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The association of body mass index to postoperative outcomes in elderly vascular surgery patients: a reverse j-curve phenomenon.
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Anesth Analg January 2011 112:23-29

The purpose of this investigation was to determine whether there is a relation between body mass index (BMI) classes and early postoperative outcomes in elderly patients undergoing vascular surgery. We hypothesized that being overweight or obese increases...
the risks of surgery. Data from the American College of Surgeons' National Surgical Quality Improvement Program Participant Use Data File was used to identify the BMI (kg/m²) and 30-day outcomes of 25,337 patients aged ≥65 years undergoing vascular surgery from 2005 to 2007. Patients were stratified into 6 BMI classes: (1) underweight (BMI ≤18.5 kg/m²), (2) normal (BMI = 18.6-24.9 kg/m²), (3) overweight (BMI = 25-29.9 kg/m²), (4) obese class I (BMI = 30-34.9 kg/m²), (5) obese class II (BMI = 35-39.9 kg/m²), and (6) obese class III (BMI ≥40 kg/m²). Morbidity and mortality rates across all BMI classes were subjected to univariate and multiple logistic regression analyses. Mortality rates varied among the BMI classes: 9.4% underweight, 4.0% normal, 3.0% overweight and obese I, 3.3% obese II, and 4.6% obese III (P < 0.001). Major postoperative morbidity paralleled the risk of death. Independent preoperative factors associated with mortality included diabetes mellitus, chronic obstructive pulmonary disease, active congestive heart failure, recent weight loss, disseminated cancer, and an inability to function independently. Each of these factors was statistically more important than the BMI alone in defining an increased risk of surgery. Increased BMI alone was not a major factor predicting perioperative 30-day mortality in this cohort of elderly surgical patients; the effect was a nonlinear one with a reversed J-curve response documenting the poorest outcomes in underweight, normal, and a slight increase in excessively obese patients.

High risk of surgery. Data from the American College of Surgeons' National Surgical Quality Improvement Program Participant Use Data File was used to identify the BMI (kg/m²) and 30-day outcomes of 25,337 patients aged ≥65 years undergoing vascular surgery from 2005 to 2007. Patients were stratified into 6 BMI classes: (1) underweight (BMI ≤18.5 kg/m²), (2) normal (BMI = 18.6-24.9 kg/m²), (3) overweight (BMI = 25-29.9 kg/m²), (4) obese class I (BMI = 30-34.9 kg/m²), (5) obese class II (BMI = 35-39.9 kg/m²), and (6) obese class III (BMI ≥40 kg/m²). Morbidity and mortality rates across all BMI classes were subjected to univariate and multiple logistic regression analyses. Mortality rates varied among the BMI classes: 9.4% underweight, 4.0% normal, 3.0% overweight and obese I, 3.3% obese II, and 4.6% obese III (P < 0.001). Major postoperative morbidity paralleled the risk of death. Independent preoperative factors associated with mortality included diabetes mellitus, chronic obstructive pulmonary disease, active congestive heart failure, recent weight loss, disseminated cancer, and an inability to function independently. Each of these factors was statistically more important than the BMI alone in defining an increased risk of surgery. Increased BMI alone was not a major factor predicting perioperative 30-day mortality in this cohort of elderly surgical patients; the effect was a nonlinear one with a reversed J-curve response documenting the poorest outcomes in underweight, normal, and a slight increase in excessively obese patients.

Review article: etiology and assessment of hypercoagulability with lessons from heparin-induced thrombocytopenia.
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Anesth Analg January 2011 112:46-58

Hypercoagulability, or thrombophilia, is a condition associated with an abnormally increased tendency toward blood clotting. Affected individuals are prone to developing venous or arterial thrombosis and often require thromboprophylaxis. Hypercoagulability can be generally classified as either an inherited or acquired condition. Patients with an...
inherited thrombophilia have genetic variances that alter the quality or quantity of proteins involved with hemostasis. Hypercoagulability may also be acquired and develop as an exaggeration of normal physiologic responses to major tissue injury, or an abnormal response to various prothrombotic clinical factors. Careful assessment for hypercoagulability is important because effective management strategies, often involving anticoagulation, may be available. Heparin-induced thrombocytopenia is an example of an acquired hypercoagulable state that has been well studied and, when recognized, responds to appropriate therapy. In this article, we review the etiology, risks, and assessment of thrombophilia, with emphasis on the clinical lessons learned from heparin-induced thrombocytopenia.

**Respiratory Variation in Pulse Pressure and Plethysmographic Waveforms: Intraoperative Applicability in a North American Academic Center**

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Anesth Analg January 2011 112:94–96

Dynamic variables are the best predictors of fluid responsiveness in patients under general anesthesia and mechanical ventilation; namely, respiratory variations in pulse pressure and in the plethysmographic waveform. However, these variables have potential limitations. Our aim was to evaluate their intraoperative applicability. We extracted clinical data from all anesthesia procedures performed at our institution in 2009 and identified the number of cases that presented predetermined conditions of application. Among the 12,308 procedures, 39% met the criteria for the noninvasive monitoring of variations in the plethysmographic waveform of which 23% had arterial lines and met the criteria for the invasive monitoring of variations in pulse pressure. (Anesth Analg 2011;112:94–96)

**Perioperative pulmonary outcomes in patients with sleep apnea after noncardiac surgery**

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BACKGROUND: Although patients with sleep apnea (SA) are considered to be at increased risk for postoperative complications, evidence supporting increased risk of perioperative pulmonary morbidity is limited. The objective of this study, therefore, was to analyze perioperative demographics and pulmonary outcomes of patients with SA after orthopedic and general surgical procedures using a population-based sample. We hypothesized that SA is an independent risk factor for perioperative pulmonary complications, thus providing a basis for an increase in the utilization of resources, including intensive monitoring and development of strategies to prevent and treat these events.

METHODS: National Inpatient Sample data for each year between 1998 and 2007 were accessed. Orthopedic and general surgical procedures were included and discharged with a diagnosis code for SA were identified. Patients with the diagnosis of SA were matched to those without the disease based on demographic variables using the propensity scoring method. Aspiration pneumonia, adult respiratory distress syndrome (ARDS), pulmonary
embolism (PE), and the need for intubation and mechanical ventilation were the primary outcomes. Odds ratio (OR) and absolute risk reduction along with 95% confidence interval were reported.

RESULTS: We identified 2,610,441 entries for orthopedic and 3,441,262 for general surgical procedures performed between 1998 and 2007. Of those, 2.52% and 1.40%, respectively, carried a diagnosis of SA. Patients with SA developed pulmonary complications more frequently than their matched controls after both orthopedic and general surgical procedures, respectively (i.e., aspiration pneumonia: 1.18% vs 0.84% and 2.79% vs 2.05%; ARDS: 1.06% vs 0.45% and 3.79% vs 2.44%; intubation/mechanical ventilation: 3.99% vs 0.79% and 10.8% vs 5.94%, all P values <0.0001). Comparatively, PE was more frequent in SA patients after orthopedic procedures (0.51% vs 0.42%, P = 0.0038) but not after general surgical procedures (0.45% vs 0.49%, P = 0.22). SA was associated with a significantly higher adjusted OR of developing pulmonary complications after both orthopedic and general surgical procedures, respectively, with the exception of PE (OR for aspiration pneumonia: 1.41 [1.35, 1.47] and 1.37 [1.33, 1.41]; for ARDS: 2.39 [2.28, 2.51] and 1.58 [1.54, 1.62]; for PE: OR 1.22 [1.15, 1.29] and 0.90 [0.84, 0.97]; for intubation/mechanical ventilation: 5.20 [5.05, 5.37] and 1.95 [1.91, 1.98]).

CONCLUSION: SA is an independent risk factor for perioperative pulmonary complications. Our results may be used for hypothesis generation for clinical studies targeted to improve perioperative outcomes in this patient population.
BACKGROUND: Chest radiographs (CXRs) are obtained frequently in the intensive care unit (ICU). Whether these CXRs should be performed routinely or on clinical indication only is often debated. The aim of our study was to investigate the incidence and clinical significance of abnormalities found on routine postoperative CXRs in cardiac surgery patients and whether a restricted use of CXRs would influence the number of significant findings.

METHODS: We prospectively included all consecutive patients who underwent cardiac surgery during a 2-month period. Two or three CXRs were performed in the first 24 hours of ICU stay. After ICU admission and after drain removal, a clinical assessment was performed before a CXR was obtained. All CXR abnormalities were noted and it was also noted whether they led to an intervention. For the admission CXR and the drain removal CXR, a comparison was made between CXRs clinically indicated by the physician and those not clinically indicated.

RESULTS: Two hundred fourteen patients were included. The majority of patients underwent coronary arterial bypass grafting (60%), heart valve surgery (21%), or a combination of these (14%). In total, 534 CXRs were performed (2.5 per patient). Abnormalities were found on 179 CXRs (33.5%) and 13 CXR results led to an intervention (2.4%). The association between clinically indicated CXRs and the presence of CXR abnormalities was poor. For 32 (10%) of the 321 admission and drain removal CXRs, clinical indications were stated by the physician beforehand. If these CXRs would not have been performed routinely, 68 abnormalities would have been missed, of which 5 led to an intervention.

CONCLUSIONS: Partial elimination of routine CXRs in the first 24 hours after cardiac surgery seems possible for the majority of patients, but it is limited by the insensitivity of clinical assessment in predicting clinically important abnormalities detectable by CXRs.

危重患者膠體復蘇的有效性和安全性

The Efficacy and Safety of Colloid Resuscitation in the Critically Ill
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Anesth Analg January 2011 112:156-164

儘管臨床研究和 Meta 分析表明晶體液和膠體液在危重患者的復蘇方面同樣有效，且高品質的臨床研究和 Meta 分析報告經乙基（HES）液潤粉的腎毒性、出血風險和增加危重患者的死亡率趨勢，膠體液仍然被廣泛使用，且 HES 在全球範圍內使用越來越多。
Despite evidence from clinical studies and meta-analyses that resuscitation with colloids or crystalloids is equally effective in critically ill patients, and despite reports from high-quality clinical trials and meta-analyses regarding nephrotoxic effects, increased risk of bleeding, and a trend toward higher mortality in these patients after the use of hydroxyethyl starch (HES) solutions, colloids remain popular and the use of HES solutions is increasing worldwide.

We investigated the major rationales for colloid use, namely that colloids are more effective plasma expanders than crystalloids, that synthetic colloids are as safe as albumin, that HES solutions have the best risk/benefit profile among the synthetic colloids, and that the third-generation HES 130/0.4 has fewer adverse effects than older starches.

Evidence from clinical studies shows that comparable resuscitation is achieved with considerably less crystalloid volumes than frequently suggested, namely, <2-fold the volume of colloids.

Albumin is safe in intensive care unit patients except in patients with closed head injury. All synthetic colloids, namely, dextran, gelatin, and HES have dose-related side effects, which are coagulopathy, renal failure, and tissue storage. In patients with severe sepsis, higher doses of HES may be associated with excess mortality. The assumption that third-generation HES 130/0.4 has fewer adverse effects is yet unproven. Clinical trials on HES 130/0.4 have notable shortcomings. Mostly, they were not performed in intensive care unit or emergency department patients, had short observation periods of 24 to 48 hours, used cumulative doses below 1 daily dose limit (50 mL/kg), and used unsuitable control fluids such as other HES solutions or gelatins.

In conclusion, the preferred use of colloidal solutions for resuscitation of patients with acute hypovolemia is based on rationales that are not supported by clinical evidence.
Synthetic colloids are not superior in critically ill adults and children but must be considered harmful depending on the cumulative dose administered. Safe threshold doses need to be determined in studies in high-risk patients and observation periods of 90 days. Such studies on HES 130/0.4 are still lacking despite its widespread and increasing use. Because there are safer and equally effective alternatives in the form of crystalloids, use of synthetic colloids should be avoided except in the context of clinical studies.

全腫氣體和地球環境

General Anesthetic Gases and the Global Environment

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Anesth Analg January 2011 112:213-217

美國每年約有 5 千萬人接受全身麻醉。麻醉氣體也廣泛用於牙科診所、獸醫門診和實驗室做動物實驗。今年常用的揮發性麻醉藥都是對臭氧層有破壞性的鹵族化合物。這些鹵族麻醉藥可能對全球變暖有潛在的巨大影響。廣泛使用的麻醉氣體一氧化二氮是衆所周知的溫室氣體且是重要的減少臭氧的氣體。這些麻醉氣體不被代謝分解而主要通過呼氣排出人體，而且大部分麻醉機直接將這些氣體當做廢氣以原形排入大氣層。對於麻醉氣體的生態毒理的關注很少。我們依據最近的資料來估算，顯示在美國麻醉用氧化亞氮構成了總排放量的 3.0%。研究提示隨著氯氟碳類的水準的降低鹵代麻醉藥對全球變暖的影響將變得相對重要了。除了麻醉時的這些不可忽略的污染效應，尚無這些氣體在其他公共場所的產生和排放的資料。這篇文章的主要目的是嚴謹地回顧最近的有關全麻藥對全球環境潛在影響的資料，同時描述出可能的選擇和新的可能防止這些氣體排入大氣的技術。

（張玥瑛譯，薛張綱校）

General anesthetics are administered to approximately 50 million patients each year in the United States. Anesthetic vapors and gases are also widely used in dentists' offices, veterinary clinics, and laboratories for animal research. All the volatile anesthetics that are currently used are halogenated compounds destructive to the ozone layer. These halogenated anesthetics could have potential significant impact on global warming. The widely used anesthetic gas nitrous oxide is a known greenhouse gas as well as an important ozone-depleting gas. These anesthetic gases and vapors are primarily eliminated through exhalation without being metabolized in the body, and most anesthesia systems transfer these gases as waste directly and unchanged into the atmosphere. Little consideration has been given to the ecotoxicological properties of gaseous general anesthetics. Our estimation using the most recent consumption data indicates that the anesthetic use of nitrous oxide contributes 3.0% of the total emissions in the United States. Studies suggest that the influence of halogenated anesthetics on global warming will be of increasing relative importance given the decreasing level of chlorofluorocarbons globally. Despite these nonnegligible pollutant effects of the anesthetics, no data on the production or emission of these gases and vapors are publicly available. The primary goal of this article is to critically review the current data on the potential effects of general anesthetics on the global environment and to describe possible
alternatives and new technologies that may prevent these gases from being discharged into the atmosphere.

Simulation techniques are increasingly being used in anesthesia training programs and to a lesser extent in evaluation of residents. We describe 7 years of experience with Objective Structured Clinical Examination–based regional anesthesia assessment in the Israeli National Board Examinations in Anesthesiology. We believe this is the first use of such mock scenarios for the assessment of regional anesthesia for the important purpose of national accreditation. During the study period, 308 candidates were examined in 1 of 8 different blocks. The total pass rate was 83% (257 of 308), ranging from 73% to 91%. The interrater correlation for total, critical, and global scores were 0.84, 0.88, and 0.75, respectively. Technological and cost constraints preclude actual assessment of regional anesthesia. However, testing formats that more closely reflect clinical practice are potentially valuable adjuncts to traditional examinations.
BACKGROUND: Thrombin generation has a key role in the pathophysiology of hemostasis. Research has focused on the intraoperative course of hemostasis, while little is known about postoperative hemostatic activation. Thrombin generation assays quantify the potential for thrombin generation ex vivo and may be useful for determining hypercoagulability. The thrombin dynamics test (TDT) assesses the initial kinetics of thrombin formation. We hypothesized that there would be an increase in thrombin generation as well as thrombin capacity after cardiac surgery.

METHODS: Two hundred twenty patients undergoing primary coronary artery bypass grafting or aortic valve replacement (AVR) surgery were prospectively enrolled. Patients undergoing AVR received warfarin beginning on the second postoperative day. In addition to prothrombin fragment (F\textsubscript{1+2}), TDT, D-dimer, and troponin T were assessed. Blood samples were obtained preoperatively, at the end of the operation, 4 hours postoperatively, and the morning of postoperative days (PODs) 1, 3, and 5. The primary end point was the change of thrombin dynamics on POD 1.

RESULTS: In all patients, F\textsubscript{1+2} peaked at the end of the operation and remained significantly elevated until POD 5. Compared with baseline and after an initial decrease, TDT was found to be significantly elevated on POD 1. After coronary artery bypass graft, TDT remained significantly elevated, whereas in AVR patients with warfarin treatment, TDT was significantly reduced on PODs 3 and 5.

CONCLUSIONS: After cardiac surgery, thrombin generation continues, accompanied by a high thrombin-generating capacity and elevated fibrinogen levels. This constellation suggests a marked procoagulopathic state in the postoperative period with the potential to aggravate the risk of thromboembolic complications. Warfarin treatment after AVR significantly reduced thrombin-generating capacity.
使用體外恒流實驗設備檢測肺動脈熱稀釋導管的精度誤差

Determination of the Precision Error of the Pulmonary Artery Thermodilution Catheter Using an In Vitro Continuous Flow Test Rig

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Anesth Analg 2011;112(1):70-77

背景：使用肺動脈導管檢測心輸出量的熱稀釋法是判斷所有心輸出量測定新方法的參考方法。然而，熱稀釋法缺乏精度，且有±20%的引證精度誤差。目前，並不清楚它的真實精度，這也給驗證心輸出量測定新方法帶來了困難。我們在本研究中的目的是為了解熱稀釋法的當前精度誤差。

方法：安裝試驗台，水以不同的恒定流速迴圈通過此試驗台，並且有孔插入導管到一個流動室。通過外置的超聲流量探測器和量器檢測流速。使用同步填充的量筒校準量器。將“Arrow”和“Edwards”7Fr熱稀釋導管連接到Siemens SC9000心輸出量監測儀，對其進行測試。通過注射5 mL冰水來獲取熱稀釋法的讀數。精度誤差分為隨機和系統誤差，兩者分別測定。通過獲取在不同的流速時的每組十個讀數確定每個導管的讀數間（隨機）變異性。計算每組的變異係數並計算均值。對每套導管繪製校準線，得出導管間的系統（系統）變異性。用斜率評估系統誤差的成分。比較以下三個心輸出量監護儀的性能：Siemens SC9000、Siemens Sirecust 1261和Philips MP50。

結果：使用Siemens SC9000監護儀測試5根Arrow和5根Edwards導管。研究的流速在0.7到7.0 L/min間。Arrow的變異係數（隨機誤差）為5.4%，Edwards為4.8%。隨機精度誤差為±10.0%（95%置信區間）。Arrow和Edwards的變異係數（系統誤差）分別為5.8%和6.0%。系統精度誤差為±11.6%。單次熱稀釋法讀數的總精度誤差為±15.3%，三次熱稀釋法讀數的總精度誤差為±13.0%。使用Sirecust監護儀時，精度誤差增加45%；使用Philips監護儀，精度誤差增加100%。

結論：體外測試肺動脈導管使我們能檢測熱稀釋法測定心輸出量的隨機和系統誤差組分，並且因此能計算精度誤差。使用Siemens監護儀，我們評估單次和三次讀數的精度誤差分別為±15.3%和±13.0%，這與以前的評估（±20%）接近。然而，使用Sirecust和Philips監護儀後，精度誤差明顯增加。臨床醫生應該意識到：心輸出量熱稀釋法的精度誤差依賴於導管和監測模型的選擇。

（王海濤譯，馬皓琳，李士通校）

BACKGROUND: Thermodilution cardiac output using a pulmonary artery catheter is the reference method against which all new methods of cardiac output measurement are judged. However, thermodilution lacks precision and has a quoted precision error of ±20%. There is uncertainty about its true precision and this causes difficulty when validating new cardiac output technology. Our aim in this investigation was to determine the current precision error of thermodilution measurements.

METHODS: A test rig through which water circulated at different constant rates with ports to insert catheters into a flow chamber was assembled. Flow rate was measured by an externally placed transonic flowprobe and meter. The meter was calibrated by timed filling...
of a cylinder. Arrow and Edwards 7Fr thermodilution catheters, connected to a Siemens SC9000 cardiac output monitor, were tested. Thermodilution readings were made by injecting 5 mL of ice-cold water. Precision error was divided into random and systematic components, which were determined separately. Between-readings (random) variability was determined for each catheter by taking sets of 10 readings at different flow rates. Coefficient of variation (CV) was calculated for each set and averaged. Between-catheter systems (systematic) variability was derived by plotting calibration lines for sets of catheters. Slopes were used to estimate the systematic component. Performances of 3 cardiac output monitors were compared: Siemens SC9000, Siemens Sirecust 1261, and Philips MP50.

**RESULTS:** Five Arrow and 5 Edwards catheters were tested using the Siemens SC9000 monitor. Flow rates between 0.7 and 7.0 L/min were studied. The CV (random error) for Arrow was 5.4% and for Edwards was 4.8%. The random precision error was ±10.0% (95% confidence limits). CV (systematic error) was 5.8% and 6.0%, respectively. The systematic precision error was ±11.6%. The total precision error of a single thermodilution reading was ±15.3% and ±13.0% for triplicate readings. Precision error increased by 45% when using the Sirecust monitor and 100% when using the Philips monitor.

**CONCLUSION:** In vitro testing of pulmonary artery catheters enabled us to measure both the random and systematic error components of thermodilution cardiac output measurement, and thus calculate the precision error. Using the Siemens monitor, we established a precision error of ±15.3% for single and ±13.0% for triplicate reading, which was similar to the previous estimate of ±20%. However, this precision error was significantly worsened by using the Sirecust and Philips monitors. Clinicians should recognize that the precision error of thermodilution cardiac output is dependent on the selection of catheter and monitor model.

設計、執行並評估一個用於圍術期與不能熟練掌握本國語言的病人進行交流的電腦系統

**Design, Implementation, and Evaluation of a Computerized System to Communicate with Patients with Limited Native Language Proficiency in the Perioperative Period**

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Anesth Analg 2011;112(1):106-112

**背景:** 在圍術期與不能熟練掌握麻醉實施者本國語言的患者進行有效交流常常具有挑戰性。我們描述了我們如何開發、執行並且評估一個電腦化系統，該系統把與圍術期麻醉監護相關的常用且事先錄音的短語用我們最常遇見的這些患者語種傳達給這些患者。

**方法:** 在麻醉科醫生之間通過一個意見一致的程式選擇短語。這些短語包括常用于吿知病人將要發生的事、我們將要進行的干預以及他們如何配合等日常對話。還鑑定了需要回答‘是’或‘否’的普通問題。我們用瞭解醫學知識並且熟悉病人的文化以提供精確翻譯的講本國語言的人將這些短語錄音。我們開發了一種應用軟體，將短語
BACKGROUND: Effective communication with patients having limited proficiency in the native language of anesthesia care providers during the perioperative period is often challenging. We describe how we developed, implemented, and evaluated a computerized system to convey frequently used prerecorded phrases related to perioperative anesthesia care in the languages we most often encounter in such patients.

METHODS: Phrases were chosen through a consensus process among anesthesia department members. These included routine sayings used to inform patients about what they should anticipate, what interventions we are performing, and how they can participate. Common questions requiring a “yes” or “no” answer were also identified. We recorded these phrases using native speakers who were both knowledgeable medically and familiar with the culture of the patients to provide accurate translations. We developed a software application that categorically grouped the phrases and allowed care providers to select a phrase and play the associated sound file to the patient and deployed the program on our touchscreen-enabled anesthesia information management system workstations. A convenience sample of obstetrical patients speaking a Chinese dialect with whom the language program was used were asked to complete an anonymous questionnaire, translated into Chinese, about their experience. Ninety-five percent lower confidence limits (LCLs) were calculated for response proportions.

RESULTS: We approached 25 parturients with varying levels of English comprehension, and all agreed to use the language program. Each used it throughout her interaction with the anesthesia care providers during labor and delivery, and all patients completed the survey. Acceptance of the process was high, with all patients indicating that they would like to use it again were they to return for another procedure requiring anesthesia. Eighty-eight percent (LCL = 73%) indicated that having instructions in their native language made them feel more relaxed, whereas the experience was neutral in the remainder. Comprehension of the phrases presented was high, with 96% (LCL = 83%) indicating that they understood all instructions. Ninety-six percent (LCL = 83%) of patients indicated that they would be likely to refer friends and family to our institution based on the availability of this device.
CONCLUSIONS: Although patient safety likely could be improved by use of a communication device such as the one we developed, our study was insufficiently powered to be able to measure this potential improvement. The process we describe should be useful wherever anesthesia care providers are not able to communicate in the same language as their patients.

**Dopexamine Has No Additional Benefit in High-Risk Patients Receiving Goal-Directed Fluid Therapy Undergoing Major Abdominal Surgery**

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Anesth Analg 2011;112(1):130-138
μg · kg\(^{-1}\) · min\(^{-1}\)). A reduced oxygen uptake at the anaerobic threshold (AT) has been shown to confer a significant risk of mortality in patients undergoing major abdominal surgery and allows objective identification of a high-risk operative group. In this study, we assessed the effects of low-dose dopexamine on morbidity after major abdominal surgery in patients who were at increased risk by virtue of a reduced AT.

**METHODS:** Patients undergoing elective major colorectal or urological surgery who had an AT of <11 mL · kg\(^{-1}\) · min\(^{-1}\) or an AT of 11 to 14 mL · kg\(^{-1}\) · min\(^{-1}\) with a history of ischemic heart disease were recruited. Before surgery, a radial arterial cannula was placed and attached to an Edwards Lifesciences FloTrac/Vigileo™ system for measuring cardiac output. Patients were given a 250-mL bolus of Voluven® (6% hydroxyethyl starch 130/0.4 in 0.9% sodium chloride) until the stroke volume no longer increased by 10%, then received either dopexamine (0.5 μg · kg\(^{-1}\) · min\(^{-1}\)) or saline 0.9% for 24 hours. During surgery, fluid boluses of Voluven were given if the stroke volume variation was >10%. No crystalloid was given during surgery. A standardized postoperative fluid regime with Hartmann solution was prescribed at 1.5 mL · kg\(^{-1}\) · h\(^{-1}\) for 24 hours. The primary outcome measure was postoperative morbidity measured by the Postoperative Morbidity Survey.

**RESULTS:** One hundred twenty-four patients were recruited over a 23-month period. The incidence of morbidity as measured by the Postoperative Morbidity Survey on day 5 was 55% in the control group versus 47% in the dopexamine group (P = 0.14). There was no significant reduction in morbidity on any measured postoperative day. Complication rates, mortality, and hospital length of stay were similar between the 2 groups; however, administration of dopexamine was associated with earlier return of tolerating an enteral diet.

**CONCLUSION:** With the effective use of goal-directed fluid therapy in elective surgical patients, the routine use of dopexamine does not confer an additional clinical benefit.

危重病人針刺治療可改善胃排空延遲：一項隨機對照試驗
Acupuncture in Critically Ill Patients Improves Delayed Gastric Emptying: A Randomized Controlled Trial

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Anesth Analg 2011;112(1):150-155

背景：營養不良仍是影響危重病人恢復的嚴重問題，並可導致住院期間死亡率和住院天數的增加。即便已有研究表明早期腸內營養可改善重症監護室（ICU）中病人的預後，給予管餌仍會伴隨胃排空延遲及胃食道反流的併發症。針刺治療已經成功用於防治術後噁心嘔吐。在本項研究中，我們在接受腸內營養的危重病人中，對針刺治療與標準促胃動力藥相比是否改善胃排空進行了研究。
BACKGROUND: Malnutrition remains a severe problem in the recovery of critically ill patients and leads to increased in-hospital morbidity and in-hospital stay. Even though early enteral nutrition has been shown to improve overall patient outcomes in the intensive care unit (ICU), tube feeding administration is often complicated by delayed gastric emptying and gastroesophageal reflux. Acupuncture has been successfully used in the treatment and prevention of perioperative nausea and vomiting. In this study we evaluated whether acupuncture can improve gastric emptying in comparison with standard promotility drugs in critically ill patients receiving enteral feeding.

METHODS: Thirty mechanically ventilated neurosurgical ICU patients with delayed gastric emptying, defined as a gastric residual volume (GRV) >500 mL for ≥2 days, were prospectively and randomly assigned to either the acupoint stimulation group (ASG; bilateral transcutaneous electrical acupoint stimulation at Neiguan, PC-6) or the conventional promotility drug treatment group (DTG) over a period of 6 days (metoclopramide, cisapride, erythromycin). Patients in the ASG group did not receive any conventional promotility drugs. Successful treatment (feeding tolerance) was defined as GRV <200 mL per 24 hours.

RESULTS: Demographic and hemodynamic data were similar in both groups. After 5 days of treatment, 80% of patients in the ASG group successfully developed feeding tolerance versus 60% in the DTG group. On treatment day 1, GRV decreased from 970 ± 87 mL to 346 ± 71 mL with acupoint stimulation (P = 0.003), whereas patients in the DTG group showed a significant increase in GRV from 903 ± 60 mL to 1040 ± 211 mL (P = 0.015). In addition, GRV decreased and feeding balance (defined as enteral feeding volume minus GRV) increased in more patients in the ASG group (14 of 15) than in the DTG group (7 of 15; P = 0.014). On treatment day 1, the mean feeding balance was significantly higher in the
ASG group (121 ± 128 mL) than in the DTG group (−727 ± 259 mL) (P = 0.005). Overall, the feeding balance improved significantly on all days of treatment in comparison with the DTG group. Patients in the DTG group did not show an increase in feeding balance until day 6.

CONCLUSIONS: We introduce a new protocol for acupuncture administration in the critical care setting. We demonstrated that this protocol was more effective than standard promotility medication in the treatment of delayed gastric emptying in critically ill patients. Acupoint stimulation at Neiguan (PC-6) may be a convenient and inexpensive option (with few side effects) for the prevention and treatment of malnutrition in critically ill patients.

對插管型喉導氣管作爲兒童氣管導管插管的管道的臨床評價
A Clinical Evaluation of the Intubating Laryngeal Airway as a Conduit for Tracheal Intubation in Children
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Anesth Analg 2011;112(1):176-182

背景：空氣- Q™插管型喉導氣管（ILA）(Cookgas LLC，Mercury Medical，Clearwater, FL)是有小兒型號的聲門上通氣裝置，其設計特點是為了在引導氣管插管時方便帶套囊的氣管導管通過。我們設計了這個ILA的前瞻性觀察研究，以評估其在癱瘓的兒科病人中放置是否更容易，確定其位置並用光學纖維支氣管鏡調整到喉部，評估它作爲用帶套囊氣管導管進行纖維光學插管的管道的有效性，以及在成功氣管插管後，評估移除ILA後不發生氣管導管移位的能力。

方法：100例健康的年齡6個月至8歲，ASA I至II級並需要在氣管內全身麻醉下行擇期手術的兒童入選本前瞻性研究。基於製造商的指導，每個患者根據體重使用1.5號或2.0號的ILA。記錄成功插入的嘗試次數、漏氣壓力、視野的纖維光學分級、氣管插管的嘗試次數和時間、ILA移除的時間以及併發症。

結果：ILA的放置、纖維光學氣管插管和ILA的移除在所有患者中成功完成。儘管有足夠的通氣參數，但是1.5號ILA組較2.0號ILA年齡組有顯著較高的會厭塌陷的發生率（P < 0.001）。當比較纖維光學分級與體重的關係時，發現它們呈中等負相關（r = -0.41, P < 0.001），說明較大的患者可能有更好的纖維光學視野分級。相比2.0號ILA組，1.5號ILA組插管時間顯著較長（P = 0.04）。但是，這種差異可能不會有重大的臨床意義，因為1.5號ILA平均時間（27.0 ± 13.0 秒）和2.0號ILA平均時間（22.7 ± 6.9 秒）的可信區間有一個較大的重疊。當比較體重和氣管插管時間的關係時，發現它們相關性較弱，並不具有統計學意義（r = -0.17, P = 0.09），顯示按體重分級時，儘管體重較小的患者有較高的鏡下分級，但是插管時間沒有明顯差異。

結論：ILA很容易放置，為在氣道正常的兒童用帶套囊的氣管導管進行氣管插管提供了一個有效的通道。此外，插管成功後移除ILA可以快速達到，並無氣管導管移位的患者不發生氣管導管移位的可能。
BACKGROUND: The air-Q™ Intubating Laryngeal Airway (ILA) (Cookgas LLC, Mercury Medical, Clearwater, FL) is a suprglottic airway device available in pediatric sizes, with design features to facilitate passage of cuffed tracheal tubes when used to guide tracheal intubation. We designed this prospective observational study of the ILA to assess the ease of its placement in paralyzed pediatric patients, determine its position and alignment to the larynx using a fiberoptic bronchoscope, gauge its efficacy as a conduit for fiberoptic intubation with cuffed tracheal tubes, and evaluate the ability to remove the ILA without dislodgement of the tracheal tube after successful tracheal intubation.

METHODS: One hundred healthy children, aged 6 months to 8 years, ASA physical status I to II, and scheduled for elective surgery requiring general endotracheal anesthesia were enrolled in this prospective study. Based on the manufacturer's guidelines, each patient received either a size 1.5 or 2.0 ILA according to their weight. The number of attempts for successful insertion, leak pressures, fiberoptic grade of view, number of attempts and time for tracheal intubation, time for ILA removal, and complications were recorded.

RESULTS: ILA placement, fiberoptic tracheal intubation, and ILA removal were successful in all patients. The size 1.5 ILA cohort had significantly higher rates of epiglottic downfolding compared with the size 2.0 ILA cohort (P < 0.001), despite adequate ventilation variables. When comparing fiberoptic grade of view to weight, a moderate negative correlation was found (r = −0.41, P < 0.001), indicating that larger patients tended to have better fiberoptic grades of view. The size 1.5 ILA cohort had a significantly longer time to intubation (P = 0.04) compared with the size 2.0 ILA cohort. However, this difference may not be clinically significant because there was a large overlap of confidence bounds in the average times of the size 1.5 ILA (27.0 ± 13.0 seconds) and size 2.0 ILA cohorts (22.7 ± 6.9 seconds). When comparing weight to time to tracheal intubation, a weak correlation that was not statistically significant was found (r = −0.17, P = 0.09), showing that time to intubation did not differ significantly according to weight, despite higher fiberoptic grades in smaller patients.

CONCLUSIONS: The ILA was easy to place and provided an effective conduit for tracheal intubation with cuffed tracheal tubes in children with normal airways. Additionally, removal of the ILA after successful intubation could be achieved quickly and without dislodgement of the tracheal tube. Because of the higher incidence of epiglottic downfolding in smaller patients, the use of fiberoptic bronchoscopy is recommended to assist with tracheal intubation through this device.
BACKGROUND: Botulinum neurotoxin type A (BoNT/A) has been used as an analgesic for myofascial pain syndromes, migraine, and other types of headaches. Although an antinociceptive effect of central or peripheral administration of BoNT/A is suggested, the effect at the spinal level is still unclear. In this study, we evaluated the antinociceptive effect of intrathecally administered BoNT/A on the ICR mice during the formalin test.

METHODS: BoNT/A (0.01 U/mouse) was injected intrathecally in ICR mice, and we observed formalin-induced inflammatory pain behaviors at days 1, 4, 7, 10, 14, 21, and 28 after the injection. We also examined the level of calcitonin gene-related peptide (CGRP), phosphorylated extracellular signal-regulated kinases (p-ERK), and phosphorylated Ca\(^{2+}\)/calmodulin-dependent protein kinase type 2 (p-CaMK-II) using immunoblot or immunohistochemical analyses before and after BoNT/A intrathecal injection.

RESULTS: Even a single intrathecal injection of BoNT/A significantly decreased the nociceptive responses in the first phase (10 and 14 days later) and in the second phase of the formalin test at 1, 4, 7, 10, and 14 days later (P < 0.05) without any locomotor changes. Interestingly, intrathecal BoNT/A attenuated the expression level of CGRP, p-ERK, and p-CaMK-II in the 4th and 5th lumbar spinal dorsal horn at 10 days after injection in comparison with control.

CONCLUSIONS: We showed that intrathecally administered BoNT/A may have a central analgesic effect on inflammatory pain through the modulation of central sensitization. BoNT/A, with its long-lasting antinociceptive effect, may be a useful analgesic in inflammatory pain.
Current-Distance Relationships for Peripheral Nerve Stimulation Localization
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Anesth Analg 2011;112(1):236-241

BACKGROUND: Successful peripheral nerve blocks require accurate placement of the injection needle tip before local anesthetic application. In this investigation, we experimentally reconstructed polarity-dependent (anode and cathode) stimulation maps using ex vivo and in vivo animal models.

METHODS: A novel ex vivo configuration (muscle–nerve composite) was first used to probe both cathodic and anodic stimulation characteristics. The electrophysiology (compound nerve action potential, CAP) of rat sciatic nerve was recorded at varying stimulation (monopolar electrode) distances and intensities. We repeated this methodology with an open dissection rat model that was more analogous to the clinical setting. Resultant data from the current sweeps were plotted as a 3-dimensional distance–stimulus–CAP map. These plots depict the minimum stimulation currents required for nerve activation and describe the expected electrophysiological outcomes as a function of distance and input stimulus intensity. The stimulation maps provide positional information relevant to clinical procedures such as nerve localization during regional anesthesia.

RESULTS: Cathodic stimulation produced a complex biphasic electrophysiological response. The CAP amplitude (with fixed current) increased as the electrode moved closer...
towards the nerve, but decreased upon close proximity or nerve contact. This phenomenon was dependent upon stimulation intensity and was observed in both ex vivo and in vivo models. Anodic stimulation produced a monotonic relationship, with the CAP increasing with closer electrode-to-nerve distances. Minimum extraneural activation thresholds were found to be 0.34 ± 0.11 mA (mean ± SD) and 0.63 ± 0.12 mA for cathode and anode stimulation, respectively. Intraneural thresholds were substantially lower, 0.12 ± 0.03 mA and 0.32 ± 0.09 mA, for cathode and anode, respectively.

**CONCLUSION:** Cathodic stimulation may produce conduction block at close tip-to-nerve distances. In contrast, anodic stimulation elicited output characteristics that were predictable and more suitable for nerve localization. We believe anodic stimulation is a viable option at near-nerve distances, despite the increased current requirements. This hypothesis is a paradigm shift in stimulation nerve localization, which conventionally has been cathode based. The hypothesis should be clinically validated.

**Intraoperative Thromboelastometry Is Associated with Reduced Transfusion Prevalence in Pediatric Cardiac Surgery**

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Anesth Analg January 2011 112:30-36;

**背景：** 大多数小儿心臓手術患者術中需輸血。作者假設術中常規使用血栓彈力圖指導輸血將減少心臓手術患兒接受輸血的總比例。

**方法：** 本研究包括 100 例心臓手術患兒。其中 50 例前瞻性入選為研究組，另 50 例程式與年齡相匹配的患者作為對照組。研究組在體外迴圈期間應用血栓彈力圖來指導術中輸血。比較兩組的術中和術後所輸的濃縮紅細胞，新鮮冰凍血漿，血小板和纖維蛋白原凝集物，並比較兩組的術後出血量和血紅蛋白水準。

**結果：** 術中或術後接受任何血製品（包括濃縮紅細胞，新鮮冰凍血漿，血小板，纖維蛋白原凝集物）的輸注比例，研究組（32/50, 64%）明顯低於對照組（46/50, 92%），P 值 < 0.001。研究組輸注纖維蛋白原凝集物（58% 比 78%, P = 0.032）以及血小板（14% 比 78%, P < 0.001）的比例也明顯較低。然而，研究組輸注血小板（38% 比 12%, P = 0.002）和纖維蛋白原凝集物（16% 比 2%, P = 0.015）的比例更高。無論研究組還是對照組，術後出血量與血紅蛋白水準沒有明顯差異。

**結論：** 研究結果表明，小兒心臓手術中常規應用血栓彈力圖指導輸血可以減少輸血比例，並改變輸血模式。

(鄒巧群 譯 陳傑 校)
BACKGROUND: The majority of pediatric cardiac surgery patients receive blood transfusions. We hypothesized that the routine use of intraoperative thromboelastometry to guide transfusion decisions would reduce the overall proportion of patients receiving transfusions in pediatric cardiac surgery.

METHODS: One hundred pediatric cardiac surgery patients were included in the study. Fifty patients (study group) were prospectively included and compared with 50 procedure- and age-matched control patients (control group). In the study group, thromboelastometry, performed during cardiopulmonary bypass, guided intraoperative transfusions. Intraoperative and postoperative transfusions of packed red blood cells, fresh frozen plasma, platelets, and fibrinogen concentrates, and postoperative blood loss and hemoglobin levels were compared between the 2 groups.

RESULTS: The proportion of patients receiving any intraoperative or postoperative transfusion of packed red blood cells, fresh frozen plasma, platelets, or fibrinogen concentrates was significantly lower in the study group than in the control group (32 of 50 [64%] vs 46 of 50 [92%], respectively; \( P < 0.001 \)). Significantly fewer patients in the study group received transfusions of packed red blood cells (58% vs 78%, \( P = 0.032 \)) and plasma (14% vs 78%, \( P < 0.001 \)), whereas more patients in the study group received transfusions of platelets (38% vs 12%, \( P = 0.002 \)) and fibrinogen concentrates (16% vs 2%, \( P = 0.015 \)). Neither postoperative blood loss nor postoperative hemoglobin levels differed significantly between the study group and the control group.

CONCLUSIONS: The results suggest that routine use of intraoperative thromboelastometry in pediatric cardiac surgery to guide transfusions is associated with a reduced proportion of patients receiving transfusions and an altered transfusion pattern.

The Duration of Residual Neuromuscular Block After Administration of Neostigmine or Sugammadex at Two Visible Twitches During Train-of-Four Monitoring

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Anesth Analg January 2011 112:63-68;

背景：患者神經肌肉阻滯（NMB）的充分恢復對充分掌控咽部及呼吸肌功能是必要的。TOF比率至少應恢復到0.90，以排除臨床潛在的術後肌松藥殘餘。使用周圍神經刺激儀（PNS）時當TOF比率>0.4無法可靠地檢測出衰減。從使用PNS時觀察到的衰減消失到客觀的TOF比率恢復>0.90的這段間隔被認為是“潛在不安全恢復期”。依此作者假設，使用sugammadex相比於新斯的明這一間隔將大大縮短。

方法：50例患者接受吸入麻醉藥、阿片類藥物及羅庫溴銨誘導。使用TOF-Watch®非預載模式，麻醉醫師僅依靠視覺評價TOF刺激反應。手術結束時，最後一次給予羅庫溴銨後出現TOF中兩個顫搐刺激時，患者隨機接受新斯的明50
μg/kg 或 sugammadex 2 mg/kg。根據 PNS 和臨床資料來決定氣管拔管時間。並對由新斯的明或 sugammadex 抗拮後的潛在不安全期進行了 Mann–Whitney U 檢對總和 Pearson χ^2 檢驗的統計分析。

結果：觀察到衰減消失至 TOF 比 > 0.90 間隔 [平均值±標準差（範圍）] 在新斯的明組和 sugammadex 組分別為 10.3 ± 5.5 (1.3 〜 26.0) min 和 0.3 ± 0.3 (0.0 到 1.0) min(\( P < 0.001 \))。新斯的明或 sugammadex 抗拮 TOF 比率 > 0.90 的時間分別為 13.3 ± 5.7 (3.5 到 28.9) and 1.7 ± 0.7 (0.7 到 3.5) min，(\( P < 0.001 \))。當觀察到衰減消失時，新斯的明組和 sugammadex 組的 TOF 比率分別為 0.34 ± 0.14 (0.00 〜 0.56) 和 0.86 ± 0.11 (0.64 到 1.04) (\( P < 0.001 \))。

結論：用新斯的明拮抗羅庫溴鈉後，主觀視覺評估神經肌肉功能的衰減消失與實際 TOF 比率 > 0.90 之間有明顯差距。僅僅依賴主觀視覺評估 TOF 刺激反應時，運用 Sugammadex 相比於新斯的明更安全。
(陳毓雯 譯 陳傑 校)

BACKGROUND: Adequate recovery from neuromuscular block (NMB) is imperative for the patient to have full control of pharyngeal and respiratory muscles. The train-of-4 (TOF) ratio should return to at least 0.90 to exclude potentially clinically significant postoperative residual block. Fade cannot be detected reliably with a peripheral nerve stimulator (PNS) at a TOF ratio >0.4. The time gap between loss of visual fade by using a PNS until objective TOF ratio has returned to >0.90 can be considered “the potentially unsafe period of recovery.” According to our hypothesis the duration of this period would be significantly shorter with sugammadex than with neostigmine.

METHODS: Fifty patients received volatile anesthetics, opioids, and a rocuronium-induced NMB. TOF-Watch® without a preload was used, but the anesthesiologist relied on visual evaluation of the TOF responses only. At end of operation, patients were randomized to receive either neostigmine 50 μg/kg or sugammadex 2 mg/kg, when 2 twitch responses were detected after the last dose of rocuronium. Timing of tracheal extubation was based on PNS and clinical data. Duration of the potentially unsafe period of recovery after reversal by either neostigmine or sugammadex was analyzed. Mann–Whitney U test and Pearson \( \chi^2 \) test were used for statistical analysis.

RESULTS: The times [mean ± SD (range)] from loss of visual fade to TOF ratio >0.90 were 10.3 ± 5.5 (1.3 to 26.0) minutes and 0.3 ± 0.3 (0.0 to 1.0) minutes in the neostigmine and sugammadex groups, respectively (\( P < 0.001 \)). The times from reversal by neostigmine or sugammadex to TOF ratio >0.90 were 13.3 ± 5.7 (3.5 to 28.9) and 1.7 ± 0.7 (0.7 to 3.5) minutes, respectively (\( P < 0.001 \)). The values of TOF ratios at the time of loss of visual fade were 0.34 ± 0.14 (0.00 to 0.56) in patients given neostigmine and 0.86 ± 0.11 (0.64 to 1.04) in patients given sugammadex (\( P < 0.001 \)).

CONCLUSIONS: There is a significant time gap between visual loss of fade and return of TOF ratio >0.90 after reversal of a rocuronium block by neostigmine. Sugammadex in comparison with neostigmine allows a safer reversal of a moderate NMB when relying on visual evaluation of the TOF response.

麻醉操作人員的手部污染是術中細菌傳播的重要危險因素

Hand Contamination of Anesthesia Providers Is an Important Risk Factor for Intraoperative Bacterial Transmission

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麻省總院麻醉部

Hand Contamination of Anesthesia Providers Is an Important Risk Factor for Intraoperative Bacterial Transmission

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背景：作者近期了解到术中通过静脉活塞装置将细菌传播给患者会增加患者的死亡率。本研究中作者假设麻醉操作人员在接触病人之前的手部细菌污染将成一个直接术中细菌污染的风险因素。

方法：Dartmouth–Hitchcock 是三级综合医疗和一级创伤治疗中心，有 400 个床位和 28 个手术室。随机选取 92 个手术室中的一类和二类手术进行分析。一共挑选了 82 对案例进行分析。有 10 对案例由于标本被破坏或丢失，或者违反草案而剔出研究。根据草案确定术中通过静脉活塞装置发生的细菌传播及通过麻醉环境（可调节压力控制阀和刻度盘）的细菌传播。然后每个案例开始前我们对装置及环境分离的污染微生物和每个麻醉实施者的双手分离出的微生物的生物型进行分析比较。麻醉者来源的微生物传播的定义是：麻醉实施者双手分离出的感染原因体与患者静脉装置或麻醉环境分离出的病原体有相同的生物型。同时通过在方案开始时是否有潜在病原体来评估术中的清潔程度。术中清洁不良的定义为：方案开始时麻醉环境中发现 1 个甚至更多病原体存在，列为二类手术，而一类手术则在方案开始时未发现有病原体存在。将所有案例中符合临床逻辑的案例收集起来分析污染的风险因素。

结果：共研究了 164 例（82 对）病案。11.5%（19/164）患者静脉装置在术中感染细菌，其中 47%（9/19）由麻醉实施者传播。89%（146/164）例术中细菌传播到麻醉外环境中，其中 12%（17/146）是麻醉实施者传播。主治麻醉医生同时管理的房间数、患者年龄和患者从手术室出来至重症监护室都是细菌传播事件独立的预测因素，而麻醉实施者自身并非为直接因素。

结论：在手术室中麻醉实施者双手的细菌污染是患者周圍环境和静脉装置污染的重要原因。其他的手术细菌传播来源，包括术后周围环境的清潔，值得深入研究。
isolated potential pathogens identified at the start of case 2. Poor intraoperative cleaning was defined as 1 or more potential pathogens found in the anesthesia environment at the start of case 2 that were not there at the beginning of case 1. We collected clinical and epidemiological data on all the cases to identify risk factors for contamination.

RESULTS: One hundred sixty-four cases (82 case pairs) were studied. We identified intraoperative bacterial transmission to the IV stopcock set in 11.5% (19/164) of cases, 47% (9/19) of which were of provider origin. We identified intraoperative bacterial transmission to the anesthesia environment in 89% (146/164) of cases, 12% (17/146) of which were of provider origin. The number of rooms that an attending anesthesiologist supervised simultaneously, the age of the patient, and patient discharge from the operating room to an intensive care unit were independent predictors of bacterial transmission events not directly linked to providers.

CONCLUSION: The contaminated hands of anesthesia providers serve as a significant source of patient environmental and stopcock set contamination in the operating room. Additional sources of intraoperative bacterial transmission, including postoperative environmental cleaning practices, should be further studied.

初學者使用 Airtraq 喉鏡和 Macintosh 喉鏡進行氣管插管的學習曲線：一項臨床研究

Learning Curves of the Airtraq and the Macintosh Laryngoscopes for Tracheal Intubation by Novice Laryngoscopists: A Clinical Study

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Anesth Analg January 2011 112:122-125;

BACKGROUND: The curved laryngoscope blade described by Macintosh in 1943 remains the most widely used device to facilitate tracheal intubation. The Airtraq...
laryngoscope is a new, single-use device for tracheal intubation. Several studies compared the use of Airtraq and Macintosh laryngoscopes in simulated intubation scenarios on manikins. We evaluated learning and performance of tracheal intubation by novice laryngoscopists using the Airtraq or Macintosh laryngoscopes in a randomized controlled clinical trial.

METHODS: One hundred eight consecutive patients scheduled for surgical procedures requiring tracheal intubation were enrolled. Patients were randomly allocated to undergo tracheal intubation using a Macintosh (n = 54) or an Airtraq (n = 54) laryngoscope. Tracheal intubation was performed by first-year residents who had no prior experience with the use of either laryngoscope. Primary end points were duration of tracheal intubation and intubation difficulty scale score for both devices.

RESULTS: Eighteen residents participated in the protocol; 9 were allocated to each study group. Each participant performed at least 6 tracheal intubations with the same device. We observed a more rapid skill acquisition with the Airtraq than with the Macintosh laryngoscope, as demonstrated by the shorter duration of intubation with the Airtraq laryngoscope. Data analysis with the Student t test revealed a significant difference between the groups (P < 0.001).

CONCLUSION: The Airtraq laryngoscope facilitates a more rapid learning curve compared with the Macintosh laryngoscope when used in a clinical setting by novice laryngoscopists. The Airtraq laryngoscope was judged easier to use by novice users.

環氧合酶抑制劑在機械通氣肺損傷中的作用
Cyclooxygenase Inhibition in Ventilator-Induced Lung Injury
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Anesth Analg January 2011 112:143-149;

背景：作者在一所大學附屬實驗室進行了一項前瞻性，隨機對照的動物研究來驗證環氧合酶（COX）抑制劑是否可以減少機械通氣肺損傷的發生率。成年雄性大鼠麻醉後行創傷性機械通氣（PEEP=0，吸氣壓峰值 21mmHg），隨機分成兩組：給予非選擇性 COX 抑制剤（布洛芬）組和不予 COX 抑制剤組。

方法：本試驗中收集了實驗組和空白對照組創傷性機械通氣的相關資料（呼吸力學，細胞因數，花生四烯酸類物質），環氧合酶的表達，細胞核因數（NF-κB）的活性等。創傷性機械通氣會導致肺損傷（順應性下降，組織水腫，炎症因數、花生四烯酸和環氧合酶-2 表達增加）。

結果：布洛芬可以有效抑制花生四烯酸的合成和 COX-2 的活性，因而給予布洛芬預處理後能夠提高生存率、減少肺水腫。然而對於機械通氣引起的 NF-xB 和炎症因數（腫瘤壞死因數-α，白介素-1β，白介素-6，生長相關原癌基因/角化細胞化學引誘物）的啟動，布洛芬是無調節作用。在體大鼠研究中發現，機械通氣肺損傷的
BACKGROUND: We tested the hypothesis that inhibition of cyclooxygenase (COX) attenuates in vivo ventilator-induced lung injury (VILI) in a prospective, randomized laboratory investigation in a university-affiliated laboratory. Adult male rats were anesthetized and randomized with or without nonselective COX inhibition (ibuprofen) and were subjected to injurious mechanical ventilation (positive end-expiratory pressure = 0; peak inspiratory pressure = 21 mm Hg).

METHODS: We investigated the profile of VILI (respiratory mechanics, cytokines, eicosanoids), expression of COX enzymes, and activation of nuclear factor (NF)-κB in ibuprofen- versus vehicle-treated animals. Injurious ventilation caused lung injury (i.e., decrement in compliance, tissue edema, and elevated inflammatory cytokines, eicosanoids, and COX-2).

RESULTS: Pretreatment with ibuprofen that effectively inhibited eicosanoid synthesis and COX-2 activity increased survival and attenuated lung edema and decrement in respiratory mechanics. Ibuprofen had no modulatory effect on ventilator-induced activation of NF-κB or inflammatory cytokines (tumor necrosis factor-α, interleukin [IL]-1β, IL-6, GRO/KC [growth-related oncogene/keratinocyte chemoattractant]). COX activity seems important in the pathogenesis of VILI in the in vivo rat. Inhibition of COX provides significant protection (i.e., survival, pulmonary function) in VILI, but without affecting levels of important mediators (tumor necrosis factor-α, IL-1β, IL-6, GRO/KC) or activation of NF-κB.

CONCLUSIONS: These data confirm that nonselective COX inhibition provides partial protection against VILI and that the NF-κB signaling pathway is not exclusively eicosanoid dependent. Studies of COX inhibition in ventilator-associated lung injury might benefit from multimodal targeting that includes a comprehensive focus on inflammatory cytokines and NF-κB.

加巴噴丁改善剖腹產術後疼痛管理：一個隨機，安慰劑對照試驗
Gabapentin Improves Postcesarean Delivery Pain Management: A Randomized, Placebo-Controlled Trial
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背景: 加巴噴丁對預防和治療急性和慢性術後疼痛有效。但尚未用於剖腹產。作者假設術前應用加巴噴丁能減少剖腹產術後的疼痛。

方法: 擇期剖腹產病人隨機分成術前應用加巴噴丁 600mg，或者安慰劑。用 0.75%高比重布比卡因 12mg，芬太尼 10μg，嗎啡 100μg 施行腰麻。術後鎮痛處理包括在手術中即開始應用酮洛酸和對乙醯氨基酚，直到手術後應用雙氯酚酸，對乙醯氨基酚，嗎啡。通過在腰麻後 6, 12, 24, 和 48 小時分別在休息和活動情況下應用視覺類比量表(0 to 100 mm)、滿意度、鴉片類藥消耗量和副作用指標評估病人。同時評估的指標還有新生兒干預，Apgar 評分，臍動脈血氣，母乳餵養難度。在剖腹產術後 3 個月評估慢性疼痛程度。設立亞組監測母體和臍靜脈加巴噴丁血藥濃度。使用複合模型分析比較 24h 時主要預後(視覺類比疼痛評分分數)。

結果: 隨機分配 46 名病人，2 個被排除分析。活動狀態下 24 小時(95% 可信區間 CI)加巴噴丁組平均疼痛評分是 21 mm (CI = 13–28)，而安慰劑組(P = 0.001)是 41 mm (CI = 31–50)。母親的滿意度在加巴噴丁組更高。鴉片類藥的消耗量沒有區別。在加巴噴丁組有更嚴重的母親鎮靜作用 19% vs. 0% (P = 0.04)。新生兒的 Apgar 評分，干預，或者臍動脈的 pH 值沒有區別。平均母體靜脈血和臍靜脈血漿加巴噴丁藥物濃度之比是 0.86 (0.12)。兩組產婦在術後 3 個月的疼痛發生率是相似的。

結論: 和安慰劑比較，包括術前給予加巴噴丁 600mg 的多模式鎮痛可減少剖腹產術後疼痛並增加母親滿意率。

(陳靈科 譯 陳傑 校)

BACKGROUND: Gabapentin is effective for preventing and treating acute and chronic postoperative pain; however, it has not been described for use in cesarean delivery. We hypothesized that preoperative gabapentin would reduce postcesarean delivery pain.

METHODS: Women undergoing scheduled cesarean delivery were randomized to receive preoperative gabapentin 600 mg, or placebo. Spinal anesthesia was achieved with 0.75% hyperbaric bupivacaine 12 mg, fentanyl 10 μg, and morphine 100 μg.

Postoperative analgesia was initiated with intraoperative ketorolac and acetaminophen, and continued with postoperative diclofenac, acetaminophen, and morphine. Patients were assessed at 6, 12, 24, and 48 hours after spinal anesthesia for pain at rest and on movement using a visual analog scale (0 to 100 mm), satisfaction, opioid consumption, and side effects. Neonatal interventions, Apgar scores, umbilical artery blood gases, and breastfeeding difficulties were assessed. Chronic pain was assessed 3 months after delivery. Maternal and umbilical vein gabapentin plasma concentrations were measured in a subgroup of patients. Mixed-model analysis was used to compare the primary outcome of visual analog scale pain scores at 24 hours between groups.

RESULTS: Forty-six patients were randomized, and 2 were excluded from analysis. The mean (95% confidence interval, CI) pain scores on movement at 24 hours were 21 mm (CI = 13–28) in the gabapentin and 41 mm (CI = 31–50) in the placebo group (P = 0.001). Maternal satisfaction was higher in the gabapentin group. There was no difference in opioid consumption. Severe maternal sedation was more common in the gabapentin group (19% vs. 0%, P = 0.04). There was no difference in neonatal Apgar scores, interventions, or umbilical artery pH. The mean (SD) maternal vein:umbilical vein
plasma gabapentin ratio was 0.86 (0.12). The incidence of pain at 3 months was similar in both groups.

**CONCLUSION:** Preoperative gabapentin 600 mg in the setting of multimodal analgesia reduces postcesarean delivery pain and increases maternal satisfaction in comparison with placebo.
BACKGROUND: An inhaled anesthetic concentration required to block autonomic hyperreflexia (AHR) is high enough to cause severe hypotension in patients with high spinal cord injury (SCI). We determined the effects of remifentanil on the sevoflurane requirement to block AHR in SCI.

METHODS: The study involved 96 patients with chronic, complete SCI scheduled to undergo transurethral litholapaxy during general anesthesia. Anesthesia was induced with thiopental, and sevoflurane concentrations in 50% nitrous oxide were adjusted to maintain a bispectral index of 40 to 50. Whether the patient develops an AHR [an increase of systolic blood pressure (SBP) >20 to 40 mm Hg] was first examined by distending the bladder with glycine solution (the first trial). Patients who developed AHR were then allocated to receive no remifentanil infusion (control, n = 31), a target-controlled plasma concentration of 1 ng/mL (n = 25), or 3 ng/mL remifentanil (n = 24). After baseline hemodynamics had recovered, the target sevoflurane and remifentanil concentrations were maintained for at least 20 minutes and the procedure was resumed (the second trial). Each target sevoflurane concentration was determined by the up-and-down method based on changes (15% increase or more) of SBP in response to the bladder distension. SBP, heart rate, and bispectral index were measured before and during the bladder distension during the trials, and plasma concentrations of catecholamines during the first trial.

RESULTS: Eighty-two (85.4%) of 96 patients developed AHR during the first trial, in which 2 were excluded because of hypotension (mean arterial blood pressure <50 mm Hg) developed during target-controlled drug administration. During the second trial, the end-tidal concentrations of sevoflurane to prevent AHR were reduced to 2.6% (95% confidence interval 2.5% to 2.8%, P < 0.01) and 2.2% (2.1% to 2.4%, P < 0.0001) in the groups receiving 1 and 3 ng/mL remifentanil, respectively, in comparison with 3.1% (2.9% to 3.3%) in the control. When considering minimum anesthetic concentration (MAC) values and the contribution of 50% nitrous oxide (0.48 MAC), the combined MAC values, expressed as multiples of MAC, were 2.27, 1.98, and 1.75 in the control, 1 ng/mL remifentanil, and 3 ng/mL remifentanil groups, respectively.

CONCLUSIONS: Target-controlled concentrations of 1 and 3 ng/mL remifentanil would reduce the requirement of sevoflurane combined with 50% nitrous oxide to block AHR by 16% and 29%, respectively, in SCI patients undergoing transurethral litholapaxy.

術中用美沙酮可改善複雜脊椎手術病人的術後鎮痛
Intraoperative Methadone Improves Postoperative Pain Control in Patients Undergoing Complex Spine Surgery
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Anesth Analg January 2011 112:218-223;

背景：進行複雜脊椎手術的病人常會遭受嚴重術後疼痛。對這些病人而言，美沙酮作爲一種阿片受體激動劑與 N-甲基-D-天門冬氨酸受體拮抗劑的結合，是一種較適用的藥物，因爲 N-甲基-D-天門冬氨酸系統參與阿片耐受與痛覺過敏機制。
方法：本前瞻性研究入選29例行器械植入及椎體融合的多節段胸椎手術患者，隨機分組，一組在劃皮前接受0.2 mg/kg的美沙酮，對照組則以0.75 μg/kg舒芬太尼為負荷劑量，並以0.25 μg/kg/h的速度持續輸注。術後均採用靜脈用阿片類藥物進行病人自控鎮痛。同時對患者術後24h，48h，72h的疼痛評分（視覺類比評分從0到10），累積阿片類藥物需求量以及副作用等方面進行評估。

結果：兩組的人口資料，持續時間，手術類型都相似。用美沙酮可以減少術後50%阿片類藥物需求量（資料對應為美沙酮組比舒芬太尼組，各自的中位數[25%/75%區間距]）。術後48h為63 mg (27.3/86.1) 比25 mg (16.5/31.5) 嗎啡等值量, P = 0.023; 術後72h: 34 mg (19.9/91.5) 比15 mg (8.8/27.8) 嗎啡等值量, P = 0.024. 並且，術後48h 美沙酮組術後疼痛評分約低50%（其[均值±SD]，舒芬太尼為4.8 ± 2.4，美沙酮為2.8 ± 2.0, P = 0.026）。不良反應兩組發生率相似。

結論：術中單次注射美沙酮可改善複雜脊椎手術患者的術後疼痛。

(舒慧剛　譯　陳傑　校)

BACKGROUND: Patients undergoing complex spine surgery frequently experience severe pain in the postoperative period. The combined opiate receptor agonist/N-methyl-D-aspartate receptor antagonist methadone may be an optimal drug for these patients given the probable involvement of N-methyl-D-aspartate systems in the mechanism of opioid tolerance and hyperalgesia.

METHODS: Twenty-nine patients undergoing multilevel thoracolumbar spine surgery with instrumentation and fusion were enrolled in this prospective study and randomized to receive either methadone (0.2 mg/kg) before surgical incision or a continuous sufentanil infusion of 0.25 μg/kg/h after a load of 0.75 μg/kg. Postoperative analgesia was provided using IV opioids by patient-controlled analgesia. Patients were assessed with respect to pain scores (visual analog scale from 0 to 10), cumulative opioid requirement, and side effects at 24, 48, and 72 hours after surgery.

RESULTS: Demographic data, duration, and type of surgery were comparable between the groups. Methadone reduced postoperative opioid requirement by approximately 50% at 48 hours (sufentanil versus methadone group, median [25%/75% interquartile range]: 63 mg [27.3/86.1] vs 25 mg [16.5/31.5] morphine equivalents, P = 0.023; and 72 hours: 34 mg [19.9/91.5] vs 15 mg [8.8/27.8] morphine equivalents, P = 0.024) after surgery. In addition, pain scores were lower by approximately 50% in the methadone group at 48 hours after surgery (sufentanil versus methadone group [mean ± SD] 4.8 ± 2.4 vs 2.8 ± 2.0, P = 0.026). The incidence of side effects was comparable in both groups.

CONCLUSION: Perioperative treatment with a single bolus of methadone improves postoperative pain control for patients undergoing complex spine surgery.