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Heparin Concentration–Based Anticoagulation for Cardiac Surgery Fails to Reliably Predict Heparin Bolus Dose Requirements

Sean Garvin, Daniel C. FitzGerald, George Despotis, Prem Shekar, and Simon C. Body

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Heparin Dose Response Is Independent of Preoperative Antithrombin Activity in Patients Undergoing Coronary Artery Bypass Graft Surgery Using Low Heparin Concentrations

Sean Garvin, Daniel Fitzgerald, Jochen D. Muehlschlegel, Tjörvi E. Perry, Amanda A. Fox, Stanton K. Shernan, Charles D. Collard, Sary Aranki, and Simon C. Body

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Anesth Analg October 2010 111:887-891; published ahead of print June 25, 2010

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Postoperative Activity, but Not Preoperative Activity, of Antithrombin Is Associated with Major Adverse Cardiac Events After Coronary Artery Bypass Graft Surgery

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**Background:** Low levels of antithrombin (AT) have been independently associated with prolonged intensive care unit stay and an increased incidence of neurologic and thromboembolic events after cardiac surgery. We hypothesized that perioperative AT activity is independently associated with postoperative major adverse cardiac events (MACEs) in patients undergoing coronary artery bypass graft (CABG) surgery.
METHODS: We prospectively studied 1403 patients undergoing primary CABG surgery with cardiopulmonary bypass (CPB). The primary clinical end point was occurrence of MACE, defined as a composite outcome of any one or more of the following: postoperative death, reoperation for coronary graft occlusion, myocardial infarction, stroke, pulmonary embolism, or cardiac arrest until first hospital discharge. Plasma AT activity was measured before surgery, after post-CPB protamine, and on postoperative days (PODs) 1-5. Multivariate logistic regression modeling was performed to estimate the independent effect of perioperative AT activity upon MACE.

RESULTS: MACE occurred in 146 patients (10.4%), consisting of postoperative mortality (n = 12), myocardial infarction (n = 108), stroke (n = 17), pulmonary embolism (n = 8), cardiac arrest (n = 16), or a subsequent postoperative or catheter-based treatment for graft occlusion (n = 6). AT activity at baseline did not differ between patients with (0.91 ± 0.13 IU/mL; n = 146) and without (0.92 ± 0.13 IU/mL; n = 1257) (P = 0.18) MACE. AT activity in both groups was markedly reduced immediately after CPB and recovered to baseline values over the ensuing 5 PODs. Postoperative AT activity was significantly lower in patients with MACE than those without MACE. After adjustment for clinical predictors of MACE, AT activity on PODs 2 and 3 was associated with MACE.

CONCLUSIONS: Preoperative AT activity is not associated with MACE after CABG surgery. MACE is independently associated with postoperative AT activity but only at time points occurring predominantly after the MACE.

在氣管導管套囊或口腔黏膜上予以鹽酸苄達明噴霧治療術後咽喉痛的效果

The Effectiveness of Benzydamine Hydrochloride Spraying on the Endotracheal Tube Cuff or Oral Mucosa for Postoperative Sore Throat

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背景: 一般認為喉鏡檢查、插管損傷或膨脹的氣管導管套囊對於氣道粘膜的擠壓是術後咽喉痛（POST）的病因。在本次研究中，我們比較了鹽酸苄達明（BH）用不同的方法噴霧在氣管導管（ET）套囊、口咽腔或以上兩處對於減輕POST的效果。

方法: 在本次前瞻性雙盲研究中，我們招募了380名病人，他們被隨機分成以下4組：A組為在口咽腔內噴BH，在ET套囊上噴蒸餾水；B組為在口咽腔內及ET套囊上均噴BH；C組為在ET套囊上噴BH，在口咽腔內噴蒸餾水；D組為在口咽腔內及ET套囊上均噴蒸餾水。我們檢測病人們在拔管後0、2、4和24小時咽喉痛的程度（無、輕、中、重）。

結果: A、B、C和D組POST的發生率分別為23.2%、13.8%、14.7%和40.4%。B組和C組POST的發生率明顯低於D組（OR=0.36；95%CI為0.21-0.60；P <
BACKGROUND: The etiology of postoperative sore throat (POST) is considered to be the result of laryngoscopy, intubation damage, or inflated cuff compression of the tracheal mucosa. In this study, we compared the effectiveness in alleviating POST using different approaches to benzydamine hydrochloride (BH) administration by spraying the endotracheal tube (ET) cuff or the oropharyngeal cavity, or both.

METHODS: Three hundred eighty patients were included in this prospective and double-blind study, which was randomized into 4 groups: group A, oropharyngeal cavity spray of BH, and distilled water on the ET cuff; group B, both the oropharyngeal cavity and the ET cuff received BH spray; group C, the ET cuff received BH spray, and the oropharyngeal cavity received distilled water; and group D, distilled water sprayed on both the ET tube and into the oropharyngeal cavity. The patients were examined for sore throat (none, mild, moderate, severe) at 0, 2, 4, and 24 hours postextubation.

RESULTS: The incidence of POST was 23.2%, 13.8%, 14.7%, and 40.4% in groups A, B, C, and D, respectively. POST occurred significantly less frequently in groups B and C compared with group D (odds ratio: 0.36; 95% confidence interval: 0.21-0.60; P < 0.05). However, there was no significant difference between groups A and D (odds ratio: 0.62; 95% confidence interval: 0.38-1.01). Moreover, there was no significant interaction between spraying BH over the oropharyngeal cavity and the ET cuff on the incidence of POST (P = 0.088). The severity of POST was significantly more intense in group D compared with groups B and C (P < 0.001). Group B had a significantly higher incidence of local numbness, burning, and/or stinging sensation compared with patients in group D (P < 0.05).

CONCLUSIONS: This study indicates that spraying BH on the ET cuff decreases the incidence and severity of POST without increased BH-related adverse effects.

選擇性 5-HT1A 受體激動劑瑞匹諾坦拮抗嗎啡誘導的麻醉大鼠呼吸抑制
Repinotan, a Selective 5-HT1A-R-Agonist, Antagonizes Morphine-Induced Ventilatory Depression in Anesthetized Rats
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背景：機械通氣期間的自主呼吸能改善動脈氧合和心血管功能，但是危重病醫療過程中自主呼吸常常被阿片類藥物抑制。研究顯示，阿片類藥物誘導的麻醉大鼠呼吸抑制可以被血清素(1A)受體(5-HT1A-R)激動劑8-OH-DPAT所緩解，可是8-OH-DPAT不能用於人類。鹽酸瑞匹諾坦（Repinotan）是一種選擇性5-HT1A受體激動劑且已經用於人類研究，但是其對通氣和傷害性感受的作用還不甚瞭解。本研究中，我們試圖確定(a)瑞匹諾坦對自主呼吸和傷害性感受的效應以及(b)與標準阿片劑嗎啡之間的相互作用。

方法：在保留自主呼吸的麻醉大鼠中，同時監測單獨或聯合嗎啡的瑞匹諾坦對自主每分鐘通氣量(MV)和傷害感受性甩尾反射潛伏期(TFLs)的劑量依賴性效應。另外一組採用0.9%NaCl和5-HT1A受體拮抗劑WAY 100 135作為對照。

結果：(a)瑞匹諾坦劑量依賴性促進自主呼吸(MV,均數[95%可信區間];預處理水準的53%[29%-77%]),較大劑量瑞匹諾坦(2-200μg/kg)抑制感受性傷害(TFL,最大可能效應的91%[68%-114%])。相反，小劑量瑞匹諾坦增強傷害性感受(0.2μg/kg;TFL,最大可能效應的47%[95% to 2%])。5-HT1A受體拮抗劑WAY 100 135可以預防這些效應。(b)嗎啡誘導的呼吸抑制(MV,72% [?100% to ?44%])被瑞匹諾坦(20μg/kg)所逆轉，使得自主通氣恢復到預處理水準(MV,18% [?40% to 77%])。嗎啡誘導的傷害性感受的完全抑制持續存在於給予瑞匹諾坦和0.9%NaCl的整個過程。儘管平均動脈壓輕微下降，沒有出現由瑞匹諾坦引起的嚴重心血管副反應。

結論：即使在嗎啡誘導呼吸抑制時，5-HT1A受體激動劑瑞匹諾坦也能促進麻醉大鼠自主呼吸。5-HT1A受體激動劑刺激自主呼吸和抗傷害性感受的能力有待進一步研究。

(江繼宏譯馬皓琳李士通校)
repinotan and NaCl 0.9% administration. Despite a mild decrease in mean arterial blood pressure, there were no serious cardiovascular side effects from repinotan.

CONCLUSIONS: The 5-HT1A-R-agonist repinotan activates spontaneous breathing in anesthetized rats even in morphine-induced ventilatory depression. The potency of 5-HT1A-R-agonists to stimulate spontaneous breathing and their antinociceptive effects should be researched further.

**Oxygen Delivery During Transtracheal Oxygenation: A Comparison of Two Manual Devices**
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A 15-gauge transtracheal wire reinforced catheter was used for transtracheal oxygenation. The ENK and Manujet were studied for 3 minutes at respiratory rates of 0, 4, and 12 breaths/min, with and without the artificial lung, in a totally and a partially occluded airway. Statistical analysis was performed using analysis of variance followed by a Fisher exact test; P < 0.05 was considered significant.

**RESULTS:** Gas flow and tidal volume were 3 times greater with the Manujet than the ENK (approximately 37 vs 14 L · min?1 and 700 vs 250 mL, respectively) and were not dependent on the respiratory rate. In the absence of ventilation, the ENK delivered a 0.6 ± 0.1 L · min?1 constant gas flow. In the totally occluded airway, lung pressures increased to 136 cm H2O after 3 insufflations with the Manujet, whereas the ENK, which has a pressure release vent, generated acceptable pressures at a low respiratory rate (4 breaths/min) (peak pressure at 27.7 ± 0.7 and end-expiratory pressure at 18.8 ± 3.8 cm H2O). When used at a respiratory rate of 12 breaths/min, the ENK generated higher pressures (peak pressure at 95.9 ± 21.2 and end-expiratory pressure at 51.4 ± 21.4 cm H2O). In the partially occluded airway, lung pressures were significantly greater with the Manujet compared with the ENK, and pressures increased with the respiratory rate with both devices. Finally, the gas flow and tidal volume generated by the Manujet varied proportionally with the driving pressure.

**DISCUSSION:** This study confirms the absolute necessity of allowing gas exhalation between 2 insufflations and maintaining low respiratory rates during transtracheal oxygenation. In the case of total airway obstruction, the ENK may be less deleterious because it has a pressure release vent. Using a Manujet at lower driving pressures may decrease the risk of barotrauma and allow the safe use of higher respiratory rates.

**高仿真模擬表明麻醉醫生的年齡和自住院醫師以來的年份對急診環甲膜切開技術的影響**

**High-Fidelity Simulation Demonstrates the Influence of Anesthesiologists' Age and Years from Residency on Emergency Cricothyroidotomy Skills**

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**背景：** 大量研究表明隨著年齡增長，認知功能和對精細活動的控制力會逐漸衰退。然而對於複雜的臨床麻醉技能，這種衰退並未被闡明。環甲膜切開是臨床一種複雜的、可以挽救病人生命的操作，並且需要麻醉醫生同時具備良好的認知過程和精細活動控制力。精通此項技術在“無法插管，無法通氣”的情況下，對於重建病人吸氧通道極其重要。在這項前瞻性、對照、單盲研究中，我們在高仿真模擬“無法插管，無法通氣”的情況下，驗證年齡對經皮環甲膜切開學習和操作的影響。

**方法：** 36名麻醉醫生（19名小於45歲，17名大於45歲）在接受1小時的標準化培訓之前和之後分別處理在高仿真模擬器模擬的“無法插管，無法通氣”情境。基於
BACKGROUND: Age-related deterioration in both cognitive function and the capacity to control fine motor movements has been demonstrated in numerous studies. However, this decline has not been described with respect to complex clinical anesthesia skills. Cricothyroidotomy is an example of a complex, lifesaving procedure that requires competency in the domains of both cognitive processing and fine motor control. Proficiency in this skill is vital to minimize time to reestablish oxygenation during a "cannot intubate, cannot ventilate" scenario. In this prospective, controlled, single-blinded study, we tested the hypothesis that age affects the learning and performance of emergency percutaneous cricothyroidotomy in a high-fidelity simulated cannot intubate/cannot ventilate scenario.

METHODS: Thirty-six staff anesthesiologists (19 aged younger than 45 years and 17 older than 45 years) managed a high-fidelity cannot intubate/cannot ventilate scenario in a high-fidelity simulator before and after a 1-hour standardized training session. The group division cutoff age of 45 years was based on the median age of our sample subject population before enrollment. The scenarios required the insertion of an emergency percutaneous cricothyroidotomy. We compared cricothyroidotomy skills in the older group with those in the younger group using procedural time, 5-point task-specific checklist score, and global rating scale score. Correlation based on age, years from residency, weekly clinical hours worked, previous continuing medical education in airway management, and previous simulation experience was also performed.

RESULTS: In both prestandardization and poststandardization, age and years from residency correlated with procedural time, checklist scores, and global rating scores. Baseline, prestandardization variables were all better for the younger group, with a mean age of 37 years, compared with the older group, with a mean age of 58 years. Procedural
time was 100 (72-128) seconds versus 152 (120-261) seconds. Checklist scores were 7.0 (6.1-8.0) versus 6.0 (4.8-8.0). Global rating scale scores were 22.0 (17.8-29.8) versus 17.5 (10.4-20.6). After the 1-hour standardized training session, the younger group continued to perform better than the older group with procedural time of 75 (66-91) seconds versus 87 (78-123) seconds, checklist scores of 10.0 (9.1-10.0) versus 9.0 (8.0-10.0), and global rating scale scores of 35.0 (32.1-35.0) versus 32.0 (29.0-33.8).

Regression analysis was performed on the poststandardization data. Both age and years from residency independently affected procedural time, checklist scores, and global rating scale scores (all P < 0.05).

CONCLUSIONS: Baseline proficiency with simulated emergency cricothyroidotomy is associated with age and years from residency. Despite standardized training, operator age and years from residency were associated with decreased proficiency. Further research should explore the potential of using age and years from residency as factors for implementing periodic continuing medical education.

Pitfalls in Chronobiology: A Suggested Analysis Using Intrathecal Bupivacaine Analgesia as an Example
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Background: There have been studies showing that obstetric epidural analgesia can affect the pattern of pain over time. Our research was to determine whether intrathecal bupivacaine analgesia affects pain duration over time, with a focus on the smoothness of the data. In the fovea analysis, we found that the data is normally distributed and that the smoothing function was appropriate for the data. We then used Excel and NONMEM (nonlinear mixed-effects model) to analyze the data.

Methods: In a group of 82 pregnant women, the following variables were recorded: time to first analgesia, time to second analgesia, and time to third analgesia. The data was then analyzed using Excel and NONMEM to determine if there was a significant difference in the time to each analgesia.

Results: There was a significant difference in the time to each analgesia, with the first analgesia occurring significantly earlier than the second and third analgesia. The second analgesia occurred significantly earlier than the third analgesia. The overall trend was for the time to analgesia to decrease with each analgesia.
方差分析並沒有明顯的統計學差異。余弦分析、Excel 和 NONMEM 都得到了一致的結果：鎮痛持續時間平均為 38.4 分鐘（95% 可信區間：35.4-41.6 分鐘），波形週期為 8 小時，振幅為 5.8 分鐘（95% 可信區間：2.1-10.7 分鐘），相位偏差為 6.5 小時（95% 可信區間：5.4-8.0 小時）。在 40% 的引導分析中 8 小時週期模型並沒有統計學意義，提示 8 小時週期模式的統計學意義取決於資料子集。在 07:00 換班前的兩個數據點對週期波形的統計學意義的影響最大。沒有這些資料點，就沒有證據證明鞘內注射布比卡因鎮痛呈 8 小時週期波形。

結論：時間生物學包括所在環境中外界晝夜節律（例如護理交班）和人體生物節律的影響。我們可以聯合幾種新的分析方法來區分外界節律的影響：(1) 疊加原始資料、外界節律（比如，護理和麻醉交接班）和光滑函數的圖示；(2) 每一個數據點對統計學意義的影響的圖示；(3) 用來判斷統計學意義是否高度依賴於資料子集的引導分析。這些方法提示，兩個數據點的變化可能與護理和麻醉交接班有關。如果去掉這些點，即無法證明鞘內注射布比卡因鎮痛持續時間有生物學節律。

（徐妍君譯 馬皓琳 李士通校）

BACKGROUND: The duration of analgesia from epidural administration of local anesthetics to parturients has been shown to follow a rhythmic pattern according to the time of drug administration. We studied whether there was a similar pattern after intrathecal administration of bupivacaine in parturients. In the course of the analysis, we came to believe that some data points coincident with provider shift changes were influenced by nonbiological, health care system factors, thus incorrectly suggesting a periodic signal in duration of labor analgesia. We developed graphical and analytical tools to help assess the influence of individual points on the chronobiological analysis.

METHODS: Women with singleton term pregnancies in vertex presentation, cervical dilation 3 to 5 cm, pain score >50 mm (of 100 mm), and requesting labor analgesia were enrolled in this study. Patients received 2.5 mg of intrathecal bupivacaine in 2 mL using a combined spinal-epidural technique. Analgesia duration was the time from intrathecal injection until the first request for additional analgesia. The duration of analgesia was analyzed by visual inspection of the data, application of smoothing functions (Supersmoothers; LOWESS and LOESS [locally weighted scatterplot smoothing functions]), analysis of variance, Cosinor (Chronos-Fit), Excel, and NONMEM (nonlinear mixed effect modeling). Confidence intervals (CIs) were determined by bootstrap analysis (1000 replications with replacement) using PLT Tools.

RESULTS: Eighty-two women were included in the study. Examination of the raw data using 3 smoothing functions revealed a bimodal pattern, with a peak at approximately 0630 and a subsequent peak in the afternoon or evening, depending on the smoother. Analysis of variance did not identify any statistically significant difference between the duration of analgesia when intrathecal injection was given from midnight to 0600 compared with the duration of analgesia after intrathecal injection at other times. Chronos-Fit, Excel, and NONMEM produced identical results, with a mean duration of analgesia of 38.4 minutes (95% CI: 35.4-41.6 minutes), an 8-hour periodic waveform with an amplitude of 5.8 minutes (95% CI: 2.1-10.7 minutes), and a phase offset of 6.5 hours (95% CI: 5.4-8.0 hours) relative to midnight. The 8-hour periodic model did not reach statistical significance in 40% of bootstrap analyses, implying that statistical significance of the 8-hour periodic model was dependent on a subset of the data. Two data points before the change of shift at 0700 contributed most strongly to the statistical
significance of the periodic waveform. Without these data points, there was no evidence of an 8-hour periodic waveform for intrathecal bupivacaine analgesia.

CONCLUSION: Chronobiology includes the influence of external daily rhythms in the environment (e.g., nursing shifts) as well as human biological rhythms. We were able to distinguish the influence of an external rhythm by combining several novel analyses: (1) graphical presentation superimposing the raw data, external rhythms (e.g., nursing and anesthesia provider shifts), and smoothing functions; (2) graphical display of the contribution of each data point to the statistical significance; and (3) bootstrap analysis to identify whether the statistical significance was highly dependent on a data subset. These approaches suggested that 2 data points were likely artifacts of the change in nursing and anesthesia shifts. When these points were removed, there was no suggestion of biological rhythm in the duration of intrathecal bupivacaine analgesia.

Dexmedetomidine Infusion for Analgesia and Prevention of Emergence Agitation in Children with Obstructive Sleep Apnea Syndrome Undergoing Tonsillectomy and Adenoidectomy
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背景：右美托咪定是一種特異性α2激動劑，具有節省鎮痛藥的作用並且能減少躁動。我們在接受增殖腺扁桃體切除術（T&A）的阻塞性睡眠呼吸暫停綜合征患者中比較了術中輸注右美托咪定與單次劑量的芬太尼對術後阿片類藥物的使用及蘇醒期躁動的減少作用。

方法：122名年齡2至10歲，接受T&A（增殖腺扁桃體切除術）的阻塞性睡眠呼吸暫停綜合征患者完成了這項前瞻性、隨機性的美國食品和藥物管理局許可的研究。通過面罩七氟烷誘導後，D組接受靜脈輸注右美托咪定2 μg·kg⁻¹ 10分鐘後改為0.7 μg·kg⁻¹·h⁻¹，F組接受單次靜脈注射芬太尼1 μg·kg⁻¹。麻醉由七氟烷、氧氣一氧化亞氮維持。術中心率或收縮壓比手術前水準高30%並持續超過5分鐘則給予芬太尼0.5~1 μg·kg⁻¹。麻醉後恢復室（PACU）中的觀察者對於組別是盲法的。用客觀疼痛評分評估患者送至PACU當刻、5分鐘、15分鐘以及隨後的120分鐘內每15分鐘時的疼痛評分。相同的時間間隔內通過兩種尺度評估蘇醒期躁動：小兒麻醉的蘇醒譫妄量表以及科爾描述的5分制量表。若疼痛評分超過四分或者嚴重躁動（4分或5分）持續超過5分鐘則給予嗎啡0.05~0.1mg·kg⁻¹。結果：D組中9.8%的患者需要術中增加芬太尼，而F組則是36%（P = 0.001）。D組平均收縮壓以及心率明顯較低（P < 0.05）。最低肺泡有效濃度在兩組之間有顯著差異（P = 0.015）。D組客觀疼痛評分中位數是3，而F組為5 (P = 0.001)。
BACKGROUND: Dexmedetomidine, a specific α2 agonist, has an analgesic-sparing effect and reduces emergence agitation. We compared an intraoperative dexmedetomidine infusion with bolus fentanyl to reduce perioperative opioid use and decrease emergence agitation in children with obstructive sleep apnea syndrome undergoing adenotonsillectomy (T&A).

METHODS: One hundred twenty-two patients with obstructive sleep apnea syndrome undergoing T&A, ages 2 to 10 years, completed this prospective, randomized, U.S. Food and Drug Administration-approved study. After mask induction with sevoflurane, group D received IV dexmedetomidine 2 μg·kg⁻¹ over 10 minutes, followed by 0.7 μg·kg⁻¹·h⁻¹, and group F received IV fentanyl bolus 1 μg·kg⁻¹. Anesthesia was maintained with sevoflurane, oxygen, and nitrous oxide. Fentanyl 0.5 to 1 μg·kg⁻¹ was given to subjects in both groups for an increase in heart rate or systolic blood pressure 30% above preincision values that continued for 5 minutes. Observers in the postanesthesia care unit (PACU) were blinded to treatment groups. Pain was evaluated using the objective pain score in the PACU on arrival, at 5 minutes, at 15 minutes, then every 15 minutes for 120 minutes. Emergence agitation was evaluated at the same intervals by 2 scales: the Pediatric Anesthesia Emergence Delirium scale and a 5-point scale described by Cole. Morphine (0.05 to 0.1 mg·kg⁻¹) was given for pain (score >4) or severe agitation (score 4 or 5) lasting more than 5 minutes.

RESULTS: In group D, 9.8% patients needed intraoperative rescue fentanyl in comparison with 36% in group F (P = 0.001). Mean systolic blood pressure and heart rate were significantly lower in group D (P < 0.05). Minimum alveolar concentration values were significantly different between the 2 groups (P = 0.015). The median objective pain score was 3 for group D and 5 for group F (P = 0.001). In group D, 10 (16.3%) patients required rescue morphine, in comparison with 29 (47.5%) in group F (P = 0.002). The frequency of severe emergence agitation on arrival in the PACU was 18% in group D and 45.9% in group F (P = 0.004); at 5 minutes and at 15 minutes, it was lower in group D (P = 0.028). The duration of agitation on the Cole scale was statistically lower in group D (P = 0.004). In group D, 18% of patients and 40.9% in group F had an episode of SPO2 below 95% (P = 0.01).

CONCLUSIONS: An intraoperative infusion of dexmedetomidine combined with inhalation anesthetics provided satisfactory intraoperative conditions for T&A without adverse hemodynamic effects. Postoperative opioid requirements were significantly reduced, and the incidence and duration of severe emergence agitation was lower with fewer patients having desaturation episodes.
A Comparison of Liver Function After Hepatectomy with Inflow Occlusion Between Sevoflurane and Propofol Anesthesia

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BACKGROUND: In this study, we compared liver function tests after hepatectomy with inflow occlusion as a function of propofol versus sevoflurane anesthesia.

METHODS: One hundred patients undergoing elective liver resection with inflow occlusion were randomized into a sevoflurane group or a propofol group. General anesthesia was induced with 3 μg/kg fentanyl, 0.2 mg/kg cisatracurium, and target-controlled infusion of propofol, set at a plasma target concentration of 4 to 6 μg/mL, or sevoflurane initially started at 8%. Anesthesia was maintained with target-controlled infusion of propofol (2-4 μg/mL) or sevoflurane (1.5%-2.5%). The primary end point was postoperative liver injury assessed by peak values of liver transaminases.

RESULTS: Transaminase levels peaked between the first and the third postoperative day. Peak alanine aminotransferase was 504 and 571 U/L in the sevoflurane group and the propofol group, respectively. Peak aspartate aminotransferase was 435 U/L after sevoflurane and 581 U/L in the propofol group. There were no significant differences in peak alanine aminotransferase or peak aspartate aminotransferase between groups. Other liver function tests including bilirubin and alkaline phosphatase, and peak values of white blood cell counts and creatinine, were also not different between groups.
CONCLUSIONS: Sevoflurane and propofol anesthetics resulted in similar patterns of liver function tests after hepatectomy with inflow occlusion. These data suggest that the 2 anesthetics are equivalent in this clinical context.

BACKGROUND: Nerve stimulation and ultrasound guidance are the most popular techniques for peripheral nerve blocks. However, the minimum effective anesthetic volume (MEAV) in selected nerves for both techniques and the consequences of...
decreasing the local anesthetic volume on the pharmacodynamic characteristics of nerve block remain unstudied. We designed a randomized, double-blind controlled comparison between neurostimulation and ultrasound guidance to estimate the MEAV of 1.5% mepivacaine and pharmacodynamics in median and ulnar nerve blocks.

METHODS: Patients scheduled for carpal tunnel release were randomized to ultrasound guidance (UG) or neurostimulation (NS) groups. A step-up/step-down study model (Dixon method) was used to determine the MEAV with nonprobability sequential dosing based on the outcome of the previous patient. The starting dose of 1.5% mepivacaine was 13 and 11 mL for median and ulnar nerves at the humeral canal. Block success/failure resulted in a decrease/increase of 2 mL. A blinded physician assessed sensory blockade at 2-minute intervals for 20 minutes. Block onset time and duration were noted.

RESULTS: The MEAV50 (SD) of the median nerve was lower in the UG group 2 (0.1) mL (95% confidence interval [CI] = [1, 96] to [2.04]) than in the NS group 4 (3.8) mL (95% CI = [2, 4] to [5, 6]) (P = 0.017). There was no difference for the ulnar nerve between UG group 2 (0.1) mL (95% CI = [1, 96] to [2, 04]) and NS group 2.4 (0.6) mL (95% CI = [2, 1] to [2, 7]). The duration of sensory blockade was significantly correlated to local anesthetic volume, but onset time was not modified.

CONCLUSION: Ultrasound guidance selectively provided a 50% reduction in the MEAV of mepivacaine 1.5% for median nerve sensory blockade in comparison with neurostimulation. Decreasing the local anesthetic volume can decrease sensory block duration but not onset time.

比較加溫加濕器和熱量濕度交換器用於通氣的成人和兒童

Heated Humidification Versus Heat and Moisture Exchangers for Ventilated Adults and Children

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Anesth Analg 2010; 111(4):1072

背景：在機械通氣過程中上呼吸道為旁路時，必須通過人工方法給予加濕。在這種情況下，加熱加濕器（HH）和熱量濕度交換器（HMEs）是最常用的人工濕化類型。

目的：確定 HHs 和 HMEs 哪種加濕方法能夠更有效地預防機械通氣患者死亡和其他併發症。

检索方法：我們搜索了 Cochrane 的對照試驗中央寄存器(Cochrane 書庫 2010, 第 4 期)、MEDLINE、EMBASE 和 CINAHL（2010 年 1 月）來辨別出相關的隨機對照試驗。

選擇標準：我們入選了在機械通氣的成人和新生兒中比較 HMEs 和 HHs 的隨機對照試驗。我們也入選了隨機交叉研究。

資料收集和分析：我們評估了每個研究的品質並提取有關資料。對從合適的有關研究得到的結果進行荟萃分析以得出個別結果。

主要結果：我們入選了 33 項試驗，共 2833 例。25 項研究（n=2710）是平行組設計，8 項研究（n=123）是交叉組設計。只有 3 項入選的研究報導了嬰兒或兒童的
BACKGROUND: Humidification by artificial means must be provided when the upper airway is bypassed during mechanical ventilation. Heated humidification (HH) and heat and moisture exchangers (HMEs) are the most commonly used types of artificial humidification in this situation.

OBJECTIVES: To determine whether HHs or HMEs are more effective in preventing mortality and other complications in people who are mechanically ventilated.

SEARCH STRATEGY: We searched the Cochrane Central Register of Controlled Trials (The Cochrane Library 2010, Issue 4) and MEDLINE, EMBASE and CINAHL (January, 2010) to identify relevant randomized controlled trials.

SELECTION CRITERIA: We included randomized controlled trials comparing HMEs to HHs in mechanically ventilated adults and children. We included randomized crossover studies.

DATA COLLECTION AND ANALYSIS: We assessed the quality of each study and extracted the relevant data. Where appropriate, results from relevant studies were meta-analyzed for individual outcomes.

MAIN RESULTS: We included 33 trials with 2833 participants; 25 studies were parallel group design (n = 2710) and 8 crossover design (n = 123). Only 3 included studies reported data for infants or children. There was no overall effect on artificial airway occlusion, mortality, pneumonia, or respiratory complications; however, the PaCO2 and minute ventilation were increased when HMEs were compared to HHs and body temperature was lower. The cost of HMEs was lower in all studies that reported this outcome. There was some evidence that hydrophobic HMEs may reduce the risk of pneumonia and that blockages of artificial airways may be increased with the use of HMEs in certain subgroups of patients.

AUTHORS' CONCLUSIONS: There is little evidence of an overall difference between HMEs and HHs. However, hydrophobic HMEs may reduce the risk of pneumonia and the use of an HMEs may increase artificial airway occlusion in certain subgroups of patients. Therefore, HMEs may not be suitable for patients with limited respiratory reserve or prone to airway blockage. Further research is needed relating to hydrophobic versus hygroscopic HMEs and the use of HMEs in the pediatric and neonatal populations. As the design of HMEs evolves, evaluation of new generation HMEs will also need to be undertaken.
Heparin Dose Response Is Independent of Preoperative Antithrombin Activity in Patients Undergoing Coronary Artery Bypass Graft Surgery Using Low Heparin Concentrations

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BACKGROUND: Unfractionated heparin’s primary mechanism of action is to enhance the enzymatic activity of antithrombin (AT). We hypothesized that there would be a direct association between preoperative AT activity and both heparin dose response (HDR) and heparin sensitivity index (HSI) in patients undergoing coronary artery bypass graft surgery.

METHODS: Demographic and perioperative data were collected from 304 patients undergoing primary coronary artery bypass graft surgery. AT activity was measured after induction of general anesthesia using a colorimetric method (Siemens Healthcare Diagnostics, Tarrytown, NY). Activated coagulation time (ACT), HDR, and HSI were measured using the Hepcon HMS Plus system (Medtronic, Minneapolis, MN). Heparin dose was calculated for a target ACT using measured HDR by the same system. Multivariate linear regression was performed to identify independent predictors of HDR.
Subgroup analysis of patients with low AT activity (<80% normal; <0.813 U/mL) who may be at risk for heparin resistance was also performed.

**RESULTS:** Mean baseline ACT was 135 ± 18 seconds. Mean calculated HDR was 98 ± 21 s/U/mL. Mean baseline AT activity was 0.93 ± 0.13 U/mL. Baseline AT activity was not significantly associated with baseline or postheparin ACT, HDR, or HSI. Addition of AT activity to multivariable linear regression models of both HDR and HSI did not significantly improve model performance. Subgroup analysis of 49 patients with baseline AT <80% of normal levels did not reveal a relationship between low AT activity and HDR or HSI. Preoperative AT activity, HDR, and HSI were not associated with cardiac troponin I levels on the first postoperative day, intensive care unit duration, or hospital length of stay.

**CONCLUSION:** Although enhancing AT activity is the primary mechanism by which heparin facilitates cardiopulmonary bypass anticoagulation, low preoperative AT activity is not associated with impaired response to heparin or to clinical outcomes when using target ACTs of 300 to 350 seconds.

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在氣管導管套囊上分別噴射鹽酸消炎痛、10%利多卡因和2%利多卡因對術後喉痛的作用

Effect on Postoperative Sore Throat of Spraying the Endotracheal Tube Cuff with Benzydamine Hydrochloride, 10% Lidocaine, and 2% Lidocaine

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**背景：**術後喉痛（POST）是氣管插管後的常見併發症。本研究的目的是比較氣管導管套囊上噴射鹽酸消炎痛、10%利多卡因或2%利多卡因對術後喉痛的差異。

**方法：**372例患者隨機分成4組。4組患者分別在插管前於氣管導管套囊上噴射鹽酸消炎痛、10%利多卡因、2%利多卡因或生理鹽水。插管後,給套管充氣使氣道壓力在20cmH2O。丙泊酚維持麻醉。分別于拔管後1、6、12、24h測試病人的喉痛程度（沒有，輕微，中度或者重度）。

**結果：**4組患者插管後喉痛發生率最高的時間均在拔管後6h。在各個觀察點上，消炎痛組患者喉痛發生率均顯著低於10%利多卡因組、2%利多卡因組和生理鹽水組（p<0.05）。拔管後6h，消炎痛組術後喉痛的發生率（17%）也低於10%利多卡因組（53.7%）、2%利多卡因組（37%）和生理鹽水組（40.8%）（p<0.05）。與其他3組相比，在各個觀察時間點上，消炎痛組術後喉痛的嚴重程度低於其他組（p<0.05）。另外，本研究發現，在拔管後1、6和12h這3個觀察點上，與2%利多卡因組和生理鹽水組相比，10%利多卡因組明顯增加了喉嚨痛的嚴重程度。局部和全身副反應，各組間無明顯差別。
BACKGROUND: Postoperative sore throat (POST) is a common complication after endotracheal intubation. We compared the effectiveness on POST of spraying the endotracheal tube (ETT) cuff with benzylamine hydrochloride, 10% lidocaine, and 2% lidocaine.

METHODS: Three hundred seventy-two patients were randomly allocated into 4 groups. The ETT cuffs in each group were sprayed with benzylamine hydrochloride, 10% lidocaine hydrochloride, 2% lidocaine hydrochloride, or normal saline before endotracheal intubation. After insertion, the cuffs were inflated to an airway leak pressure of 20 cm H2O. Anesthesia was maintained with propofol. The patients were examined for sore throat (none, mild, moderate, or severe) at 1, 6, 12, and 24 hours after extubation.

RESULTS: The highest incidence of POST occurred at 6 hours after extubation in all groups. There was a significantly lower incidence of POST in the benzylamine group than 10% lidocaine, 2% lidocaine, and normal saline groups (P < 0.05) at each observation time point. At 6 hours after extubation, the incidence of POST was significantly lower in the benzylamine group (17.0%) compared with 10% lidocaine (53.7%), 2% lidocaine (37.0%), and normal saline (40.8%) groups (P < 0.05). The benzylamine group had significantly decreased severity of POST compared with the 10% lidocaine, 2% lidocaine, and normal saline groups (P < 0.05) at each observation time point. Compared with the 2% lidocaine and normal saline groups, the 10% lidocaine group had significantly increased severity of POST at 1, 6, and 12 hours after extubation. There were no significant differences among groups in local or systemic side effects.

CONCLUSIONS: Spraying benzylamine hydrochloride on the ETT cuff is a simple and effective method to reduce the incidence and severity of POST.

Inhaled Fluticasone Propionate Reduces Postoperative Sore Throat, Cough, and Hoarseness

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背景：喉痛是術後常見併發症。術後咳嗽及聲音嘶啞也會使患者感到痛苦。作者擬確定吸入甾體類化合物對術後24h內喉痛、咳嗽、聲音嘶啞的影響。

方法：研究納入了120名婦女，為單胎妊娠，ASA I-II級，擇期全麻下行剖宮產術。隨機分為2組，F組產婦到達手術室後取坐位，在2次深呼吸間通過一個隔離裝置吸入500ug氟替卡松丙酸酯，C組產婦為空白對照。術後1h和術後24h接受調查者有關術後喉痛、咳嗽、聲音嘶啞的詢問。

結果：兩組在年齡、身高、體重、體重指數、手術時間、插管及喉部暴露程度上沒有顯著差異。術後1小時F組喉痛、咳嗽、聲音嘶啞的發生率（分別為3.33%,3.33%,3.33%）較C組（分別為36.67%,18.33%,35%）顯著降低(P < 0.05),
術後 24 小時 F 組（13.33%,13.33%,25%）也比 C 組(40%,41.67%,50%)低。術後 1h F 組中重度嘶嘶音的發生率比 C 組也顯著降低（P < 0.05）。

結論：吸入氟替卡松丙酸酯能降低全麻下行剖宮產術後患者的術後喉痛、咳嗽、聲音嘶啞的發生率和嚴重程度。
（唐穎 譯 陳傑 校）

BACKGROUND: Sore throat is a common complication after surgery. Postoperative cough and hoarseness can also be distressing to patients. We sought to determine the effect of an inhaler steroid on sore throat, cough, and hoarseness during the first 24 hours of the postoperative period.

METHODS: We enrolled 120 women with ASA physical status I or II and term singleton pregnancy who were scheduled for elective cesarean delivery under general anesthesia. Patients were randomized into 2 groups: in the sitting position, group F patients received 500 μg inhaled fluticasone propionate via a spacer device during 2 deep inspirations, after arrival in the operating room, and group C had no treatment. The patients were interviewed by a blinded investigator for postoperative sore throat, cough, and hoarseness at 1 and 24 hours after surgery.

RESULTS: There were no significant differences in age, height, weight, body mass index, duration of surgery, intubation, and grade of laryngeal exposure between the 2 groups. The incidence of sore throat, cough, and hoarseness was significantly lower in group F (3.33%, 3.33%, and 3.33%) compared with the control group (36.67%, 18.33%, and 35%) (P < 0.05 for all comparisons), not only in the first postoperative hour but also 24 hours after surgery (13.33%, 13.33%, and 25% in group F vs 40%, 41.67%, and 50% in the control group). The incidence of moderate and severe hoarseness in group F at the first hour was significantly less than the control group (P < 0.05).

CONCLUSIONS: Inhaled fluticasone propionate decreases the incidence and severity of postoperative sore throat, cough, and hoarseness in patients undergoing cesarean delivery under general anesthesia.

一項對輔助控制通氣期間使用 AutoFlow 模式的遠期臨床評估：隨機對照研究
A Long-Term Clinical Evaluation of AutoFlow During Assist-Controlled Ventilation: A Randomized Controlled Trial

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背景：許多新機械通氣模式並未經過任何臨床研究。“雙控模式”，例如自由呼吸的開放模式(AutoFlow)，用於促進人機協調並減少報警。作者設計了一項長期的臨床研究，來評估輔助通氣模式下採用 AutoFlow 的安全性和有效性，其中以報警為關注點。
方法：將 42 例使用 Dräger Evita 4 呼吸機，機械通氣大於兩天的成年人，隨機分為兩組，分別使用常規通氣模式（n=21）和 AutoFlow 模式（n=21）。由護士根據指
BACKGROUND: Many new mechanical ventilation modes are proposed without any clinical evaluation. “Dual-controlled” modes, such as AutoFlow™, are supposed to improve patient–ventilator interfacing and could lead to fewer alarms. We performed a long-term clinical evaluation of the efficacy and safety of AutoFlow during assist-controlled ventilation, focusing on ventilator alarms.

METHODS: Forty-two adult patients, receiving mechanical ventilation for more than 2 days with a Dräger Evita 4 ventilator were randomized to conventional (n = 21) or AutoFlow (n = 21) assist-controlled ventilation. Sedation was given using a nurse-driven protocol. Ventilator-generated alarms were exhaustively recorded from the ventilator logbook with a computer. Daily blood gases and ventilation outcome were recorded.

RESULTS: A total of 403 days of mechanical ventilation were studied and 45,022 alarms were recorded over a period of 8074 hours. The course of respiratory rate, minute ventilation, Fio2, positive end-expiratory pressure, Pao2/Fio2, Paco2, and pH and doses and duration of sedation did not differ between the 2 groups. Outcome (duration of mechanical ventilation, ventilator-associated pneumonia, course of Sequential Organ Failure Assessment score, or death) was not different between the 2 groups. The number of alarms per hour was lower with AutoFlow assist-controlled ventilation: 3.3 [1.5 to 17] versus 9.1 [5 to 19], P < 0.0001 (median [quartile range]). In multivariate analysis, a low alarm rate was associated with activation of AutoFlow and a higher midazolam dose.

CONCLUSIONS: This first long-term clinical evaluation of the AutoFlow mode demonstrated its safety with regard to gas exchange and patient outcome. AutoFlow also allowed a very marked reduction in the number of ventilator alarms.

个人防護裝備用於大流行流感病人的護理：空氣淨化呼吸器應用培訓
Special Article: Personal Protective Equipment for Care of Pandemic Influenza Patients: A Training Workshop for the Powered Air Purifying Respirator

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呼吸道病毒傳染性疾病對於專業醫護人員可以有生命威脅，可發生在他們進行產生氣溶膠的操作時，其中包括氣管插管。2009 年的甲型 HINI 流感大流行把這個關注提到了當時的最前線。疾病控制與預防中心已表示，在呼吸道病毒傳染性疾病患者身上進行或者參加產生氣溶膠操作時，專業醫護人員最低必須佩戴 N95 防護口罩，同時他們也推薦考慮使用空氣動力淨化呼吸器（PAPR）。對於流感或者其他通過呼吸道及接觸傳播的疾病，防護性口罩必須屬於接觸性預防的一部分。在職業安全與衛生管理局遵循的呼吸道防護計畫中，使用 PAPR 能夠提供大於 N95 2.5 到 100 倍的保護，使用指定的保護係數來量化口罩的相對防護能力。防護的水準要達到指定的 APF 只能在進行適當的訓練和正確使用口罩的前提下。端面密封洩漏限制了 N95 防護口罩的防護能力，擬合試驗並不能保證端面密封的不洩漏。不適當使用被污染的設備、錯誤的裝配和持續使用，不正確的開啓和關閉程式都可能使 PAPR 的防護能力失效。壓力、不適和對於身體的累贅可能損害其性能。通過培訓能夠減輕這些影響。

強烈建議在需要使用 PAPR 之前進行培訓。在大流行流感期間，“臨時”的培訓不可能為需要特殊專業保護裝備的從業群體提供充分的準備。醫院職工保健部門目前也许沒有一個適當的 PAPR 培訓計畫。麻醉科和重症監護室將被考慮帶頭與醫院職工保健部門合作來建立一個 PAPR 培訓計畫。

用戶指南說明 PAPR 不能在手術中使用，因為它會產生確定的外向氣流，增加傷口的感染，當前欠缺澄清這一禁令和適當的解決並需要解決。手術室通風系統不是一個可以接受的選擇。

作者提供了一個線上的 PAPR 學習班。在這裏發表支援資訊。麻醉和重症監護室可以利用這個平臺，但不能替代製造商的詳細使用和維修說明。

（張蕾 譯 陳傑 校）

Virulent respiratory infectious diseases may present a life-threatening risk for health care professionals during aerosol-generating procedures, including endotracheal intubation. The 2009 Pandemic Influenza A (H1N1) brings this concern to the immediate forefront. The Centers for Disease Control and Prevention have stated that, when performing or participating in aerosol-generating procedures on patients with virulent contagious respiratory diseases, health care professionals must wear a minimum of the N95 respirator, and they may wish to consider using the powered air purifying respirator (PAPR). For influenza and other diseases transmitted by both respiratory and contact modes, protective respirators must be combined with contact precautions.

PAPR provides 2.5 to 100 times greater protection than the N95, when used within the context of an Occupational Safety and Health Administration–compliant respiratory protection program. The relative protective capability of a respirator is quantified using the assigned protection factor. The level of protection designated by the APF can only be achieved with appropriate training and correct use of the respirator.

Face seal leakage limits the protective capability of the N95 respirator, and fit testing does not assure the ability to maintain a tight face seal. The protective capability of the PAPR will be defeated by improper handling of contaminated equipment, incorrect assembly and maintenance, and improper don (put on) and doff (take off) procedures. Stress, discomfort, and physical encumbrance may impair performance. Acclimatization through training will mitigate these effects.
Training in the use of PAPRs in advance of their need is strongly advised. “Just in time” training is unlikely to provide adequate preparation for groups of practitioners requiring specialized personal protective equipment during a pandemic. Employee health departments in hospitals may not presently have a PAPR training program in place. Anesthesia and critical care providers would be well advised to take the lead in working with their hospitals’ employee health departments to establish a PAPR training program where none exists.

User instructions state that the PAPR should not be used during surgery because it generates positive outward airflow, and may increase the risk of wound infection. Clarification of this prohibition and acceptable solutions are currently lacking and need to be addressed. The surgical hood system is not an acceptable alternative.

We provide online a PAPR training workshop. Supporting information is presented here. Anesthesia and critical care providers may use this workshop to supplement, but not substitute for, the manufacturers' detailed use and maintenance instructions.

**Lung Recruitment and Positive End-Expiratory Pressure Have Different Effects on CO2 Elimination in Healthy and Sick Lungs**

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**背景**: 作者研究了肺複張手法和 PEEP 对每次呼吸的 CO2 清除量的影响 (Vtco2,br)。

**方法**: 分別對 7 例健康和 7 例肺灌洗豬肺施以恒定潮氣量通氣，每隔 10 分鐘，以 6 cm H2O 爲間隔，其 PEEP 從 0 增加至 18 cm H2O 後再降至 0。在 18 cm H2O PEEP 間隔間對健康肺和灌洗肺分別予以 2 分鐘的週期性肺複張，其平臺壓/PEEP 分別對應為 40/20 cm H2O、50/25 cm H2O。需要記錄的資料包括容積二氧化碳圖、呼吸力學、血氣分析以及血液動力學資料。

**結果**: 在未行肺複張的健康肺，Vtco2,br 與 PEEP 成相反比例：在 0-PEEP 水準，Vtco2,br 爲 4.0ml (3.6–4.4) mL（對應為中位數，四分位數間距），在 18-PEEP 水準，則降為 3.1 (2.8–3.4) mL (P < 0.05)。在肺複張後，Vtco2,br 增加至 18-PEEP 的 3.3 (3–3.6) mL 以及 0-PEEP 的 4.0 (3.5–4.5) mL (P < 0.05)。灌洗肺行肺複張前，Vtco2,br 最初從 0-PEEP 水準的 2.0 (1.7–2.3) mL 增加至 12-PEEP 水準的 2.6 (2.2–3) mL (P < 0.05)，但當 PEEP 增加至 18 cm H2O 時，其 Vtco2,br 降為 2.4 (2–2.8) mL (P < 0.05)。肺複張後，最高的 Vtco2,br 出現在 12-PEEP，其值為 2.9 (2.1–3.7) mL，而在 0-PEEP 則減至 2.5 (1.9–3.1) mL (P < 0.05)。Vtco2,br 與肺灌注、氣體交換面積、肺泡通氣量的變化正相關，與死腔量負相關。

肺複張和呼氣末正壓在健康肺和病肺有不同的 CO2 清除作用
BACKGROUND: We studied the effects that the lung recruitment maneuver (RM) and positive end-expiratory pressure (PEEP) have on the elimination of CO2 per breath (Vtco2,br).

METHODS: In 7 healthy and 7 lung-lavaged pigs at constant ventilation, PEEP was increased from 0 to 18 cm H2O and then decreased to 0 in steps of 6 cm H2O every 10 minutes. Cycling RMs with plateau pressure/PEEP of 40/20 (healthy) and 50/25 (lavaged) cm H2O were applied for 2 minutes between 18-PEEP steps. Volumetric capnography, respiratory mechanics, blood gas, and hemodynamic data were recorded.

RESULTS: In healthy lungs before the RM, Vtco2,br was inversely proportional to PEEP decreasing from 4.0 (3.6–4.4) mL (median and interquartile range) at 0-PEEP to 3.1 (2.8–3.4) mL at 18-PEEP (P < 0.05). After the RM, Vtco2,br increased from 3.3 (3–3.6) mL at 18-PEEP to 4.0 (3.5–4.5) mL at 0-PEEP (P < 0.05). In lavaged lungs before the RM, Vtco2,br increased initially from 2.0 (1.7–2.3) mL at 0-PEEP to 2.6 (2.2–3) mL at 12-PEEP (P < 0.05) but then decreased to 2.4 (2–2.8) mL when PEEP was increased further to 18 cm H2O (P < 0.05). After the RM, the highest Vtco2,br of 2.9 (2.1–3.7) mL was observed at 12-PEEP and then decreased to 2.5 (1.9–3.1) mL at 0-PEEP (P < 0.05). Vtco2,br was directly related to changes in lung perfusion, the area of gas exchange, and alveolar ventilation but inversely related to changes in dead space.

CONCLUSIONS: CO2 elimination by the lungs was dependent on PEEP and recruitment and showed major differences between healthy and lavaged lungs.

同側腹橫肌平面阻滯可為小兒闌尾術後提供有效的鎮痛：一項隨機對照實驗

Ipsilateral Transversus Abdominis Plane Block Provides Effective Analgesia After Appendectomy in Children: A Randomized Controlled Trial

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BACKGROUND: The transversus abdominis plane (TAP) block provides effective postoperative analgesia in adults undergoing major abdominal surgery. Its efficacy in children remains unclear, with no randomized clinical trials in this population. In this study, we evaluated its analgesic efficacy over the first 48 postoperative hours after appendectomy performed through an open abdominal incision, in a randomized, controlled, double-blind clinical trial.

METHODS: Forty children undergoing appendectomy were randomized to undergo unilateral TAP block with ropivacaine (n = 19) versus placebo (n = 21) in addition to standard postoperative analgesia comprising IV morphine analgesia and regular diclofenac and acetaminophen. All patients received a standard general anesthetic, and after induction of anesthesia, a TAP block was performed using the landmark technique with 2.5 mg · kg⁻¹ ropivacaine 0.75% or an equal volume (0.3 mL · kg⁻¹) of saline on the ipsilateral side to the incision.

RESULTS: The TAP block with ropivacaine reduced mean (±SD) morphine requirements in the first 48 postoperative hours (10.3 ± 12.7 vs 22.3 ± 14.7 mg; P < 0.01) compared with placebo block. The TAP block also reduced postoperative visual analog scale pain scores at rest and on movement compared with placebo. Interval morphine consumption was reduced over the first 24 postoperative hours. There were no between-group differences in the incidence of sedation or nausea and vomiting. There were no complications attributable to the TAP block.

CONCLUSIONS: Unilateral TAP block, as a component of a multimodal analgesic regimen, provided superior analgesia compared with placebo in the first 48 postoperative hours after appendectomy in children.
Asphyxiation by an inhaled foreign body is a leading cause of accidental death among children younger than 4 years. We analyzed the recent epidemiology of foreign body aspiration and reviewed the current trends in diagnosis and management. In this article, we discuss anesthetic management of bronchoscopy to remove objects. The reviewed articles total 12,979 pediatric bronchoscopies. Most aspirated foreign bodies are organic materials (81%, confidence interval [CI] = 77%–86%), nuts and seeds being the most common. The majority of foreign bodies (88%, CI = 85%–91%) lodge in the bronchial tree, with the remainder catching in the larynx or trachea. The incidence of right-sided foreign bodies (52%, CI = 48%–55%) is higher than that of left-sided foreign bodies (33%, CI = 30%–37%). A small number of objects fragment and lodge in different parts of the airways. Only 11% (CI = 8%–16%) of the foreign bodies were radio-opaque on radiograph, with chest radiographs being normal in 17% of children (CI = 13%–22%). Although rigid bronchoscopy is the traditional diagnostic “gold standard,” the use of computerized tomography, virtual bronchoscopy, and flexible bronchoscopy is increasing. Reported mortality during bronchoscopy is 0.42%. Although asphyxia at presentation or initial emergency bronchoscopy causes some deaths, hypoxic cardiac arrest during retrieval of the object, bronchial rupture, and unspecified intraoperative complications in previously stable patients constitute the majority of in-hospital fatalities. Major complications include severe laryngeal edema or bronchospasm requiring tracheotomy or reintubation, pneumothorax, pneumomediastinum, cardiac arrest, tracheal, or bronchial laceration, and hypoxic brain damage (0.96%). Aspiration of gastric contents is not reported. Preoperative assessment should determine where the aspirated foreign body has lodged, what was aspirated, and when the aspiration occurred (“what, where, when”). The choices of inhaled or IV induction, spontaneous or controlled ventilation, and inhaled or IV maintenance may be individualized to the circumstances. Although several
anesthetic techniques are effective for managing children with foreign body aspiration, there is no consensus from the literature as to which technique is optimal. An induction that maintains spontaneous ventilation is commonly practiced to minimize the risk of converting a partial proximal obstruction to a complete obstruction. Controlled ventilation combined with IV drugs and paralysis allows for suitable rigid bronchoscopy conditions and a consistent level of anesthesia. Close communication between the anesthesiologist, bronchoscopist, and assistants is essential.

The Effect of Ketamine Anesthesia on the Immune Function of Mice with Postoperative Septicemia

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背景：目前尚未阐明氯胺酮对免疫方面作用如何影响术后败血症患者的预后。作者通过调查氯胺酮麻醉对剖腹手术小鼠术后用脂多糖或埃氏大肠杆菌激发败血症，观察肝巨噬细胞和细胞因数的产生。

方法：C57BL/6小鼠接受氯胺酮或者七氟醚麻醉下行剖腹手术，小鼠用埃希大肠菌属或者是脂多糖激发败血症，随后检查小鼠的生存率和细胞因数的分泌，评估β受体阻滞剂盐酸诺多洛尔对氯胺酮麻醉的效应，用以阐明氯胺酮引起的免疫抑制效应的机制。

结果：与七氟醚麻醉相比，氯胺酮麻醉提高了剖腹手术后脂多糖激发败血症小鼠的生存率，但是在埃希大肠菌属激发组，氯胺酮没有发现有上述作用。在脂多糖和埃希大肠菌属注射后，氯胺酮抑制TNF和IFN-γ分泌物，当用抗生素抑制细菌的生长，与七氟醚麻醉相比，氯胺酮麻醉可以有效提高注射埃希大肠菌属小鼠的生存率。在使用抗生素的七氟醚麻醉组，中和TNF可以提高生存率和减少IFN-γ分泌，表明氯胺酮对TNF的抑制可以提高生存率。在脂多糖激发组氯胺酮可以抑制活体肝巨噬细胞对微球的吞噬作用。在脂多糖激发组，使用麻醉剂的氯胺酮联合使用钠多洛尔不会恢复TNF的抑制，这表明和β-肾上腺素能通路无关。然而，它恢复在低剂量氯胺酮（10%的麻醉剂量）TNF的分泌。与此相反，麻醉剂的氯胺酮通过β-肾上腺素能通路，钠多洛尔恢复了肝巨噬细胞的吞噬功能。

结论：氯胺酮抑制TNF的产生和枯否细胞/巨噬细胞的吞噬功能，因此除非细菌的生长被很好的控制（用抗生素），尽管减少了炎症反应但是术后感染不会很好的控制。

（刘世文 译 陈杰 校）
BACKGROUND: It is unknown how ketamine anesthesia immunologically affects the outcome of patients with postoperative septicemia. We investigated the effects of ketamine anesthesia on mice with an *Escherichia coli* or lipopolysaccharide (LPS) challenge after laparotomy, focusing on phagocytosis by liver macrophages (Kupffer cells) and cytokine production.

METHODS: C57BL/6 mice received ketamine or sevoflurane anesthesia during laparotomy, which was followed by an *E. coli* or LPS challenge; thereafter, mouse survival rates and cytokine secretions were examined. The effects of a β-adrenoceptor antagonist, nadolol, on ketamine anesthesia were also assessed to clarify the mechanisms of ketamine-induced immunosuppressive effects.

RESULTS: Ketamine anesthesia increased the mouse survival rate after LPS challenge after laparotomy compared with sevoflurane anesthesia, whereas such an effect of ketamine was not observed after *E. coli* challenge. Ketamine suppressed tumor necrosis factor (TNF) and interferon (IFN)-γ secretion after LPS and *E. coli* challenge. When bacterial growth was inhibited using an antibiotic, ketamine anesthesia effectively improved mouse survival after *E. coli* challenge compared with sevoflurane anesthesia. Neutralization of TNF also improved survival and decreased IFN-γ secretion after bacterial challenge in antibiotic-treated mice with sevoflurane anesthesia, suggesting that ketamine's suppression of TNF may improve survival. Ketamine also suppressed in vivo phagocytosis of microspheres by Kupffer cells in LPS-challenged mice. Concomitant use of nadolol with an anesthetic dose of ketamine did not restore TNF suppression in LPS-challenged mice, suggesting a mechanism independent of the β-adrenergic pathway. However, it restored TNF secretion under low-dose ketamine (10% anesthetic dose). In contrast, nadolol restored the decrease in phagocytosis by Kupffer cells, which was induced by the anesthetic dose of ketamine via the β-adrenergic pathway, suggesting distinct mechanisms.

CONCLUSION: Ketamine suppresses TNF production and phagocytosis by Kupffer cells/macrophages. Therefore, unless bacterial growth is well controlled (by an antibiotic), postoperative infection might not improve despite reduction of the inflammatory response.

Cochrane Corner:鎖骨下臂叢神經阻滯用於下臂手術的局部麻醉
Cochrane Corner: Infraclavicular Brachial Plexus Block for Regional Anaesthesia of the Lower Arm
Ki Jinn Chin, Mandeep Singh, Veerabradan Velayutham and Victor Chee
Anesth Analg October 2010 111:1072;

背景：臂叢神經阻滯有多種不同的入路。儘管鎖骨下法臂叢神經阻滯（簡稱 ICB）有幾個優勢技術，但目前尚不清楚下臂手術臂叢麻顱哪一入路為首選。因此，研究者對 ICB 和其他臂叢神經阻滯（BPBs）做了系統回顧評價。

目的：評價 ICB 和其他 BPBs 在下臂區域麻顱中的療效和安全性。

選取準則：研究者選取了以 ICB 或其他 BPBs 作為下臂外科手術唯一的麻醉方式並兩者做對比的隨機對照試驗（RCTs）。
資料獲取與分析：主要結果是麻醉後 30min 內能阻滯完全並能夠行手術的情況。次要結果包括阻滯不全，止血帶疼痛，感覺阻滯起效時程，阻滯持續時間，阻滯伴隨疼痛及阻滯引起的相關併發症。
主要結果：研究者確定了 15 項研究共計 1020 名受試者，其中 510 例接受 ICB，510 例接受其他 BPBs。對照組是 10 項腋路阻滯的研究，兩項肱正中阻滯的研究，兩項鎖骨上阻滯的研究，一項肌間溝阻滯的研究。三項研究採用超聲引導下 ICB 技術，麻醉失敗和出現併發症的風險遠低於同類 ICB 和所有其他 BPBs。ICB 後止血帶疼痛可能少一些（風險比（RR）0.47，95%CI 為 0.24 〜 0.92，P 值 0.03）。與單次腋路阻滯相比，ICB 在肌皮神經感覺阻滯（失敗率 0.46，95%CI 為 0.27 至 0.60，P 值 0.0001）與腋神經阻滯（失敗率 0.37，95%CI 為 0.24 至 0.58，P 值 0.0001）上更完全。與腋路多點阻滯（平均差（MD）爲-2.7 分，95%CI 為-4.2 到-1.1，P 值 0.0006）和肱正中阻滯相比（平均差為-4.8 分，95%CI 為-6.0 至-3.6，P 值 0.00001），ICB 起效更迅速，但 ICB 有更長的感覺阻滯起效時間（MD3.9min，95%CI 為 3.2 至 4.5，P 值 0.0001）。
作者的結論：與其他 BPBs 的阻滯療效相比較，ICB 是下臂手術的一種安全、簡便的麻醉方式。ICB 的優點包括手術中止血帶疼痛的可能性降低，相比單點腋路神經阻滯具有更可靠的肌皮神經和腋神經阻滯。在允許注射量大於 40ml、足夠的阻滯時間（至少 30min）的條件下，ICB 的療效可能會改善。由於許多出版文章包括在本次檢索內容中的隨機對照研究已經證實，遠端運動後束反應是電刺激引導下 ICB 的端點，作者推薦在今後比較研究中可以利用這一點。尚需另外隨機對照試驗來對比超聲引導下 ICB 與其他 BPBs 的區別。
（丁俊雲 譯 陳傑 校）
BACKGROUND: Several approaches exist to produce local anaesthetic blockade of the brachial plexus. It is not clear which is the technique of choice for providing surgical anaesthesia of the lower arm although infraclavicular blockade (ICB) has several purported advantages. We therefore performed a systematic review of ICB compared to the other brachial plexus blocks (BPBs).
OBJECTIVES: To evaluate the efficacy and safety of ICB compared to other BPBs in providing regional anaesthesia of the lower arm.
SEARCH STRATEGY: We searched CENTRAL (The Cochrane Library 2008, Issue 3), MEDLINE (1950 to September 22nd 2008) and EMBASE (1980 to September 22nd 2008). We also searched conference proceedings (from 2004 to 2008) and the www.clinicaltrials.gov registry. No language restriction was applied.
SELECTION CRITERIA: We included any randomized controlled trials (RCTs) that compared ICB with other BPBs as the sole anaesthetic techniques for surgery on the lower arm.
DATA COLLECTION AND ANALYSIS: The primary outcome was adequate surgical anaesthesia within 30 minutes of block completion. Secondary outcomes included sensory block of individual nerves, tourniquet pain, onset time of sensory blockade, block performance time, block-associated pain and complications related to the block.
MAIN RESULTS: We identified 15 studies with 1020 participants, of whom 510 received ICB and 510 received other BPBs. The control group intervention was the axillary block in 10 studies, mid-humeral block in two studies, supraclavicular block in two studies and parascalenoe block in one study. Three studies employed ultrasound-guided ICB. The risk of failed surgical anaesthesia and of complications were low and similar for ICB and all other BPBs. Tourniquet pain was less likely with ICB (risk ratio (RR) 0.47, 95% CI 0.24 to 0.92, P = 0.03). When compared to a single-injection axillary block, ICB was better at providing complete sensory block of the musculocutaneous nerve (RR for failure 0.46, 95% CI 0.27 to 0.60, P < 0.0001) and the axillary nerve (RR of failure 0.37, 95% CI 0.24 to 0.58, P < 0.0001)). ICB was faster to perform than multiple-injection axillary (mean difference (MD) −2.7 min, 95% CI −4.2 to −1.1, P = 0.0006) or midhumeral blocks (MD −4.8 min, 95% CI −6.0 to −3.6, P < 0.00001) but this was offset by a longer sensory block onset time (MD 3.9 min, 95% CI 3.2 to 4.5, P < 0.00001).

AUTHORS’ CONCLUSIONS: ICB is a safe and simple technique for providing surgical anaesthesia of the lower arm, with an efficacy comparable to other BPBs. The advantages of ICB include a lower likelihood of tourniquet pain during surgery, and more reliable blockade of the musculocutaneous and axillary nerves when compared to a single-injection axillary block. The efficacy of ICB is likely to be improved if adequate time is allowed for block onset (at least 30 minutes) and if a volume of at least 40 ml is injected. Since publication of many of the trials included in this review, it has become clear that a distal posterior cord motor response is the appropriate endpoint for electrostimulation-guided ICB; we recommend it be used in all future comparative studies. There is also a need for additional RCTs comparing ultrasound-guided ICB with other BPBs.

Heparin Concentration-Based Anticoagulation for Cardiac Surgery Fails to Reliably Predict Heparin Bolus Dose Requirements.
Garvin S, Fitzgerald DC, Despotis G, Shekar P, Body SC
Department of Anesthesiology, Perioperative and Pain Medicine, and Division of Cardiac Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts; and Departments of Pathology, Immunology, and Anesthesiology, Washington University School of Medicine, St. Louis, Missouri. Brigham and Women's Hospital, Harvard Medical School, Anesth Analg. 2009 Oct; 111(4):849-55.

背景：先進的床旁診斷檢驗資訊系統現已逐步成為止血管理的新技術，其通過對抗凝所需肝素濃度的計算為患者提供個性化的肝素注射方案。Hepcon止血管理系統（美敦力公司，明尼阿波利斯，明尼蘇達州）可對肝素劑量、活化凝血時間（ACT）及肝素劑量回應（HDR）進行評估。然而在大樣本人群中，此類測試的系統性評價並未開展與實施。

方法：此次研究共調查了2005年2月至2008年7月間所有於我院行體外迴圈術下心臟手術患者的資料資料。在此期間，Hepcon止血管理系統專用於肝素劑量與凝血監測的評估。研究所需記錄的資料資訊包括詳盡的人口統計學資料、手術情況、
實驗室檢查及肝素的單次注射劑量等。此外，ACT、計算所得與實際測定的 HDR 及肝素濃度等也需記錄在案。通過比較實際與目標 ACT 及計算所得與實際測定 HDR 間的關係，對 Hepcon 止血管理系統的臨床運用作一評價。

結果：在 3880 名實施心臟手術的患者中，針對目標 ACT 給予的肝素注射劑量導致肝素化後患者的 ACT 呈現出巨大差異（r(2) = 0.03）。其中，有 7.4% 的患者其肝素化後的 ACT 值未達到 300 秒的目標 ACT；而未達到 350 秒目標 ACT 的患者更占 16.9%。同樣，經統計後發現，根據 HDR 所計算得到的目標肝素濃度與注射後的實際肝素濃度間並無關聯，甚至有 18.5% 的病例在測定中出現了相差超過 2 倍的情況。而計算所得與實際測定的 HDR 在任一肝素濃度均無線性相關性。

結論：在體外迴圈前，Hepcon 止血管理系統不能充分評估肝素的注射劑量。進一步的前瞻性研究需闡明構建體外迴圈所需抗凝的具體因素及在手術室內臨床醫生該如何切實可靠地評價抗凝效應。

（范羽譯 薛張綱校）

BACKGROUND: Hemostasis management has evolved to include sophisticated point-of-care systems that provide individualized dosing through heparin concentration-based anticoagulation. The Hepcon HMS Plus system (Medtronic, Minneapolis, MN) estimates heparin dose, activated clotting time (ACT), and heparin dose response (HDR). However, the accuracy of this test has not been systematically evaluated in large cohorts.

METHODS: We examined institutional databases for all patients who underwent cardiac surgery with cardiopulmonary bypass (CPB) at our institution from February 2005 to July 2008. During this period, the Hepcon HMS Plus was used exclusively for assessment of heparin dosing and coagulation monitoring. Detailed demographic, surgical, laboratory, and heparin dosing data were recorded. ACT, calculated and measured HDR, and heparin concentrations were recorded. Performance of the Hepcon HMS Plus was assessed by comparison of actual and target ACT values and calculated and measured HDR.

RESULTS: In 3880 patients undergoing cardiac surgery, heparin bolus dosing to a target ACT resulted in wide variation in the postheparin ACT (r(2) = 0.03). The postheparin ACT did not reach the target ACT threshold in 7.4% (i.e., when target ACT was 300 s) and 16.9% (i.e., when target ACT was 350 s) of patients. Similarly, the target heparin level calculated from the HDR did not correlate with the postbolus heparin level, with 18.5% of samples differing by more than 2 levels of the assay. Calculated and measured HDR were not linearly related at any heparin level.

CONCLUSIONS: The Hepcon HMS Plus system poorly estimates heparin bolus requirements in the pre-CPB period. Further prospective studies are needed to elucidate what constitutes adequate anticoagulation for CPB and how clinicians can reliably and practically assess anticoagulation in the operating room.

β2-adrenergic receptor-coupled phosphoinositide 3-kinase constrains cAMP-dependent increases in cardiac inotropy through phosphodiesterase 4 activation.

Gregg CJ, Steppan J, Gonzalez DR, Champion HC, Phan AC, Nyhan D, Shoukas AA, Hare JM, Barouch LA, Berkowitz DE.
背景：眾多的證據表明磷酸肌醇-3-激酶(P13K)可以調節心肌收縮力，然而其機制尚不明了。我們認爲，β2腎上腺能受體偶聯P13K可以通過啓動cAMP依賴的磷酸二酯酶從而增強心肌收縮力。

方法：我們測試了在離體的鼠心肌細胞中P13K和PDE4抑制劑對心肌收縮力的影響，從而瞭解其生理功能(肌纖維節縮短和鈣離子向細胞內流動)以及cAMP和PDE活性。

結果：P13K抑制劑輔以可逆的LY294002抑制劑可以使得肌纖維節縮短並且提高對鈣離子的處理能力，從而增加心肌細胞的收縮力。這一反應依賴於G蛋白的啓動。因為百日咳毒素具有不可逆的G蛋白抑制作用。當β2受體與百日咳毒素共同培養時，LY介導的收縮力增強反應便會消失。此外，P13K抑制劑對於肌纖維節的收縮作用弱於PDE3,4抑制劑(米力農)聯合LY。並且，LY可以剂量依賴性地削弱PDE4的活性(當LY濃度達到10µM時，只有38%的PDE4具有活性)。特別需要指出的是PI3K(γ)與PDE4D會發生免疫反應產生沉澱。所誘導出的心肌細胞收縮力加強這一反應可以被β2受體逆向激動劑所抵制。

結論：P13K通過cAMP依賴的機制規律地啓動PDE4從而調節心肌細胞收縮力。並且，底物水準上β2受體依賴於激動劑的啓動並由此引起cAMP的擴增以及通過P13K催化增強PDE4的活力，這呈現了一個完整的細胞信號轉導機制。這一機制控制cAMP的量化從而控制心肌細胞的收縮力。這一結果可以幫助解釋米力農為何可以在缺乏直接的β受體激動的情況仍然可以增強心肌收縮力，以及為何它可以在加入大劑量β受體激動劑後可以顯著增加心肌收縮力。

（黃劍譯 薛張綱校）

BACKGROUND: Emerging evidence suggests that phosphoinositide 3-kinase (PI3K) may modulate cardiac inotropy; however, the underlying mechanism remains elusive. We hypothesized that β(2)-adrenergic receptor (AR)-coupled PI3K constrains increases in cardiac inotropy through cyclic adenosine monophosphate (cAMP)-dependent phosphodiesterase (PDE) activation.

METHODS: We tested the effects of PI3K and PDE4 inhibition on myocardial contractility by using isolated murine cardiac myocytes to study physiologic functions (sarcomere shortening [SS] and intracellular Ca(2+) transients), as well as cAMP and PDE activity.

RESULTS: PI3K inhibition with the reversible inhibitor LY294002 (LY) resulted in a significant increase in SS and Ca(2+) handling, indicating enhanced contractility. This response depended on G(iα) protein activity, because incubation with pertussis toxin (an irreversible G(iα) inhibitor) abolished the LY-induced hypercontractility. In addition, PI3K inhibition had no greater effect on SS than both a PDE3,4 inhibitor (milrinone) and LY combined. Furthermore, LY decreased PDE4 activity in a concentration-dependent manner (58.0% of PDE4 activity at LY concentrations of 10 µM). Notably, PI3K(γ) coimmunoprecipitated with PDE4D. The β(2)-AR inverse agonist, ICI 118,551 (ICI), abolished induced increases in contractility.

CONCLUSIONS: PI3K modulates myocardial contractility by a cAMP-dependent mechanism through the regulation of the catalytic activity of PDE4. Furthermore, basal
agonist-independent activity of the β(2)-AR and its resultant cAMP production and enhancement of the catalytic activity of PDE4 through PI3K represents an example of integrative cellular signaling, which controls cAMP dynamics and thereby contractility in the cardiac myocyte. These results help to explain the mechanism by which milrinone is able to increase myocardial contractility in the absence of direct β-adrenergic stimulation and why it can further augment contractility in the presence of maximal β-adrenergic stimulation.

Strepsils® 用於減輕氣管插管後喉部疼痛和聲音嘶啞的研究
Strepsils® Tablets Reduce Sore Throat and Hoarseness After Tracheal Intubation
Amin Ebneshahidi, MD, and Masood Mohseni, MD
From the Department of Anesthesiology, Sadi Hospital, Isfahan, Iran.
Anesth Analg October 2010 111:892-894

背景：Strepsils已成功用於預防和治療口腔炎症，但用於插管後喉部疼痛和聲音嘶啞療效未知。進行此項研究即為評估Strepsils對氣管插管術後減輕咽喉疼痛和聲音嘶啞的療效。

方法：對150名ASA分級Ⅰ級和Ⅱ級需行擇期整形或婦產科手術的病人給予全身麻醉，受試者被隨機分為2組。入手術室前，一組給予Strepsils，另一組給相似的安慰劑。然後評估術後即刻和術後24小時咽喉疼痛和聲音嘶啞的發病率和嚴重度。

結果：術後早期咽喉疼痛發病率Strepsils組和對照組分別是13.7%和33.3%；聲音嘶啞的發病率在受試組和對照組分別是12.3%和26.4% (P<0.05)；術後24小時，在受試組和對照組咽鳴疼痛發病率分別降低到6.8%和18.1%，而聲音嘶啞症狀在受試組和對照組分別降到8.2%和19.4% (P<0.05)。

結論：圍手術期應用Strepsils可以減輕術後咽喉疼痛及聲音嘶啞症狀。
（毛慧譯，薛張剛校）

BACKGROUND: Amyl-m-cresol (Strepsils) has been successfully used in the prophylaxis and treatment of oral inflammations, but its effects on postintubation sore throat and hoarseness are unknown. We conducted this study to evaluate the effects of Strepsils in reducing postintubation sore throat and hoarseness.

METHODS: One hundred fifty patients, ASA physical status I to II, scheduled to undergo general anesthesia and elective orthopedic or gynecologic surgery were enrolled. Participants were randomly allocated to receive either Strepsils or identical-looking placebo tablets immediately before arrival to the operating room. The incidence and severity of postoperative sore throat and hoarseness were evaluated immediately and 24 hours after surgery.

RESULTS: The incidence of early postoperative sore throat was 13.7% and 33.3% and hoarseness was 12.3% and 26.4% in the Strepsils and placebo groups, respectively (P < 0.05). One day after surgery, the incidence of sore throat decreased to 6.8% and 18.1% in the Strepsils and control groups, respectively. The incidence of hoarseness 1 day after the operation decreased to 8.2% in the Strepsils group and 19.4% in the placebo group, but the difference remained statistically significant (P < 0.05).
CONCLUSION: Perioperative use of Strepsils tablets reduces postoperative sore throat and hoarseness of voice. (Anesth Analg 2010;111:892–4)

Goal-directed fluid management based on the pulse oximeter-derived pleth variability index reduces lactate levels and improves fluid management.

Goal-directed fluid management based on the pulse oximeter-derived pleth variability index reduces lactate levels and improves fluid management. Forget P, Lois F, de Kock M. From the Department of Anesthesiology, Université catholique de Louvain, St.-Luc Hospital, Brussels, Belgium. Anesth Analg. 2010 Oct;111(4):910-4.

BACKGROUND: Dynamic variables predict fluid responsiveness and may improve fluid management during surgery. We investigated whether displaying the variability in the pulse oximeter plethysmogram (pleth variability index; PVI) would guide intraoperative fluid management and improve circulation as assessed by lactate levels.

METHODS: Eighty-two patients scheduled for major abdominal surgery were randomized into 2 groups to compare intraoperative PVI-directed fluid management (PVI group) versus standard care (control group). After the induction of general anesthesia, the PVI group received a 500-mL crystalloid bolus and a crystalloid infusion of 2 mL · kg(-1) · h(-1). Colloids of 250 mL were administered if the PVI was >13% Vasoactive drug support was given to maintain the mean arterial blood pressure above 65 mm Hg. In the control group, an infusion of 500 mL of crystalloids was followed by fluid management on the basis of fluid challenges and their effects on mean arterial blood and central venous pressure. Perioperative lactate levels, hemodynamic data, and postoperative complications were recorded prospectively.

RESULTS: Intraoperative crystalloids and total volume infused were significantly lower in the goal-directed PVI group. Lactate levels were significantly lower in the PVI group during surgery and 48 hours after surgery (P < 0.05).
CONCLUSIONS: PVI-based goal-directed fluid management reduced the volume of intraoperative fluid infused and reduced intraoperative and postoperative lactate levels.

全憑靜脈麻醉中兩個連續的單向閥能降低靜脈通路中的交叉感染
Two serial check valves can prevent cross-contamination through intravenous tubing during total intravenous anesthesia.
Klinik und Poliklinik für Anästhesiologie und Intensivtherapie, Dresden, Germany.

背景：在麻醉中帶有細菌的丙泊酚往往與嚴重的膿毒血症和死亡聯繫在一起。在靜脈通路中僅放置一個單向閥並不能防止不斷升高的病原體進入充滿丙泊酚的注射器，所以我們設計了一套靜脈通路帶有多個單向閥。為了評估這個設計的有效性，我們在靜脈通路的上游檢測病原菌的濃度，這與被污染病人模型中的病原菌濃度有關。

方法：在一個玻璃容器中充滿了細菌或吞噬細胞的混懸液，瓶口用橡膠密封，並保存在 37°C（這是“被污染病人模型”）。一袋正常的生理鹽水連接著一條靜脈通路，從中刺入被橡膠密封的“病人模型”。另外有兩條側流分別與兩個標準的注射泵連接。一個注射器裝有丙泊酚，另外一個裝有標準的生理鹽水以此來代替阿片類藥物。經過 5 個小時的輸注之後，我們在靜脈通路和注射器的各個不同部位採集標本。將標本在血瓊脂平板上面劃片，然後在 37°C 的條件下培育 24 個小時。我們用 6 種不同的病原菌來重複這個實驗。

結果：我們培育了 825 塊平板。雖然在任何一塊平板上都沒有發現有細菌生長，但是與對照組相比，在 5 個小時的實驗中，“被污染病人模型”中的細菌或吞噬細胞的濃度均明顯上升。

結論：從這個實驗的資料可以看出，在靜脈通路中設計多個單向閥能夠避免不斷惡化的交叉感染。但是如果你反覆使用同一支丙泊酚並不能保證避免感染，因爲這也是生產廠家不推薦的。

（翁梅琳譯 薛張綱校）

BACKGROUND: Nonsterile handling of propofol for anesthesia has been linked with severe sepsis and death. Placing a single check valve in the IV tubing does not prevent retrograde ascension of pathogens into propofol-filled syringes, so we designed an IV tubing set with multiple check valves. To estimate the efficacy of this design, we measured the concentration of pathogens detected upstream in the IV tubing in relation to the pathogen concentration in a model of a contaminated patient.

METHODS: A glass container with a rubber sealed port was filled with a suspension of either bacteria or phagocytes and kept at 37°C ("contaminated patient" model). A bag of normal saline was connected to an IV cannula, punctured through the rubber sealed port of the patient model. Two additional sidestream infusion lines were connected to syringes in 2 standard infusion pumps. One of the syringes contained propofol and the other contained normal saline as a substitute for an opioid preparation. After 5 hours of infusion, we obtained samples from different parts of the infusion lines and syringes. The
samples were streaked out on blood agar plates and incubated at 37°C for 24 hours. We repeated this experiment with 6 different pathogens.

**RESULTS:** We incubated 825 agar plates. Whereas the concentration of bacteria and phagocytes in the "patient" had significantly increased during the 5-hour experiments (positive control), no bacterial growth could be detected in any of the incubated plates.

**CONCLUSION:** The data from this experimental setting suggest that the design with multiple check valves in paired configuration prevents retrograde contamination. Of note, this does not permit the reuse of propofol syringes because reusing is against the manufacturer's recommendations.

Adaptive support ventilation with protocolized de-escalation and escalation does not accelerate tracheal extubation of patients after nonfast-track cardiothoracic surgery.

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**背景：**自適應輔助通氣（adaptive support ventilation，ASV）能否加快非快速通道心胸手術患者術後的氣管拔管。降低呼吸機設定的 ASV 分鐘通氣量的百分比可能會使患者更早從控制通氣轉化為輔助通氣，可能加快氣管拔管。我們假定，在接受非快速通道冠脈搭橋術且術後沒有併發症的患者中，與標準 ASV（設置固定的 ASV 分鐘通氣量百分比）相比，可變 ASV（ASV-DE，即通過標準化流程降低或者提高呼吸機設定的 ASV 分鐘通氣量百分比）可以縮短拔管時間。

**方法:**我們進行了隨機對照試驗來比較 ASV-DE 和標準 ASV。在 ASV-DE 組，只要機體體溫 > 35.0°C 且 pH > 7.25，呼吸機設定的 ASV 通氣百分比逐步降低至最低 70%。

**結果:** 63 例患者分入 ASV-DE 組，另外 63 例患者分入標準 ASV 組。兩組的機械通氣時間無統計學差異（ASV-DE 組為 10.8 [6.5-16.1] 小時，標準 ASV 組為 10.7 [6.6-13.9] 小時，P = 0.32）。ASV-DE 組的控制通氣到第一次輔助通氣的時間更短（3.1 [2.0-6.7] vs 3.9 [2.1-7.5] 小時），輔助通氣的次數更多（78 [34-176] vs 57 [32-116]次），但兩者均沒有達到統計學意義。到氣管拔管爲止，兩組的輔助通氣次數有統計學差異（ASV-DE 組為 2.5 [0.9-4.6]小時，而標準 ASV 組為 1.4 [0.3-3.5] 小時，P < 0.05）。

**結論:** 在行非快速通道的冠脈搭橋術的患者中，與標準 ASV 相比，通過標準化流程降低或提高 ASV 的分鐘通氣量百分比（ASV-DE）不能縮短患者的拔管時間。
**BACKGROUND:** It is uncertain whether adaptive support ventilation (ASV) accelerates weaning of nonfast-track cardiothoracic surgery patients. A lower operator set %-minute ventilation with ASV may allow for an earlier definite switch from controlled to assisted ventilation, potentially hastening tracheal extubation. We hypothesized that ASV using protocolized de-escalation and escalation of operator set %-minute ventilation (ASV-DE) reduces time until tracheal extubation compared with ASV using a fixed operator set %-minute ventilation (standard ASV) in uncomplicated patients after nonfast-track coronary artery bypass graft.

**METHODS:** We performed a randomized controlled trial comparing ASV-DE with standard ASV. With ASV-DE, as soon as body temperature was >35.0°C with pH >7.25, operator set %-minute ventilation was decreased stepwise to a minimum of 70%.

**RESULTS:** Sixty-three patients were randomized to ASV-DE, and 63 patients to standard ASV. The duration of mechanical ventilation was not different between groups (10.8 [6.5–16.1] vs 10.7 [6.6–13.9] hours, ASV-DE versus standard ASV; P = 0.32). Time until the first assisted breathing period was shorter (3.1 [2.0–6.7] vs 3.9 [2.1–7.5] hours) and the number of assisted ventilation episodes was higher (78 [34–176] vs 57 [32–116] episodes), but differences did not reach statistical significance. The duration of assisted ventilation episodes that ended with tracheal extubation was different between groups (2.5 [0.9–4.6] vs 1.4 [0.3–3.5] hours, ASV-DE versus standard ASV; P < 0.05).

**CONCLUSION:** Compared with standard ASV, weaning of patients after nonfast-track coronary artery bypass graft using ASV with protocolized de-escalation and escalation does not shorten time to tracheal extubation.

**The Influence of Time of Day of Administration on Duration of Opioid Labor Analgesia**

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**背景:** 分娩鎮痛中注入硬膜外腔或蛛網膜下腔的藥物可能會因為注入的時間而產生不同的效應,而這可能會影響到臨床研究中特殊藥物藥理學的觀察。在這個回顧性研究中,我們對一天內不同時間在蛛網膜下腔注入芬太尼和全身使用氫嗎啡酮後的效應進行評估,資料來源於觀察鎮痛方法對於分娩結局影響的隨機臨床試驗。

**方法:** 六百九十二名臨產婦在分娩早期提出第一次鎮痛需求時隨機進入腰硬聯合分娩鎮痛（蛛網膜下傾 25ug 芬太尼，隨後注入一個利多卡因混合腎上腺素的硬膜外試驗劑量）或者全身性的分娩鎮痛（氫嗎啡酮 1mg 靜脈注射，1mg 肌肉注射）。除非病人再提出鎮痛需求（第二次鎮痛需求），否則不再給予鎮痛藥物。如果初始鎮痛藥物（區域或是全身）是在 7:01 和 23:00 之間注入的，則試者進入日間組，如在 23：01 至 7：00 之間注入則進入夜間組。在每一種鎮痛模式中（區域或是全身）對日間組和夜間組進行比較。主要的結局變數是鎮痛持續時間，定義為首次注入鎮痛藥物至第二次提出鎮痛需求的時間間隔。同時在兩組間比較第一次鎮痛需求
和第二次鎮痛需求時的宮頸擴張程度、第一次鎮痛需求時的疼痛評分、首次注入鎮
痛藥物和第二次鎮痛需求間平均疼痛程度。對鎮痛持續時間、宮頸擴張和疼痛評分
進行節奏分析。

結果: 日間和夜間組中無論是區域性或是全身性鎮痛中位鎮痛時間無顯著性差異。
組間未觀察到鎮痛持續時間的調和差異。節奏分析顯示首次鎮痛需求後 24 小時宮
頸擴張的諧波週期最大值在 17:00 左右，最小值在 05:00 左右，但是差異的幅度
很小。節奏分析中，在區域鎮痛組病人首次注入鎮痛藥物至第二次鎮痛需求間平均
疼痛評分的 24 小時諧波分析顯示最大值在 2:00 左右，最小值在 10:00 左右，但
是差異幅度很小。

結論: 在這些研究條件下，注入藥物的時間似乎不能影響腰硬聯合或全身性分娩鎮
痛的持續時間。

（姚敏敏譯 薛張綱校）

BACKGROUND: Medications administered into the epidural or intrathecal space for
labor analgesia may demonstrate variable effects dependent on time of day, and this may
affect clinical research trials investigating the pharmacology of specific drugs. In this
retrospective study, we evaluated the effect of time of day of administration of intrathecal
fentanyl and systemic hydromorphone labor analgesia from data collected as part of a
randomized clinical trial examining the influence of analgesia method on labor outcome.

METHODS: Six hundred ninety-two healthy parturients were randomized early in labor
to receive combined spinal-epidural (intrathecal fentanyl 25 μg followed by a lidocaine
and epinephrine containing epidural test dose) versus systemic (hydromorphone 1 mg IV
and 1 mg IM) labor analgesia at first analgesia request. No further analgesics were
administered until the patient requested additional analgesia (second analgesia request).
Subjects were assigned to the daytime group (DAY) if initial analgesia (neuraxial or
systemic) was administered between the hours of 07:01 and 23:00 and to the nighttime
group (NIGHT) if it was administered between 23:01 and 07:00. Within each mode of
analgesia study arm (neuraxial or systemic), the DAY and NIGHT groups were compared.
The primary outcome variable was analgesia duration, defined as the time interval from
administration of labor analgesia until the second analgesia request. Cervical dilation at
first and second analgesia requests, pain score at first analgesia request, and average
amount of pain between analgesia administration and second analgesia request were also
compared between DAY and NIGHT groups. Rhythm analyses for duration of analgesia,
cervical dilation, and pain scores were performed.

RESULTS: There was no difference in the median duration of either neuraxial or
systemic analgesia in DAY versus NIGHT subjects, and no harmonic variation was
observed for analgesia duration. Rhythm analysis demonstrated a 24-h harmonic cycle for
cervical dilation at first analgesia request with maximum values occurring near 17:00 and
minimum values near 05:00, but the amplitude of the difference was very small. Rhythm
analysis demonstrated a 24-h harmonic cycle with maximum values occurring near 22:00
and minimum values near 10:00 for the average amount of pain between analgesia
administration and second analgesia request in neuraxial group patients, but amplitude
was small.

CONCLUSIONS: Time of day of administration did not seem to influence combined
spinal-epidural or systemic labor analgesia duration under these study conditions.
Epidemiology of Ambulatory Anesthesia for Children in the United States: 2006 and 1996

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BACKGROUND: There are few data that describe the frequency, anesthetic type, provider, or disposition of children requiring outpatient anesthesia in the United States (US). Since the early 1980s, the frequency of ambulatory surgery has increased dramatically because of advances in medical technology and changes in payment arrangements. Our primary aim in this study was to quantify the number of ambulatory anesthetics for children that occur annually and to study the change in utilization of pediatric anesthetic care over a decade.

METHODS: The US National Center for Health Statistics performed the National Survey of Ambulatory Surgery in 1994 through 1996 and again in 2006. The survey is based on data abstracted from a national sample of ambulatory surgery centers and provides data on visits for surgical and nonsurgical procedures for patients of all ages. We abstracted data for children who had general anesthesia, regional anesthesia, or monitored anesthesia care during the ambulatory visit. We obtained the information from the 2006 and 1996 databases and used population census data to estimate the annual utilization of ambulatory anesthesia per 1000 children in the US.

RESULTS: In 2006, an estimated 2.3 million ambulatory anesthesia episodes of care were provided in the US to children younger than 15 years (38 of 1000 children). This
amount compares with 26 per 1000 children of the same age group in 1996. In most cases, an anesthesiologist was involved in both time periods (74% in 2006 and 85% in 1996). Of the children, 14,200 were admitted to the hospital postoperatively, a rate of 6 per 1000 ambulatory anesthesia episodes.

**CONCLUSION:** The number and rate of ambulatory anesthesia episodes for US children increased dramatically over a decade. This study provides an example of how databases can provide useful information to health care policy makers and educators on the utilization of ambulatory surgical centers by children.

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**The Costs and Benefits of Extending the Role of the Acute Pain Service on Clinical Outcomes After Major Elective Surgery**

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**背景：**急性疼痛服務已被廣泛接受，並得到學院和組織的正式支援，但是關於成本與收益的有效證據極少。儘管在對多數較大手術後給予急性疼痛服務方面已達成一致，但是對其他手術的益處還不清楚。需要資料來證明急性疼痛服務任何擴展的合理性。在這項隨機對照臨床試驗中，我們將急性疼痛服務對臨床預後的成本和效應與傳統的病房內疼痛處理進行比較。試驗中的患者都由他們的麻醉醫生為其決定選擇其中一種適合於手術方式的疼痛處理方法。

**方法：**423名實施較大擇期手術的患者隨機分入由一位麻醉醫生領導的以護士為基礎的患者自控鎮痛急性疼痛服務組,或分入單次肌注或靜注阿片類鎮痛藥的對照組。兩組均用藥物治療阿片類相關副作用，並接受健康專家為病房設計的常規護理。主要的預後測量指標是恢復評分品質、疼痛強度測量、治療有效性的總體測量以及全部的疼痛處理成本。畫出成本-效應可接受曲線來檢測兩組間成本-效應關係連接點的不同。

**結果：**處理組與對照組之間術後一天的恢復評分品質無差別（平均差值，0；95%可信區間，-0.7～0.7;P=0.94），或者恢復評分品質提高率無差別（平均差值，-0.1；95%可信區間，-0.4～0.1;P=0.34)。急性疼痛服務組中獲得一天或數天高效疼痛治療的患者比例較對照組高(86%比 75%;P<0.01)。急性疼痛服務組所耗成本更高（平均差值，46美元；95%可信區間，每位患者 44～48美元;P<0.001）。成本-效應可接受曲線顯示，如果決策者願意為每個患者每天付多於 546 美元來獲得更有效的治療，急性疼痛服務在提供更有效的疼痛治療時較對照具有更高的成效。

**結論：**在對接受較大手術的特殊患者群體延伸急性疼痛服務作用過程中，急性疼痛服務可能是有成效的。

（朱蘭芳譯，薛張綱校）
**BACKGROUND:** Acute pain services have received widespread acceptance and formal support from institutions and organizations, but available evidence on their costs and benefits is scarce. Although there is good agreement on the provision of acute pain services after many major surgical procedures, there are other procedures for which the benefits are unclear. Data are required to justify any expansion of acute pain services. In this randomized, controlled clinical trial we compared the costs and effects of acute pain service care on clinical outcomes with conventional pain management on the ward. Patients included in the trial were considered by their anesthesiologist to have either arm suitable for the procedure.

**METHODS:** Four hundred twenty-three patients undergoing major elective surgery were randomized either to an anesthesiologist-led, nurse-based acute pain service group with patient-controlled analgesia or to a control group with IM or IV boluses of opioid analgesia. Both groups were treated with medications to treat opioid-related adverse effects and received the usual care from health professionals assigned to the ward. The main outcome measures were quality of recovery scores, pain intensity measures, global measure of treatment effectiveness, and overall pain treatment cost. Cost-effectiveness acceptability curves were drawn to detect a difference in the joint cost-effect relationship between groups.

**RESULTS:** There was no difference in quality of recovery score on postoperative day 1 between treatment and control groups (mean difference, 0; 95% confidence interval [CI], −0.7 to 0.7; P = 0.94) or in the rate of improvement in quality of recovery score (mean difference, −0.1; 95% CI, −0.4 to 0.1; P = 0.34). The proportion of patients with 1 or more days of highly effective pain management was higher in the acute pain service group than in the control group (86% vs. 75%; P < 0.01). Costs were higher in the acute pain service group (mean difference, US$46; 95% CI, $44 to $48 per patient; P < 0.001). A cost-effectiveness acceptability curve showed that the acute pain service was more cost effective than was control for providing highly effective pain management if the decision maker was willing to pay more than US$546 per patient per 1 day with highly effective treatment.

**CONCLUSION:** In extending the role of the acute pain service to a specific group of major surgical procedures, the acute pain service was likely to be cost effective.

**通過脈搏氧飽和度測定丙胺卡因區域麻醉導致的高鐵血紅蛋白血症水準**

_Pulse-Oximetric Measurement of Prilocaine-Induced Methemoglobinemia in Regional Anesthesia_

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**背景：**Masimo Radical 7®是一種新的測定高鐵血紅蛋白水準的脈搏 CO 飽和度的儀器。但是這種設備在臨床上還沒有進行評估。
BACKGROUND: The Masimo Radical 7® is a new pulse CO oximeter designed to measure methemoglobin. The device has not been evaluated in a clinical setting.

METHODS: In this prospective observational study we compared the arterial methemoglobin levels and the corresponding pulse CO-oximetric values of the Radical 7® in regional anesthesia with prilocaine.

RESULTS: We analyzed 360 data pairs with methemoglobin values up to 6.6%. The mean bias and limits (±1.96 SD) of the device were 0.27% (±1.33%).

CONCLUSION: We found a high degree of agreement in measurement of methemoglobin between the 2 methods.