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# 出血性大手术期间实验室凝血检查和凝血因子水平对旋转式血栓弹力测定（ROTEM）的影响

## The Influence of Laboratory Coagulation Tests and Clotting Factor Levels on Rotation Thromboelastometry (ROTEM® ) During Major Surgery with Hemorrhage

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**背景：**此项研究目的是确定对于经历出血的大手术患者，标准实验室检查或凝血因子浓度与旋转式血栓弹力测定法（ROTEM® delta, TEM 国际有限公司，慕尼黑，德国）之间的关联性。

**方法：**在术中分别测定 45 名患者的纤维蛋白原、凝血因子 VIII、凝血因子 XIII、国际标准化比值（INR）、活化部分凝血酶时间（APTT）、凝血酶原时间、血红蛋白、粒细胞和血小板计数指标，同时测定 ROTEM(EXTEM，INTEM, FIBTEM ，APTEM)法参数。ROTEM 参数为：凝血时间（CT）, 血凝块形成时间（CFT），最大凝块硬度（MCF）和 α 角。人口统计学和实验数据表示为平均值±标准差和中位数[范围]；进行非参数 Spearman 秩相关和多元线性回归分析；P 值≤0.003 被认为差异显著。

**结果：**在 EXTEM、INTEM、APTEM 中的 CFT、α 角和 MCF 与血小板、INR 和纤维蛋白原有显著相关性。凝血因子 VIII（18 次测量）表现出与 EXTEM、INTEM 中的 MCF、CFT 和 α 角，以及 FIBTM 中的 MCF（不包含 EXTEM、INTEM、FIBTM 中的 CT 值）有显著的相关性，并且与 APTEM 中的 α 角有显著相关性, 与 APTEM 中的 CFT 和 MCF 有中度相关性（r≥0.7 或 r≤-0.7; 所有 P 值均≤0.003）。研究发现凝血因子 VIII 与 EXTEM、INTEM、FIBTEM 和 APTEM 中的 MCF 有着中度至显著的相关性。血红蛋白与 APTEM 中的 MCF(P＝0.003)呈中度相关（r=0.3 到 0.7 或 r=-0.3 到-0.7）。研究还发现标准凝血试验与所有 ROTEM 参数，尤其是 CT 值，均有中强度的显著相关性。APTT 与 INTEM 中的 CT、CFT、α 角和 MCF 有中强度的显著相关性。然而除了 APTEM 中的 MCF，多元线性回归不能显示 INR 对 ROTEM 各参数的影响。 APTT 对 INTEM-CT 有显著影响。纤维蛋白原和血小板对 EXTEM、INTEM 以及 APTEM 有显著影响。

**结论：**这些结果可证实以下临床假设：EXTEM、INTEM、APTEM 与纤维蛋白原和血小板水平相关；INTEM 中的 CT 值与 APTT 显著相关；FIBTEM 与纤维蛋白原显著相关。除了 EXTEM、INTEM 、FIBTEM 中的 CT 以及 APTEM 中的 CFT 和 MCF，凝血因子 VIII 与所有的 ROTEM 参数显著相关。

（王苑　译　陈杰　校）

**BACKGROUND:** The aim of this study was to determine the association between standard laboratory tests, coagulation factor concentrations, and Rotation Thromboelastometry (ROTEM® delta, TEM® International GmbH, Munich, Germany) in patients undergoing major surgery with hemorrhage.

**METHODS:** In 45 patient's fibrinogen, factor VIII, factor XIII, International Normalized Ratio (INR), activated partial thromboplastin time (aPTT), thrombin time, hemoglobin, leukocytes, and

platelet count were simultaneously measured intraoperatively with ROTEM (EXTEM, INTEM, FIBTEM, APTEM) measurements. ROTEM parameters were: clotting time (CT), clot formation time (CFT), maximum clot firmness (MCF), and α-angle. Demographic and laboratory data were expressed as mean ± SD and median [range]; nonparametric Spearman rank correlations and multiple linear regressions were performed; P-values ≤0.003 were considered significant.

**RESULTS:** Significant correlations ($P \leq 0.003$) were found for CFT, α-angle, and MCF, in EXTEM, INTEM, and APTEM with platelets, INR, and fibrinogen. Factor VIII (18 measurements) showed a strong correlation ($r \geq 0.7$ or $r \leq -0.7$; all $P \leq 0.003$) with MCF, CFT, and α-angle of EXTEM, INTEM, MCF of FIBTEM excluding CT of EXTEM, INTEM, FIBTEM and strong significant correlation for α-angle of APTEM and moderate for CFT and MCF of APTEM. A significant moderate to strong correlation of factor XIII with MCF of EXTEM, INTEM, FIBTEM, and APTEM was found. Hemoglobin was moderately correlated ($r = 0.3–0.7$ or $r = -0.3$ to $-0.7$) with MCF in APTEM ($P = 0.003$). A moderate to strong correlation of the standard coagulation tests with all ROTEM parameters was found, in particular the CT. The aPTT correlated significantly moderate to strong with CT, CFT, α-angle, and MCF of INTEM. However, multiple linear regressions were not able to show an influence of INR on ROTEM parameters except for APTEM-MCF. A significant impact of the aPTT on INTEM-CT was found. EXTEM, INTEM, and APTEM are significantly influenced by fibrinogen and platelets.

**CONCLUSIONS:** The results confirm the clinical assumption that EXTEM, INTEM, and APTEM are associated with fibrinogen and platelets levels; INTEM-CT significantly to aPTT; and FIBTEM significantly to fibrinogen. Factor VIII showed a significant correlation with all ROTEM parameters except CT of EXTEM, INTEM, FIBTEM, and CFT and MCF of APTEM.

## 在缺乏监测情况下使用 Sugammadex 逆转不能排除残余肌松

## Reversal with Sugammadex in the Absence of Monitoring Did Not Preclude Residual Neuromuscular Block

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Anesth Analg August 2013 117:345-351

**背景：**在日本，常规临床监护通常不涉及使用监测仪来指导肌松药或其拮抗剂的使用。虽然很多先前报告表明，sugammadex 能对罗库溴铵引发的肌松效应进行更快、更可靠地拮抗，这种优势在无肌松监测的临床条件下未经证实。此项多中心观察性研究试图确定：当没有肌松监测指导罗库溴铵和拮抗剂使用时，与新斯的明相比，sugammadex 是否能降低术后无力状态的发生率。

**方法：**此项研究在将 sugammadex 引入日本的临床实践的前后各 5 个月期间进行。五个大学附属教学医院参与研究。第一阶段使用新斯的明来拮抗罗库溴铵诱导的神经肌肉阻滞，第二阶段则使用 sugammadex。在不使用肌松监测仪情况下，由主治麻醉医师决定罗库溴铵、新斯的明、sugammadex 的给药时间与剂量。为了确定术后残余无力的发生率，在气管拔管后使用加速度法测定 4 个成串反应的比值（TOFR）。由于参与研究单位的工作常

规通常不涉及加速度测量反应的校准和标准化，TOFR<0.9 和 TOFR<1.0 定义为术后残余肌松的标准。

**结果：**第一阶段共 109 例患者接受新斯的明（平均剂量 33μg／kg）给药，23 例患者由于被认为（由临床标准决定）恢复足够故并未进行拮抗（自然恢复组）。在第二阶段，作为对罗库溴铵诱导的拮抗，117 例患者接受 sugammadex（平均剂量为 2.7mg/kg）给药。在自然恢复、使用新斯的明和使用 sugammadex 后 TOFR＜0.9 的发生率（95%置信区间）分别为 13%（2.8%–33.6%）、23.9%（16.2%–33%）和 4.3%（1.7%–9.4%）。而三组 TOFR＜1.0 的发生率（95%置信区间）分别是 69.6%（47.1%–86.6%）、67%（57.3%–75.7%）和 46.2%（36.9%–55.6%）。在新斯的明组中七氟醚的使用、最后一次罗库溴铵给药和 sugammadex 给药之间较短的时间隔间与术后残余无力的较高发生率有关。

**结论：**这项研究表明，在临床未使用肌松监测（客观或主观）的情况下，气管拔管后使用 sugammadex，其 TOFR<0.9 的风险仍高达 9.4%。此发现强调：即使应用 sugammadex 来拮抗罗库溴铵诱导的神经肌肉阻滞，肌松监测仍然重要。

（孙莉荔　译　陈杰　校）

**BACKGROUND:** In Japan, routine clinical care does not normally involve the use of a monitoring device to guide the administration of neuromuscular blocking drugs or their antagonists. Although most previous reports demonstrate that sugammadex offers more rapid and reliable antagonism from rocuronium-induced neuromuscular blockade, this advantage has not been confirmed in clinical settings when no neuromuscular monitoring is used. In this multicenter observational study, we sought to determine whether sugammadex reduces the incidence of postoperative residual weakness compared with neostigmine when the administration of rocuronium and its antagonists is not guided by neuromuscular monitoring.

**METHODS:** This study was conducted in two 5-month periods that preceded and followed the introduction of sugammadex into clinical practice in Japan. Five university-affiliated teaching hospitals participated in this study. Neostigmine was used to antagonize rocuronium-induced neuromuscular blockade in the first phase, and sugammadex was used in the second phase. The timing and doses of rocuronium, neostigmine, and sugammadex were determined by the attending anesthesiologists without the use of neuromuscular function monitoring devices. To ascertain the incidence of postoperative residual neuromuscular weakness, the train-of-four ratio (TOFR) was determined acceleromyographically after tracheal extubation. Since our practice also does not usually involve calibration and normalization of accelerographic responses, both TOFR <0.9 and TOFR <1.0 were used as the criteria for defining postoperative residual weakness.

**RESULTS:** In the first phase, 109 patients received neostigmine (average dose 33 μg/kg) and 23 patients were considered (by clinical criteria) to have adequate recovery and did not receive neostigmine (spontaneous recovery group). In the second phase, 117 patients received sugammadex (average dose 2.7 mg/kg) for antagonism of rocuronium-induced blockade. The incidence (95% confidence interval) of TOFR <0.9 under spontaneous recovery, after neostigmine, and after sugammadex, was 13.0% (2.8%–33.6%), 23.9% (16.2%–33.0%), and 4.3% (1.7%–9.4%), respectively. The incidence (95% confidence interval) of TOFR <1.0 in these groups was 69.6% (47.1%–86.6%), 67.0% (57.3%–75.7%), and 46.2% (36.9%–55.6%), respectively. The use of sevoflurane in the neostigmine group and the short interval between the administration of the last doses of rocuronium and sugammadex were associated with a higher incidence of postoperative residual weakness.

**CONCLUSIONS:** This study demonstrated that the risk of TOFR <0.9 after tracheal extubation after sugammadex remains as high as 9.4% in a clinical setting in which neuromuscular monitoring (objective or subjective) was not used. Our finding underscores the importance of neuromuscular monitoring even when sugammadex is used for antagonism of rocuronium-induced neuromuscular block.

# 前负荷改变前后使用 Nexfin 进行无创连续心输出量测定：与间歇热稀释法心输出量测定的比较

## Noninvasive Continuous Cardiac Output by the Nexfin Before and After Preload-Modifying Maneuvers: A Comparison with Intermittent Thermodilution Cardiac Output

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**背景:**Nexfin 使用一种未校准的脉搏波形方法来连续测定心输出量(CO)，它是完全无创。由于脉搏波形方法和其感知 CO 变化的能力被一再质疑，本研究将心脏外科手术中前负荷处理前后 Nexfin 测量的 CO(NAPCO)与肺动脉导管测量的 CO 作比较。

**方法:** 对共 28 例接受体外循环下心脏手术,其中 18 例接受血管加压素和/或强心药物治疗的患者在术后若干小时内进行研究。根据临床需要，通过给予补液或下肢被动抬高的形式改变前负荷，在每项干预措施前后同时进行 PACCO 和 NAPCO 的测量。

**结果：**22 例患者接受液体负荷，6 例患者接受下肢被动抬高处理。这些干预在 19 名患者中进行重复，共收集 47 例配对测量数据。基线时，PACCO 和 NAPCO 得到 CO 的平均值（±平均差）分别为 4.9±1.1 和 5.0±1.4 L•min-1，偏倚为 0.1±1.0，95%预测区间−2.5—2.4 L•min−1，误差为 39%。前负荷改变后，两方法得到的 CO 平均值分别为 5.6±1.3 和 5.6±1.5 L•min-1，偏倚为-0.0±1.1，95%预测区间−2.6—2.7 L•min−1，误差为 38%。前负荷改变先后 PACCO 和 NAPCO 之间的相关系数（r）分别为 0.71（95%置信区间[95%CI]，0.53—0.82）和 0.70（95%CI，0.52—0.82）。前负荷改变对 PACCO 和 NAPCO 引起了相似的绝对值变化 (r = 0.9,P < 0.0001)。四个象限散点图显示 PACCO 和 NAPCO 之间变化一致率为 100%(95%CI,80.5% -100%)。极坐标图分析显示一个小的极角和协议的径向一致性界限远低于 30°基准。作为评估 Nexfin 感知 PACCO 增加≥15%的能力的指标，ROC 为 0.974(95% CI,0.93 —0.99)。

**结论：**与肺动脉导管相比尽管 Nexfin 精度有限，但它能可靠地感知对心脏手术后稳定患者使用中等剂量血管加压素和强心药物治疗，前负荷改变引起的 CO 变化。此能力结合其完全无创、易于放置、便捷使用的特点使 Nexfin 适用于围手术期连续 CO 的监测。而当外周阻力发生显著改变时此项仪器是否能可靠感知 CO 变化仍需进一步研究。

（孙晓琼　译　陈杰　校）

**BACKGROUND:** The Nexfin uses an uncalibrated pulse contour method for the continuous measurement of cardiac output (CO) in a totally noninvasive manner. Since the accuracy of pulse contour methods and their ability to track changes in CO have been repeatedly questioned, we have compared the CO measured by the Nexfin (NAPCO) with the CO measured by the pulmonary artery catheter (PACCO) in cardiosurgical patients before and after preload-modifying maneuvers.

**METHODS:** Twenty-eight patients who underwent on-pump cardiac surgery, of whom 18 were receiving vasopressor and/or inotropic therapy, were studied during the first postoperative hours. Preload modification, in the form of either a fluid challenge or a passive leg raising maneuver, was done whenever clinically indicated, with PACCO and NAPCO being simultaneously measured before and after each intervention.

**RESULTS:** A fluid challenge was administered to 22 patients, and the passive leg raising maneuver was performed in 6 patients. These interventions were repeated in 19 patients

producing a total of 47 pairs of measurements. At baseline, mean (±SD) CO was 4.9 ± 1.1 and 5.0 ± 1.4 L•min−1, for the PACCO and NAPCO, respectively, bias 0.1 ± 1.0, 95% prediction interval −2.5 to 2.4 L•min−1, and 39% of error. After preload modification, the mean CO was 5.6 ± 1.3 and 5.6± 1.5 L•min−1 for the PACCO and NAPCO, respectively, bias −0.0 ± 1.1, 95% prediction interval −2.6 to 2.7 L•min−1, and 38% of error. The correlation coefficients (r) between the PACCO and NAPCO before and after preload modification were 0.71 (95% confidence interval [95% CI], 0.53–0.82) and 0.70 (95% CI, 0.52–0.82), respectively. Preload modification induced similar absolute changes in PACCO and NAPCO (r = 0.9, P < 0.0001). A 4-quadrant scatter plot showed a concordance rate of 100% (95% CI, 80.5%–100%) between the changes in NAPCO and PACCO. Polar plot analysis demonstrated a small polar angle and radial limits of agreement well below the 30° benchmark. The area under a receiver operating characteristic curve, testing the ability of Nexfin to detect an increase of ≥15% in PACCO, was 0.974 (95% CI, 0.93–0.99).

**CONCLUSIONS:** Although the Nexfin has limited accuracy when compared with the pulmonary artery catheter, it can reliably track preload-induced changes in CO in stable patients after cardiac surgery in the presence of moderate vasopressor and inotropic therapy. This ability, combined with its total noninvasiveness, fast installation, and ease of use, make the Nexfin a suitable monitor for the perioperative continuous measurement of CO. The reliability of this monitor in tracking the CO when significant changes in peripheral resistance take place still needs to be established.

## 患者保温产生的余热对矫形外科手术室空气流通模式的影响

## Patient Warming Excess Heat: The Effects on Orthopedic Operating Room Ventilation Performance

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**背景：**基于在普外科手术中应用的得益，使用患者保温装置已成为预防术中意外低体温发生的一项标准监护。然而，这些收益可能无法在易感染手术（例如移植手术）中完全实现，由于患者保温装置释放的余热可能扰乱预期的从天花板到地面的气流流通模式并使外科手术区域遭受额外污染。因此本实验研究在矫形外科手术室中，对一个模拟接受全膝置换手术铺巾方式的人体模型采取两项流行的患者保温技术，暖风机和加温毯，与对照环境比较空气流通模式的差异。

**方法：**通过在麻醉铺巾头侧的无菌区域释放中性悬浮洗涤剂气泡（“气泡”）来评估空气流通模式。然后监测对人体模型上半身进行加热产生的余热是否会导致“气泡”进入手术野。形式上，采取随机化、可重复设计来评估设备（暖风机，加温毯，对照）和麻醉铺巾高度（低，高）对手术野上方拍摄到的“气泡”数量的影响。

**结果：**直接的大量漂浮气流从暖风机中排出，形成热对流气流，并使气泡越过麻醉铺巾上方进入手术野，由于患者加温装置的因素导致“气泡”计数有明显增加（P<0.001）。在各铺巾高度情况下，暖风机组平均“气泡”计数为 132.5，而加温毯组为 0.48（P=0.003），而对照组为 0.01（P=0.008）在所有高度。在各铺巾高度情况下，加温毯组与对照组间的平均“气泡”计数的差异忽略不计（P=0.87）铺巾高度对”气泡”计数无明显影响（P=0.94）

**结论：**暖风机加温装置产生的余热可导致手术区域空气流通模式的破坏，然而传导加温装置对空气流通没有显著影响，这个发现推动了将来研究暖风机余热对易感染手术临床预后的影响。

（詹恺诞　译　陈杰　校）

**BACKGROUND:** Patient warming has become a standard of care for the prevention of unintentional hypothermia based on benefits established in general surgery. However, these benefits may not fully translate to contamination-sensitive surgery (i.e., implants), because patient warming devices release excess heat that may disrupt the intended ceiling-to-floor ventilation airflows and expose the surgical site to added contamination. Therefore, we studied the effects of 2 popular patient warming technologies, forced air and conductive fabric, versus control conditions on ventilation performance in an orthopedic operating room with a mannequin draped for total knee replacement.

**METHODS:** Ventilation performance was assessed by releasing neutrally buoyant detergent bubbles ("bubbles") into the nonsterile region under the head-side of the anesthesia drape. We then tracked whether the excess heat from upper body patient warming mobilized the "bubbles" into the surgical site. Formally, a randomized replicated design assessed the effect of device (forced air, conductive fabric, control) and anesthesia drape height (low-drape, high-drape) on the number of bubbles photographed over the surgical site.

**RESULTS:** The direct mass-flow exhaust from forced air warming generated hot air convection currents that mobilized bubbles over the anesthesia drape and into the surgical site, resulting in a significant increase in bubble counts for the factor of patient warming device ($P < 0.001$). Forced air had an average count of 132.5 versus 0.48 for conductive fabric ($P = 0.003$) and 0.01 for control conditions ($P = 0.008$) across both drape heights. Differences in average bubble counts across both drape heights were insignificant between conductive fabric and control conditions ($P = 0.87$). The factor of drape height had no significant effect ($P = 0.94$) on bubble counts.

**CONCLUSIONS:** Excess heat from forced air warming resulted in the disruption of ventilation airflows over the surgical site, whereas conductive patient warming devices had no noticeable effect on ventilation airflows. These findings warrant future research into the effects of forced air warming excess heat on clinical outcomes during contamination-sensitive surgery.

## 外科 Apgar 评分与高风险腹腔手术后 ICU 入住率密切相关

### The Surgical Apgar Score Is Strongly Associated with Intensive Care Unit Admission After High-Risk Intraabdominal Surgery

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**背景：**了解 ICU（重症监护病房）对高危手术病人选择策略可能最终促进资源配置和提高疗效。外科 Apgar 评分（SAS）是一个简单的评分，它采用术中血流动力学和血液丢失信息来预测术后并发症发生率和死亡率，得分较低则预后更坏。本研究推测 SAS 与术后患者是否进入 ICU 的决策相关。

**方法：**在一个教学医疗中心进行一项回顾性队列研究，对象是从 2003 年至 2010 年进行重大腹腔手术的成年人。根据每个病人术中的心率、平均动脉压和估计失血量计算出 SAS（0-10）。采用 Logistic 回归分析评估 SAS 与病人术后直接进入 ICU 决定的相关性。

**结果：**研究对象包括 8501 例患者，其中 72.7%的患者的 SAS 是 7-10 分,少于 5%患者的 SAS 是 0-4 分。其中 8.7%的病人术毕立即转入 ICU。多因素校正后，SAS 和接纳病人进 ICU 的决定有较强的相关性。（与 SAS7-8 的病人相比较，SAS0-2 的病人，校正后比值比 14.1[95%的可信区间 6.88-30.19，p<0.001]；SAS3-4 的病人，校正后比值比 4.42[95%的可信区间 3.19-6.13，p<0.001]；SAS5-6 的病人，校正后比值比 2.08[95%的可信区间 2.08-3.24，p<0.001]）。

**结论：**SAS 与高风险腹腔手术病人术后是否立即转入 ICU 的临床决定密切相关。这些结果有利于初步理解术中血流动力学变化和血液丢失是否影响术后病人的 ICU 收治。

（郑华容　译　陈杰　校）

**BACKGROUND:** Understanding intensive care unit (ICU) triage decisions for high-risk surgical patients may ultimately facilitate resource allocation and improve outcomes. The surgical Apgar score (SAS) is a simple score that uses intraoperative information on hemodynamics and blood loss to predict postoperative morbidity and mortality, with lower scores associated with worse outcomes. We hypothesized that the SAS would be associated with the decision to admit a patient to the ICU postoperatively.

**METHODS:** We performed a retrospective cohort study of adults undergoing major intraabdominal surgery from 2003 to 2010 at an academic medical center. We calculated the SAS (0–10) for each patient based on intraoperative heart rate, mean arterial blood pressure, and estimated blood loss. Using logistic regression, we assessed the association of the SAS with the decision to admit a patient directly to the ICU after surgery.

**RESULTS:** The cohort consisted of 8501 patients, with 72.7% having an SAS of 7 to 10 and <5% an SAS of 0 to 4. A total of 8.7% of patients were transferred immediately to the ICU postoperatively. After multivariate adjustment, there was a strong association between the SAS and the decision to admit a patient to the ICU (adjusted odds ratio 14.41 [95% confidence interval {CI}, 6.88–30.19, P < 0.001] for SAS 0–2, 4.42 [95% CI, 3.19–6.13, P < 0.001] for SAS 3–4, and 2.60 [95% CI, 2.08–3.24, P < 0.001] for SAS 5–6 compared with SAS 7–8).

**CONCLUSIONS:** The SAS is strongly associated with clinical decisions regarding immediate ICU admission after high-risk intraabdominal surgery. These results provide an initial step toward understanding whether intraoperative hemodynamics and blood loss influence ICU triage for postsurgical patients.

## 全麻后早期诊断谵妄的老年患者的预后

## Outcomes of Early Delirium Diagnosis After General Anesthesia in the Elderly

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**背景：**老年患者外科手术后谵妄与不良临床预后显著相关。此项研究评估全麻后早期诊断谵妄的老年患者的患病率和住院期间的预后。

**方法：**对 2010 年 7 月至 8 月之前，年龄在 70 岁及以上，讲英语的外科手术患者进行连续入组。每名对象在麻醉后苏醒室（PACU）中按《诊断与统计手册：精神障碍 IV（DSM-IV) -谵妄的诊断》的诊断标准评估，并在之后的住院期间多次进行评估。从术前测试及出院方式来看，PACU 期间谵妄被作为一项与术前测试和出院确认时认知功能改变无关的疾病来评估。

**结果：**91 名患者（58%为女性），其中 78%在术前独立生活，在 PACU 中谵妄的患病率为 45%。在随后住院期间发生的谵妄有 74%患者始于 PACU。早期谵妄与术前测试得出的认知功能受损（如用词种类及流畅性的减少）非相关（T 评分变化的校正后差异[95%可信区间]: −6.02 [−10.58 至 −1.45]; P = 0.01)。术后第一天谵妄消除的患者，表现出阴性的预后，其严重程度介于那些住院期间从未有谵妄发作与那些在 PACU 发生谵妄并持续到转入病房后的患者之间（三组出院时校正后概率分别为[95%可信区间]3% [0%–10%], 26% [1%–51%], 39% [0%–81%] ）。

**结论：**PACU 期间谵妄常见但不普遍，与随后在病房发生的谵妄有关，并可能伴有认知功能的减退并增加出院后入住康复机构的几率。

（诸琳婕　译　陈杰　校）

**BACKGROUND:** Postoperative delirium in the elderly, measured days after surgery, is associated with significant negative clinical outcomes. In this study, we evaluated the prevalence and in-hospital outcomes of delirium diagnosed immediately after general anesthesia and surgery in elderly patients.

**METHODS:** Consecutive English-speaking surgical candidates, aged 70 years or older, were prospectively enrolled during July to August 2010. After surgery, each participant was evaluated for a Diagnostic and Statistical Manual of Mental Disorders IV diagnosis of delirium in the postanesthesia care unit (PACU) and repeatedly thereafter while hospitalized. Delirium in the PACU was evaluated for an independent association with change in cognitive function from preoperative baseline testing and discharge disposition.

**RESULTS:** Ninety-one (58% female) patients, 78% of whom were living independently before surgery, were found to have a prevalence of delirium in the PACU of 45% (41/91); 74% (14/19) of all delirium episodes detected during subsequent hospitalization started in the PACU. Early delirium was independently associated with impaired cognition (i.e., decreased category word fluency) relative to presurgery baseline testing (adjusted difference [95% confidence interval] for change in T-score: −6.02 [−10.58 to −1.45]; P = 0.01). Patients whose delirium had resolved by postoperative day 1 showed negative outcomes that were intermediate in severity between those who were never delirious during hospitalization and those whose delirium in the PACU persisted after transfer to hospital wards (adjusted probability [95% confidence interval] of discharge to institution: 3% [0%–10%], 26% [1%–51%], 39% [0%–81%] for the 3 groups, respectively).

**CONCLUSIONS:** Delirium in the PACU is common, but not universal. It is associated with subsequent delirium on the ward, and potentially with a decline in cognitive function and increased institutionalization at hospital discharge.

## 根治性胃切除术后肋下腹横肌平面阻滞与胸段硬膜外和静脉阿片类药物给予镇痛效应的比较

**The Analgesic Efficacy of Subcostal Transversus Abdominis Plane Block Compared with Thoracic Epidural Analgesia and Intravenous Opioid Analgesia After Radical Gastrectomy**

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**背景:** 腹横肌平面 (TAP) 阻滞已经被证实在下腹部手术中可提供有效的术后镇痛，肋下 TAP 阻滞也已同样被证明是一种对于脐以上腹部提供镇痛作用的新技术。本文比较单次肋下 TAP 阻滞与持续胸段硬膜外、静脉阿片类药物给予的镇痛效应的差异。

**方法:** 90 例择期行根治性胃切除术的病人随机分为三组：接受全麻联合肋下 TAP 阻滞（TAP 组）、全麻联合硬膜外麻醉（EA 组）或全麻（GA 组）。在 TAP 组，全麻诱导后以 0.375%罗哌卡因行双侧肋下 TAP 阻滞。在 EA 组，全麻诱导前 T8、T9 水平行硬膜外置管，给予 8ml0.25%罗哌卡因作为负荷剂量。术中硬膜外维持量为 0.25%罗哌卡因 5ml/h。GA 组接受标准的全身麻醉。在复苏室, 所有组在 VAS>3 时接受静脉吗啡。所有病人在 PACU 开始接受含有吗啡的静脉病人自控镇痛，而 EA 组为 0.125%布比卡因 5ml/h 的硬膜外镇痛， 在 PACU,术后 1,3,6,24,48 和 72h 对病人进行疼痛评估，主要预后指标为 24h 内吗啡消耗量和所有 VAS 疼痛评分。

**结果:** 90 例中有 82 例患者纳入了研究(91.1%) 。TAP 组显示 24h 累计吗啡消耗量减少 (98.75% 可信区间, −29 to −9 mg) 且所有时点 VAS 疼痛评分均非劣于进行标准阿片药镇痛的 GA 组，而 EA 组在减少 24h 吗啡累计用量方面优于 TAP 组(98.75% 可信区间, −23 to −4 mg)，并且在所有时点 VAS 评分均非劣于 TAP 组。TAP 组在进入 PACU 到术后 6h 之间吗啡使用量少于 GA 组，但在术后 6h 到 24h 之间的吗啡使用量高于 EA 组。

**结论:**单次肋下 TAP 阻滞比静脉阿片类镇痛药有效,而持续胸段硬膜外镇痛比单次肋下 TAP 阻滞更有效。

（瞿亦枫　译　陈杰　校）

**BACKGROUND:** The transversus abdominis plane (TAP) block has been shown to provide effective postoperative analgesia in lower abdominal surgery. Subcostal TAP block has also been proposed as a new technique to provide analgesia for the supraumbilical abdomen. We compared the analgesic and opioid-sparing effects of a single-injection subcostal TAP block with continuous thoracic epidural analgesia and IV opioid analgesia.

**METHODS:** Ninety patients undergoing elective radical gastrectomy were randomized to receive either combined general–subcostal TAP anesthesia (group TAP), combined general–epidural anesthesia (group EA), or general anesthesia (group GA), and were analyzed on an intention-to-treat basis. In group TAP, a bilateral subcostal TAP block was performed after induction of general anesthesia using 20 mL of 0.375% ropivacaine. In group EA, a thoracic epidural was placed between T8 and T9 and bolused with 8 mL of 0.25% ropivacaine before induction of general anesthesia. The epidural was maintained with 5 mL/h of 0.25% ropivacaine during the surgery. Group GA received standard general anesthesia. In the postanesthesia care unit (PACU), all groups received IV morphine titration for visual analog scale (VAS) pain scores >3. All patients were started on IV patient-controlled analgesia with morphine after morphine titration in the PACU, while group EA also had their epidural maintained with 5 mL/h of 0.125% bupivacaine with 8 μg/mL morphine. Patients were assessed in the PACU and at 1, 3, 6, 24, 48, and 72 hours postoperatively. Primary outcomes measured were morphine consumption at 24 hours and all VAS pain scores.

**RESULTS:** Data from 82 of 90 (91.1%) patients were included in the study. Group TAP demonstrated decreased cumulative morphine consumption at 24 hours (98.75% confidence intervals, −29 to −9 mg) and noninferiority on VAS pain scores at all measurement times, as compared with group GA with standard opioid analgesia. However, group EA was superior to group TAP regarding cumulative morphine consumption at 24 hours (98.75% confidence intervals, −23 to −4 mg) and noninferior to group TAP on VAS pain scores at all comparison points. Group TAP had reduced morphine consumption from PACU admission to 6 hours as compared with group GA, but increased morphine consumption for 6 to 24 hours as compared with group EA.

**CONCLUSION:** Single-injection subcostal TAP block was more effective than IV opioid analgesia, while continuous thoracic epidural analgesia was more effective than the single-injection subcostal TAP block.

## 关于冠状动脉搭桥或脊柱手术患者术前服糖的研究

**Preoperative Carbohydrate Loading in Patients Undergoing Coronary Artery Bypass or Spinal Surgery**

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**研究背景：**手术应激引发的胰岛素抵抗反应可能导致高血糖症，并由此诱发术后并发症。手术前给患者口服糖类可能改善病人对胰岛素的敏感性，并减少高血糖症。本研究探讨了给冠状动脉搭桥手术和椎管减压消融手术病人补充糖类对于患者胰岛素抵抗反应的影响。

**方法：**26 个冠状动脉搭桥手术病人和 12 个脊柱手术病人，随机分两组：CHO 组为术前一晚口服 800mL、术前 2 小时口服 400mL 糖；FAST 组为按照标准的医院方案执行禁食。采用胰岛素短时耐受实验和体内平衡模型评估（HOMA）对病人的胰岛素敏感度的基础值和术后值进行评估。分别记录术前和术后 24 小时、48 小时、72 小时时的白细胞介素-6、C 反应蛋白和游离脂肪酸水平；测得脂联素的基础值。在手术前即刻测量病人的良好自我感觉，并记录术中及术后的预后。

**结果：**无论是短时胰岛素耐受实验，还是体内平衡模型评估（HOMA），FAST 和 CHO 两组的术后胰岛素敏感度并无明显区别。短时胰岛素耐受实验结果为：血糖消失速度为 0.29%/分钟比 0.38%/分钟，差异的 99%置信区间，-0.17～0.32，P=0.41；HOMA 结果为：值大于 1 时的胰岛素耐受值:2.3 比 3.3，差异 99%置信区间，-0.8～2.8，P=0.14。CHO 组术后循环血糖水平 6.2mmol/L，比 FAST 组 6.9mmol/L 有降低趋势（差异的 99%置信区间，-1.7～0.25，P=0.05）;而 CHO 组由 HOMA-β 测得的术后 β 细胞功能 (值<100%时的损坏 β 细胞功能)87% 比 FAST 组的 47.5%有增高趋势（99%置信区间下，-9.4～88.4）。但这些差异并不显著。两组的脂联素水平在基线上并无差异；游离脂肪酸水平、白细胞介素-6 及 C 反应蛋白不受处理影响。

**结论：**术前服糖并不提高术后胰岛素敏感度。但是，本研究所观察到的术后血糖水平、β 细胞功能及继发性的预后需要进一步的研究以重新评估手术患者的传统禁食措施。

（赵晓 译 马皓琳 李士通校）

**BACKGROUND:** Surgical stress creates a state of insulin resistance which may contribute to the development of hyperglycemia and, subsequently, postoperative complications. Consumption of an oral carbohydrate supplement before surgery may improve insulin sensitivity and reduce hyperglycemia. In this trial, we investigated the effects of carbohydrate supplementation on insulin resistance in coronary artery bypass graft and spinal decompression and fusion surgical patients.

**METHODS:** Twenty-six patients undergoing coronary artery bypass graft and 12 undergoing spine surgery were randomized to receive 800 mL of an oral carbohydrate supplement the evening before and 400 mL 2 hours before surgery (CHO) or to fasting per standard hospital protocol (FAST). Baseline and postoperative measurements of insulin sensitivity were assessed using the short insulin tolerance test and homeostasis model assessment (HOMA). Interleukin-6, C-reactive protein, and free fatty acid levels were determined at baseline, postoperatively, and 24, 48, and 72 hours after surgery. Adiponectin was measured at baseline. Subjective feelings of well-being were measured immediately before surgery, and intra- and postoperative outcomes were documented.

**RESULTS:** Postoperative insulin sensitivity did not differ significantly between the FAST and CHO groups whether measured by the short insulin tolerance test (rate of disappearance of blood glucose: 0.29%/min vs 0.38%/min; 99% confidence interval [CI] for difference, −0.17 to 0.32, P = 0.41) or HOMA (insulin resistance at values >1: 2.3 vs 3.3; 99% CI for difference, −0.8 to 2.8, P = 0.14). Circulating blood glucose levels after surgery in the CHO group, 6.2 mmol/L, tended to be lower than the FAST group, 6.9 mmol/L (99% CI for difference, −1.7 to 0.25, P = 0.05) and postoperative β-cell function, measured by HOMA-β (impaired β-cell function at values <100%), tended to be higher in the CHO group, 87%, vs 47.5% in the FAST group (99% CI for difference, −9.4 to 88.4), but these differences were not significant. Adiponectin levels were not different between groups at baseline, and levels of free fatty acid, interleukin-6 and C-reactive protein were not affected by treatment.

**CONCLUSIONS:** Preoperative carbohydrate loading did not improve postoperative insulin sensitivity. However, the observed postoperative blood glucose levels and β-cell function as well as secondary outcomes warrant further study to reevaluate traditional fasting practices in surgical patients.

## 对雷莫司琼预防术后恶心呕吐效用的再评价：系统回顾和 meta 分析

## Reevaluation of the Effectiveness of Ramosetron for Preventing Postoperative Nausea and Vomiting: A Systematic Review and Meta-Analysis

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**背景：**先前的 meta 分析结果显示，雷莫司琼对术后恶心呕吐（PONV）有很好的预防作用。然而，这些先前的 meta 分析包括 Fujii 等的很多研究，而 Fujii 等的很多研究现在已被证实是捏造的。本次 meta 分析在除外 Fujii 等人的随机对照试验之后，再次对雷莫司琼预防术后 PONV 的效用进行评估。

**方法：**我们检索了 Medline、Cochrane、对照临床试验的中央寄存器（CENTRAL）、Embase 和科学网。选取所有与安慰剂或者作为对照的其他药物作对比来检验雷莫司琼对 PONV 预防作用的双盲随机对照试验。手术后的第一个 24h 被划分为早期（0-6 小时）和晚期（6-24 小时）两个时间段，并分别收集相关数据。

**结果：**总共有 1372 名患者进行了最终分析。与安慰剂相比，雷莫司琼降低术后早期恶心（PON）（相对危险度[RR][95%置信区间]0.59[0.47-0.73]:需要治疗的例数[NNT][95%置信区间]6.0 [4.3–9.7]）、术后晚期 PON（RR 0.65 [0.49–0.85]: NNT 7.2 [4.6–16.6]）、早期术后呕吐（POV）(RR 0.48 [0.31–0.74]: NNT 14.8 [8.3–70.4])和晚期 POV(RR 0.50 [0.35–0.73]: NNT 12.3 [7.1–47.6])的发生率。与昂丹司琼相比，雷莫司琼能降低早期 POV(RR 0.50 [0.28–0.90]: NNT 24.1 [10.7–98.0])和晚期 POV(RR 0.53 [0.34–0.81]: NNT 27.2 [12.0–102.0]) 发生率，而不降低 PON 的发生率。

**结论:**与安慰剂相比，雷莫司琼对预防 PONV 有重要的意义，但不如之前报道分析的结果明显。与昂丹司琼相比，雷莫司琼在预防早期和晚期 POV 上也有统计学意义，但是由于 NNTs 多，其临床意义可能尚有质疑。

（董静 译 马皓琳 李士通 校）

**BACKGROUND:** Ramosetron has been shown to have a very strong effect for preventing postoperative nausea and vomiting (PONV) in previous meta-analyses. However, these previous meta-analyses included a number of studies by Fujii et al. which have now been proven to have been fabricated. In the present meta-analysis, we reevaluated the effectiveness of ramosetron in preventing PONV after excluding Fujii et al.'s randomized controlled trials.

**METHODS:** We searched MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), Embase, and Web of Science. All double-blind randomized controlled trials that tested the efficacy of ramosetron compared with a placebo or other drugs as a control in the prophylaxis of PONV were considered to be eligible. The first postoperative 24 hours were divided into early (0−6 hours) and late (6–24 hours) time periods, and we collected these data separately.

**RESULTS:** A total of 1372 patients were included in the final analysis. Compared with a placebo, ramosetron reduced the incidence of early postoperative nausea (PON) (relative risk [RR] [95% confidence interval] 0.59 [0.47–0.73]: number needed to treat [NNT] [95% confidence interval] 6.0 [4.3–9.7]), late PON (RR 0.65 [0.49–0.85]: NNT 7.2 [4.6–16.6]), early postoperative vomiting (POV) (RR 0.48 [0.31–0.74]: NNT 14.8 [8.3–70.4]), and late POV (RR 0.50 [0.35–0.73]: NNT 12.3 [7.1–47.6]). Compared with ondansetron, ramosetron reduces early POV (RR 0.50 [0.28–0.90]: NNT 24.1 [10.7–98.0]) and late POV (RR 0.53 [0.34–0.81]: NNT 27.2 [12.0–102.0]) but not PON.

**CONCLUSIONS:** Ramosetron has a significant effect for preventing PONV compared with a placebo, but less than that reported in previous analyses. Ramosetron also has statistically significant differences in preventing early and late POV compared with ondansetron, but the clinical significance may be questioned because the NNTs are large.

## 丙泊酚通过减少对 γ-氨基丁酸（GABA）能神经元的抑制来刺激腹外侧视前核中的去甲肾上腺素抑制性神经元

**Propofol Stimulates Noradrenalin-Inhibited Neurons in the Ventrolateral Preoptic Nucleus by Reducing GABAergic Inhibition**

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**背景：**全身麻醉药镇静作用的细胞机制仍然不完全清楚。越来越多的证据表明下丘脑腹外侧视前区（VLPO）起着关键的作用。VLPO 包含两类神经元：去甲肾上腺素抑制性 GABA 能投射性神经元（NA(−) 神经元）和同样可能包含 GABA 神经元的去甲肾上腺素

兴奋性中间神经元（NA(+) 神经元)。我们之前的工作表明正常情况下 NA(−) 神经元是处于 NA(+)神经元的抑制性调控。先前的研究同样表明通过对 GABA 能神经元起作用的试剂如丙泊酚激活 VLPO 的 GABA 能投射性神经元，从而产生对结节乳头核上的觉醒产生核的抑制和镇静作用。然而丙泊酚如何激活 VLPO 神经元仍然不清楚。我们研究了丙泊酚通过抑制包括来自于 VLPO NA(+) 神经元的 GABA 能神经传递间接激活 NA(−) 神经元的可能性。

**方法：**记录大鼠急性脑片中的 VLPO 细胞的电生理活动。

**结果：**丙泊酚促进 NA(−)神经元的放电，并减少 NA(−)神经元中自发性 GABA 能抑制性突触后电流的频率，但不降低其幅度。相反，丙泊酚抑制 NA(+)神经元的放电。

**结论：**丙泊酚通过减少 GABA 能神经传递来兴奋 VLPO 上的 NA(-)神经元，至少部分通过抑制 VLPO 上的 NA(+)神经元。这可能是丙泊酚产生镇静作用的一个关键机制。

（杨礼 译 马皓琳 李士通 校）

**BACKGROUND:** The cellular mechanisms underlying the sedative effect of general anesthetics are not completely understood. Accumulating evidence indicates that the ventrolateral preoptic area (VLPO) of the hypothalamus plays a critical role. The VLPO contains 2 major types of neurons, the noradrenalin-inhibited GABAergic projecting neurons (NA(−) neurons) and the noradrenalin-excited interneurons (NA(+) neurons) which are probably also γ-aminobutyric acid (GABA)-containing neurons. Our previous work suggests that NA(−) neurons are normally under the inhibitory control of NA(+) neurons. Previous studies also show that GABAergic agents including propofol activate GABAergic projecting neurons in the VLPO, which is believed to lead to the inhibition of the arousal-producing nuclei in the tuberomammillary nucleus and sedation. However, how propofol activates VLPO neurons remains unclear. We explored the possibility that propofol activates NA(−) neurons indirectly, by inhibiting GABAergic transmission including those from VLPO NA(+) neurons.

**METHODS:** Electrophysiological activities were recorded from VLPO cells in acute brain slices of rats.

**RESULTS:** Propofol facilitates the discharges of NA(−) neurons and reduces the frequency, but not the amplitude of spontaneous GABAergic inhibitory postsynaptic currents in NA(−) neurons. Conversely, propofol suppressed the discharges of NA(+) neurons.

**CONCLUSION:** Propofol excites VLPO NA(−) neurons by reducing GABAergic transmission, at least in part by inhibiting VLPO NA(+) neurons. This may be a critical mechanism contributing to propofol-induced sedation.

## 对一项专家系统在人类患者模拟器麻醉期间关键事件检出的评估：一项前瞻性随机对照研究

## An Evaluation of an Expert System for Detecting Critical Events During Anesthesia in a Human Patient Simulator: A Prospective Randomized Controlled Study

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**背景：**围手术期监测系统提供了大量未解释的数据，使用易于产生假象的阈值警报，并且依赖临床医生连续性地肉眼追溯生理数据中的变化。为了弥补这些缺陷，我们开发了一项能够提供实时临床决定以识别关键事件的专家系统。我们评估了在模拟环境下这套专家系统提高关键事件识别的效率。假设在这套专家系统的帮助下麻醉医师将会更加迅速并准确地识别关键性通气事件。

**方法：**我们使用了高保真人类患者模拟器来模拟一个手术室的环境。参与者以随机的顺序管理了 4 个场景（麻醉气体过量、张力性气胸、过敏反应和气管内导管气囊泄露）。在其中 2 个场景中，参与者随机分配到这项提供趋势性警报和潜在鉴别诊断的专家系统。测定发生到识别的时间和发生到处理的时间。每项场景结束后完成工作量问卷调查和结构化述职报告，研究期结束时完成可用性问卷调查。数据分析使用了混合线性回归模型；工作量分数使用了 Fisher's 精确检验。

**结果：**20 名麻醉实习生和 15 名麻醉医师参与了试验，年龄的混合中位数为 36 岁（29-66 岁），麻醉经验年限中位数为 6 年（1-38 年）。在气管内导管气囊泄露场景中，专家系统将事件发生到识别的时间缩短了 128（99%可信区间，54-202）秒，事件发生到处理的时间缩短了 140（99%可信区间，79-200）秒。在其他 3 项场景中发现，最好的案例是将过敏反应发生到诊断的时间缩短了 97 秒（99%可信区间下限），最差的案例是将麻醉气体过量发生到处理的时间增加了 63 秒（99%可信区间上限）。参加者对这项专家系统非常满意（评分中位数 2 分，1-7 分制）。在参加者述职报告的基础上，我们确认了避免任务固定、再次确保才开始有创治疗及明确可能诊断是 3 项保障安全的关键点。

**结论：**在气管内导管气囊泄露的场景中使用专家系统时，事件发生到诊断和事件发生到处理的时间有临床意义及统计学显著意义地缩短。在其他 3 个场景中观察到的差别要小地多，也无统计学显著意义。需要进一步的评估以确定实时专家系统用于麻醉的临床实用性。

（盛嘉君 译， 马皓琳、李士通 审校）

**BACKGROUND:** Perioperative monitoring systems produce a large amount of uninterpreted data, use threshold alarms prone to artifacts, and rely on the clinician to continuously visually track changes in physiological data. To address these deficiencies, we developed an expert system that provides real-time clinical decisions for the identification of critical events. We evaluated the efficacy of the expert system for enhancing critical event detection in a simulated environment. We hypothesized that anesthesiologists would identify critical ventilatory events more rapidly and accurately with the expert system.

**METHODS:** We used a high-fidelity human patient simulator to simulate an operating room environment. Participants managed 4 scenarios (Anesthetic Vapor Overdose, Tension Pneumothorax, Anaphylaxis, and Endotracheal Tube Cuff Leak) in random order. In 2 of their 4 scenarios, participants were randomly assigned to the expert system, which provided trend-based alerts and potential differential diagnoses. Time to detection and time to treatment were measured. Workload questionnaires and structured debriefings were completed after each scenario, and a usability questionnaire at the conclusion of the session. Data were analyzed using a mixed-effects linear regression model; Fisher exact test was used for workload scores.

**RESULTS:** Twenty anesthesiology trainees and 15 staff anesthesiologists with a combined median (range) of 36 (29–66) years of age and 6 (1–38) years of anesthesia experience participated. For the Endotracheal Tube Cuff Leak, the expert system caused mean reductions of 128 (99% confidence interval [CI], 54–202) seconds in time to detection and 140 (99% CI, 79–200) seconds in time to treatment. In the other 3 scenarios, a best-case decrease of 97 seconds (lower 99% CI) in time to diagnosis for Anaphylaxis and a worst-case increase of 63 seconds (upper 99% CI) in time to treatment for Anesthetic Vapor Overdose were found. Participants were highly satisfied with the expert system (median score, 2 on a scale of 1–7). Based on participant debriefings, we identified avoidance of task fixation, reassurance to initiate invasive treatment, and confirmation of a suspected diagnosis as 3 safety-critical areas.

**CONCLUSION:** When using the expert system, clinically important and statistically significant decreases in time to detection and time to treatment were observed for the Endotracheal Tube Cuff Leak scenario. The observed differences in the other 3 scenarios were much smaller and not statistically significant. Further evaluation is required to confirm the clinical utility of real-time expert systems for anesthesia.

## 气管导管套囊漏气：原因、后果及处理

**Endotracheal Tube Cuff Leaks: Causes, Consequences, and Management**

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气管导管（ETT）套囊漏气的后果可从漏气的气泡声到威胁生命的通气失败。尽管最终解决的方法是更换气管导管，但这通常是不需要且操作起来不安全的。一般来说，导致漏气的原因并不在气管导管的结构性缺陷。套囊充气太少、ETT 向头侧的移位（部分导管拔出）、错误置入的口胃管或鼻胃管，、气管导管及气管内径之间的较大差异或者增高的气道峰压值均会导致完整的套囊周围漏气。纠正这些问题就可停止漏气而不更换气管导管。然而，归咎于意外损伤或制造缺陷的气管导管套囊、指示气囊及注气系统的损坏可能就责任重大了。解决这个问题的保守的处理意见（不更换气管导管的处理）已经在之前发表过了。但是，如存在大的结构性缺陷或保守处理措施失败的话，就必须更换气管导管。如喉镜视野较好的话可以通过喉镜直视下实施。当存在困难气道的迹象和/或困难气道史的时候，应该预期到一个困难的更换过程可能导致的气道丢失并有所准备。在做出最有利决策前，针对每个个体情况都应确保做好风险/获益分析。在换管前需提前计划好可供选择的后备通气方案及准备好必要的器材。本综述将针对各种处理问题及方案进行讨论，并提出一简易的气管导管套囊漏气处理步骤。

（王赟 译 马皓琳 李士通 校）

The consequences of endotracheal tube (ETT) cuff leak may range from a bubbling noise to a life-threatening ventilatory failure. Although the definitive solution is ETT replacement, this is often neither needed nor safe to perform. Frequently, the leak is not caused by a structural defect in the ETT. Cuff underinflation, cephalad migration of the ETT (partial tracheal extubation), misplaced orogastric or nasogastric tubes, wide discrepancy between ETT and tracheal diameters, or increased peak airway pressure can cause leaks around intact cuffs. Correction of these problems will stop the leak without ETT replacement. Alternatively, ETT cuff, pilot balloon, and inflation system damage due to inadvertent trauma or manufacturing defects may be responsible. Conservative management ideas (management without ETT replacement) were previously published to solve the problem. However, when a large structural defect is identified or conservative measures fail, ETT replacement becomes necessary. This can be performed with direct laryngoscopy if laryngeal visualization is adequate. A difficult exchange with possible airway loss should be anticipated, and prepared for, when there are signs and/or history of difficult intubation. A risk/benefit analysis of each individual situation is warranted before decisions are made on how best to proceed. Alternative back-up ventilation plans should be preformulated and the necessary equipment ready before the exchange. In this review, various management concerns and plans are discussed, and a simple algorithm to manage leaky ETT cuff situations is presented.

## 婴幼儿声门下气道长度的测量新方法

**Novel Measurements of the Length of the Subglottic Airway in Infants and Young Children**

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**背景：**至今，声门下气道和气管的长度测量结果仍来源于尸检。头颈部的计算机断层扫描（CT）图像提供了一种交错法。本研究的目的在于从婴幼儿 CT 扫描来确认解剖学标志从而估计声门下气道和气管的长度并计算长度与年龄的相关性。

**方法：**我们对≤3 岁儿童用于各种诊断指标的颈部 CT 扫描图像进行了回顾性分析。我们获取了在声带（VCs）、环状软骨和隆突（C）水平重建的平面，这些平面相互平行并垂直于气管矢状长轴。声门下气道长度（SG 长）和喉气管气道总长度（VC-C 长）分别通过测量声带与环状软骨和声带与隆突重建平面之间的长度来获得。然后计算 VC-C 长与 SG 长之间的差值作为气管长度。

**结果：**56 名儿童符合入选标准，其中 29 名是男孩。体重中位数为 10.7kg（范围 3.1-19.0kg）。回归分析产生了平均 SG 长度（mm）=7.8+0.03•校准的月龄，r2 = 0.07, P = 0.056；在 β = 0.03 时 95%可信区间为−0.001 至 0061。平均 SG 长度为 8.4mm，标准差为 1.4mm。SG 长的第 95 位百分位数为 10.8mm，5%至 95%四分位距为 4.9mm。第 95 位百分位数的 95%可信区间估值为 10.2 至 11.3mm。VC-C 长随年龄增长：平均 VC-C 长（cm）=5.3+0.05•校准的月龄，r2 = 0.7, P < 0.001。气管长度同样随年龄增长：平均气管长度（cm）=4.5+0.05•校准的月龄，r2 = 0.6, P < 0.001。

**结论：**通过对 56 名婴幼儿的研究，我们报道了一种新的估算声带和隆突之间气道部分长度的方法，并提示声门下气道和气管的成长特征也许不同。

（张怡 译 马皓琳 李士通 校）

**BACKGROUND:** To date, the lengths of the subglottic and tracheal airway segments have been measured from autopsy specimens. Images of the head and neck obtained from computerized tomography (CT) provide an alternate method. Our objective in this study was to identify anatomic landmarks from CT scans in infants and young children to estimate the lengths of the subglottic and tracheal airway segments and to correlate these lengths with age.

**METHODS:** We performed a retrospective analysis of CT images of the neck for various diagnostic indications in children ≤3 years. We obtained planes of reconstruction at the level of the vocal cords (VCs), cricoid cartilage, and carina (C) which were parallel to each other and perpendicular to sagittal long axis of the trachea. The lengths of the subglottic airway (LengthSG) and total length of the laryngotracheal airway (LengthVC–C) were measured from the distance between, respectively, the VC versus cricoid cartilage and the VC versus C planes of reconstruction. Tracheal length was then calculated as the difference between LengthVC–C and LengthSG.

**RESULTS:** Fifty-six children met the inclusion criteria. There were 29 boys. The median weight was 10.7 kg (range 3.1–19.0 kg). Regression analysis yielded mean LengthSG (mm) = 7.8 + 0.03•corrected age (months), r2 = 0.07, P = 0.056; lower and upper 95% confidence interval for β = 0.03 were −0.001 and 0061. The mean LengthSG was 8.4 mm with an SD of 1.4 mm. The 95th percentile for LengthSG was 10.8 mm, and the 5% to 95% interquartile range was 4.9 mm. The estimate for the 95% confidence interval of the 95th percentile was between 10.2 and 11.3 mm. The LengthVC–C increased with age: mean LengthVC–C (cm) = 5.3 + 0.05•corrected age

(months), r2 = 0.7, P < 0.001. Tracheal length also increased with age: mean tracheal length (cm) = 4.5 + 0.05•corrected age (months), r2 = 0.6, P < 0.001.

**CONCLUSION:** We report a novel estimate method for the lengths of the airway segments between the VC and C in 56 infants and young children and suggest that the growth characteristics of the subglottic and tracheal airway may differ.

## 关于 **Horace Wells** 在康乃狄克州哈特福德的遗址和遗物

**Sites and Artifacts Related to Horace Wells in Hartford, Connecticut**

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Horace Wells，作为先驱麻醉发现者的竞争者，在他进行了大部分工作的康乃狄克州哈特福德镇庆祝。他唯一的继承者是他的儿子 Charles Thomas Wells (1839–1909)，一位在 Aetna 保险公司有影响力成功的商业经理。他是一位有广泛影响力的人，他不辞辛劳地和城镇官员及康涅狄格州牙医学会工作，为了庆祝他父亲对医学事业的贡献。这一发现是独一无二的，因为这些事和人在一个国家——美国，完全贡献给一个医学专业的诞生。在佐治亚州杰弗逊、康乃狄克州哈特福德、马萨诸塞州波士顿及它们的市郊的遗址庆祝这次最珍贵的对现代医学的贡献，尤其是因为安全麻醉的引进促进了外科专业和产科的发展。我们追寻了 Horace Wells 和在康乃狄克州哈特福德的这些遗迹之间的历史和关系。这些遗迹反映了一个城市最重要、最与众不同、最吸引人的部分:布什内尔公园、三一学院、香柏山公墓、雅典娜神庙和康涅狄格州的历史协会。

Horace Wells, a contender for recognition as the discoverer of anesthesia, is celebrated in the town where he conducted most of his work, Hartford, CT. His only descendant was his son, Charles Thomas Wells (1839–1909), an influential and successful business executive at Aetna Insurance Company. He was a man of considerable influence, and he worked tirelessly with city officials and the Connecticut Dental Association in celebrating the 50th anniversary of his father's contribution to medicine. This discovery is unique because events and individuals in 1 country, the United States, contributed entirely to the birth of a medical specialty. Sites in Jefferson, GA; Hartford, CT; and Boston, MA and their environs celebrate this most precious contribution to modern medicine, especially since the introduction of safe anesthesia permitted the development of surgical specialties and obstetrics. We trace the history and relationship between Horace Wells and several sites and artifacts in Hartford, CT. These sites span the most important, distinctive, and attractive parts of the city: Bushnell Park, Trinity College, Cedar Hill Cemetery, the Athenaeum, and the Connecticut Historical Society.

## 静脉注射一个剂量利多卡因对最小肺泡浓度七氟醚的影响：一个前瞻，随机，双盲，安慰剂对照试验

**The effect of a bolus dose of intravenous lidocaine on the minimum alveolar concentration of sevoflurane: a prospective, randomized, double-blinded, placebo-controlled trial.**

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**背景**：吸入麻醉药的药效通过最小肺泡浓度(MAC)来量化，是指 50%的患者在疼痛刺激时的肺泡浓度。吸入麻醉药抑制体动的机制尚未完全阐述，但有些药物会影响 MAC。在这个试验中，我们研究了单个剂量静脉注射的利多卡因对七氟醚 MAC 值的影响。

**方法**：我们用 Dixon"up-and-down"法来确定七氟醚的 MAC 值。入选行择期手术的患者，分成 3 组，每组 30 人，年龄 30 至 65 岁。3 组分别给予安慰剂，0.75mg/kg 利多卡因，1.5mg/kg 利多卡因。诱导后 15 分钟平衡期，然后应用试验药物，3 分钟后切皮，记录有无体动。

**结果**：安慰剂组 MAC 值 1.86% ± 0.40%，0.75mg/kg 利多卡因组 MAC 值 1.87% ± 0.45% (P = 1.00)。1.5mg/kg 利多卡因组 MAC 值 1.63% ± 0.24%( P = 0.022)，明显小于安慰剂组，七氟醚的平均浓度差 0.23%，95%CI 0.03-0.43。安慰剂组和 0.75mg/kg 利多卡因组两者之间没有显著差异，七氟醚的平均浓度差-0.01%，95%CI -0.27 to 0.25，P = 1.00。

**结论**：静脉注射 1.5mg/kg 利多卡因降低至少 0.03%七氟醚 MAC (平均浓度差 0.23%，95%CI 0.03-0.43)。我们没有观察到 0.75mg/kg 利多卡因有相似的效果。

(陈实玉译 薛张纲校)

**BACKGROUND:** The anesthetic effect of volatile anesthetics can be quantified by the minimum alveolar concentration (MAC) of the drug that prevents movement in response to a noxious stimulus in 50% of patients. The underlying mechanism regarding how immobilization is achieved by volatile anesthetics is not thoroughly understood, but several drugs affect MAC. In this study, we investigated the effect of a single IV bolus dose of lidocaine on the MAC of sevoflurane in humans.

**METHODS:** We determined the MAC for sevoflurane using the Dixon "up-and-down" method in 3 groups of patients, aged 30 to 65 years, who underwent elective surgery (30 patients per group). Study medication (placebo, 0.75 mg•kg(-1) lidocaine or 1.5 mg•kg(-1) lidocaine) was administered 3 minutes before skin incision after a 15-minute equilibration period and the response to skin incision was recorded (movement versus no movement).

**RESULTS:** MAC was 1.86% ± 0.40% in the placebo and 1.87% ± 0.45% in the 0.75 mg•kg(-1) lidocaine group (P = 1.00). MAC was 1.63% ± 0.24% in the 1.5 mg•kg(-1) lidocaine group, which was significantly lower than that of the placebo group (mean difference of 0.23% sevoflurane [95% adjusted confidence interval {CI}, 0.03-0.43]; P = 0.022). No significant difference was observed between the 0.75 mg•kg(-1) lidocaine and the placebo groups (mean difference of -0.01% sevoflurane [95% adjusted CI, -0.27 to 0.25]; P = 1).

**CONCLUSIONS:** IV 1.5 mg•kg(-1) lidocaine decreased the MAC by at least 0.03% sevoflurane (mean difference 0.23% sevoflurane [95% adjusted CI, 0.03-0.43]). We did not observe a significant reduction in the MAC of sevoflurane with the IV administration of 0.75 mg•kg(-1) lidocaine.

## 利多卡因基醇质体经皮给药的方式和评估

**Formulation and evaluation of lidocaine base ethosomes for transdermal delivery**.

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**背景：**尽管预先经皮给予局麻药被通常应用于减少皮肤手术导致的疼痛，由于角质层和较厚的表皮层的阻挡，这些预处理并不能有效地渗透表皮组织。基于醇质体的热力学稳定性，小分子，包裹率高以及其经皮渗透性，它可以有效地运送药物穿过皮肤。本研究评估了利多卡因基醇质体的体外负载剂量，包裹率，热力学稳定性以及经皮渗透性以及体内的效能以及皮肤刺激作用。

**方法：**利多卡因醇质体通过注射超声滤过法制得。其大小，负载效能，包裹率以及稳定性通过激光粒度仪和高效液相色谱法评估。剂型由正交试验中测得的最大包裹率决定。应用弗朗兹型扩散细胞实验分析其体外经皮渗透效率。应用针刺实验分析体内有效性。使用白色豚鼠进行皮肤刺激性试验，后进行组织病理学分析。该结果将会与利多卡因脂质体以及利多卡因乙醇溶液进行比较。

**结果：**利多卡因基醇质体由 5%鸡蛋磷脂酰胆碱，35%乙醇，0.2%胆固醇，5%利多卡因基，超纯水的平均最大包裹率为 51% ±4%，平均粒径为 31 ± 3 nm，平均负载效率 95.0% ± 0.1%。利多卡因基醇质体的包裹率在 25℃ ± 1℃ 情况下保持 60 天的稳定性（95%可信区间[CI]，-1.12% to 1.34%; P = 0.833）。三种基质利多卡因的皮肤渗透性有显著差异（F = 120, P < 0.001），醇质体显著高于脂质体（95%修正度，1129-1818 μg/(cm(2)•h); P < 0.001），醇质体也显著高于乙醇溶液（95%修正度，1468-2157 μg/(cm(2)•h); P < 0.001）。相较于利多卡因脂质体以及利多卡因乙醇溶液，利多卡因基醇质体在体内起效时间更快而且作用时间更长。没有证据显示利多卡因基醇质体对豚鼠表皮有刺激作用。

**结论：**醇质体是可以作为局麻药经皮给药的潜在的载体并可用于其它需要经皮快速起效的药物。

（陈婉南译 薛张纲校）

**BACKGROUND:** Although transdermal preparations of local anesthetics have been used to reduce pain caused by skin surgery, these preparations cannot effectively penetrate through the epidermis because of the barrier formed by the stratum corneum and the thick epidermis. Ethosomes can effectively transport drugs across the skin because of their thermodynamic stability, small size, high encapsulation efficiency, and percutaneous penetration. We evaluated lidocaine base ethosomes by measuring their loading efficiency, encapsulation efficiency, thermodynamic stability, and percutaneous penetration capability in vitro, and their effectiveness and cutaneous irritation in vivo.

**METHODS:** Lidocaine base ethosomes were prepared using the injection-sonication-filter method. Size, loading efficiency, encapsulation efficiency, and stability were evaluated using a Zetasizer and high performance liquid chromatography. Formulation was determined by measuring the maximum encapsulation efficiency in the orthogonal test. Percutaneous penetration efficiency in vitro was analyzed using a Franz-type diffusion cell experiment. In vivo effectiveness was analyzed using the pinprick test. Cutaneous irritancy tests were performed on white guinea pigs, followed by histopathologic analysis. The results were compared with lidocaine liposomes as well as lidocaine delivered in a hydroethanolic solution.

**RESULTS:** Lidocaine base ethosomes composed of 5% (w/w) egg phosphatidyl choline, 35% (w/w) ethanol, 0.2% (w/w) cholesterol, 5% (w/w) lidocaine base, and ultrapure water had a mean maximum encapsulation of 51% ± 4%, a mean particle size of 31 ± 3 nm, and a mean loading efficiency of 95.0% ± 0.1%. The encapsulation efficiency of lidocaine base ethosomes remained stable for 60 days at 25℃ ± 1℃ (95% confidence interval [CI], -1.12% to 1.34%; P = 0.833). The transdermal flux of lidocaine base differed significantly for the 3 preparations (F = 120, P < 0.001), being significantly greater from ethosomes than from liposomes (95% corrected CI, 1129-1818 μg/(cm(2)•h); P < 0.001), and from hydroethanolic solution (95% corrected CI, 1468-2157 μg/(cm(2)•h); P < 0.001). Lidocaine base ethosomes had a shorter onset time and longer

duration in vivo than did lidocaine base liposomes or lidocaine delivered in a hydroethanolic solution. Lidocaine base ethosomes showed no evidence of dermal irritation in guinea pigs.

**CONCLUSIONS:** Ethosomes are potential carriers of local anesthetics across the skin and may have applicability for other percutaneous drugs that require rapid onset.

## 在使用非去极化肌松药的全麻病人的恢复过程中，使用 AMG 和 EMG 的单侧比较。

## An Ipsilateral Comparison of Acceleromyography and Electromyography During Recovery from Nondepolarizing Neuromuscular Block Under General Anesthesia in Humans

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**背景**：残余肌松的定义是 MMG 或者 EMG 显示四个成串刺激比值小于 0.09,这在使用过去极化肌松药的病人中很常见。相对的神经肌肉监测是判断残余肌松唯一可以相信的指标。AMG 是临床上最经常使用并且使用方便的方式。但是，AMG 并不可以替代 MMG 或者 EMG。至今为止，排除残余肌松的 AMG TOF 值尚未明确。

**方法**：在神经肌肉阻滞自发恢复的过程中，我们在同一个手臂的尺侧内收肌上使用 AMG 测试 TOF 值，同时在第一背侧骨间肌使用 EMG。使用 Bland－Altman 分析法重复分析 AMG 和 EMG 的 TOF 值。两个工具的精确度都用可重复的系数评估。一个小的可重复系数代表仪器的高准确度。仪器的吻合度按照偏移和接近范围为 95%评估。小的偏移和狭窄的超出范围提示高度的吻合。我们定义了临床上 AMG 和 EMG 可以接受的吻合偏移小于 0.025,超出范围在－0.05 到 0.05 之间。这就保证了我们的 EMG 与其自己的控制性比较可以满足标准。

**结果**：在 26 个病人之间，做了 261 次 AMG 和 EMG 之间的比较。AMG 与 EMG 之间的可重复系数为 0.094 和相对的 0.051。AMG 和 EMG 的 TOF 值之间的偏移为 0.176,同时的吻合范围是－0.045 到 0.396。

**总结**：AMG 没有 EMG 精确，且会超出 EMG 的 TOF 值至少 0.15。这个结果未达成一致不能归结于试验的不准确或者判断成功的基线不同。当 AMG 值达到 1.0 时，不能排除残余肌松。

（蒋鑫梅译 薛张纲校）

**BACKGROUND:** Residual neuromuscular block is defined as a mechanomyography (MMG) or electromyography (EMG) train-of-four (TOF) ratio <0.90, and is common in patients receiving neuromuscular blocking drugs. Objective neuromuscular monitoring is the only reliable way to detect and exclude residual neuromuscular block. Acceleromyography (AMG) is commercially available and easy to use in the clinical setting. However, AMG is not interchangeable with MMG or EMG. Currently, it is unclear what value must be reached by AMG TOF ratio to reliably exclude residual neuromuscular block.

**METHODS:** During spontaneous recovery from neuromuscular block, we monitored TOF ratio on the same arm using AMG at the adductor pollicis and EMG at the first dorsal interosseus. AMG and EMG TOF ratios were compared by the Bland–Altman analysis for repeated measurements. The precision of each device was assessed by the repeatability coefficient. A small repeatability coefficient indicates high precision of the device. The agreement between the

devices was assessed by the bias and the 95% limits of agreement. Small bias and narrow limits of agreement indicate strong agreement. We defined clinically acceptable agreement between AMG and EMG as a bias <0.025 and limits of agreement within −0.050 to 0.050, provided that the control comparison between EMG and itself can fulfill these criteria.

**RESULTS:** In 26 patients, 261 comparisons between AMG and EMG were made. The repeatability coefficient of AMG and EMG were 0.094 (95% confidence interval [CI], 0.088–0.100) and 0.051 (95% CI, 0.048–0.055), respectively. The bias between AMG and EMG TOF ratio was 0.176 (95% CI, 0.162–0.190), with limits of agreement −0.045 to 0.396 (95% CI, −0.067 to 0.419).

**CONCLUSIONS:** AMG is less precise than EMG and overestimates EMG TOF ratio by at least 0.15. The lack of agreement cannot be attributed to instrumental imprecision or the baseline difference between successive measurements during spontaneous recovery of neuromuscular function. Residual neuromuscular block cannot be excluded on reaching an AMG TOF ratio of 1.00.

## 非心脏手术后高氯血症与发病率和死亡率增高独立相关：一项倾向匹配队列研究

**Hyperchloremia after noncardiac surgery is independently associated with increased morbidity and mortality: a propensity-matched cohort study**

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**背景：**生理盐水的使用与高氯性代谢性酸中毒有关。这项研究调查了术后急性高氯血症（血氯>110 mEq/L）的发生率以及此种电解质紊乱是否与住院时间延长，发病率或术后 30 天的死亡率增加有关。

**方法：**本研究回顾性收集了 2003 年 1 月 1 日至 2008 年 12 月 31 日期间接受非心脏、非外科移植手术的成年（>18 岁）住院患者的数据。术后高氯血症对患者发病率和住院天数的影响使用倾向匹配和 Logistic 多变量分析进行研究。

**结果：**该数据集包括了 22,851 例术前血清氯离子浓度和肾功能正常的手术患者。急性术后高氯血症（血氯>110 mmol/L）的发生率为 22%。根据患者发生术后急性高氯血症的可能性进行了倾向性匹配。在术后发生高氯血症的 4955 例患者中，4266 例（85%）与术后血清氯水平正常的患者相匹配。除此之外所有收集的变量在两组之间均平衡一致。高血氯组术后 30 天的死亡风险增加（3.0%vs1.9%，比值比= 1.58，95%可信区间 1.25-1.98）（相对危险度 1.6 或风险增加 1.1%），并且同术后血清氯化物含量正常的患者相比有更长的住院时间（7.0 天[四分位距 4.1-12.3] vs 6.3 天[四分位距 4.0-11.3]）。术后高氯血症的患者更易出现术后肾功能不全。使用所有术前变量和测量的结果变量进行 Logistic 回归分析，高氯血症仍为术后 30 天死亡率增加的独立预测因素（比值比为 2.05，95%可信区间为 1.62-2.59）。

**结论：**本项回顾性队列研究提示高氯血症与术后预后不良之间存在联系。需要更多的研究来证明这些变量之间的因果关系。

(凌晓敏译 薛张纲校）

**BACKGROUND:**The use of normal saline is associated with hyperchloremic metabolic acidosis. In this study, we sought to determine the incidence of acute postoperative

hyperchloremia (serum chloride >110 mEq/L) and whether this electrolyte disturbance is associated with an increase in length of hospital stay, morbidity, or 30-day postoperative mortality.

**METHODS:**Data were retrospectively collected on consecutive adult patients (>18 years of age) who underwent inpatient, noncardiac, nontransplant surgery between January 1, 2003 and December 31, 2008. The impact of postoperative hyperchloremia on patient morbidity and length of hospital stay was examined using propensity-matched and logistic multivariable analysis.

**RESULTS:**The dataset consisted of 22,851 surgical patients with normal preoperative serum chloride concentration and renal function. Acute postoperative hyperchloremia (serum chloride >110 mmol/L) is quite common, with an incidence of 22%. Patients were propensity-matched based on their likelihood to develop acute postoperative hyperchloremia. Of the 4955 patients with hyperchloremia after surgery, 4266 (85%) patients were matched to patients who had normal serum chloride levels after surgery. These 2 groups were well balanced with respect to all variables collected. The hyperchloremic group was at increased risk of mortality at 30 days postoperatively (3.0% vs 1.9%; odds ratio = 1.58; 95% confidence interval, 1.25-1.98) (relative risk 1.6 or risk increase of 1.1%) and had a longer hospital stay (7.0 days [interquartile range 4.1-12.3] compared with 6.3 [interquartile range 4.0-11.3]) than patients with normal postoperative serum chloride levels. Patients with postoperative hyperchloremia were more likely to have postoperative renal dysfunction. Using all preoperative variables and measured outcome variables in a logistic regression analysis, hyperchloremia remained an independent predictor of 30-day mortality with an odds ratio of 2.05 (95% confidence interval, 1.62-2.59).

**CONCLUSION:**This retrospective cohort trial demonstrates an association between hyperchloremia and poor postoperative outcome. Additional studies are required to demonstrate a causal relationship between these variables.

## 先天性心脏病患儿应用心导管检查及术后急性肾功能不全

**Cardiac catheterization and postoperative acute kidney failure in congenital heart pediatric patients.**

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**背景：**急性肾功能（ARF）不全是儿科病人心脏手术后的严重并发症。血管造影使用的造影剂是 ARF 的危险因素。在我们的研究中，我们研究了患儿行心脏手术后 ARF 的发生率与血管造影剂的使用时间、剂量的关系。

**方法：**我们采用回顾性研究的方法。我们收集了 277 名年龄小于 12 岁的患儿血管造影方面的数据及其它协变量的信息，他们接受血管造影检查与心脏手术间隔时间相同。评价肾功能分为损伤、不全、功能丧失、终末期肾病。

**结果：**64%的患者术后肾功能不全的情况相似，55 名（20%）患者出现 ARF（终末期肾病）。相比于其他患者 ARF 的患者 (2.8 ± 2.2 g/kg)，ARF 患者接受较大剂量的碘造影剂 (4.6 ± 2.6 g/kg) (P < 0.001)，每增加 1 g/kg 剂量的碘剂，ARF 的风险增加 31%。多因素模型提示，年龄小于 2 岁的患儿 ARF 的风险增加 20 倍，术后低心排患者 ARF 的风险增加 3

倍。在这个模型中，血管造影时使用的碘剂是 ARF 的独立危险因子，每增加 1 g/kg 剂量的碘剂，ARF 的风险增加 16%。

**结论：**患儿心脏手术前血管造影检查室 ARF 的重要危险因子。危险因子分层示除了一些危险因素（如年龄、术后低心排），造影剂剂量应限制在最小范围，避免大剂量使用碘剂是术后 ARF 的决定因素。

（刘毅译 薛张纲校）

**BACKGROUND:** Acute renal failure (ARF) is a severe complication of cardiac operations in pediatric patients. Angiography with the exposure to contrast media is a risk factor for ARF. In the present study, we explored the association between timing of angiography, dose of contrast media, and the incidence of ARF after cardiac operations in pediatric patients.

**METHODS:** We performed a retrospective analysis of prospectively collected data. Angiographic data and other covariates were collected in 277 patients aged ≤12 years receiving angiography and cardiac operations during the same hospital stay. Renal outcome was assessed according to the pediatric Risk, Injury, Failure, Loss of function, End stage score (pRIFLE).

**RESULTS:** One hundred seventy-seven (64%) patients suffered some degree of postoperative renal dysfunction, and 55 (20%) had ARF (pRIFLE stage Failure). Patients with ARF received a significantly ($P < 0.001$) larger dose of iodine contrast media (4.6 ± 2.6 g/kg) with respect to the other patients (2.8 ± 2.2 g/kg), with a relative risk increase for ARF of 31% per each incremental iodine dose of 1 g/kg at the univariate analysis. A multivariable risk model demonstrated that the risk for ARF is 20 times higher in patients aged younger than 2 years and 3 times higher in case of postoperative low cardiac output. Within this model, the iodine dose on angiography is confirmed as an independent risk factor for ARF, with a relative risk increase for ARF of 16% per each incremental iodine dose of 1 g/kg.

**CONCLUSIONS:** Angiography before cardiac surgery is an important risk factor for ARF in pediatric patients. Being a modifiable risk factor, the contrast media dose should be limited to the lowest possible value, avoiding large doses of iodine which, together with other factors (age and postoperative low cardiac output), concur in the determinism of postoperative ARF.

## 综述：在癫痫手术时，术中皮层脑电图的麻醉考虑。

**Review article: the anesthetic considerations of intraoperative electrocorticography during epilepsy surgery.**

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**摘要：**癫痫手术是一种行之有效的治疗难治性癫痫的手术。癫痫手术的成功取决于准确的定位致痫灶并彻底清除。尽管术前定位方式有了很大的进步，在美国北部的癫痫中心仍然约 60%-70%依靠脑电图指导癫痫外科手术切除病灶并评估病灶是否切除完整。在这篇综述中，我们讨论在术中运用皮层脑电图的原理和麻醉药物对脑电图的影响，并利用麻醉药的药代学为术中的的致痫区定位。

（徐峥译 薛张纲校）

Epilepsy surgery is a well-established therapeutic intervention for patients with medically refractory seizures. Success of epilepsy surgery depends on the accurate localization and complete removal of the epileptogenic zone. Despite the advances in presurgical localization

modalities, electrocardiography is still used in approximately 60% to 70% of the epilepsy centers in North America to guide surgical resection of the epileptogenic lesion and to assess for completeness of surgery. In this review, we discuss the principles and intraoperative use of electrocorticography, the effect of anesthetic drugs on electrocorticography, and the use of pharmacoactivation for intraoperative localization of epileptogenic zone.

## 布比卡因，罗哌卡因，甲哌卡因对人体软骨细胞和软骨的细胞毒性。

**The cytotoxicity of bupivacaine, ropivacaine, and mepivacaine on human chondrocytes and cartilage.**

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**背景：**关节内注射局部麻醉剂经常用作为联合镇痛的一部分。然而，最近的数据表明，局麻药可能影响软骨细胞的活性。在这项研究中，我们评估了甲哌卡因，罗哌卡因，布比卡因的药物毒性作用。我们假设，特定的细胞毒性效力直接作用在完整的软骨的镇痛效力，其细胞毒作用比在骨关节炎的组织是不同的。

**方法：**将等效浓度布比卡因，罗哌卡因，甲哌卡因浸润注射人体关节软骨各 1 小时。确定在预定的时间点，使用流式细胞仪、活死细胞染色试剂盒和细胞凋亡蛋白酶检测细胞活力，来判定细胞凋亡和坏死。对完好无损和骨关节炎软骨外植体用等效浓度的命名药物应用荧光显微镜，以确定细胞存活率。

**结果：**毒性效果随着罗哌卡因甲哌卡因布比卡因时间依赖性和浓度依赖性增加。与对照组相比，1 小时内 0.5％布比卡因软骨细胞活力下降至 78％±9％（P =0.0183），16％±10％（P<0.0001），24 小时后，由单层培养的活死染色。存活率降低到 80％±7％（P=0.0475）1 小时，80％±10％（P =0.0095）处理 24 小时后用 0.75％罗哌卡因。暴露在甲哌卡因 2％中，24 小时后存活的细胞，分别得到 36％±6％，1 小时后和 30％±11％（P <0.0001）（P <0.0001）。罗哌卡因治疗比布比卡因（P=0.0006）和甲哌卡因（P= 0.0059）。流式细胞仪没有揭示浓度高达 0.25％的布比卡因，罗哌卡因，0.5％和 0.5％甲哌卡因存在明显药物毒性。然而，chondrotoxicity 没有相关的局部麻醉药效力。细胞死亡主要是由于细胞凋亡坏死。细胞死亡率均明显高于骨性关节炎较完好的软骨后，甲哌卡因布比卡因和罗哌卡因治疗顺序递减。

**结论：**布比卡因，罗哌卡因，甲哌卡因的毒性取决于时间依赖性，浓度依赖性，药物依赖的方式。 药物毒性和镇痛效力不直接相关。经过局部麻醉剂治疗后，细胞死亡率均高于骨关节炎较完整软骨。

（徐升译 薛张纲校）

**BACKGROUND:**Intraarticular injections of local anesthetics are frequently used as part of multimodal pain regimens. However, recent data suggest that local anesthetics affect chondrocyte viability. In this study, we assessed the chondrotoxic effects of mepivacaine, ropivacaine, and bupivacaine. We hypothesized that specific cytotoxic potencies directly correlate with analgesic potencies, and that cytotoxic effects in intact cartilage are different than in osteoarthngritic tissue.

**METHODS:**Human articular chondrocytes were exposed to equal and equipotent concentrations of bupivacaine, ropivacaine, and mepivacaine for 1 hour. Cell viability, apoptosis, and necrosis were determined at predefined time points using flow cytometry, live-dead staining, and caspase detection. Intact and osteoarthritic human cartilage explants were treated with equipotent concentrations of named drugs to determine cell viability applying fluorescence microscopy.

**RESULTS:** Chondrotoxic effects increased from ropivacaine to mepivacaine to bupivacaine in a time-dependent and concentration-dependent manner. Compared with control, bupivacaine 0.5% decreased chondrocyte viability to 78% ± 9% ($P = 0.0183$) 1 hour and 16% ± 10% ($P < 0.0001$) 24 hours later, as determined by live-dead staining in monolayer cultures. Viability rates were reduced to 80% ± 7% ($P = 0.0475$) 1 hour and 80% ± 10% ($P = 0.0095$) 24 hours after treatment with ropivacaine 0.75%. After exposure to mepivacaine 2%, viable cells were scored 36% ± 6% ($P < 0.0001$) after 1 hour and 30% ± 11% ($P < 0.0001$) after 24 hours. Ropivacaine treatment was less chondrotoxic than bupivacaine ($P = 0.0006$) and mepivacaine exposure ($P = 0.0059$). Exposure to concentrations up to 0.25% of bupivacaine, 0.5% of ropivacaine, and 0.5% of mepivacaine did not reveal significant chondrotoxicity in flow cytometry. However, chondrotoxicity did not correlate with potency of local anesthetics. Immediate cell death was mainly due to necrosis followed by apoptosis. Cellular death rates were clearly higher in osteoarthritic compared with intact cartilage after bupivacaine, mepivacaine, and ropivacaine treatment in a decreasing order.

**CONCLUSION:**Bupivacaine, ropivacaine, and mepivacaine are chondrotoxic in a time-dependent, concentration-dependent, and drug-dependent manner. Chondrotoxic and analgesic potencies do not directly correlate. Cellular death rates were higher in osteoarthritic compared with intact cartilage after local anesthetic treatment.