intravascular volume resuscitation, but there are increasing reports about the nephrotoxic side effects of synthetic colloids in septic patients. Therefore, we investigated the influence of colloids (HES130/0.4 (Voluven®), gelatin (Gelifundin®), human albumin, and the crystalloid Sterofundin® ISO) on cell viability of human proximal tubular (HK-2) cells. HK-2 cells were incubated with colloids (0.1%–4%) and with equivalent volumes of the crystalloid solution Sterofundin ISO. After 21 hours, cell viability of HK-2 cells was measured by EZ4U assay (dye XTT). Application of HES130/0.4 decreased cell viability significantly in a concentration-dependent manner (86.80% ± 10.79% by 0.5% HES down to 24.02% ± 4.27% by 4% HES). Human albumin (>1.25%) as well as gelatin (>1%) also showed deleterious effects on HK-2 cells. Interestingly, in lower concentrations, human albumin and the crystalloid solution Sterofundin ISO were cytoprotective in comparison with the NaCl control. In conclusion, synthetic and natural colloids showed a harmful impact on HK-2 cells in higher concentrations without any prior proinflammatory stimulus. HES130/0.4 exhibited the most distinctive harmful impact, whereas the application of crystalloid Sterofundin ISO revealed cytoprotective effects.

### 异氟醚与地氟醚对人认知功能的影响

#### The Effects of Isoflurane and Desflurane on Cognitive Function in Humans

Bin Zhang, MD, MS\*, Ming Tian, MD, PhD\*, Yu Zhen, MD, PhD\*, Yun Yue, MD, MS#, Janet Sherman, PhD†, Hui Zheng, PhD‡, Shuren Li, MD\*, Rudolph E. Tanzi, PhD§, Edward R. Marcantonio, MD, MS || and Zhongcong Xie, MD, PhD¶

From the \*Department of Anesthesia, Beijing Friendship Hospital, Capital Medical University, Beijing, P.R. China; †Psychology Assessment Center, ‡Biostatistics Center, and §Genetics and Aging Research Unit, Department of Neurology, Massachusetts General Hospital and Harvard Medical School, Charlestown, MA; || Divisions of General Medicine and Primary Care and Gerontology, Department of Medicine, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Massachusetts; ¶Geriatric Anesthesia Research Unit, Department of Anesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital and Harvard Medical School, Charlestown, MA; #Department of Anesthesia, Beijing Chaoyang Hospital, Capital Medical University, Beijing, P.R. China.

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**背景：**术后认知功能障碍（POCD）的病因仍有待明确。异氟醚，而非地氟醚可导致神经毒性。然而，这些效应带来的功能性后果尚未评估。本队列研究目的在于确定异氟醚与地氟醚对人类认知功能的影响。

**方法：**本研究对象分为腰麻下行下肢或腹部手术组（S，N = 15），腰麻复合地氟醚麻醉组（SD，N = 15），腰麻复合异氟醚麻醉组（SI，N = 15）。一名对麻醉方案未知的观察者在术前、术后1周对每例患者进行认知测试。由这些测试得出的评分来判定是否为POCD。

**结果：**研究对象共45例，24例男性和21例女性。受试者平均年龄为69.0 ± 1.9岁。年龄等其他特征无显著差异性。认知功能减退的平均数在S,SD，和SI组分别为1.

13, 1.07和1.40。SI组术后POCD发生率为27%，明显高于S组(0%) $P = 0.028$ （三者间比较），SD组术后发生率为0%。

讨论：本队列研究结果表明，异氟醚与地氟醚对术后认知功能的影响可能不同，需进行更大样本量和更长随访时间的后续研究。

（陈毓雯 译 陈杰 校）

**BACKGROUND:** The etiology of postoperative cognitive decline (POCD) remains to be determined. Anesthetic isoflurane, but not desflurane, may induce neurotoxicity. However, the functional consequences of these effects have not been assessed. We therefore performed a pilot study to determine the effects of isoflurane and desflurane on cognitive function in humans.

**METHODS:** The subjects included patients who had lower extremity or abdominal surgery under spinal anesthesia alone (S,  $n = 15$ ), spinal plus desflurane anesthesia (SD,  $n = 15$ ), or spinal plus isoflurane anesthesia (SI,  $n = 15$ ) by randomization. Each of the subjects received cognitive tests immediately before and 1 week after anesthesia and surgery administered by an investigator who was blinded to the anesthesia regimen. POCD was defined using the scores from each of these tests.

**RESULTS:** We studied 45 subjects, 24 males and 21 females. The mean age of the subjects was  $69.0 \pm 1.9$  years. There was no significant difference in age and other characteristics among the treatment arms. The mean number of cognitive function declines in the S, SD, and SI groups was 1.13, 1.07, and 1.40, respectively. POCD incidence after SI (27%), but not SD (0%), anesthesia was higher than that after S (0%),  $P = 0.028$  (3-way comparison).

**CONCLUSION:** These findings from our pilot study suggest that isoflurane and desflurane may have different effects on postoperative cognitive function, and additional studies with a larger sample size and longer times of follow-up testing are needed.

### 全膝置换术患者围术期脑脊液神经递质的变化：一项随机试验

#### Cerebrospinal Fluid Neurotransmitter Changes During the Perioperative Period in Patients Undergoing Total Knee Replacement: A Randomized Trial

Asokumar Buvanendran, MD\*, Jeffrey S. Kroin, PhD\*, Craig J. Della Valle, MD†, Mario Moric, MS\* and Kenneth J. Tuman, MD\*

From the Departments of \*Anesthesiology and †Orthopedic Surgery, Rush University Medical Center, Chicago, Illinois.

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**背景：**全膝置换术对患有骨关节炎的患者有颇多好处，但急性术后疼痛很严重且难以处理。尽管已开展一些人体研究，脊髓神经递质在这种剧烈疼痛中起的作用尚不明确。本研究组完成了首个术后（例如：全膝置换术）脊髓神经递质变化的前瞻性临床研究。另外，也证明了围术期使用临床允许剂量的抗痛觉敏感药物是否调整了患者脊髓在神经递质的浓度。

**方法：**所有患者均接受腰椎穿刺，获得脑脊液后测定基础神经递质浓度。椎管内留置导管进行脊髓麻醉下标准全膝置换术，术后行连续脊髓镇痛。分别从留置的脊髓导管，留置置管后2,4,8,12,24,32小时的脑脊液样本。分别测样本中的去甲肾上腺素，P物质，降钙素基因相关肽（CGRP）以及谷氨酸的浓度。术前行SF-

36表（36项简明健康调查量表）评价。术后32小时，每隔4小时进行数字疼痛分级法评估，记录椎管内镇痛药用量。此项随机，双盲，安慰剂对照研究将患者分为3组（每组16人

)：安慰剂组，单剂给普瑞巴林组（术前注射150mg）和多次给予普瑞巴林组（术前注射150mg，12以及24小时后再注射），测定抗痛觉敏感药（如普瑞巴林）对脊髓神经递质的影响。

**结果：**48名患者随机分为3个围术期处理组。44名患者成功留取多个样本的脑脊液。术前躯体疼痛增加（术前采用SF-36评估）与脑脊液中去甲肾上腺素的升高有关( $P = 0.044$ )。与术前数值比较，安慰剂组去甲肾上腺素在置管2小时和4小时浓度降低( $P < 0.005$ )，但单剂量和多剂量组，浓度下降的趋势分别持续到了置管12小时和24小时( $P < 0.001$ )。三组2小时的脑脊液中P物质水平平均达到峰值，之后回到基线。和基础值相比，安慰剂组的CGRP水平只在置管32小时的样本中下降，但在两组普瑞巴林处理组中，脑脊液中的CGRP浓度从置管4小时到32小时均有下降。只有安慰剂组的脑脊液中谷氨酸浓度从置管4小时到32小时与基线相比均下降。三组长于置管后32小时的脑脊液样本中的神经递质浓度没有差异。安慰剂组中，早期的疼痛数字分级法的曲线下面积（AUC）与脑脊液中去甲肾上腺素浓度的曲线下面积正性相关（ $R=0.67, P=0.0088$ ），但其他神经递质与疼痛数字分级结果无关。脑脊液中神经递质浓度和术后镇痛药物使用也没有联系。

**结论：**围术期，有四种脊髓神经递质随时间有明显的浓度变化。脑脊液中P物质因为手术影响上升很快，而去甲肾上腺素浓度呈下降趋势。使用临床允许剂量的普瑞巴林对脊髓神经递质的浓度可能没有调节作用。

（陆秉玮 译 陈杰 校）

**BACKGROUND:** Total knee replacement (TKR) is of enormous benefit to patients with osteoarthritis of the knee; however, the acute postoperative pain can be severe and difficult to manage. The role of major spinal cord neurotransmitters in this acute postoperative period is not clear, although there are a few studies in humans. We performed the first prospective clinical study undertaken to delineate the changes in the spinal neurotransmitters after a surgery such as TKR. Furthermore, we also determined whether antihyperalgesic drugs at clinically acceptable doses modulate spinal neurotransmitter concentrations in patients during the perioperative period.

**METHODS:** All patients had a spinal needle placed in the lumbar region and cerebrospinal fluid (CSF) obtained for baseline measurement of the neurotransmitters. An intrathecal catheter was then placed for spinal anesthesia for standard TKR and for continuous spinal postoperative analgesia. The spinal catheter was also used postoperatively to sample CSF at 2, 4, 8, 12, 24, and 32 hours after catheter placement. CSF samples were assayed for norepinephrine, substance P, calcitonin gene-related peptide (CGRP), and glutamate concentrations. SF-36 (36-item Short Form Health Survey) was measured preoperatively. Numerical rating scale (NRS) pain scores and intrathecal analgesic consumption were recorded postsurgery at 4-hour intervals for 32 hours. We performed a randomized, placebo-controlled, double-blind trial with 3 drug groups ( $n = 16$  per group): placebo; single-dose pregabalin (150 mg administered before surgery); and multidose pregabalin (150 mg administered presurgery and 12 and 24 hours later), to determine the effect of an antihyperalgesic drug such as pregabalin on spinal neurotransmitters.

**RESULTS:** Forty-eight patients were randomly assigned to the 3 perioperative treatment groups, and multiple CSF samples were successfully obtained from 44 patients. Before surgery, increased bodily pain (from preoperative SF-36 measure) was correlated with increased CSF norepinephrine concentration ( $P = 0.044$ ). Compared with presurgery values, norepinephrine levels were lower in the placebo group at the 2- and 4-hour time points ( $P < 0.005$ ) whereas in the single and multidose groups, the reduction ( $P < 0.001$ ) continued until 12 and 24 hours,

respectively. Substance P CSF levels had an early peak value (at 2 hours) in all 3 groups, and then returned to baseline. Compared with baseline value, the CGRP CSF levels only decreased at the 32-hour time point in the placebo group, but in both pregabalin groups, CGRP levels decreased over the 4- to 32-hour period. In the placebo group only, CSF glutamate decreased over 4 to 32 hours compared with presurgery values. However, there was no difference in the CSF neurotransmitter concentrations among the 3 treatment groups over the 32-hour sampling period. In the placebo group, the early NRS pain score area under the curve, AUC [0–12 hours], was positively correlated ( $R = 0.67$ ,  $P = 0.0088$ ) with the CSF norepinephrine concentration AUC [12–24 hours], but none of the other neurotransmitters was correlated with the NRS. None of the CSF neurotransmitter concentrations correlated with postoperative analgesic consumption. **CONCLUSION:** In the perioperative period, the concentration changes of the 4 spinal neurotransmitters have a distinct time course. CSF substance P seems to increase very rapidly with surgical intervention, whereas the CSF norepinephrine concentration tends to decrease. At clinical doses, pregabalin does not seem to modulate these spinal neurotransmitter concentrations.

一项关于微创髋关节成形术后连续囊外注射0.3%罗哌卡因与连续伤口处局部注射吗啡用于病人自控镇痛比较的前瞻，随机，双盲，安慰剂对照研究

**Continuous Epicapsular Ropivacaine 0.3% Infusion After Minimally Invasive Hip Arthroplasty: A Prospective, Randomized, Double-Blinded, Placebo-Controlled Study Comparing Continuous Wound Infusion with Morphine Patient-Controlled Analgesia**

Jose Aguirre, MD, MSc\*, Barbara Baulig, MD\*, Claudio Dora, MD†, Georgios Ekatothramis, MD\*, Gina Votta-Velis, MD, PhD\*, Philipp Ruland, MD\* and Alain Borgeat, MD\*

From the \*Division of Anesthesiology and †Department of Orthopedic Surgery, Balgrist University Hospital Zurich, Zurich, Switzerland.

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**背景：** 此项研究探索微创人工髋关节成形术后伤口处局部连续注射0.3%罗哌卡因对止痛效果以及吗啡用量的影响。

**方法：** 76例患者纳入此项前瞻性的双盲研究中。患者在腰麻下行择期微创髋关节成形术。

在囊外放置一根长15cm带侧孔导管，由外科医生完成这项操作。患者在伤口关闭前随机接受0.3%罗哌卡因20ml (R组) 或0.9%生理盐水20毫升 (P组) 局部单次伤口内注射。术后48小时予连续泵注0.3%罗哌卡因或安慰剂8 mL /

h。向所有病人提供静脉吗啡自控镇痛。分别在48小时的研究期间内记录吗啡的用量、静息和运动时的疼痛度、总体和游离罗哌卡因血浆浓度。术后随访3个月。

**结果：** 人口学资料和手术相关数据两组相似。在术后第一个48小时内平均吗啡用量R组显著低于在P组：45.4±9.5 比 69.7±9.6 (P

<0.001)。术后第一个24小时内平均减少了14.4mg (95%可信区间[CI]12.6-

16.1) 和第二个24小时内减少了20.8mg (95%CI为19.1-

22.4)。静息和运动疼痛评分中的R组 (P

<0.0001) 更低。R组病人的平均满意度相对基础值 (95%CI15.9-

29.6) 增加22.7%。R组总体和游离罗哌卡因血浆浓度均低于局麻药中毒浓度。R组游离的罗哌卡因浓度在T<sub>24</sub>和T<sub>48</sub>时分别为0.14和0.11μg/mol/



L。术后3个月内，两组髋关节疼痛和镇痛药的消耗量相似，但R组经观察在伤口触摸不适（31.2;95%CI为27.7%-34.7%）和加压不适（24;95%CI为20.1-27.9）方面的发生率显著减少（ $P < 0.0001$ ）

**结论：**微创髋关节置换术术后连续囊外伤口输注0.3%罗哌卡因有效减少吗啡消耗量和改善术后镇痛质量。这项技术的益处可持续至术后三个月。

（孙晓琼 译 陈杰 校）

**BACKGROUND:** In this study, we investigated the impact of a continuous wound infusion with ropivacaine 0.3% on pain and morphine consumption after minimally invasive hip arthroplasty.

**METHODS:** Seventy-six consecutive patients scheduled for elective minimally invasive hip replacement using spinal anesthesia were prospectively included in this double-blind study. Epicapsular placement of a 15-cm fenestrated catheter was performed by the surgeon. Patients were randomized to receive either 20 mL ropivacaine 0.3% (R-group) or 20 mL NaCl 0.9% (P-group) applied into the wound as a bolus before wound closure. A continuous infusion of either ropivacaine 0.3% or placebo was then infused at 8 mL/h for 48 hours after surgery with an elastomeric pump. Morphine IV-patient-controlled analgesia was offered to all patients. Morphine consumption, pain at rest and with motion, and total and unbound ropivacaine plasma concentration were recorded during the 48-hour study period. Postoperative follow-up was performed at 3 months.

**RESULTS:** Demographic and surgical data were similar in both groups. Mean morphine consumption was significantly lower in the R-group than in the P-group during the first 48 postoperative hours:  $45.4 \pm 9.5$  vs  $69.7 \pm 9.6$  ( $P < 0.0001$ ). There was a mean reduction of 14.4 mg for the first 24 postoperative hours (95% confidence interval [CI] 12.6 to 16.1) and 20.8 mg for the next 24 hours (95% CI 19.1 to 22.4). Pain scores at rest and with motion were lower in the R-group ( $P < 0.0001$ ). Mean patient satisfaction increased 22.7% from baseline (CI 95% 15.9 to 29.6) in the R-group. Total and unbound ropivacaine plasma concentrations were below toxic levels in the R-group. The free ropivacaine concentration was 0.14 and 0.11  $\mu\text{g}/\text{mL}$  at  $T_{24}$  and  $T_{48}$ , respectively, in the R-group. At 3 months postoperatively, hip pain and analgesic consumption were similar, but a significant reduction in wound discomfort to touch (31.2; 95% CI 27.7 to 34.7) and pressure (24; 95% CI 20.1 to 27.9) was observed in the R-group ( $P < 0.0001$ ).

**CONCLUSIONS:** Continuous epicapsular wound infusion with ropivacaine 0.3% after minimally invasive hip replacement is an efficient technique for reducing morphine consumption and improving the quality of postoperative analgesia. The beneficial effects of this technique are still present 3 months after surgery.