增強嬰兒復蘇器的評價：新生兒氣囊活瓣面罩復蘇器的監測設備

Evaluation of the Augmented Infant Resuscitator: A Monitoring Device for Neonatal Bag-Valve-Mask Resuscitation

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背景：每年有 600 萬新生兒需要氣囊活瓣面罩復蘇，提供即時回饋有可能提高復蘇品質。增強嬰兒復蘇器（AIR）是一種即時回饋設備，旨在識別氣囊活瓣面罩復蘇期間的洩漏、阻塞，以及不適當的呼吸頻率。但是，它的功能尚未進行評估。

方法：將其連接在呼吸機和呼吸機測試儀之間來測量 AIR 的阻力。為了測試設備在訓練和臨床應用的可靠性，將其置於氣囊或呼吸機與新生兒人體模型和臨床肺模型模擬器之間。肺模型模擬器類比 3 種尺寸（2,4 和 6 kg）的新生兒。評估洩漏，阻塞和呼吸頻率的變化。

結果：流量為 5L/min 時，AIR 上的壓力降低僅 0.38 cm H2O，該設備對呼吸機呼吸參數幾乎沒有影響。在人體模型試驗期間，它能夠檢測到所有洩漏和阻塞，100%及時正確顯示警報。在模擬的臨床試驗中，AIR 在 6 公斤新生兒模型中效果最佳，其次是 4 公斤模型，最後是 2 公斤模型。在所有 3 種臨床模型中，模型顯示 73.5%的正確指標，當這樣做時，耗時 1.6±0.9 秒。

結論：AIR是可能改善新生兒復蘇的一項有希望的創新，但它僅引入阻力邊緣值，並僅在新生兒模型上表現良好，在臨床使用前仍需改善其固件。

（馬益梅譯 潘豔、薛張綱校）

BACKGROUND Annually, 6 million newborns require bag-valve-mask resuscitation, and providing live feedback has the potential to improve the quality of resuscitation. The Augmented Infant Resuscitator (AIR), a real-time feedback device, has been designed to identify leaks, obstructions, and inappropriate breath rates during bag-valve-mask resuscitation. However, its function has not been evaluated.

METHODS The resistance of the AIR was measured by attaching it between a ventilator and a ventilator tester. To test the device's reliability in training and clinical-use settings, it was placed in-line between a ventilation bag or ventilator and a neonatal manikin and a clinical lung model simulator. The lung model simulator simulated neonates of 3 sizes (2, 4, and 6 kg). Leaks, obstructions, and respiratory rate alterations were introduced.
RESULTS At a flow of 5 L/min, the pressure drop across the AIR was only 0.38 cm H2O, and the device had almost no effect on ventilator breath parameters. During the manikin trials, it was able to detect all leaks and obstructions, correctly displaying an alarm 100% of the time. During the simulated clinical trials, the AIR performed best on the 6-kg neonatal model, followed by the 4-kg model, and finally the 2-kg model. Over all 3 clinical models, the prototype displayed the correct indicator 73.5% of the time, and when doing so, took 1.6 ± 0.9 seconds.
CONCLUSIONS The AIR is a promising innovation that has the potential to improve neonatal resuscitation. It introduces only marginal resistance and performs well on neonatal manikins, but its firmware should be improved before clinical use.

腋窩溫度如 iThertimor WT701 所記錄的很好地代表了成人非心臟手術的核心溫度

Axillary Temperature,as Recorded by the iThermonitor WT701, Well Represents CoreTemperature in Adults Having Noncardiac Surgery.

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背景：全身麻醉期間，核心溫度可以從食管或鼻咽準確測量，但這兩個位置都不適合椎管內麻醉。 因此，我們確定了新型無線腋窩溫度計的精確度和準確性，iThermonitor，以確定其在椎管內麻醉期間和其他非插管期患者中的適用性。

方法：我們招募了 80 名氣管插管的上腹部手術的成年人。 術中測量食管遠端的核心溫度，用無線儀器估計腋窩的溫度。用波士頓醫療公司的 RMonitor WT 701(RAIING Medical，波士頓 MA).每隔 5 分鐘監測一次。用線性回歸法和重複測量法 Bland-Altman 法對成對的腋窩和食管遠端溫度進行了比較和總結。我

們先驗地確定，如果大多數估計值在食管參考的±0.5° C 範圍內，則 iThermonitor 具有臨床上可接受的準確性，如果一致性限度在±0.5° C 內，則具有合適的精確度。

結果：共有 3339 套配對溫度。腋窩溫度與食管溫度相近，平均差異(食管腋窩)僅為 0.14° C±0.26° C(標準差)。Bland-Altman 95%協議範圍相當狹窄，估計上限在 0.66° C，下限在-0.38° C，因此±0.52° C，表明在 34.9° C 至 38.1° C 的平均溫度範圍內具有良好的一致性。 在 91%的測量中，絕對差值在 0.5° C 以內（95%置信區間，88%-93%）。

結論：腋窩溫度，如 iThertror WT701 所記錄的，很好地代表了成人非心臟手術的核心溫度，因此似乎適合於臨床使用。

（吳靜怡譯 潘豔、薛張綱校）

BACKGROUND: Core temperature can be accurately measured from the esophagus or nasopharynx during general anesthesia, but neither site is suitable for neuraxial anesthesia. We therefore determined the precision and accuracy of a novel wireless axillarythermometer, the iThermonitor, to determine its suitability for use during neuraxial anesthesia and in other patients who are not intubated.METHODS: We enrolled 80 adults having upper abdominal surgery with endotracheal intubation. Intraoperative core temperature was measured in distal esophagus and was estimated at the axilla with a wireless iThermonitor WT701 (Raiing Medical, Boston MA) at 5-minute intervals. Pairs of axillary and reference distal esophageal temperatures were compared and summarized using linear regression and repeated-measured Bland-Altman methods. We a priori determined that the iThermonitor would have clinically acceptable accuracy if most estimates were within ±0.5° C of the esophageal reference, and suitable precision if the limits of agreement were within ±0.5° C.

RESULTS: There were 3339 sets of paired temperatures. Axillary and esophageal temperatures were similar, with a mean difference (esophageal minus axillary) of only 0.14° C ± 0.26° C (standard deviation). The Bland-Altman 95% limits of agreement were reasonably narrow, with the estimated upper limit at 0.66° C and the lower limit at -0.38° C, thus ±0.52° C, indicating good agreement across the range of mean temperatures from 34.9° C to 38.1° C. The absolute difference was within 0.5° C in 91% of the measurements (95% confidence interval, 88%-93%).
CONCLUSIONS: Axillary temperature, as recorded by the iThermonitor WT701, well represents core temperature in adults havingnoncardiac surgery and thus appears suitable for clinical use.

Macintosh 可視喉鏡聯合 Bonfils 插管內鏡可以給困難氣道的病人提供一個建立氣道的方法

Macintosh Blade Videolaryngoscopy Combined With Rigid Bonfils Intubation Endoscope Offers a Suitable Alternative for Patients With Difficult Airways.
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Anesthesia & Analgesia: 2018 126 988–994

背景：在麻醉醫師的各項設備中可視喉鏡是保護氣道安全的重要設備。然而當可視喉鏡無法完成插管時，幾乎沒有其他設備能夠完成插管。之前，我們展示了一項在有困難氣道歷史的病人中採用Macintosh可視喉鏡和Bonfils插管內鏡聯合使用的插管技術。在這項研究中，我們將評估這項技術是否是一個有價值的選擇。

方法：在這項單盲非隨機對照的研究中，我們包含 38 個有困難氣道病史或者有 1 個或 1 個以上困難氣道預測因素或者用 Macintosh 喉鏡觀察 Cormack & Lehane 分級在 3-4 級的病人。這些病人使用 Macintosh 可視喉鏡聯合 Bonfils 氣管內鏡的插管方法。在直接喉鏡下、可視喉鏡下、Macintosh 可視喉鏡聯合 Bonfils 氣管內鏡下三種情況下分別用 Cormack & Lehane 評分進行打分。之後 2 個實行盲法的麻醉師根據操作過程中所拍攝的圖片評估 Cormack & Lehane 分級。

結果：38 個病人的資料被分析。38 個病人有 33 個病人在應用 Macintosh 可視喉鏡聯合 Bonfils 氣管內鏡插管的方法時 Cormack & Lehane 評分得到了提高。（86.8%，95%可信區間，71.9%-95.6%）。評估員 1 認為 38 名病人中有 37 名病人在應用 Macintosh 可視喉鏡聯合 Bonfils 氣管內鏡插管的方法時 Cormack & Lehane 評分得到了提高。評估員 2 認為有 33 名病人在應用 Macintosh 可視喉鏡聯合 Bonfils 氣管內鏡插管的方法時 Cormack & Lehane 評分得到了提高，有 2 名評分降低。實驗中沒有發現併發症。

結論：Macintosh 可視喉鏡聯合 Bonfils 氣管內鏡的插管方法給麻醉醫師對於極端困難氣道的病人提供了一個有價值的可選的氣管插管方案。

(嚴歡譯 潘豔、薛張綱校)

BACKGROUND: In the armamentarium of an anesthesiologist, videolaryngoscopy is a valuable addition to secure the airway. However, when the videolaryngoscope (VLS) offers no solution, few options remain. Earlier, we presented an intubation technique combining Macintosh blade VLS and Bonfils intubation endoscope (BIE) for a patient with a history of very difficult intubation. In the present study, we evaluated this technique to establish whether it is a valuable alternative.

METHODS: In this single-blinded nonrandomized study, 38 patients with a history of difficult intubation or 1 or more predictors of difficult intubation, scoring a Cormack & Lehane (C&L) grade III or IV using Macintosh blade VLS, were included. Patients were intubated combining the VLS with the BIE. The C&L grade was scored 3 times during (1) direct laryngoscopy; (2) indirect videolaryngoscopy; and (3) using the combined technique (VLS + BIE). Afterward, 2 blinded anesthesiologists assessed the C&L grade using the pictures taken during the procedure.

RESULTS: Data of 38 patients were analyzed. An improvement of the C&L grade with the combined technique occurred in 33 of 38 patients (86.8%; 95% confidence interval, 71.9%-95.6%). Reviewer 1 reported an improvement of the C&L grade with the combined technique in 37 of 38 patients. Reviewer 2 reported improvement in 33 and deterioration in 2 of the patients. No complications occurred.

CONCLUSIONS: The combined use of a VLS with Macintosh blade and BIE gives the anesthesiologist a valuable alternative intubation option in patients with extremely difficult airways.

圍術期炎症反應及麻醉藥物的調節作用

Perioperative Inflammation and Its Modulation by Anesthetics.

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全身麻醉期間，手術及其他侵入性治療可能引起患者的炎症反應。作為機體對干預措施的固有應答，這種炎性反應可能同時具有益處和潛在傷害性。免疫系統是高級生物獨特的進化成果，能有效抵禦外界病原體。然而，除了細菌，其他非感染性刺激因素，如手術創傷或機械通氣也可能引起不同程度的炎性反應。在這些情況下，免疫系統啟動並非對患者總是有益的，也可能對宿主細胞、組織甚至器官系統造成損傷。過去十年間，研究者發現了很多關於外科手術患者炎性反應作用通路的資訊。圍術期患者免疫系統的調節可能通過麻醉藥物的使用、手術創傷及支持療法等觸發。對患者的影響是多方面的，包括多種促炎效應。本綜述關注圍術期炎性反應的原因和效應。另外，我們也強調了未來圍術期調控免疫反應的可能措施。

（趙曦甯譯 潘豔、薛張綱校）

Surgery and other invasive procedures, which are routinely performed during general anesthesia, may induce an inflammatory response in the patient. This inflammatory response is an inherent answer of the body to the intervention and can be both beneficial and potentially harmful. The immune system represents a unique evolutionary achievement equipping higher organisms with an effective defense mechanism against exogenous pathogens. However, not only bacteria might evoke an immune response but also other noninfectious stimuli like the surgical trauma or mechanical ventilation may induce an inflammatory response of varying degree. In these cases, the immune system activation is not always beneficial for the patients and might carry the risk of concomitant, harmful effects on host cells, tissues, or even whole organ systems. Research over the past decades has contributed substantial information in which ways surgical patients may be affected by inflammatory reactions. Modulations of the patient's immune system may be evoked by the use of anesthetic agents,

the nature of surgical trauma and the use of any supportive therapy during the perioperative period. The effects on the patient may be manifold, including various proinflammatory effects. This review focuses on the causes and effects of inflammation in the perioperative period. In addition, we also highlight possible approaches by which inflammation in the perioperative may be modulated in the future.

扁桃體切除術圍手術期類固醇的使用和術後出血再次手術的關係:回顧性佇列研究

Perioperative Steroid Use for Tonsillectomy and Its Association With Reoperation for Posttonsillectomy Hemorrhage: A Retrospective Cohort Study

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背景:類固醇可減少扁桃體切除術後的併發症,如噁心、嘔吐、疼痛和延遲恢復。然而,類固醇也可能增加扁桃體切除術後嚴重出血需要再次手術的風險。

方法:為了評估圍手術期使用類固醇後發生術後出血需要再次手術的風險,我們使用醫院索賠資料庫對68家醫院接受治療的6149名患者進行了回顧性佇列研究。主要觀察結果是術後14天內再次手術的數量。我們通過調整混雜因素後的多因素回歸分析來估計圍術期類固醇使用和再次手術之間的優勢比。我們還估計了調整後的風險差異,將患者分為成人和兒童後進行亞組分析。

結果:扁桃體切除術當天接受激素治療的患者中,再次手術的發生率沒有顯著差異(1.8%,n = 15比1.5%,n = 79;校正後OR 0.81,95%置信區間[CI],0.45-1.43; P = .46)。我們還發現在成人(OR,0.73; 95%CI,0.38-1.38; P = .33)和兒童(OR,1.18; 95%CI,0.34-4.11; P = .80)之間均無顯著相關性。回歸模型評估調整後的風險差異為-0.30%(95%CI,-1.05至0.45),成

人為-0.64%（95%CI，-1.82 至 0.54），兒童為 0.13%（95% CI，-0.93 至 1.19）。

結論：在扁桃體切除術當天使用類固醇與出血而再次手術的風險增加無關。儘管 OR 的廣泛 CI 不能消除增加風險的可能性，尤其是在兒童中，但類固醇使用後發生再次手術的風險在成人和兒童中是可接受的。我們的研究結果支援在扁桃體切除術的圍手術期使用類固醇的安全性，同時也考慮到因出血而再次手術的危險程度。

（劉娟蘭譯 潘豔、薛張綱校）

BACKGROUND: Steroids reduce postoperative complications after tonsillectomy such as nausea and vomiting, pain, and delayed recovery. However, steroids may also increase the risk of severe posttonsillectomy bleeding requiring reoperation.
METHODS: To evaluate the risk of postoperative bleeding requiring reoperation related to perioperative steroid use, we conducted a retrospective cohort study of 6149 patients treated at 68 hospitals using a hospital-based claims database. The primary outcome was reoperation for bleeding within 14 postoperative days. We estimated odds ratios (ORs) between perioperative steroid use and reoperation by multivariable logistic regression analysis adjusted for confounders. We also estimated differences in the adjusted risk. Subgroup analyses after dividing patients into adults and children were also performed.
RESULTS: The incidence of reoperation did not differ significantly between patients who received steroids on the day of tonsillectomy and those who did not (1.8%, n = 15 vs 1.5%, n = 79; adjusted OR 0.81, 95% confidence interval [CI], 0.45-1.43; P = .46). We also found nonsignificant associations in both adults (OR, 0.73; 95% CI, 0.38-1.38; P = .33) and children (OR, 1.18; 95% CI, 0.34-4.11; P = .80). The adjusted risk differences estimated by the logistic regression model were -0.30% (95% CI, -1.05 to 0.45) in all patients, -0.64% (95% CI, -1.82 to 0.54) in adults, and 0.13% (95% CI, -0.93 to 1.19) in children.
CONCLUSIONS: Steroid use on the day of tonsillectomy was not associated with an increased risk of reoperation for bleeding. Although the wide range of CIs for the ORs could not eliminate the possibility of increased risk, especially in children, the incremental risks of reoperation for steroid use were within an acceptable range for both adults and children. Our results support the safety of perioperative steroid use for

tonsillectomy, considering the magnitude of risk of reoperation because of bleeding.

在電腦斷層掃描中靜脈注射非離子型造影劑造成的全身性低血壓——碘普羅胺 vs 碘克沙醇

Systemic Hypotension Following Intravenous Administration of Nonionic Contrast Medium During Computed Tomography: Iopromide Versus Iodixanol
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背景：鑒於有越來越多的患者在全麻下接受放射性干預，造影劑對於迴圈和器官灌注的影響十分重要。本研究的目的是系統性地量化靜脈注射等滲和低滲非離子型造影劑後對血壓、心率和腎功能的影響。

方法：本研究是雙盲 IV 期臨床對照研究，40 名連續的患者隨機分配入組，實驗組接受低滲的碘普羅胺或等滲的碘克沙醇注射，對照組接受普通生理鹽水注射。在造影劑和生理鹽水注射前 1 分鐘開始，連續記錄受試者血壓和心率，直至注射完成後 3 分鐘。每小時記錄受試者尿量。

結果：碘普羅胺注射後，全身性低血壓持續最長至 300 秒（105 ± 61 秒），最低平均動脈壓為 39 mm Hg (56.7 ± 12.2 mm Hg)。碘普羅胺導致收縮壓/舒張壓降低 31/26mmHg (P < .001)，心率顯著升高 (P = .042)，尿量顯著增多，每小時尿量約對照組的 2 倍(P = .010)。碘克沙醇對於血壓的影響與生理鹽水無顯著差異 (P > .640)。

結論：低滲的碘普羅胺使用後會導致短暫的顯著血壓下降和心率上升，麻醉醫生及放射科醫生應充分認識到它會短暫干擾患者的組織微循環，從而存在潛在的臨床風險。

（劉雯珺譯 潘豔、薛張綱校）

BACKGROUND: In light of the increasing number of radiologic interventions performed under general anesthesia, the effects of contrast media (CM) on circulation and organ perfusion are of paramount importance. The objectives of this study were to systematically quantify effects on blood pressure, heart rate, and kidney function following intravenous administration of nonionic CM with normal and low osmolality.
METHODS: In this controlled, double-blinded phase IV clinical trial, 40 consecutive patients were randomly assigned to receive repeated measures of either low-osmolar iopromide or iso-osmolar iodixanol. Normal saline solution (NSS) served as control. Blood pressure and heart rate were measured continuously from 1 minute before until 3 minutes after administration of CM and NSS. Urine output was recorded hourly.
RESULTS: Administration of iopromide resulted in systemic hypotension lasting up to 300 seconds (105 ± 61 seconds) with the lowest mean arterial pressure of 39 mm Hg (56.7 ± 12.2 mm Hg). Iopromide caused a systolic/diastolic decrease of 31/26 mm Hg ($P < .001$), significant increase in heart rate ($P = .042$), and significant diuresis with a 2-fold higher per-hour urine output ($P = .010$). Administration of iodixanol and NSS had no significant influence on blood pressure ($P > .640$).
CONCLUSIONS: Administration of low-osmolar iopromide was followed by a significant transient decrease in blood pressure and a rise in heart rate. Anesthetists and radiologists should be aware of these effects in patients in whom short episodes of disturbed tissue microcirculation may pose a clinical risk.

普外科手術患者合併術後併發症影響心跳驟停後的生存率

Postoperative Complications Affecting Survival After Cardiac Arrest in General Surgery Patients.

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背景：術後發生心跳驟停並不常見，但是它與普外科手術病人高死亡率相關，並且心跳驟停前常先出現術後併發症。普外科手術病人術後發生心跳驟停前合併術後併發症與心跳驟停後的死亡率之間的相關性尚未被完全地評估。

方法：回顧性觀察性佇列研究納入 2012-2013 年美國外科醫生學會國家外科品質改進計畫中術後當天至術後 30 天內發生心跳驟停的普外科手術病人。心跳驟停前發生的術後併發症定義如下：1.急性腎損傷；2.急性呼吸衰竭；3.深靜脈血栓

形成/肺栓塞；4.心肌梗死；5.敗血症/感染性休克；6.卒中；7.輸血。採用 Cox 比例風險模型進行評估術後併發症與心跳驟停後的死亡率之間的相關性，並校正術前危險因素。

結果：納入 1352 名發生心跳驟停的普外科手術患者，其中 746 名患者（55%）在心跳驟停前至少合併一種術後併發症。合併術後併發症的心跳驟停患者與未合併術後併發症的心跳驟停患者相比，術後 30 天總體死亡率無明顯差異。（71%[533/746]vs70%[425/606]，P=0.60）。在校正後的 COX 模型中顯示，心臟驟停前合併術後併發症與未合併術後併發症相比，並沒有增加死亡風險。（風險比 1.03，95%置信區間為 0.90-1.18，P=0.70）。此外，個案分析顯示，心跳驟停前未合併術後併發症與高死亡率相關。

結論：普外科手術患者術後發生心跳驟停前合併術後併發症很常見，但並沒有增加死亡率。

（王雨婷譯 潘豔、薛張綱校）

BACKGROUND: Postoperative cardiac arrest is uncommon but associated with a high mortality risk in general surgery patients and is often preceded by postoperative complications. The relationships between previous complications and mortality after cardiac arrest in general surgery patients have not been completely Evaluated.

METHODS: A retrospective, observational cohort of general surgery in patients with cardiac arrest occurring after postoperative day (POD) #0 (and up to POD #30) was obtained from the 2012-2013 American College of Surgeons National Surgical Quality Improvement Program. Previous complication was defined as at least one of the following occurring before the POD of cardiac arrest: (1) acute kidney injury; (2) acute respiratory failure; (3) deep vein thrombosis/pulmonary embolus; (4) myocardial infarction; (5) sepsis/septic shock; (6) stroke; and/or (7) transfusion. The associations between previous complications and mortality after cardiac arrest were assessed using Cox proportional hazards models that adjusted for preoperative risk factors.

RESULTS: Of 1352 patients with postoperative cardiac arrest, 746 patients (55%) developed at least 1 complication before cardiac arrest. Overall

30-day mortality was 71% (958/1352) and was similar among patients with and without a previous complication (71% [533/746] vs 70% [425/606]; P = .60). Patients with previous complications did not have an increased risk of mortality, compared to patients without previous complications, in adjusted Cox models (hazard ratio, 1.03; 95% confidence interval, 0.90-1.18; P = .70). In addition, no previous complication was associated with increased mortality risk in individual analyses.
CONCLUSIONS: Among general surgery patients with cardiac arrest after POD #0, complications occurring before cardiac arrest are common but are not associated with increased mortality risk.

手術室裡的心臟驟停：部分 2-圍手術期的特殊情況

Cardiac Arrest in the Operating Room: Part 2—Special Situations in the Perioperative Period

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在本系列的部分 1 中指出：圍術期心臟驟停（PPCA）可以從美國心臟協會的高級心臟生命支援的演算法所描述的病因和治療中鑒別，這在很大程度上運用於院外和圍手術空間之外的心臟驟停。明確地說，有幾個生命威脅因素導致的 PPCA，它們必須在麻醉醫生的技能下管理。然而，以往的研究已經證明，這些場景的不斷回顧和培訓的管理是十分必要的，也是與提高 PPCA 的治療和預後相關。有越來越多的文章描述常見 PPCA 的發病率、原因、治療、和結果（如惡性高熱、重大創傷、麻醉全身和局部毒性）；以及這些話題需要在麻醉協會中得到更好、更廣泛地認識。本系列的第 1 部分描述到：這些事件總是被圍手術期小組的一名成員目睹的，這是經常發生的，並且涉及救援人員對病人和正在經歷或已經發生的程式的瞭解。制定適當的鑒別診斷和快速應用有針對性的干預措施對患者的良好

預後是至關重要。復蘇演算法，包括對導致心臟在圍手術期設置的常見原因進行評估和管理。執業麻醉醫師需要擁有這些演算法的工作知識，以便達到最優化的效果。

（張連芳譯 潘豔、薛張綱校）

As noted in part 1 of this series, periprocedural cardiac arrest (PPCA) can differ greatly in etiology and treatment from what is described by the American Heart Association advanced cardiac life support algorithms, which were largely developed for use in out-of-hospital cardiac arrest and in-hospital cardiac arrest outside of the perioperative space. Specifically, there are several life-threatening causes of PPCA of which the management should be within the skill set of all anesthesiologists. However, previous research has demonstrated that continued review and training in the management of these scenarios is greatly needed and is also associated with improved delivery of care and outcomes during PPCA. There is a growing body of literature describing the incidence, causes, treatment, and outcomes of common causes of PPCA (eg, malignant hyperthermia, massive trauma, and local anesthetic systemic toxicity) and the need for a better awareness of these topics within the anesthesiology community at large. As noted in part 1 of this series, these events are always witnessed by a member of the perioperative team, frequently anticipated, and involve rescuer-providers with knowledge of the patient and the procedure they are undergoing or have had. Formulation of an appropriate differential diagnosis and rapid application of targeted interventions are critical for good patient outcome. Resuscitation algorithms that include the evaluation and management of common causes leading to cardiac in the perioperative setting are presented. Practicing anesthesiologists need a working knowledge of these algorithms to maximize good outcomes.

高頻率有條理的專家回饋對區域阻滯基礎超聲學習曲線的影響

The Effect of High-Frequency, Structured Expert Feedback on the Learning Curves of Basic Interventional Ultrasound Skills Applied to Regional Anesthesia.

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Anesthesia & Analgesia: 2018 126 1028–1034

背景：在超聲引導的區域阻滯中，熟練地對準針-超聲束及準確的入路是十分關鍵的。本研究評估了高頻率、有條理的專家回饋對該技能模擬訓練的影響。

方法：42 位受試者隨機分為對照組或干預組進行了 2 組試驗，每組 25 次。試驗一是將針刺入牛肌肉模型使針與超聲束平行，即保持針的完整顯像。試驗二中針需要接觸到模型內的目標。干預組在試驗之間獲得有條理的回饋意見。對照組在試驗結束後接受全面的評價。對從成功及失敗的試驗序列中獲得的學習曲線的斜率進行比較。通過變點分析確定試驗序列中學習的始點和終點。對干預組與控制組間與學習有關的試驗次數、技術錯誤的數量和訓練時間的長短進行比較。

結果：在試驗 1 中，兩組的學習曲線在成功率上發生了偏離，控制組成功率為 73%，干預組為 76%；斜率(標準誤)分別為 0.79%(0.02%)和 0.71%(0.04%)，平均絕對差為 0.18%(95%置信區間[CI]，0.17%-0.19%，P=0)；干預組受試者的學習曲線較對照組更短、更陡。在試驗 2 中，兩組學習曲線的成功率分別為 43%(控制組)和 80%(干預組)；斜率(標準誤)分別為 1.06%(0.02%)和 0.42%(0.03%)，平均差為 0.65% (95% CI, 0.64%-0.66%;P = 0).兩組試驗中，回饋與增加學習相關的試驗次數有關，試驗 1：(平均差，1.55 次;95%可信區間,0.15-3 次;P = 0)，試驗 2：(平均差，4.25 次;95%置信區間,1.47-7.03 次;P = 0)；也與減少每次試驗中的技術錯誤相關，試驗 1:(平均差，0.19;95%置信區間,0.07-0.30;P = .02)，試驗 2：(平均差，0.58;95%置信區間,0.45-0.70;P = 0)，但回饋延長了兩組試驗的訓練時間，試驗 1:(平均差，9.2 分鐘;95%置信區間,4.15-14.24

分鐘;P = .01)，試驗 2：(平均差，7.4 分鐘;95%置信區間,1.17-13.59 分鐘;P = .02)。

結論：高頻率、有條理的專家回饋與自主學習相比，優勢在於縮短了學習曲線、減少了技術錯誤並增加訓練中技能改善階段的持續時間，但也導致訓練持續時間延長。

（肖亞男譯 潘豔、薛張綱校）

BACKGROUND: Proficiency in needle-to-ultrasound beam alignment and accurate approach to structures are pivotal for ultrasound-guided regional anesthesia. This study evaluated the effects of high-frequency, structured expert feedback on simulation training of such abilities.

METHODS: Forty-two subjects randomly allocated as controls or intervention participated in two 25-trial experiments. Experiment 1 consisted of inserting a needle into a bovine muscular phantom parallel to the ultrasound beam while maintaining full imaging of the needle. In experiment 2, the needle aimed to contact a target inside the phantom. Intervention subjects received structured feed back between trials. Controls received a global critique after completing the trials. The slopes of the learning curves derived from the sequences of successes and failures were compared. Change-point analyses identified the start and the end of learning in trial sequences. The number of trials associated with learning, the number of technical errors, and the duration of training sessions were compared between intervention and controls.

RESULTS: In experiment 1, learning curves departed from 73% (controls) and 76% (intervention) success rates; slopes (standard error) were 0.79% (0.02%) and 0.71% (0.04), respectively, with mean absolute difference of 0.18% (95% confidence interval [CI], 0.17%-0.19%; P = 0). Intervention subjects' learning curves were shorter and steeper than those of controls. In experiment 2, the learning curves departed from 43% (controls) and 80% (intervention) success rates; slopes (standard error) were 1.06% (0.02%) and 0.42% (0.03%), respectively, with a mean difference of 0.65% (95% CI, 0.64%-0.66%; P = 0). Feedback was associated with a greater number of trials associated with learning in both experiment 1 (mean difference, 1.55 trials; 95% CI, 0.15-3 trials; P = 0) and experiment 2 (mean difference, 4.25 trials; 95% CI, 1.47-7.03 trials; P = 0) and a lower number of technical errors per trial in experiments 1 (mean difference, 0.19; 95% CI, 0.07-0.30; P = .02) and 2

(mean difference, 0.58; 95% CI, 0.45-0.70; P = 0), but longer training sessions in both experiments 1 (mean difference, 9.2 minutes; 95% CI, 4.15-14.24 minutes; P = .01) and 2 (mean difference, 7.4 minutes; 95% CI, 1.17-13.59 minutes; P = .02).

CONCLUSIONS: High-frequency, structured expert feedback compared favorably to self-directed learning, being associated with shorter learning curves, smaller number of technical errors, and longer duration of in-training improvement, but increased duration of the training sessions.

分娩過程中使用過催產素的剖宮產患者產後催產素用量增加

Patients Undergoing Cesarean Delivery After Exposure to Oxytocin During Labor Require Higher Postpartum Oxytocin Doses.

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背景：專家推薦產後使用催產素以預防宮縮乏力及出血，但是催產素可能有劑量依賴性副作用，並且產後催產素的正確劑量目前尚無明確規定。在分娩中使用過催產素的剖宮產患者，其產後催產素的 ED90 值相較於分娩中未使用過催產素的剖宮產患者高。因此，本研究擬對採用同一機構治療原則的剖宮產患者進行研究，比較剖宮產前使用過催產素者和剖宮產前未使用過催產素的患者產後催產素的使用情況。

方法:本研究採用回顧性圖表總結法，對硬膜外麻醉下行剖宮產手術患者的病史、一般情況、相關合併症以及催產素的使用、滴速、以及產前使用持續時間進行回顧。剖宮產前使用催產素的患者（OXY+組）與剖宮產前未使用催產素的患者（OXY-組）進行比較。主要結果變數為按照機構治療原則使用產後催產素的最大滴速。次要結果變數包括預計出血量，產後出血的患者比例，以及需要其他子宮收縮劑治療或紅細胞輸注的患者比例。

結果：相比於 OXY-組，OXY+組患者中初產婦占比更大、估計胎齡更大、新生兒

體重更重。此外，OXY+組的絨毛膜羊膜炎發生率更高並且多胎妊娠情況更少。OXY+組患者比 OXY-組產後催產素使用需要高滴速的情況更多（調整後優勢比 1.94（95%可信區間，1.19-3.15；P=0.008））。OXY+組需要其他子宮收縮劑的情況更常見。預計出血量、出血速度、及輸血速度方面兩組之前無顯著差異。

結論：在分娩中使用過催產素的產婦其產後縮宮素 ED90 值臨床中確實有顯著增加。據此，本機構修正了治療原則，對產前使用過催產素的產婦常規提高產後催產素的滴注速度。

(劉邱阿雪譯 潘豔、薛張綱校)

BACKGROUND: Experts recommend postpartum oxytocin to prevent uterine atony and hemorrhage, but oxytocin may be associated with dose-dependent adverse effects, and the correct dose of postpartum oxytocin has yet to be determined. The effective dose in 90% of patients (ED90) of oxytocin after cesarean delivery may be higher in patients exposed to oxytocin during labor compared to patients unexposed. We therefore undertook this study to compare postpartum oxytocin requirements in patients exposed to oxytocin prior to cesarean delivery versus those not exposed, when all were treated according to a specific institutional protocol.
METHODS: In this retrospective chart review, we reviewed medical records of patients who underwent cesarean delivery under neuraxial anesthesia and noted demographic data, relevant comorbidities, and oxytocin exposure, infusion rate, and duration prior to delivery. Patients exposed to oxytocin before cesarean (OXY+ group) were compared to those not exposed (OXY- group). The primary outcome variable was highest infusion rate of postpartum oxytocin required per institutional protocol. Secondary outcomes included estimated blood loss, proportion of patients with postpartum hemorrhage, and proportions who received other uterotonic medications or red blood cell transfusion.
RESULTS: OXY+ patients were more likely to be nulliparous and had higher estimated gestational age and neonatal weight than OXY- patients. They also had higher incidence of chorioamnionitis and lower incidence of multiple gestation. OXY+ patients required a high postpartum oxytocin infusion rate more often than OXY- patients (adjusted odds ratio 1.94 [95% confidence interval, 1.19-3.15; P = .008]). They also received other uterotonic agents more commonly. Estimated blood loss, hemorrhage rates, and transfusion rates did not differ between groups.
CONCLUSIONS: Reported increases in the ED90 of postpartum oxytocin after

oxytocin exposure during labor appear to be clinically significant. We have therefore altered our institutional protocol so that women preexposed to oxytocin routinely receive higher initial postpartum oxytocin infusion rates.

1非體外迴圈狀態下經心尖人工腱索植入治療二尖瓣返流患者的麻醉管理和手術結果：76例病例系列報導

Anesthetic Management and Procedural Outcomes of Patients Undergoing Off-Pump Transapical Implantation of Artificial Chordae to Correct Mitral Regurgitation: Case Series of 76 Patients

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背景：使用NeoChord系統（NeoChord Inc，Minneapolis，MN）經心尖人工腱索植入是一種新興的在心臟跳動狀態下，通過微創左胸小切口手術矯正二尖瓣返流（MR）的技術。該研究的目的是描述接受該手術患者的麻醉管理和手術結果。

方法：所有在2011年12月至2016年12月期間在作者醫院接受使用NeoChord系統行二尖瓣修復手術的患者（n = 76）均納入本次觀察性前瞻性研究。所有患者均使用芬太尼、丙泊酚和七氟醚聯合麻醉。只要有可能，每位元患者的核心溫度都保持在> 36°C。所有患者均使用二維和三維經食管超聲心動圖，將裝置引導至二尖瓣後葉（76例中的68例）、二尖瓣前葉（76例中的3例）或兩個瓣葉（76例中的5例）。在有效虜獲瓣膜後，放置人工腱索。人工腱索的位置和功能通過評估人工腱索緊張時MR的程度來評估。術後所有患者都轉入重症監護病房。

結果：患者的平均年齡為60±13歲（範圍33-87歲），男女比例為52/24。大多數患者有嚴重的MR（25 [33％]例為4 +級患者，51 [67％]例為3 +級患者）。術前平均EuroSCORE II為1.23％±1.16％（範圍為0.46％-4.23％）。手術中位持續時間為120min（四分位間距[IQR] 115-145min）。術後，42例（56％）患者有輕微MR，27例（36％）有1+ 級MR，4例（5％）有2級MR，2例（3％）MR> 2。由於二尖瓣後瓣穿孔，一名患者轉為接受傳統的二尖瓣修復術。患者對整個過程的耐受性良好，大部分病例的血流動力學保持穩定。只有20例（26％）患者需要低劑量的正性肌力藥物支持。所有患者術後平穩。拔管的中位時間為4小時（IQR，2.6-6），重症監護室住院時間為22小時（IQR，21-24）。5（6.6％）例患者需要異體血液製品輸注。

結論：經心臟NeoChord植入手術的麻醉可安全地在心臟跳動條件下進行，圍手術期死亡率低，罕見輸血。經食道超聲心動圖對手術的指導，安全性和有效性至關重要。

（張松 譯　陳傑 校）

BACKGROUND: Transapical implantation of artificial chordae using the NeoChord system (NeoChord Inc, Minneapolis, MN) is an emerging beating-heart technique for correction of mitral regurgitation (MR) through a minimally invasive left minithoracotomy. The purpose of the study was to describe the anesthetic management and procedural success of patients undergoing this procedure.

METHODS: All patients (n = 76) who underwent mitral valve repair with the NeoChord system in our institution from December 2011 to December 2016 were included in this observational

prospective study. Balanced anesthesia with a combination of fentanyl, propofol, and sevoflurane was used in all patients. Each patient's core temperature was maintained at >36°C whenever possible. Two- and 3-dimensional transesophageal echocardiography was used in all patients to navigate the device to the posterior mitral valve leaflet (68 of 76 patients), anterior mitral valve leaflet (3 of 76 patients), or both leaflets (5 of 76 patients). After effective leaflet capture, the artificial chordae were deployed. Position and function of the artificial chordae were assessed by evaluating the degree of MR when the neochordae were tensed. After surgery, all patients were transferred to the intensive care unit.

RESULTS: The mean age of the patients was 60 ± 13 years (range, 33-87 years), and the male/female ratio was 52/24. Most patients had severe MR (grade 4+ in 25 [33%] patients, grade 3+ in 51 [67%] patients). The average preoperative EuroSCORE II was 1.23% ± 1.16% (range, 0.46%-4.23%). The median duration of the procedure was 120 minutes (interquartile range [IQR] 115-145 minutes). After the procedure, 42 (56%) patients had trivial MR, 27 (36%) had grade 1+ MR, 4 (5%) had grade 2+ MR, and 2 (3%) had >2+ MR. One patient underwent conversion to conventional mitral valve repair due to perforation of the posterior mitral valve leaflet. The whole procedure was well tolerated by the patients, with hemodynamics remaining stable in the majority of the cases. Only 20 (26%) patients needed low-dose inotropic support perioperatively. All patients had an uneventful postoperative course. The median time to extubation was 4 hours (IQR, 2.6-6), and the length of intensive care unit stay was 22 hours (IQR, 21-24). Five (6.6%) patients required allogeneic blood products.

CONCLUSIONS: Anesthesia for transapical NeoChord implantation can be safely performed under beating-heart conditions, with low perioperative morbidity and rare blood transfusions. Transesophageal echocardiography is crucial for the guidance, safety, and effectiveness of the procedure.

Rho激酶抑制劑法舒地爾對脊髓缺血再灌注損傷大鼠的神經保護作用

Neuroprotective Effects of Fasudil, a Rho-Kinase Inhibitor, After Spinal Cord Ischemia and Reperfusion in Rats

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背景：卒中後繼發Rho/ Rho激酶通路過度啟動。作者研究常溫條件下大鼠短暫脊髓缺血再灌注模型中法舒地爾（Rho激酶抑制劑）預處理和後處理的神經保護作用。

方法：經動物研究委員會批准後，雄性SD大鼠隨機分配至1-6組：預處理、後處理對照組（C）；預處理、後處理法舒地爾組（F）；預處理、後處理sham組（S）。在pre-F或pre-C組中，SD大鼠缺血前使用法舒地爾（10 mg/kg）或生理鹽水靜脈注射至少30分鐘，post-F 或 post-C組中大鼠再灌注後使用法舒地爾（10 mg/kg）或生理鹽水靜脈注射至少30分鐘。Sham組不進行缺血處理。採用主動脈球囊阻斷聯合控制性降壓10分鐘誘導缺血。評估缺血後1、7、14天的神經功能缺損評分（NDS；0 - 8分），以及組織病理結果。

結果：pre-F組缺血後7天和14天后NDS評分(中位數[範圍]; 3.5 [2–6]和2.5 [0–6])較pre-C組低(5.5 [4–7]和4.5 [4–6]; $P = .046$ 和 $P = .049$),然而post-F和post-C組之間的NDS評分沒有明顯差異。pre-F和post-F組灰質中完整神經元的數目平均標準差[95%CI]: 25 ± 7 [20–30]和16 ± 5 [12–19])顯著高於pre-C和post-C組(11 ± 5 [7–14]和9 ± 3 [7–11]; $P < .001$和$P = .002$)。post-F組

完整神經元的數目(16 ± 5 [12–19])低於post-S組(26 ± 2 [24–29]; *P* < .001)。pre-F組和post-F組白質中空泡的百分比(21.5 ± 8.4 [15.5–27.5]和13.6 ± 7.4 [8.3–18.9])低於pre-C和post-C組(43.7 ± 10.4 [36.3–51.1]和40.6 ± 12.3 [31.8–49.4]; *P* < .001和*P* < .001)。

結論：本研究結果表明，常溫下大鼠缺血前靜脈注射法舒地爾預處理能改善缺血再灌注損傷後的神經學和組織病理學結局，甚至在缺血長達14天之後。而使用法舒地爾後處理僅可改善組織病理學結局。法舒地爾可能成為脊髓缺血高風險的一種預處理模式。

（徐僑翌 譯　陳傑 校）

BACKGROUND: Excessive Rho/Rho-kinase pathway activation occurs subsequent to stroke. We examined the neuroprotective effects of pre- and posttreatment with fasudil (a Rho-kinase inhibitor) in a rat transient spinal cord ischemia-reperfusion model under normothermic conditions.

METHODS: After approval by our animal research committee, male Sprague-Dawley rats were assigned to 1 of 6 groups: pre- and postcontrol (C); pre- and postfasudil (F); and pre- and post-sham (S). Fasudil (10 mg/kg) or normal saline was administered intravenously over 30 minutes before ischemia in the pre-F or pre-C groups, and over 30 minutes after reperfusion in the post-F or post-C groups. Sham groups were not subjected to ischemia. Ischemia was induced by aortic occlusion using a balloon catheter combined with hypotension for 10 minutes. Neurologic deficit scores (NDS; 0–8 points) were assessed 1, 7, and 14 days after ischemia, and then histopathologic outcomes were assessed.

RESULTS: NDS 7 and 14 days after ischemia in the pre-F group (median [range]; 3.5 [2–6] and 2.5 [0–6]) were lower than those in the pre-C group (5.5 [4–7] and 4.5 [4–6]; *P* = .046 and *P* = .049), whereas NDS in the post-F group and in the post-C group were not different. The numbers of intact neurons in the gray matter in the pre- and post-F groups (mean ± standard deviation [95% confidence interval]: 25 ± 7 [20–30] and 16 ± 5 [12–19]) were greater than those in the pre- and post-C groups (11 ± 5 [7–14] and 9 ± 3 [7–11]; *P* < .001 and *P* = .002). The number of intact neurons in the post-F group (16 ± 5 [12–19]) was lower than the number in the post-S group (26 ± 2 [24–29]; *P* < .001). The percentages of vacuolation in the white matter in the pre- and post-F groups (21.5 ± 8.4 [15.5–27.5] and 13.6 ± 7.4 [8.3–18.9]) were lower than those in the pre- and post-C groups (43.7 ± 10.4 [36.3–51.1] and 40.6 ± 12.3 [31.8–49.4]; *P* < .001 and *P* < .001).

CONCLUSIONS: Our results demonstrated that intravenous fasudil administered before ischemia improved both neurologic and histopathologic outcomes even 14 days after ischemia, while fasudil administered postinsult improved histopathologic outcomes only in normothermic rats. Fasudil may be a relevant pretreatment paradigm for planned procedures at risk for spinal cord ischemia.

呼吸氣體分析—技術方面

Respiratory Gas Analysis—Technical Aspects

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本文是一篇以二氧化碳分析為重點，專注於技術的呼吸氣體分析相關的綜述。重點介紹了商業應用的測量技術，討論了紅外光譜和主流與旁流氣體採樣的基本原理和技術問題。介紹了臨床醫師特別感興趣的二氧化碳監測儀相關內容：包括準確性和回應時間，以及相關的標

準，並給出了典型的數值。具有代表性的時間和容量的二氧化碳描記圖顯示與臨床相關的參數描述。綜述了目前使用術語的一些方面以及對呼吸和呼末值的明確定義。並指出了呼末二氧化碳監測儀是麻醉醫師特別感興趣的應用，並提供了關鍵的參考文獻。記錄了在呼吸氣體分析方面正在進行的發展，以及那些將會影響到它的發展。
（陳聰 譯　陳傑 校）

A technology-focused review of respiratory gas analysis, with an emphasis on carbon dioxide analysis, is presented. The measurement technologies deployed commercially are highlighted, and the basic principles and technical concerns of infrared spectroscopy and mainstream versus sidestream gas sampling are discussed. The specifications of particular interest to the clinician, accuracy and response time, and the related standard, with typical values for a capnometer, are presented. Representative time and volumetric capnograms are shown with the clinically relevant parameters described. Aspects of the terminology in present-day use and the need for clarity in defining what is a breath and an end-tidal value are reviewed. The applications of capnography of particular interest to the anesthesiologist are noted, and key references are provided. Ongoing developments with respect to respiratory gas analysis, and those that will impact it, are noted.

心臟驟停後有針對性的體溫管理：一項系統評估和薈萃分析

Targeted Temperature Management After Cardiac Arrest: Systematic Review and Meta-analyses
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背景：具有治療性低溫的目標體溫管理（TTM）是心跳驟停倖存者後期護理不可或缺的組成部分。然而，最近的隨機對照試驗（RCTs）未能證明TTM對臨床結局的益處。作者試圖確定來自現有隨機對照試驗的匯總資料是否支援心臟驟停後使用院前和/或院內TTM。
方法：從1966年到2016年11月，利用預先定義的標準對SCOPUS，Elsevier的同行評審文獻的摘要和引文資料庫進行了全面搜索。治療性低溫被定義為旨在將心臟驟停後存活者冷卻至≤34˚C的任何策略。正常體溫是≥36℃。作者通過將這些研究分為兩組，對患者的死亡率和神經系統結局進行了比較：（1）亞低溫與正常體溫和（2）院前低溫與院內低溫相比，採用標準薈萃分析方法。隨機效應模型被用來估計比較風險比（RR）和95％置信區間（CIs）。
結果：對5項隨機對照試驗中的1389名患者比較了低溫和正常體溫策略，而對6項隨機對照試驗的3393名患者比較了院前低溫和院內低溫。作者觀察到低溫和正常體溫策略之間的死亡率（RR，0.88; 95％CI，0.73-1.05）或神經系統結局（RR，1.26; 95％CI，0.92-1.72）無差異。同樣，院前低溫與住院低溫策略之間的死亡率（RR，1.00; 95％CI，0.97-1.03）或神經系統結局（RR，0.96; 95％CI，0.85-1.08）之間沒有差異。

結論：本研究結果表明TTM與治療性低溫可能無法改善死亡率或倖存者的神經系統結局。使用治療性低溫作為倖存者後期護理護理策略的標準可能需要重新評估。
（崔璀 譯　陳傑 校）

BACKGROUND: Targeted temperature management (TTM) with therapeutic hypothermia is an integral component of postarrest care for survivors. However, recent randomized controlled trials (RCTs) have failed to demonstrate the benefit of TTM on clinical outcomes. We sought to determine if the pooled data from available RCTs support the use of prehospital and/or in-hospital TTM after cardiac arrest.

METHODS: A comprehensive search of SCOPUS, Elsevier's abstract and citation database of peer-reviewed literature, from 1966 to November 2016 was performed using predefined criteria. Therapeutic hypothermia was defined as any strategy that aimed to cool post-cardiac arrest survivors to a temperature ≤34°C. Normothermia was temperature of ≥36°C. We compared mortality and neurologic outcomes in patients by categorizing the studies into 2 groups: (1) hypothermia versus normothermia and (2) prehospital hypothermia versus in-hospital hypothermia using standard meta-analytic methods. A random effects modeling was utilized to estimate comparative risk ratios (RR) and 95% confidence intervals (CIs).

RESULTS: The hypothermia and normothermia strategies were compared in 5 RCTs with 1389 patients, whereas prehospital hypothermia and in-hospital hypothermia were compared in 6 RCTs with 3393 patients. We observed no difference in mortality (RR, 0.88; 95% CI, 0.73-1.05) or neurologic outcomes (RR, 1.26; 95% CI, 0.92-1.72) between the hypothermia and normothermia strategies. Similarly, no difference was observed in mortality (RR, 1.00; 95% CI, 0.97-1.03) or neurologic outcome (RR, 0.96; 95% CI, 0.85-1.08) between the prehospital hypothermia versus in-hospital hypothermia strategies.

CONCLUSIONS: Our results suggest that TTM with therapeutic hypothermia may not improve mortality or neurologic outcomes in postarrest survivors. Using therapeutic hypothermia as a standard of care strategy of postarrest care in survivors may need to be reevaluated.

乳酸是否影響嚴重鈍性創傷患者早期高血糖與多器官功能衰竭之間的關係？

Does Lactate Affect the Association of Early Hyperglycemia and Multiple Organ Failure in Severely Injured Blunt Trauma Patients?

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背景：創傷後，早期高血糖與多器官功能衰竭（MOF）相關。但很少研究考慮臨床休克程度對其影響作用。作者推測當同時考慮血糖和乳酸時，二者均與嚴重鈍性創傷患者MOF相關。

方法：作者在一家三級醫療創傷中心進行了回顧性調查。納入標準為患者年齡≥18歲，創傷嚴重評分（ISS）＞ 15，病因為鈍性損傷且重症監護病房住院時間＞ 48小時。排除糖尿病病史和48小時內死亡的患者。記錄人口統計學、損傷嚴重程度和生理資料。在住院24小時內收集血糖和乳酸值。記錄多個時間點的血糖和乳酸值：入院的第一個血糖（Glucadm,mg/dl）和乳酸值（Lacadm,mmol/L），平均初始24小時內血糖（Gluc24hMean, mg/dl）和乳酸（Lac24hMean, mmol/L）值和時間加權初始24小時內血糖（Gluc24hTW）和乳酸（Lac24hTW）值。這些指標均以四分位數表示。主要預後指標是MOF。在控制ISS，入院時休克指數和入院後是否手術的因素後，採用單獨Cox回歸比例風險模型評估血糖和乳酸與MOF之間的關係。在多變數回歸模型中評估血糖和乳酸之間的相互作用。結果以血糖和乳酸值四分位數增加的危險比（HRs）[95%可行區間]表示。

結果：本研究總共納入507名嚴重鈍性損傷患者。507名患者中有46名（9.1%）存在MOF，擁有更高的中位ISS（33.5，四分位數間距[IQR]22-41 vs 27，四分位數間距21-34；P<0.001）和中位休克指數（0.82，IQR:0.68-1.1 vs 0.73，IQR：0.60-0.91；P=0.02）。初始創傷復蘇階段轉入手術室更可能發展為　　MOF（119例中20例，14.4% vs 369例中7.1%；P=0.01）。三種獨立的Cox回歸模型顯示，在控制混雜變數前提下，每個血糖四分位數和多器官功能衰

竭增加的危險比(HR)關係如下：Glucadm HR:1.35，95% CI：1.02-1.80；Glu24hMean HR:1.63，95%CI：1.14-2.32；Gluc24hTW HR:1.14，95%CI，0.86-1.50。三個獨立的Cox比例風險模型還顯示，在控制相同的混雜因素的前提下，每個乳酸四分位數和MOF增加的危險比(HR)關係如下：Lacadm HR:1.94，95% CI：1.38-2.96；Lac24hMean HR:1.68，95% CI，1.22-2.31；Lac24Htw HR:1.49, 95% CI，1.10-2.02。當血糖和乳酸同時進入模型分析，顯示只有乳酸仍然與MOF顯著相關：Lacadm HR：1.86,95% CI，1.29-2.69，Lac24hMean HR:1.54, 95% CI，1.11-2.12，Lac24hTW HR：1.48, 95% CI，1.08-2.01。從主要結局考慮，乳酸與血糖之間並沒有顯著的相互作用。

結論：在嚴重鈍性創傷患者中，當同時考慮血糖和乳酸時，只有乳酸與多器官功能衰竭顯著相關。

（丁曦冰 譯　陳傑 校）

BACKGROUND: Early hyperglycemia is associated with multiple organ failure (MOF) after traumatic injury; however, few studies have considered the contribution of depth of clinical shock. We hypothesize that when considered simultaneously, glucose and lactate are associated with MOF in severely injured blunt trauma patients.

METHODS: We performed a retrospective investigation at a single tertiary care trauma center. Inclusion criteria were patient age ≥18 years, injury severity score (ISS) >15, blunt mechanism of injury, and an intensive care unit length of stay >48 hours. Patients with a history of diabetes or who did not survive the initial 48 hours were excluded. Demographics, injury severity, and physiologic data were recorded. Blood glucose and lactate values were collected from admission through the initial 24 hours of hospitalization. Multiple metrics of glucose and lactate were calculated: the first glucose (Glucadm, mg/dL) and lactate (Lacadm, mmol/L) at hospital admission, the mean initial 24-hour glucose (Gluc24hMean, mg/dL) and lactate (Lac24hMean, mmol/L), and the time-weighted initial 24-hour glucose (Gluc24hTW) and lactate (Lac24hTW). These metrics were divided into quartiles. The primary outcome was MOF. Separate Cox proportional hazard models were generated to assess the association of each individual glucose and lactate metric on MOF, after controlling for ISS, admission shock index, and disposition to the operating room after hospital admission. We assessed the interaction between glucose and lactate metrics in the multivariable models. Results are reported as hazard ratios (HRs) for an increase in the quartile level of glucose and lactate measurements, with 95% confidence intervals (CIs).

RESULTS: A total of 507 severely injured blunt trauma patients were evaluated. MOF occurred in 46 of 507 (9.1%) patients and was associated with a greater median ISS (33.5, interquartile range [IQR]: 22-41 vs 27, IQR: 21-34; P < .001) and a greater median admission shock index (0.82, IQR: 0.68-1.1 vs 0.73, IQR: 0.60-0.91; P = .02). Patients who were transferred to the operating room after the initial trauma resuscitation were also more likely to develop MOF (20 of 119, 14.4% vs 26 of 369, 7.1%; P = .01). Three separate Cox proportional regression models demonstrated the following HR for an increase in the individual glucose metric quartile and MOF, while controlling for confounding variables: Glucadm HR: 1.35, 95% CI, 1.02-1.80; Gluc24hMean HR: 1.63, 95% CI, 1.14-2.32; Gluc24hTW HR: 1.14, 95% CI, 0.86-1.50. Three separate Cox proportional hazards models also demonstrated the following HR for each individual lactate metric quartile while controlling for the same confounders, with MOF again representing the dependent variable: Lacadm HR: 1.94, 95% CI, 1.38-2.96; Lac24hMean HR: 1.68, 95% CI, 1.22-2.31; Lac24hTW HR: 1.49, 95% CI, 1.10-2.02. When metrics of both glucose and lactate were entered into the same model only lactate remained significantly associated with MOF:

Lacadm HR: 1.86, 95% CI, 1.29-2.69, Lac24hMean HR: 1.54, 95% CI, 1.11-2.12, and Lac24hTW HR: 1.48, 95% CI, 1.08-2.01. There was no significant interaction between lactate and glucose variables in relation to the primary outcome.
CONCLUSIONS: When glucose and lactate are considered simultaneously, only lactate remained significantly associated with MOF in severely injured blunt trauma patients.

在正常剖宮產期間的胎盤來源的微粒釋放

Microparticle Release During Normal Cesarean Delivery

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妊娠期凝血增加並在分娩時達高峰。作者推測胎盤分離時胎盤來源的血漿中微粒（MP）水準增高，數小時後消退。作者進行了一項前瞻性觀察性研究探討健康產婦剖宮產術前後血漿MP水準。主要結果是產後MP水準與基線水準相比。採用流式細胞術和染色法測定MP水準。胎盤來源的MP以凝血蛋白的存在為特徵。在健康產婦分娩後MP立即升高，隨後返回到基線水準。

（葛家希 譯　陳傑 校）

Coagulation increases during pregnancy and peaks during parturition. We hypothesized that an increase in microparticle (MP) levels in plasma occurs around the time of placental separation and subsides over several hours. We performed a prospective observational pilot study to investigate plasma MP levels in healthy parturients immediately before and after cesarean delivery. The primary outcome was MP levels at postdelivery time points compared to baseline levels. Samples underwent flow cytometry and staining to determine MP levels. Placental-derived MPs were further characterized for the presence of procoagulant proteins. Placental-derived MPs increased immediately after delivery before returning to baseline in healthy parturients.

幼年豬和成年豬模型急性等容血液稀釋後的心肺改變：一項前瞻干預性研究

Cardiorespiratory Alterations Following Acute Normovolemic Hemodilution in a Pediatric and an Adult Porcine Model: A Prospective Interventional Study

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背景：急性等容血液稀釋（ANH）被認作是圍手術期管理期間節約用血的一項干預措施。作者旨在比較成年豬和斷奶仔豬ANH後的心肺變化，以確定這些年齡組降低血細胞比容的效果，從而測試ANH後心肺呼吸變化反映年齡相關生理行為差異的假設。
方法：通過逐步取血（10 mL / kg）並晶體液替代的方式，在麻醉機械通氣的成年小型豬和5周齡斷奶仔豬中實現ANH。心肺呼吸評估包括測量呼吸道阻力、呼吸組織彈性、有效肺容積、血管外肺水、平均動脈壓、肺血流量和心輸出量。在控制條件下進行呼吸和血液動力學測量，並在每個ANH條件下進行5至7個步驟。
結果：ANH在兩組中均引起氣道阻力和組織彈性的即時和漸進性增加，儘管血細胞比容降低相似，但成年更顯著惡化。成年豬中血管外肺水的增加明顯更多，平均值（DM）差異為25.1％（95％置信區間[CI]，5.3％-44.9％）。進行性ANH僅在成年組中導致肺血流DM（45.3

%; 95%CI，19.8%-70.8%）和平均動脈壓（36.3%; 95%CI，18.7%-53.9%）的顯著降低，而仔豬的中心輸出量顯著增加（DM，51.6; 95%CI，14.2%-89.0%）。

結論：雖然ANH導致斷奶仔豬出現輕微有害心肺呼吸變化，但在成年豬中觀察到支氣管收縮逐漸發展，肺組織外滲和硬化，全身和肺血流動力學惡化。 ANH可能存在年齡依賴性心肺效應。

（俞蘇洋 譯　陳傑 校）

BACKGROUND: Acute normovolemic hemodilution (ANH) is considered as a blood-sparing intervention during the perioperative management. We aimed at comparing the cardiopulmonary consequences of ANH between adult pigs and weaned piglets to establish the effects of lowering hematocrit in these age groups, and thereby testing the hypothesis that difference in the age-related physiological behavior will be reflected in the cardiorespiratory changes following ANH.

METHODS: ANH was achieved in anesthetized, mechanically ventilated adult minipigs and 5-week-old weaned piglets by stepwise blood withdrawal (10 mL/kg) with crystalloids replacement. Cardiorespiratory assessments consisted of measuring airway resistance, respiratory tissue elastance, effective lung volume, extravascular lung water, mean arterial pressure, pulmonary blood flow, and cardiac output. Respiratory and hemodynamic measurements were made at control conditions and following each ANH condition obtained with 5 to 7 steps.

RESULTS: ANH induced immediate and progressive increases in airway resistance and tissue elastance in both groups, with more pronounced worsening in adults despite the similar decreases in hematocrit. The increases in extravascular lung water were significantly greater in the adult population with the differences in mean (DM) of 25.1% (95% confidence interval [CI], 5.3%–44.9%). Progressive ANH led to significant decreases in the DM of pulmonary blood flow (45.3%; 95% CI, 19.8%–70.8%) and mean arterial pressure (36.3%; 95% CI, 18.7%–53.9%) only in adults, whereas cardiac output increased significantly only in the piglets (DM, 51.6; 95% CI, 14.2%–89.0%).

CONCLUSIONS: While ANH led to mild detrimental cardiorespiratory changes in weaned piglets, gradual developments of bronchoconstriction, lung tissue extravasation and stiffening, and deteriorations in systemic and pulmonary hemodynamics were observed in adults. ANH may exert age-dependent cardiorespiratory effect.

兒科程式性鎮靜臨床試驗的有效結局指標：一項ACTTION系統性回顧

Efficacy Outcome Measures for Pediatric Procedural Sedation Clinical Trials: An ACTTION Systematic Review

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對比較不同兒科程式性鎮靜技術和方法的研究進行客觀評估受到結局指標缺乏一致性的限制。本研究回顧了現有的（指標）測量方法，這些方法已經歷了在兒科程式性鎮靜環境中的心理學分析，來確定在涵蓋各種（操作）流程、年齡組和技術等的範圍內，到什麼程度和在什麼情況下，這些方法的使用是恰當的。作者研究結果表明，許多不同的測量方法已被用

於評估兒科程式性鎮靜的效能和效力。(這些方法中)大多數都缺乏有效性和可靠性的證據，而這些對於推進嚴格的臨床試驗設計，新藥和新設備的評估是必需的。根據本研究結果，可以開發一套核心的兒科鎮靜結局情況和結局指標。作者認為，所有利益相關者在評估兒科程式性鎮靜的適當領域和測量方法方面達成共識是可能的，而且應該推行這類建議的廣泛實施。

（姚雪雅 譯 陳傑 校）

Objective evaluations comparing different techniques and approaches to pediatric procedural sedation studies have been limited by a lack of consistency among the outcome measures used in assessment. This study reviewed those existing measures, which have undergone psychometric analysis in a pediatric procedural sedation setting, to determine to what extent and in what circumstances their use is justified across the spectrum of procedures, age groups, and techniques. The results of our study suggest that a wide range of measures has been used to assess the efficacy and effectiveness of pediatric procedural sedation. Most lack the evidence of validity and reliability that is necessary to facilitate rigorous clinical trial design, as well as the evaluation of new drugs and devices. A set of core pediatric sedation outcome domains and outcome measures can be developed on the basis of our findings. We believe that consensus among all stakeholders regarding appropriate domains and measures to evaluate pediatric procedural sedation is possible and that widespread implementation of such recommendations should be pursued.

術中應用艾司洛爾輔助減少術中阿片類藥物用量和減輕術後疼痛：一項系統性回顧、薈萃分析

Intraoperative Esmolol as an Adjunct for Perioperative Opioid and Postoperative Pain Reduction: A Systematic Review, Meta-analysis, and Meta-regression

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背景：艾司洛爾是一種超短效β1受體拮抗劑。近期研究表明艾司洛爾可以調節疼痛反應。作者進行了一項薈萃分析來探討術中使用艾司洛爾是否減少阿片類藥物的用量或降低疼痛評分。

方法：通過PubMed，CDS，CCRCT，pubget和Google學術進行搜索。設置安慰劑組和阿片類藥物組，且患者年齡大於等於18歲的隨機對照研究被納入。為了比較阿片類藥物的用量，納入的研究在術中和/或麻醉復蘇室中統計阿片類藥物的用量。手術後第一個小時進行疼痛評分。

結果：一共73項研究被納入，其中23項納入了系統評價，19項納入了一項或多項比較。在7項研究共433名患者中，術中應用艾司洛爾減少了術中阿片類藥物的用量（[SMD]，-1.60；95％置信區間[CI]，-2.25－-0.96；P ≤ 0.001）。在12項研究共659名患者中，術中應用艾司洛爾降低了麻醉復蘇室阿片類藥物的使用(SMD，-1.21；95％CI，-1.66－-0.77; P ≤ 0.001)。在11項研究共688名患者中，術後1小時疼痛評分的改變無統計學意義（SMD，-0.60；95％CI，-1.44－0.24；P = 0 .163）。

結論：該項meta分析表明，術中使用艾司洛爾減少術中和術後阿片類藥物的用量，而術後疼痛評分無變化。

（翟小竹 譯　陳傑 校）

BACKGROUND: Esmolol is an ultrashort β-1 receptor antagonist. Recent studies suggest a role for esmolol in pain response modulation. The authors performed a meta-analysis to determine if the intraoperative use of esmolol reduces opioid consumption or pain scores.
METHODS: PubMed, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, pubget, and Google Scholar were searched. Studies were included if they were randomized, placebo- or opioid-controlled trials written in English, and performed on patients 18 years of age or older. For comparison of opioid use, included studies tracked opioid consumption intraoperatively and/or in the postanesthesia care unit. Pain score comparisons were performed during the first hour after surgery.
RESULTS: Seventy-three studies were identified, 23 were included in the systematic review, and 19 were eligible for 1 or more comparisons. In 433 patients from 7 trials, intraoperative esmolol decreased intraoperative opioid consumption (Standard Mean Difference [SMD], -1.60; 95% confidence interval [CI], -2.25 to -0.96; P ≤ .001). In 659 patients from 12 trials, intraoperative esmolol decreased postanesthesia care unit opioid consumption (SMD, -1.21; 95% CI, -1.66 to -0.77; P ≤ .001). In 688 patients from 11 trials, there was insufficient evidence of change in postoperative 1 hour pain scores (SMD, -0.60; 95% CI, -1.44 to 0.24; P = .163).
CONCLUSIONS: This meta-analysis demonstrates that intraoperative esmolol use reduces both intraoperative and postoperative opioid consumption, with no change in postoperative pain scores.

研究效應量的統計學意義與臨床重要性：P值和置信區間真的代表什麼？

Statistical Significance Versus Clinical Importance of Observed Effect Sizes: What Do P Values and Confidence Intervals Really Represent?

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效應量测量是量化治療效果或變數之間的關聯的一種方式。這種測量包括在手段、風險差異、風險率、比值比，或關聯性方面的未標準化及標準化差異，其中超過70%的內容已包含在此文獻的描述中。虛無假設顯著性檢驗是效應量統計推理的主要方法，但該檢驗的結果常常被曲解，導致其無法為估量的等級提供資訊，也無法告知某種效應的臨床重要性。因此，研究者們不應僅僅關注統計學意義，還應該彙報其觀察到的效應量大小。不過，所有樣本在某種程度上都會受到隨機性的影響，例如，觀察到的效應大小能夠多大程度上體現研究群體中效應的等級和方向，在這方面存在一定程度的不確定性。因此，效應量大小的估測值應與此種不確定性進行量化的合理值的整體範圍相結合進行判斷。這種方式有利於評估觀察到的效應在研究群體中應有的實際大小，並由此判斷其臨床重要性的大小。本教程評述了不同的效應量測量方式，並描述了置信區間在處理觀察到的效應或關聯的統計學意義及臨床重要性方面的應用。另外也討論了P值的實際所指，及其在有意義及（相對的）無意義二分法方面的補充。本教程有意強調概念的直觀解釋及結果的直觀解析，而不是注重於背後的數學理論或概念。
（張金源 譯 陳傑 校）

Effect size measures are used to quantify treatment effects or associations between variables. Such measures, of which >70 have been described in the literature, include unstandardized and standardized differences in means, risk differences, risk ratios, odds ratios, or correlations. While null hypothesis significance testing is the predominant approach to statistical inference on effect

sizes, results of such tests are often misinterpreted, provide no information on the magnitude of the estimate, and tell us nothing about the clinically importance of an effect. Hence, researchers should not merely focus on statistical significance but should also report the observed effect size. However, all samples are to some degree affected by randomness, such that there is a certain uncertainty on how well the observed effect size represents the actual magnitude and direction of the effect in the population. Therefore, point estimates of effect sizes should be accompanied by the entire range of plausible values to quantify this uncertainty. This facilitates assessment of how large or small the observed effect could actually be in the population of interest, and hence how clinically important it could be. This tutorial reviews different effect size measures and describes how confidence intervals can be used to address not only the statistical significance but also the clinical significance of the observed effect or association. Moreover, we discuss what P values actually represent, and how they provide supplemental information about the significant versus nonsignificant dichotomy. This tutorial intentionally focuses on an intuitive explanation of concepts and interpretation of results, rather than on the underlying mathematical theory or concepts.

術中運動誘發電位對於預防胸科手術及胸腹部動脈瘤修補術後脊髓損傷的臨床應用

Clinical Utility of Intraoperative Motor-Evoked Potential Monitoring to Prevent Postoperative Spinal Cord Injury in Thoracic and Thoracoabdominal Aneurysm Repair: An Audit of the Japanese Association of Spinal Cord Protection in Aortic Surgery Database

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背景：脊髓缺血再灌注損傷是降主動脈及胸腹部主動脈術後嚴重的併發症。運動誘發電位（Motor-evoked potentials ，MEPs）曾被用於評估術中運動神經束功能，但是 MEP 檢測是否可以減少術後運動缺陷的發生尚不清楚。因此，我們評估了多個醫療中心進行過降主動脈及胸腹部主動脈修補手術（包括開放手術以及介入手術）患者的醫療記錄以評估 MEP 檢測與術後運動功能損傷的關係。

方法：本研究中納入的病例為於 2000 年至 2013 年之間在隸屬于日本主動脈手術脊髓保護協會的 12 家醫院中進行降主動脈或胸腹主動脈修補術的患者。應用多變數混合回歸分析，我們探索是否術中 MEP 檢測與患者出院時開放及介入主動脈修補術後運動缺陷相關。

結果：我們收集到 1214 例患者病例資料（開放手術有 601 例（49.5%）；介入手術有 613 例（50.5%））。其中 631 例患者進行了 MEP 檢測剩餘 583 例未進行檢測。75 位患者（6.2%）于出院時發生術後運動功能損傷。多變數回歸分析結果表明出院時術後運動功能損傷與 MEP 檢測無顯著關聯（矯正後比值比 [OR]：1.13；95%置信區間[CI]：0.69–1.88; P = 0.624），

但與其他因素相關：神經損傷病史（矯正後 OR: 6.08;　95% CI:3.10–11.91;　P <0 .001）；腦脊液引流術史（矯正後 OR: 2.14;　95% CI: 1.32–3.47;　P =0.002）；介入操作（校正後 OR: 0.45; 95% CI:0.27–0.76;　P =0.003。術中 MEP 值小於控制閾值的 25%用於預測出院時運動功能損傷的敏感性及特異性分別為 37.8% (95% CI, 26.5%–49.5%) 及 95.5% (95% CI, 94.7%–96.4%)。

結論：術中 MEP 檢測與主動脈手術患者出院是運動功能損傷無相關性。

（蘭海丹譯 李士通校）

BACKGROUND: Spinal cord ischemic injury is the most devastating sequela of descending and thoracoabdominal aortic surgery. Motor-evoked potentials (MEPs) have been used to intraoperatively assess motor tract function, but it remains unclear whether MEP monitoring can decrease the incidence of postoperative motor deficits. Therefore, we reviewed multicenter medical records of patients who had undergone descending and thoracoabdominal aortic repair (both open surgery and endovascular repair) to assess the association of MEP monitoring with postoperative motor deficits.

METHODS: Patients included in the study underwent descending or thoracoabdominal aortic repair at 12 hospitals belonging to the Japanese Association of Spinal Cord Protection in Aortic Surgery between 2000 and 2013. Using multivariable mixed-effects logistic regression analysis, we investigated whether intraoperative MEP monitoring was associated with postoperative motor deficits at discharge after open and endovascular aortic repair.

RESULTS: We reviewed data from 1214 patients (open surgery, 601 [49.5%]; endovascular repair, 613 [50.5%]). MEP monitoring was performed in 631 patients and not performed in the remaining 583 patients. Postoperative motor deficits were observed in 75 (6.2%) patients at discharge. Multivariable logistic regression analysis revealed that postoperative motor deficits at discharge did not have a significant association with MEP monitoring (adjusted odds ratio [OR], 1.13; 95% confidence interval [CI], 0.69–1.88; P = .624), but with other factors: history of neural deficits (adjusted OR, 6.08; 95% CI, 3.10–11.91; P < .001), spinal drainage (adjusted OR, 2.14; 95% CI, 1.32–3.47; P = .002), and endovascular procedure (adjusted OR, 0.45; 95% CI, 0.27–0.76; P = .003). The sensitivity and specificity of MEP <25% of control value for motor deficits at discharge were 37.8% (95% CI, 26.5%–49.5%) and 95.5% (95% CI, 94.7%–96.4%), respectively.

CONCLUSIONS: MEP monitoring was not significantly associated with motor deficits at discharge.

吸入麻醉藥對於供肝者肝臟再生能力的影響——傾向性評分匹配分析

Impact of Inhalational Anesthetics on Liver Regeneration After Living Donor Hepatectomy: A Propensity Score-Matched Analysis

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背景：雖然地氟烷及七氟烷是吸入麻醉藥中最常被使用的吸入麻醉藥，但其曾與術後肝臟損傷相關，其對肝臟再生功能的影響尚不清楚。我們比較這兩種麻醉藥對活供體肝切除術（ living donor hepatectomy ，LDH）後肝臟再生指數（ liver regeneration index ，LRI）的影響。

方法：我們對在 2008 年 1 月至 2016 年 8 月間為 LDH 進行左肝切除術的 1629 例患者進行了回顧性表格分析。患者被分為七氟烷組（1206 例）及地氟烷組（423 例）。使用多變數回歸分析探討與 LRI 相關的因素。傾向性評分匹配分析比較了兩組間早期（術後 1 周）及後期（術後 1-2 個月）LRIs 以及肝功能的延遲恢復。

結果：1629 例患者平均早期及後期 LRIs 分別為 63.3% ± 41.5% 及 93.7% ± 48.1%。傾向性評分匹配後，七氟烷組及地氟烷組將早期及後期 LRIs 均未觀察到顯著差異（早期 LRI: 61.2% ± 41.5% vs 58.9% ± 42.4%, P = 0.438; 後期 LRI: 88.3% ± 44.3% vs 94.6% ± 52.4%, P = 0.168）。男性（回歸係數[β]: 4.6; 置信區間:1.6-7.6; P = 0.003）及剩餘肝體積（β: -4.92; 置信區間: -5.2 to -4.7; P < 0.001）與 LRI 相關。LDH 術後肝功能延遲恢復的發生率為 3.6%（n=29），但兩組間差異無統計學意義(3.0% vs 4.2%, P = 0.375) 。

結論：七氟烷和地氟烷均可安全地用於 LDH 不會影響術後肝臟再生以及延遲肝功能恢復。（蘭海丹譯 李士通校）

BACKGROUND: Although desflurane and sevoflurane, the most commonly used inhalational anesthetics, have been linked to postoperative liver injury, their impact on liver regeneration remains unclear. We compared the influence of these anesthetics on the postoperative liver regeneration index (LRI) after living donor hepatectomy (LDH).

METHODS: We conducted a retrospective chart review of 1629 living donors who underwent right hepatectomy for LDH between January 2008 and August 2016. The patients were divided into sevoflurane (n = 1206) and desflurane (n = 423) groups. Factors associated with LRI were investigated using multivariable logistic regression analysis. Propensity score matching analysis compared early (1 postoperative week) and late (within 1-2 months) LRIs and delayed recovery of hepatic function between the 2 groups.

RESULTS: The mean early and late LRIs in the 1629 patients were 63.3% ± 41.5% and 93.7% ± 48.1%, respectively. After propensity score matching (n = 403 pairs), there were no significant differences in early and late LRIs between the sevoflurane and desflurane groups (early LRI: 61.2% ± 41.5% vs 58.9% ± 42.4%, P = .438; late LRI: 88.3% ± 44.3% vs 94.6% ± 52.4%, P = .168). Male sex (regression coefficient [β], 4.6; confidence interval, 1.6-7.6; P = .003) and remnant liver volume (β, -4.92; confidence interval, -5.2 to -4.7; P < .001) were associated with LRI. The incidence of delayed recovery of hepatic function was 3.6% (n = 29) with no significant difference between the 2 groups (3.0% vs 4.2%, P = .375) after LDH.

CONCLUSIONS: Both sevoflurane and desflurane can be safely used without affecting liver regeneration and delaying liver function recovery after LDH.

患者術後呼吸室內空氣與吸氧氧飽和度下降特點和呼吸頻率有何不同？

Characteristics of Desaturation and Respiratory Rate in Postoperative Patients Breathing Room Air Versus Supplemental Oxygen: Are They Different?

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背景：術後常規監測患者的脈搏氧飽和度已被證實能減少不良事件的發生。然而，通過脈搏血氧飽和度檢測患者飽和度下降的速度有限，往往無法及時給予吸氧等干預措施。為了解決這些問題，本研究比較術後呼吸室內空氣患者與吸氧患者氧飽和度下降特點和呼吸頻率之間

的差異。
方法：根據脈搏氧飽和度值和患者特點，分別監測 67 例術後患者夜間接受吸氧或呼吸室內空氣的飽和度情況。本研究比較了這兩種不同方式的患者，飽和度降低的速度、程度和持續時間。此外，我們還比較了患者夜間脈率、氧飽和度、呼吸頻率、和從正常的氧飽和度水準過渡到降低水準的時間。統計方法包括多變數回歸、調節吸氧和呼吸室內空氣患者之間的不平衡性的逆概率加權，和線性混合效應模型。
結果：本研究包括 33 名呼吸室內空氣患者和 34 名吸氧患者。兩類患者氧飽和度下降速度無差異吸空氣患者下降速度 22.4%, 95%可信區間-51.5%至 209%; P = .67；吸氧患者下降速度 -17.3%, 95%可信區間-53.8% 至 47.6%; P = .52。接受吸氧的患者平均氧飽和度較高，平均相差 2.4，95%可信區間[0.7-4.0]，P = .006。兩組患者夜間平均呼吸、脈率和低氧飽和度持續時間均無差異。吸氧從正常的氧飽和度(92%)下降到 88%或以下的過渡時間稍短，P = .42，兩組差異 26.1%，95% 可信區間-28.1%至 121%。兩組患者總體呼吸頻率、氧飽和度下降時呼吸頻率和恢復階段呼吸頻率均無差異。
結論：在這項研究中，吸氧患者和呼吸室內空氣患者在氧飽和度下降速度、程度和持續時間均無差異。兩組患者氧飽和度下降至低氧警報界線的過渡時間也無差異，而在這些事件中，患者呼吸速率均保持在正常範圍內。這些結果表明，基於脈搏的氧飽和度監測對於吸氧患者和呼吸室內空氣患者同樣有效。
（陸曉斐 譯 李士通 審校）

BACKGROUND: Routine monitoring of postoperative patients with pulse oximetry-based surveillance monitoring has been shown to reduce adverse events. However, there is some concern that pulse oximetry is limited in its ability to detect deterioration quickly enough to allow for intervention in patients receiving supplemental oxygen. To address such concerns, this study expands on the current limited knowledge of differences in desaturation and respiratory rate characteristics between patients breathing room air and those receiving supplemental oxygen.
METHODS: Pulse oximetry-derived data and patient characteristics were used to examine overnight desaturation patterns of 67 postoperative patients who were receiving either supplemental oxygen or breathing room air. The 2 modalities with respect to the speed of desaturation, in addition to magnitude and duration of desaturation events, are compared. Night-time pulse rate, oxygen saturation, respiratory rate, and the transition times from normal oxygen saturation levels to desaturated states are also compared. The behavior of respiratory rate in proximity to desaturation events is described. Statistical methods included multivariable regression and inverse probability of treatment weighted to adjust for any imbalance in patient characteristics between the oxygen and room air patients and linear mixed effect models to account for clustering by patient.
RESULTS: The study included 33 patients on room air and 34 receiving supplemental oxygen. The speed of desaturation was not different for room air versus oxygen for 2 types of desaturation (adjusted % difference, 95% confidence interval [CI]: type I; 22.4%, -51.5% to 209%; P = .67, type II; -17.3%, -53.8% to 47.6%; P = .52). Patients receiving supplemental oxygen had a higher mean oxygen saturation (adjusted difference, 95% CI, 2.4 [0.7-4.0]; P = .006). No differences were found for the average overnight respiratory or pulse rate, or proportion of time in desaturation states between the 2 groups. The time to transition from a normal oxygen saturation (92%) to 88% or below was not longer for supplemental oxygen patients (P = .42, adjusted difference 26.1%: 95% CI, -28.1% to 121%). Respiratory rates did not differ between the overall mean and desaturation or recovery phases or between the oxygen and room air group.

CONCLUSIONS: In this study, desaturation characteristics did not differ between patients receiving supplemental oxygen and breathing room air with regard to speed, depth, or duration of desaturation. Transition time for desaturations to reach low oxygen saturation alarms was not different, while respiratory rate remained in the normal range during these events. These findings suggest that pulse oximetry-based surveillance monitoring for deterioration detection can be used equally effectively for patients on supplemental oxygen and for those on room air.

應用潛在類別分析腹部手術患者術後主要併發症的危險分層

Risk Stratification for Major Postoperative Complications in Patients Undergoing Intra-abdominal General Surgery Using Latent Class Analysis

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背景：術前危險分層是評估手術風險和獲益的關鍵因素。已有研究證明，腹部手術患者可以根據其合併症和危險因素進行潛在類別分析（LCA），LCA 是一項基於聚類技術以找出具有相似特徵患者組的模型。此外，潛在風險等級可預測患者 30 天的死亡率。我們評估使用潛在風險分級來預測患者術後主要併發症的可行性。

方法：本研究對 2005 至 2010 年間美國外科醫師學會全國外科品質改善計畫中行腹部手術患者進行了一項觀察性、回顧性佇列研究。將已知的術前合併症和危險因素資料登錄 LCA 模型，以確定潛在風險類別。其中併發症包括：急性腎損傷、急性呼吸衰竭、心臟驟停、深靜脈血栓、心肌梗塞、器官腔隙感染、肺炎、術後出血、肺栓塞、敗血症或感染性休克、腦卒中、非計畫二次插管，和傷口裂開。在調整手術過程後，使用相對風險回歸研究潛在類別與患者 30 天併發症風險之間的關係。使用 ROC 曲線下面積（AUC）評估該模型性能。

結果：根據 LCA 將 466177 例受試者分為 9 級模型。患者整體併發症風險為 18.4%，包括從最低風險等級患者的 7.7%至最高風險等級患者的 56.7%。在調整後，患者潛在風險等級與併發症顯著相關，相對於平均風險而言，最低風險等級患者的風險比為 0.56（0.54–0.58，95%置信區間），而最高風險等級患者的風險比為 2.15（2.11–2.20），其間相差 4 倍。在合併手術方案、潛在的風險級別，與美國麻醉醫師身體狀況的模型中，併發症的 AUC 為 0.76（0.76–0.76）。然而，使用該模型評估一些特別的併發症存在異質性，例如肺動脈栓塞 AUC 為 0.70（0.69–0.71），而急性呼吸衰竭 AUC 為 0.90（0.90–0.90）。

結論：LCA 可用於根據術前危險因素對腹部手術患者進行分類，該分類與術後併發症密切相關。然而，該模型對於某些併發症的評估存在異質性，導致該術前風險分層方法的效果取決於被評估的併發症。

（陸曉斐 譯 李士通 審校）

BACKGROUND: Preoperative risk stratification is a critical element in assessing the risks and benefits of surgery. Prior work has demonstrated that intra-abdominal general surgery patients can be classified based on their comorbidities and risk factors using latent class analysis (LCA), a model-based clustering technique designed to find groups of patients that are similar with respect to characteristics entered into the model. Moreover, the latent risk classes were predictive of 30-day mortality. We evaluated the use of latent risk classes to predict the risk of major postoperative complications.

METHODS: An observational, retrospective cohort of patients undergoing intra-abdominal general surgery in the 2005 to 2010 American College of Surgeons National Surgical Quality

Improvement Program was obtained. Known preoperative comorbidity and risk factor data were entered into LCA models to identify the latent risk classes. Complications were defined as: acute kidney injury, acute respiratory failure, cardiac arrest, deep vein thrombosis, myocardial infarction, organ space infection, pneumonia, postoperative bleeding, pulmonary embolism, sepsis/septic shock, stroke, unplanned reintubation, and/or wound dehiscence. Relative risk regression determined the associations between the latent classes and the 30-day complication risks, with adjustments for the surgical procedure. The area under the curve (AUC) of the receiver operator characteristic curve assessed model performance.

RESULTS: LCA fit a 9-class model on 466,177 observations. The composite complication risk was 18.4% but varied from 7.7% in the lowest risk class to 56.7% in the highest risk class. After adjusting for procedure, the latent risk classes were significantly associated with complications, with risk ratios (95% confidence intervals) (compared to the class with the average risk) varying from 0.56 (0.54–0.58) in the lowest risk class to 2.15 (2.11–2.20) in the highest risk class, a 4-fold difference. In models incorporating surgical procedure, latent risk class, and the American Society of Anesthesiologists Physical Status, the AUC for composite complications was 0.76 (0.76–0.76). However, for individual complications, there was heterogeneity in model performance using these variables, with AUCs ranging from 0.70 (0.69–0.71) for pulmonary embolus to 0.90 (0.90–0.90) for acute respiratory failure.

CONCLUSIONS: LCA can be used to classify patients undergoing intra-abdominal general surgery based on preoperative risk factors, and the classes are independently associated with postoperative complications. However, model performance is not uniform across individual complications, resulting in variations in the utility of preoperative risk stratification tools depending on the complication evaluated.

手術室內心臟驟停：麻醉醫師搶救和治療的第 1 部分

Cardiac Arrest in the Operating Room: Resuscitation and Management for the Anesthesiologist Part 1

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發生在手術室內和常規區域中的心臟驟停有不同的原因（如低血容量、空氣栓塞和高鉀血症），對這些原因進行快速適當的評估和處理，需要改變傳統心臟驟停的步驟。有一小部分但越來越多的文獻，記載了關於迴圈危象和圍手術期心臟驟停的發病率、原因、治療和結局。這些事件幾乎總是被發現且經常被人所知，並且涉及救治人員對病人及其過程的瞭解。在這種情況下，可以制定鑒別診斷和有針對性的干預措施，以處理危機潛在的根本原因，同時處理危機本身。圍手術期患者的心臟驟停救治是基於專家的意見、生理基礎以及對這些事件發生的背景的理解。搶救步驟應考慮圍手術期內對這些危機原因的評估和處理。

（俞泳 譯 李士通 審校）

Cardiac arrest in the operating room and procedural areas has a different spectrum of causes (ie,

hypovolemia, gas embolism, and hyperkalemia), and rapid and appropriate evaluation and management of these causes require modification of traditional cardiac arrest algorithms. There is a small but growing body of literature describing the incidence, causes, treatments, and outcomes of circulatory crisis and perioperative cardiac arrest. These events are almost always witnessed, frequently known, and involve rescuer providers with knowledge of the patient and their procedure. In this setting, there can be formulation of a differential diagnosis and a directed intervention that treats the likely underlying cause(s) of the crisis while concurrently managing the crisis itself. Management of cardiac arrest of the perioperative patient is predicated on expert opinion, physiologic rationale, and an understanding of the context in which these events occur. Resuscitation algorithms should consider the evaluation and management of these causes of crisis in the perioperative setting.

光電容積脈搏波和心率變異性診斷先兆子癇

Photoplethysmography and Heart Rate Variability for the Diagnosis of Preeclampsia

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背景：這項研究的目標是，通過無創性監測孕婦心電圖和光電容積描記標識來鑒別先兆子癇患者，以建立一組時機、發展和統計特徵。

方法：進入接生房的孕婦採用脈搏血氧儀和心電圖監測 30 分鐘。從每個資料集中提取光電容積描記圖特徵和心率變異性，並將其應用到序列特徵選擇演算法中，以區分具有來自血壓正常和高血壓對照嚴重特徵的先兆子癇孕婦。選擇分類邊界以減少預期誤分類的成本。假設錯誤分類成本的先驗概率是相等的。

結果：37 例臨床上診斷為重度先兆子癇的患者與 43 例正常對照組比較，均為早產或引產。最終模型中使用了 6 個變數。受試者操作特徵曲線下面積為 0.907（標準誤差[SE] = 0.004）（靈敏度 78.2%[SE = 0.3%]，特異性 89.9%[SE = 0.1%]），陽性預測值為 0.883（SE =0.001）。將 28 例慢性或妊娠高血壓患者與同一先兆子癇組進行比較，生成一個具有 5 個特徵的模型，其曲線下面積為 0.795（SE = 0.007；敏感度 79.0%[SE = 0.2%]，特異性 68.7% [SE = 0.4%]），陽性預測值為 0.799（SE = 0.002）。

結論：通過光電容積描記術和心率變異性無創性評估血管參數，可能在篩查懷疑患有先兆子癇的孕婦中發揮作用，特別是在資源有限的地區。

（俞泳 譯 李士通 審校）

BACKGROUND: The goal of this study was to determine a set of timing, shape, and statistical features available through noninvasive monitoring of maternal electrocardiogram and photoplethysmography that identifies preeclamptic patients.

METHODS: Pregnant women admitted to Labor and Delivery were monitored with pulse oximetry and electrocardiogram for 30 minutes. Photoplethysmogram features and heart rate variability were extracted from each data set and applied to a sequential feature selection algorithm to discriminate women with preeclampsia with severe features, from normotensive and

hypertensive controls. The classification boundary was chosen to minimize the expected misclassification cost. The prior probabilities of the misclassification costs were assumed to be equal.

RESULTS: Thirty-seven patients with clinically diagnosed preeclampsia with severe features were compared with 43 normotensive controls; all were in early labor or beginning induction. Six variables were used in the final model. The area under the receiver operating characteristic curve was 0.907 (standard error [SE] = 0.004) (sensitivity 78.2% [SE = 0.3%], specificity 89.9% [SE = 0.1%]) with a positive predictive value of 0.883 (SE = 0.001). Twenty-eight subjects with chronic or gestational hypertension were compared with the same preeclampsia group, generating a model with 5 features with an area under the curve of 0.795 (SE = 0.007; sensitivity 79.0% [SE = 0.2%], specificity 68.7% [SE = 0.4%]), and a positive predictive value of 0.799 (SE = 0.002).

CONCLUSIONS: Vascular parameters, as assessed noninvasively by photoplethysmography and heart rate variability, may have a role in screening women suspected of having preeclampsia, particularly in areas with limited resources.

產科麻醉和圍產期學共識聲明關於孕婦和產後婦女接受血栓預防或更高劑量抗凝劑的麻醉管理

The Society for Obstetric Anesthesia and Perinatology Consensus Statement on the Anesthetic Management of Pregnant and Postpartum Women Receiving Thromboprophylaxis or Higher Dose Anticoagulants

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靜脈血栓栓塞被認為是導致美國孕產婦死亡的主要原因。血栓預防被強調為減少孕產婦因靜脈血栓栓塞而死亡的一項重要預防措施。然而，在產科中擴大血栓預防的使用將會對女性進行陰道或剖宮產術和其他產科手術的使用和時機的椎管內麻醉產生重大影響。來自產科麻醉和會計學協會、美國區域麻醉學協會和血液學協會的專家們合作開發了這一綜合性的、妊娠特異性的關於產科病人接受血栓預防或更高劑量抗凝血劑的神經軸程式的共識聲明。到目前為止，現有的麻醉協會的建議都沒有考慮到在血栓預防的情況下，椎管內的潛在風險，在全身麻醉中存在潛在的困難的氣道，或者是由於避免或延遲的椎管內麻醉而造成的母體或胎兒的傷害。此外，現有的指南還沒有將抗凝劑的藥代動力學和藥效學結合在產科人群中。這一共識聲明的目標是提供一個實用指南如何適當地在產前期,生產中,產後時期來識別、準備和管理孕婦接受血栓的預防或高劑量抗凝劑。促進多學科交流、循證藥代動力學和脊髓硬膜外血腫資料的策略和決策輔助手段應有助於與患者進行風險利益討論並促進共同決策。

（董欣怡譯 李士通校）

Venous thromboembolism is recognized as a leading cause of maternal death in the United States. Thromboprophylaxis has been highlighted as a key preventive measure to reduce venous thromboembolism-related maternal deaths. However, the expanded use of thromboprophylaxis in obstetrics will have a major impact on the use and timing of neuraxial analgesia and anesthesia for women undergoing vaginal or cesarean delivery and other obstetric surgeries. Experts from the Society of Obstetric Anesthesia and Perinatology, the American Society of Regional Anesthesia, and hematology have collaborated to develop this comprehensive, pregnancy-specific consensus statement on neuraxial procedures in obstetric patients receiving thromboprophylaxis or higher dose anticoagulants. To date, none of the existing anesthesia societies' recommendations have weighed the potential risks of neuraxial procedures in the presence of thromboprophylaxis, with the competing risks of general anesthesia with a potentially difficult airway, or maternal or fetal harm from avoidance or delayed neuraxial anesthesia. Furthermore, existing guidelines have not integrated the pharmacokinetics and pharmacodynamics of anticoagulants in the obstetric population. The goal of this consensus statement is to provide a practical guide of how to appropriately identify, prepare, and manage pregnant women receivingthromboprophylaxis or higher dose anticoagulants during the ante-, intra-, and postpartum periods. The tactics to facilitate multidisciplinary communication, evidence-based pharmacokinetic and spinal epidural hematoma data, and Decision Aids should help inform risk-benefit discussions with patients and facilitate shared decision making.

內窺鏡和開放修復顱縫早閉的嬰兒使用傾向得分匹配比較結果:一項多中心研究

兒科顱面的協作組

Endoscopic Versus Open Repair for Craniosynostosis in Infants Using Propensity Score Matching to Compare Outcomes: A Multicenter Study from the Pediatric Craniofacial Collaborative Group

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背景：北美兒科顱面協作組(PCCG)建立了兒童顱面部手術圍手術期，以評估嬰兒和兒童進行顱骨組織修復的結果。這項多中心研究的目的是利用本登記處評估血液利用、重症監護病房(ICU)的使用率、住院時間和內窺鏡輔助治療(ESC)的圍手術期併發症和顱縫早閉嬰兒的開放性修復。我們假設從單中心研究的 ESC 的優點將基於一個大型多中心註冊中心的合併資料進行驗證。

方法：31 個機構在 2012 年 6 月至 2015 年 9 月期間提供了資料。我們分析了 1382 名年齡在 12 個月以下的嬰兒(前和/或後顱穹窿重建，改良 pi 程式，或帶狀顱骨切除術)或內鏡下顱骨切除術。主要結果包括輸血資料、ICU 使用率、住院時間、圍手術期併發症;次要結果包括麻醉和手術持續時間。非匹配組比較(ESC: N = 311, open repair: N = 1071)，傾向評分 2:1 匹配組(ESC: N = 311, open repair: N = 622)，採用條件邏輯回歸分析。

結果：由於 ESC 的手術選擇標準，基線年齡和體重的失衡是內在的。在平衡年齡和體重之間，ESC 和開放組之間的傾向評分匹配的品質由傾向評分的五分位數。與開放組相比，在 ESC 組中，對配對組的分析證實，血液的利用率顯著降低(26% vs 81%， P < 0.001)，凝血(3% vs 16%， P < 0.001)。中位供血者暴露(0 比 1)、麻醉(168 vs 248 分鐘)和手術持續時間(70 vs 130 分鐘)、ICU (0 vs 2)、住院時間(2 比 4)均顯著低於 ESC 組(P < 0.001)。平均紅細胞體積管理顯著低於 ESC(19.6 vs 26.9 毫升/公斤,P = .035) ，差異的減少大約 7 毫升/公斤的 ESC(95%置信區間的差異,3 - 12 毫升/公斤),而凝固的平均體積產品 2 組之間沒有明顯不同(21.2 vs 24.6 毫升/公斤,P = =.73)。需要治療的併發症包括低血壓發生率與作用於血管的藥物(3% vs 4%),靜脈空氣栓塞(1%),和體溫過低,定義為< 35°C(22% vs 26%),兩組之間的相似,而插管術後明顯高於開放組(2%比 10%,P <.001)。

結論：該多中心研究的 ESC 與開放顱縫修復是迄今為止最大的比較。它展示了 ESC 對年幼嬰兒的顯著優勢，這可能會改善臨床結果，並增加安全性。

（董欣怡譯 李士通校）

BACKGROUND: TheNorthAmerican Pediatric Craniofacial Collaborative Group (PCCG) established the Pediatric Craniofacial Surgery Perioperative Registry to evaluate outcomes in infants and children undergoing craniosynostosis repair. The goal of this multicenter study was to utilize this registry to assess differences in blood utilization, intensive care unit (ICU) utilization, duration of hospitalization, and perioperative complications between endoscopic-assisted (ESC) and open repair in infants with craniosynostosis. We hypothesized that advantages of ESC from single-center studies would be validated based on combined data from a large multicenter registry.

METHODS: Thirty-one institutions contributed data from June 2012 to September 2015. We analyzed 1382 infants younger than 12 months undergoing open (anterior and/or posterior cranial vault reconstruction, modified-Pi procedure, or strip craniectomy) or endoscopic craniectomy. The primary outcomes included transfusion data, ICU utilization, hospital length of stay, and perioperative complications; secondary outcomes included anesthesia and surgical duration. Comparison of unmatched groups (ESC: N = 311, open repair: N = 1071) and propensity score 2:1 matched groups (ESC: N = 311, open repair: N = 622) were performed by conditional logistic regression analysis.

RESULTS: Imbalances in baseline age and weight are inherent due to surgical selection criteria for ESC. Quality of propensity score matching in balancing age and weight between ESC and open groups was assessed by quintiles of the propensity scores. Analysis of matched groups confirmed significantly reduced utilization of blood (26% vs 81%, P < .001) and coagulation (3%

vs 16%, P < .001) products in the ESC group compared to the open group. Median blood donor exposure (0 vs 1), anesthesia (168 vs 248 minutes) and surgical duration (70 vs 130 minutes), days in ICU (0 vs 2), and hospital length of stay (2 vs 4) were all significantly lower in the ESC group (all P < .001). Median volume of red blood cell administered was significantly lower in ESC (19.6 vs 26.9 mL/kg, P = .035), with a difference of approximately 7 mL/kg less for the ESC (95% confidence interval for the difference, 3-12 mL/kg), whereas the median volume of coagulation products was not significantly different between the 2 groups (21.2 vs 24.6 mL/kg, P = .73). Incidence of complications including hypotension requiring treatment with vasoactive agents (3% vs 4%), venous air embolism (1%), and hypothermia, defined as <35°C (22% vs 26%), was similar between the 2 groups, whereas postoperative intubation was significantly higher in the open group (2% vs 10%, P < .001).

CONCLUSIONS: This multicenter study of ESC versus open craniosynostosis repair represents the largest comparison to date. It demonstrates striking advantages of ESC for young infants that may result in improved clinical outcomes, as well as increased safety.

一項關於全膝關節置換術後 6 周內收肌管阻滯對膝關節伸肌肌力的影響的隨機對照試驗

The Effect of Adductor Canal Block on Knee Extensor Muscle Strength 6 Weeks After Total Knee Arthroplasty: A Randomized, Controlled Trial

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背景：基於相對大量的局部麻醉劑優化內收管阻滯（ACB）的假設，我們推測，與持續輸注相比，以重複推注施用的 ACB 會改善鎮痛而不會損害移動性。

方法：我們進行了一項隨機、雙盲、對照的研究，其中包括脊柱麻醉下全膝關節置換術患者。患者接受 0.2%羅呱卡因經收肌管為重複間歇丸給藥導管（21 毫升/ 3 小時）或連續輸注（7 毫升/小時）。主要結果為術後第一天（POD），0 - 2）阿片類藥物作為病人自控鎮痛的總消耗量（mg）。疼痛、行走和股四頭肌肌力是次要的結果。

結果：我們對 110 例患者進行隨機分組，其中 107 例進行了分析。 推注組的總阿片類藥物消耗量（POD，0-2）為 23 mg（0-139），輸注組為 26 mg（3-120）（估計的中位數差異為 4 mg; 95％ 置信區間[CI]，-13 至 5; P = .29）。線性混合模型分析顯示膝關節屈曲時疼痛無統計學差異（平均差 2.6 mm; 95％CI，-2.9 至 8.0）或靜息時（平均差 1.7 mm; 95％CI，-1.5 至 4.9）。推注組患者股四頭肌的POD 2節律得到改善（中位數差異為7.4％; 95％CI 為0.5％-15.5％）。然而，這種差異在 POD 1 上沒有出現或者在步行試驗中反映出來（P> 0.05）。

討論：將 ACB 的給藥方式從連續輸注改變為反復間歇性推注不會減少阿片類藥物的消耗，疼痛或移動。

（呂良策譯 李士通校）

BACKGROUND: Based on the assumption that relatively large volumes of local anesthetic optimize an adductor canal block (ACB), we theorized that an ACB administered as repeated boluses would improve analgesia without compromising mobility, compared with a continuous infusion.

METHODS: We performed a randomized, blinded, controlled study, including patients scheduled for total knee arthroplasty with spinal anesthesia. Patients received 0.2% ropivacaine via a catheter

in the adductor canal administered as either repeated intermittent boluses (21 mL/3 h) or continuous infusion (7 mL/h). The primary outcome was total (postoperative day [POD], 0–2) opioid consumption (mg), administered as patient-controlled analgesia. Pain, ambulation, and quadriceps muscle strength were secondary outcomes.

RESULTS: We randomized 110 patients, of whom 107 were analyzed. Total opioid consumption (POD, 0–2) was a median (range) of 23 mg (0–139) in the bolus group and 26 mg (3–120) in the infusion group (estimated median difference, 4 mg; 95% confidence interval [CI], −13 to 5; P = .29). Linear mixed-model analyses revealed no difference in pain during knee flexion (mean difference, 2.6 mm; 95% CI, −2.9 to 8.0) or at rest (mean difference, 1.7 mm; 95% CI, −1.5 to 4.9). Patients in the bolus group had improved quadriceps sparing on POD 2 (median difference, 7.4%; 95% CI, 0.5%–15.5%). However, this difference was not present on POD 1 or reflected in the ambulation tests (P > .05).

CONCLUSIONS: Changing the mode of administration for an ACB from continuous infusion to repeated intermittent boluses did not decrease opioid consumption, pain, nor mobility.

被截短的具有 6 個跨膜區的 μ 受體是阿片類藥物鎮痛的關鍵

Truncated μ-Opioid Receptors With 6 Transmembrane Domains Are Essential for Opioid Analgesia

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背景：大多數臨床阿片類藥物通過 μ 阿片受體起作用。它們有效地減輕了疼痛，但受到副作用的限制，如便秘，呼吸抑制，依賴和成癮。已經做出許多努力來開發無副作用的有效鎮痛劑。三碘苯甲醯-6β-納曲酮（IBNtxA）是一類新型的阿片類藥物，能夠抵抗熱，炎症和神經性疼痛，無呼吸抑制，身體依賴和獎勵行為。 μ-阿片受體（OPRM1）基因經歷廣泛的替代前體信使核糖核酸剪接，產生從齧齒動物保守到人類的多種剪接變體。一種類型的變體是包含 6 個跨膜結構域（6TM 變體）的外顯子 11（E11）相關的截短變體。在小鼠 OPRM1 基因中有 5 個 6TM 變體，包括 mMOR-1G，mMOR-1M，mMOR-1N，mMOR-1K 和 mMOR-1L。基因靶向小鼠模型中敲除 6tm 選擇性去除 E11 變種（KO）小鼠消除 ibntxa 鎮痛不影響嗎啡的鎮痛作用。相反，在沒有全部 7 個跨膜（7TM）變體但保留 6TM 變體表達，而 IBNtxA 止痛保持完整的外顯子 1（E1）KO 小鼠中，嗎啡鎮痛喪失。在 E1 / E11 雙 KO 小鼠中消除 E1 和 E11 均消除嗎啡和 IBNtxA 鎮痛。通過慢病毒表達重建 E1 / E11 KO 小鼠中 6TM 變體 mMOR-1G 的表達，挽救 IBNtxA 而不是嗎啡鎮痛。本研究的目的是研究 E1 / E11 KO 小鼠中其他 6TM 變體的慢病毒表達對 IBNtxA 鎮痛的影響。

方法：將表達 6TM 變體的慢病毒包裝在 HEK293T 細胞中，通過超速離心濃縮，並鞘內給藥 3 次。 使用輻射熱甩尾測定法測定阿片樣鎮痛。 通過聚合酶鏈式反應（PCR）或定量 PCR 檢測慢病毒 6TM 變體信使核糖核酸的表達。

結果：所有 6TM 變體在 E1 / E11 KO 小鼠中恢復 IBNtxA 鎮痛，而嗎啡保持無效。 通過 PCR 或定量 PCR 證實慢病毒 6TM 變體的表達。 IBNtx 從救助小鼠的累積劑量反應研究確定的半數有效劑量值與野生型動物無法區分。 在救援小鼠中 IBNtxA 止痛維持長達 33 周，並且容易被阿片拮抗劑利瓦洛凡拮抗。

結論：我們的研究證明了小鼠 6TM 變體在 IBNtxA 鎮痛中的藥理學相關性，並且證實與由

外顯子 2 和 3 編碼的跨膜結構域相對應的受體的共同功能核心足以用於活性。 因此，6TM 變體為一類不同類型的鎮痛藥提供了潛在的治療靶點，這些鎮痛藥對廣譜疼痛模型有效，沒有許多與傳統阿片類藥物相關的副作用。

（呂良策譯 李士通校）

BACKGROUND: Most clinical opioids act through μ-opioid receptors. They effectively relieve pain but are limited by side effects, such as constipation, respiratory depression, dependence, and addiction. Many efforts have been made toward developing potent analgesics tha t lack side effects. Three-iodobenzoyl-6β-naltrexamide (IBNtxA) is a novel class of opioid active against thermal, inflammatory, and neuropathic pain, without respiratory depression, physical depe ndence, and reward behavior. The μ-opioid receptor (OPRM1) gene undergoes extensive alternati ve precursor messenger ribonucleic acid splicing, generating multiple splice variants that are cons erved from rodents to humans. One type of variant is the exon 11 (E11)–
associated truncated variant containing 6 transmembrane domains (6TM variant). There are 5 6T M variants in the mouse OPRM1 gene, including mMOR-1G, mMOR-1M, mMOR-1N, mMOR-1 K, and mMOR-1L. Gene-targeting mouse models selectively removing 6TM variants in E11 knoc kout (KO) mice eliminated IBNtxA analgesia without affecting morphine analgesia. Conversely, morphine analgesia is lost in an exon 1 (E1) KO mouse that lacks all 7 transmembrane (7TM) vari ants but retains 6TM variant expression, while IBNtxA analgesia remains intact. Elimination of bo th E1 and E11 in an E1/E11 double KO mice abolishes both morphine and IBNtxA analgesia. Rec onstituting expression of the 6TM variant mMOR-1G in E1/E11 KO mice through lentiviral expre ssion rescued IBNtxA but not morphine analgesia. The aim of this study was to investigate the eff ect of lentiviral expression of the other 6TM variants in E1/E11 KO mice on IBNtxA analgesia.
METHODS: Lentiviruses expressing 6TM variants were packaged in HEK293T cells, concentrate d by ultracentrifugation, and intrathecally administered 3 times. Opioid analgesia was determined using a radiant-heat tail-flick assay. Expression of lentiviral 6TM variant messenger ribonucleic ac ids was examined by polymerase chain reaction (PCR) or quantitative PCR.
RESULTS: All the 6TM variants restored IBNtxA analgesia in the E1/E11 KO mouse, while morp hine remained inactive. Expression of lentiviral 6TM variants was confirmed by PCR or quantitati ve PCR. IBNtxA median effective dose values determined from cumulative dose–
response studies in the rescued mice were indistinguishable from wild-type animals. IBNtxA anal gesia was maintained for up to 33 weeks in the rescue mice and was readily antagonized by the op ioid antagonist levallorphan.
CONCLUSIONS: Our study demonstrated the pharmacological relevance of mouse 6TM variants in IBNtxA analgesia and established that a common functional core of the receptors correspondin g to the transmembrane domains encoded by exons 2 and 3 is sufficient for activity. Thus, 6TM va riants offer potential therapeutic targets for a distinct class of analgesics that are effective against b road-spectrum pain models without many side effects associated with traditional opioids.