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输注新鲜和储存的红细胞均可以导致亚临床的肺部气体交换功能缺陷，两者没有显著差异

Fresh and Stored Red Blood Cell Transfusion Equivalently Induce Subclinical Pulmonary Gas Exchange Deficit in Normal Humans

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背景：输血可以导致严重的急性肺损伤，尽管大多数输血看似并没有导致该种并发症。我们验证该假定，即输血可以导致轻度肺功能受损，这种肺功能受损在临床上没有显著症状，并且并没有达到输血相关肺损伤的诊断标准。

方法：我们研究了35名健康的正常志愿者，他们在研究前4周献血1u血，间隔一周后在第二次研究前3周再献血1u。在研究的日子，2U的血分开保存，志愿者随机输注保存时间小于2小时的自体血或者是储存的自体血。在随后的一周内，每一名志愿者再次接受试验，输注另一储存的RBCs。主要结论是研究肺泡—动脉血氧分压差(AaDo(2))的变化，从开始输注前60min直至输血结束后。

结果：新鲜RBCs和储存了24.5天的RBCs均可以增加AaDo(2) (新鲜组：2.8 mm Hg [95%置信区间为0.8-4.8；P = 0.007]； 储存组：3.0 mm Hg [95%置信区间为1.4-4.7； P = 0.0006])，两者间没有显著差异。除了IL-10以外，所有测得的细胞因子的浓度在储存的去白RBCs组比非去白组少(P

0.15)。然而血管内皮生长因子是在体唯一测得的在输注去白或非去白保存RBCs后会增加的细胞因子。血管内皮生长因子是唯一在在体测得的与AaDo(2)相关的细胞因子。

结论：输注RBC可以导致细微的肺功能障碍，可以导致氧气的气体交换功能受损，支持我们提出的假设，即输血可以导致非损伤。这些数据并不支持该假设即相比于新鲜RBCs，储存时间大于21天的RBCs更易出现肺损伤。

(邓利兵译 薛张纲校)

BACKGROUND: Transfusion can cause severe acute lung injury, although most transfusions do not seem to induce complications. We tested the hypothesis that transfusion can cause mild pulmonary dysfunction that has not been noticed clinically and is not sufficiently severe to fit the definition of transfusion-related acute lung injury.

METHODS: We studied 35 healthy, normal volunteers who donated 1 U of blood 4 weeks and another 3 weeks before 2 study days separated by 1 week. On study days, 2 U of blood were withdrawn while maintaining isovolemia, followed by transfusion with either the volunteer's autologous fresh red blood cells (RBCs) removed 2 hours earlier or their autologous stored RBCs (random order). The following week, each volunteer was studied again, transfused with the RBCs of the other storage duration. The primary outcome variable was the change in alveolar to arterial difference in oxygen partial pressure (AaDo(2)) from before to 60 minutes after transfusion with fresh or older RBCs.

RESULTS: Fresh RBCs and RBCs stored for 24.5 days equally (P = 0.85) caused an increase of AaDo(2) (fresh: 2.8 mm Hg [95% confidence interval: 0.8-4.8; P = 0.007]; stored: 3.0 mm Hg [1.4-4.7; P = 0.0006]). Concentrations of all measured cytokines, except for interleukin-10 (P = 0.15), were less in stored leukoreduced (LR) than stored non-LR packed RBCs; however, vascular endothelial growth factor was the only measured in vivo cytokine that increased more after transfusion with LR than non-LR stored packed RBCs. Vascular endothelial growth factor was the only cytokine tested with in vivo concentrations that correlated with AaDo(2).

CONCLUSION: RBC transfusion causes subtle pulmonary dysfunction, as evidenced by impaired gas exchange for oxygen, supporting our hypothesis that lung impairment after transfusion includes a wide spectrum of physiologic derangements and may not require an existing state of altered physiology. These data do not support the hypothesis that transfusion of RBCs stored for >21 days is more injurious than that of fresh RBCs.

血管紧张素转化酶抑制剂不与非心脏手术术后的呼吸道并发症和死亡率相关

Angiotensin Converting Enzyme Inhibitors Are Not Associated with Respiratory Complications or Mortality After Noncardiac Surgery

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背景：一般认为采用血管紧张素转化酶抑制剂（ACEIs）与下呼吸道的并发症如咳嗽，血管神经源性水肿和支气管痉挛相关；此外，术前使用与已增加的并发症和死亡率相关。这个研究的首要目标是评价在非心脏手术的成年病人中围术期呼吸道并发症与ACEI治疗的关系。我们的第二目标是评价在非心脏手术全身麻醉的成年病人中，围术期使用ACEI和30天死亡率的关系，同时评价院内并发症和死亡率的一个综合结果。

方法：我们评价了2005年到2009年间在Cleveland医学中心就诊的79,228名非心脏手术病人（9905名使用ACEI的患者[13%]和66,620[87%]不使用ACEI的患者）。倾向匹配成功地配对了9028名ACEI使用者（9905名患者中的91%）和9028名对照者。配对了术中ACEI使用者和非ACEI使用者在术中和术后的呼吸道并发症以及特有并发症，30天死亡率，院内并发症和死亡率综合结果这些方面加以对照。

结果：使用ACEI和呼吸道并发症在术中（OR: 1.09 [97.5% CI: 0.91, 1.31], ACEI相对非ACEI; P = 0.28）和术后（OR: 0.97 [97.5% CI: 0.81, 1.16], ACEI相对非ACEI; P = 0.69）没有明显的统计学意义上的联系。在倾向匹配下，ACEI的使用与30天死亡率(OR: 0.93 [95% CI: 0.73, 1.19], ACEI相对非ACEI; P = 0.56)和院内并发症和死亡率的综合结果(OR: 1.06 [95% CI: 0.97, 1.15], ACEI相对非ACEI; P =

0.22)不相关。我们同时也观察到，在多个时期内ACEI组和非ACEI组的术中血流动力学特征，血管加压素的使用，以及胶体和晶体的输注是相似的（标准化差异<0.03）。

结论：我们没有发现ACEIs的使用与术中或术后的下呼吸道并发症有任何联系。此外，ACEI的使用与院内并发症及已增长的30天死亡率不相关联。

(方昕译 薛张纲校)

BACKGROUND: General use of angiotensin-converting enzyme inhibitors (ACEIs) is associated with upper-airway complications such as cough, angioedema, and bronchospasm; furthermore, preoperative use is associated with increased morbidity or mortality. Our primary goal in this study was thus to evaluate the association of ACEI therapy with perioperative respiratory morbidity in adult noncardiac surgical patients. Our secondary goals were to evaluate the association between preoperative use of ACEI and 30-day mortality, as well as to a composite outcome of in-hospital morbidity and mortality in adult noncardiac surgical patients having general anesthesia.

METHODS: We evaluated 79,228 patients (9905 ACEI users [13] and 66,620 [87%] non-ACEI users) who had noncardiac surgery at the Cleveland Clinic between 2005 and 2009. Propensity matching successfully paired 9028 ACEI users (91% of 9905 patients) with 9028 controls. Matched intraoperative ACEI users and non-ACEI users were compared on intraoperative and postoperative respiratory morbidity composites as well as individual complications, 30-day mortality, and a composite of in-hospital morbidity and mortality.

RESULTS: The association between ACEI use and respiratory morbidity composites was not statistically significant intraoperatively (OR: 1.09 [97.5% CI: 0.91, 1.31], ACEI versus non-ACEI; P = 0.28) or postoperatively (OR: 0.97 [97.5% CI: 0.81, 1.16], ACEI versus non-ACEI; P = 0.69). Within the propensity-matched subset, ACEI usage was not associated with either 30-day mortality (OR: 0.93 [95% CI: 0.73, 1.19], ACEI versus non-ACEI; P = 0.56) or the composite of in-hospital morbidity and mortality (OR: 1.06 [95% CI: 0.97, 1.15], ACEI versus non-ACEI; P = 0.22). We also observed that the ACEI and the non-ACEI groups were descriptively similar (standardized differences <0.03) on multiple time periods of intraoperative hemodynamic characteristics, vasopressor use, and colloid and crystalloid infusions.

CONCLUSIONS: We did not find any association between use of ACEIs and intraoperative or postoperative upper-airway complications. Furthermore, ACEI use was not associated with in-hospital complications or increased 30-day mortality.

PT-SAFE：一款运行和显示医疗音频警报的软件

PT-SAFE: Software Tool for Development and Annunciation of Medical Audible Alarms.

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背景：不久前麻醉患者安全基金会和联合委员会的研究报告显示医疗音频警报的效果值得改进。最近的几项研究探索了改进音频警报的多种方式，这激发了笔者开发一款能比较这些警报的实时软件的兴趣。我们试着设计了一款软件既能兼容不同设计的音频警报，同时也能融入已有的手术室设备中。该软件是用来作为让警报研究者们快速评估各项新颖警报系统设计的工具。

方法：该软件用于制造并发出音频警报，警报是由患者身上的监护仪发出的信号数据作为信号源映射形成的。这些数据由这个运行时非常灵活且模块化的目标指向软件转化为磁盘中的波形文件，由使用者用MATLAB编程来自定义报警算法。该软件在一个模拟的手术室中进行了试验，测试了它的性能，并与现有报警设备比较报警延时证实了它发出警报的准确性。

结果：该软件在一个模拟手术室中进行，对一个模拟患者的监护仪及呼吸机信号作出反应发出警报，结果显示它比现有的手术室警报设备平均快6.2秒发出警报，效果非常明显。分析显示该软件在信号丢失前能在一个中等性能的笔记本上持续发出15声音频警报。

结论：这些结果显示这款设计目的是评估各项报警设计的软件在无论是实验室还是仿真环境下都能提供快速多次报警，因此对于医疗音频报警的标准化有非常大的价值。

(郭晨跃译 薛张纲校)

BACKGROUND:Recent reports by The Joint Commission as well as the Anesthesia Patient Safety Foundation have indicated that medical audible alarm effectiveness needs to be improved. Several recent studies have explored various approaches to improving the audible alarms, motivating the authors to develop real-time software capable of comparing such alarms. We sought to devise software that would allow for the development of a variety of audible alarm designs that could also integrate into existing operating room equipment configurations. The software is meant to be used as a tool for alarm researchers to quickly evaluate novel alarm designs.

METHODS:A software tool was developed for the purpose of creating and annunciating audible alarms. The alarms consisted of annunciators that were mapped to vital sign data received from a patient monitor. An object-oriented approach to software design was used to create a tool that is flexible and modular at run-time, can announce wave-files from disk, and can be programmed with MATLAB by the user to create custom alarm algorithms. The software was tested in a simulated operating room to measure technical performance and to validate the time-to-annunciation against existing equipment alarms.

RESULTS:The software tool showed efficacy in a simulated operating room environment by providing alarm annunciation in response to physiologic and ventilator signals generated by a human patient simulator, on average 6.2 seconds faster than existing equipment alarms. Performance analysis showed that the software was capable of supporting up to 15 audible alarms on a mid-grade laptop computer before audio dropouts occurred.

CONCLUSIONS:These results suggest that this software tool provides a foundation for rapidly staging multiple audible alarm sets from the laboratory to a simulation environment for the purpose of evaluating novel alarm designs, thus producing valuable findings for medical audible alarm standardization.

围术期失误对麻醉医生的影响：国家调查的结果

The Impact of Perioperative Catastrophes on Anesthesiologists: Results of a National Survey

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背景：多数麻醉医生在他们的职业生涯中都至少经历过一次围术期失误。非常少见，然而，要知道这种事件的情绪影响，他们的作用是立即出现的且会产生长久的影响。在这次研究中，我们调查了围术期失误的影响和这些影响对美国麻醉医生产生的后果。

方法：我们随机地给1200位ASA成员寄出了问卷调查。提前寄给参与者一封信，共两份调查，两份人物明信片 and 一小笔薪酬。659名医生（56%）完成了这项调查。

结果：84%的调查对象在他们的职业生涯中已经涉及到至少一例意外死亡或者严重损伤的围术期病人。询问这种最难忘的围术期失误情绪的影响，大于70%的人感觉到愧疚，焦虑，消除这些影响有88%的人是需要时间从中恢复，19%的人确认从没有完全恢复。12%的人考虑转行。67%的调查对象认为他们在此事件的前4个小时内对病人的监护能力受到影响，仅有7%不需要时间。

结论：一次围术期的困难对麻醉医生或许产生深刻且持续的情绪影响，而且或许会影响到他们在此事件随后对病人的监测。

（孙莉萍译 薛张纲校）

BACKGROUND: Most anesthesiologists will experience at least one perioperative catastrophe over the course of their careers. Very little, however, is known about the emotional impact of these events and their effects on both immediate and long-term ability to provide care. In this study, we examined the incidence of perioperative catastrophes and the impact of these outcomes on American anesthesiologists.

METHODS: We sent a self-administered postal survey to 1200 randomly selected members of the American Society of Anesthesiologists. Participants were sent an advance letter, up to 2 copies of the survey, up to 2 reminder postcards, and a small cash incentive. Six hundred fifty-nine physicians (56%) completed the survey.

RESULTS: Eighty-four percent of respondents had been involved in at least one unanticipated death or serious injury of a perioperative patient over the course of his/her career. Queried about the emotional impact of a "most memorable" perioperative catastrophe, >70% experienced guilt, anxiety, and reliving of the event with 88% requiring time to recover emotionally from the event and 19% acknowledging having never fully recovered. Twelve percent considered a career change. Sixty-seven percent of respondents believed that their ability to provide patient care was compromised in the first 4 hours subsequent to the event, but only 7% were given time off.

CONCLUSION: A perioperative catastrophe may have a profound and lasting emotional impact on the anesthesiologist involved and may affect his or her ability to provide patient care in the aftermath of such events.

放置中心静脉导管前使用单纯酒精消毒是否具有与外科消毒液等同的消毒效果

Is alcohol-based hand disinfection equivalent to surgical scrub before placing a central venous catheter?

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背景：手部清洁与消毒有下列方法可使用：无水抗菌外科消毒液（1%葡萄糖洗必泰和61%乙醇，Avagard™；

3M医疗保健，圣保罗，明尼苏达），纯酒精消毒液（62%乙醇）和传统外科消毒液（用4%洗必泰肥皂清洗并使用无菌刷子刷手5分钟）。我们假设在置中心静脉导管前手部消毒时使用纯酒精消毒液和无水抗菌消毒液（Avagard）与传统外科消毒有相当的消毒效果。

方法：按手部消毒方法共分5组，消毒后对手指主体进行24小时平板培养：方法1：传统外科消毒法（n=49，14个主体的平板）；方法2：传统外科消毒（用4%洗必泰肥皂刷手5分钟并用水冲洗）后15分钟使用纯酒精消毒液（62%酒精）（n=49,14感染主体的平板）；方法3：单独纯酒精消毒液（n=49,14个主体的平板）；方法4：纯酒精消毒液（62%乙

醇) 15分钟后使用传统消毒法(用4%洗必泰肥皂刷手5分钟并用水冲洗)(n=49,14个主体的平板)方法5:单独使用无水外科消毒液(Avagard)(n=116,38个主体的平板)。15分钟的间隔可重新沾染细菌并可监测前一消毒液的残留效果。

结果:单独酒精消毒液(方法3)的消毒效果远远小于传统外科消毒法(方法1)($P < 0.001$; 82% 平板生长)。无水外科消毒液(Avagard)(方法5)与传统5分钟消毒方法(方法1)未观察到区别(95%可信区间[CI]: -14% ~ 11%)($P = 0.99$; 16%

平板生长)。在方法2中若先使用传统外科消毒方法消毒,再等待15分钟重新沾染细菌,可观察到与方法1有6%的差异。(95% CI: -10% to 22%)与方法4无差异(95% CI: -15% to 15%)

结论:与传统外科消毒方法(方法1)相比,单独酒精消毒液(方法3)的消毒效果远远不足($P < 0.001$)。

(杨琰译 薛张纲校)

BACKGROUND: Waterless antiseptic surgical hand scrub (1% chlorhexidine gluconate and 61% ethyl alcohol, Avagard™; 3M Health Care, St. Paul, MN), alcohol-only cleanser (62% ethyl alcohol), and traditional surgical scrub (5-minute scrub with 4% chlorhexidine soap using a sterile scrub brush with water) are techniques used for hand cleansing and disinfection. We hypothesized that alcohol-only cleanser and waterless antiseptic scrub (Avagard) would be as effective as a traditional surgical scrub for hand cleansing before placement of central venous catheters.

METHODS: Fingers of subjects were plate-cultured for 24 hours after 5 methods of hand cleansing: method 1: traditional surgical scrub (n = 49 plates produced by 14 subjects); method 2: traditional surgical scrub (5-minute scrub with water, brush, and 4% chlorhexidine soap) followed by a 15-minute break, then alcohol-only cleanser (62% alcohol) (n = 49 plates produced by 14 subjects); method 3: alcohol-only cleanser alone (n = 49 plates produced by 14 subjects); method 4: alcohol-only cleanser (62% alcohol), followed by a 15-minute break, then traditional surgical scrub (5-minute scrub with brush, and 4% chlorhexidine soap with water) (n = 49 plates produced by 14 subjects); and method 5: waterless surgical scrub (Avagard) alone (n = 116 plates produced by 38 subjects). The 15-minute break was introduced to allow a short period of recontamination, and to test for residual effects from prior cleansing.

RESULTS: Alcohol-only cleanser alone (method 3) was significantly less effective than the traditional surgical scrub (method 1) ($P < 0.001$; 82% plate growth). Waterless surgical scrub (Avagard) (method 5) had a 0% observed difference (95% confidence interval [CI]: -14% to 11%) compared with the traditional 5-minute scrub (method 1) ($P = 0.99$; 16% plate growth). When a traditional surgical scrub was used first followed by a 15-minute period of recontamination, there was a 6% observed difference in method 2 from reference (method 1) (95% CI: -10% to 22%), and 0% observed difference in method 4 from reference (95% CI: -15% to 15%).

CONCLUSION: As the initial cleansing method, the alcohol-only cleanser (method 3) was significantly less effective than the traditional surgical scrub (method 1) ($P < 0.001$).

硬膜外分娩镇痛开始时丈夫陪伴不能减轻产妇压力:一项前瞻性随机对照试验

Partner's Presence During Initiation of Epidural Labor Analgesia Does Not Decrease Maternal Stress: A Prospective Randomized Controlled Trial

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背景：硬膜外镇痛可以减轻分娩时的疼痛和焦虑。在这个随机对照试验中，我们试图明确，在硬膜外镇痛开始时，有丈夫陪伴是否可以减轻产妇和丈夫的压力以及他们对产妇疼痛的主观感觉。

方法：将有陪伴、要求硬膜外镇痛的健康初产妇纳入研究。此研究在以色列一家大型三级医院的产科进行。根据硬膜外镇痛的要求，对产妇及丈夫进行评估，包括基础焦虑值（数值评定量表，从0至10），收缩压，心率，预计的宫缩痛（疼痛口头评定量表，从0至10）和唾液淀粉酶含量。夫妻在测量后被随机分组，进入“有陪伴组”或“无陪伴组”。在硬膜外导管置入后，焦虑值，收缩压，心率和唾液淀粉酶含量将再次测定。每对夫妻都须完成焦虑状态量表问卷以评估目前的焦虑状态。评估产妇硬膜外导管置入引起的疼痛。主要的测量结果是用数值评定量表评定的产妇及丈夫的焦虑值。

结果：84对夫妻被随机分组（41对进入有陪伴组，42对进入无陪伴组，1对因违反协议而剔除）。在基线水平，有陪伴组和无陪伴组产妇自我评估的焦虑值无差异（四分位数中位数为7.5[6.0至9.0]和7.0[3.5至8.5]； $P=0.26$ ，中位数差异=-1.0；95%可信区间[CI]范围-2.0至1.0）。硬膜外导管置入后，有陪伴组的产妇焦虑程度高于无陪伴组的产妇（8.0[7.0至10.0]和7.0[5.0至9.0]； $P=0.03$ ，中位数差异=-1.0；95%可信区间范围-2.0至0.0）。硬膜外导管置入过程中，有陪伴组的产妇疼痛评分高于无陪伴组的产妇（7.0[4.0至8.0]和4.0[3.0至6.0]； $P=0.004$ ，中位数差异=-2.0；95%可信区间范围-3.0至-1.0）。
结论：分娩镇痛置入硬膜外导管时有丈夫陪伴并不能减轻焦虑。相反，硬膜外导管置入过程中如果丈夫在场，产妇的焦虑和疼痛会更严重。

（郁玲玲译 薛张纲校）

BACKGROUND: Epidural analgesia reduces pain and anxiety during childbirth. In this randomized controlled trial, we sought to determine whether partner presence during the initiation of epidural analgesia reduces stress of both the mother and her partner and their perception of maternal pain.

METHODS: Healthy, nulliparous women who were accompanied by their partners and requested neuraxial analgesia were enrolled into the study. The study took place in the Labor and Delivery Unit of a large tertiary hospital in Israel. Upon request for epidural analgesia, both partners were assessed for baseline anxiety (numerical rating scale, 0 to 10), systolic blood pressure, heart rate, estimated contraction pain of parturient (verbal rating scale for pain, 0 to 10), and salivary amylase. After measurements, couples were randomized into 1 of 2 groups: “partner in” and “partner out.” Immediately after epidural catheter insertion, anxiety, arterial blood pressure, heart rate, and salivary amylase were measured again in both partners. Both partners were asked to complete the State Anxiety Inventory questionnaire measuring current anxiety. The parturient was asked to rate the pain of epidural catheter insertion. The primary outcome measurement was parturient and partner anxiety as assessed by the numerical rating scale.

RESULTS: Eighty-four couples were randomized (partner in 41, partner out 42, protocol violation 1). At baseline there was no difference in self-reported anxiety of parturients between the partner-in and partner-out groups (median interquartile range 7.5 [6.0 to 9.0] versus 7.0 [3.5 to 8.5]; $P=0.26$, difference in medians $=-1.0$; 95% confidence interval [CI] of difference -2.0 to 1.0). After epidural catheter insertion, parturients in the partner-in group had a higher level of anxiety than those in the partner-out group (8.0 [7.0 to 10.0] versus 7.0 [5.0 to 9.0]; $P=0.03$, difference in medians -1.0 ; 95% CI of difference -2.0 to 0.0). Pain scores during epidural catheter placement were higher in partner-in than in partner-out groups (7.0 [4.0 to 8.0] versus 4.0 [3.0 to 6.0]; $P=0.004$, difference in medians -2.0 ; 95% CI of difference -3.0 to -1.0).

CONCLUSION: Partner presence during epidural catheter insertion for labor analgesia did not decrease anxiety levels. To the contrary, anxiety and pain of epidural catheter placement were greater if the partner remained in the room.

鞘内注射非典型抗抑郁药噻奈普汀对炎性疼痛大鼠模型的镇痛活性

The analgesic activity of intrathecal tianeptine, an atypical antidepressant, in a rat model of inflammatory pain.

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背景：噻奈普汀是一种非典型抗抑郁药，它与三环类抗抑郁药有相似的结构，但却有着不同的神经化学特性。我们评估噻奈普汀的镇痛活性及其在脊髓水平上与5-羟色胺能和肾上腺素能神经递质系统相关的作用机制。

方法：通过研究在大鼠脚掌内注射福尔马林后诱发出的退缩行为，从而判断鞘内注射噻奈普汀和DUP-697（一种COX-2抑制剂）的疗效，并使用等辐射分析了解两者之间的相互作用。双氢麦角汀、哌唑嗪和育亨宾分别是5-羟色胺能、 α -1和 α -2肾上腺素能受体拮抗剂，通过在使用噻奈普汀前10分钟鞘内注射这三种药物来探索其作用机制。

结果：在第一和第二阶段中，在鞘内注射噻奈普汀和DUP-697能够减少由注射福尔马林后诱发的退缩反应。在福尔马林试验的两个阶段中，哌唑嗪和育亨宾减轻由鞘内注射噻奈普汀而产生的镇痛效果。双氢麦角汀能够在第二阶段中翻转噻奈普汀的镇痛作用，但在第一阶段却没有作用。

结论：鞘内注射噻奈普汀能够有效地缓解大鼠的炎性疼痛。5-羟色胺能神经递质系统与噻奈普汀在脊髓水平上的易化疼痛有关。肾上腺素能神经递质系统也参与噻奈普汀对疼痛易化和急性疼痛的镇痛作用。联合应用噻奈普汀和COX-2抑制剂对控制炎性疼痛有较好的益处。

（周玲译 薛张纲校）

BACKGROUND: Tianeptine is an atypical antidepressant that exhibits structural similarities to the tricyclic antidepressants but has distinct neurochemical properties. We evaluated the antinociceptive activity of tianeptine and its mechanism of action regarding serotonergic and adrenergic transmission at the spinal level.

METHODS:The effects of intrathecally administered tianeptine and DUP-697 (a cyclooxygenase-2 inhibitor) were examined on flinching behavior evoked by intraplantar formalin injection, and their interaction was characterized using isobolographic analysis. Dihydroergocristine, prazosin, or yohimbine—which are serotonergic, α -1, and α -2 adrenergic receptor antagonists, respectively—were intrathecally administered 10 minutes before tianeptine to investigate its mechanism of action.

RESULTS:Intrathecally administered tianeptine and DUP-697 reduced the flinching response evoked by formalin injection during phases 1 and 2 in an additive fashion. Prazosin and yohimbine attenuated the antinociceptive effect of intrathecal tianeptine during both phases of the formalin test. Dihydroergocristine reversed the antinociception of tianeptine during phase 2, but not during phase 1.

CONCLUSIONS:Intrathecally administered tianeptine effectively relieved inflammatory pain in rats. The serotonergic system is related to the activity of tianeptine for facilitated pain at the spinal level. Adrenergic transmission is also involved in tianeptine-induced analgesia for both facilitated and acute pain. The combination of tianeptine and cyclooxygenase-2 inhibitor may provide additional benefits for the management of inflammatory pain.

体外循环期间脑血流自身调节限度的预测

Predicting the Limits of Cerebral Autoregulation During Cardiopulmonary Bypass

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背景

体外循环（CPB）期间对平均动脉压（MAP）的控制目标往往凭经验确定。已经证明近红外光谱（NIRS）可用于临床监测脑血流的自动调节。本研究假设体外循环期间使用基于近红外光谱的方法实时监测脑血流的自动调节，较根据年龄、术前病史、术前血压的经验性判断，能更为准确地判定脑自动调节下限（LLA）时的平均动脉压值。

方法

对232名接受体外循环下冠状动脉搭桥和/或瓣膜手术患者进行经颅的大脑中动脉多普勒监测及NIRS监测。持续动态地计算MAP和大脑血流速度以及MAP和NIRS之间的皮尔逊相关系数，得出平均流速指数和脑血氧饱和度指数。大脑能够自动调节时，脑血流量和MAP之间不存在相关性（即平均流速指数和大脑血氧饱和度指数接近0）；当MAP低于LLA水平时，平均流速指数和大脑血氧饱和度指数接近1。LLA是指在MAP下降同时平均流速指数增加 ≥ 0.4 时的MAP水平。作者还分别将术前收缩压、MAP、MAP比基线降低10%的值和平均大脑血氧饱和度指数与LLA时的MAP进行了线性回归分析。

结果

在225名患者中观察到脑血流自动调节下限的MAP值是66mmHg（95%的可信区间为43到90mmHg）。在处理了年龄、性别、中风史和高血压造成的偏倚后，得出术前MAP与LLA之间无相关性（ $P = 0.829$ ）；而大脑血氧饱和指数 >0.5 时与LLA相关（ $p=0.022$ ）。在219名患者（94.4%）中，可以根据大脑血氧饱和指数确定LLA。平均流速指数与大脑血氧饱和指数得到的LLA进行对比，平均相差 -0.2 ± 10.2 mm Hg（95%可信区间是 -1.5 to 1.2 mm Hg）。在收缩压 ≤ 160 mm Hg的患者中，术前收缩压水平与LLA升高相关。

结论

在体外循环病人中，脑血流调节下限时MAP个体差异很大，评估也十分困难。根据脑血氧饱和指数实时监测脑血流的自动调节可能为在CPB时个体化评估MAP水平提供了合理的方法。

（夏苏云 译 陈杰 校）

BACKGROUND: Mean arterial blood pressure (MAP) targets are empirically chosen during cardiopulmonary bypass (CPB). We have previously shown that near-infrared spectroscopy (NIRS) can be used clinically for monitoring cerebral blood flow autoregulation. The hypothesis of this study was that real-time autoregulation monitoring using NIRS-based methods is more accurate for delineating the MAP at the lower limit of autoregulation (LLA) during CPB than empiric determinations based on age, preoperative history, and preoperative blood pressure.

METHODS: Two hundred thirty-two patients undergoing coronary artery bypass graft and/or valve surgery with CPB underwent transcranial Doppler monitoring of the middle cerebral arteries and NIRS monitoring. A continuous, moving Pearson correlation coefficient was calculated between MAP and cerebral blood flow velocity and between MAP and NIRS data to generate mean velocity index and cerebral oximetry index. When autoregulated, there is no correlation between cerebral blood flow and MAP (i.e., mean velocity and cerebral oximetry indices approach 0); when MAP is below the LLA, mean velocity and cerebral oximetry indices approach 1. The LLA was defined as the MAP at which mean velocity index increased with declining MAP to ≥ 0.4 . Linear regression was performed to assess the relation between preoperative systolic blood pressure, MAP, MAP in 10% decrements from baseline, and average cerebral oximetry index with MAP at the LLA.

RESULTS: The MAP at the LLA was 66 mm Hg (95% prediction interval, 43 to 90 mm Hg) for the 225 patients in which this limit was observed. There was no relationship between preoperative MAP and the LLA ($P = 0.829$) after adjusting for age, gender, prior stroke, diabetes, and hypertension, but a cerebral oximetry index value of >0.5 was associated with the LLA ($P = 0.022$). The LLA could be identified with cerebral oximetry index in 219 (94.4%) patients. The mean difference in the LLA for mean velocity index versus cerebral oximetry index was -0.2 ± 10.2 mm Hg (95% CI, -1.5 to 1.2 mm Hg). Preoperative systolic blood pressure was associated with a higher LLA ($P = 0.046$) but only for those with systolic blood pressure ≤ 160 mm Hg.

CONCLUSIONS: There is a wide range of MAP at the LLA in patients during CPB, making estimation of this target difficult. Real-time monitoring of autoregulation with cerebral oximetry index may provide a more rational means for individualizing MAP during CPB.

综述：心脏手术中利用脑电描记技术和脑电双频谱指数进行脑监测

Review Article: Brain Monitoring with Electroencephalography and the Electroencephalogram-Derived Bispectral Index During Cardiac Surgery

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心脏手术会给麻醉医生带来许多特别挑战。术中除了常规和其他特殊的监护外，麻醉医生可能还需要考虑使用原始或者经处理的脑电图进行脑监测。有力证据表明，和常规监护相比，当监护方案加用经处理的脑电双频谱指数技术可减少术中知晓发生率。然而，心脏麻醉中引入脑电双频指数是否能促进“快通道麻醉”，减少麻醉药物用量以及发现脑缺血，其证据尚存争议。近期一项包括许多心脏手术的研究显示：在预防术中知晓方面，基于脑电双频谱技术的监控并不优于呼末麻醉药浓度的监控。较多文献反映出目前研究者对原始脑电图监测有越来越多的兴趣，包括了一些无专利经处理的监测指标。研究还显示，麻醉医生在经过正规训练之后可以从原始的脑电图波形中获得有用的信息。本篇综述将讨论脑电双频谱指数以及额部通道EEG监测在心脏手术中的优势以及不足。

(俞芳译 陈杰 校)

Cardiac surgery presents particular challenges for the anesthesiologist. In addition to standard and advanced monitors typically used during cardiac surgery, anesthesiologists may consider monitoring the brain with raw or processed electroencephalography (EEG). There is strong evidence that a protocol incorporating the processed EEG bispectral index (BIS) decreases the incidence intraoperative awareness in comparison with standard practice. However, there is conflicting evidence that incorporating the BIS into cardiac anesthesia practice improves “fast-tracking,” decreases anesthetic drug use, or detects cerebral ischemia. Recent research, including many cardiac surgical patients, shows that a protocol based on BIS monitoring is not superior to a protocol based on end-tidal anesthetic concentration monitoring in preventing awareness. There has been a resurgence of interest in the anesthesia literature in limited montage EEG monitoring, including nonproprietary processed indices. This has been accompanied by research showing that with structured training, anesthesiologists can glean useful information from the raw EEG trace. In this review, we discuss both the hypothesized benefits and limitations of BIS and frontal channel EEG monitoring in the cardiac surgical population.

全身性应用利多卡因并不减少大鼠肝脏手术后的肝功能不全

Systemic Lidocaine Does Not Attenuate Hepatic Dysfunction After Liver Surgery in Rats

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背景：可能由于对炎症反应和凋亡信号传导通路的调节,利多卡因已证明能减轻心、肺和脑的缺血再灌注(I/R)损伤。由于肝脏手术后的肝缺血/再灌注损伤对术后肝功能不全或甚至衰竭仍构成重大风险,本实验调查全身性应用利多卡因是否将对肝细胞损伤和肝功能的肝缺血/再灌注损伤产生积极的影响。此外,对潜在的作用机制进行了研究。

方法：一个70%

I/R损伤的标准化大鼠模型被用于评估全身性应用利多卡因对缺血60分钟并再灌注情况下肝细胞损伤的影响。为了更好地模拟临床情况,本实验在对第二个模型处理中将缺血45分钟与肝部分切除相结合。从缺血开始前30分钟至再灌注后20分钟全身性持续应用利多卡因。使用代表肝脏合成、细胞完整性和代谢的不同参数来评估肝功能。监测白细胞流入和通过TUNEL染色和Caspase - 3检测的细胞凋亡情况来评价炎症反应。

结果：两个模型显示,在对照组和利多卡因治疗动物组中同时发现了I/R造成的生化和组织学上的肝细胞损伤。术后发生了继发于缺血的肝功能明显受损,但对照组和利多卡因组没有观察到显著性差异。同样作为炎症反应的一项标志,在I/R损伤导致的白细胞流入方面,对照组和利多卡因治疗组之间也没有显著差异。

结论：全身性应用利多卡因的治疗浓度并不减少肝缺血/再灌注损伤后肝细胞损伤也不改善术后肝功能。

(龚寅 译 陈杰 校)

BACKGROUND: Lidocaine has been shown to attenuate ischemia–reperfusion (I/R) injury in the heart, lung, and brain, potentially due to modulation of inflammatory responses and apoptotic signaling pathways. Because hepatic I/R injury after liver surgery still poses a significant risk for postoperative liver dysfunction or even failure, we investigated whether systemic lidocaine would also positively affect hepatocellular damage and overall liver function after hepatic I/R injury. In addition the potential underlying mechanisms of action were studied.

METHODS: A standardized rat model of 70% I/R injury was used to assess the effects of systemic lidocaine on hepatocellular damage after 60 minutes of ischemia and subsequent reperfusion. To better mimic the clinical situation, we combined 45 minutes of ischemia with partial hepatectomy in a second model. Systemic lidocaine was administered continuously, starting 30 minutes before the ischemic insult until 20 minutes of reperfusion. Hepatocellular function was assessed using different variables of liver synthesis, cellular integrity, and metabolism. Inflammation was evaluated by measuring leukocyte influx and apoptosis detected using TUNEL staining and a caspase-3 assay.

RESULTS: In both models, I/R injury resulted in a significant increase in biochemical and histological hepatocellular damage with comparable values in control and lidocaine-treated animals. Postoperative liver function was significantly impaired secondary to ischemia, yet no significant differences between control and lidocaine groups could be observed. Likewise, there was no significant difference between control and lidocaine-treated animals with respect to I/R injury–induced leukocyte influx, as a marker for inflammatory response.

CONCLUSION: Systemic lidocaine in therapeutic concentrations neither attenuated hepatocellular damage nor improved postoperative liver function after hepatic I/R injury.

技术交流：开普勒插管系统

Technical Communication: The Kepler Intubation System

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此项实验目标是开发一个机器人插管系统，并进行一项关于使用机器人插管系统实施气管插管的可行性试验性研究。开普勒插管系统的开发包括一个通过机械臂与标准的可视喉镜相连的远程控制中心（操纵杆和插管驾驶舱）。一个操作者独立使用开普勒插管系统在人体气管插管训练模型上完成90例插管操作。第一组30例气管插管是在对人体模型直视下完成（直视组）。第二组30例气管插管是在无法看到人体模型的视野下完成（间接视野组）。30例半自动插管是在机器人系统重复之前的人体模型插管记录时完成的（半自动组）。记录气管插管的首次尝试成功率和插管时间。采用线性回归分析趋势。数据以平均值(标准差)表示。所有插管首次尝试都是成功的。平均插管时间直视组、间接视野组和半自动组分别为46（18）秒，51（19）秒和41（1）秒。直视和间接视野组显示为负斜率，这表明每次插管较前次需要更少的时间。半自动组斜率为0，且标准差低为1秒，这表明自动插管组的高重复性。作者认为机器人气管插管系统可行40至60秒内的远程插管。

（滕凌雅 译 陈杰 校）

Our goal in this study was to develop a robotic intubation system and to conduct a feasibility pilot study on the use of a robotic intubation system for endotracheal intubations. The Kepler Intubation System was developed, consisting of a remote control center (joystick and intubation cockpit) linked to a standard videolaryngoscope via a robotic arm. Ninety intubations were performed by the Kepler Intubation System on an airway trainer mannequin by a single operator. The first group of 30 intubations was performed with the operator in direct view of the mannequin (direct view group). The second group of 30 intubations was performed with the operator unable to see the mannequin (indirect view group). Thirty semiautomated intubations were also performed during which the robotic system replayed a trace of a previously recorded intubation maneuver (semiautomated group). First-attempt success rates and intubation times for each trial were recorded. Trends were analyzed using linear regression. Data are presented as mean (SD). All intubations were successful at first attempt. The mean intubation times were 46 (18) seconds, 51 (19) seconds, and 41 (1) seconds for the direct view, indirect view, and semiautomated group, respectively. Both the direct and indirect view groups had a negative slope, denoting that each successive trial required less time. The semiautomated group had a slope of 0 and a low SD of 1 second, illustrating the high reproducibility of automated intubations. We concluded that a robotic intubation system has been developed that can allow remote intubations within 40 to 60 seconds.

综述：医疗过失意外后果的告知—对麻醉医生意味着什么？

Review Article: The Disclosure of Unanticipated Outcomes of Care and Medical Errors: What Does This Mean for Anesthesiologists?

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向病人告知意外风险，包括医疗过失，最近已经受到广泛的关注。麻醉规范在保护患者安全方面占主导地位，因为充分告知获得广泛支持。麻醉医生需要具备这些思维和技巧。有

效的告知有助于提高病患-

医生之间的关系，促进对于医疗系统的认识，同时可以减少医疗不当所带来的额外费用。但是由于考虑到可能的诉讼、交流的挑战和自尊心的丧失很多临床医生仍然对于和病患讨论医疗过失保持高度警惕。结果，很多严重有害的错误并没有向家属告知。告知对于麻醉医生来说有特殊的挑战。在麻醉以前只有非常有限的时间来建立于医生与患者之间的关系。而且麻醉医生通常作为综合医疗团队的组成成员。其他成员，比如外科医生，可能对是否应向患者告知手术室过失存在异议。当外科医生就事件和家属进行初步讨论时，麻醉医生可能仍在照顾患者。结果麻醉医生可能被排除于重要的最初告知交流和计划之外。告知策略需要麻醉医生作为积极的参与者向患者告知意外情况。麻醉医生需要了解最好的告知的环境。同时日益增加的训练机会和告知材料。应该发展创新的模型来促进在告知过程中的围术期各科室成员的合作。发生意外情况和医疗事故之后，在确定特殊-具体的告知方法以及更有效地满足家属的需求方面起主导作用对麻醉医师来说是非常重要的。

(范逸辰 译 陈杰 校)

The disclosure of unanticipated outcomes to patients, including medical errors, has received considerable attention of late. The discipline of anesthesiology is a leader in patient safety, and as the doctrine of full disclosure gains momentum, anesthesiologists must become acquainted with these philosophies and practices. Effective disclosure can improve doctor-patient relations, facilitate better understanding of systems, and potentially decrease medical malpractice costs. However, many physicians remain wary of discussing errors with patients due to concern about litigation, the communication challenges of disclosure, and loss of self-esteem. As a result, harmful errors are often not disclosed to patients. Disclosure poses special challenges for anesthesiologists. There is often very limited time before the anesthetic in which to build the patient-physician relationship, and anesthesiologists usually function within complex health care teams. Other team members such as the surgeon may have different perspectives on what the patient should be told about operating room errors. The anesthesiologist may still be physically caring for the patient while the surgeon has the initial discussion with the family about the event. As a result the anesthesiologist may be excluded from the planning or conduct of the important initial disclosure conversations. New disclosure strategies are needed to engage anesthesiologists as active participants in the disclosure of unanticipated outcomes. Anesthesiologists should be aware of the emerging best practices surrounding disclosure, as well as the training opportunities and disclosure support resources that are increasingly available. Innovative models should be developed that promote collaboration between all perioperative team members in the disclosure process. There are important opportunities for anesthesiologists to play a leading role in defining specialty-specific disclosure practices and to more effectively meet patients' needs for disclosure after unanticipated outcomes and medical errors.

外科大手术围术期液体管理策略：分层荟萃分析

Perioperative Fluid Management Strategies in Major Surgery: A Stratified Meta-Analysis

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背景:

大量液体治疗 (LVR) 以及目标定向性液体治疗 (GD) 这两项策略其共同点都在术中应用大量液体, 但其后的结果却截然不同。本研究目的, 即确定这两项策略孰优孰劣。

方法:从MEDLINE, EMBASE, PubMed和Cochrane无语言限制登记在册的试验(1951至2011年4月)中选择应用于成人外科手术中目标定向性液体治疗或限制液体治疗与大量液体治疗之间的随机对照试验(RCTs)。进行了GD和LVR的分层间接比较。

结果: 23个GD随机对照试验中的3861名患者(样本量中位数=90, 四分位间距为57至109)和12个LVR随机对照试验中的1160名患者(样本量中位数=80, 四分位间距为36至151)

列入研究范围。LVR和GD治疗相比各自对照组, 都使用了更多的液体, 但预后却截然不同。大量液体治疗组的患者有较高的肺炎(危险比率[RR]为2.2,

95%置信区间[CI]为1.0至4.5), 肺水肿 (RR为3.8,

95%CI为1.1至13)发生率, 以及相对于限制液体组的患者其住院时间延长(平均差[MD]为2天, 95%CI为0.5至3.4)。同样目标定向性液体治疗组的患者肺炎(RR为0.7, 95%CI为0.6至0.9)和肾脏并发症(0.7, 95%

CI为0.5至0.9)的风险也更低, 住院时间相对于非目标定向性液体治疗的患者也较短(MD为2天, 95%CI为1至3)

。与目标定向性液体治疗相比, 大量液体治疗与住院时间延长(4天, 95%CI为3.4至4.4)、首次肠蠕动时间延长(2天, 95%CI为1.3至2.3)和肺炎发生率(RR危险率为3, 95%CI为1.8至4.8)增加有关。

结论:

各种结果表明除去血流动力学的考虑, 目标定向性液体治疗要优于大量液体治疗。而目标定向性治疗是否优于限制液体治疗尚待研究。

(俞劼晶 译 陈杰 校)

BACKGROUND: Both “liberal” and “goal-directed” (GD) therapy use a large amount of perioperative fluid, but they appear to have very different effects on perioperative outcomes. We sought to determine whether one fluid management strategy was superior to the others.

METHODS: We selected randomized controlled trials (RCTs) on the use of GD or restrictive versus liberal fluid therapy (LVR) in major adult surgery from MEDLINE, EMBASE, PubMed (1951 to April 2011), and Cochrane controlled trials register without language restrictions.

RESULTS: A total of 3861 patients from 23 GD RCTs (median sample size = 90, interquartile range [IQR] 57 to 109) and 1160 patients from 12 LVR RCTs (median sample size = 80, IQR 36 to 151) were considered. Both liberal and GD therapy used more fluid compared to their respective comparative arm, but their effects on outcomes were very different. Patients in the liberal group of the LVR stratum had a higher risk of pneumonia (risk ratio [RR] 2.2, 95% confidence interval [CI] 1.0 to 4.5), pulmonary edema (RR 3.8, 95% CI 1.1 to 13), and a longer hospital stay than those in the restrictive group (mean difference [MD] 2 days, 95% CI 0.5 to 3.4). Using GD therapy also resulted in a lower risk of pneumonia (RR 0.7, 95% CI 0.6 to 0.9)

and renal complications (0.7, 95% CI 0.5 to 0.9), and a shorter length of hospital stay (MD 2 days, 95% CI 1 to 3) compared to not using GD therapy. Liberal fluid therapy was associated with an increased length of hospital stay (4 days, 95% CI 3.4 to 4.4), time to first bowel movement (2 days, 95% CI 1.3 to 2.3), and risk of pneumonia (RR ratio 3, 95% CI 1.8 to 4.8) compared to GD therapy.

CONCLUSION: Perioperative outcomes favored a GD therapy rather than liberal fluid therapy without hemodynamic goals. Whether GD therapy is superior to a restrictive fluid strategy remains uncertain.

背根神经节水平给予蝇蕈醇应用于坐骨神经损伤大鼠可防止发生痛觉过敏并刺激髓磷脂蛋白表达

Dorsal Root Ganglion Application of Muscimol Prevents Hyperalgesia and Stimulates Myelin Protein Expression After Sciatic Nerve Injury in Rats

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背景：外周神经损伤可产生慢性疼痛，后者对传统治疗不敏感。外周神经损伤会引起神经病理性疼痛，部分原因是由于损伤部位或背根神经节(DRG)的异位放电导致中枢传入增强和中枢系统兴奋过度。不同家族的 γ 氨基丁酸(GABA)通道对于稳定神经元的兴奋性至关重要。近期活体研究发现于背根神经节处调节GABA神经元后，可以改变外周神经损伤后神经病理性疼痛发展过程。似乎在同侧背根神经节应用有效的GABA拮抗剂-蝇蕈醇，可防止坐骨神经损伤的大鼠发生痛觉过敏。除了可以减少兴奋过度的发生，氨基丁酸兴奋后还可上调髓磷脂蛋白22(PMP22)的表达，PMP22是基膜的一个主要成分，它与外周髓磷脂的形成和神经再生有关。

方法：由于PMP22对髓磷脂的形成和稳定密切相关，而刺激氨基丁酸后可调节PMP22表达，故本试验主要观察坐骨神经损伤后，直接在背根神经节应用蝇蕈醇是否可恢复PMP22蛋白的表达和神经纤维完整性。

结果：使用成年雌性大鼠的坐骨神经损伤模型作为研究对象发现同侧背根神经节处的氨基丁酸的调节可恢复坐骨神经远端的PMP22蛋白的表达，同时能稳定神经纤维基膜，因而从形态学上可减少神经损伤或加快神经纤维再生。增加PMP22蛋白的表达和神经原形态学上的改变与热超敏及机械性超敏的消除是一致的。

结论：对于外周髓鞘神经损伤后的神经再生以及疼痛缓解，背根神经节可能是个有前景的治疗靶点。

(张婷 译 陈杰 校)

BACKGROUND: Peripheral nerve injuries may result in debilitating pain that is poorly responsive to conventional treatment. Neuropathic pain induced by peripheral nerve injury is caused, in part, by ectopic discharges from the injury site or the dorsal root ganglia (DRG) resulting in enhanced central input and central hyperexcitability. A heterogeneous family of γ -aminobutyric acid (GABA)_A channels is important in quieting neuronal excitability. We have

recently reported that in vivo modulation of GABAergic neurons in DRG can alter the course of neuropathic pain development after peripheral nerve injury. It seems that direct application of a potent GABA_A agonist, muscimol, to the ipsilateral DRG prevents the development of hyperalgesia in rats subjected to a sciatic nerve crush injury. In addition to potentially curtailing hyperexcitability, GABAergic stimulation upregulated expression of peripheral myelin protein 22 (PMP22), a key component of the basal lamina. PMP22 expression correlates with peripheral myelin formation and nerve regeneration.

METHODS: Because of the importance of PMP22 for the formation and stability of myelin, and the fact that PMP22 expression could be GABAergically modulated, we examined whether direct DRG application of muscimol can restore PMP22 protein expression and the integrity of nerve fibers after crush injury of a sciatic nerve.

RESULTS: Using adult female rats and a crush injury model, we found that GABAergic modulation in the ipsilateral DRG restores PMP22 protein expression in the distal segment of the sciatic nerve and improves myelin stability in the basal membrane of nerve fibers, thus giving the morphological appearance of lessened nerve injury or faster nerve fiber regeneration. Both the enhanced PMP22 protein expression and morphological improvements coincide with the abolishment of thermal and mechanical hypersensitivity.

CONCLUSIONS: The DRG could be a promising therapeutic target in nerve regeneration and pain alleviation after crush injury of a myelinated peripheral nerve.

班布里奇和“反向”班布里奇反射：历史、生理和临床意义

The Bainbridge and the “Reverse” Bainbridge Reflexes: History, Physiology, and Clinical Relevance

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弗朗西斯A.班布里奇在1915年证实输注盐水或血到麻醉的狗颈静脉内产生心动过速。他发现离断心脏自主神经供应和注射胆碱能阻断药阿托品证实心动过速起源于反射，迷走神经组成传入纤维和迷走神经张力降低组成传出纤维。随后调查者证实静脉回流增加被左右心房中的牵张感受器检测到。在80年代人们充分证明班布里奇反射存在于包括人类的灵长类动物，但这个反射远远不如在狗身上显著。这种差异可能是由于在人类存在更加重要的动脉压力感受器反射。“反向”班布里奇反射被提出用来解释静脉回流减少情况下的心率降低，例如在脊麻和硬膜外麻醉、控制性降压和严重出血。在外科和危重监护背景下被用来描述患者静脉回流改变对心率的影响的班布里奇反射在整个麻醉文献中调用。但实验和临床证据的重要分析是缺乏的。在这篇综述中我们的主要目的是总结班布里奇反射的历史，描述它的解剖和生理，并讨论支持和反对它对在临床上观察到的心率变化有影响的证据。讨论了班布里奇反射和动脉压力感受器反射、贝-亚反射（抑制性心室感受器反射）的相互作用。

（刘朝辉译，李士通，马皓琳校）

Francis A. Bainbridge demonstrated in 1915 that an infusion of saline or blood into the jugular vein of the anesthetized dog produced tachycardia. His findings after transection of the cardiac autonomic nerve supply and injection of the cholinergic blocking drug atropine demonstrated that the tachycardia was reflex in origin, with the vagus nerves constituting the afferent limb and

a withdrawal of vagal tone the primary efferent limb. Subsequent investigators demonstrated that the increase in venous return was detected by stretch receptors in the right and left atria. In the 1980s, it was shown convincingly that the Bainbridge reflex was present in primates, including humans, but that the reflex was much less prominent than in the dog. This difference may be due to a more dominant arterial baroreceptor reflex in humans. A “reverse” Bainbridge reflex has been proposed to explain the decreases in heart rate observed under conditions in which venous return is reduced, such as during spinal and epidural anesthesia, controlled hypotension, and severe hemorrhage. The Bainbridge reflex is invoked throughout the anesthesia literature to describe the effect of changes in venous return on heart rate in patients in the surgical and critical care settings, but a critical analysis of the experimental and clinical evidence is lacking. Our main objectives in this review are to summarize the history of the Bainbridge reflex, to describe its anatomy and physiology, and to discuss the evidence for and against it having an influence on heart rate changes observed clinically. The interaction of the Bainbridge reflex with the arterial baroreceptor and Bezold–Jarisch reflexes is discussed.

兔子肝纤维化对七氟烷最小肺泡浓度的影响

Minimum Alveolar Concentration of Sevoflurane in Rabbits with Liver Fibrosis

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背景：术中被广泛使用的七氟烷能够同时影响肝脏功能和肝脏血流量。然而，肝脏纤维化对七氟烷最小肺泡浓度（MAC）的影响仍不清楚。因此，本研究旨在探究兔子肝脏纤维化对七氟烷最小肺泡浓度的影响。

方法：30只体重约为2.5Kg的雄性新西兰白兔随机分为2组：纤维化组（ $n=20$ ）和正常对照组（ $n=10$ ）。纤维化组兔子通过50%四氯化碳处理12个月来建立兔子肝纤维化模型。麻醉前检测血清总蛋白、白蛋白、球蛋白、总胆汁酸、丙氨酸氨基转移酶、总胆红素、天冬氨酸氨基转移酶、碱性磷酸酶、 γ 谷氨酰胺转肽酶、总胆红素、直接胆红素和间接胆红素。使用七氟烷对两组中存活的动物进行麻醉诱导和麻醉维持。使用标准的尾钳技术来确定自主呼吸兔子的七氟烷MAC。麻醉后，处死动物进行肝的病理检查。

结果：使用50%四氯化碳处理后12周，纤维化组20只兔子中的14只存活，对照组10只兔子中的9只存活。纤维化组中所有存活的动物出现了中度至重度的肝纤维化。经过纤维化挑战后存活的3只存活的兔子因其他疾病或对疼痛刺激没有反应而被排除。与对照组比较，肝纤维化动物的球蛋白、天冬氨酸氨基转移酶、 γ -谷氨酰胺转肽酶水平显著增加。然而，纤维化组的白蛋白及碱性磷酸酶水平显著低于对照组。七氟烷麻醉期间，两组平均动脉压、心率、呼末 CO_2 以及体温均较稳定。纤维化组的七氟烷MAC显著低于对照组（3.52%比4.10%， $P = 0.018$ ）。

结论：兔肝纤维化的七氟烷MAC显著降低。

（许辛 译 马皓琳 李士通 校）

BACKGROUND: Sevoflurane is widely used in patients undergoing surgical procedures, which could affect both the liver function and hepatic blood flow. However, the effects of liver fibrosis

on minimum alveolar concentration (MAC) of sevoflurane are still unclear. Therefore, we designed this study to determine the MAC of sevoflurane in rabbits with liver fibrosis.

METHODS: Thirty male New Zealand white rabbits weighing approximately 2.5 kg were divided randomly into 2 groups: fibrosis ($n = 20$) and normal control group ($n = 10$). The rabbits in the fibrosis group were treated with 50% carbon tetrachloride for 12 weeks to induce liver fibrosis. The serum concentration of total protein, albumin, globulin, total bile acids, alanine aminotransferase, aspartame aminotransferase, alkaline phosphatase, γ -glutamyl transpeptidase, total bilirubin, direct bilirubin, and indirect bilirubin were measured before anesthesia. The anesthesia for animals that survived in both groups was induced and maintained with sevoflurane. A standard tail-clamp technique was used to determine the MAC of sevoflurane in spontaneously breathing rabbits. After anesthesia, animals were killed for liver pathologic examination.

RESULTS: Twelve weeks after 50% carbon tetrachloride administration, 14 of 20 rabbits survived in the fibrosis group, and 9 of 10 survived in the control group. All surviving animals in the fibrosis group had developed moderate to severe liver fibrosis. Three rabbits that survived after the fibrosis challenge were excluded for other diseases or no response to pain stimulation. The levels of globulin, aspartame aminotransferase, and γ -glutamyl transpeptidase significantly increased in fibrosis animals compared with controls. However, the albumin and alkaline phosphatase levels were significantly lower in the fibrosis group than in the control group. Mean arterial blood pressure, heart rate, end-tidal CO_2 , and temperature were stable in both groups during sevoflurane anesthesia. The MAC of sevoflurane was significantly less in the fibrosis group than in the control group (3.52% vs 4.10%, $P = 0.018$).

CONCLUSION: The MAC of sevoflurane decreased significantly in rabbits with liver fibrosis.

昆士兰大学生命体征数据集：一个可获取的用于麻醉病人监护数据研究的资源档案库的发展

University of Queensland Vital Signs Dataset: Development of an Accessible Repository of Anesthesia Patient Monitoring Data for Research

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背景:，从监测病人生命体征的设备记录的数据常常用于监护仪、报警器和信息系统的发展，但是麻醉期间病人麻醉监测数据的高解析度、多参数数据集常难以获取。现存的数据集典型地是从重症监护室中患者收集而来。然而，重症监护患者的身体状况与术中患者有一定差异，手术室患者的循环和呼吸参数变化更频繁更明显，并且从这些重症监护数据集中忽略了与麻醉高度相关的额外信息（例如呼气末气体监测等）。我们收集了一系列适合于麻醉监测研究的高质量、高解析度、多参数监护数据。

方法：我们收集了阿德莱德皇家医院麻醉中病人的生命体征数据。我们开发了可以从Philips IntelliVue MP70和MP30病人监护仪以及Datex-Ohmeda

Aestiva/5麻醉机中获取、同步化、修改生命体征数据的软件，并且精确到10毫秒解析度的样本。将记录的数据储存到多种可打开的文件格式。

结果：我们记录了32例患者的监护数据（25例全麻，3例腰麻，4例镇静患者），监护时间从13分钟到5小时（平均105分钟）。多数病例包括来自于心电图仪、脉搏氧饱和度仪、二氧化碳分析仪、无创动脉血压监测仪、气道流量和压力监测仪的数据，少数病例监测包括来自于Y形肺活量计、脑电图监测仪和连续动脉血压监测仪的数据。记录的数据经过处理，并被保存为四种文件格式：（1）全部数值和波形数据的逗号分隔数值（CSV）格式文本文档、（2）一秒间隔的数值参数数据的CSV格式文档、（3）所有波形图像数据的PNG格式的图片 and （4）整个病例数值数据的图形表格显示以PNG和可变向量图形学（SVG）格式储存的文件。完整的数据资料可在网上免费获取，网址：102.100.100/6914，并且已经列入澳大利亚国家数据服务收集注册处。

讨论：本数据集提供了进行麻醉的患者的整个手术病例的临床麻醉监护数据，包括了术中常规监测的大量程的生命体征变量，并且以方便使用者查看的文件形式公布。文字和图像的文件格式使得研究者即使没有工程或计算机科学背景也能够使用标准的电子表格和图形浏览软件方便地打开数据。在将来的工作中，应当从更广范围且更多病例收集监护数据，并且需要支持搜索和导航数据库的软件工具。

（张怡译 马皓琳 李士通校）

BACKGROUND: Data recorded from the devices used to monitor a patient's vital signs are often used in the development of displays, alarms, and information systems, but high-resolution, multiple-parameter datasets of anesthesia monitoring data from patients during anesthesia are often difficult to obtain. Existing databases have typically been collected from patients in intensive care units. However, the physical state of intensive care patients is dissimilar to those undergoing surgery, more frequent and marked changes to cardiovascular and respiratory variables are seen in operating room patients, and additional and highly relevant information to anesthesia (e.g., end-tidal agent monitoring, etc.) is omitted from these intensive care databases. We collected a set of high-quality, high-resolution, multiple-parameter monitoring data suitable for anesthesia monitoring research.

METHODS: Vital signs data were recorded from patients undergoing anesthesia at the Royal Adelaide Hospital. Software was developed to capture, time synchronize, and interpolate vital signs data from Philips IntelliVue MP70 and MP30 patient monitors and Datex-Ohmeda Aestiva/5 anesthesia machines into 10 millisecond resolution samples. The recorded data were saved in a variety of accessible file formats.

RESULTS: Monitoring data were recorded from 32 cases (25 general anesthetics, 3 spinal anesthetics, 4 sedations) ranging in duration from 13 minutes to 5 hours (median 105 min). Most cases included data from the electrocardiograph, pulse oximeter, capnograph, noninvasive arterial blood pressure monitor, airway flow, and pressure monitor and, in a few cases, the Y-piece spirometer, electroencephalogram monitor, and arterial blood pressure monitor. Recorded data were processed and saved into 4 file formats: (1) comma-separated values text files with full numerical and waveform data, (2) numerical parameters recorded in comma-separated values files at 1-second intervals, (3) graphical plots of all waveform data in a range of resolutions as Portable Network Graphics image files, and (4) graphical overview plots of numerical data for entire cases as Portable Network Graphics and Scalable Vector Graphics files. The complete

dataset is freely available online via doi:10.1001/100/6914 and has been listed in the Australian National Data Service Collections Registry.

DISCUSSION: The present dataset provides clinical anesthesia monitoring data from entire surgical cases where patients underwent anesthesia, includes a wide range of vital signs variables that are commonly monitored during surgery, and is published in accessible, user-friendly file formats. The text and image file formats let researchers without engineering or computer science backgrounds easily access the data using standard spreadsheet and image browsing software. In future work, monitoring data should be collected from a wider range and larger number of cases, and software tools are needed to support searching and navigating the database.

报告麻醉不良事件和错误的障碍

Barriers to Adverse Event and Error Reporting in Anesthesia

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背景：虽然麻醉医师对患者的安全负主要责任，但对于他们报告不良事件和错误的影响因素，目前相关研究甚少。首先，我们研究了态度和情感因素对报告因错误导致的非特定不良事件的影响。其次，我们设计了一项组间研究，探讨在报告由错误导致的与非错误导致的过敏反应中，是否存在不同的认知上的障碍。最后，我们检验了麻醉医师认为有助于促进报告的措施。如有可能，我们将把我们的研究结果与出版的其他医师组的结果进行对照。

方法：本项匿名、自我管理的邮件调查在澳大利亚维多利亚的澳大利亚和新西兰大学麻醉医师学院的邮件列表中的629名麻醉主治医师和263名麻醉住院医师中进行。参与者被随机分配到特定过敏反应不良事件调查区的“错误”组或“非错误”组。数据分析采用非参数性描述和推理检验。

结果：共回收433份有用的调查问卷，有用应答率为49%。首先，13项有关影响错误导致非特定不良事件报告的态度或情感因素的报告书中，仅有一项被更多麻醉医师同意或强烈同意，即“犯错的医生会被他们的同事谴责。”其次，当过敏反应由错误导致时，参与者更倾向于同意或强烈同意以下6项——

诉讼、陷入困境、惩罚行为、受到谴责、同事不支持、不希望在会议上讨论此事——被认为是报告的障碍。最后，最受青睐的报告保障措施，是对不良事件和错误报告采用全面匿名反馈、建立角色模型（比如公开鼓励报告的高年资同事）和立法保护报告者免受法律上的曝光。

结论：我们研究中的大部分麻醉医师不认同调查的态度和情感障碍影响错误导致的非特定不良事件的报告，除了关心同事谴责的障碍。6项对报告特定过敏不良事件的障碍可能产生的影响，与是否存在错误有关。本研究中的麻醉医师支持报告的保障措施。我们的研究结果似乎与先前出版的其他医师组的研究存在一些差别。

（陈彬彬译 马皓琳 李士通校）

BACKGROUND: Although anesthesiologists are leaders in patient safety, there has been little research on factors affecting their reporting of adverse events and errors. First, we explored the attitudinal/emotional factors influencing reporting of an unspecified adverse event caused by error. Second, we used a between-groups study design to ask whether there are different perceived barriers to reporting a case of anaphylaxis caused by an error compared with anaphylaxis not caused by error. Finally, we examined strategies that anesthesiologists believe would facilitate reporting. Where possible, we contrasted our results with published findings from other physician groups.

METHODS: An anonymous, self-administered, mailed survey was conducted of 629 consultant anesthesiologists and 263 anesthesiology residents on the mailing list of the Australian and New Zealand College of Anaesthetists in Victoria, Australia. Participants were randomized into “Error” versus “No Error” groups for the specified anaphylaxis adverse event section of the survey. Data were analyzed using nonparametric descriptive and inferential tests.

RESULTS: There were 433 usable returned surveys, a usable response rate of 49%. First, there was only 1 of 13 statements on attitudinal/emotional factors that influenced reporting of an unspecified adverse event caused by error with which more anesthesiologists agreed/strongly agreed than disagreed/strongly disagreed: “Doctors who make errors are blamed by their colleagues.” Second, when an error rather than no error had caused anaphylaxis, participants were more likely to agree/strongly agree that 6 statements about litigation, getting into trouble, disciplinary action, being blamed, unsupportive colleagues, and not wanting the case discussed in meetings, were perceived as reporting barriers. Finally, the most favored assistive strategies for reporting were generalized deidentified feedback about adverse event and error reports, role models such as senior colleagues who openly encourage reporting, and legislated protection of reports from legal discoverability.

CONCLUSION: The majority of anesthesiologists in our study did not agree that the attitudinal/emotional barriers surveyed would influence reporting of an unspecified adverse event caused by error, with the exception of the barrier of being concerned about blame by colleagues. The probable influence of 6 perceived barriers to reporting a specified adverse event of anaphylaxis differed with the presence or absence of error. Anesthesiologists in our study supported assistive reporting strategies. There seem to be some differences between our results and previously published research for other physician groups.

超声引导下中心静脉无菌穿刺技术教学：比较单独教学训练与复合模拟的教学训练的随机试验

Teaching Aseptic Technique for Central Venous Access Under Ultrasound Guidance: A Randomized Trial Comparing Didactic Training Alone to Didactic Plus Simulation-Based Training

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背景：我们的目的是评定超声（US）引导中心静脉（CVC）置管过程中，复合模拟的教学训练与单独教学训练相比，是否能提高初学者无菌操作水平。我们假设，接受复合模拟教学训练的初学者，在模拟器上进行US引导CVC置入操作时，能够获得同富有经验的住院医师类似的无菌操作评分、知识的掌握度以及舒适度的感觉。

方法：72位受试者参加随机、对照的教学训练实验。54位初学者随机纳入教学组和复合模拟教学组。每组受试者均接受教学训练，但复合模拟教学组同时接受基于模拟的CVC置入训练。两组均在模拟器上进行超声引导下CVC置入操作的示范测试。不知道受试者随机分组的评定者对8步无菌操作技术分别按“是/否”和利克特七分量表（七分为“优秀操作”）进行评分。初次测试后，教学组接受基于模拟的训练并进行再测试。每组受试者均在训练前后进行知识测验，并采用利克特五分量表评定他们训练前后使用超声和CVC置入的舒适度。18位熟练的住院医师随后也参加知识测验，评定他们的舒适度，并在模拟器上进行超声引导下无菌CVC置入时对他们进行评分。

结果：相比初学者教学组，复合模拟方法的教学组“是/否”评分和利克特量表评分分别增加167%（95%可信区间[CI] 133%–167%）和115%（CI 112%–127%）。与富有经验的住院医师相比，复合模拟方法的教学训练出的初学者无菌操作的“是/否”评分和利克特量表评分分别增加33.3%（CI 16.7%–50%）和20%（CI 13.3%–40%），同时其知识测验分数高出2.5倍。对于所有初学者，接受复合模拟训练的教学后，其知识测试分数增加3倍，舒适度增加2倍。

结论：在诸如超声引导CVC置入的临床技能训练中，复合模拟的教学训练优于单独教学训练。接受复合模拟的教学训练后，初学者能够在无菌操作和知识掌握上超越富有经验的住院医师。

（江继宏 译 马皓琳 李士通 校）

BACKGROUND: Our goal was to determine whether simulation combined with didactic training improves sterile technique during ultrasound (US)-guided central venous catheter (CVC) insertion compared with didactic training alone among novices. We hypothesized that novices who receive combined didactic and simulation-based training would perform similarly to experienced residents in aseptic technique, knowledge, and perception of comfort during US-guided CVC insertion on a simulator.

METHODS: Seventy-two subjects were enrolled in a randomized, controlled trial of an educational intervention. Fifty-four novices were randomized into either the didactic group or the simulation combined with didactic group. Both groups received didactic training but the simulation combined with didactic group also received simulation-based CVC insertion training. Both groups were tested by demonstrating US-guided CVC insertion on a simulator. Aseptic technique was scored on 8 steps as “yes/no” and also using a 7-point Likert scale with 7 being “excellent technique” by a rater blinded to subject randomization. After initial testing, the didactic group was offered simulation-based training and retesting. Both groups also took a pre- and posttraining test of knowledge and rated their comfort with US and CVC insertion pre- and posttraining on a 5-point Likert scale. Subsequently, 18 experienced residents also took the test of knowledge, rated their comfort level, and were scored while performing aseptic US-guided CVC insertion using a simulator.

RESULTS: The simulation combined with didactic group achieved a 167% (95% confidence interval [CI] 133%–167%) incremental increase in yes/no scores and 115% (CI 112%–127%) incremental increase in Likert scale ratings on aseptic technique compared with novices in the didactic group. Compared with experienced residents, simulation combined with didactic trained

novices achieved an increase in aseptic scores with a 33.3% (CI 16.7%–50%) increase in yes/no ratings and a 20% (CI 13.3%–40%) increase in Likert scaled ratings, and scored 2.5-fold higher on the test of knowledge. There was a 3-fold increase in knowledge and 2-fold increase in comfort level among all novices ($P < 0.001$) after combined didactic and simulation-based training.

CONCLUSION: Simulation combined with didactic training is superior to didactic training alone for acquisition of clinical skills such as US-guided CVC insertion. After combined didactic and simulation-based training, novices can outperform experienced residents in aseptic technique as well as in measurements of knowledge.

异丙酚和依托咪酯在麻醉诱导的意识丧失过程中抑制皮层、丘脑以及网状结构的神经元 **Propofol and Etomidate Depress Cortical, Thalamic, and Reticular Formation Neurons During Anesthetic-Induced Unconsciousness**

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背景：麻醉药物产生意识丧失的作用位点尚未完全明确。可能的位点包括大脑皮质、丘脑以及网状结构。我们在完整动物体内检测了异丙酚和依托咪酯对于皮质、丘脑以及网状结构的神经元功能的影响。

方法：对五只猫在麻醉状态下放置记录套管和脑电波螺丝钉电极。经过5天恢复期后，每周重复研究猫3-

4次。在丙泊酚或依托咪酯注射前、注射时和注射后记录脑皮质（7、18和19区）、丘脑（腹后外侧核，腹后内侧核和内侧膝状体）以及网状结构（中脑网状核和中央被盖区域）的神经元（单一单元）活动。皮层神经元动作电位被单独分为规则尖峰神经元或快速尖峰形成神经元进行分析。

结果：异丙酚和依托咪酯使皮层神经元自发性激发率减少了37%~41%；快速尖峰形成神经元以及规则尖峰神经元受到麻醉药物的影响相似。丘脑和网状结构神经元激发率被异丙酚和依托咪酯减少了30%~49%。在注射药物时，脑电波图形从低幅、高频模式转变为高幅、低频模式，提示此为麻醉药物的效应；在注射异丙酚时出现峰值的频率为12-13 Hz。在依托咪酯麻醉时有两个主要峰值：一个在12-14 Hz，另一个在7-8 Hz。猫被深度镇静，角膜及胡须反射被抑制；对伤害性刺激的回缩反应保持完整。

结论：这些数据显示皮层、丘脑以及网状结构中的神经元被异丙酚和依托咪酯相似地抑制。尽管麻醉对神经元活动的抑制可能促使麻醉诱导的意识丧失，但仍需进一步研究以确定麻醉药在这些位点的效应如何相互作用来产生意识丧失。

（瞿亦枫 译 马皓琳 李士通 校）

BACKGROUND: The sites where anesthetics produce unconsciousness are not well understood. Likely sites include the cerebral cortex, thalamus, and reticular formation. We examined the effects of propofol and etomidate on neuronal function in the cortex, thalamus, and reticular formation in intact animals.

METHODS: Five cats had a recording well and electroencephalogram screws placed under anesthesia. After a 5-day recovery period, the cats were repeatedly studied 3 to 4 times per week. Neuronal (single-unit) activity in the cerebral cortex (areas 7, 18 and 19), thalamus (ventral posterolateral and ventral posteromedial nuclei and medial geniculate body), and reticular formation (mesencephalic reticular nucleus and central tegmental field) was recorded before, during, and after infusion of either propofol or etomidate. Cortical neuronal action potentials were analyzed separately as either regular spiking neurons or fast spiking neurons.

RESULTS: Propofol and etomidate decreased the spontaneous firing rate of cortical neurons by 37% to 41%; fast spiking neurons and regular spiking neurons were similarly affected by the anesthetics. The neuronal firing rate in the thalamus and reticular formation decreased 30% to 49% by propofol and etomidate. The electroencephalogram shifted from a low-amplitude, high-frequency pattern to a high-amplitude, low-frequency pattern during drug infusion suggesting an anesthetic effect; peak power occurred at 12 to 13 Hz during propofol infusion. There were 2 major peaks during etomidate anesthesia: one at 12 to 14 Hz and another at 7 to 8 Hz. The cats were heavily sedated, with depressed corneal and whisker reflexes; withdrawal to noxious stimulation remained intact.

CONCLUSION: These data show that neurons in the cortex, thalamus, and reticular formation are similarly depressed by propofol and etomidate. Although anesthetic depression of neuronal activity likely contributes to anesthetic-induced unconsciousness, further work is needed to determine how anesthetic effects at these sites interact to produce unconsciousness.

鞘内导管置入影响大鼠对长期吗啡镇痛的耐受性

Intrathecal Catheterization Influences Tolerance to Chronic Morphine in Rats

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我们评估了行腰椎穿刺置入导管和假手术的大鼠给予短期和长期吗啡鞘内注射的镇痛作用。吗啡的短期作用组间无差异。导管置入的大鼠较假试验的大鼠更早出现对长期吗啡作用的耐受性。因此，导管的存在促进了对阿片类药物镇痛效果的耐受性。用测定三维细胞体积来检测脊髓星形胶质化，我们在导管置入的大鼠观察到脊髓星形胶质化，其较假试验组大鼠的细胞体积显著增加。长期给首次手术的动物鞘内注射吗啡引起的神经胶质增生与在注射生理盐水的置入导管动物上观察到的相近似。

(毛祖旻 译 马皓琳 李士通 校)

We evaluated the antinociceptive effects of acute and chronic morphine administered spinally via lumbar puncture in intrathecally catheterized and sham-surgery rats. The effects of acute morphine did not differ between groups. Catheterized rats developed tolerance to chronic morphine more rapidly, compared with sham and naive rats. Therefore, catheter presence facilitated development of opioid antinociceptive tolerance. Spinal astrogliosis, determined by measurement of 3-dimensional cell volumes, was observed in catheterized rats as indicated by significantly larger cell volumes compared with surgery-naive controls. Gliosis induced by chronic intrathecal morphine administered to surgery-naive animals was comparable to that observed in saline-treated catheterized rats.

