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出血性大手術期間實驗室凝血檢查和凝血因數水準對旋轉式血栓彈力測定（ROTEM）的影響

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：此項研究目的是確定對於經歷出血的大手術患者，標準實驗室檢查或凝血因數濃度與旋轉式血栓彈力測定法（ROTEM® delta, TEM 國際有限公司，慕尼克，德國）之間的關聯性。

方法：在術中分別測定 45 名患者的纖維蛋白原、凝血因數 VIII、凝血因數 XIII、國際標準化比值（INR）、活化部分凝血酶時間（APTT）、凝血酶原時間、血紅蛋白、粒細胞和血小板計數指標，同時測定 ROTEM(EXTEM，INTEM, FIBTEM ，APTEM)法參數。ROTEM 參數爲：凝血時間（CT）, 血凝塊形成時間（CFT），最大凝塊硬度（MCF）和 α 角。人口統計學和實驗資料表示爲平均值±標準差和中位數[範圍]；進行非參數 Spearman 秩相關和多元線性回歸分析；P 值≤0.003 被認爲差異顯著。

結果：在 EXTEM、INTEM、APTEM 中的 CFT、α 角和 MCF 與血小板、INR 和纖維蛋白原有顯著相關性。凝血因數 VIII（18 次測量）表現出與 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）有顯著的相關性，並且與 APTEM 中的 α 角有顯著相關性, 與 APTEM 中的 CFT 和 MCF 有中度相關性（r≥0.7 或 r≤-0.7; 所有 P 值均≤0.003）。研究發現凝血因數 VIII 與 EXTEM、INTEM、FIBTEM 和 APTEM 中的 MCF 有著中度至顯著的相關性。血紅蛋白與 APTEM 中的 MCF(P＝0.003)呈中度相關（r=0.3 到 0.7 或 r=-0.3 到-0.7）。研究還發現標準凝血試驗與所有 ROTEM 參數，尤其是 CT 值，均有中強度的顯著相關性。APTT 與 INTEM 中的 CT、CFT、α 角和 MCF 有中強度的顯著相關性。然而除了 APTEM 中的 MCF，多元線性回歸不能顯示 INR 對 ROTEM 各參數的影響。 APTT 對 INTEM-CT 有顯著影響。纖維蛋白原和血小板對 EXTEM、INTEM 以及 APTEM 有顯著影響。

結論：這些結果可證實以下臨床假設：EXTEM、INTEM、APTEM 與纖維蛋白原和血小板水準相關；INTEM 中的 CT 值與 APTT 顯著相關；FIBTEM 與纖維蛋白原顯著相關。除了 EXTEM、INTEM 、FIBTEM 中的 CT 以及 APTEM 中的 CFT 和 MCF，凝血因數 VIII 與所有的 ROTEM 參數顯著相關。

（王苑　譯　陳傑　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.

在缺乏監測情況下使用 Sugammadex 逆轉不能排除殘餘肌松

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

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背景：在日本，常規臨床監護通常不涉及使用監測儀來指導肌松藥或其拮抗劑的使用。雖然很多先前報告表明，sugammadex 能對羅庫溴銨引發的肌松效應進行更快、更可靠地拮抗，這種優勢在無肌松監測的臨床條件下未經證實。此項多中心觀察性研究試圖確定：當沒有肌松監測指導羅庫溴銨和拮抗劑使用時，與新斯的明相比，sugammadex 是否能降低術後無力狀態的發生率。

方法：此項研究在將 sugammadex 引入日本的臨床實踐的前後各 5 個月期間進行。五個大學附屬教學醫院參與研究。第一階段使用新斯的明來拮抗羅庫溴銨誘導的神經肌肉阻滯，第二階段則使用 sugammadex。在不使用肌松監測儀情況下，由主治麻醉醫師決定羅庫溴銨、新斯的明、sugammadex 的給藥時間與劑量。爲了確定術後殘餘無力的發生率，在氣管拔管後使用加速度法測定 4 個成串反應的比值（TOFR）。由於參與研究單位的工作常

規通常不涉及加速度測量反應的校準和標準化，TOFR<0.9 和 TOFR<1.0 定義爲術後殘餘肌松的標準。

結果：第一階段共 109 例患者接受新斯的明（平均劑量 33μg／kg）給藥，23 例患者由於被認爲（由臨床標準決定）恢復足夠故並未進行拮抗（自然恢復組）。在第二階段，作爲對羅庫溴銨誘導的拮抗，117 例患者接受 sugammadex（平均劑量爲 2.7mg/kg）給藥。在自然恢復、使用新斯的明和使用 sugammadex 後 TOFR＜0.9 的發生率（95%置信區間）分別爲 13%（2.8%–33.6%）、23.9%（16.2%–33%）和 4.3%（1.7%–9.4%）。而三組 TOFR＜1.0 的發生率（95%置信區間）分別是 69.6%（47.1%–86.6%）、67%（57.3%–75.7%）和 46.2%（36.9%–55.6%）。在新斯的明組中七氟醚的使用、最後一次羅庫溴銨給藥和 sugammadex 給藥之間較短的時間隔間與術後殘餘無力的較高發生率有關。

結論：這項研究表明，在臨床未使用肌松監測（客觀或主觀）的情況下，氣管拔管後使用 sugammadex，其 TOFR<0.9 的風險仍高達 9.4%。此發現強調：即使應用 sugammadex 來拮抗羅庫溴銨誘導的神經肌肉阻滯，肌松監測仍然重要。

（孫莉荔　譯　陳傑　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.

前負荷改變前後使用 Nexfin 進行無創連續心輸出量測定：與間歇熱稀釋法心輸出量測定的比較

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 使用一種未校準的脈搏波形方法來連續測定心輸出量(CO)，它是完全無創。由於脈搏波形方法和其感知 CO 變化的能力被一再質疑，本研究將心臟外科手術中前負荷處理前後 Nexfin 測量的 CO(NAPCO)與肺動脈導管測量的 CO 作比較。

方法: 對共 28 例接受體外迴圈下心臟手術,其中 18 例接受血管加壓素和/或強心藥物治療的患者在術後若干小時內進行研究。根據臨床需要，通過給予補液或下肢被動抬高的形式改變前負荷，在每項干預措施前後同時進行 PACCO 和 NAPCO 的測量。

結果：22 例患者接受液體負荷，6 例患者接受下肢被動抬高處理。這些干預在 19 名患者中進行重複，共收集 47 例配對測量資料。基線時，PACCO 和 NAPCO 得到 CO 的平均值（±平均差）分別爲 4.9±1.1 和 5.0±1.4 L•min-1，偏倚爲 0.1±1.0，95%預測區間−2.5—2.4 L•min−1，誤差爲 39%。前負荷改變後，兩方法得到的 CO 平均值分別爲 5.6±1.3 和 5.6±1.5 L•min-1，偏倚爲-0.0±1.1，95%預測區間−2.6—2.7 L•min−1，誤差爲 38%。前負荷改變先後 PACCO 和 NAPCO 之間的相關係數（r）分別爲 0.71（95%置信區間[95%CI]，0.53—0.82）和 0.70（95%CI，0.52—0.82）。前負荷改變對 PACCO 和 NAPCO 引起了相似的絕對值變化 (r = 0.9,P < 0.0001)。四個象限散點圖顯示 PACCO 和 NAPCO 之間變化一致率爲 100%(95%CI,80.5% -100%)。極座標圖分析顯示一個小的極角和協議的徑向一致性界限遠低於 30°基準。作爲評估 Nexfin 感知 PACCO 增加≥15%的能力的指標，ROC 爲 0.974(95% CI,0.93 —0.99)。

結論：與肺動脈導管相比儘管 Nexfin 精度有限，但它能可靠地感知對心臟手術後穩定患者使用中等劑量血管加壓素和強心藥物治療，前負荷改變引起的 CO 變化。此能力結合其完全無創、易於放置、便捷使用的特點使 Nexfin 適用於圍手術期連續 CO 的監測。而當外周阻力發生顯著改變時此項儀器是否能可靠感知 CO 變化仍需進一步研究。

（孫曉瓊　譯　陳傑　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.

患者保溫產生的餘熱對矯形外科手術室空氣流通模式的影響

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

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背景：基於在普外科手術中應用的得益，使用患者保溫裝置已成爲預防術中意外低體溫發生的一項標準監護。然而，這些收益可能無法在易感染手術（例如移植手術）中完全實現，由於患者保溫裝置釋放的餘熱可能擾亂預期的從天花板到地面的氣流流通模式並使外科手術區域遭受額外污染。因此本實驗研究在矯形外科手術室中，對一個模擬接受全膝置換手術鋪巾方式的人體模型採取兩項流行的患者保溫技術，暖風機和加溫毯，與對照環境比較空氣流通模式的差異。

方法：通過在麻醉鋪巾頭側的無菌區域釋放中性懸浮洗滌劑氣泡（“氣泡”）來評估空氣流通模式。然後監測對人體模型上半身進行加熱產生的餘熱是否會導致“氣泡”進入手術野。形式上，採取隨機化、可重複設計來評估設備（暖風機，加溫毯，對照）和麻醉鋪巾高度（低，高）對手術野上方拍攝到的“氣泡”數量的影響。

結果：直接的大量漂浮氣流從暖風機中排出，形成熱對流氣流，並使氣泡越過麻醉鋪巾上方進入手術野，由於患者加溫裝置的因素導致“氣泡”計數有明顯增加（P<0.001）。在各鋪巾高度情況下，暖風機組平均“氣泡”計數爲 132.5，而加溫毯組爲 0.48（P=0.003），而對照組爲 0.01（P=0.008）在所有高度。在各鋪巾高度情況下，加溫毯組與對照組間的平均“氣泡”計數的差異忽略不計（P=0.87）鋪巾高度對”氣泡”計數無明顯影響（P=0.94）

結論：暖風機加溫裝置產生的餘熱可導致手術區域空氣流通模式的破壞，然而傳導加溫裝置對空氣流通沒有顯著影響，這個發現推動了將來研究暖風機餘熱對易感染手術臨床預後的影響。

（詹愷誕　譯　陳傑　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 評分與高風險腹腔手術後 ICU 入住率密切相關

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

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背景：瞭解 ICU（重症監護病房）對高危手術病人選擇策略可能最終促進資源配置和提高療效。外科 Apgar 評分（SAS）是一個簡單的評分，它採用術中血流動力學和血液丟失資訊來預測術後併發症發生率和死亡率，得分較低則預後更壞。本研究推測 SAS 與術後患者是否進入 ICU 的決策相關。

方法：在一個教學醫療中心進行一項回顧性佇列研究，物件是從 2003 年至 2010 年進行重大腹腔手術的成年人。根據每個病人術中的心率、平均動脈壓和估計失血量計算出 SAS（0-10）。採用 Logistic 回歸分析評估 SAS 與病人術後直接進入 ICU 決定的相關性。

結果：研究物件包括 8501 例患者，其中 72.7%的患者的 SAS 是 7-10 分,少於 5%患者的 SAS 是 0-4 分。其中 8.7%的病人術畢立即轉入 ICU。多因素校正後，SAS 和接納病人進 ICU 的決定有較強的相關性。（與 SAS7-8 的病人相比較，SAS0-2 的病人，校正後比值比 14.1[95%的可信區間 6.88-30.19，p<0.001]；SAS3-4 的病人，校正後比值比 4.42[95%的可信區間 3.19-6.13，p<0.001]；SAS5-6 的病人，校正後比值比 2.08[95%的可信區間 2.08-3.24，p<0.001]）。

結論：SAS 與高風險腹腔手術病人術後是否立即轉入 ICU 的臨床決定密切相關。這些結果有利於初步理解術中血流動力學變化和血液丟失是否影響術後病人的 ICU 收治。

（鄭華容　譯　陳傑　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.

全麻後早期診斷譫妄的老年患者的預後

Outcomes of Early Delirium Diagnosis After General Anesthesia in the Elderly

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背景：老年患者外科手術後譫妄與不良臨床預後顯著相關。此項研究評估全麻後早期診斷譫妄的老年患者的患病率和住院期間的預後。

方法：對 2010 年 7 月至 8 月之前，年齡在 70 歲及以上，講英語的外科手術患者進行連續入組。每名物件在麻醉後蘇醒室（PACU）中按《診斷與統計手冊：精神障礙 IV（DSM-IV) -譫妄的診斷》的診斷標準評估，並在之後的住院期間多次進行評估。從術前測試及出院方式來看，PACU 期間譫妄被作爲一項與術前測試和出院確認時認知功能改變無關的疾病來評估。

結果：91 名患者（58%爲女性），其中 78%在術前獨立生活，在 PACU 中譫妄的患病率爲 45%。在隨後住院期間發生的譫妄有 74%患者始于 PACU。早期譫妄與術前測試得出的認知功能受損（如用詞種類及流暢性的減少）非相關（T 評分變化的校正後差異[95%可信區間]: −6.02 [−10.58 至 −1.45]; P = 0.01)。術後第一天譫妄消除的患者，表現出陰性的預後，其嚴重程度介於那些住院期間從未有譫妄發作與那些在 PACU 發生譫妄並持續到轉入病房後的患者之間（三組出院時校正後概率分別爲[95%可信區間]3% [0%–10%], 26% [1%–51%], 39% [0%–81%] ）。

結論：PACU 期間譫妄常見但不普遍，與隨後在病房發生的譫妄有關，並可能伴有認知功能的減退並增加出院後入住康復機構的幾率。

（諸琳婕　譯　陳傑　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.

根治性胃切除術後肋下腹橫肌平面阻滯與胸段硬膜外和靜脈阿片類藥物給予鎮痛效應的比較

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) 阻滞已經被證實在下腹部手術中可提供有效的術後鎮痛，肋下 TAP 阻滞也已同樣被證明是一種對於臍以上腹部提供鎮痛作用的新技術。本文比較單次肋下 TAP 阻滞與持續胸段硬膜外、靜脈阿片類藥物給予的鎮痛效應的差異。

方法: 90 例擇期行根治性胃切除術的病人隨機分爲三組：接受全麻聯合肋下 TAP 阻滞（TAP 組）、全麻聯合硬膜外麻醉（EA 組）或全麻（GA 組）。在 TAP 組，全麻誘導後以 0.375%羅呱卡因行雙側肋下 TAP 阻滞。在 EA 組，全麻誘導前 T8、T9 水平行硬膜外置管，給予 8ml0.25%羅呱卡因作爲負荷劑量。術中硬膜外維持量爲 0.25%羅呱卡因 5ml/h。GA 組接受標準的全身麻醉。在復蘇室, 所有組在 VAS>3 時接受靜脈嗎啡。所有病人在 PACU 開始接受含有嗎啡的靜脈病人自控鎮痛，而 EA 組爲 0.125%布比卡因 5ml/h 的硬膜外鎮痛， 在 PACU,術後 1,3,6,24,48 和 72h 對病人進行疼痛評估，主要預後指標爲 24h 內嗎啡消耗量和所有 VAS 疼痛評分。

結果: 90 例中有 82 例患者納入了研究(91.1%) 。TAP 組顯示 24h 累計嗎啡消耗量減少 (98.75% 可信區間, −29 to −9 mg) 且所有時點 VAS 疼痛評分均非劣于進行標準阿片藥鎮痛的 GA 組，而 EA 組在減少 24h 嗎啡累計用量方面優於 TAP 組(98.75% 可信區間, −23 to −4 mg)，並且在所有時點 VAS 評分均非劣於 TAP 組。TAP 組在進入 PACU 到術後 6h 之間嗎啡使用量少於 GA 組，但在術後 6h 到 24h 之間的嗎啡使用量高於 EA 組。

結論:單次肋下 TAP 阻滞比靜脈阿片類鎮痛藥有效,而持續胸段硬膜外鎮痛比單次肋下 TAP 阻滞更有效。

（瞿亦楓　譯　陳傑　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.

關於冠狀動脈搭橋或脊柱手術患者術前服糖的研究

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

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研究背景：手術應激引發的胰島素抵抗反應可能導致高血糖症，並由此誘發術後併發症。手術前給患者口服糖類可能改善病人對胰島素的敏感性，並減少高血糖症。本研究探討了給冠狀動脈搭橋手術和椎管減壓消融手術病人補充糖類對於患者胰島素抵抗反應的影響。

方法：26 個冠狀動脈搭橋手術病人和 12 個脊柱手術病人，隨機分兩組：CHO 組爲術前一晚口服 800mL、術前 2 小時口服 400mL 糖；FAST 組爲按照標準的醫院方案執行禁食。採用胰島素短時耐受實驗和體內平衡模型評估（HOMA）對病人的胰島素敏感度的基礎值和術後值進行評估。分別記錄術前和術後 24 小時、48 小時、72 小時時的白細胞介素-6、C 反應蛋白和游離脂肪酸水準；測得脂聯素的基礎值。在手術前即刻測量病人的良好自我感覺，並記錄術中及術後的預後。

結果：無論是短時胰島素耐受實驗，還是體內平衡模型評估（HOMA），FAST 和 CHO 兩組的術後胰島素敏感度並無明顯區別。短時胰島素耐受實驗結果爲：血糖消失速度爲 0.29%/分鐘比 0.38%/分鐘，差異的 99%置信區間，-0.17～0.32，P=0.41；HOMA 結果爲：值大於 1 時的胰島素耐受值:2.3 比 3.3，差異 99%置信區間，-0.8～2.8，P=0.14。CHO 組術後迴圈血糖水準 6.2mmol/L，比 FAST 組 6.9mmol/L 有降低趨勢（差異的 99%置信區間，-1.7～0.25，P=0.05）;而 CHO 組由 HOMA-β 測得的術後 β 細胞功能 (值<100%時的損壞 β 細胞功能)87% 比 FAST 組的 47.5%有增高趨勢（99%置信區間下，-9.4～88.4）。但這些差異並不顯著。兩組的脂聯素水準在基線上並無差異；游離脂肪酸水準、白細胞介素-6 及 C 反應蛋白不受處理影響。

結論：術前服糖並不提高術後胰島素敏感度。但是，本研究所觀察到的術後血糖水準、β 細胞功能及繼發性的預後需要進一步的研究以重新評估手術患者的傳統禁食措施。

（趙曉 譯 馬皓琳 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.

對雷莫司瓊預防術後噁心嘔吐效用的再評價：系統回顧和 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 分析結果顯示，雷莫司瓊對術後噁心嘔吐（PONV）有很好的預防作用。然而，這些先前的 meta 分析包括 Fujii 等的很多研究，而 Fujii 等的很多研究現在已被證實是捏造的。本次 meta 分析在除外 Fujii 等人的隨機對照試驗之後，再次對雷莫司瓊預防術後 PONV 的效用進行評估。

方法：我們檢索了 Medline、Cochrane、對照臨床試驗的中央寄存器（CENTRAL）、Embase 和科學網。選取所有與安慰劑或者作爲對照的其他藥物作對比來檢驗雷莫司瓊對 PONV 預防作用的雙盲隨機對照試驗。手術後的第一個 24h 被劃分爲早期（0-6 小時）和晚期（6-24 小時）兩個時間段，並分別收集相關資料。

結果：總共有 1372 名患者進行了最終分析。與安慰劑相比，雷莫司瓊降低術後早期噁心（PON）（相對危險度[RR][95%置信區間]0.59[0.47-0.73]:需要治療的例數[NNT][95%置信區間]6.0 [4.3–9.7]）、術後晚期 PON（RR 0.65 [0.49–0.85]: NNT 7.2 [4.6–16.6]）、早期術後嘔吐（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])的發生率。與昂丹司瓊相比，雷莫司瓊能降低早期 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]) 發生率，而不降低 PON 的發生率。

結論:與安慰劑相比，雷莫司瓊對預防 PONV 有重要的意義，但不如之前報導分析的結果明顯。與昂丹司瓊相比，雷莫司瓊在預防早期和晚期 POV 上也有統計學意義，但是由於 NNTs 多，其臨床意義可能尚有質疑。

（董靜 譯 馬皓琳 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.

丙泊酚通過減少對 γ-氨基丁酸（GABA）能神經元的抑制來刺激腹外側視前核中的去甲腎上腺素抑制性神經元

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

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背景：全身麻醉藥鎮靜作用的細胞機制仍然不完全清楚。越來越多的證據表明下丘腦腹外側視前區（VLPO）起著關鍵的作用。VLPO 包含兩類神經元：去甲腎上腺素抑制性 GABA 能投射性神經元（NA(−) 神經元）和同樣可能包含 GABA 神經元的去甲腎上腺素

興奮性中間神經元（NA(+) 神經元)。我們之前的工作表明正常情況下 NA(−) 神經元是處於 NA(+)神經元的抑制性調控。先前的研究同樣表明通過對 GABA 能神經元起作用的試劑如丙泊酚啓動 VLPO 的 GABA 能投射性神經元，從而產生對結節乳頭核上的覺醒產生核的抑制和鎮靜作用。然而丙泊酚如何啓動 VLPO 神經元仍然不清楚。我們研究了丙泊酚通過抑制包括來自於 VLPO NA(+) 神經元的 GABA 能神經傳遞間接啓動 NA(−) 神經元的可能性。

方法：記錄大鼠急性腦片中的 VLPO 細胞的電生理活動。

結果：丙泊酚促進 NA(−)神經元的放電，並減少 NA(−)神經元中自發性 GABA 能抑制性突觸後電流的頻率，但不降低其幅度。相反，丙泊酚抑制 NA(+)神經元的放電。

結論：丙泊酚通過減少 GABA 能神經傳遞來興奮 VLPO 上的 NA(-)神經元，至少部分通過抑制 VLPO 上的 NA(+)神經元。這可能是丙泊酚產生鎮靜作用的一個關鍵機制。

（楊禮 譯 馬皓琳 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.

對一項專家系統在人類患者模擬器麻醉期間關鍵事件檢出的評估：一項前瞻性隨機對照研究

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：圍手術期監測系統提供了大量未解釋的資料，使用易於產生假像的閾值警報，並且依賴臨床醫生連續性地肉眼追溯生理資料中的變化。爲了彌補這些缺陷，我們開發了一項能夠提供即時臨床決定以識別關鍵事件的專家系統。我們評估了在模擬環境下這套專家系統提高關鍵事件識別的效率。假設在這套專家系統的幫助下麻醉醫師將會更加迅速並準確地識別關鍵性通氣事件。

方法：我們使用了高保真人類患者模擬器來模擬一個手術室的環境。參與者以隨機的順序管理了 4 個場景（麻醉氣體過量、張力性氣胸、過敏反應和氣管內導管氣囊洩露）。在其中 2 個場景中，參與者隨機分配到這項提供趨勢性警報和潛在鑒別診斷的專家系統。測定發生到識別的時間和發生到處理的時間。每項場景結束後完成工作量問卷調查和結構化述職報告，研究期結束時完成可用性問卷調查。資料分析使用了混合線性回歸模型；工作量分數使用了 Fisher's 精確檢驗。

結果：20 名麻醉實習生和 15 名麻醉醫師參與了試驗，年齡的混合中位數爲 36 歲（29-66 歲），麻醉經驗年限中位數爲 6 年（1-38 年）。在氣管內導管氣囊洩露場景中，專家系統將事件發生到識別的時間縮短了 128（99%可信區間，54-202）秒，事件發生到處理的時間縮短了 140（99%可信區間，79-200）秒。在其他 3 項場景中發現，最好的案例是將過敏反應發生到診斷的時間縮短了 97 秒（99%可信區間下限），最差的案例是將麻醉氣體過量發生到處理的時間增加了 63 秒（99%可信區間上限）。參加者對這項專家系統非常滿意（評分中位數 2 分，1-7 分制）。在參加者述職報告的基礎上，我們確認了避免任務固定、再次確保才開始有創治療及明確可能診斷是 3 項保障安全的關鍵點。

結論：在氣管內導管氣囊洩露的場景中使用專家系統時，事件發生到診斷和事件發生到處理的時間有臨床意義及統計學顯著意義地縮短。在其他 3 個場景中觀察到的差別要小地多，也無統計學顯著意義。需要進一步的評估以確定即時專家系統用於麻醉的臨床實用性。

（盛嘉君 譯， 馬皓琳、李士通 審校）

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.

氣管導管套囊漏氣：原因、後果及處理

Endotracheal Tube Cuff Leaks: Causes, Consequences, and Management

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氣管導管（ETT）套囊漏氣的後果可從漏氣的氣泡聲到威脅生命的通氣失敗。儘管最終解決的方法是更換氣管導管，但這通常是不需要且操作起來不安全的。一般來說，導致漏氣的原因並不在氣管導管的結構性缺陷。套囊充氣太少、ETT 向頭側的移位元（部分導管拔出）、錯誤置入的口胃管或鼻胃管，、氣管導管及氣管內徑之間的較大差異或者增高的氣道峰壓值均會導致完整的套囊周圍漏氣。糾正這些問題就可停止漏氣而不更換氣管導管。然而，歸咎於意外損傷或製造缺陷的氣管導管套囊、指示氣囊及注氣系統的損壞可能就責任重大了。解決這個問題的保守的處理意見（不更換氣管導管的處理）已經在之前發表過了。但是，如存在大的結構性缺陷或保守處理措施失敗的話，就必須更換氣管導管。如喉鏡視野較好的話可以通過喉鏡直視下實施。當存在困難氣道的跡象和/或困難氣道史的時候，應該預期到一個困難的更換過程可能導致的氣道丟失並有所準備。在做出最有利決策前，針對每個個體情況都應確保做好風險/獲益分析。在換管前需提前計畫好可供選擇的後備通氣方案及準備好必要的器材。本綜述將針對各種處理問題及方案進行討論，並提出一簡易的氣管導管套囊漏氣處理步驟。

（王贇 譯 馬皓琳 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.

嬰幼兒聲門下氣道長度的測量新方法

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

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背景：至今，聲門下氣道和氣管的長度測量結果仍來源於屍檢。頭頸部的電腦斷層掃描（CT）圖像提供了一種交錯法。本研究的目的在於從嬰幼兒 CT 掃描來確認解剖學標誌從而估計聲門下氣道和氣管的長度並計算長度與年齡的相關性。

方法：我們對≤3 歲兒童用於各種診斷指標的頸部 CT 掃描圖像進行了回顧性分析。我們獲取了在聲帶（VCs）、環狀軟骨和隆突（C）水準重建的平面，這些平面相互平行並垂直於氣管矢狀長軸。聲門下氣道長度（SG 長）和喉氣管氣道總長度（VC-C 長）分別通過測量聲帶與環狀軟骨和聲帶與隆突重建平面之間的長度來獲得。然後計算 VC-C 長與 SG 長之間的差值作爲氣管長度。

結果：56 名兒童符合入選標準，其中 29 名是男孩。體重中位數爲 10.7kg（範圍 3.1-19.0kg）。回歸分析產生了平均 SG 長度（mm）=7.8+0.03•校準的月齡，r2 = 0.07, P = 0.056；在 β = 0.03 時 95%可信區間爲−0.001 至 0061。平均 SG 長度爲 8.4mm，標準差爲 1.4mm。SG 長的第 95 位百分位數爲 10.8mm，5%至 95%四分位距爲 4.9mm。第 95 位百分位數的 95%可信區間估值爲 10.2 至 11.3mm。VC-C 長隨年齡增長：平均 VC-C 長（cm）=5.3+0.05•校準的月齡，r2 = 0.7, P < 0.001。氣管長度同樣隨年齡增長：平均氣管長度（cm）=4.5+0.05•校準的月齡，r2 = 0.6, P < 0.001。

結論：通過對 56 名嬰幼兒的研究，我們報導了一種新的估算聲帶和隆突之間氣道部分長度的方法，並提示聲門下氣道和氣管的成長特徵也許不同。

（張怡 譯 馬皓琳 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.

關於 Horace Wells 在康乃狄克州哈特福德的遺址和遺物

Sites and Artifacts Related to Horace Wells in Hartford, Connecticut

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Horace Wells，作爲先驅麻醉發現者的競爭者，在他進行了大部分工作的康乃狄克州哈特福德鎮慶祝。他唯一的繼承者是他的兒子 Charles Thomas Wells (1839–1909)，一位在 Aetna 保險公司有影響力成功的商業經理。他是一位有廣泛影響力的人，他不辭辛勞地和城鎮官員及康涅狄格州牙醫學會工作，爲了慶祝他父親對醫學事業的貢獻。這一發現是獨一無二的，因爲這些事和人在一個國家——美國，完全貢獻給一個醫學專業的誕生。在佐治亞州傑弗遜、康乃狄克州哈特福德、麻塞諸塞州波士頓及它們的市郊的遺址慶祝這次最珍貴的對現代醫學的貢獻，尤其是因爲安全麻醉的引進促進了外科專業和產科的發展。我們追尋了 Horace Wells 和在康乃狄克州哈特福德的這些遺跡之間的歷史和關係。這些遺跡反映了一個城市最重要、最與眾不同、最吸引人的部分:布希內爾公園、三一學院、香柏山公墓、雅典娜神廟和康涅狄格州的歷史協會。

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.

靜脈注射一個劑量利多卡因對最小肺泡濃度七氟醚的影響：一個前瞻，隨機，雙盲，安慰劑對照試驗

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：吸入麻醉藥的藥效通過最小肺泡濃度(MAC)來量化，是指 50%的患者在疼痛刺激時的肺泡濃度。吸入麻醉藥抑制體動的機制尚未完全闡述，但有些藥物會影響 MAC。在這個試驗中，我們研究了單個劑量靜脈注射的利多卡因對七氟醚 MAC 值的影響。

方法：我們用 Dixon"up-and-down"法來確定七氟醚的 MAC 值。入選行擇期手術的患者，分成 3 組，每組 30 人，年齡 30 至 65 歲。3 組分別給予安慰劑，0.75mg/kg 利多卡因，1.5mg/kg 利多卡因。誘導後 15 分鐘平衡期，然後應用試驗藥物，3 分鐘後切皮，記錄有無體動。

結果：安慰劑組 MAC 值 1.86% ± 0.40%，0.75mg/kg 利多卡因組 MAC 值 1.87% ± 0.45% (P = 1.00)。1.5mg/kg 利多卡因組 MAC 值 1.63% ± 0.24%(P = 0.022)，明顯小於安慰劑組，七氟醚的平均濃度差 0.23%，95%CI 0.03-0.43。安慰劑組和 0.75mg/kg 利多卡因組兩者之間沒有顯著差異，七氟醚的平均濃度差-0.01%，95%CI -0.27 to 0.25，P = 1.00。

結論：靜脈注射 1.5mg/kg 利多卡因降低至少 0.03%七氟醚 MAC (平均濃度差 0.23%，95%CI 0.03-0.43)。我們沒有觀察到 0.75mg/kg 利多卡因有相似的效果。

(陳實玉譯 薛張綱校)

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.

利多卡因基醇質體經皮給藥的方式和評估

Formulation and evaluation of lidocaine base ethosomes for transdermal delivery.

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背景：儘管預先經皮給予局麻藥被通常應用於減少皮膚手術導致的疼痛，由於角質層和較厚的表皮層的阻擋，這些預處理並不能有效地滲透表皮組織。基於醇質體的熱力學穩定性，小分子，包裹率高以及其經皮滲透性，它可以有效地運送藥物穿過皮膚。本研究評估了利多卡因基醇質體的體外負載劑量，包裹率，熱力學穩定性以及經皮滲透性以及體內的效能以及皮膚刺激作用。

方法：利多卡因醇質體通過注射超聲濾過法制得。其大小，負載效能，包裹率以及穩定性通過鐳射細微性儀和高效液相色譜法評估。劑型由正交試驗中測得的最大包裹率決定。應用弗朗茲型擴散細胞實驗分析其體外經皮滲透效率。應用針刺實驗分析體內有效性。使用白色豚鼠進行皮膚刺激性試驗，後進行組織病理學分析。該結果將會與利多卡因脂質體以及利多卡因乙醇溶液進行比較。

結果：利多卡因基醇質體由 5%雞蛋磷脂醯膽鹼，35%乙醇，0.2%膽固醇，5%利多卡因基，超純水的平均最大包裹率爲 51% ±4%，平均粒徑爲 31 ± 3 nm，平均負載效率 95.0% ± 0.1%。利多卡因基醇質體的包裹率在 25℃ ± 1℃ 情況下保持 60 天的穩定性（95%可信區間[CI]，-1.12% to 1.34%; P = 0.833）。三種基質利多卡因的皮膚滲透性有顯著差異（F = 120, P < 0.001），醇質體顯著高於脂質體（95%修正度，1129-1818 μg/(cm(2)•h); P < 0.001），醇質體也顯著高於乙醇溶液（95%修正度，1468-2157 μg/(cm(2)•h); P < 0.001）。相較於利多卡因脂質體以及利多卡因乙醇溶液，利多卡因基醇質體在體內起效時間更快而且作用時間更長。沒有證據顯示利多卡因基醇質體對豚鼠表皮有刺激作用。

結論：醇質體是可以作爲局麻藥經皮給藥的潛在的載體並可用於其它需要經皮快速起效的藥物。

（陳婉南譯 薛張綱校）

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.

在使用非去極化肌松藥的全麻病人的恢復過程中，使用 AMG 和 EMG 的單側比較。

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

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背景：殘餘肌松的定義是 MMG 或者 EMG 顯示四個成串刺激比值小於 0.09,這在使用過去極化肌松藥的病人中很常見。相對的神經肌肉監測是判斷殘餘肌松唯一可以相信的指標。AMG 是臨床上最經常使用並且使用方便的方式。但是，AMG 並不可以替代 MMG 或者 EMG。至今爲止，排除殘餘肌松的 AMG TOF 值尚未明確。

方法：在神經肌肉阻滯自發恢復的過程中，我們在同一個手臂的尺側內收肌上使用 AMG 測試 TOF 值，同時在第一背側骨間肌使用 EMG。使用 Bland－Altman 分析法重複分析 AMG 和 EMG 的 TOF 值。兩個工具的精確度都用可重複的係數評估。一個小的可重複係數代表儀器的高準確度。儀器的吻合度按照偏移和接近範圍爲 95%評估。小的偏移和狹窄的超出範圍提示高度的吻合。我們定義了臨床上 AMG 和 EMG 可以接受的吻合偏移小於 0.025,超出範圍在－0.05 到 0.05 之間。這就保證了我們的 EMG 與其自己的控制性比較可以滿足標準。

結果：在 26 個病人之間，做了 261 次 AMG 和 EMG 之間的比較。AMG 與 EMG 之間的可重複係數爲 0.094 和相對的 0.051。AMG 和 EMG 的 TOF 值之間的偏移爲 0.176,同時的吻合範圍是－0.045 到 0.396。

總結：AMG 沒有 EMG 精確，且會超出 EMG 的 TOF 值至少 0.15。這個結果未達成一致不能歸結於試驗的不準確或者判斷成功的基線不同。當 AMG 值達到 1.0 時，不能排除殘餘肌松。

（蔣鑫梅譯 薛張綱校）

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.

非心臟手術後高氯血症與發病率和死亡率增高獨立相關：一項傾向匹配佇列研究

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

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背景：生理鹽水的使用與高氯性代謝性酸中毒有關。這項研究調查了術後急性高氯血症（血氯>110 mEq/L）的發生率以及此種電解質紊亂是否與住院時間延長，發病率或術後 30 天的死亡率增加有關。

方法：本研究回顧性收集了 2003 年 1 月 1 日至 2008 年 12 月 31 日期間接受非心臟、非外科移植手術的成年（>18 歲）住院患者的數據。術後高氯血症對患者發病率和住院天數的影響使用傾向匹配和 Logistic 多變數分析進行研究。

結果：該資料集包括了 22,851 例術前血清氯離子濃度和腎功能正常的手術患者。急性術後高氯血症（血氯>110 mmol/L）的發生率爲 22%。根據患者發生術後急性高氯血症的可能性進行了傾向性匹配。在術後發生高氯血症的 4955 例患者中，4266 例（85%）與術後血清氯水準正常的患者相匹配。除此之外所有收集的變數在兩組之間均平衡一致。高血氯組術後 30 天的死亡風險增加（3.0%vs1.9%，比值比= 1.58，95%可信區間 1.25-1.98）（相對危險度 1.6 或風險增加 1.1%），並且同術後血清氯化物含量正常的患者相比有更長的住院時間（7.0 天[四分位距 4.1-12.3] vs 6.3 天[四分位距 4.0-11.3]）。術後高氯血症的患者更易出現術後腎功能不全。使用所有術前變數和測量的結果變數進行 Logistic 回歸分析，高氯血症仍爲術後 30 天死亡率增加的獨立預測因素（比值比爲 2.05，95%可信區間爲 1.62-2.59）。

結論：本項回顧性佇列研究提示高氯血症與術後預後不良之間存在聯繫。需要更多的研究來證明這些變數之間的因果關係。

(凌曉敏譯 薛張綱校）

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.

先天性心臟病患兒應用心導管檢查及術後急性腎功能不全

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

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背景：急性腎功能（ARF）不全是兒科病人心臟手術後的嚴重併發症。血管造影使用的造影劑是 ARF 的危險因素。在我們的研究中，我們研究了患兒行心臟手術後 ARF 的發生率與血管造影劑的使用時間、劑量的關係。

方法：我們採用回顧性研究的方法。我們收集了 277 名年齡小於 12 歲的患兒血管造影方面的資料及其它協變數的資訊，他們接受血管造影檢查與心臟手術間隔時間相同。評價腎功能分爲損傷、不全、功能喪失、終末期腎病。

結果：64%的患者術後腎功能不全的情況相似，55 名（20%）患者出現 ARF（終末期腎病）。相比于其他患者 ARF 的患者 (2.8 ± 2.2 g/kg)，ARF 患者接受較大劑量的碘造影劑 (4.6 ± 2.6 g/kg) (P < 0.001)，每增加 1 g/kg 劑量的碘劑，ARF 的風險增加 31%。多因素模型提示，年齡小於 2 歲的患兒 ARF 的風險增加 20 倍，術後低心排患者 ARF 的風險增加 3

倍。在這個模型中，血管造影時使用的碘劑是 ARF 的獨立危險因數，每增加 1 g/kg 劑量的碘劑，ARF 的風險增加 16%。

結論：患兒心臟手術前血管造影檢查室 ARF 的重要危險因數。危險因數分層示除了一些危險因素（如年齡、術後低心排），造影劑劑量應限制在最小範圍，避免大劑量使用碘劑是術後 ARF 的決定因素。

（劉毅譯 薛張綱校）

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.

綜述：在癲癇手術時，術中皮層腦電圖的麻醉考慮。

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

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摘要：癲癇手術是一種行之有效的治療難治性癲癇的手術。癲癇手術的成功取決於準確的定位致癇灶並徹底清除。儘管術前定位方式有了很大的進步，在美國北部的癲癇中心仍然約 60%-70%依靠腦電圖指導癲癇外科手術切除病灶並評估病灶是否切除完整。在這篇綜述中，我們討論在術中運用皮層腦電圖的原理和麻醉藥物對腦電圖的影響，並利用麻醉藥的藥代學爲術中的的致癇區定位。

（徐崢譯 薛張綱校）

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，羅呱卡因，甲呱卡因對人體軟骨細胞和軟骨的細胞毒性。

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

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背景：關節內注射局部麻醉劑經常用作爲聯合鎮痛的一部分。然而，最近的資料表明，局麻藥可能影響軟骨細胞的活性。在這項研究中，我們評估了甲呱卡因，羅呱卡因，布比卡因的藥物毒性作用。我們假設，特定的細胞毒性效力直接作用在完整的軟骨的鎮痛效力，其細胞毒作用比在骨關節炎的組織是不同的。

方法：將等效濃度布比卡因，羅呱卡因，甲呱卡因浸潤注射人體關節軟骨各 1 小時。確定在預定的時間點，使用流式細胞儀、活死細胞染色試劑盒和細胞凋亡蛋白酶檢測細胞活力，來判定細胞凋亡和壞死。對完好無損和骨關節炎軟骨外植體用等效濃度的命名藥物應用螢光顯微鏡，以確定細胞存活率。

結果：毒性效果隨著羅呱卡因甲呱卡因布比卡因時間依賴性和濃度依賴性增加。與對照組相比，1 小時內 0.5％布比卡因軟骨細胞活力下降至 78％±9％（P =0.0183），16％±10％（P<0.0001），24 小時後，由單層培養的活死染色。存活率降低到 80％±7％（P=0.0475）1 小時，80％±10％（P =0.0095）處理 24 小時後用 0.75％羅呱卡因。暴露在甲呱卡因 2％中，24 小時後存活的細胞，分別得到 36％±6％，1 小時後和 30％±11％（P <0.0001）（P <0.0001）。羅呱卡因治療比布比卡因（P=0.0006）和甲呱卡因（P= 0.0059）。流式細胞儀沒有揭示濃度高達 0.25％的布比卡因，羅呱卡因，0.5％和 0.5％甲呱卡因存在明顯藥物毒性。然而，chondrotoxicity 沒有相關的局部麻醉藥效力。細胞死亡主要是由於細胞凋亡壞死。細胞死亡率均明顯高於骨性關節炎較完好的軟骨後，甲呱卡因布比卡因和羅呱卡因治療順序遞減。

結論：布比卡因，羅呱卡因，甲呱卡因的毒性取決於時間依賴性，濃度依賴性，藥物依賴的方式。 藥物毒性和鎮痛效力不直接相關。經過局部麻醉劑治療後，細胞死亡率均高於骨關節炎較完整軟骨。

（徐升譯 薛張綱校）

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.