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Use of a Disposable Acupressure Device as Part of a Multimodal Antiemetic Strategy for Reducing Postoperative Nausea and Vomiting

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Background: Given the high risk of nausea and vomiting (PONV) in the postoperative period, effective prophylactic strategies are critical to optimize patient outcomes. Although several strategies have been successful in reducing PONV, there remains a need for nonpharmacological interventions that can be used as part of a multimodal antiemetic strategy.

Methods: In a prospective, randomized, double-blind, parallel-group study, patients undergoing major laparoscopic surgery were randomized to either a control group or an acupressure device group. The acupressure device was placed on the bilateral P6 acupressure points. Both groups received propofol, remifentanil, and ondansetron IV for induction of anesthesia. Both groups received a single dose of ondansetron IV 4 mg and dexamethasone IV 4 mg for antiemetic prophylaxis. The incidence of vomiting and the need for rescue antiemetic medications were assessed at specific time intervals postoperatively. Patient-reported outcomes of recovery and satisfaction with PONV management were assessed at 48 and 72 hours.

Results: The two groups were comparable in terms of demographics and risk factors for nausea and vomiting. Patients in the acupressure device group had a significantly lower incidence of vomiting in the first 24 hours (P = 0.04, 10% vs. 26%). All other outcomes were comparable between the two groups.

Conclusion: The use of a disposable acupressure device as part of a multimodal antiemetic strategy for reducing PONV is safe, well tolerated, and effective.
間1%–31%）。穴位按壓組從術後0到72小時，嘔吐的總體發病率也顯著從30%下降至12%的（$P=0.03$, 95%置信區間2%–33%）。此外，穴位按壓設備的輔助使用似乎提高了患者對PONV管理的滿意度和術後48小時的恢復品質。然而，達到出院、恢復正常生理活動及恢復工作的恢復時間在兩組之間無顯著差異。

結論：聯合使用Pressure Right穴位按壓設備和止吐藥物能降低從術後0到72小時的嘔吐發生率，並且改善病人對PONV管理的滿意度。然而，恢復和預後參數無法證實穴位設備的增加有任何改善作用。

（馬皓琳譯李士通校）

BACKGROUND: There is still controversy regarding the optimal strategy for managing postoperative nausea and vomiting (PONV) in high-risk surgical populations. Although acustimulation at the P6 acupoint has been demonstrated to be effective in preventing PONV, the effect of this nonpharmacologic therapy on the patient's recovery with respect to resumption of normal activities of daily living has not been previously assessed when it is used as part of a multimodal antiemetic regimen. Therefore, we designed this randomized, sham-controlled, and double-blind study to assess the efficacy of a disposable acupressure device (Pressure Right®; Pressure Point Inc., Grand Rapids, MI) on the incidence of emetic episodes and quality of recovery when used in combination with ondansetron and dexamethasone for antiemetic prophylaxis.

METHODS: One hundred ASA physical status I and II patients undergoing major laparoscopic procedures were randomly assigned to either a control group ($n=50$) receiving a “sham” acustimulation device or an acupressure group ($n=50$) receiving a disposable Pressure Right device placed bilaterally at the P6 point 30 to 60 minutes before induction of anesthesia. All patients received a standardized general anesthetic. A combination of ondansetron, 4 mg IV, and dexamethasone, 4 mg IV, was administered during surgery for antiemetic prophylaxis in both study groups. The incidence of nausea and vomiting and the need for “rescue” antiemetic therapy were assessed at specific time intervals for up to 72 hours after surgery. The recovery profiles and quality of recovery questionnaires were evaluated at 48 hours and 72 hours after surgery. Patient satisfaction with the management of their PONV was assessed at the end of the 72-hour study period.

RESULTS: The 2 study groups did not differ in their demographic characteristics or risk factors for PONV. The incidence of vomiting at 24 hours was significantly decreased in the acupressure group (10% vs 26%, $P = 0.04$, 95% confidence interval for absolute risk reduction 1%–31%). The overall incidence of vomiting from 0 to 72 hours after surgery was also significantly decreased from 30% to 12% in the acupressure group ($P = 0.03$, 95% confidence interval 2%–33%). Furthermore, adjunctive use of the acupressure device seemed to enhance patient satisfaction with their PONV management and quality of recovery at 48 hours after surgery. However, the recovery times to hospital discharge, resumption of normal physical activities, and return to work did not differ significantly between the 2 study groups.

CONCLUSION: Use of the Pressure Right acupressure device in combination with antiemetic drugs provided a reduction in the incidence of vomiting from 0 to 72 hours after surgery with an associated improvement in patient satisfaction with their PONV management. However, recovery and outcome variables failed to demonstrate any improvement with the addition of the acupressure device.
Biophysical and Pharmacological Properties of Glucagon-Like Peptide-1 in Rats Under Isoflurane Anesthesia

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BACKGROUND: Glucagon-like peptide-1 (GLP-1) increases insulin secretion and has an important role in maintaining glucose homeostasis. In this study, we evaluated the biophysical and pharmacological properties of GLP-1 by performing in vivo and in vitro experiments to determine the applicability of GLP-1 in glycemic control in rats under isoflurane anesthesia.

METHODS: Levels of portal GLP-1, insulin, and glucose and dipeptidyl peptidase-4 activity were measured in the basal fasting state and after gastric glucose load before, during, and after exposure to 30% O₂ in air (control) or 1.4% isoflurane in a mixture of 30% O₂ and air. The direct effects of isoflurane on GLP-1 secretion were assessed in human enteroendocrine NCI-H716 cells. Insulin release from isolated pancreatic islets was measured using a radioimmunoassay.
Single pancreatic β-cell membrane potentials were recorded using whole-cell current-clamp patches perforated by β-escin.

**RESULTS:** In fasting rats, inhalation of isoflurane led to a decrease in the basal levels of GLP-1 but did not affect insulin and glucose levels. Levels of GLP-1, insulin, and glucose increased after gastric administration of glucose in control rats. However, isoflurane attenuated the glucose-induced increase in GLP-1 and insulin levels and increased plasma glucose levels. In contrast, isoflurane did not affect dipeptidyl peptidase-4 activity before or after gastric glucose loading. Isoflurane (0.35 mM) inhibited GLP-1 release in NCI-H716 cells; this finding was similar to that observed in in vivo studies. In perfusion experiments, isoflurane (0.35 mM) inhibited glucose-induced insulin release, whereas exogenous GLP-1 (10 nM) enhanced insulin release. Importantly, combined administration of isoflurane and GLP-1 enhanced both phases of glucose-induced insulin release to an extent similar to that achieved with GLP-1 alone. Whole-cell patches showed that exposure to GLP-1 (10 nM) led to nearly complete restoration of glucose-stimulated depolarization that had been suppressed by isoflurane (0.35 mM).

**CONCLUSIONS:** GLP-1 secretion is impaired during isoflurane anesthesia. However, our study showed that the insulinotropic action of GLP-1 was not affected by isoflurane. Furthermore, exposure to GLP-1 increased the membrane activity of pancreatic β-cells, preventing isoflurane-induced impairment of glucose-induced insulin secretion. These results support the hypothesis that GLP-1-based therapy may be a useful approach for achieving intraoperative glycemic control.
TDCO的相關性分析和Bland-Altman分析，同時也評估了偏差隨時間的變化。此外，我們觀察了全身血管阻力（SVR）改變對偏差變化的影響，因爲異常的SVR被假定為促使這種偏差變化的因素。

結果：在588個esCCO和TDCO資料集中（除了標定點），分析了213名病人的587個資料集。分析結果顯示相関係數值為0.79（P<0.0001，95%可信區間為0.756–0.819），偏差（指esCCO和TDCO之間的平均差）為0.13 L/min（偏差的95%可信區間為0.04–0.22 L/min），以及精度（1個標準差）為1.15 L/min（95%可信區間為−2.13至2.39 L/min）。在ICU，定標後超過48小時的三個確定的時間區間之間沒有顯著的差異（重複測量方差分析P=0.781）。

SVR對esCCO分析的影響顯示SVR和誤差之間的相關係數為0.37（P<0.0001，95%置信區間0.298–0.438）。

結論：在213例病例中比較了無創esCCO技術和TDCO的功效。587個資料集顯示esCCO和TDCO之間相關密切、偏差較小且精確，可與當前的動脈波形分析技術相媲美。

（唐瑩譯 馬皓琳 李士通校）

BACKGROUND: Many technologies have been developed for minimally invasive monitoring of cardiac output. Estimated continuous cardiac output (esCCO) measurement using pulse wave transit time is one noninvasive method. Because it does not require any additional sensors other than those for conducting 3 basic forms of monitoring (electrocardiogram, pulse oximeter wave, and noninvasive (or invasive) arterial blood pressure measurement), esCCO measurement is potentially useful in routine clinical circulatory monitoring for any patient including low-risk patients. We evaluated the efficacy of noninvasive esCCO using pulse wave transit time in this multicenter study.

METHODS: We compared esCCO and intermittent bolus thermodilution cardiac output (TDCO) in 213 patients, 139 intensive care units (ICUs), and 74 operating rooms (ORs), at 7 participating institutions. We performed electrocardiogram, pulse oximetry, TDCO, and arterial blood pressure measurements in patients in ICUs and ORs; a single calibration was performed to measure esCCO continuously. TDCO measurement was performed once daily for ICU patients and every hour for OR patients, and just before the removal of the pulmonary arterial catheter from patients in both the ICU and OR. We evaluated esCCO against TDCO with correlation analysis and Bland and Altman analysis and also assessed the change of bias over time. Furthermore, we inspected the impact of change in systemic vascular resistance (SVR) on change in bias because abnormal SVR was assumed to be a factor contributing to the change of the bias.

RESULTS: From among 588 esCCO and TDCO datasets (excluding calibration points), 587 datasets were analyzed for 213 patients. The analysis results show a correlation coefficient of 0.79 (P < 0.0001, 95% confidence limits of 0.756–0.819), a bias (mean difference between esCCO and TDCO) of 0.13 L/min (95% confidence interval of bias 0.04–0.22 L/min), and a precision (1 SD) of 1.15 L/min (95% prediction interval was −2.13 to 2.39 L/min). There were no significant differences among 3 defined time intervals over 48 hours after calibration (repeated-measures analysis of variance P = 0.781) in the ICU. The influence of SVR on esCCO analysis showed a correlation coefficient between SVR and an error of 0.37 (P < 0.0001, 95% confidence interval 0.298–0.438).

CONCLUSION: The efficacy of noninvasive esCCO technology was compared with TDCO in 213 cases. Five hundred eighty-seven datasets comparing esCCO and TDCO showed close
correlation and small bias and precision, which were comparable to current arterial waveform analysis technologies.

Can We Make Postoperative Patient Handovers Safer? A Systematic Review of the Literature

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Postoperative patient handovers are fraught with technical and communication errors and may negatively impact patient safety. We systematically reviewed the literature on handover of care from the operating room to postanesthesia or intensive care units and summarized process and communication recommendations based on these findings. From >500 papers, we identified 31 dealing with postoperative handovers. Twenty-four included recommendations for structuring the handover process or information transfer. Several recommendations were broadly supported, including (1) standardize processes (e.g., through the use of checklists and protocols); (2) complete urgent clinical tasks before the information transfer; (3) allow only patient-specific discussions during verbal handovers; (4) require that all relevant team members be present; and (5) provide training in team skills and communication. Only 4 of the studies developed an intervention and formally assessed its impact on different process measures. All 4 interventions improved metrics of effectiveness, efficiency, and perceived teamwork. Most of the papers were cross-sectional studies that identified barriers to safe, effective postoperative handovers including the incomplete transfer of information and other communication issues, inconsistent or
incomplete teams, absent or inefficient execution of clinical tasks, and poor standardization. An association between poor-quality handovers and adverse events was also demonstrated. More innovative research is needed to define optimal patient handovers and to determine the effect of handover quality on patient outcomes.

產婦硬膜意外穿破後預防性硬膜外血補片用於防止硬膜穿破後頭痛
Prophylactic Epidural Blood Patch After Unintentional Dural Puncture for the Prevention of Postdural Puncture Headache in Parturients
Ashley N. Agerson, MD and Barbara M. Scavone, MD

硬膜意外穿破是產科患者行椎管內麻醉主要發病率的一個原因。本焦點綜述中，我們探討了預防性硬膜外血補片預防硬膜穿破後頭痛，尤其在產科人群。儘管硬膜外血補片一直被認爲是一種有效治療硬膜穿破後頭痛的方法，目前並無充足證據支持其作爲一個預防性操作的應用。
(許辛譯 馬皓琳 李士通 校)
Unintentional dural puncture is a source of significant morbidity in obstetric patients undergoing neuraxial anesthesia. In this focused review, we discuss the use of a prophylactic epidural blood patch to prevent postdural puncture headache, particularly as it relates to the obstetric population. Although epidural blood patch is thought to be an effective treatment for postdural puncture headache, there is insufficient evidence to support its use as a prophylactic procedure.

兒童顱面重建術中低血壓期間沒有心動過速
Absence of Tachycardia During Hypotension in Children Undergoing Craniofacial Reconstruction Surgery
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背景：心動過速是一種壓力感受器介導的對低血壓的反應。麻醉期間兒童在發生低血壓時的心率（HR）表現的特徵不是很明顯。我們進行了這項研究來評估經歷大量失血的麻醉兒童人群中HR與低血壓之間的關係。我們主要的假設是在低血容量引起低血壓時心率會較無低血壓時增快。
方法：我們對於行顱頂重建術的兩歲以內兒童，查詢了預期顱面手術圍術期登記。提取人口統計學和圍術期資料，計算術中失血量。從電腦化的麻醉記錄提取生命體征並分析。低血壓的定義為平均動脈壓小於40mmHg 持續至少三個電腦化麻醉記錄（每 15 秒捕獲一次）。比較術前 HR、整個手術期間的平均 HR、低血壓開始發生時的 HR 及低血壓前後五分鐘的 HR。
BACKGROUND: Tachycardia is a baroreceptor-mediated response to hypotension. Heart rate (HR) behavior in the setting of hypotension in anesthetized children is not well characterized. We conducted this study to assess the relationship between HR and hypotension in a population of anesthetized children experiencing massive blood loss. Our primary hypothesis was that HR would be increased with the onset of hypotension associated with hypovolemia in comparison with time points without hypotension.

METHODS: We performed a query of our prospective craniofacial perioperative registry for children younger than 24 months who underwent cranial vault reconstruction surgery. Demographic and perioperative data were extracted, and the intraoperative blood loss was calculated. Vital signs were extracted from our computerized anesthesia record and analyzed. Hypotension was defined as a mean arterial blood pressure <40 mm Hg for at least 3 computerized anesthesia record entries (captured every 15 seconds). The preoperative HR, the average HR over the entire intraoperative period, the HR at the onset of hypotension, and the HR 5 minutes before and 5 minutes after the hypotensive episode were compared.

RESULTS: The registry query yielded data from 57 procedures. There were 29 episodes of hypotension occurring in 10 subjects. There was no significant difference in HR at the onset of hypotension (when mean arterial blood pressure decreased below 40 mm Hg) in comparison with the preoperative HR, the average intraoperative HR, or in comparison with 5 minutes before and 5 minutes after the episode of hypotension.

CONCLUSIONS: In this study of anesthetized children younger than 24 months undergoing surgery with massive blood loss, hypotension was not associated with an increased HR. HR does not appear to be a useful indicator of hypovolemia in this population.
介紹：麻醉醫師在決定肥胖兒童的麻醉藥適宜用量時，經常面臨兩難的局面。本研究在肥胖與非肥胖患兒中，通過睫毛反射的消失，測定了丙泊酚引起95%患兒意識喪失的劑量（ED₉₅）。

方法：40名肥胖的（體重指數[BMI]＞同齡同性別兒童的第95百分位數）和40名正常體重的（BMI在第25~第84百分位數之間）、ASA 1~2級、年齡3~17歲行外科手術的的健康兒童參與了本項偏倚硬幣設計研究。主要觀察指標是丙泊酚注射後20秒睫毛反射消失。每組第一名患兒接受1.0mg/kg丙泊酚靜脈注射，此後的患兒根據之前一名患兒的睫毛反射效果，接受預設的丙泊酚劑量。如果睫毛反射存在，則下一名患兒的劑量增加0.25mg/kg。如果睫毛反射消失，則下一名患兒隨機接受相同劑量（幾率95%）或劑量減少0.25mg/kg（幾率5%）。ED₉₅和95%可信區間（CI）分別通過保序回歸和引導法計算。

結果：丙泊酚引起睫毛反射消失的ED₉₅在肥胖患兒中（2.0mg/kg，近似95%可信區間1.8~2.2mg/kg）顯著低於非肥胖患兒（3.2mg/kg，近似95%可信區間2.7~3.2mg/kg），P≤0.05。

討論：決定丙泊酚對3~17歲患兒進行麻醉誘導必須用多少劑量的一個簡單方法是為了首先確定該患兒的BMI在性別特異分佈圖的位置。肥胖兒童（BMI>同齡同性別兒童的第95百分位數）進行麻醉誘導所需單位體重丙泊酚的劑量低於非肥胖兒童。

（陳彬彬譯 馬皓琳 李士通校）

INTRODUCTION: Anesthesiologists face a dilemma in determining appropriate dosing of anesthetic drugs in obese children. In this study we determined the dose of propofol that caused loss of consciousness in 95% (ED₉₅) of obese and nonobese children as determined by loss of eye lash reflex.

METHODS: Forty obese (body mass index [BMI] > 95th percentile for age and gender) and 40 normal weight (BMI 25th to 84th percentile) healthy ASA 1 to 2 children ages 3 to 17 years presenting for surgical procedures were studied using a biased coin design. The primary endpoint was loss of lash reflex at 20 seconds after propofol administration. The first patient in each group received 1.0 mg/kg of IV propofol, and subsequent patients received predetermined propofol doses based on the lash reflex response in the previous patient. If the lash reflex was present, the next patient received a dose increment of 0.25 mg/kg. If the lash reflex was absent, the next patient was randomized to receive either the same dose (95% probability) or a dose decrement of 0.25 mg/kg (5% probability). The ED₉₅ and 95% confidence intervals (CI) were calculated using isotonic regression and bootstrapping methods respectively.

RESULTS: The ED₉₅ of propofol for loss of lash reflex was significantly lower in obese pediatric patients (2.0 mg/kg, approximate 95% CI, 1.8 to 2.2 mg/kg) in comparison with nonobese patients (3.2 mg/kg, approximate 95% CI, 2.7 to 3.2 mg/kg), P ≤ 0.05.

DISCUSSION: A simple approach to deciding what dose of propofol should be used for induction of anesthesia in children ages 3 to 17 years is to first establish the child's BMI on readily available gender-specific charts. Obese children (BMI >95th percentile for age and gender) require a lower weight–based dose of propofol for induction of anesthesia, than do normal-weight children.
Effect of Dexmedetomidine on Brain Edema and Neurological Outcomes in Surgical Brain Injury in Rats
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BACKGROUND:
Surgical brain injury (SBI) is damage to functional brain tissue resulting from neurosurgical manipulations such as sharp dissection, electrocautery, retraction, and direct applied pressure. Brain edema is the major contributor to morbidity with inflammation, necrosis, oxidative stress, and apoptosis likely playing smaller roles. Effective therapies for SBI may improve neurological outcomes and postoperative morbidities associated with brain surgery. Previous studies show an adrenergic correlation to blood-brain barrier control. The α-2 receptor agonist dexmedetomidine (DEX) has been shown to improve neurological outcomes in stroke models. We hypothesized that DEX may reduce brain edema and improve neurological outcomes in a rat model of SBI.

METHODS: Male Sprague-Dawley rats (n = 63) weighing 280 to 350 g were randomly assigned to 1 of 4 IP treatment groups: sham IP, vehicle IP, DEX 10 mg/kg, and DEX 30 mg/kg.
Treatments were given 30 min before SBI. These treatment groups were repeated to observe the physiologic impact of DEX on mean arterial blood pressure (MAP), heart rate (HR), and blood glucose on SBI naïve animals. Rats were also assigned to 4 postinjury IV treatment groups: sham IV, vehicle IV, DEX 10/5, and DEX 30/15 (DEX group doses were 10 and 30 mg/kg/hr, with 5 and 15 mg/kg initial loading doses, respectively). Initial loading doses began 20 min after SBI, followed by 2 h of infusion. SBI animals were subjected to neurological testing 24 h after brain injury by a blinded observer, promptly killed, and brain water content measured via the dry/wet weight method.

RESULTS: All treatment groups showed a significant difference in ipsilateral frontal brain water content and neurological scores when compared with sham animals. However, there was no difference between DEX-treated and vehicle animals. Physiologic monitoring showed treatment with low or high doses of DEX significantly decreased MAP and HR, and briefly increased blood glucose compared with naïve or vehicle-treated animals.

CONCLUSIONS: DEX administration did not reduce brain edema or improve neurological function after SBI in this study. The statistical difference in brain water content and neurological scores when comparing sham treatment to vehicle and DEX treatments shows consistent reproduction of this model. Significant changes in MAP, HR, and blood glucose after DEX as compared to vehicle and sham treatments suggest appropriate delivery of drug.

The impact of hematocrit on fibrin clot formation assessed by rotational thromboelastometry.

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The red blood cell count in the novel rat model was reduced to <25%, ≥25% to 30%, ≥30%, and 200 mg/dL of plasma fibrinogen level corresponded to 11 mm/10 mm/8 mm of MCF. The lower the hematocrit, the higher was the correlation between FIBTEM-MCF and plasma fibrinogen. This indicates that FIBTEM is a practical method to determine the need for fibrinogen replacement in bleeding patients who typically develop perioperative anemia.

**BACKGROUND:** Rotational thromboelastometry (ROTEM®)-based FIBTEM is used perioperatively to assess the extent of fibrin polymerization in whole blood. In FIBTEM, cytochalasin D eliminates the contribution of platelets to whole blood clotting, but changing levels in fibrin(ogen) and erythrocytes may differently affect clot formation. Because dynamic changes of hematocrit are not reflected in plasma fibrinogen measurements, we hypothesized that the lack of erythrocytes in isolated plasma measurements would affect the relationship between the Clauss method and whole blood-based FIBTEM during cardiac surgery. Therefore, in the current study we investigated the influence of perioperative hematocrit changes on FIBTEM and fibrinogen measurements.

**METHODS:** Blood samples were collected from 6 consenting healthy volunteers. FIBTEM tests were run before and after serial in vitro dilutions of whole blood with saline or autologous plasma (5:1, 2:1, and 1:1 v/v). We then evaluated the relationship between FIBTEM-maximal clot firmness (MCF) and the Clauss fibrinogen method in relation to hematocrit values before and after cardiac surgery. Pearson correlation coefficients were determined between laboratory test results and ROTEM variables.

**RESULTS:** Upon in vitro hematocrit reduction, FIBTEM-MCF was progressively decreased depending on the extent of saline dilution, but it was increased by 31% after 1:1 volume replacement with autologous plasma (P < 0.05). In samples from cardiac patients (150 measurements in 50 patients), the overall correlation coefficient between FIBTEM-MCF and plasma fibrinogen was 0.80 (P < 0.001). In hemodiluted blood samples (during surgery or at intensive care unit), FIBTEM-MCF 10 mm corresponded to plasma fibrinogen levels of 200 mg/dL. In the subgroup analysis (n = 50 each), according to hematocrit levels (<25%, ≥25% to 30%, ≥30%), plasma fibrinogen levels of 200 mg/dL corresponded to 11 mm, 10 mm, and 8 mm of FIBTEM-MCF, respectively. The correlation between FIBTEM-MCF and plasma fibrinogen was higher at lower hematocrit (<25%) than at higher hematocrit (>30%) (r = 0.88 and 0.67, respectively).

**CONCLUSIONS:** Perioperative changes in hematocrit affect the correlation between plasma fibrinogen levels and FIBTEM-MCF values. The higher correlation between FIBTEM-MCF and plasma fibrinogen with lower hematocrit (<25%) indicates that FIBTEM is a practical method to determine the need for fibrinogen replacement in bleeding patients who typically develop perioperative anemia.

In a novel rat model, dexmedetomidine prevents alterations of intestinal microcirculation that are induced by surgical stress and pain.
背景：麻醉可以在不经意间产生不足或在手术过程中出现误差，手术应激和疼痛刺激没有得到适当的治疗会增加。明显的刺激可以启动交感神经系统，增加血液儿茶酚胺水平，并引起内脏动脉血管收缩。

方法：我们将30只雄性大白鼠分为了以下三组：对照组、手术应激和疼痛组（SSP）及手术应激和疼痛+右美托咪定组（SSP+ Dex）。我们将大鼠沿中线剖腹，取出末端回肠一部分，通过一个全视野镭射灌注成像和侧流暗场视频显微镜对大白鼠的黏膜、肌肉和集合淋巴小结进行微循环检查。SSP组和SSP+Dex组异氟醚吸入浓度从1.2%下降到0.7%。在SSP+Dex组，大鼠接受右美托咪定的初始负荷剂量（0.5μg/kg）和维持输入量（0.5 μg · kg(-1) · h(-1))。

结果：右美托咪啶可以防止手术应激和疼痛相关性心率过速和高血压，并且可以减弱肠黏膜（1100 ± 185 perfusion units [PU] vs 800 ± 105 PU, P = 0.001）和肌肉（993 ± 208 PU vs 713 ± 92 PU, P < 0.001）微循环血流量降低的强度。右美托咪啶修复肠黏膜和肌肉中的小血管灌注。

结论：我们建立了一个有效的大鼠模型，研究在浅麻醉时手术应激和疼痛刺激对肠道微循环的影响。利用此大鼠模型，我们发现，右美托咪定能使全身血流动力学趋于稳定，防止肠道微循环的改变。

（贺贤祥 杨真校）

BACKGROUND: Anesthesia can become inadequate inadvertently or by misjudgment during surgery or emergence, and the surgical stress and pain stimulation will increase without adequate treatment. Overt stimulation may activate the sympathetic nervous system, increase the blood level of catecholamines, and lead to splanchnic arterial vasoconstriction.

METHODS: We divided 30 male Wistar rats into the following 3 groups: control, surgical stress and pain (SSP), and surgical stress and pain + dexmedetomidine (SSP + Dex). The rats received midline laparotomy to exteriorize a segment of terminal ileum for microcirculation examination by a full-field laser perfusion imager and sidestream dark-field video microscope on mucosa, muscle, and Peyer patch. The inspired concentration of isoflurane was decreased from 1.2% to 0.7% in SSP and SSP + Dex groups. In the SSP + Dex group, the rats received an initial loading dose of dexmedetomidine (0.5 μg/kg) and a maintenance infusion (0.5 μg · kg(-1) · h(-1)).

RESULTS: Dexmedetomidine prevented surgical stress and pain-related tachycardia and hypertension, and it attenuated the reduction of the microcirculatory blood flow intensity in intestinal mucosa (1100 ± 185 perfusion units [PU] vs 800 ± 105 PU, P = 0.001) and muscle (993 ± 208 PU vs 713 ± 92 PU, P < 0.001). Dexmedetomidine restored perfused small vessel density in intestinal mucosa and muscle.

CONCLUSIONS: We established a promising rat model to investigate the effect of surgical stress and pain stimulation on the intestinal microcirculation during light anesthesia. Using this rat model, we found that dexmedetomidine can normalize global hemodynamics and prevent the alteration of intestinal microcirculation.
BACKGROUND: Carboetomidate is an etomidate derivative that produces hypnosis without inhibiting adrenal corticosteroid synthesis. Similar to etomidate, carboetomidate modulates γ-aminobutyric acid type A receptors, but its effects on other ion channel targets of general anesthetics are unknown.

METHODS: We compared etomidate and carboetomidate effects on human N-methyl-D-aspartate receptors or neuronal nicotinic acetylcholine receptors (nnAChRs) expressed in Xenopus oocytes, using 2-microelectrode voltage clamp electrophysiology.

RESULTS: Etomidate did not affect either type of receptor at clinically relevant concentrations, whereas carboetomidate concentrations near 50% effective concentration for anesthesia significantly inhibited nnAChRs.

CONCLUSIONS: Compared with etomidate, carboetomidate's higher hydrophobicity is associated with greater inhibition of nnAChRs.
BACKGROUND: Unplanned tracheal intubation after surgery has been associated with high mortality. Few studies have examined the risk factors for this complication.

METHODS: The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) is a multicenter, prospective, outcome-oriented database for patients having undergone major surgical procedures. Using the NSQIP data for the years 2005 to 2007 (n = 231,548) and Cox proportional hazards modeling, we identified risk factors and used them to derive a scoring system to stratify patients’ risk of having an unplanned intubation outcome. NSQIP data for the year 2008 (n = 176,031) were then used to validate the scoring system.

RESULTS: The variables most predictive of unplanned intubation were patient age (0-4 points), ASA physical status (0-7 points), the presence of preoperative sepsis (3 points), and total operative time (0-4 points). The Unplanned Intubation Risk Index based on the adjusted hazard ratios for these variables, ranging from 0 (lowest risk) to 18 (highest risk), had a 79% accuracy in distinguishing patients requiring unplanned intubation from those not requiring it (area under the receiver operating characteristic curve 0.79, 95% confidence interval 0.79-0.80). When the scoring system was applied to the validation cohort data, its discriminative performance remained virtually unchanged (area under the receiver operating characteristic curve 0.79, 95% confidence interval 0.79-0.80).

CONCLUSIONS: A scoring system based on clinical risk factors was able to accurately predict unplanned intubation after surgery. Further investigation is needed to assess the utility of the Unplanned Intubation Risk Index in reducing the incidence of unplanned intubation through improved risk stratification and management in perioperative care.
BACKGROUND: Intrathecal morphine (ITM) provides effective analgesia after posterior spinal fusion (PSF). Although most anesthetic drugs have well-characterized effects on evoked potentials, there is little data on the effects of ITM on transcranial electric motor-evoked potentials (tcMEPs). We performed this study to assess the effects of ITM on tcMEPs in the first 30 minutes after administration. We hypothesized that administration of ITM in doses currently used at our institution would not significantly affect mean tcMEP amplitudes and latencies of an ITM study group relative to control patients who did not receive the drug.

METHODS: tcMEPs were recorded before ITM injection and 5, 10, 20, and 30 minutes after injection in 14 subjects ages 11 through 18 years undergoing PSF. These recordings were compared to an age-matched control group undergoing PSF in which ITM was not injected. The effects of ITM on tcMEP amplitude and latency were compared between the 2 groups.
RESULTS: Fourteen subjects were enrolled in the ITM group and 16 served as controls. There were no significant differences in the baseline mean response amplitudes of the 2 groups for any of the 8 muscles studied. Mean response amplitudes over the 30-minute posttreatment period in the ITM group did not differ significantly from those of the control subjects. Average response amplitudes collapsed across all muscles for each subject were not significantly different during the baseline period (95% CI = -38% to 45%; P = 0.783), nor were they significantly different between the 2 groups during the posttreatment period (95% CI = -30% to 78%; P = 0.640). There also were no significant differences in the mean response latencies of the 2 groups in either the baseline or posttreatment periods. Average response latencies collapsed across all muscles for each subject were 4% larger for the ITM group than for controls during the baseline period (95% CI = -5% to 13%; P = 0.377), and 3% larger for the ITM group than for controls during the posttreatment period (95% CI = -4% to 12%; P = 0.359).

CONCLUSIONS: Administration of ITM in doses currently used at our institution did not cause more than a 70% attenuation of mean tceMEP amplitudes or latency changes of an ITM study group relative to control subjects during the 30-minute period after injection. Further studies are required to determine if there are delayed effects after this initial time period.
and risk factors for chronic headache and chronic back pain in parturients who experienced unintentional dural puncture with a 17-gauge Tuohy needle compared with matched controls.

METHODS: In a case control design, 40 parturients who sustained unintentional dural puncture with a 17-gauge Tuohy needle over an 18-month period and 40 controls matched for age, weight, and time of delivery were recruited by telephone and 2 validated questionnaires were administered assessing headache and back pain symptoms 12 to 24 months after delivery.

RESULTS: The incidence of chronic headaches in the study group (28%) was significantly higher than in the matched controls (5%) (OR = 7, P = 0.0129). Subjects who experienced dural punctures were more likely than controls to report chronic back pain (OR = 4, P = 0.0250), but treatment with an epidural blood patch was not a risk factor for chronic back pain.

CONCLUSIONS: Patients who incur unintentional dural punctures with large-gauge needles are surprisingly likely to continue to suffer chronic headaches. Treatment with an epidural blood patch does not enhance the risk of chronic back pain. The pathophysiology underlying these symptoms and the best treatment for this syndrome are not known.

加巴噴丁對七氟醚麻醉下大鼠的瑞芬太尼急性阿片藥物耐受的影響
The Effects of Gabapentin on Acute Opioid Tolerance to Remifentanil Under Sevoflurane Anesthesia in Rats
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背景：在七氟醚麻醉過程中出現瑞芬太尼耐受可能會降低其減少麻醉藥使用量的能力。加巴噴丁被證實能有效降低術後麻醉藥物使用量，這種作用可能與降低阿片類藥物耐受及痛覺過敏有關。本試驗研究加巴噴丁是否能在七氟醚最低肺泡有效濃度下（MAC）預防由瑞芬太尼引起明顯的急性阿片類藥物耐受（AOT）

方法：用七氟醚麻醉 Wistar 大鼠，給予加巴噴丁 150mg/kg 或 300mg/kg，觀察其對七氟醚 MAC 的單獨效應。第二個實驗：在使用瑞芬太尼前（120μg·kg⁻¹·h⁻¹ 和 240μg·kg⁻¹·h⁻¹）給予加巴噴丁 300mg/kg。在給予加巴噴丁前測定 MAC，並在給予後每 1.5 小時測定 MAC 共 3 次，以評估 AOT。從氣道採樣並使用測流氣體分析儀來測定 MAC；使用鼠尾夾來給予閾上刺激。統計分析採用單因素方差分析。

結果：瑞芬太尼 120μg·kg⁻¹·h⁻¹ 和 240μg·kg⁻¹·h⁻¹ 分別降低七氟醚 MAC（2.5±0.2%）16%±5% 和 36%±6%，在同時應用加巴噴丁（300mg/kg）時七氟醚 MAC 進一步降低分別達 39%±12% 和 62%±14%（與單獨使用瑞芬太尼相比，P < 0.01）。單獨使用加巴噴丁時（150mg/kg 和 300mg/kg）降低七氟醚 MAC 26%（兩組，P < 0.01）。1.5 小時以後，通過觀察 MAC 降低程度的減少來確定發生了瑞芬太尼 AOT。當瑞芬太尼與加巴噴丁同時使用時，未觀察到瑞芬太尼的 AOT (P > 0.05)。
BACKGROUND: Tolerance to remifentanil during sevoflurane anesthesia may blunt the ability of this drug to reduce anesthetic requirements. Gabapentin has been shown to be effective in reducing postoperative narcotic usage, a reduction that may be associated with a reduction in opioid-induced tolerance and hyperalgesia. We sought to determine whether gabapentin might prevent the observed acute opioid tolerance (AOT) produced by remifentanil in sevoflurane minimum alveolar concentration (MAC).

METHODS: Wistar rats were anesthetized with sevoflurane and the effects of gabapentin alone on sevoflurane MAC were determined at doses of 150 and 300 mg · kg⁻¹. In a second experiment, gabapentin 300 mg · kg⁻¹ was administered before remifentanil (120 and 240 μg · kg⁻¹ · h⁻¹). The MAC was determined before gabapentin administration and 3 more times at 1.5-hour intervals after drug administration to assess AOT. MAC was determined from intratracheal gas samples using a sidestream gas analyzer; tail clamping was used as a supramaximal stimulus. Statistical analysis was performed with the 1-way analysis of variance test.

RESULTS: Remifentanil reduced MAC (2.5 ± 0.2%) by 16% ± 5% and 36% ± 6% (120 and 240 μg · kg⁻¹ · h⁻¹, respectively, P < 0.01) with a further reduction produced by coadministration with gabapentin 300 mg · kg⁻¹ to 39% ± 12% and 62% ± 14%, respectively (P < 0.01 versus remifentanil alone). Gabapentin given alone at 150 and 300 mg · kg⁻¹ reduced MAC by 26% (both doses, P < 0.01). AOT was observed with remifentanil and characterized by a lower degree of MAC reduction, approximately 1.5 hours later (P < 0.05). However, when remifentanil was administered with gabapentin, the AOT to remifentanil was not observed (P > 0.05).

CONCLUSIONS: Gabapentin reduced the sevoflurane MAC and enhanced the MAC reduction produced by remifentanil. This enhancement may limit AOT in rats.

異氟醚預處理可維持暴露於高血糖引起的氧化應激狀態下人體動脈的三磷酸腺苷敏感的鉀離子通道的功能

ISOFLURANE PRETREATMENT PRESERVES ADENOSINE TRIPHOSPHATE–SENSITIVE K⁺ CHANNEL FUNCTION IN THE HUMAN ARTERY EXPOSED TO OXIDATIVE STRESS CAUSED BY HIGH GLUCOSE LEVELS

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背景: 在生理和病理情况下, 三磷酸腺苷 (ATP) 敏感的钾通道在器官血流调节机制中发挥着重要的作用。高血糖时通过过氧化物的产生导致动脉内 ATP 敏感型钾通道活性的损伤, 但至今仍缺乏相关研究评价其对人体内这一病理过程的作用。本试验探究挥发性
麻醉藥異氟醚對暴露于高血糖引起的氧化應激狀態下的人體動脈能否維持其三磷酸腺苷敏感型鉀離子通道的功能。

方法：實驗中使用了 D-葡萄糖(5.5 mmol/L)處理的去內皮化人網膜動脈，使用異氟醚(1.15% or 2.3%)及 D-葡萄糖或 L-葡萄糖(20 mmol/L)處理其中一部分動脈共 60min，後僅停用異氟醚，分別用等長張力記錄儀及電生理研究評估動脈段在 ATP 敏感型鈉通道開啟劑——左色滿卡林作用下，其舒張和超極化情況。使用氫化乙啡啶螢光檢測超氧化物，用免疫組化分析濃縮化煙醯胺腺嘌呤二核苷酸磷酸 (NADPH) 氧化酶 p47phox 的亞基。最後對資料進行 Scheffé 檢驗後根據情況選擇重複測量方差分析或多因素方差分析進行資料的分析。

結果：累積量的左克羅卡林(10−8 到 10−5 mol/L)對经 L-葡萄糖 (20 mmol/L)處理動脈的舒張作用可被 ATP 敏感型鈉通道拮抗劑格列本脲(10−6 mol/L)消除。而 D-葡萄糖(20 mmol/L)的培養作用可破壞左克羅卡林引起的血管舒張，使用選擇性 NADPH 氧化酶 NOX2 抑制剂 gp91ds-tat (10−6 mol/L)和異氟醚(1.15% 及 2.3%)預處理可恢復左克羅卡林對 D-葡萄糖(20 mmol/L)處理動脈的舒張反應。在 20 mmol/L 的 D-葡萄糖溶液中，單獨使用異氟醚(2.3%)、 gp91ds-tat (10−6 mol/L)、或兩者合用恢復左克羅卡林(3 × 10−6 mol/L)對經 D-葡萄糖(20 mmol/L)處理動脈的超極化能力相似。與此同時，2.3%的異氟醚可減少經 20 mmol/L D-葡萄糖溶液處理的動脈中過氧化物的產生及減少細胞內胞質 NOX2 亞基 p47phox 向平滑肌細胞膜的移動。

結論：本試驗首次證明使用異氟醚預處理對離體人體動脈的保護作用，異氟醚預處理可保護暴露于高血糖引起的氧化應激中的人網膜動脈 ATP 敏感型鈉通道的活性，而這一作用似乎由 NADPH 氧化酶的抑制所介導。因此，揮發性麻醉藥可能對氧化應激造成的人體內臟動脈功能障礙具有保護作用。

（夏蘇雲譯 陳傑校）

BACKGROUND: Adenosine triphosphate (ATP)-sensitive K+ channels contribute to significant regulatory mechanisms related to organ blood flow in both physiological and pathological conditions. High glucose impairs arterial ATP-sensitive K+ channel activity via superoxide production. However, the effects of anesthetics on this pathological process have not been evaluated in humans. In the present study, we investigated whether pretreatment with the volatile anesthetic isoflurane preserves ATP-sensitive K+ channel activity in the human artery exposed to oxidative stress caused by high glucose.

METHODS: All experiments were performed using human omental arteries without endothelium in the presence of d-glucose (5.5 mmol/L). Some arteries were treated with isoflurane (1.15% or 2.3%) in combination with d- or l-glucose (20 mmol/L) for 60 minutes, and then only isoflurane was discontinued. Relaxation and hyperpolarization of arterial segments in response to an ATP-sensitive K+ channel opener levcromakalim were evaluated using the isometric force recording or electrophysiological study, respectively. Superoxide production was determined by dihydroethidium fluorescence. Immunohistochemical analysis for a subunit of reduced nicotinamide adenine dinucleotide phosphate (NADPH) oxidase p47phox was performed. Data were evaluated using repeated-measures analysis of variance or a factorial analysis of variance as appropriate, followed by Scheffé test.

RESULTS: The ATP-sensitive K+ channel antagonist glibenclamide (10−6 mol/L) abolished relaxation induced by cumulative addition of levcromakalim (10−8 to 10−5 mol/L) in arteries treated with l-glucose (20 mmol/L). Incubation with d-glucose (20 mmol/L) impaired the
vasorelaxation induced by levocromakalim. The selective NADPH oxidase NOX2 inhibitor gp91ds-tat (10⁻⁶ mol/L) and pretreatment with isoflurane (1.15% and 2.3%) restored relaxation in response to levocromakalim in arteries treated with d-glucose (20 mmol/L). Isoflurane (2.3%), gp91ds-tat (10⁻⁶ mol/L), and their combination similarly restored hyperpolarization in response to levocromakalim (3 x 10⁻⁶ mol/L) in arteries treated with d-glucose (20 mmol/L). Along with these results, isoflurane (2.3%) reduced superoxide production and the intracellular mobilization of the cytosolic NOX2 subunit p47phox toward smooth muscle cell membrane in arteries treated with d-glucose (20 mmol/L).

CONCLUSIONS: We have demonstrated for the first time a beneficial effect from the pretreatment with isoflurane on the isolated human artery. Pretreatment with isoflurane preserves ATP-sensitive K⁺ channel activity in the human omental artery exposed to oxidative stress induced by high glucose, whereas the effect seems to be mediated by NADPH oxidase inhibition. Volatile anesthetics may protect human visceral arteries from malfunction caused by oxidative stress.

使用光體積描記術波形的時頻分析探究抽取 900 毫升血液期間變化

Using Time-Frequency Analysis of the Photoplethysmographic Waveform to Detect the Withdrawal of 900 mL of Blood
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背景：此研究目的為確定健康志願者自主呼吸下抽取 900 毫升血液期間在心率或動脈血壓顯著變化前，是否可通過檢查光體積描記圖（PPG）波形的心率頻譜帶和/或呼吸頻譜帶隨時間變化頻譜幅度檢測其變化。本研究還探討耳朵、手指和額頭，哪個是用於早期檢測血容量損失時 PPG 採頭放置的最佳部位。

方法：八位受試者被抽取 900 毫升血液後再回輸。生理監測包括耳朵、手指和額頭部位的 PPG 的波形、標準心電圖、標準血壓袖帶測量。從心率頻段和呼吸頻率段在 PPG 波形隨時間變化的振幅序列中提取高解析度時頻譜。這些振幅用於作爲失血檢測參數。

結果：處理期間受試者心率和血壓沒有顯著變化。使用從耳朵、手指和額頭探測部位收集的 PPG 波形的時頻分析，當抽出 900ml 血液時，發現相對於基線，提取的相對心率的頻率振幅信號顯著下降（P <0.05）；在耳部，僅 300 毫升血液被抽出時相應的信號下降就出現下降。在耳朵、手指和額頭三個部位分別進行監測，損失 900 毫升血液時相對基線的心率分量的振幅分別平均下降 45.2%（38.2%），42.0%（29.2%）和 42.3%（30.5%），括弧中顯示 95%的置信區間。900 毫升血回輸後，顯示心率的振幅信號向基線恢復。基線和 900 毫升的血液抽出後之間心率振幅值有一個明顯的分離。將心率頻率優化分離 2 節心率振幅值（基線和失血）而得到的選定耳 PPG 信號的閾值，其特異性和敏感性都為 87.5%，95%
置信區間是（47.4%，99.7%）。同時，發現相似的呼吸頻率波段的光譜幅度沒有顯著變化。

結論：時頻光譜法可監測自主呼吸下血壓心率顯著變化前的血液丟失。發現自主呼吸患者失血時，心率頻率帶的光譜振幅顯著減少，呼吸頻率帶的無顯著變化。這項技術可作爲手術中和創傷期有價值監測出血的監測方法。

（孫曉瓊 譯 陳傑 校）

BACKGROUND: We designed this study to determine if 900 mL of blood withdrawal during spontaneous breathing in healthy volunteers could be detected by examining the time-varying spectral amplitude of the photoplethysmographic (PPG) waveform in the heart rate frequency band and/or in the breathing rate frequency band before significant changes occurred in heart rate or arterial blood pressure. We also identified the best PPG probe site for early detection of blood volume loss by testing ear, finger, and forehead sites.

METHODS: Eight subjects had 900 mL of blood withdrawn followed by reinfusion of 900 mL of blood. Physiological monitoring included PPG waveforms from ear, finger, and forehead probe sites, standard electrocardiogram, and standard blood pressure cuff measurements. The time-varying amplitude sequences in the heart rate frequency band and breathing rate frequency band present in the PPG waveform were extracted from high-resolution time-frequency spectra. These amplitudes were used as a parameter for blood loss detection.

RESULTS: Heart rate and arterial blood pressure did not significantly change during the protocol. Using time-frequency analysis of the PPG waveform from ear, finger, and forehead probe sites, the amplitude signal extracted at the frequency corresponding to the heart rate significantly decreased when 900 mL of blood was withdrawn, relative to baseline (all P < 0.05); for the ear, the corresponding signal decreased when only 300 mL of blood was withdrawn. The mean percent decrease in the amplitude of the heart rate component at 900 mL blood loss relative to baseline was 45.2% (38.2%), 42.0% (29.2%), and 42.3% (30.5%) for ear, finger, and forehead probe sites, respectively, with the lower 95% confidence limit shown in parentheses. After 900 mL blood reinfusion, the amplitude signal at the heart rate frequency showed a recovery towards baseline. There was a clear separation of amplitude values at the heart rate frequency between baseline and 900 mL blood withdrawal. Specificity and sensitivity were both found to be 87.5% with 95% confidence intervals (47.4%, 99.7%) for ear PPG signals for a chosen threshold value that was optimized to separate the 2 clusters of amplitude values (baseline and blood loss) at the heart rate frequency. Meanwhile, no significant changes in the spectral amplitude in the frequency band corresponding to respiration were found.

CONCLUSION: A time-frequency spectral method detected blood loss in spontaneously breathing subjects before the onset of significant changes in heart rate or blood pressure. Spectral amplitudes at the heart rate frequency band were found to significantly decrease during blood loss in spontaneously breathing subjects, whereas those at the breathing rate frequency band did not significantly change. This technique may serve as a valuable tool in intraoperative and trauma settings to detect and monitor hemorrhage.

改良快速順序誘導和插管：美國最新臨床調查

Modified Rapid Sequence Induction and Intubation: A Survey of United States Current Practice

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BACKGROUND: Rapid sequence induction and intubation (RSII) is a technique commonly used to resist regurgitation of gastric contents and protect the airway. A modification of this technique is implemented in certain clinical circumstances. However, there is currently no standard definition for a modified RSII. Therefore, we surveyed clinicians at academic centers across the United States to establish a working definition of a modified RSII as well as the clinical scenarios in which it is being used.

METHODS: A survey was created that queried the use and definition of modified RSII, and validated with test respondents. We then mailed the survey to all 131 anesthesia residency training programs across the United States. Logistic regression models were created to estimate the percentage of affirmative responses among respondents that performed modified RSII procedures and answered survey items in a consistent manner. Similar quantities were calculated by physician status (resident and attending).

RESULTS: Four hundred ninety surveys were received from 58 institutions (44% institution response rate); 93% of respondents reported using a modified RSII, and of those 85% consistently completed the survey instrument. A majority of respondents (71%, CI: 63%–77%) reported administering oxygen before anesthesia induction, applying cricoid pressure, and attempting to ventilate the lungs via a facemask before securing the airway. Respondents noted that they would use a modified RSII procedure if the patient were either moderately or morbidly obese (each ~59%, 53%–64%), had a history but no current symptoms of gastroesophageal reflux disease (52%, 46%–57%), had a hiatal hernia (42%, 36%–48%) or were a trauma patient who had been NPO for at least 8 h (39%, 33%–45%). Similar RSII results were obtained when repeating the analysis on the subset that did not enforce the consistency requirements.
CONCLUSIONS: Based on our survey we have established three defining features of a modified RSII: (1) oxygen administration before induction; (2) the use of cricoid pressure; and (3) an attempt to ventilate the patient's lungs before securing the airway. Although this definition seems intuitively obvious, no previous work has tested whether it is commonly accepted.

BACKGROUND: Mechanical ventilation (MV) can lead to ventilator-induced lung injury secondary to trauma and associated increases in pulmonary inflammatory cytokines. There is controversy regarding the associated systemic inflammatory response. In this report, we demonstrate the effects of MV on systemic inflammation.

METHODS: This report is part of a previously published study (Hong et al. Anesth Analg 2010;110:1652–60). Female pigs were randomized into 3 groups. Group H-Vt/3 was ventilated with a tidal volume (Vt) of 15 mL/kg predicted body weight (PBW)/positive end-expiratory pressure (PEEP) of 3 cm H2O; group L-Vt/3 with a Vt of 6 mL/kg PBW/PEEP of 3 cm H2O; and group L-Vt/10 with a Vt of 6 mL/kg PBW/PEEP of 10 cm H2O, for 8 hours. Each group had 6 subjects (n = 6). Prelung and postlung sera were analyzed for inflammatory markers. Hemodynamics, airway mechanics, and arterial blood gases were monitored.

RESULTS: There were no significant differences in systemic cytokines among groups. There were similar trends of serum inflammatory markers in all subjects. This is in contrast to findings...
previously published demonstrating increases in inflammatory mediators in bronchoalveolar lavage.

CONCLUSION: Systemic inflammatory markers did not correlate with lung injury associated with MV.

Background: It has been reported that <50% of neuropathic pain patients are satisfactorily treated with drugs. It is possible that this lack of efficacy of drugs on neuropathic pain might be due to the drugs prescribed, regardless of the origin of pain. We compared the efficacy of orally administered morphine, pregabalin, gabapentin, and duloxetine on mechanical allodynia with that on neuroma pain using the tibial neuroma transposition (TNT) model.

Methods: In the TNT model, the tibial nerve is transected, and the tibial nerve stump is transpositioned to the lateral aspect of the hindlimb. After TNT injury, mechanical allodynia and neuroma pain are observed. Morphine, pregabalin, gabapentin, and duloxetine were administered orally and were examined for the antiallodynic and antineuroma pain effects.

Results: Morphine, pregabalin, gabapentin, and duloxetine attenuated the level of mechanical allodynia in a dose-dependent manner. Morphine—but not pregabalin, gabapentin, and duloxetine—attenuated the neuroma pain. Morphine was less potent in neuroma pain than in mechanical allodynia. In the 2-drug-combination studies (morphine + pregabalin, morphine + duloxetine, and pregabalin + duloxetine), all drug combinations produced a synergistic effect on mechanical allodynia, but not on neuroma pain.
CONCLUSIONS: These data indicate that the potency of morphine and the efficacy of pregabalin, gabapentin, and duloxetine on mechanical allodynia are different from those on neuroma pain and that combination therapy is one of different therapeutic choices for the treatment of neuropathic pain.

Gabapentin Augments the Antihyperalgesic Effects of Diclofenac Sodium Through Spinal Action in a Rat Postoperative Pain Model
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BACKGROUND: Gabapentin and nonsteroidal antiinflammatory drugs (NSAIDs) attenuate postoperative pain and neuropathic pain in humans. The combination of gabapentin and NSAIDs is effective for postoperative pain and enhances functional recovery after surgery. Intrathecal administration of gabapentin or NSAIDs inhibits hyperalgesia in a rat postoperative pain model. However, there is no information on the effects of intrathecal administration of a combination of gabapentin and NSAIDs. We therefore investigated the effects of intrathecal administration of gabapentin and NSAIDs in a rat model of postoperative pain.

METHODS: Rats were prepared for intrathecal catheters under halothane anesthesia. Two days after catheterization, gabapentin (4, 40, or 400 μg per 20 μL of saline), diclofenac sodium, a nonselective cyclooxygenase inhibitor (2, 20, or 200 μg per 20 μL of 6% glucose), 20 μL saline, 20 μL 6% glucose, and a combination of gabapentin and diclofenac (40 μg gabapentin + 20 μg diclofenac and 4 μg gabapentin + 2 μg diclofenac per 20 μL 6% glucose) were injected
intrathecally. We performed a hindpaw incision 30 minutes after injection. Each group consisted of 6 rats. The mechanical threshold was measured to evaluate secondary hyperalgesia using von Frey filaments before intrathecal catheterization and at 2 hours, and 1, 3, 5, and 7 days after paw incision.

**RESULTS:** Gabapentin 400 μg attenuated mechanical hyperalgesia for 7 days compared with the control group. Diclofenac 200 μg inhibited hyperalgesia for 5 days compared with the control group. The 40 μg gabapentin + 20 μg diclofenac group had a significantly reduced secondary hyperalgesic response in 2 hours and 1 day compared with 40 μg gabapentin and 20 μg diclofenac, respectively. The 4 μg gabapentin + 2 μg diclofenac group had a significantly reduced secondary hyperalgesic response in 2 hours and 1 day compared with 2 μg diclofenac. The withdrawal threshold on the contralateral paw did not change compared with the preincision threshold.

**CONCLUSION:** Intrathecal administration of gabapentin and diclofenac in combination reduced secondary hyperalgesia at doses having no antihyperalgesic effects when given individually. Our results suggest that gabapentin and diclofenac have an important role in postoperative pain reduction at the spinal level, and that gabapentin augments the antihyperalgesic effects of diclofenac through action in the spinal cord.

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超聲引導下眼部阻滯是否損傷眼睛？家兔模型下使用兩種超聲設備評估眶內熱量和結構變化的比較研究

Are Ultrasound-Guided Ophthalmic Blocks Injurious to the Eye? A Comparative Rabbit Model Study of Two Ultrasound Devices Evaluating Intraorbital Thermal and Structural Changes

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背景：自 1936 年 Atkinson's 描述球後阻滯，以針刺給藥為基礎的麻醉技術已成爲眼科麻醉的主要方法。但是，這項技術有罕見，但嚴重的併發症，如眼球穿孔。超聲技術在外周神經阻滯已廣泛應用，但其在眼部麻醉的應用因顧慮超聲可能對脆弱眼組織產生熱敏或生物力學傷害而受阻。美國食品和藥物管理局（FDA）已制定超聲眼科檢查指南，但大多數麻醉醫師使用的眼部超聲設備沒有通過 FDA 批准，因爲此類設備產生過多能量。國家監管機構指出，只要不超過組織生理溫度水準 1.5°C，即可安全進行超聲檢查。

方法：利用家兔模型，調查長時間使用眼眶超聲及非眼眶超聲對眼部的溫度及機械效應。此雙階段研究旨在檢測是否會導致眼外傷，對 8 只家兔的眼睛進行 2 種設備連續 10 分鐘的超聲檢查：(1) the Sonosite Micromaxx（非特定眼眶型）(2) the Sonomed VuMax（特定眼眶型）。第一階段，通過植入熱電偶，在特定的眼部結構連續監測溫度（N =4）。第二階段，無手術治療情況下進行超聲暴露（n =4）。對所有眼睛行光學顯微鏡檢查，並由眼科病理學家進行不定時組織學評估。
結果：4只家兔的眼睛被檢測到溫度變化。三隻家兔的晶狀體（分別在5.0, 5.5, 及1.5min）及兩隻家兔的角膜（均在1.5min）在非特定眼眶型超聲下，眼部組織溫度超過安全上限（增加>1.5°C）。繼而進行時間溫度分析，發現在3.5min時角膜處，在2.5min時晶狀體處，在4.0min時玻璃體處，特定眼眶型及非特定眼眶型組存在明顯的統計學差異（Bonferroni校正法P<0.05）。兩組光學顯微鏡和組織學檢查均未發現眼外傷。

結論：非特定眼眶型超聲（Sonosite Micromaxx）會增加眼部組織的溫度。需進行更大更多的調查研究來證實其安全性。目前，眼科超聲引導阻滯應僅在特定眼眶型設備下進行。

（陳毓雯譯 陳傑校）

BACKGROUND: Since Atkinson's original description of retrobulbar block in 1936, needle- based anesthetic techniques have become integral to ophthalmic anesthesia. These techniques are unfortunately associated with rare, grave complications such as globe perforation. Ultrasound has gained widespread acceptance for peripheral nerve blockade, but its translation to ocular anesthesia has been hampered because sonic energy, in the guise of thermal or biomechanical insult, is potentially injurious to vulnerable eye tissue. The US Food and Drug Administration (FDA) has defined guidelines for safe use of ultrasound for ophthalmic examination, but most ultrasound devices used by anesthesiologists are not FDA-approved for ocular application because they generate excessive energy. Regulating agencies state that ultrasound examinations can be safely undertaken as long as tissue temperatures do not increase >1.5°C above physiological levels.

METHODS: Using a rabbit model, we investigated the thermal and mechanical ocular effects after prolonged ultrasonic exposure to single orbital- and nonorbital-rated devices. In a dual-phase study, aimed at detecting ocular injury, the eyes of 8 rabbits were exposed to continuous 10-minute ultrasound examinations from 2 devices: (1) the Sonosite Micromaxx (nonorbital rated) and (2) the Sonomed VuMax (orbital rated) machines. In phase I, temperatures were continuously monitored via thermocouples implanted within specific eye structures (n = 4). In phase II the eyes were subjected to ultrasonic exposure without surgical intervention (n = 4). All eyes underwent light microscopy examinations, followed at different intervals by histology evaluations conducted by an ophthalmic pathologist.

RESULTS: Temperature changes were monitored in the eyes of 4 rabbits. The nonorbital-rated transducer produced increases in ocular tissue temperature that surpassed the safe limit (increases >1.5°C) in the lens of 3 rabbits (at 5.0, 5.5, and 1.5 minutes) and cornea of 2 rabbits (both at 1.5 minutes). A secondary analysis of temporal temperature differences between the orbital-rated and nonorbital transducers revealed statistically significant differences (Bonferroni-adjusted P < 0.05) in the cornea at 3.5 minutes, the lens at 2.5 minutes, and the vitreous at 4.0 minutes. Light microscopy and histology failed to elicit ocular injury in either group.

CONCLUSIONS: The nonorbital-rated ultrasound machine (Sonosite Micromaxx) increases the ocular tissue temperature. A larger study is needed to establish safety. Until then, ophthalmic ultrasound-guided blocks should only be performed with ocular-rated devices.

Femoral Nerve Block With Selective Tibial Nerve Block Provides Effective Analgesia Without Foot Drop After Total Knee Arthroplasty: A Prospective, Randomized, Observer-Blinded Study
背景：坐骨神經阻滯聯合股神經阻滯對於全膝關節置換術，可提供優越的鎮痛效果，但會產生足下垂的併發症，這可能掩蓋了手術引起的腓總神經損傷。這項前瞻性、隨機、觀察者盲法的研究目的是評估在膕窩行選擇性脛神經阻滯是否能避免完全的腓運動神經阻滯。

方法：擇期行膝關節置換術的患者80例，隨機接受膕窩處的脛神經阻滯或坐骨神經分叉處阻滯，並聯合股神經阻滯，作為多模式鎮痛的一部分。為了阻滯目標神經需要足夠的局部麻醉劑量，最多20毫升。手術中使用全身麻醉。麻醉蘇醒後，在恢復室需評價腓神經感覺阻滯和運動阻滯是否存在。同時記錄術後24小時疼痛評分和阿片類的用量。

結果：脛神經阻滯和坐骨神經阻滯分別在膕橫紋近端1.7cm處（99%置信區間為1.3～2.1）和9.4cm處（99% CI, 8.3 to 10.5）進行，（均數間差異的99% CI為6.4至9.0，P<0.001）。低劑量的0.5%羅呱卡因用於脛神經阻滯，分別為8.7ml（99% CI, 7.9～9.4）與15.2ml（99% CI, 14.9至15.5），（均數間差異的99% CI為5.6 7.3; P<0.001）。接受脛神經阻滯的病人中無人發生完全性腓運動神經阻滯，而行坐骨神經阻滯的病人中則有82.5%發生這種併發症（P <0.01）。疼痛評分和阿片類藥物用量在兩組之間沒有顯著差異。

結論：對於接受全膝關節置換術的患者聯合股神經阻滯情況下，在膕窩靠近膕橫紋處行脛神經阻滯可以避免完全的腓運動神經阻滯，又能提供與坐骨神經阻滯類似的鎮痛效果。

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BACKGROUND: Sciatic nerve block when combined with femoral nerve block for total knee arthroplasty may provide superior analgesia but can produce footdrop, which may mask surgically induced peroneal nerve injury. In this prospective, randomized, observer-blinded study, we evaluated whether performing a selective tibial nerve block in the popliteal fossa would avoid complete peroneal motor block.

METHODS: Eighty patients scheduled for primary total knee arthroplasty were randomized to receive either a tibial nerve block in the popliteal fossa or a sciatic nerve block proximal to its bifurcation with femoral nerve block as part of a multimodal analgesia regimen. Local anesthetic solution of sufficient volume to encircle the target nerve was administered for the block, up to a maximum of 20 mL. General anesthesia was administered for surgery. After emergence from anesthesia, in the recovery room, the presence or absence of peroneal sensory and motor block was noted. Pain scores and opioid consumption were recorded for 24 hours after surgery.

RESULTS: The tibial nerve block and sciatic nerve block were performed 1.7 cm (99% CI, 1.3 to 2.1) and 9.4 cm (99% CI, 8.3 to 10.5) proximal to the popliteal crease, respectively (99% CI for difference between means: 6.4 to 9.0; P < 0.001). A lower volume of ropivacaine 0.5% was used for the tibial nerve block, 8.7 mL (99% CI, 7.9 to 9.4) versus 15.2 mL (99% CI, 14.9 to 15.5), respectively (99% CI for difference between means, 5.6 to 7.3; P < 0.001). No patient receiving a tibial nerve block developed complete peroneal motor block compared to 82.5% of
patients with sciatic nerve block ($P < 0.001$). There were no significant differences in the pain scores and opioid consumption between the groups.

**CONCLUSIONS:** Tibial nerve block performed in the popliteal fossa in close proximity to the popliteal crease avoided complete peroneal motor block and provided similar postoperative analgesia compared to sciatic nerve block when combined with femoral nerve block for patients undergoing total knee arthroplasty.