心血管麻醉医师学会对心脏手术患者围术期出血及止血管理的临床实践的改善建议

Society of Cardiovascular Anesthesiologists Clinical Practice Improvement Advisory for Management of Perioperative Bleeding and Hemostasis in Cardiac Surgery Patients

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术后出血是心脏手术常见且严重的并发症，可造成多种血液制品的输注，增加相关并发症的发病率及术后死亡率。尽管已经出台了大量关于心脏手术患者血液管理的指南及共识，但据调查，医生们并未严格遵守指南，因而患者实际的输血管理存在明显差异。此外，在过去十年来，虽然床旁凝血功能监测的应用和浓缩凝血因子等新的围术期止血治疗的实施明显增加，但这些新方法并不能在所有机构中得到广泛应用。因此，过去十年间，即使我们付出了不懈的努力，心脏手术患者的血液制品输注仅有小幅下降，并且高危患者仍≥50%。基于上述不足，为积极响应监管和立法机关的新要求，心血管麻醉医师协会（SCA）成立了心脏手术血液保护工作组，以期组织、总结和传播心脏手术患者血液管理的最佳实践知识。通过工作组对现有的心脏手术患者血液管理的相关指南、共识及建议的收集回顾，本文囊括了其对声明及流程的总结。我们的最终目标是创造一个便利的可教学的动态资源，从而提高治疗团队对现有心脏患者血液管理的最佳循证实践的依从性。（许芳霞 译 李金宝校）

Bleeding after cardiac surgery is a common and serious complication leading to transfusion of multiple blood products and resulting in increased morbidity and mortality. Despite the publication of numerous guidelines and consensus statements for patient blood management in cardiac surgery, research has revealed that adherence to these guidelines is poor, and as a result, a significant variability in patient transfusion practices among practitioners still remains. In addition, although utilization of point-of-care (POC) coagulation monitors and the use of novel therapeutic strategies for perioperative hemostasis, such as the use of coagulation factor concentrates, have increased significantly over the last decade, they are still not widely available in every institution. Therefore, despite continuous efforts, blood transfusion in cardiac surgery has only modestly declined over the last decade, remaining at ≥50% in high-risk patients. Given these limitations, and in response to new regulatory and legislature requirements, the Society of Cardiovascular

Anesthesiologists (SCA) has formed the Blood Conservation in Cardiac Surgery Working Group to organize, summarize, and disseminate the available best-practice knowledge in patient blood management in cardiac surgery. The current publication includes the summary statements and algorithms designed by the working group, after collection and review of the existing guidelines, consensus statements, and recommendations for patient blood management practices in cardiac surgery patients. The overall goal is creating a dynamic resource of easily accessible educational material that will help to increase and improve compliance with the existing evidence-based best practices of patient blood management by cardiac surgery care teams.

红肉综合征和麻醉有何关系？α-半乳糖综合征的围术期管理

What Does a Red Meat Allergy Have to Do With Anesthesia? Perioperative Management of Alpha-Gal Syndrome

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在过去的几十年里，一种称为α-半乳糖过敏或α-半乳糖综合征的新型过敏性综合征越来越被人们所关注，即通常认为的红肉过敏症。我们通过回顾一系列有关α-半乳糖综合征的背景，相关药物和医疗器械副作用的文章，完成了这篇综述。α-半乳糖综合征与寡糖半乳糖α-1,3-半乳糖特异性IgE相关，寡糖半乳糖α-1,3-半乳糖在非峡鼻猿类动物的肌肉和组织中表达。半乳糖综合征由孤星蜱虫叮咬所诱发，并与西妥昔单抗引起的即发型过敏反应和食用红肉后引起的迟发型超敏反应相关。目前一些对于含有α-半乳糖的药物和医疗器械过敏的现象也逐渐被认识到，这主要是由于药物和医疗器械制备过程中的一些凝胶或硬脂酸等非活性物质所引起。这种过敏反应可能会被多种方式所记录，也可能来自于患者的非专业表述，鉴于其严重的影响，麻醉医生需保持高度警惕，及时发现这种综合征。α-半乳糖综合征给麻醉师带来了许多独特的挑战，包括正确识别这些患者以及为其正确选择不会引起过敏的麻醉药物和辅助性药物。

（许芳霞译 李金宝校）

Over the past decade, there has been a growing awareness of a new allergic syndrome known as alpha-gal allergy or alpha-gal syndrome, commonly recognized as a red meat allergy. We performed a review of the literature to identify articles that provide both background on this syndrome in general and any reports of reactions to medications or medical devices related to alpha-gal syndrome. Alpha-gal syndrome results from IgE to the oligosaccharide galactose-α-1,3-galactose, expressed in the meat and tissues of noncatarrhine mammals. It is triggered by the bite of the lone star tick and has been implicated in immediate-onset hypersensitivity to the monoclonal antibody cetuximab and delayed-onset hypersensitivity reactions after the consumption of red meat. There is growing recognition of allergic reactions in these patients to other drugs and medical devices

that contain alpha-gal. Many of these reactions result from inactive substances that are part of the manufacturing or preparation process such as gelatin or stearic acid. This allergy may be documented in a variety of ways or informally reported by the patient, requiring vigilance on the part of the anesthesiologist to detect this syndrome, given its serious implications. This allergy presents a number of unique challenges to the anesthesiologist, including proper identification of a patient with alpha-gal syndrome and selection of anesthetic and adjunctive medications that will not trigger this allergy.

术前认知筛查有助于预测体弱人群住院时间的回顾性病例对照研究

A Preoperative Cognitive Screening Test Predicts Increased Length of Stay in a Frail Population: A Retrospective Case–Control Study

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背景：患者体弱与围手术期不良结局相关，如增加主要并发症、死亡率和延长住院时间等。我们试图阐明术前简易智力状态评估在预测高危体弱人群围手术期不良结局风险中所起的作用。

方法：在这项回顾性病例对照研究中，满足年龄> 60 岁、卧床、或服用药物> 5 种这三项的至少其中之一，且术前做过握力，步行速度和简易智力状态评估的人群被纳入该研究。然后通过埃默里大学临床数据库提取相关信息及其它围术期和术后结局的各种数据。

结果：有 1132 例接受各种外科手术的患者的数据可用，其中 747 名患者的预期住院时间延长，其预期值> 1 的机率的增加与其术前简易智力状态评分的异常相关（比值比，1.52；95%可信区间，1.05-2.19）；P = .025）。重症监护病房住院时间超过 3 天（P = .182）或出院自我照顾（P = .873）或再入院的风险（P = .104）均与建议智力状态评分无相关性。基线血红蛋白水平低与本研究所讨论的 4 种结局中其中 2 种的风险增加相关。

结论：在高危体弱患者中，术前简易智力状态评估可能不够灵敏，无法检测出大多数不良结局之间的显著差异。我们需要做进一步的工作来评估在这种情况下更严格的认知筛查是否有价值，并比较可以评估整体体弱状况的工具。

（许芳霞译 李金宝校）

BACKGROUND: Frailty is associated with adverse perioperative outcomes including major morbidity, mortality, and increased length of stay. We sought to elucidate the role that a preoperatively assessed Mini-Cog can play in assessing the risk of adverse perioperative outcomes in a population at high risk of frailty.

METHODS: In this retrospective case-control study, patients who were >60 years of age, nonambulatory, or had >5 documented medications were preoperatively assessed for handgrip strength, walking speed, and

Mini-Cog score. The Emory University Clinical Data Warehouse was then used to extract this information and other perioperative data elements and outcomes data.

RESULTS: Data were available for 1132 patients undergoing a wide variety of surgical procedures. For the subset of 747 patients with data for observed-to-expected length of stay, an abnormal Mini-Cog was associated with an increased odds of observed-to-expected >1 (odds ratio, 1.52; 95% CI, 1.05-2.19; P = .025). There was no association of abnormal Mini-Cog with intensive care unit length of stay >3 days (P = .182) discharge to home with self-care (P = .873) or risk of readmission (P = .104). Decreased baseline hemoglobin was associated with increased risk of 2 of the 4 outcomes studied.

CONCLUSIONS: In a high-risk pool of patients, Mini-Cog may not be sensitive enough to detect significant differences for most adverse outcomes. Further work is needed to assess whether cognitive screens with greater resolution are of value in this context and to compare tools for assessing overall frailty status.

行复苏性主动脉球囊阻断术的创伤患者的麻醉管理

Anesthetic Management of Patients After Traumatic Injury With Resuscitative Endovascular Balloon Occlusion of the Aorta

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复苏性血管内球囊闭塞术(REBOA)是针对躯体不可压迫性出血的一种临时性操作方法。据我们所知，这个单中心的简报所提供的相关麻醉数据是迄今为止所发表的关于接受 REBOA 的患者中最丰富的。正如预期那样，这些患者往往病情危重，表现为乳酸性酸中毒、低血压、高血糖、体温过低和凝血障碍。他们所有人都会在手术期间接受血液制品输注，并且吸入的麻醉气体少于同年龄健康患者的正常需要。本研究是 REBOA 患者的麻醉管理相关的临床教育和研究的一个重要起点。（许芳霞译 李金宝校）

Resuscitative endovascular balloon occlusion of the aorta (REBOA) is a temporizing maneuver for noncompressible torso hemorrhage. To our knowledge, this single-center brief report provides the most extensive anesthetic data published to date on patients who received REBOA. As anticipated, patients were critically ill, exhibiting lactic acidosis, hypotension, hyperglycemia, hypothermia, and coagulopathy. All patients received blood products during their index operations and received less inhaled anesthetic gas than normally required for healthy patients of the same age. This study serves as an important starting point for clinician

education and research into anesthetic management of patients undergoing REBOA.

产科硬脊膜穿破后头痛相关主要神经系统并发症的回顾性队列研究

Major Neurologic Complications Associated With Postdural Puncture Headache in Obstetrics: A Retrospective Cohort Study

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产科硬膜外穿刺后头痛（PDHP）的患者出现脑静脉血栓、硬膜下血肿、细菌性脑膜炎、持续性头痛或持续性腰痛的风险会增加。此外，急性产后疼痛如 PDHP 也可能导致产后抑郁症。这项研究想要研究 PDHP 是否与产后主要神经系统及其他并发症的风险显著增加相关。这项回顾性队列研究纳入了 2005 年 1 月至 2014 年 9 月期间在纽约州医院采用椎管内麻醉的方法分娩的 1003803 名女性，主要结果为脑静脉血栓形成和硬膜下血肿，四种次要结果为发生细菌性脑膜炎、抑郁症、头痛和腰痛。我们所研究的 PDPH 和并发症是指在分娩住院期间到分娩后 1 年内发现的。采用逆处理概率加权法估计校正比值比（aORs）和 95%可信区间（CIs）。在被研究的女性中，4808 人（0.48%；95% CIs，0.47-0.49）表现为 PDHP，其中 264 例（5.2%）在再入院期间被确诊，平均再入院的住院时间为 4 天。患 PDPH 产妇的脑静脉血栓形成和硬膜下血肿的发生率明显高于无 PDPH 的妇女（分别为每 1000 例椎管内麻醉发生数为 3.12，即 1:320 vs 每 1000 例椎管内麻醉发生数为 0.16，即 1:6250，P＜.001）。患 PDPH 产妇的四种次要结果的发生率也明显高于无 PDPH 的产妇。脑静脉血栓形成和硬膜下血肿发生率的 aORs 为 19.0（95%CI，11.2-32.1），细菌性脑膜炎的 aORs 为 39.7（95%CI，13.6-115.5），抑郁症为 1.9（95%CI，1.4-2.6），头痛为 7.7（95%CI，6.5-9.0），腰痛为 4.6（95%CI，3.3-6.3）。 其中 70%的脑静脉血栓形成和硬膜下血肿是在再入院时发现的，再入院的平均时间为 5 天。PDPH 与产后大幅度增加的主要神经系统并发症及其他并发症的风险相关，提示我们早期识别和治疗产科麻醉相关并发症的重要性。（许芳霞译 李金宝校）

Increased risks of cerebral venous thrombosis or subdural hematoma, bacterial meningitis, persistent headache, and persistent low back pain are suggested in obstetric patients with postdural puncture headache (PDPH). Acute postpartum pain such as PDPH may also lead to postpartum depression. This study tested the hypothesis that PDPH in obstetric patients is associated with significantly increased postpartum risks of major neurologic and other maternal complications. This retrospective cohort study consisted of 1,003,803 women who received neuraxial anesthesia for childbirth in New York State hospitals between January 2005 and September 2014. The primary outcome was the composite of cerebral venous thrombosis and subdural hematoma. The 4 secondary outcomes were bacterial meningitis, depression, headache, and low back pain. PDPH and complications were identified during the delivery hospitalization and up to 1 year postdelivery. Adjusted odds ratios (aORs) and 95% confidence intervals (CIs) were estimated using the inverse probability of treatment

weighting approach. Of the women studied, 4808 (0.48%; 95% CI, 0.47-0.49) developed PDPH, including 264 cases (5.2%) identified during a readmission with a median time to readmission of 4 days. The incidence of cerebral venous thrombosis and subdural hematoma was significantly higher in women with PDPH than in women without PDPH (3.12 per 1000 neuraxial or 1:320 vs 0.16 per 1000 or 1:6250, respectively; P < .001). The incidence of the 4 secondary outcomes was also significantly higher in women with PDPH than in women without PDPH. The aORs associated with PDPH were 19.0 (95% CI, 11.2-32.1) for the composite of cerebral venous thrombosis and subdural hematoma, 39.7 (95% CI, 13.6-115.5) for bacterial meningitis, 1.9 (95% CI, 1.4-2.6) for depression, 7.7 (95% CI, 6.5-9.0) for headache, and 4.6 (95% CI, 3.3-6.3) for low back pain. Seventy percent of cerebral venous thrombosis and subdural hematoma were identified during a readmission with a median time to readmission of 5 days. PDPH is associated with substantially increased postpartum risks of major neurologic and other maternal complications, underscoring the importance of early recognition and treatment of anesthesia-related complications in obstetrics.

自发运动可恢复大鼠在生命早期异氟烷暴露后导致的空间记忆损伤

Voluntary Exercise Rescues the Spatial Memory Deficit Associated With Early Life Isoflurane Exposure in Male Rats

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背景：大鼠在生命早期暴露于麻醉药可导致其长期认知功能损伤。由居住环境、环境刺激和自发运动组成的环境丰富度可改善这一损伤。本研究中我们猜测仅运动这一项足以恢复围生产期麻醉暴露引起的认知损伤。

方法：雄性大鼠进行异氟醚(Iso)或空气对照暴露，从出生后 7 天一直到出生后 21 天停止。随后单独分笼饲养，每个笼子里有一个转动的或固定的轮子。经过 3 周的锻炼，动物们接受评估空间记忆和认知记忆的行为测试。在不同时间点处死动物，进行溴脱氧尿苷(BrdU)标记或实时定量聚合酶链反应(qRT-PCR)检测脑源性神经营养因子(BDNF)信使核糖核酸(mRNA)水平。

结果：Iso 停止暴露后的自发运动可减轻与围产期 Iso 暴露相关的长期空间记忆缺陷。与其它组相比，Iso 暴露后非运动组的动物在巴恩斯迷宫探针试验中未正确识别目标象限，在目标象限所花的时间不多（单样本 t 检验，P = .524），而其它组的大鼠均在目标象限的时间多（单样本 t 检验，P 异氟烷暴露后运动组 = .033; P 对照 = .004）。本次实验中，我们没有检测到以前发现的 Iso 暴露后引起的识别记忆缺陷。与空气暴露的非运动组相比，Iso 暴露后的非运动组大鼠成年海马内 BrdU 的结合率降低(Tukey P = .005)。自发运动可改善这种减少，与 Iso 暴露后非运动组相比，Iso 暴露后的运动组大鼠成年海马内 BrdU 的结合率增高(Tukey P < .001)。自发运动和 Iso 暴露对海马和大脑皮层的 BDNF mRNA 均无明显影响(皮层: F 运动[1,32] = 0.236, P = .631; F 异氟烷暴露 [1,32] =

0.038, P = .847; F 相互作用 [1,32] = 1.543, P = .223; 海马: F 运动[1,33] = 1.186, P = .284; F 异氟烷 [1,33] = 1.46, P = .236; F 相互作用[1,33] = 1.78, P = .191)。

结论：自发运动可以恢复生命早期麻醉暴露所导致的 BrdU 减少，并减轻空间记忆的缺陷。本研究证明了在围生期的麻醉暴露，仅环境丰富度中的运动这一项就可以恢复其行为表现。

（许芳霞译 李金宝校）

BACKGROUND: Early life anesthesia exposure results in long-term cognitive deficits in rats. Environmental enrichment consisting of social housing, a stimulating environment, and voluntary exercise can rescue this deficit. We hypothesized that exercise alone is sufficient to rescue the cognitive deficit associated with perinatal anesthesia.

METHODS: Postnatal day 7 male rats (P7) underwent isoflurane (Iso) or sham exposure and were subsequently weaned at P21. They were then singly housed in a cage with a running wheel or a fixed wheel. After 3 weeks of exercise, animals underwent behavioral testing for spatial and recognition memory assessments. Animals were killed at various time points to accomplish either bromodeoxyuridine (BrdU) labeling or quantitative real-time polymerase chain reaction (qRT-PCR) to quantify brain-derived neurotrophic factor (BDNF) messenger ribonucleic acid (mRNA) levels.

RESULTS: Postweaning voluntary exercise rescued the long-term spatial memory deficit associated with perinatal Iso exposure. Iso-sedentary animals did not discriminate the goal quadrant, spending no more time than chance during the Barnes maze probe trial (1-sample t test, P = .524) while all other groups did (1-sample t test, PIso-exercise = .033; Pcontrol [Con]-sedentary = .004). We did not find a deficit in recognition memory tasks after Iso exposure as we observed previously. BrdU incorporation in the adult hippocampus of Iso-sedentary animals was decreased compared to sedentary controls (Tukey P = .005). Exercise prevented this decrease, with Iso-exercise animals having more proliferation than Iso-sedentary (Tukey P < .001). There was no effect of exercise or Iso on BDNF mRNA in either the cortex or hippocampus (cortex: FExercise[1,32] = 0.236, P = .631; FIso [1,32] = 0.038, P = .847; FInteraction [1,32] = 1.543, P = .223; and hippocampus: FExercise[1,33] = 1.186, P = .284; FIso [1,33] = 1.46, P = .236; FInteraction[1,33] = 1.78, P = .191).

CONCLUSIONS: Exercise restores BrdU incorporation and rescues a spatial memory deficit after early life anesthesia exposure. This demonstrates sufficiency of exercise alone in the context of environmental enrichment to recover a behavioral phenotype after a perinatal insult.

开放性胸腹主动脉修复术中使用亚甲蓝后脉搏血氧饱和度快速下降的特征研究

Characterization of the Rapid Drop in Pulse Oximetry Reading After Intraoperative Administration of Methylene Blue in Open Thoracoabdominal Aortic Repairs

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本研究评估了 103 例接受开放性胸腹主动脉修复手术的患者在静脉注射亚甲蓝后血氧饱和度（SpO_2）的变化情况。作者发现，在亚甲蓝静脉注射后 1 分钟内，SpO_2 下降了 49%（37%-81%，四分位间距[IQR]），并在大约 6 分钟后完全恢复（IQR 中位数 270 秒，180 秒-510 秒）。达到 SpO_2 最低值的时间越短，其 SpO_2 最低值越高（Spearman r[95%置信区间{CI}], -0.03[-0.50 至-0.13]；P=0.001）。体表面积（BSA）与 SpO_2 最低值呈正相关（Spearman r [95%置信区间，0.36[0.15-0.51]；P＜0.001)。

（陈思涵 译　陈杰 校）

This study evaluates the changes of oxygen saturation
(SpO2) after intravenous administration of methylene blue in 103 patients undergoing open repair of thoracoabdominal aortic aneurysms. We found that SpO2 decreased by a median (interquartile range [IQR]) of 49% (37%-81%) <1 minute after methylene blue administration and recovered completely after approximately 6 minutes-median (IQR) of 270 seconds (180-510). A shorter time to nadir SpO2 was associated with a higher nadir (Spearman r [95% confidence interval {CI}], -0.32 [-0.50 to -0.13]; P = .001). Body surface area (BSA) was positively correlated with nadir SpO2 (Spearman r [95% CI], 0.36 [0.15-0.51]; P < .001).

术后患者输注 20%白蛋白后长时血管内滞留的研究

Long Intravascular Persistence of 20% Albumin in Postoperative Patients

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背景：由于外科手术导致的内皮糖萼层的分解（脱落），大型手术后患者血管内白蛋白的持续时间比健康志愿者更短。

方法：在本次随机临床试验中，15 位接受腹部开放手术术后 1 天（平均手术时间 5.9 小时）的患者和 15 位清醒的志愿者在 30 分钟内以恒定速率接受静脉内输注 3 mL / kg 的 20％白蛋白。5 小时期间收集血和尿液标本，根据质量守恒定律计算输注白蛋白分子的半衰期并根据血液稀释和血浆白蛋白浓度血浆容量估计血浆容量扩充的半衰期。

结果：输注结束时，外科术后患者和志愿者的血浆稀释增量分别为 13.3％±4.9％（平均值±标准差）、14.2％±4.8％（平均值相差-0.9、95％可信区间，-4.7 至 2.9; 单因素方差分析，P＝0.61），相当于白蛋白输入量的两倍。外科手术患者和志愿者中，输注白蛋白分子在血管内的半衰期分别为 9.1（5.7-11.2）小时、6.0（5.1-9.0）小时（Mann-Whitney U 检验，P＝0.26；几何平均差为 1.2，95％可信区间，0.8-2.0）。手术患者和志愿者中的血浆容量扩充半衰期分别为 10.3（5.3-17.6；中位数和四分位数范围）小时、7.6（3.5-9.0）小时（P＝0.10；几何平均差 1.5％，95％ 可信区间，0.8-2.8）。所有这些参数都与体重指数呈正相关（相关系数为 0.42-0.47），而年龄和性别均不影响结果。

结论：术后患者和健康志愿者接受 20%白蛋白的输注可导致相似的长时血浆容量扩充效应。

（陈思涵 译 陈杰 校）

BACKGROUND: Albumin may persist intravascularly for a shorter time in patients after major surgery than in healthy volunteers due to a surgery-induced breakdown (shedding) of the endothelial glycocalyx layer.

METHODS: In this nonrandomized clinical trial, an IV infusion of 3 mL/kg of 20% albumin was given at a constant rate during 30 minutes to 15 patients on the first day after major open abdominal surgery (mean operating time 5.9 h) and to 15 conscious volunteers. Blood samples and urine were collected during 5 h and mass balance calculations used to estimate the half-lives of the administered albuminmolecules and the induced plasma volume expansion, based on measurements of hemodilution and the plasma albumin concentration.

RESULTS: At the end of the infusions, albumin had diluted the plasma volume by 13.3% ± 4.9% (mean ± SD) in the postoperativepatients and by 14.2% ± 4.8% in the volunteers (mean difference -0.9, 95% CI, -4.7 to 2.9; 1-way ANOVA P = .61), which amounted to twice the infused volume. The intravascular half-life of the infused albumin molecules was 9.1 (5.7-11.2) h in the surgical patients and 6.0 (5.1-9.0) h in the volunteers (Mann-Whitney U test, P = .26; geometric mean difference 1.2, 95% CI, 0.8-2.0). The half-life of the plasma volume expansion was 10.3 (5.3-17.6; median and interquartile range) h in the surgical patients and 7.6 (3.5-9.0) h in the volunteers (P = .10; geometric mean difference 1.5, 95% CI, 0.8-2.8). All of these parameters correlated positively with the body mass index (correlation coefficients being 0.42-0.47) while age and sex did not affect the results.

CONCLUSIONS: Twenty percent albumin caused a long-lasting plasma volume expansion of similar magnitude in postoperative patients and volunteers.

宽带和离散波长的近红外光谱检测细胞色素 aa3 降低水平的比较

Comparison of Broadband and Discrete Wavelength Near-Infrared Spectroscopy Algorithms for the Detection of Cytochrome aa_3 Reduction

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背景：电子传递链的末端成分细胞色素 aa3 根据其氧化态（Cytox）的差异可吸收不同程度的近红外辐射（NIR），据此，理论上可使用近红外光谱法（NIRS）将通过特定波长光的吸收值来测量生色团的浓度。一些 NIRS 算法使用离散波长，而另一些算法则分析近红外波段（即宽带 NIRS）。本项研究的目的是测试离散波长和宽带算法测量 Cytox 变化（主要结果）的能力，并确定在分阶段的缺氧氰化物模型中（缺氧和氰化物对组织饱和有相反的影响，但两者都会导致细胞色素减少），离散波长 NIRS 算法是否可以类似于宽带 NIRS 算法来测量细胞中的 Cytox 的含量。

方法：20 只 Sprague-Dawley 大鼠接受异氟烷麻醉、气管插管和仪器监测，同时测量血压、潮气末二氧化碳浓度和动脉血氧饱和度。卤素光源经颅透射近红外辐射（NIR），将来自光源和颅骨的 NIR 传输到 2 个冷却的电荷耦合器件光谱仪。使大鼠进入缺氧状态（吸入氧气的分数，0.0），直到动脉血氧饱和度降至 70%；恢复后，再静脉注射氰化钠 5 mg / kg，重复该循环直到大鼠发生心脏骤停。同时使用离散波长和宽带 NIRS 算法计算血红蛋白和细胞色素 aa3 的相对浓度。

结果：缺氧可导致去氧血红蛋白增加（0.20 任意单位[AUs]; 95％的置信区间[CI]，0.17-0.22; P <0.0001），氧合血红蛋白降低（-0.16 AUs; 95％CI，-0.19 至-0.14； P <0.0001），以及 Cytox 降低（-0.057 AUs； 95％CI，-0.073 至 0.0040； P <0.001）。氰化物可导致去氧血红蛋白减少（-0.037 AUs; 95％CI，0.046 至-0.029; P <.001），氧基血红素增加（0.053 AUs; 95％CI，0.040-0.065; P <0.001），以及 Cytox 降低（-0.056 AUs; 95％CI，-0.064 至-0.048; P <0.001）。"离散"波长算法（使用 4、6、8 和 10 个波长）与宽带测量算法计算 Cytox 浓度之间的相关性分别为 0.54（95％CI，0.52-0.56），0.87（0.87-0.88），0.88 （0.88-0.89）和 0.95（0.95-0.95）。
结论：使用宽带和 10 个波长算法均能在所有实验中准确测量 Cytox 的变化。
（陈思涵 译 陈杰 校）

BACKGROUND: Cytochrome aa3, the terminal component of the electron transport chain, absorbs near-infrared radiation (NIR) differentially depending on its oxidation state (Cytox), which can in theory be measured using near-infrared spectroscopy (NIRS) by relating light absorption at specific wavelengths to chromophore concentrations. Some NIRS algorithms use discrete wavelengths, while others analyze a band of NIR (broadband NIRS). The purpose of this study was to test the ability of discrete wavelength and broadbandalgorithms to measure changes in Cytox (primary outcome), and to determine whether or not a discreet wavelength NIRS algorithm could perform similarly to a broadband NIRS algorithm for the measurement of Cytox in a staged hypoxia-cyanide model (hypoxia and cyanide have oppositional effects on tissue saturation, but both cause cytochrome reduction).

METHODS: Twenty Sprague-Dawley rats were anesthetized with isoflurane, intubated, and instrumented. Blood pressure, end-tidal carbon dioxide, and arterial oxygen saturation were measured. A halogen light source transmitted NIR transcranially. NIR from the light source and the skull was transmitted to 2 cooled charge-coupled device spectrometers. Rats were subjected to anoxia (fraction of inspired oxygen, 0.0) until arterial oxygen saturation decreased to 70%. After recovery, 5 mg/kg sodium cyanide was injected intravenously. The cycle was repeated until cardiac arrest occurred. Relative concentrations of hemoglobin and cytochrome aa3 were calculated using discreet wavelength and broadband NIRS algorithms.

RESULTS: Hypoxia led to an increase in calculated deoxyhemoglobin (0.20 arbitrary units [AUs]; 95% confidence interval [CI], 0.17-0.22; P < .0001), a decrease in calculated oxyhemoglobin (-0.16 AUs; 95% CI, -0.19 to -0.14; P < .0001), and a decrease in calculated Cytox (-0.057 AUs; 95% CI, -0.073 to 0.0040; P < .001). Cyanide led to a decrease in calculated deoxyhemoglobin (-0.037 AUs; 95% CI, 0.046 to -0.029; P < .001), an increase in calculated oxyhemoglobin (0.053 AUs; 95% CI, 0.040-0.065; P < .001), and a decrease in calculated Cytox (-0.056 AUs; 95% CI, -0.064 to -0.048; P < .001). The correlations between "discreet" wavelength algorithms (using 4, 6, 8, and 10 wavelengths) and the broadband algorithm for the measurement of calculated Cytox were 0.54 (95% CI, 0.52-0.56), 0.87 (0.87-0.88), 0.88 (0.88-0.89), and 0.95 (0.95-0.95), respectively.

CONCLUSIONS: The broadband and 10 wavelength algorithm were able to accurately track changes in Cytox for all experiments.

培养阴性和培养阳性脓毒症：特征和结果的比较

Culture-Negative and Culture-Positive Sepsis: A Comparison of Characteristics and Outcomes

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背景：本研究的主要目的是比较培养阳性和阴性脓毒症患者的不同特征。作者还分别确定了培养状况是否与死亡率相关，以及不同培养状况患者的死亡率是否与独特变量相关。
方法：在一所大型学术医疗中心的重症监护病房、急诊科和普通病房的患者病历中筛选并纳入 2007 年 1 月 1 日至 2014 年 5 月 31 日期间，疑似感染且≥2 项全身炎症反应综合征标准的成年患者。作者比较了培养阳性和培养阴性患者的特征，并使用二元逻辑回归分析来确定与培养状况和死亡率独立相关的变量。同时对符合脓毒症序贯器官衰竭评估（SOFA）和快速序贯器官衰竭评估（qSOFA）标准的患者进行敏感性分析。
结果：纳入 9288 名培养阴性患者（占 89％）和 1105 名培养阳性患者（占 11％）。培养阴性的患者在诊断前 48 小时内接受了更多的抗生素，但在其他方面表现出与培养阳性的患者相似的特征。在对疾病严重程度进行校正后，阳性培养与死亡率没有独立相关性（优势比=1.01[95％CI，0.81-1.26]；P=.945）。预测培养阴性和培养阳性患者死亡率的模型分别显示出良好、优异的区分度（C 统计量±SD，0.87±0.01 和 0.92±0.01）。在使用符合 SOFA 和 qSOFA 标准的脓毒症患者进行敏感性分析中，在对疾病严重程度校正后，阳性培养仍与死亡率无关（优势比=1.13[95％CI，0.86-1.43]；P=.303；优势比=1.05[95％CI，0.83–1.33]；P=.665）。在所有模型中，生理紊乱都与死亡率有关。
结论：培养状态对于抗生素的选择很重要，而培养阴性和培养阳性脓毒症患者表现出相似特征，且对疾病严重程度进行校正后，也得到同样结果。与阴性培养有关的最重要因素是在前 48 小时内接受了抗生素。疑似感染患者的死亡风险与疾病严重程度最相关。这与使用 SOFA 评分的脓毒症 3.0 定义相符，以便于更好地识别那些最可能有不良预后的疑似感染者。
（娄晓梅 译　陈杰 校）

BACKGROUND The primary objective of this study was to compare the characteristics of culture-positive and culture-negative status in septic patients. We also determined whether culture status is associated with mortality and whether unique variables are associated with mortality in culture-positive and culture-negative patients separately.
METHODS: Utilizing patient records from intensive care units, emergency department, and general care wards in a large academic medical center, we identified adult patients with suspected infection and ≥2 systemic inflammatory response syndrome criteria between January 1, 2007, and May 31, 2014. We compared the characteristics between culture-positive and culture-negative patients and used binary logistic regression to identify variables independently associated with culture status and mortality. We also did sensitivity analyses using patients with Sequential Organ Failure Assessment and quick Sequential Organ Failure Assessment criteria for sepsis.
RESULTS The study population included 9288 culture-negative patients (89%) and 1105 culture-positive patients (11%). Culture-negative patients received more antibiotics during the 48 hours preceding diagnosis but otherwise demonstrated similar characteristics as culture-positive patients. After adjusting for illness severity, a positive culture was not independently associated with mortality (odds ratio = 1.01 [95% CI, 0.81-1.26]; P = .945). The models predicting mortality separately in culture-negative and culture-positive patients demonstrated very good and excellent discrimination (C-statistic ± SD, 0.87 ± 0.01 and 0.92 ± 0.01), respectively. In the sensitivity analyses using patients with sepsis by Sequential Organ Failure Assessment and quick Sequential

Organ Failure Assessment criteria, after adjustments for illness severity, positive cultures were still not associated with mortality (odds ratio = 1.13 [95% CI, 0.86-1.43]; P = .303; and odds ratio = 1.05 [95% CI, 0.83-1.33]; P = .665), respectively. In all models, physiological derangements were associated with mortality.

CONCLUSIONS While culture status is important for tailoring antibiotics, culture-negative and culture-positive patients with sepsis demonstrate similar characteristics and, after adjusting for severity of illness, similar mortality. The most important factor associated with negative cultures is receipt of antibiotics during the preceding 48 hours. The risk of death in patients suspected of having an infection is most associated with severity of illness. This is aligned with the Sepsis-3 definition using Sequential Organ Failure Assessment score to better identify those suspected of infection at highest risk of a poor outcome.

使用连续实时压力传感技术的客观硬膜外腔识别：与荧光检查和传统阻力消失法的随机对照比较

Objective Epidural Space Identification Using Continuous Real-Time Pressure Sensing Technology: A Randomized Controlled Comparison With Fluoroscopy and Traditional Loss of Resistance

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背景：硬膜外麻醉和镇痛的效果取决于硬膜外腔（ES）的成功识别。尽管多项研究描述了确认 ES 的一些客观和替代方法，但传统的阻力消失法（LOR）和荧光检查（FC）目前分别是分娩（L＆D）和慢性疼痛（CP）管理的治疗标准。尽管 FC 成功率较高，但它使患者暴露于放射线下，并需要适当的放射设备。LOR 简单却很主观，因此失败率更高。此项研究目的是比较使用新型计算机控制的 ES 识别技术下的连续、定量、实时针尖压力传感与 FC 和 LOR 在腰 ES 识别方面的差异。

方法：本前瞻、随机、对照、非劣效性试验共纳入 400 名患者。CP 人群，有 240 名计划接受腰椎硬膜外类固醇注射的患者通过 FC 或针尖压力测量来确定 ES 位置。L＆D 人群，将 160 名接受腰椎硬膜外导管置入的女性患者随机分配至 LOR 组或针尖压力测量组。盲法观察员判断 CP 和 L&D 方面 ES 的成功确认情况。实施了改良的意向性处理方案，排除了由于干预前的原因而无法进行手术的患者。当优势比（OR）的 97.27%可信区间（CI）下限超过 0.5 时（即 ES 确认可能性小于 50%），根据成功 ES 确认概率的针尖压力测量是非劣的。非劣效性的 P 值<0.023。

结果：通过标准化差异评估时，除了性别方面存在轻度失衡，其他组间的人口统计学参数具有可比性。在疼痛治疗患者通过两种方法对于 ES 确认成功率均为 100%的情况下，与 FC 相比，针尖压力测量具有非劣效性（OR，1.1；97.27％CI，0.52-8.74；非劣质性 P 值为.021）。在 L＆D 患者中，当先验非劣效性临界值为 0.50 时，新技术具有非劣的成功率（97.1％vs91％；OR，3.3；97.27％CI，0.62–21.54；P=.019）。

结论：使用连续、定量、实时的针尖压力测量结合 CompuFlo 硬膜外计算机控制麻醉系统进行客观的腰椎 ES 确认，分别在 CP 治疗人群和 L&D 人群中与 FC 和 LOR 方法相比，成功率不低。这项新技术的好处可能包括使患者免于辐射和造影剂暴露，从而降低医疗治疗成本。（娄晓梅 译　陈杰 校）

BACKGROUND Performance of epidural anesthesia and analgesia depends on successful identification of the epidural space (ES). While multiple investigations have described objective and alternative methodologies to identify the ES, traditional loss of resistance (LOR) and fluoroscopy (FC) are currently standard of care in labor and delivery (L&D) and chronic pain (CP) management, respectively. While FC is associated with high success, it exposes patients to radiation and requires appropriate radiological equipment. LOR is simple but subjective and consequently associated with higher failure rates. The purpose of this investigation was to compare continuous, quantitative, real-time, needle-tip pressure sensing using a novel computer-controlled ES identification technology to FC and LOR for lumbar ES identification.
METHODS A total of 400 patients were enrolled in this prospective randomized controlled noninferiority trial. In the CP management arm, 240 patients scheduled to receive a lumbar epidural steroid injection had their ES identified either with FC or with needle-tip pressure measurement. In the L&D arm, 160 female patients undergoing lumbar epidural catheter placements were randomized to either LOR or needle-tip pressure measurement. Blinded observers determined successful ES identification in both arms. A modified intention-to-treat protocol was implemented, with patients not having the procedure for reasons preceding the intervention excluded. Noninferiority of needle-tip pressure measurement regarding the incidence of successful ES identification was claimed when the lower limit of the 97.27% confidence interval (CI) for the odds ratio (OR) was above 0.50 (50% less likely to identify the ES) and P value for noninferioirty <.023.
RESULTS Demographics were similar between procedure groups, with a mild imbalance in relation to gender when evaluated through a standardized difference. Noninferiority of needle-tip pressure measurement was demonstrated in relation to FC where pain management patients presented a 100% success rate of ES identification with both methodologies (OR, 1.1; 97.27% CI, 0.52-8.74; P = .021 for noninferiority), and L&D patients experienced a noninferior success rate with the novel technology (97.1% vs 91%; OR, 3.3; 97.27% CI, 0.62-21.54; P = .019) using a a priori noninferiority delta of 0.50.
CONCLUSIONS Objective lumbar ES identification using continuous, quantitative, real-time, needle-tip pressure measurement with the CompuFlo Epidural Computer Controlled Anesthesia System resulted in noninferior success rates when compared to FC and LOR for CP management and L&D, respectively. Benefits of this novel technology may include nonexposure of patients to radiation and contrast medium and consequently reduced health care costs.

除了麻醉毒性之外：减少新生儿神经系统损伤风险的麻醉考虑

Beyond Anesthesia Toxicity: Anesthetic Considerations to Lessen the Risk of Neonatal Neurological Injury

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在生命的最初几个月内接受外科手术的婴儿，死亡或继发神经发育异常的风险更高。尽管这些结局的发病机制是多因素的，但了解这些婴儿脑损伤的性质和发病机制可能有助于麻醉医师思考他们的日常实践以最大程度地降低此类风险。这篇综述将总结早产和足月婴儿脑损伤的主要类型及其主要致病途径。此外，本综述还将探讨可避免的关键潜在致病途径，包括术

中低血压，低碳酸血症，高氧血症或低氧血症，低血糖症和体温过高。这些情况中的每一种都可能增加围术期神经系统损伤的风险，但其长期影响尚不清楚。
（娄晓梅 译　陈杰 校）
Infants who undergo surgical procedures in the first few months of life are at a higher risk of death or subsequent neurodevelopmental abnormalities. Although the pathogenesis of these outcomes is multifactorial, an understanding of the nature and pathogenesis of brain injury in these infants may assist the anesthesiologist in consideration of their day-to-day practice to minimize such risks. This review will summarize the main types of brain injury in preterm and term infants and their key pathways. In addition, the review will address key potential pathogenic pathways that may be modifiable including intraoperative hypotension, hypocapnia, hyperoxia or hypoxia, hypoglycemia, and hyperthermia. Each of these conditions may increase the risk of perioperative neurological injury, but their long-term ramifications are unclear.

术后认知功能障碍患者中脑脊液单核细胞的流式细胞特征：一项初步研究

Flow Cytometry Characterization of Cerebrospinal Fluid Monocytes in Patients With Postoperative Cognitive Dysfunction: A Pilot Study

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动物模型显示术后认知功能障碍可能是由脑部单核细胞汇集引起。为了研究人体中的类似机制，作者收集了 5 例 60 岁以上大型非心脏手术术后发生认知功能障碍的病人术前和术后的脑脊液，以及与之匹配的 5 例未发生术后认知功能障碍的对照组标本，建立流式细胞通道来测定以上脑脊液（CSF）样品。在 10 毫升脑脊液样品中检测到了 12,654±4895 个细胞（均值±标准差）。 术后认知功能障碍的病人脑脊液分析示单核细胞/淋巴细胞比例升高和术后 24 小时脑脊液单核细胞趋化蛋白 1 受体下调。这些初步研究的数据表明脑脊液流式细胞检测能用于术后神经认知功能障碍的机制研究。
（邹沅芜 译　陈杰 校）

Animal models suggest postoperative cognitive dysfunction may be caused by brain monocyte influx. To study this in humans, we developed a flow cytometry panel to profile cerebrospinal fluid (CSF) samples collected before and after major noncardiac surgery in 5 patients ≥60 years of age who developed postoperative cognitive dysfunction and 5 matched controls who did not. We detected 12,654 ± 4895 cells/10 mL of CSF sample (mean ± SD). Patients who developed postoperative cognitive dysfunction showed an increased CSF monocyte/lymphocyte ratio and monocyte chemoattractant protein 1 receptor downregulation on CSF monocytes 24 hours after surgery. These pilot data demonstrate that CSF flow cytometry can be used to study mechanisms of postoperative neurocognitive dysfunction.

苯肾上腺素和去甲肾上腺素间歇静脉注射预防和治疗剖宫产术中脊髓诱发性低血压的比较：随机对照试验

Comparison of Intermittent Intravenous Boluses of Phenylephrine and Norepinephrine to Prevent and Treat Spinal-Induced Hypotension in Cesarean Deliveries: Randomized Controlled Trial

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背景：苯肾上腺素（PE）是目前预防和治疗剖宫产（CD）时脊髓诱发的低血压的首选血管活性药物。 但是，它的使用常导致反射性心动过缓。去甲肾上腺素（NE）已被提出作为 CD 期间的替代性升压药，因为它具有在治疗低血压的同时维持心律（HR）能力。 最近的研究集中于与 PE 相比选择输注 NE 具有良好的效果。尚无研究比较 CD 中 PE 和 NE 的等效推注剂量。我们假设当以等效剂量作为预防和治疗脊髓诱发的低血压的间歇推注方案时，NE 与 PE 相比可降低心动过缓的发生率。

方法：这是一项针对在椎管内麻醉下接受选择性 CD 的女性的双盲、随机临床试验。当收缩压（SBP）低于基线时，受试者被随机分配注射 PE 100 μg 或 NE 6 μg。除随机治疗方案外，当两组中连续两次 SBP 低于基线且 HR <60 次/分或 SBP < 基线的 80％，则两组受试者均予静脉注射麻黄碱。主要观察的结果为分娩前简短出现心动过缓（HR <50 次/分）。次要观察的结果包括低血压（SBP <基线的 80％），高血压（SBP>基线的 120％），心动过速（HR>基线的 120％），≥2 次心动过缓，恶心，呕吐，脐动脉和静脉血气和 Apgar 得分。

结果：112 例患者被随机分组。 NE 组的心动过缓发生率比 PE 组低（10.7％vs 37.5％； P <.001；差值[95％置信区间{CI}]，-26.8％[−41.8％—-11.7％] ），意味着发生率相对减少约 71％（95％CI，35％—88％）。两组之间心动过缓发作次数的分布也不同（P = .007）。进一步的测试表明，与 NE 组相比，PE 组的患者发生多次心动过缓（≥2 次）的风险更高（PE 组为 19.6％，NE 组为 3.6％； P = 0.008）。 与 PE 组相比，NE 组中需要麻黄碱补救推注的患者比例更低（NE 组为 7.2％，PE 组为 21.4％； P <.03；差值[95％CI]，-14.3％[-27.0％—-1.6％]）。两组之间其他次要结果的发生率未见差异。

结论：当采用间歇推注方案预防和治疗 CD 期间椎管内诱发的低血压时，与 PE 等当量推注方案相比，使用 NE 显著降低心动过缓的发生率。因此我们得出结论，

由于对心率和可能对心输出量造成较少的影响，在 CD 期间 NE 对血流动力学的影响优于 PE。
(吴兆艺 译 潘艳、薛张纲校)

BACKGROUND: Phenylephrine (PE) is currently the vasopressor of choice to prevent and treat spinal-induced hypotension at cesarean delivery (CD). However, its use is often associated with reflex bradycardia. Norepinephrine (NE) has been put forward as an alternative vasopressor during CD due to its ability to treat hypotension while maintaining heart rate (HR). Recent studies have focused on the role of NE used as an infusion with favorable results compared to PE. No studies have compared equipotent bolus doses of PE and NE at CD. We hypothesized that when used in equipotent doses as an intermittent bolus regimen to prevent and treat spinal-induced hypotension, NE would result in a reduction in the incidence of bradycardia compared to PE.

METHODS: This was a double-blind, randomized clinical trial of women undergoing elective CD under spinal anesthesia. Women were randomized to receive either PE 100 μg or NE 6 μg when the systolic blood pressure (SBP) was below baseline. In addition to the randomized treatment, ephedrine was given intravenously to both groups if the SBP was below baseline and the HR <60 bpm or if the SBP was <80% of baseline for 2 consecutive readings. The primary outcome was bradycardia (HR <50 bpm) in the predelivery period. Secondary outcomes included hypotension (SBP <80% of baseline), hypertension (SBP >120% of baseline), tachycardia (HR >120% of baseline), ≥2 episodes of bradycardia, nausea, vomiting, umbilical artery and vein blood gases, and Apgar scores.

RESULTS: One hundred twelve patients were randomized. The incidence of bradycardia was lower in the NE group compared to the PE group (10.7% vs 37.5%; P < .001; difference [95% confidence interval {CI}], −26.8% [−41.8% to −11.7%]), implying an estimated 71% relative reduction (95% CI, 35%–88%). The distribution of the number of bradycardia episodes was also different between the 2 groups (P = .007). Further testing showed that the patients in the PE group had a higher risk of multiple bradycardia episodes (≥2 episodes) compared to the NE group (19.6% for PE versus 3.6% for NE; P = .008). The proportion of patients requiring rescue boluses of ephedrine was lower in the NE group compared to the PE group (7.2% for NE versus 21.4% for PE; P < .03; difference [95% CI], −14.3% [−27.0% to −1.6%]). No differences were observed between the 2 groups in the incidence of other secondary outcomes.

CONCLUSIONS: When used as an intermittent bolus regimen to prevent and treat spinal-induced hypotension during CD, NE resulted in a significant reduction in the incidence of bradycardia as compared to an equipotent bolus regimen of PE. We conclude that the hemodynamic profile offered by NE during CD is superior to that of PE due to less fluctuations in HR and possibly cardiac output.

血管内冷却装置与食管热交换器用于轻度治疗性低温的比较

Intravascular Cooling Device Versus Esophageal Heat Exchanger for Mild Therapeutic Hypothermia in an Experimental Setting

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背景：目标导向的体温管理是无意识心脏骤停患者的一种标准治疗。现如今，有多种冷却装置可供采用，如有创血管内冷却装置（IVDs），在临床中已被广泛使用。近期，食道热交换器（EHEs）也已被开发出来，这是一种通过位于主动脉弓和下腔静脉附近的食道提供的一种冷却装置。本研究的目的在于比较目标温度维持及复温期间有创血管内冷却装置（IVD）和食道热交换器（EHE）的平均制冷速度及两者间的差别。

方法：此研究对象为 16 只母猪。在随机化分为有创血管内冷却装置（IVD）组和食道热交换器（EHE）组（每组各 8 只母猪）后，将母猪的核心体温降至 33℃并维持 24 小时以后，使用每小时升高 0.25℃的目标导向复温设备复温 10 小时。所有动物在冷却期间都使用颈内静脉和冷切器之间的闭合反馈系统控制。在处死动物之前，留取动物喉和食管的组织进行组织病理学检验。

结果：在平均冷却速度上，有创血管内冷却装置（IVD）组为 4℃/h±0.4℃/h，食道热交换器（EHE）组为 2.4℃/h±0.3℃/h（P<0.0008）,达到目标温度所需时间有创血管内冷却装置（IVD）组为 85.1±9.2min，食道热交换器（EHE）组为 142.0±21.2min（P=0.0008），两者间有显著差别。在目标温度维持期间，两者的体温波动幅度有创血管内冷却装置（IVD）组为 0.07℃±0.05℃，食道热交换器（EHE）组为 0.08℃/h±0.10℃（P=0.496），在平均复温速度上有创血管内冷却装置（IVD）组为 0.2℃/h±0.1℃/h，食道热交换器（EHE）组为 0.3℃/h±0.2℃/h（P=0.226），两者基本相似。实验中相关的喉部和食管损伤未被发现。两者在不良副反应（如心动过缓和心动过速，低钾血症和高钾血症，低血压，低体温，寒战等）方面无显著差异。

结论：与食道热交换器（EHE）相比，有创血管内冷却装置（IVD）能更快的达到目标温度。根据重症监护室的指南，这两个设备在目标温度的维持和积极复温操作中的性能效果是没有明显差异的。

（石平 译 潘艳、薛张纲校）

BACKGROUND: Targeted temperature management is a standard therapy for unconscious survivors of cardiac arrest. To date, multiple cooling methods are available including invasive intravascular cooling devices (IVDs), which are widely used in the clinical setting. Recently, esophageal heat exchangers (EHEs) have been developed providing cooling via the esophagus that is located close to the aorta and inferior vena cava. The objective was to compare mean cooling rates, as well as differences, to target temperature during maintenance and the rewarming period of IVD and EHE.

METHODS: The study was conducted in 16 female domestic pigs. After randomization to either IVD or EHE (n = 8/group), core body temperature was reduced to 33℃. After 24 hours of maintenance (33℃), animals were rewarmed using a target rate of 0.25℃/h for 10 hours. All cooling phases were steered by a

closed-loop feedback system between the internal jugular vein and the chiller. After euthanasia, laryngeal and esophageal tissue was harvested for histopathological examination.
RESULTS: Mean cooling rates (4.0℃/h ± 0.4℃/h for IVD and 2.4℃/h ± 0.3℃/h for EHE; $P < .0008$) and time to target temperature (85.1 ± 9.2 minutes for IVD and 142.0 ± 21.2 minutes for EHE; $P = .0008$) were different. Mean difference to target temperature during maintenance (0.07℃ ± 0.05℃ for IVD and 0.08℃ ± 0.10℃ for EHE; $P = .496$) and mean rewarming rates (0.2℃/h ± 0.1℃/h for IVD and 0.3℃/h ± 0.2℃/h for EHE; $P =.226$) were similar. Relevant laryngeal or esophageal tissue damage could not be detected.There were no significant differences in undesired side effects (eg,bradycardia or tachycardia,hypokalemia or hyperkalemia, hypoglycemia or hyperglycemia, hypotension, overcooling, or shivering).
CONCLUSIONS: After insertion, target temperatures could be reached faster by IVD compared to EHE. Cooling performance of IVD and EHE did not significantly differ in maintaining target temperature during a targeted temperature management process and in active rewarming protocols according to intensive care unit guidelines in this experimental setting.（Anesth Analg 2019;129:1224–31）

系统综述和荟萃分析：儿科学领域中虚拟现实（VR）技术在减轻疼痛和焦虑方面的效果

Systematic Review and Meta-analysis of Virtual Reality in Pediatrics: Effects on Pain and Anxiety

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背景：医疗操作往往会引起儿童患者的疼痛和焦虑。VR 作为一项相对新颖的技术，可以用于在医疗操作准备前或操作中分散病人的注意力。本文是第一篇收集了相关证据的荟萃研究，研究关于 VR 技术在医疗操作过程中减轻儿科病人的疼痛和焦虑的效用。
方法：在 2018 年 4 月 35 日，我们在 EMBASE、MEDLINE、CENTRAL、PubMed、Web of Science、PsycINFO 等数据库中以“VR”、“儿童”和“成年人”为关键词进行了相关搜索。我们纳入了在患者背景下将 VR 技术用于 21 岁以下参与者的研究。VR 被定义为通过头戴式设备，将自身置于立体视野的完全沉浸式的三维环境。我们分别评估了在 VR 条件下和标准环境中儿童患者的疼痛和焦虑情况。
结果：我们查找到 2889 篇文献，其中 17 篇满足我们的纳入标准。在 16 篇文献中，VR 技术在静脉采血、拔牙、治疗烧伤或肿瘤照顾等情况下被应用以分散病人的注意力；而另一篇则应用于择期手术的全身麻醉前，通过将患者置于虚拟现实的环境中。VR 技术的效果在烧伤病人中进行了最多的研究（共有 6 篇文献）。总体加权标准化均数差（SMD）在疼痛方面（基于 14 篇文献）是 1.3（95%CI，0.68-1.91），在焦虑方面（基于 7 篇文献）是 1.32（95%CI，0.21-2.44）。VR 技术在减轻儿童疼痛方面的效果是显著的，无论是基于照顾者的观察（SMD=2.08，

95%CI：0.55-3.61）还是专业人员的观察（SMD=3.02，95%CI：0.79-2.25）。在减轻焦虑方面，只有较为有限的观察者数据是有价值的。
结论：VR 在儿科学中的研究主要专注于分散注意力方面。大量的有效数据表明 VR 技术是一种有效的分散儿童注意力的干预措施，在他们接受医疗操作的过程中可以减轻他们的疼痛和焦虑。然而，将 VR 暴露作为医疗操作前的准备步骤的研究较少，需要更多的研究。
（王沛 译 潘艳、薛张纲校）
BACKGROUND: Medical procedures often evoke pain and anxiety in pediatric patients. Virtual reality(VR) is a relatively new intervention that can be used to provide distraction during, or to prepare patients for, medical procedures. This meta-analysis is the first to collate evidence on the effectiveness of VR on reducing pain and anxiety in pediatric patients undergoing medical procedures.
METHODS: On April 25, 2018, we searched EMBASE, MEDLINE, CENTRAL, PubMed, Web of
Science, and PsycINFO with the keywords “VR,” “children,” and “adolescents.” Studies that
applied VR in a somatic setting with participants ≤21 years of age were included. VR was defined as a fully immersive 3-dimensional environment displayed in surround stereoscopic vision on a head-mounted display (HMD). We evaluated pain and anxiety outcomes during medical procedures in VR and standard care conditions.
RESULTS: We identified 2889 citations, of which 17 met our inclusion criteria. VR was applied as distraction (n = 16) during venous access, dental, burn, or oncological care or as exposure (n = 1) before elective surgery under general anesthesia. The effect of VR was mostly studied in patients receiving burn care (n = 6). The overall weighted standardized mean difference (SMD) for VR was 1.30 (95% CI, 0.68–1.91) on patient-reported pain (based on 14 studies) and 1.32 (95% CI, 0.21–2.44) on patient-reported anxiety (based on 7 studies). The effect of VR on pediatric pain was also significant when observed by caregivers (SMD = 2.08; 95% CI, 0.55–3.61) or professionals (SMD = 3.02; 95% CI, 0.79–2.25). For anxiety, limited observer data were available.
CONCLUSIONS: VR research in pediatrics has mainly focused on distraction. Large effect sizes indicate that VR is an effective distraction intervention to reduce pain and anxiety in pediatric patients undergoing a wide variety of medical procedures. However, further research on the effect of VR exposure as a preparation tool for medical procedures is needed because of the paucity of research into this field.

回顾术中知晓：一项基于调查的描述性队列研究

Intraoperative Awareness With Recall: A Descriptive, Survey-Based, Cohort Study.

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背景：意外的术中知晓与是全身麻醉的潜在并发症。 患者通常报告以下情况的回忆：（1）听到声音或交谈，（2）无法呼吸或移动，（3）感到疼痛，和/或（4）遭受情绪困扰。 本研究的目的是通过对一大批未选定的成人手术队列进行术后调查，确定并进一步表明术中知晓的体验。
方法：这是一项前瞻性注册研究的子研究，该研究对患者的手术后健康状况进行了调查。 分析了针对术中知晓的 4 个问题的回答。 通过电话联系了疼痛，瘫痪和/或困扰的患者，以获取有关其术中知晓经历的更多信息。 将接受全身麻醉的患者的访谈结果发送给 3 位麻醉师，他们对报告的术中知晓进行裁决。
结果：发送的 48,151 项调查中，我们收到了 17,875 例患者的答复。 在这些受访者中，有 622 人报告了从入睡到觉察到的全身麻醉之间的特定记忆，其中 282 人报告了相关的疼痛，麻痹和/或困扰。 我们试图联系这 282 位患者，其中 149 位参加了电话调查。 在 149 位参与者中，有 87 位赞同了他们先前的术中知晓报告。 但是，这些患者中只有 22 例接受了全身麻醉，而 51 例仅接受了镇静，而 14 例接受了局部麻醉。 三名麻醉师分别对 22 例全身麻醉病例的调查结果进行了裁决，并分别将 6 例确定为术中知晓，8 例确定为可能 AWR，8 例确定为非术中知晓。 在接受区域或镇静麻醉后认为自己术中知晓的 65 位患者中，有 37 位（镇静患者 31 位，局部麻醉 6 位）其实是在手术期间无意识。
结论：在全身麻醉期间，术中知晓还在继续发生。 许多关于术中知晓发作的报道发生在接受镇静或区域麻醉的患者中，这些患者对麻醉技术和意识体验有不匹配的期望，这也是潜在的干预。
（王硕 译潘艳、薛张纲校）
BACKGROUND: Unintended *intraoperative awareness with* recall (AWR) is *a* potential complication of general anesthesia. Patients typically report recollections of (1) hearing sounds or conversations, (2) being unable to breathe or move, (3), feeling pain, and/or (4) experiencing emotional distress. The purpose of the current *study* was to identify and further characterize AWR experiences identified through postoperative surveys of *a* large unselected adult surgical cohort.
METHODS: This is *a* substudy of *a* prospective registry *study*, which surveys patients on their health and well-being after surgery. Responses to 4 questions focusing on AWR were analyzed. Patients who reported AWR *with* pain, paralysis, and/or distress were contacted by telephone to obtain more information about their AWR experience. The interview results for patients who received general anesthesia were sent to 3 anesthesiologists, who adjudicated the reported AWR episodes.
RESULTS: Of 48,151 surveys sent, 17,875 patient responses were received. Of these respondents, 622 reported *a* specific memory from the period between going to sleep and waking up from perceived general anesthesia and 282 of these reported related pain, paralysis, and/or distress. An attempt was made to contact these 282 patients, and 149 participated in *a* telephone survey. Among the 149 participants, 87 endorsed their prior report of AWR. However, only 22 of these patients had received general anesthesia, while 51 received only sedation and 14 received regional anesthesia. Three anesthesiologists independently adjudicated the survey results of the 22 general anesthesia cases and assigned 6 as definite AWR, 8 as possible AWR, and 8 as not AWR episodes. Of the 65 patients who confirmed their report of AWR after regional

or sedation anesthesia, 37 (31 *with* sedation and 6 *with* regional anesthesia) had not expected to be conscious during surgery.
CONCLUSIONS: The complication of AWR continues to occur during intended general anesthesia. Many reports of AWR episodes occur in patients receiving sedation or regional anesthesia and relate to incorrect expectations regarding anesthetic techniques and conscious experiences, representing *a* potential target for intervention.

静脉注射利多卡因预防咳嗽：随机对照试验的系统回顾和荟萃分析
Intravenous Lidocaine for the Prevention of Cough: Systematic Review and Meta-analysis of Randomized Controlled Trials
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背景：目前尚不清楚静脉注射利多卡因在多大程度上预防咳嗽，以及是否存在剂量反应性和危害风险。
方法：我们检索了截至 2017 年 1 月 1 日的电子数据库，以进行比较静脉注射利多卡因和安慰剂预防外科患者咳嗽的随机试验。主要结果是咳嗽的发生率。数据采用随机效应模型进行分析，以 95%可信区间表示为风险比（RR）和治疗所需次数（NNT）。
结果：在 20 项成人试验（n=3062）和 5 项儿童试验（n=445），静脉注射利多卡因 0.5-2mg·kg-1 用于预防插管、拔管或阿片类药物引起的咳嗽，其中 22 项试验仅包括美国麻醉师学会 I 或 II 级患者；3 项试验（n=99）也包括美国麻醉师学会 III 级患者。与安慰剂相比，利多卡因在成人和儿童中的咳嗽发生率较低，与剂量和咳嗽病因无关。来自成人的数据表明剂量反应性：0.5 mg·kg-1，RR 为 0.66（0.50–0.88），NNT 为 8（5.4–14.3）；1 mg·kg-1，RR 为 0.58（0.49–0.69）NNT 为 7（4.6–8.9）；1.5 mg·kg^{-1}，RR 为 0.44（0.33–0.58），NNT 为 5（3.3–5.2）；2 mg·kg^{-1}，RR 为 0.39（0.24–0.62），NNT 为 3（2.0–3.4）。不良反应报告很少。
结论：在 0.5-2 mg·kg^{-1} 范围内，静脉注射利多卡因预防成人和儿童的插管、拔管和阿片诱导的咳嗽 NNTs 范围在 8-3。高危患者的伤害风险仍然未知。
（魏婉婷 译 潘艳、薛张纲校）
BACKGROUND: It remains unclear to what extent intravenous lidocaine prevents cough and whether there is dose-responsiveness and risk of harm.
METHODS: We searched electronic databases to January 1, 2017 for randomized trials comparing intravenous lidocaine with placebo for the prevention of cough in surgical patients. Primary outcome was the incidence of cough. Data were analyzed using a random-effects model and were expressed as risk ratio (RR) and number needed to treat (NNT) with 95% confidence interval.
RESULTS: In 20 trials in adults (n = 3062) and 5 trials in children (n = 445), intravenous lidocaine 0.5–2 mg·kg $^{-1}$ was tested for the prevention of intubation-, extubation-, or opioid-induced cough. Twenty-two trials included only American Society of Anesthesiologists I or II patients; 3 trials (n = 99) also included American Society of Anesthesiologists III patients. Lidocaine was associated with a lower incidence of cough compared to placebo in adults and children, irrespective of dosage

and cough etiology. Data from adults suggested dose-responsiveness; with 0.5 mg·kg $^{-1}$, RR was 0.66 (0.50–0.88) and NNT was 8 (5.4–14.3); with 1 mg·kg $^{-1}$, RR was 0.58 (0.49–0.69) and NNT was 7 (4.6–8.9); with 1.5 mg·kg $^{-1}$, RR was 0.44 (0.33–0.58) and NNT was 5 (3.3–5.2); and with 2 mg·kg $^{-1}$, RR was 0.39 (0.24–0.62) and NNT was 3 (2.0–3.4). Adverse effect reporting was sparse.
CONCLUSIONS: Within a range of 0.5–2 mg·kg $^{-1}$, intravenous lidocaine dose dependently prevents intubation-, extubation-, and opioid-induced cough in adults and children with NNTs ranging from 8 to 3. The risk of harm in high-risk patients remains unknown.

发作性睡病、麻醉和镇静:发作性睡病患者围手术期情况的调查

Narcolepsy, Anesthesia, and Sedation: A Survey of the Perioperative Experience of Patients With Narcolepsy.

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Anesthesia & Analgesia: 2019 129 1374-1380

背景:由于麻醉、发作性睡病和发作性睡病药物之间的相互作用，发作性睡病患者的围手术期风险可能增加。本研究试图确定发作性睡病患者麻醉或镇静状态的围手术期经验、围手术期咨询的频率和自我报告的手术并发症。
方法:以专家共识为基础，通过发作性睡病网络进行了包含 22 个问题的调查。入组是通过发作性睡病网络的列表服务和 Facebook 上的调查链接进行的。120 名调查对象被报告诊断为发作性睡病，并在麻醉或镇静状态下进行了 1 次或 1 次以上的手术。文章采用了描述性、比较统计学和逻辑回归分析来分析数据。
结果:调查对象多为女性(79.5%)和白人(84.9%)，平均年龄 45 ± 16 岁。大多数调查对象没有咨询麻醉后嗜睡(70%)、猝倒(90%)或疲劳驾驶(59%)等问题。超过一半的调查对象报告了不良事件(药物戒断症状、疼痛未完全缓解、猝倒次数增加)。合并猝倒的患者更常报告手术并发症(70% vs 31%;P =0.03)和药物戒断症状(激动剂:优势比 3.0 [95% CI, 1.9-3.06];P > 0.001 和抗抑郁药物:优势比 6.5 [95% CI, 2.1-19.5];P =0.001)。在所有调查对象中，18%报告出现手术并发症。经历 5 次或 5 次以上独立手术或程序的患者自我报告并发症(优势比，2.2 [95% CI, 1.3-3.4];P = 0.001)，苏醒困难(优势比，2.1 [95% CI, 1.45-3.06];P = 0.001)，以及疼痛未完全缓解(优势比 1.77 [95% CI, 1.01-3.13];P <0 .05)可高达 2 倍。
结论:大多数发作性睡病患者报告说，他们没有接受有关麻醉后嗜睡症状可能恶化或疲劳驾驶风险增加的咨询。加强对围手术期麻醉提供者的教育，让他们了解发作性睡病患者潜在的问题是至关重要的。调查对象在围手术期经常自我报告不良事件。未来的研究应明确与发作性睡病相关的围手术期风险，以优化对发作性睡病患者的护理和安全管理。
（王甲利潘艳、薛张纲校译）
BACKGROUND: Patients with narcolepsy may be at increased perioperative risk due to the interactions among anesthesia, narcolepsy, and narcolepsy medications. This study sought to determine the perioperative experience of narcoleptic patients undergoing anesthesia or sedation, the frequency of perioperative counseling, and self-reported surgical complications.

METHODS: A 22-question survey was developed by expert consensus and distributed by the Narcolepsy Network. Recruitment was via the Narcolepsy Network's list-serve and a Facebook link to the survey. One thousand and twenty respondents reported a diagnosis of narcolepsy and 1 or more procedures under anesthesia or sedation. Descriptive, comparative statistics and logistic regression were utilized.
RESULTS: Respondents were mostly women (79.5%) and Caucasian (84.9%), with a mean age of 45 ± 16 years. Most respondents did not receive counseling regarding the possibility of increased sleepiness (70%), cataplexy (90%), or drowsy driving (59%) postanesthesia. More than half of respondents reported adverse events (medication withdrawal symptoms, inadequate pain relief, increased cataplexy). Subjects with cataplexy more frequently reported surgical complications (70% vs 31%; $P = .03$) and medication withdrawal symptoms (stimulant medications: odds ratio, 3.0 [95% CI, 1.9, 3.06]; $P > .001$ and antidepressant medications: odds ratio, 6.5 [95% CI, 2.1-19.5]; $P = .001$). Of the total sample, 18% indicated surgical complications. Undergoing 5 or more separate surgeries or procedures was associated with a 2-fold increase in self-reported complications (odds ratio, 2.2 [95% CI, 1.3-3.4]; $P = .001$), difficulty waking (odds ratio, 2.1 [95% CI, 1.45-3.06]; $P = .001$), and inadequate pain relief (odds ratio, 1.77 [95% CI, 1.01-3.13]; $P < .05$).
CONCLUSIONS: Most narcoleptic patients report not receiving counseling regarding potential worsening of narcolepsy symptoms postanesthesia or an increased risk of drowsy driving. Enhanced education of perioperative providers about potential narcolepsy-related issues is essential. Respondents frequently self-report adverse events in the perioperative period. Future studies should clarify the perioperative risk associated with narcolepsy to optimize the care and safety of narcoleptic patients.