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围手术期心肌形变的评估

Perioperative Assessment of Myocardial Deformation

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Anesthesia & Analgesia 2014 118 525–544

评价左心室性能提高风险评估和麻醉决策水平。然而，心肌功能最常见的超声心动图测量参数是左心室射血分数(LVEF)，有相当的局限性。LVEF 受到主观判断的限制，降低其准确性和可重复性，并且 LVEF 评估的是整体功能，不包括局部心肌的异常表现。因此需要另一种客观评价心肌功能的超声心动图参数。心肌形变分析，可对整体和局部的心肌功能进行定量的评估，对于手术患者的围手术期监护是有用的。心肌形变分析通过定量应变及应变率来评估左室力学参数。应变描述在纵向(从基底部到心尖部)和周向(围绕着心室短轴)上心肌长度的变化和在径向上心肌厚度的变化。节段应变描述局部心肌功能。当心室行纵向或周向缩短时应变是一个负值，而发生径向增厚时其为正值时。近期一项经胸心超的 Meta 分析显示正常纵向应变的参考值为 (平均数±标准差)−19.7%±0.4%,而径向和周向应变正常值分别为 47.3%±1.9%和−23.3%±0.7%。心肌应变的速度也很重要，被称为应变速率。正常人群的纵向收缩期应变率平均值为 1.10±0.16s−1。心肌形变的评估需要考虑各应变(形变变化)，这与 LVEF 和应变率(形变速度)相关，也与左室压力的上升速度(dP / dt)有关。心肌形变分析还评估心室的舒张、扭转、松弛活动，提供一种新颖无创的方法来评估心肌收缩和舒张期组成。心肌形变分析是基于多普勒或非多普勒技术,称为斑点追踪超声心动图。心肌形变分析提供整体和局部心肌功能的定量评估，用于手术患者围手术期的监护。例如,可通过受累冠脉支配区域应变值急剧降低来诊断冠状动脉旁路移植后移植物闭塞。此外,评估左心室力学参数可在常规心超之前发现潜在的心肌病变。当然，主动脉瓣返流患者在 LVEF 减少发生前表现为纵向应变减少，它可发现亚临床的左心室功能障碍并预测修补术后发生心衰和心功能受损的风险增加。此综述描述了心肌形变分析得原理、技术和临床应用。

（李峰日 译 陈杰 校）

Evaluation of left ventricular performance improves risk assessment and guides anesthetic decisions. However, the most common echocardiographic measure of myocardial function, the left ventricular ejection fraction (LVEF), has important limitations. LVEF is limited by subjective interpretation that reduces accuracy and reproducibility, and LVEF assesses global function without characterizing regional myocardial abnormalities. An alternative objective echocardiographic measure of myocardial function is thus needed. Myocardial deformation analysis, which performs quantitative assessment of global and regional myocardial function, may be useful for perioperative care of surgical patients. Myocardial deformation analysis evaluates left ventricular mechanics by quantifying strain and strain rate. Strain describes percent change in myocardial length in the longitudinal (from base to apex) and circumferential (encircling the short-axis of the ventricle) direction and change in thickness in the radial direction. Segmental strain describes regional myocardial function.Strain is a negative number when the ventricle shortens longitudinally or circumferentially and is positive with radial thickening. Reference values for normal longitudinal strain from a recent meta-analysis by using transthoracic echocardiography are (mean ± SD) −19.7% ± 0.4%, while radial and circumferential strain are 47.3% ± 1.9% and −23.3% ± 0.7%, respectively. The speed of myocardial deformation is also important and is characterized by strain rate. Longitudinal systolic strain rate in healthy subjects averages −1.10 ± 0.16 s−1. Assessment of myocardial deformation requires consideration of both strain (change in deformation), which correlates with LVEF, and strain rate (speed of deformation), which correlates with rate of rise of left ventricular pressure (dP/dt). Myocardial deformation analysis also evaluates ventricular relaxation, twist, and untwist, providing new and noninvasive methods to assess components of myocardial systolic and diastolic function. Myocardial deformation analysis is based on either Doppler or a

non-Doppler technique, called speckle-tracking echocardiography. Myocardial deformation analysis provides quantitative measures of global and regional myocardial function for use in the perioperative care of the surgical patient. For example, coronary graft occlusion after coronary artery bypass grafting is detected by an acute reduction in strain in the affected coronary artery territory. In addition, assessment of left ventricular mechanics detects underlying myocardial pathology before abnormalities become apparent on conventional echocardiography. Certainly, patients with aortic regurgitation demonstrate reduced longitudinal strain before reduction in LVEF occurs, which allows detection of subclinical left ventricular dysfunction and predicts increased risk for heart failure and impaired myocardial function after surgical repair. In this review, we describe the principles, techniques, and clinical application of myocardial deformation analysis.

环丙基甲氧基羰酰美托咪酯的药理学：与异丙酚的比较

The Pharmacology of Cyclopropyl-Methoxycarbonyl Metomidate: A Comparison with Propofol

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Anesthesia & Analgesia 2014 118 563–567

背景：作为麻醉诱导和维持中异丙酚的替代物，环丙基甲氧基羰酰美托咪酯（CPMM）是一种最近研发作用温和的依托咪酯类似药物。

方法：研究通过评估 CPMM 和异丙酚直接激动 α 1(L264T)β3γ2GABAA 型受体和引起蝌蚪翻正反射消失的能力比较了两种药物的效能。同时测试大鼠在持续输注 CPMM 和异丙酚 5 至 120min 后脑电图恢复的速率。

结果：CPMM 和异丙酚激活 GABAA 受体以及引起蝌蚪翻正反射消失的 50%有效浓度（EC50S）分别为 3.8 ± 0.4 和 3.9 ± 0.2 μM（GABAA 受体）以及 2.6 ± 0.19 and 1.3 ± 0.04 μM （蝌蚪）。长时输注 CPMM 者脑电图的恢复比输注异丙酚者快，而缺乏异丙酚的持续静注即时半衰期。

结论：在激活 GABAA 受体和引起蝌蚪翻正反射消失方面 CPMM 和异丙酚有相似的效能。然而，尤其是长时输注后，CPMM 提供了比异丙酚更快速和可预测的恢复。

（边文玉 译 陈杰 校）

BACKGROUND: Cyclopropyl-methoxycarbonyl metomidate (CPMM) is a “soft” etomidate analogue currently being developed as a propofol alternative for anesthetic induction and maintenance.

METHODS: We compared the potencies of CPMM and propofol by assessing their abilities to directly activate α1(L264T)β3γ2 gamma-aminobutyric acid type A (GABAA) receptors and induce loss of righting reflexes in tadpoles. We also measured the rates of encephalographic recovery in rats after CPMM and propofol infusions ranging in duration from 5 to 120 minutes.

RESULTS: CPMM and propofol activate GABAA receptors and induce loss of righting reflexes in tadpoles with respective 50% effective concentrations (EC50s) of 3.8 ± 0.4 and 3.9 ± 0.2 μM (GABAA receptor) and 2.6 ± 0.19 and 1.3 ± 0.04 μM (tadpole). Encephalographic recovery after prolonged infusion was faster with CPMM and lacked propofol’s context sensitivity.

CONCLUSION: CPMM and propofol have similar potencies in GABAA receptors and tadpoles; however, CPMM provides more rapid and predictable recovery than propofol, particularly after prolonged infusion.

一项关于产妇使用瑞芬太尼进行自控静脉镇痛和硬膜外自控镇痛的效能及呼吸影响的随机对照试验

A Randomized Controlled Trial of the Efficacy and Respiratory Effects of Patient-Controlled Intravenous Remifentanil Analgesia and Patient-Controlled Epidural Analgesia in Laboring Women

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Anesthesia & Analgesia 2014 118 611–618

背景：当硬膜外镇痛效果欠佳时需要寻找安全有效的替代方法。本研究假设自控静脉瑞芬太尼输注镇痛效果非劣于自控硬膜外镇痛。

方法：此项随机、非盲、对照、非劣性、单中心研究选择单胎头位顶先露的健康产妇入选。产妇随机分为两组：接受静脉自控镇痛，单次剂量自 20ug 起开始滴定最大至 60ug，间隔 1-2 分钟给予；或接受硬膜外镇痛，配方为 0.1%的布比卡因和芬太尼 2ug/ml（首次推注剂量 15ml，维持单次剂量 10ml，锁定时间 20min，基础维持量 5ml/h）。30min 后进行交叉互换。 主要研究结果是效能【每小时使用数值评定量表(NRS)进行疼痛评分(共计 11 分)】和产妇满意度评分（共计 11 分); 次要研究结果是安全性(产妇呼吸暂停)。在呼吸监测期间进行持续供氧。在镇痛的第一小时，比较两组的心率、呼吸频率，脉搏氧饱和度和作为呼吸暂停标志的呼末 CO2 值。若呼吸暂停持续大于 40 秒，麻醉科主治医生可以通过给予小的刺激来处理。

结果：40 例产妇入选：瑞芬太尼组 19 例(排除 1 例)，硬膜外组 20 例，其中 4 例进行了交叉(3 例是从瑞芬太尼组到硬膜外组；1 例从硬膜外组到瑞芬太尼组)。两组基线的 NRS 疼痛评分均值（±标准差）相似（瑞芬太尼组 8.4±1.5，硬膜外组 8.7±1.2，P 值=0.52； 30min 时两组疼痛评分分别为：瑞芬太尼组 3.7±2.8，硬膜外组 1.5±2.2，P 值=0.009）。 由于观察评分差异大于预期的−1.5 个单位，瑞芬太尼组在各个时间点的 NRS 评分均低于硬膜外镇痛组。两组的产妇满意度分别为：瑞芬太尼组 8.6±1.4,硬膜外镇痛组 9.1±1.5, P 值=0.26；瑞芬太尼组平均呼吸次数要低于硬膜外组（18±4VS21±4 次/min,p=0.03）。瑞芬太尼组的平均 SpO2 值低于硬膜外组（96.8% ± 1.4 vs 98.4 ± 1.2 , P < 0.0001）。期间有 9 次呼吸暂停事件，所有的均发生在接受瑞芬太尼镇痛者。新生儿 Apgar 评分和新生儿呼吸预后相同。

结论：静脉给予瑞芬太尼优于硬膜外镇痛。瑞芬太尼可以为产妇提供一个满意的镇痛水平。但是使用瑞芬太尼镇痛的产妇需要接受足够的监测和警惕呼吸暂停的发生。

（梁玉丹 译 陈杰 校）

BACKGROUND: Safe and effective alternatives are required in labor when epidural analgesia is not appropriate. We hypothesized that patient-controlled IV remifentanil labor analgesia would not be inferior to patient-controlled epidural labor analgesia.

METHODS: This randomized nonblinded controlled noninferiority study in healthy women with a singleton fetus and vertex presentation was performed at 1 site. Women were randomized to receive patient-controlled IV analgesia titrated from 20 mcg up to a maximum bolus dose of 60 mcg with a lockout interval of 1 to 2 minutes, or patient-controlled epidural analgesia 0.1% bupivacaine with 2 mcg/mL fentanyl (initiation bolus 15 mL; maintenance bolus 10 mL, lockout interval 20 minutes, basal infusion 5 mL/h). Crossover was permitted after 30 minutes. The primary study outcome was efficacy (assessed as hourly numerical rating scale [NRS] pain score [11-point NRS] and maternal satisfaction [11-point NRS]); the secondary outcome was safety (maternal apnea). Supplementary oxygen was administered continuously during the respiratory monitoring period. During the first hour of analgesia, the heart rate, respiratory rate, pulse oximetry (SpO2), and end-tidal CO2, as an indication of apnea, were compared. Apnea lasting >40 seconds was managed by light stimulation by the attending anesthesiologist.

RESULTS: Forty women were recruited to the following groups: remifentanil n = 19 (1 exclusion), epidural n = 20. Four crossed over: 3 from the remifentanil to epidural group and 1 from the epidural to remifentanil group. Mean (± SD) baseline NRS pain scores were similar, 8.4 ± 1.5 for remifentanil and 8.7 ± 1.2 for epidural analgesia, P = 0.52. Baseline adjusted mean NRS reduction at 30 minutes for remifentanil was −4.5 (± 0.6) vs −7.1(± 0.6) for epidural analgesia, P < 0.0001 for both. Pain score at 30 minutes was 3.7 ± 2.8 for remifentanil and 1.5 ± 2.2 for epidural analgesia, P = 0.009. Remifentanil was inferior to epidural analgesia with respect to the NRS at all time points, because the observed difference in NRS was greater than the expected −1.5 units. Maternal satisfaction was 8.6 ± 1.4 for the remifentanil group and 9.1 ± 1.5 for epidural group, P = 0.26. Mean respiratory rate was lower in the remifentanil group, 18 ± 4 vs 21 ± 4 breaths/min in the epidural group, P = 0.03. Mean SpO2 was lower in the remifentanil group 96.8% ± 1.4 vs 98.4 ± 1.2 for epidural group, P < 0.0001. There were 9 apnea events; all occurred in 5 women receiving remifentanil (5/19 [26.3%], P = 0.046). Apgar scores and neonatal respiratory outcomes were similar.

CONCLUSION: IV remifentanil is inferior to epidural analgesia for provision of labor analgesia; however, remifentanil does provide a satisfactory level of labor analgesia. Laboring women receiving remifentanil require suitable monitoring to detect and alert for apnea.

脊麻下行择期剖腹产期间解救性推注新福林复合不同速率输注与单纯解救性推注新福林的随机对照试验

A Randomized Controlled Trial of Variable Rate Phenylephrine Infusion With Rescue Phenylephrine Boluses Versus Rescue Boluses Alone on Physician Interventions During Spinal Anesthesia for Elective Cesarean Delivery

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背景：新福林注射常用于缓解脊麻下剖腹产手术中产生的低血压。预防性的固定速率注射无法明显改善血流动力学的控制，根据动脉血压和心率进行变化的速率注射可以更加精确地维持血压的基础值。本研究认为，晶体液的输注合并变化速率注射加单独抢救性快速注射新福林，相比之于仅仅晶体液输注合并单独抢救性快速注射新福林，可以减少医生介入处理维持母体收缩压变化在基线的 20%内，而且血流动力学方面更稳定。

方法：本次前瞻性、双盲试验中，80 名患者在脊麻后立刻使用 15ml/kg 的乳酸林格氏液。各患者随机使用预防性的变化速率注射新福林（起始为 0.75 μg/kg/min）（P 组）或输注生理盐水（S 组）。使用预设的方法抢救性快速输注新福林，使母体收缩压维持在基线值的上下 20%之内。对比在胎儿产出前，两组之间的内科介入次数（主要结果）、血流动力学表现、恶心/呕吐、以及脐动静脉血气值。

结果：S 组有 1 人因违反实验规则而被排除， P 组有 40 例而 S 组有 39 人。需要医生处理以维持血流动力学在指定范围内的中位数（范围：0 [0–6] 对 3 [0–9]，中值差异：3，95%可信区间的差异：2-4），以及低血压的发生率（8/40 [20%] 对 35/39 [90%]），P 组均低于 S 组（P＜0.001）。P 组相对 S 组有更高的高血压发生率（6/40 [15%] 对 0/39 [0%], P = 0.026）。P 组相对 S 组执行误差中位数更接近于基线（P＜0.001），且执行误差绝对值的中位数较小（P=0.001）。P 组中，4/40 (10%)的病人发生了恶心/呕吐，而 S 组中有 17/39 (44%)（P=0.001）。需要处理的次数方面，1.4 位女性中有 1 例需预防低血压，3 位女性中有 1 例需预防恶心/呕吐，高血压的处理率为 6.7 位女性中有 1 例。两组的母婴预后没有差异。

结论：变化速率输注新福林附加抢救性快速注射大剂量新福林，与仅仅依靠单独抢救性快速注射大剂量新福林相比，在减少临床工作量、缓解母体于脊麻剖腹产中的症状方面更有效果。

（贺加贝 译 陈杰 校）

BACKGROUND: Phenylephrine infusion is used to reduce hypotension during spinal anesthesia for cesarean delivery. A prophylactic fixed rate infusion regimen may not improve hemodynamic control; a variable rate regimen adjusted in response to changes in arterial blood pressure and heart rate may allow more accurate maintenance of baseline blood pressure. We hypothesized that a combination of crystalloid solution coload with a variable rate phenylephrine infusion and phenylephrine rescue boluses may be associated with fewer physician interventions needed to maintain maternal systolic blood pressure within 20% of baseline and greater hemodynamic stability than crystalloid solution coload with phenylephrine rescue boluses alone.

METHODS: In this prospective, double-blind study, 80 patients received a coload with 15 mL/kg lactated Ringer's solution immediately after the initiation of spinal anesthesia. Patients were randomized to receive a prophylactic variable rate phenylephrine infusion starting at 0.75 μg/kg/min (group P) or infusion of normal saline (group S). Maternal systolic blood pressure was maintained within 20% of baseline with rescue phenylephrine boluses using a preset algorithm. During the predelivery period, the number of physician interventions (primary outcome), hemodynamic performance, nausea/vomiting, and umbilical cord blood gas values were compared between the groups.

RESULTS: One patient from group S was excluded due to protocol violation. Therefore, group P included 40 patients and group S 39 patients. The median (range) number of physician interventions needed to maintain maternal hemodynamics within the target range (0 [0–6] vs 3 [0–9], difference in median: 3, 95% confidence interval of difference: 2–4) and incidence of hypotension (8/40 [20%] vs 35/39 [90%]) were lower in group P compared with group S ($P < 0.001$). Group P had a higher incidence of hypertension compared with group S (6/40 [15%] vs 0/39 [0%], $P = 0.026$). The median performance error was closer to baseline ($P < 0.001$) with a smaller median absolute performance error ($P = 0.001$) in group P versus group S. In group P, 4/40 (10%) patients had nausea/vomiting compared with 17/39 (44%) in group S ($P = 0.001$). The number needed to treat was 1.4 women to prevent 1 case of hypotension, and 3 women to prevent 1 case of nausea/vomiting; the rate of hypertension was 1 case per 6.7 women treated. Neonatal outcomes were not different between the 2 groups.

CONCLUSION: Prophylactic variable rate phenylephrine infusion and rescue phenylephrine bolus dosing is more effective than relying on rescue phenylephrine bolus dosing with respect to limiting clinician workload and maternal symptoms during spinal anesthesia for cesarean delivery.

在血液稀释过程中脑和脊髓血流量增加的机制

The Mechanism of Increased Blood Flow in the Brain and Spinal Cord During Hemodilution

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背景:血液稀释常伴随脑血流量增加，但这是否由于动脉氧含量降低、血粘度降低或两种机制的共同作用所导致的代偿性血管扩张，仍然存在争议。此项研究以深入了解这个问题，通过评估血液稀释对（1）血管扩张储备（2）在大脑和脊髓的区域高碳酸血症引起血管舒张时的血流水平。

方法：用 0.9%氟烷麻醉（1MAC）16 只杂种犬并进行机械通气。放射性微球（15um）用来在大脑皮层，小脑，脑桥，延髓，脊髓（颈，胸，和腰段）测量区域的血流量（RBF）。通过动脉导管测量动脉压。血管扩张储备是由高碳酸血症时的 RBF（PaCO2 大约是 65mmHg）与高碳酸血症前的 RBF 的比值来评估。PaCO2 的增高是通过增加通气死腔而不改变通气设置。用血细胞比容来评估高碳酸血症对中枢神经系统的扩张作用，正常组（组 1，n=8），用 5%右旋糖酐介导等容稀释使血细胞比容达 19 ± 4 (SD)（组 2，n=8）。

结果：血液稀释增加了 RBF（$P < 0.0001$），减少了脑内所有区域和脊髓的血管扩张储备比值($P < 0.05$)。血液稀释组的比值（组 2）为 48%，而未血液稀释组的比值则为 68%（组 1）。高碳酸血症时的 RBF 程度在血液稀释和不稀释时无显著差别(大脑皮层: 平均值, 122 mL/min/100 g vs 平均值, 108 mL/min/100 g; 95% 可信区间(95% CID), −53 to 26; $P = 0.46$; 小脑: 平均值, 117 mL/min/100 g vs 平均值, 100 mL/min/100 g; 95% CID, −52 to 18; $P = 0.32$; 脑桥: 平均值, 83 mL/min/100 g vs 平均值, 73 mL/min/100 g; 95% CID, −12 to 31; $P = 0.35$; 髓质: 平均值, 96 mL/min/100 g vs 平均值, 82 mL/min/100 g; 95% CID, −11 to 40; $P = 0.25$; 颈髓: 平均值, 61 mL/min/100 g vs 平均值, 52 mL/min/100 g; 95% CID, −18 to 34; $P = 0.51$; 胸髓: 平均值, 35 mL/min/100 g vs 平均值, 46 mL/min/100 g; 95% CID, −30 to 8; $P = 0.24$; 腰髓: 平均值, 54 mL/min/100 g vs 平均值, 58 mL/min/100 g ; 95% CID, −25 to 15; $P = 0.61$)。仅高碳酸血症或者高碳酸血症和血液稀释同时存在对平均动脉压没有影响（分别为 $P = 0.78$ and $P = 0.81$）。

结论：血液稀释引起血管扩张储备的增加，这表明在血管舒张对于整个中枢神经系统 RBF 的增加发挥了作用。尽管在高碳酸血症时血液稀释和不稀释的 RBF 平均值类似，反应存在较大变化，排除了一个决定性的问题：降低血粘度与否也促进了血液稀释引起 RBF 的增加。在血液稀释过程中，对血管扩张的依赖将限制整个中枢神经系统自动调节能力，这将会增加低血压性缺血的风险。

（谈婧华 译 陈杰 校）

BACKGROUND: Hemodilution is accompanied by an increase in cerebral blood flow, but whether this is due to vasodilation in response to reduced arterial oxygen content, reduced blood viscosity, or a combination of these mechanisms is a matter of debate. We performed the current study to gain insight into this question by evaluating the effect of hemodilution on (1) vasodilator reserve and (2) the level of blood flow during hypercapnia-induced vasodilation in regions of the brain and spinal cord.

METHODS: Sixteen mongrel dogs were anesthetized with halothane 0.9% (1 minimum alveolar concentration) while their lungs were mechanically ventilated. Radioactive microspheres (15 μm) were used to measure regional blood flow (RBF) in the cerebral cortex, cerebellum, pons, medulla, and spinal cord (cervical, thoracic, and lumbar segments). Arterial blood pressure was measured via an aortic catheter. Vasodilator reserve was assessed from the ratio of RBF during hypercapnia (PaCO2 approximately 65 mm Hg) to RBF before hypercapnia. PaCO2 was increased by the addition of dead-space tubing without changing the ventilator settings. The dilating effects of hypercapnia within the central nervous system (CNS) were assessed with hematocrit normal (group 1; n = 8) and after induction of isovolemic hemodilution to a hematocrit of 19 ± 4 (SD) with 5% dextran (group 2; n = 8).

RESULTS: Hemodilution increased RBF ($P < 0.0001$) and decreased the vasodilator reserve ratio ($P < 0.05$) in all regions of the brain and spinal cord; the ratios during hemodilution (group 2) were only 48% to 68% of those without hemodilution (group 1). The level of RBF during hypercapnia was not significantly different in the absence and presence of hemodilution (cerebral cortex: mean, 122 mL/min−1/100 g−1 vs mean, 108 mL/min−1/100 g−1; 95% confidence interval of the difference (95% CID), −53 to 26; $P = 0.46$; cerebellum: mean, 117 mL/min−1/100 g−1 vs mean, 100 mL/min−1/100 g−1; 95% CID, −52 to 18; $P = 0.32$; pons: mean, 83 mL/min−1/100 g−1 vs mean, 73 mL/min−1/100 g−1; 95% CID, −12 to 31; $P = 0.35$; medulla: mean, 96 mL/min−1/100 g−1 vs mean, 82 mL/min−1/100 g−1; 95% CID, −11 to 40; $P = 0.25$; cervical spinal cord: mean, 61 mL/min−1/100 g−1 vs mean, 52 mL/min−1/100 g−1; 95% CID,

−18 to 34; P = 0.51; thoracic spinal cord: mean, 35 mL/min−1/100 g−1 vs mean, 46 mL/min−1/100 g−1; 95% CID, −30 to 8; P = 0.24; lumbar spinal cord: mean, 54 mL/min−1/100 g−1 vs mean, 58 mL/min−1/100 g−1; 95% CID, −25 to 15; P = 0.61). Neither hypercapnia alone nor combined with hemodilution affected mean arterial blood pressure (P = 0.78 and P = 0.81, respectively).

CONCLUSIONS: Hemodilution caused recruitment of the vasodilator reserve, suggesting that vasodilation played a role in the increase in RBF throughout the CNS. Although the mean values for RBF during hypercapnia were similar with and without hemodilution, a large variation in the responses precluded a conclusive determination of whether or not reduced blood viscosity also contributed to the hemodilution-induced increases in RBF. A dependence on vasodilation would limit autoregulatory capability throughout the CNS during hemodilution, which would enhance the risk for ischemia if hypotension was superimposed.

大鼠核苷逆转录酶抑制剂诱导的机械性痛觉过敏被 p55TNFSR 抑制，p55TNFSR 是单纯疱疹病毒载体通过 SDF1 alpha/CXCR4 系统所介导

Mechanical Allodynia Induced by Nucleoside Reverse Transcriptase Inhibitor Is Suppressed by p55TNFSR Mediated by Herpes Simplex Virus Vector Through the SDF1 alpha/CXCR4 System in Rats

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背景：在人类免疫缺陷病毒（HIV）相关的感觉神经病变，使用核苷类逆转录酶抑制剂（NRTI 类药物）的艾滋病毒/获得性免疫缺陷综合症患者发生神经病理性疼痛在临床上较为常见。尽管有证据表明，神经病理性疼痛是由神经炎症相关的，包括促炎分子，肿瘤坏死因子-α（TNF-α），基质细胞衍生因子 1-α（SDF1-α）和 CXC 趋化因子受体类型 4（CXCR4），其中 NRTI 类药物在神经病理性疼痛发展的详细机制尚不清楚。在这项研究中，作者调查在背根神经节（DRG）和脊髓背角的促炎分子在 NRTI 类药物介导的神经病理性疼痛的作用。

方法：神经病理性疼痛由 2'，3'-二脱氧胞苷（核苷类逆转录酶抑制剂类药物之一）介导产生。机械痛阈用 von Frey 丝纤维进行测定。非复制性的单纯疱疹病毒（HSV）载体表达的 p55 肿瘤坏死因子可溶性受体（p55TNFSR）接种于大鼠后爪。用 Western 印迹技术测定在两腰段脊髓和 L4 /5 背根神经节 TNF-α，SDF1-α 和 CXCR4 的表达。鞘内注射 CXCR4 拮抗剂。

结果：本研究表明（1）全身性的 ddC 给药诱导上调腰段脊髓和 L4 /5 背根神经节 TNF-α，SDF1-α 和 CXCR4 的表达；（2）由非复制性 HSV 载体介导的 p55TNFSR 能逆转全身性 ddC 给药引起的机械性痛觉过敏；(3) 鞘内注射 CXCR4 拮抗剂 AMD3100 增加机械痛阈；（4）单纯疱疹病毒载体表达 p55TNFSR 能逆转 ddC 给药所引起的腰段脊髓背角和背根神经节 TNF-α，SDF1-α 和 CXCR4 的上调。

结论：研究表明，TNF-α 通过 SDF1/CXCR4 系统在 NRTI 类药物相关的神经病理性疼痛发挥作用并且阻断这些促炎分子的信号传导能够减少 NRTI 类药物相关的神经病理性疼痛。这些结果提供了一种新的以（基因治疗）机制为基础的方法治疗 HIV 相关神经病理性疼痛。

（林甲票 译 陈杰 校）

BACKGROUND: In the human immunodeficiency virus (HIV)–associated sensory neuropathy, neuropathic pain associated with the use of nucleoside reverse transcriptase inhibitors (NRTIs) in

patients with HIV/acquired immunodeficiency syndrome is clinically common. While evidence demonstrates that neuropathic pain is influenced by neuroinflammatory events that include the proinflammatory molecules, tumor necrosis factor-α (TNF-α), stromal cell–derived factor 1-α (SDF1-α), and C-X-C chemokine receptor type 4 (CXCR4), the detailed mechanisms by which NRTIs contribute to the development of neuropathic pain are not known. In this study, we investigated the role of these proinflammatory molecules in the dorsal root ganglion (DRG) and the spinal dorsal horn in NRTIs-mediated neuropathic pain state.

METHODS: Neuropathic pain was induced by intraperitoneal administration of 2´,3´-dideoxycytidine (ddC, one of the NRTIs). Mechanical threshold was tested using von Frey filament fibers. Nonreplicating herpes simplex virus (HSV) vectors expressing p55 TNF soluble receptor (p55TNFSR) were inoculated into hindpaw of rats. The expression of TNF-α, SDF1-α, and CXCR4 in both the lumbar spinal cord and the L4/5 DRG was examined using Western blots. Intrathecal CXCR4 antagonist was administered.

RESULTS: The present study demonstrated that (1) systemic ddC induced upregulation of TNF-α, SDF1-α, and CXCR4 in both the lumbar spinal cord and the L4/5 DRG; (2) p55TNFSR mediated by a nonreplicating HSV vector reversed mechanical allodynia induced by systemic ddC; (3) intrathecal administration of the CXCR4 antagonist AMD3100 increased mechanical threshold; and (4) HSV vector expressing p55TNFSR reversed upregulation of TNF-α, SDF1-α, and CXCR4 induced by ddC in the lumbar spinal dorsal horn and the DRG.

CONCLUSIONS: Our studies demonstrate that TNF-α through the SDF1/CXCR4 system is involved in the NRTIs-related neuropathic pain state and that blocking the signaling of these proinflammatory molecules is able to reduce NRTIs-related neuropathic pain. These results provide a novel mechanism-based approach (gene therapy) to treating HIV-associated neuropathic pain.

唤醒时间在脊柱侧弯手术中响应面模型预测

Response surface model predictions of wake-up time during scoliosis surgery

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背景：在已发表数据的基础上，研究者建立了新的不同镇静程度的七氟醚-瑞芬太尼交互模型。这个新模型根据最小肺泡浓度(MAC 值)和阿片类药物等效剂量与地氟醚-芬太尼等效。这些模型用来预测脊柱侧弯手术患者在唤醒实验中应答时间。我们的假设是某种交互模型可以精确地预估唤醒试验中患者的应答时间。

方法：前期已有观察者警觉/镇静评分法（OAA/S3）评估志愿者的数据。基于这些数据建立了 3 个新的七氟醚-瑞芬太尼交互模型。这些模型包括 OAA/S<2（无反应）的预测，OAA/S< 3 和 OAA/S<4（镇静状态）。23 个择期行脊柱侧弯手术的患者接受了地氟醚-芬太尼麻醉。根据已发表的药代动力学模型，记录了整个手术过程中芬太尼和地氟醚效应室浓度的预测值。当关闭地氟醚挥发罐后，每 10 秒记录一次数据，直至患者有移动手足的反应后 10 分钟。模型预测与图形和时间分析观察进行比较。

结果：实际患者第一次反应的时间和模型所预测 50%患者反应的时间的平均差为：OAA / S < 2 模型中-2.6 ± 3.6 分钟（均数±标准差），OAA / S < 3 模型中 2.8 ± 5.6 分钟，OAA / S < 4 模型中 52.6 ± 32.3 分钟。

结论：实验结果证实了我们的研究假设；基于对志愿者观察数据建立的七氟醚-瑞芬太尼交互模型，以及相对应的地氟醚-芬太尼模型在唤醒实验中精确地预测了患者的反应时间。这些研究与我们前期研究的结论相似，都是比较了七氟醚-瑞芬太尼/芬太尼麻醉下模型预测时间和实际观察到患者的反应时间。OAA / S < 2 模型最为精确地预测了患者移动手足的时间。这个模型或许可以帮助麻醉医生更好地在脊柱侧弯手术需要术中唤醒时预测患者。

（陈实玉译 薛张纲校）

BACKGROUND: With the use of previously published data, new sevoflurane-remifentanil interaction models of various degrees of sedation were created and adapted to desflurane-fentanyl by using minimal alveolar concentration and opioid equivalencies. These models were used to predict return of responsiveness in patients undergoing scoliosis surgery during a wake-up test. Our hypothesis was that one of the interaction models would accurately predict return of responsiveness during a wake-up test.

METHODS: Three new sevoflurane-remifentanil interaction models were constructed from previous observations in volunteers by using the Observer's Assessment of Alertness/Sedation (OAA/S) scores. These models included predictions of OAA/S<2 (unresponsive), OAA/S< 3, and OAA/S<4 (sedation). Twenty-three patients scheduled for scoliosis surgery received a fentanyl-desflurane anesthetic. With the use of published pharmacokinetic models, predictions of fentanyl and desflurane effect-site concentrations were recorded throughout surgery and converted to equivalent remifentanil and sevoflurane effect-site concentrations. Data were recorded every 10 seconds from the time when desflurane was turned off until 10 minutes after the patients responded by moving their hands and toes. Model predictions were compared with observations with graphical and temporal analyses.

RESULTS: The average difference between the time when a patient first responded and the time when the model predicted that there was a 50% probability that the patient would respond were -2.6 ± 3.6 minutes (mean ± SD) for the OAA/S<2 model, 2.8 ± 5.6 minutes for the OAA/S<3 model and 52.6 ± 32.3 minutes for the OAA/S<4 model.

CONCLUSIONS: The results confirmed our study hypothesis; a sevoflurane-remifentanil interaction model built from observations in volunteers and adapted to desflurane and fentanyl accurately predicted patient response during a wake-up test. These results were similar to our previous study comparing model predictions and patient observations after a sevoflurane-remifentanil/fentanyl anesthetic. The OAA/S <2 model most accurately predicted the time patients would respond by moving their fingers and toes. This model may help anesthesiologists better predict return of responsiveness during a wake-up test in patients undergoing spine surgery.

在麻醉的瘫痪患者通过实施环状软骨按压来堵塞食管开口的有效性：一项针对 **Glidescope** 喉镜的实验和观察性研究

The effectiveness of cricoid pressure for occluding the esophageal entrance in anesthetized and paralyzed patients: an experimental and observational glidescope study.

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背景：在过去的 20 年里，环状软骨按压（CP）对堵塞食管开口的有效性受到了质疑。最近的磁共振成像研究取得了相互矛盾的结论。我们在麻醉和瘫痪的成年患者上，使用实时视觉及机械手段，评估了有或无环状软骨按压时食管开口的开放情况。

方法：研究纳入了 107 名非肥胖、ASA 分级 I-II 的患者。使用 30N 的力量环状加压。在对每一例患者实施环状软骨按压前，通过使用重量秤来标准化力量大小。在给氧、麻醉诱导、神经肌肉阻滞及实施纯氧手控通气后，暴露声门和食管开口的视野，录像通过 Glidescope 视频喉镜获得。在给予或不给予环状软骨按压的情况下，由一位对研究不知情的操作者尝试向食管插入 2 根规格分别为 12F 和 20F 的胃管（GTs），但插入的时间是随机的。存在 CP 的情况下成功置入胃管被认为是食管入口开放的证据（无效 CP），而未成功插入胃管则被认为是一个食管入口堵塞的证据（有效 CP ）。经过放置胃管的尝试后，在使用 CP 的情况下进行气管插管。从视频录像来评估使用或不使用 CP 时食管开口与声门的位置关系（中线或横向）。

结果：我们在收集了 79 名合格患者（41 例男性，38 例女性）资料后停止并完成了研究（95%-100%的双侧 Clopper-Pearson 可信区间（CI），N =72）。在实施 CP 的所有患者中，两种规格的胃管均不能插入食管，但在所有未行 CP 的患者中很容易置入胃管。不管食管开口是在中线位置或相对于声门的左侧或右侧，上述结果都相同。在无 CP 的情况下，能观察到到食管入口开放，而在所有实施 CP 患者中都观察到食道开口的闭塞。没有进行 CP 时，观察到 57%的患者食管开口位于声门左侧（95%CI，45%-68%），32%的患者为中线位置（CI，22%-43%），11%的患者（CI，5%-21%）食管开口位于声门右侧。该位置关系不会随环状软骨按压而发生变化。

结论：目前的研究提供了额外的视觉和机械证据支持在麻醉和瘫痪的正常成年患者中，使用 30N 的环状力来阻塞食道开口至少有 95%的成功率。该手法的效果与食管开口相对于声门的位置无关，无论处于中线或侧位关系。

（凌晓敏译 薛张纲校）

BACKGROUND: In the last 2 decades, the effectiveness of cricoid pressure (CP) in occluding the esophageal entrance has been questioned. Recent magnetic resonance imaging studies yielded conflicting conclusions. We used real-time visual and mechanical means to assess the patency of the esophageal entrance with and without CP in anesthetized and paralyzed adult patients.

METHODS: One hundred seven, nonobese ASA physical status I and II patients were recruited for the study. A cricoid force of 30 N was used. This force was standardized by using a weighing scale before application of CP in each patient. After oxygen administration, anesthetic induction, neuromuscular blockade, and establishment of manual ventilation with FIO2 = 1.0, the view of the glottis and esophageal entrance was visualized, and video recordings were obtained by using a Glidescope video laryngoscope. Attempts to insert 2 gastric tubes (GTs), size 12 and 20 F, into the esophagus were made by a "blinded" operator without and with CP, the timing of which was randomized. A successful insertion of a GT in the presence of CP was considered evidence of a patent esophageal entrance (ineffective CP), whereas an unsuccessful insertion of a GT was considered evidence of an occluded esophageal entrance (effective CP). After the attempts to insert the GTs were completed, tracheal intubation was performed while CP was applied. The position of the esophageal entrance in relation to the glottis (midline versus lateral) was assessed from the video recordings, with and without CP.

RESULTS: We stopped the study when 79 patients (41 men and 38 women) qualified for and completed the study (2-sided Clopper-Pearson confidence interval (CI) 95% to 100%, n = 72). Advancement of either size GT into the esophagus could not be accomplished during CP in any

patient but was easily done in all subjects when CP was not applied. This occurred whether the esophageal entrance was in a midline position or in a left or right lateral position relative to the glottis. Esophageal patency was visually observed in the absence of CP, whereas occlusion of the esophageal entrance was observed during CP in all patients. Without CP, the esophageal entrance was in a left lateral position in relation to the glottis in 57% ([95 % CI, 45%-68%)] of patients, at midline in 32% (CI, 22%-43%), and in a right lateral position in 11% (CI, 5%-21%). The position did not change with CP.

CONCLUSIONS: The current study provides additional visual and mechanical evidence supporting a success rate of at least 95% by using a cricoid force of 30N to occlude the esophageal entrance in anesthetized and paralyzed normal adult patients. The efficacy of the maneuver was independent of the position of the esophageal entrance relative to the glottis, whether midline or lateral.

瑞芬太尼产妇自控静脉镇痛与硬膜外镇痛的比较：随机对照试验的元分析

A comparison of remifentanil parturient-controlled intravenous analgesia with epidural analgesia: a meta-analysis of randomized controlled trials.

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背景：硬膜外镇痛是公认的分娩过程中最有效的镇痛方式。瑞芬太尼经静脉患者自控镇痛法(PCIA)相比于硬膜外镇痛创伤更少，可能成为更具吸引力的替代疗法。在这篇 meta 分析中，我们将比较这两种分娩镇痛技术的有效性和安全性。

方法：两名调查人员分别搜索 PubMed、EMBASE 和 Cochrane 图书馆的数据库，以便检索出符合条件的随机控制临床试验。主要的观察终点是 1 到 2 小时的疼痛评分，第二个观察终点是恶心、呕吐、瘙痒和脐带动脉的 PH 值。计算 95%置信区间（CIs）下各端点的的平均差（MD）或风险率。分级（GRADE）分析工具被用于评估证据的质量。

结果：通过对五次合格试验的检索和分析，我们发现使用瑞芬太尼静脉自控镇痛的产妇比接受硬膜外镇痛的孕妇每小时（MD=1.9 毫米； 95%CI,0.5-3.3；I=94%）或每两小时（MD=3.0 毫米； 95%CI，0.7-5.2；I=89%）具有更高的视力模拟比例（10-毫米比例）疼痛评分。在使用硬膜外镇痛和瑞芬太尼静脉自控镇痛(PCIA)疗法控制恶心，呕吐，皮肤瘙痒，脐动脉 pH 值方面，两者没有统计学上的差异。然而， CIs 非常广泛，并且具有临床上的显著差异。根据 GRADE 分析工具，除了 1 小时处的疼痛评分质量较低之外，大多数观察终点质量中等。

结论：此次 meta 分析表明，在分娩过程中的镇痛功效方面，瑞芬太尼 PCIA 不比硬膜外止痛法优越。继发的孕妇及新生儿结果的综合结果，还不能得出确定的结论。确认这些结论还需进一步的研究。

（刘毅译 薛张纲校）

BACKGROUND: Epidural analgesia is generally accepted as the most effective form of pain relief during labor. Remifentanil patient-controlled IV analgesia (PCIA), which is less invasive than epidural analgesia, may be an attractive alternative. In this meta-analysis, we compared the efficacy and safety of the 2 analgesic techniques for labor pain.

METHODS: Databases of PubMed, EMBASE, and Cochrane Library were searched independently by 2 reviewers to retrieve eligible randomized controlled clinical trials. The primary end points were pain scores at 1 and 2 hours, and the secondary end points were nausea,

vomiting, pruritus, and umbilical artery pH values. Mean difference (MD) or risk ratio with 95% confidence intervals (CIs) were calculated for each end point. GRADE profiler was applied to assess the quality of evidence.

RESULTS: Five eligible trials were retrieved and analyzed. We found that parturients with remifentanil PCIA had higher visual analog scale (10-cm scale) pain scores than those who received epidural analgesia at 1 hour (MD = 1.9 cm; 95% CI, 0.5-3.3; I = 94%) and 2 hours (MD = 3.0 cm; 95% CI, 0.7-5.2; I = 89%) after initiation of analgesia. There was no statistical difference between epidural analgesia and remifentanil PCIA in the incidence of nausea, vomiting, pruritus, or umbilical artery pH values. However, the CIs are quite wide and contain clinically significant differences. According to GRADE profiler, most end points had moderate quality except that pain scores at 1 hour were of low quality.

CONCLUSIONS: This meta-analysis suggests that remifentanil PCIA is not superior to epidural analgesia in analgesic efficacy during labor. Given the wide CIs of the pooled results for secondary maternal and neonatal outcomes, definite conclusions cannot be drawn for those outcomes. Further studies are still warranted to validate these conclusions.

门诊儿童和青少年进行持续外周神经阻滞：连续 8 年的单中心研究

Ambulatory continuous peripheral nerve blocks in children and adolescents: a longitudinal 8-year single center study.

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背景：虽然近年来区域麻醉在小儿患者中的应用不断增加，但是在门诊患儿给予连续外周神经阻滞（CPNBs）的案例仍较少。在这份报告中，我们记录了 1285 名患儿门诊使用 CPNBs 的信息。

方法：我们收集了从 2005 年 1 月至 2011 年 12 月间在费城儿童医院行 CPNBs 患儿的信息。收集的数据包括人口统计学、导管放置的部位和神经阻滞技术、感觉/运动神经阻滞的情况、围手术期使用阿片类药物情况以及与 CPNBs 相关并发症。

结果：给予 1285 名门诊患儿经导管连续输注局麻药。CPNB 的平均持续时间为 50.7±14.4（平均值±标准差）。在 CPNBs 出院回家的患儿中，969 名（75.4%）患儿不需要额外给予阿片类药物或仅口服基础剂量的阿片类药物（可信区间，73.0%-77.8%）。 2 例患者再次入院的并静脉给予止痛。随访 6 个月后，没有一例患儿出现 CPNBs 相关的神经功能障碍（置信区间，0%-0.29%）。

结论：通过对 1285 行 CPNBs 患儿的研究表明，CPNBs 可以有效提供术后镇痛，并可减少需要住院给予静脉阿片类药物治疗。

（徐升译 薛张纲校）

BACKGROUND: Although the role of regional anesthesia in pediatric patients has been increasing over the last few years, there are only a few small case series that describe the use of ambulatory continuous peripheral nerve blocks (CPNBs) in this patient population. In this report, we describe our experience with the use of ambulatory CPNBs in 1285 children.

METHODS: Data were collected for consecutive children who had a CPNB placed between January 2005 and December 2011 at The Children's Hospital of Philadelphia from the departmental regional anesthesia database. Data collected included demographics, the site of

catheter placement and technique of nerve block, presence of sensory/motor blockade, use of perioperative opioids, and any complications related to CPNBs.

RESULTS: Continuous infusions of local anesthetics were administered via the catheters in 1285 outpatients. The mean duration of the CPNB was 50.7 ± 14.4 hours (mean ± SD). Among patients discharged home with the CPNBs, 969 (75.4%) of the patients required either no supplemental opioids or oral opioids only on an "as needed" basis in the postoperative period (confidence interval, 73.0%-77.8%). Two patients were readmitted for IV pain management after they were discharged home with the CPNB catheters. No neurological deficit related to the CPNBs was identified in any of the patients at their 6-month follow-up with the orthopedic surgeon (confidence interval, 0%-0.29%).

CONCLUSION: This audit of 1285 children shows ambulatory CPNBs can provide postoperative analgesia and may reduce the need for inpatient parenteral opioid therapy.

设置个体化的呼气末正压通气水平与呼气末正压通气减量试验后肺复张改善单肺通气时的氧合和肺动力学。

Setting individualized positive end-expiratory pressure level with a positive end-expiratory pressure decrement trial after a recruitment maneuver improves oxygenation and lung mechanics during one-lung ventilation.

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我们研究的是单肺通气时个体化的呼气末正压通气（PEEP）改善氧合，通气和肺动力学与标准的 PEEP 值进行比较。三十例开胸手术患者随机分为研究组和对照组。两组在开始和结束的单肺通气后进行肺泡复张。肺泡复张后，对照组以 5 cm•H2O 的 PEEP 进行肺通气，而研究组对肺通气进行个体化的 PEEP 水平减量试验测定。动脉血液样本，肺动力学，和容量二氧化碳记录仪记录了整个过程中多个时间点的数据。在研究组个体化的 PEEP 值均高于标准的 PEEP 值(10 ± 2 vs 5 cm•H2O; P < 0.001)。在两组中，双肺通气转换到单肺通气时动脉血氧下降，肺泡复张后增加。在单肺通气过程中，肺通气在研究组能保持供应而在对照组则下降。单肺通气后，研究组的动脉氧合显着较高(306 vs 231 mm•Hg, P = 0.007)。两组双肺通气转换到单肺通气时肺顺应性降低。肺顺应性只有在研究组显著增加(P < 0.001)通过肺泡复张和最佳 PEEP 调整后。肺泡复张并没有减少任何病人的心脏指数。在单肺通气时，相对于标准的 5 cm•H2O 的 PEEP 值，通过肺复张手法改善氧合和肺动力学时个体化的 PEEP 值以及 PEEP 减量实验能更好的保护肺通气。

（徐峥译 薛张纲校）

Abstract：We investigated whether individualized positive end-expiratory pressure (PEEP) improves oxygenation, ventilation, and lung mechanics during one-lung ventilation compared with standardized PEEP. Thirty patients undergoing thoracic surgery were randomly allocated to the study or control group. Both groups received an alveolar recruitment maneuver at the beginning and end of one-lung ventilation. After the alveolar recruitment maneuver, the control group had their lungs ventilated with a 5 cm•H2O PEEP, while the study group had their lungs ventilated with an individualized PEEP level determined by a PEEP decrement trial. Arterial blood samples, lung mechanics, and volumetric capnography were recorded at multiple timepoints throughout the procedure. The individualized PEEP values in study group were higher than the standardized PEEP values (10 ± 2 vs 5 cm•H2O; P < 0.001). In both groups,

arterial oxygenation decreased when bilateral-lung ventilation was switched to one-lung ventilation and increased after the alveolar recruitment maneuver. During one-lung ventilation, oxygenation was maintained in the study group but decreased in the control group. After one-lung ventilation, arterial oxygenation was significantly higher in the study group (306 vs 231 mm•Hg, P = 0.007). Static compliance decreased in both groups when bilateral-lung ventilation was switched to one-lung ventilation. Static compliance increased significantly only in the study group (P < 0.001) after the alveolar recruitment maneuver and optimal PEEP adjustment. The alveolar recruitment maneuver did not decrease cardiac index in any patient. During one-lung ventilation, the improvements in oxygenation and lung mechanics after an alveolar recruitment maneuver were better preserved by ventilation by using individualized PEEP with a PEEP decrement trial than with a standardized 5 cm•H2O of PEEP.

可诱发运动反应的最小电流强度不能辨别穿刺针-神经接触和穿刺针神经内插入

Minimal Current Intensity to Elicit an Evoked Motor Response Cannot Discern Between Needle-Nerve Contact and Intraneural Needle Insertion

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背景：近来通过低电流强度刺激是否诱发运动反应(EMR)来判断神经刺激器穿刺针已置入神经内的可靠性受到了质疑。在这项研究中，我们假设穿刺针-神经接触的电流强度较穿刺针神经内置入的电流强度更高。

方法：将 6 头猪麻醉后手术暴露臂丛神经。将绝缘针连接到神经刺激器，并将其尖端分别置于距神经 1mm 处（对照位置），神经外膜旁（穿刺针-神经接触位置），及神经内（穿刺针神经内置入位置）。将三个脉冲持续时间以随机方式施加于各置针位置（0.1, 0.3 或 1.0ms）。从 0.0mA 开始逐渐增加电流强度，直到可观察到产生特定 EMR 的最小阈值电流。对每个置针位置的各脉冲持续时间分别测定 50 个阈值电流。

结果：共测定 50 个周围神经处阈值电流共计 450 个。穿刺针-神经接触和穿刺针神经内置入可引出 EMR 的阈值电流强度(mA)之间仅有微小差异，且这一差异不具有临床相关性和统计学显著性[中位数（第 25-第 75 百分位数）；穿刺针-神经接触：0.1ms: 0.12 (0.08–0.18)mA; 0.3ms: 0.10 (0.06–0.12)mA; 1.0ms: 0.06 (0.04–0.10)mA。穿刺针神经内置入：0.1ms 0.12 (0.10–0.16)mA; 0.3ms: 0.08 (0.06–0.10)mA; 1.0ms: 0.06 (0.06–0.08)mA]。不考虑所应用的脉冲持续时间，98.33%可信区间显示在 0.02mA 差异最大。无论如何，穿刺针-神经接触位置引出 EMR 的阈值电流强度，低于对照位置的阈值电流强度(0.1ms: 0.28 (0.26–0.32)mA; 0.3 ms: 0.20 (0.16–0.22)mA; 1.0 ms: 0.12 (0.10–0.14)mA)。

结论：对于可信区间的差异表明，可引起运动反应的最小电流强度不能可靠地分辨穿刺针神经内置入和针-神经接触。此外，阈值电流<0.2mA 仍有 EMR（与所施加的脉冲持续时间无关）提示神经内置针或针-神经接触。

（朱怡琦译 薛张纲校）

BACKGROUND: The ability of an evoked motor response (EMR) with nerve stimulation to detect intraneural needle placement reliably at low current intensity has recently been challenged.

In this study, we hypothesized that current intensity is higher in needle-nerve contact than in intraneural needle placement.

METHODS: Brachial plexus nerves were exposed surgically in 6 anesthetized pigs. An insulated needle connected to a nerve stimulator was placed either with 1 mm distance to the nerve (control position), adjacent to nerve epineurium (needle-nerve contact position), or inside the nerve (intraneural position). Three pulse duration settings were applied in random fashion (0.1, 0.3, or 1.0 milliseconds) at each needle position. Starting at 0.0 mA, electrical current was increased until a minimal threshold current resulting in a specific EMR was observed. Fifty threshold current measurements were scheduled for each needle position-pulse duration setting.

RESULTS: Four hundred-fifty threshold currents in 50 peripheral nerves were measured. Threshold current intensities (mA) to elicit EMR showed small differences between the needle-nerve contact position [median (25th–75th percentiles); 0.1 milliseconds: 0.12 (0.08–0.18) mA; 0.3 milliseconds: 0.10 (0.06–0.12) mA; 1.0 milliseconds: 0.06 (0.04–0.10) mA] and the intraneural position (0.1 milliseconds: 0.12 [0.10–0.16] mA; 0.3 milliseconds: 0.08 [0.06–0.10] mA; 1.0 milliseconds: 0.06 [0.06–0.08] mA) that are neither statistically significant nor clinically relevant. Regardless of the pulse duration that was applied, the 98.33% confidence interval revealed a difference of at most 0.02 mA. However, threshold current intensities to elicit EMR were lower for the needle-nerve contact position than for the control position (0.1 milliseconds: 0.28 [0.26–0.32] mA; 0.3 milliseconds: 0.20 [0.16–0.22] mA; 1.0 milliseconds: 0.12 [0.10–0.14] mA).

CONCLUSIONS: The confidence interval for differences suggests minimal current intensity to elicit a motor response that cannot reliably discern between a needle-nerve contact from intraneural needle placement. In addition, an EMR at threshold currents <0.2 mA (irrespective of the applied pulse duration) indicates intraneural needle placement or needle-nerve contact.

支气管封堵肺萎陷技术：氧化亚氮对单肺通气条件下支气管封堵的肺萎陷有利

Bronchial Blocker Lung Collapse Technique: Nitrous Oxide for Facilitating Lung Collapse During One-Lung Ventilation with a Bronchial Blocker

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背景：闭塞肺的有效肺萎陷对胸外科手术有利。之前的研究表明：与使用双腔气管内导管相比，使用支气管封堵能延迟肺萎陷时间。我们假设双肺通气中吸入混合气体氧化亚氮（笑气）则会在随后支气管封堵单肺通气中改善的临床相关肺萎陷。

方法：随机选择 50 名患者并分成两组：笑气组（26 人），氧气组（24 人）。直到开始单肺通气，笑气组接受氧气和笑气混合气体（氧体积分数=0.5），氧气组接受百分之百氧气通气。肺隔离通过一个 Arndt® （Cook® Critical Care, Bloomington, IN）有线制导的支气管封堵器材实现。将患者翻动并保持侧卧位，在纤维支气管镜监视下将支气管封堵的袖带充气，然后在两组单肺通气时进行功能肺的百分之百纯氧通气。外科医生通过盲法随机化评估病人在打开胸膜 5 分钟后，并采用口述分级评分法方式得出肺萎陷的等级（肺萎陷等级，0 到 10 无萎陷到完全萎陷）。同时，在一分钟和十分钟时的肺萎陷作为第二评估指标。

结果：在打开胸膜 5 分钟后，笑气组的肺萎陷评级明显高于氧气组（7 比 5，P < 0.001, WMWodds = 7.3，95%置信区间为 6 到 9）。在打开胸膜 10 分钟后笑气组的肺萎陷依然高于氧气组（10 比 7, P < 0.001, WMWodds = 10.1，95%置信区间为 1.9–13.3）。在打开胸膜 1 分钟后两组没有显著性差异（2 比 2，P = 0.76, WMWodds = 1.1, 95% 置信区间为 0.96–1.2）。在单肺通气中没有病人出现低氧（血氧饱和度小于百分之九十二）。

结论：当打开胸膜后 5 分钟后，与通入百分之百纯氧并使用支气管封堵组相比，在单肺通气前给肺吸入 50%的笑气能促进肺萎陷。使用混合气体—笑气/氧气（氧体积分数=0.5）对随后的单肺通气中的动脉氧合作用没有不良影响。

（赵晓 译 李士通 校 ）

BACKGROUND: Effective lung collapse of the nonventilated lung can facilitate thoracic surgery. Previous studies showed that using a bronchial blocker could delay the time of lung collapse compared with using a double-lumen endotracheal tube. We hypothesized that the use of nitrous oxide (N2O) in the inspired gas mixture during 2-lung ventilation would lead to clinically relevant improvement of lung collapse during subsequent 1-lung ventilation with a bronchial blocker.

METHODS: Fifty patients were randomized into 2 groups: N2O (n =26) or O2 (n = 24). The N2O group received a gas mixture of oxygen and N2O (FIO2 = 0.5), and the O2 group received 100% oxygen until the start of 1-lung ventilation. Lung isolation was achieved with an Arndt® wire-guided bronchial blocker (Cook® Critical Care, Bloomington, IN). After turning patients to the lateral decubitus position, the cuff of the bronchial blocker was inflated under fiberoptic bronchoscopy surveillance, and thereafter, the dependent lung was ventilated with 100% oxygen during 1-lung ventilation in both groups. Surgeons blinded to the randomization evaluated the degree of lung collapse by using a verbal rating scale (lung collapse scale, 0 = no collapse to 10 = complete collapse) at 5 minutes after opening the pleura. Also, as secondary outcomes, lung collapse at 1 and 10 minutes were evaluated.

RESULTS: The score on the lung collapse scale in the N2O group was significantly higher compared with the O2 group at 5 minutes after opening the pleura (7 vs 5, P < 0.001, WMWodds = 7.3, 95% confidence interval (CI), 6.0 to 9.0). It was also higher in the N2O group at 10 minutes (10 vs 7, P < 0.001, WMWodds = 10.1, 95% CI, 1.9–13.3). The lung collapse scale between groups was not significant at 1 minute after opening the pleura (2 vs 2, P = 0.76, WMWodds = 1.1, 95% CI, 0.96–1.2). None of the patients developed hypoxia (SpO2 <92%) during 1-lung ventilation.

CONCLUSIONS: Filling the lung with 50% N2O before 1-lung ventilation facilitated lung collapse 5 minutes after opening the chest compared with 100% oxygen when a bronchial blocker was used. The N2O/O2 mixture (FIO2 = 0.5) did not have a harmful effect on subsequent arterial oxygenation during 1-lung ventilation.

抗纤溶药物应用在小儿非心脏手术中效果：文献的系统回顾

The Efficacy of Antifibrinolytic Drugs in Children Undergoing Noncardiac Surgery: A Systematic Review of the Literature

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接受大型手术的小儿经常面临失血的风险并通常需要输血。尽管近十年来，输注血制品相关的风险已经大大下降，但输血仍会导致相关显著的发病率和死亡率。因此，仍需要做出严格的努力来减少外科手术的失血及对血制品的需求。抗纤溶药物曾被证实在成人及小儿外科病人中都有效。自从 2008 年限制了抑肽酶的使用，最常用的抗纤溶药物就是赖氨酸类似物、氨甲环酸（TXA）和 ε -氨基己酸，其原理为抑制纤溶酶原转换为纤溶酶从而减少纤溶。本文对有关小儿非心脏手术中抗纤溶药物使用的效果的文献进行了系统回顾。在脊柱外科手术中，TXA 和 ε -氨基己酸均可减少失血和输血的要求，然而此项结果来源于小型回顾性为主的研究。有两项前瞻随机对照试验检测了在接受颅颌面外科手术的儿童的 TXA 的疗效并且报道了 TXA 可以减少输血需求。另外最近有两项相关的药代动力学试验结果发表并被总结在此综述中。没有关于 TXA 在儿科创伤人群的使用疗效的已发表的数据。在该研究领域仍需进一步的数据，本文讨论对未来研究的展望。

(王赟译、李士通校)

Children undergoing major surgery are frequently exposed to a high risk of blood loss often requiring transfusion. Although the risks associated with blood product transfusion have considerably decreased over the last decade, transfusion is still associated with significant morbidity and mortality. Thus, rigorous efforts should be made to decrease surgical bleeding and the need for blood product transfusion. Antifibrinolytic drugs have been shown to be effective when used in both adult and pediatric surgical patients. While there are data in adults to support safety, data remain limited for pediatric patients. Since the restriction of aprotinin use in 2008, the most commonly used antifibrinolytic drugs have been the lysine analogs, tranexamic acid (TXA), and ε-aminocaproic acid, which inhibit the conversion of plasminogen to plasmin and decrease the degree of fibrinolysis. We performed a systematic review of the literature pertaining to the efficacy of antifibrinolytic drugs in children undergoing noncardiac surgery. During spine surgery, both TXA and ε-aminocaproic acid decrease blood loss and transfusion requirements; however, this information comes from small, mainly retrospective trials. Two prospective, randomized, controlled trials have tested the efficacy of TXA in children undergoing craniofacial surgery and have reported that TXA decreases transfusion requirements. Two pharmacokinetic trials were also recently published and are summarized in this review. No data have been published regarding the efficacy of TXA administration in the pediatric trauma population. Further data are still needed in this field of study, and we discuss some perspectives for future research.

高误吸风险患者中胃管留置和气道管理的历史，流行观点和规程建议

Gastric Tubes and Airway Management in Patients at Risk of Aspiration: History, Current Concepts, and Proposal of an Algorithm

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存在胃食管内容物呼吸道误吸风险的患者中常用的麻醉技术是快速序贯诱导插管（Rapid sequence induction and intubation, RSII）和清醒状态气管插管。有些患者术前可能留置了胃管（gastric tube, GT），目前关于哪部分患者麻醉前应留置胃管尚无指南。而且，临床医生对于麻醉诱导前是否需要保留胃管、部分拔出或完全拔除胃管的意见没有达成统一。在这篇综述中我们为存在呼吸道误吸风险的患者是否应该在麻醉诱导过程中留置胃管进行了历史回顾。1961 年使用环状软骨压迫（cricoid pressure, CP）技术以前，使用头高位快速序贯诱导插管技术。Sellick 最早建议麻醉诱导前拔除胃管。他假设留置胃管增加了反流的风险，并且影响了环状软骨压迫时食管上段的压力。之后 Sellick 修改了他的观点并且强调了留置胃管时行环状软骨压迫手法的安全性。尽管后续研究证实了环状软骨压迫法可以有效隔断胃管周围的食管，Sellick 的早期观点仍被研究人员引用，他们建议部分或完全拔除胃管。在已有的大量信息的基础上，我们为存在胃食管内容物误吸风险的患者制定了一项气道管理规程。个体化的方案根据一下几点：操作过程；潜在病理类型和严重程度；意识状态；困难气道评估；胃管留置是否到位；RSII 或 CP 的禁忌症。规程要求麻醉前留置大口径胃管以排出未消化食物残块，对贲门失驰缓症患者实行清醒插管，并且对 Zenker ‘s 憩室患者利用外部压力排空胃部。它也规定在预计无困难气道的胃扩张患者中，需通过临床和影像学特点评估是否有必要留置胃管，在重症患者中应该尝试留置胃管。后一种情况下，成功留置胃管与否将提示是使用 RSII 或是清醒插管。在诱导过程中，胃管不应拔除，应持续性连接负压吸引。我们也讨论了婴幼儿几种胃肠道异常外科矫正术中的气道管理和胃管留置。

（盛嘉君 译，李士通 审校）

Rapid sequence induction and intubation (RSII) and awake tracheal intubation are commonly used anesthetic techniques in patients at risk of pulmonary aspiration of gastric or esophageal contents. Some of these patients may have a gastric tube (GT) placed preoperatively. Currently, there are no guidelines regarding which patient should have a GT placed before anesthetic induction. Furthermore, clinicians are not in agreement as to whether to keep a GT in situ, or to partially or completely withdraw it before anesthetic induction. In this review we provide a historical perspective of the use of GTs during anesthetic induction in patients at risk of pulmonary aspiration. Before the introduction of cricoid pressure (CP) in 1961, various techniques were used including RSII combined with a head-up tilt. Sellick initially recommended the withdrawal of the GT before anesthetic induction. He hypothesized that a GT increases the risk of regurgitation and interferes with the compression of the upper esophagus during CP. He later modified his view and emphasized the safety of CP in the presence of a GT. Despite subsequent studies supporting the effectiveness of CP in occluding the esophagus around a GT, Sellick's early view has been perpetuated by investigators who recommend partial or complete withdrawal of the GT. On the basis of available information, we have formulated an algorithm for airway management in patients at risk of aspiration of gastric or esophageal contents. The approach in an individual patient depends on: the procedure; type and severity of the underlying pathology; state of consciousness; likelihood of difficult airway; whether or not the GT is in place; contraindications to the use of RSII or CP. The algorithm calls for the preanesthetic use of a large-bore GT to remove undigested food particles and awake intubation in patients with achalasia, and emptying the pouch by external pressure and avoidance of a GT in patients with Zenker diverticulum. It also stipulates that in patients with gastric distension without predictable airway difficulties, a clinical and imaging assessment will determine the need for a GT and in severe cases an attempt to insert a GT should be made. In the latter cases, the success of placement will indicate whether to use RSII or awake intubation. The GT should not be withdrawn and should be connected to suction during induction. Airway management and the use of GTs in the surgical correction of certain gastrointestinal anomalies in infants and children are discussed.

内源性大麻素花生四烯酸乙醇胺抑制爪蟾卵母细胞的电压门控钠通道 Nav1.2, Nav1.6, Nav1.7 及 Nav1.8

The Endocannabinoid Anandamide Inhibits Voltage-Gated Sodium Channels Nav1.2, Nav1.6, Nav1.7, and Nav1.8 in Xenopus Oocytes

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背景：花生四烯酸是一种内源性大麻素，可通过药理作用调节多种生理功能，方式类似于大麻。最近，因内源性大麻素的镇痛效果将其作为顽固性疼痛治疗的新药物疗法备受关注。然而花生四烯酸乙醇胺的镇痛作用机制仍旧不明了。电压门控钠离子通道被认为在炎症和神经性疼痛中起重要作用。我们研究了大麻素对钠离子通道的 4 种 α 亚基，Nav1.2、Nav1.6、 Nav1.7 及 Nav1.8 的作用以探讨大麻素镇痛效应的作用机制。

方法：我们通过全细胞双电极电压钳技术，研究了非洲爪蟾卵母细胞内花生四烯酸对 Nav1.2、Nav1.6、Nav1.7 及 Nav1.8 的 α 亚基和 β1 亚基的作用。

结果：花生四烯酸抑制了所有钠通道的亚基持续电压引起的 1/2 最大电流，并呈浓度依赖。 Nav1.2、Nav1.6、Nav1.7 及 Nav1.8 的半数最大抑制浓度值分别为 17、12、27 及 40μmol/L。对 Nav1.6 抑制作用最大。花生四烯酸乙醇胺在所有 α 亚集中，引起活化曲线向去极化方向移动，及失活曲线向超级化方向移动，表明钠离子通道的抑制作用是由激活

减少和失活增加导致的。此外，花生四烯酸乙醇胺呈使用依赖性的阻滞 Nav1.2、Nav1.6 及 Nav1.7 ，不阻滞 Nav1.8。

结论：花生四烯酸乙醇胺抑制神经元钠离子通道的 α 亚基 Nav1.2、Nav1.6、Nav1.7 及 Nav1.8 的功能。这些结果有助于明确大麻素镇痛作用的机制。

（邢怡安 译 李士通 校）

BACKGROUND: Anandamide is an endocannabinoid that regulates multiple physiological functions by pharmacological actions, in a manner similar to marijuana. Recently, much attention has been paid to the analgesic effect of endocannabinoids in terms of identifying new pharmacotherapies for refractory pain management, but the mechanisms of the analgesic effects of anandamide are still obscure. Voltage-gated sodium channels are believed to play important roles in inflammatory and neuropathic pain. We investigated the effects of anandamide on 4 neuronal sodium channel α subunits, Nav1.2, Nav1.6, Nav1.7, and Nav1.8, to explore the mechanisms underlying the antinociceptive effects of anandamide.

METHODS: We studied the effects of anandamide on Nav1.2, Nav1.6, Nav1.7, and Nav1.8 α subunits with β1 subunits by using whole-cell, 2-electrode, voltage-clamp techniques in Xenopus oocytes.

RESULTS: Anandamide inhibited sodium currents of all subunits at a holding potential causing half-maximal current (V1/2) in a concentration-dependent manner. The half-maximal inhibitory concentration values for Nav1.2, Nav1.6, Nav1.7, and Nav1.8 were 17, 12, 27, and 40 μmol/L, respectively, indicating an inhibitory effect on Nav1.6, which showed the highest potency. Anandamide raised the depolarizing shift of the activation curve as well as the hyperpolarizing shift of the inactivation curve in all α subunits, suggesting that sodium current inhibition was due to decreased activation and increased inactivation. Moreover, anandamide showed a use-dependent block in Nav1.2, Nav1.6, and Nav1.7 but not Nav1.8.

CONCLUSION: Anandamide inhibited the function of α subunits in neuronal sodium channels Nav1.2, Nav1.6, Nav1.7, and Nav1.8. These results help clarify the mechanisms of the analgesic effects of anandamide.

预防性抗生素对硬膜外分娩镇痛引起的产时发热的有效性:一个随机试验

A Randomized Trial of the Effects of Antibiotic Prophylaxis on Epidural-Related Fever in Labor

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背景：据研究表明产妇在硬膜外镇痛分娩时出现的发热可能是由于产时感染。我们探讨在硬膜外置管前使用预防性抗生素能否降低硬膜外分娩镇痛引起的产时发热的发生率。

方法：此次试验采用双盲、安慰剂对照。将需硬膜外镇痛分娩的 400 名初产妇随机分为两组，在即将行硬膜外分娩镇痛时分别予以头孢西丁 2g 或安慰剂。每小时测量一次产妇鼓膜温度，温度≥38°C 定义为产时发热。发热产妇的新生儿评估是否出现新生儿败血症，若有胎盘标本则评估是否可有中性粒细胞炎症。主要结果指标就是硬膜外分娩镇痛时产妇的发热。

结果：头孢西丁组 38%的产妇和安慰剂组 40%的产妇出现了发热 (P = 0.68)。分娩时体温≥38°C（抗生素对安慰剂）的风险差异（95%的可信区间）是−2.0% (−11.5 —7.5)，而体温>39°C 的是−1.5% (−4.7—1.7)。每组大约有一半的产妇胎盘出现了中性粒细胞炎症，而且头孢西丁对任一级的炎症均无明显预防作用。有胎盘炎症的产妇比没有炎症的产妇更有可

能出现产时发热(73/158 vs 33/144, P < 0.001; 风险差异 23% [95%可信区间, 13.0–34.0])。在任何新生儿结局方面，头孢西丁组和安慰剂组无明显差异，所有新生儿中无新生儿败血症，无新生儿死亡。

结论：硬膜外分娩镇痛时的产时发热与胎盘炎症有关，但预防性的使用抗生素不能减少发热与胎盘炎症的发生。此研究表明硬膜外分娩镇痛相关的产时发热与胎盘炎症并非感染引起的。

（王慧娟 译 李士通 校）

BACKGROUND: It has been suggested that the development of maternal fever during epidural analgesia could be due to intrapartum infection. We investigated whether antibiotic prophylaxis before epidural placement decreases the rate of epidural-related fever.

METHODS: In this double-blind, placebo-controlled trial, 400 healthy nulliparous women requesting epidural analgesia were randomly assigned to receive either cefoxitin 2 g or placebo immediately preceding initiation of epidural labor analgesia. Maternal tympanic temperature was measured hourly, and intrapartum fever was defined as a maternal temperature of ≥38°C. Neonates born to women with fever were evaluated for possible sepsis, and available placentas were evaluated for the presence of neutrophilic inflammation. The primary outcome was maternal fever during epidural analgesia.

RESULTS: Thirty-eight percent of women in the cefoxitin group and 40% of women in the placebo group developed fever (P = 0.68). The risk difference (95% confidence interval) for fever ≥38°C during labor (antibiotic versus placebo) was −2.0% (−11.5 to 7.5), and for fever >39°C during labor was −1.5% (−4.7 to 1.7). Approximately half of each study group had placental neutrophilic inflammation, but administration of cefoxitin had no significant effect on any grade of neutrophilic inflammation. Fever developed significantly more often in the women with placental neutrophilic inflammation compared with those without such inflammation (73/158 vs 33/144, P < 0.001; risk difference 23% [95% confidence interval, 13.0–34.0]). There were no significant differences in any neonatal outcomes between the antibiotic and placebo study groups. Sepsis was not diagnosed in any of the infants. There were no neonatal deaths.

CONCLUSION: Fever during labor epidural analgesia is associated with placental inflammation, but fever and placental inflammation were not reduced with antibiotic prophylaxis. This finding suggests that infection is unlikely to be the cause in its development.

局部麻醉注射后外周神经损伤：勘误表

Peripheral Nerve Injury After Local Anesthetic Injection: Erratum

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Farber 等 2013 年 9 月发表在《麻醉与镇痛》杂志上的论著，“局部麻醉注射后外周神经损伤”在 Figure 4 中浓度有误。方法部分中的浓度是正确，为：布比卡因 0.5%，罗哌卡因 0.5%，和利多卡因 1.0%。

（董静 译 李士通 校）

In the September 2013 issue of Anesthesia & Analgesia, in the article by Farber et al., “Peripheral Nerve Injury After Local Anesthetic Injection,” the concentrations in Figure 4 were mislabeled.

The correct concentrations are those reported in the Methods section: bupivacaine 0.5%, ropivacaine 0.5%, and lidocaine 1.0%.