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術前動脈脈壓水準與下肢動脈搭橋術後圍術期死亡率無明顯關聯

Preoperative Arterial Pulse Pressure Has No Apparent Association with Perioperative Mortality After Lower Extremity Arterial Bypass

背景：在心臟手術患者中，動脈脈壓性高血壓與圍術期的死亡率相關。但對於其他高手術風險人群，兩者的相關性仍不得而知。本研究旨在驗證術前動脈脈壓的增加與下肢動脈搭橋術後 30 天和 1 年內所有原因引起的死亡率之間關係。

方法：對 6 年內（從 2002 年 1 月至 2008 年 1 月）單中心 556 名腹股溝下動脈搭橋手術患者進行回顧性分析。麻醉給藥前，使用無創示波袖帶測量平均動脈壓、收縮壓及舒張壓，再根據收縮壓減去舒張壓計算得到脈壓。在研究中使用社會保險死亡指數（social security death index, SSDI）確定所有受試者的死亡率，同時還記錄了每位患者者的合併症、術前用藥及麻醉方法。然後使用單變數和多變數的分析方法評估動脈脈壓與主要預後變數及所有病因引起的 30 天和 1 年內死亡率之間的關係。

結果：在 556 例患者中，大部分存在脈壓升高（其中 44.9%脈壓大於 80），30 天的死亡率為 5.1%，1 年內的死亡率為 17.8%。術前脈壓值與 30 天及 1 年內的總死亡率均無明顯相關性（p 分別為 0.35 和 0.14）。30 天死亡率的獨立預測因數為年齡 ≥80 歲 ( p=0.02)，ASA 分級 ≥IV ( p=0.04)，腎酐的基礎水準 >2.0mg/dL (P<0.0001) 及急診
BACKGROUND: Arterial pulse pressure hypertension is associated with perioperative morbidity and mortality in cardiac surgery patients. However, its association with perioperative mortality in other high-risk surgical populations has not been determined. In this study, we tested the hypothesis that increased preoperative arterial pulse pressure is associated with 30-day and 1-year all-cause mortality after lower extremity arterial bypass surgery.

METHODS: A retrospective review of patients who had infrainguinal arterial bypass surgery at a single center over a 6-year period (January 2002 to January 2008) was performed ($n = 556$). Mean, systolic, and diastolic arterial blood pressure were determined from a single noninvasive oscillometric blood pressure cuff reading in the operating room before the administration of anesthetic drugs. Pulse pressure was calculated from this measurement in a retrospective manner by subtracting diastolic pressure from systolic pressure. Mortality for all subjects was determined using the social security death index. Comorbid conditions, preoperative medications, and anesthetic techniques were recorded. Univariate and multivariate analyses were performed to evaluate the association between arterial pulse pressure and the primary outcome variables, and all-cause 30-day and 1-year mortality.

RESULTS: Of the 556 patients, a large percentage had elevated pulse pressure (44.9% had pulse pressure $\geq 80$). Thirty-day mortality was 5.1% and 1-year mortality was 17.8%. There was no apparent association between preoperative pulse pressure and 30-day ($P = 0.35$) or 1-year ($P = 0.14$) all-cause mortality. Independent predictors of 30-day mortality were age $\geq 80$ years ($P = 0.02$), ASA physical status $\geq IV$ ($P = 0.04$), baseline creatinine $>2.0$ mg/dL ($P < 0.0001$), and emergency surgery ($P = 0.009$). The same variables were associated with 1-year mortality, as were the Lee's Revised Cardiac Risk Index score, female gender, and gangrene or ulcer as an indication for surgery.

CONCLUSION: Our results suggest that increased preoperative arterial pulse pressure might not be associated with all-cause mortality after lower extremity arterial bypass surgery.
As the number of ambulatory surgery procedures continues to grow in an aging global society, the implementation of evidence-based perioperative care programs for the elderly will assume increased importance. Given the recent advances in anesthesia, surgery, and monitoring technology, the ambulatory setting offers potential advantages for elderly patients undergoing elective surgery. In this review article we summarize the physiologic and pharmacologic effects of aging and their influence on anesthetic drugs, the important considerations in the preoperative evaluation of elderly outpatients with coexisting diseases, the advantages and disadvantages of different anesthetic techniques on a procedural-specific basis, and offer recommendations regarding the management of common postoperative side effects (including delirium and cognitive dysfunction, fatigue, dizziness, pain, and gastrointestinal dysfunction) after ambulatory surgery. We conclude with a discussion of future challenges related to the growth of ambulatory surgery practice in this segment of our surgical population. When information specifically for the elderly population was not available in the peer-reviewed literature, we drew from relevant information in other ambulatory surgery populations.

Performance Validation of a Modified Magnetic Resonance Imaging–Compatible Temperature Probe in Children

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INTRODUCTION: During magnetic resonance imaging (MRI), children are at risk for body temperature variations. The cold MRI environment that preserves the MRI magnet can cause serious hypothermia. On the other hand, hyperthermia may also develop because of radiofrequency-induced heating of the tissues, particularly in prolonged examinations. Because of a lack of MRI-compatible core temperature probes, temperature assessment is unreliable, and specific absorption rate–related patient heat gain must be calculated to determine the allowable scan duration. We compared an MRI-compatible temperature probe and a modification thereof to a standard esophageal core body temperature probe in children.

METHODS: Children undergoing general anesthesia were recruited, each patient serving as his/her own control. Core body temperature was measured using 3 different devices: (1) a fiberoptic MRI-compatible skin surface temperature probe (MRI-skin) located on the child's skin surface; (2) a fiberoptic MRI-compatible temperature probe modified with a single-use sleeve at the tip (MRI-core), located in the nasopharynx; and (3) a standard temperature monitor (STRD) located in the esophagus or nasopharynx. The Bland–Altman method was used for statistical analysis.

RESULTS: We enrolled 60 children aged 7.8 ± 6 years (mean ± SD) weighing 32.4 (±26.4) kg. The estimated difference between the STRD and MRI-core measurements of core temperature was 0.06°C (confidence interval [CI]: −0.02, 0.15), and between the STRD and the MRI-skin
1.19°C (CI: 0.97, 1.41). According to the Bland–Altman analysis, the 95% limits of agreement ranged from −0.9 to 3.4 and from −1.3 to 1.2 between the STRD and the MRI-skin probe and the MRI-core probe, respectively.

DISCUSSION: Our results show good agreement between standard esophageal measurements of core temperature and core temperature measured using a modified MRI-core probe during general anesthesia in a general surgical pediatric population. The ability to accurately assess core temperature in the MRI suite may safely allow longer scan times and therefore reduce repeat anesthetic exposure, improve patient safety, and enhance the quality of care in children.

簡報：分娩時宮外治療時胎兒臍血的血清芬太尼濃度的量化

Brief Report: Quantification of Serum Fentanyl Concentrations from Umbilical Cord Blood During Ex Utero Intrapartum Therapy

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急性等容血液稀釋可加重小鼠脊髓缺血後的神經損傷

Acute Normovolemic Hemodilution Can Aggravate Neurological Injury After Spinal Cord Ischemia in Rats

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給予胎兒芬太尼肌注經常在宮外分娩期治療時應用（EXIT）。本文對臍靜脈血液中芬太尼濃度進行定量，對來自 13 名胎兒的 13 個樣本進行了分析。中位數和範圍如下：分娩時新生兒體重為 3000 克（2020–3715 克）。芬太尼肌注劑量為 60 微克（45-65 微克）。肌注芬太尼到樣本採集之間的時間為 37 分鐘（5-86 分鐘）。芬太尼在所有的樣本均檢測到，血清濃度中位數為 14.0 納克/毫升（4.3-64.0 納克/毫升）。

（俞劼晶 譯 陳傑 校）

Fetal IM injection of fentanyl is frequently performed during ex utero intrapartum therapy (EXIT procedure). We quantified the concentration of fentanyl in umbilical vein blood. Thirteen samples from 13 subjects were analyzed. Medians and ranges are reported as follows. Weight of the newborn at delivery was 3000 g (2020–3715 g). The dose of fentanyl was 60 μg (45–65 μg). The time between IM administration of fentanyl and collection of the sample was 37 minutes (5–86 minutes). Fentanyl was detected in all of the samples, with a median serum concentration of 14.0 ng/mL (4.3–64.0 ng/mL).
BACKGROUND: Acute normovolemic hemodilution (ANH) is currently performed during thoracoabdominal aortic surgery. However, the effects of ANH on spinal cord ischemic injury are currently unknown. Because hemodilution below a certain level of hematocrit (Hct) aggravates the neurological damage after cerebral ischemia, we hypothesized that ANH may increase neurological damage after spinal cord ischemia. The aim of these experiments was to determine the effects of ANH on spinal cord ischemic injury.

 METHODS: Thirty male Sprague-Dawley rats were randomly assigned to 1 of the following 3 groups: no hemodilution (group C), target Hct level of 30% (group HD30), and target Hct level of 25% (group HD25). ANH was performed upon withdrawal of blood and simultaneous replacement with the same volume with hydroxyethyl starch. Spinal cord ischemia and reperfusion were induced by using a balloon-tipped catheter placed in the descending thoracic aorta, and changes in mean arterial blood pressure were recorded. Neurological function of the hindlimbs was evaluated for 7 days and recorded using a motor deficit score (MDS) (0 = normal;
The number of motor neurons within the spinal cord was counted after final MDS evaluation.

RESULTS: Group HD25 developed hypotension during the latter part of the ANH procedure. Group C and group HD30 experienced 3 minutes of reperfusion hypotension, whereas 6 minutes of hypotension was observed in group HD25. Two rats in group HD25 died during the experimental period. Seven days after reperfusion, the MDS of group C, group HD30, and group HD25 was 1.0 (0.5–2.0), 1.0 (0.5–2.0), and 4.0 (2.8–4.2) (median [95% confidence interval]), respectively. Group HD25 showed significantly higher MDS compared with group C (corrected $P = 0.0018$; 95% CI for median difference = 1.0–3.5). Motor neuron numbers in the anterior horns of group C, group HD30, and group HD25 were 26.5 (25.0–27.5), 23.5 (22.0–26.5), and 12.5 (8.4–16.6) (median [95% CI]), respectively. Motor neuron numbers of group HD25 were significantly lower than those of group C (corrected $P < 0.0001$; 95% CI for median difference = 9.0–18.0).

CONCLUSION: The results of the present study indicate that intraoperative ANH to an Hct of 25%, combined with coincident hypotension, caused a delayed recovery of baseline mean arterial blood pressure during the reperfusion period and aggravated neurological outcome after spinal cord ischemia.
BACKGROUND: Ilioinguinal and iliohypogastric nerve blocks are used in the clinical management of persistent inguinal postherniorrhaphy pain, but no controlled studies have been published on the subject. In this controlled study, we investigated the analgesic and sensory effects of ultrasound-guided blocks of the ilioinguinal and iliohypogastric nerves with lidocaine.

METHODS: A randomized, double-blind, placebo-controlled, crossover trial in 12 patients with severe persistent inguinal postherniorrhaphy pain, including a control group of 12 healthy controls, was performed. Assessments included pain ratings under standardized conditions with a numerical rating scale (0–10), sensory mapping to a cool roller, and quantitative sensory testing (QST) in the groin regions, before and after each ultrasound-guided block. A needle approach of 1 to 2 cm superior and medial to the anterior superior iliac spine was used. Outcomes were changes in pain ratings, sensory mapping, and QST compared with preblock values. Lidocaine responders were a priori defined by a pain reduction of ≥80% after lidocaine block and ≤25% after placebo block, nonresponders by pain reduction of <80% after lidocaine block and ≤25% after placebo block, and placebo responders by pain reduction of >25% after placebo block.

RESULTS: One of 12 pain patients was a lidocaine responder, 6 patients were nonresponders, and 5 patients were placebo responders. No consistent QST changes were observed in patients after the lidocaine block. In 10 of 12 healthy controls, a cool hypoesthesia area developed in the groin after the lidocaine block. Furthermore, QST assessments demonstrated significantly decreased suprathreshold heat pain perception in the groin after lidocaine versus placebo blocks (95% confidence interval = −3.5 to −0.5, P = 0.008).

CONCLUSION: Ultrasound-guided lidocaine blocks of the ilioinguinal and iliohypogastric nerves, at the level of the anterior superior iliac spine, are not useful in diagnosis and management of persistent inguinal postherniorrhaphy pain.

The Effects of Peptide and Lipid Endocannabinoids on Arthritic Pain at the Spinal Level

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Abstract

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BACKGROUND: Hemopressin, a nonapeptide (PVNFKFLSH: HP) derived from the α chain of hemoglobin was shown to interact specifically with brain cannabinoid CB1 receptors. Therefore, it seems to be the only peptide structure with cannabinoid activities. Our goal in this study was to further characterize this peptide and to clarify the antinociceptive potency of the polyunsaturated fatty acid derivates, 2-arachidonoyl-glycerol (2-AG) and anandamide, by investigating their effects on mechanical allodynia at the spinal level.

METHODS: HP was prepared on solid phase by in situ neutralization. After chronic intrathecal catheterization, mechanical hypersensitivity was produced in male Wistar rats by injection of carrageenan (300 μg/30 μL) into the tibiotarsal joint of one of the hind legs. Three hours after carrageenan administration, the ligands were administered intrathecally. The mechanical threshold was assessed using a dynamic aesthesiometer.

RESULTS: 2-AG (1–200 μg) and anandamide (10–200 μg) decreased carrageenan-induced mechanical allodynia in a dose-dependent manner, whereas HP had no antinociceptive effect in a wide dose range (0.3–30 μg). The effect of 2-AG was prevented by the CB1 receptor antagonist AM 251, but not by the CB2 antagonist SSR144528-2. HP (3 and 30 μg) also inhibited the effect of 2-AG. None of the ligands influenced the degree of edema.

CONCLUSIONS: HP posttreatment had no effect on mechanical allodynia, whereas spinally injected 2-AG and anandamide were potent drugs.

簡報: 採用弱磁場處理重比重利多卡因，：一項初步研究

Brief Report: Manipulation of Hyperbaric Lidocaine Using a Weak Magnetic Field: A Pilot Study
High spinal block is a potentially fatal complication of spinal anesthesia, with an incidence of 0.6 per 1000. Current prevention strategies include decreasing the dose of local anesthetic drug and altering patient positioning such that the location of hyperbaric anesthetic drugs in the neuraxis can be manipulated by gravity. Incorporation of a ferrofluid into a local anesthetic solution, combined with application of an external magnetic field in an in vitro spine model, allowed control of position of a solution of ferrofluid, dye, and local anesthetic against gravity, suggesting an additional mechanism by which anesthesia providers may prevent high spinal block.
BACKGROUND: Preoperative increased pulse pressure (PP) has been found to be a predictor of major adverse cardiovascular events (MACEs) after coronary artery bypass graft surgery. In this study, we evaluated the predictive ability of increased preoperative PP to identify MACEs in patients with peripheral vascular disease undergoing lower extremity vascular bypass surgery.

METHODS: We used the prospectively collected vascular surgery database at our institution to identify 412 consecutive patients who had lower extremity bypass surgery between January 2003 and December 2004. Preoperative demographics including comorbidities, medications, intraoperative characteristics, and postoperative MACE outcomes (myocardial infarction, congestive heart failure, stroke, and in-hospital mortality) were recorded. PP data as a continuous and categorical variable (PP <80 or ≥80 mm Hg) were tested for the ability to predict postoperative MACEs. A final parsimonious logistic regression was built to evaluate the predictive ability of PP.

RESULTS: MACEs occurred in 5.7% of patients in the PP <80 mm Hg group compared with 8.8% in the PP ≥80 mm Hg group (P = 0.229). Patients with MACEs were older (76 ± 10 years vs 68 ± 12 years; P = 0.001), had a history of myocardial infarction (9% vs 4%; P = 0.049), and had a preoperative PP of 75 ± 19 mm Hg vs 71 ± 21 mm Hg (P = 0.306). In the final logistic regression model, only age in years was a predictor of MACEs (odds ratio, 1.062; 95% confidence interval, 1.02–1.10; P = 0.02). There was no relationship between PP ≥80 mm Hg and risk for MACEs (odds ratio, 1.36; 95% confidence interval, 0.62–2.90; P = 0.44).

CONCLUSIONS: Preoperative increase in PP is not a predictor of adverse cardiovascular outcomes in patients having lower extremity revascularization surgery.

Cannabinoid Receptor 1 Inhibition Causes Seizures During Anesthesia Induction in Experimental Sepsis

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We report on seizures during anesthesia induction in animals treated with a cannabinoid receptor 1 (CB1R) antagonist for experimental sepsis. Animals received surgery for colon ascendens stent peritonitis–induced sepsis or sham surgery followed by treatment of CB1R antagonist, CB1R agonist, or placebo. Fourteen hours later, animals received pentobarbital or ketamine for anesthesia induction and animal behavior was observed. Tonic-clonic seizures were observed in 5 of 12 septic animals (42%) treated with CB1R antagonist after induction of anesthesia with pentobarbital. The data suggest that CB1R inhibition in combination with pentobarbital may increase the incidence of anesthetic-induced seizures in the case of sepsis.
BACKGROUND: Intraoperative stopcock contamination is a frequent event associated with increased patient mortality. In the current study we examined the relative contributions of anesthesia provider hands, the patient, and the patient environment to stopcock contamination. Our secondary aims were to identify risk factors for stopcock contamination and to examine the prior association of stopcock contamination with 30-day postoperative infection and mortality. Additional microbiological analyses were completed to determine the prevalence of bacterial pathogens within intraoperative bacterial reservoirs. Pulsed-field gel electrophoresis was used to assess the contribution of reservoir bacterial pathogens to 30-day postoperative infections.

METHODS: In a multicenter study, stopcock transmission events were observed in 274 operating rooms, with the first and second cases of the day in each operating room studied in series to identify within- and between-case transmission events. Reservoir bacterial cultures were obtained and compared with stopcock set isolates to determine the origin of stopcock contamination. Between-case transmission was defined by the isolation of 1 or more bacterial
isolates from the stopcock set of a subsequent case (case 2) that were identical to reservoir isolates from the preceding case (case 1). Within-case transmission was defined by the isolation of 1 or more bacterial isolates from a stopcock set that were identical to bacterial reservoirs from the same case. Bacterial pathogens within these reservoirs were identified, and their potential contribution to postoperative infections was evaluated. All patients were followed for 30 days postoperatively for the development of infection and all-cause mortality.

RESULTS: Stopcock contamination was detected in 23% (126 out of 548) of cases with 14 between-case and 30 within-case transmission events confirmed. All 3 reservoirs contributed to between-case (64% environment, 14% patient, and 21% provider) and within-case (47% environment, 23% patient, and 30% provider) stopcock transmission. The environment was a more likely source of stopcock contamination than provider hands (relative risk [RR] 1.91, confidence interval [CI] 1.09 to 3.35, \( P = 0.029 \)) or patients (RR 2.56, CI 1.34 to 4.89, \( P = 0.002 \)). Hospital site (odds ratio [OR] 5.09, CI 2.02 to 12.86, \( P = 0.001 \)) and case 2 (OR 6.82, CI 4.03 to 11.5, \( P < 0.001 \)) were significant predictors of stopcock contamination. Stopcock contamination was associated with increased mortality (OR 58.5, CI 2.32 to 1477, \( P = 0.014 \)). Intraoperative bacterial contamination of patients and provider hands was linked to 30-day postoperative infections.

CONCLUSIONS: Bacterial contamination of patients, provider hands, and the environment contributes to stopcock transmission events, but the surrounding patient environment is the most likely source. Stopcock contamination is associated with increased patient mortality. Patient and provider bacterial reservoirs contribute to 30-day postoperative infections. Multimodal programs designed to target each of these reservoirs in parallel should be studied intensely as a comprehensive approach to reducing intraoperative bacterial transmission.

青少年患者在單次術後鼻內給藥後酮咯酸的藥代動力學

The Pharmacokinetics of Ketorolac After Single Postoperative Intranasal Administration in Adolescent Patients

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背景：給予酮咯酸氨丁三醇（酮咯酸）可減少術後阿片類藥物的需求。對兒童鼻內給予酮咯酸氨丁三醇的藥代動力學特徵尚未研究過。本研究的目的是確定青少年患者鼻內單個劑量的酮咯酸的藥代動力學。

方法：招募了 20 例年齡 12~17 歲的手術患者。術後用專用的給藥系統給予患者鼻內酮咯酸 15mg（體重≤50 kg）或 30mg（體重>50 kg）。在給藥前 15min 內（基礎值）及給藥後 1、2、3、4、6、8、12 和 24 小時獲得血樣用於酮咯酸含量測定。用非線性混合效應模型進行人群分析。將參數估計標準化到 70kg 的人。
BACKGROUND: Ketorolac tromethamine (ketorolac) administration reduces postoperative opioid requirements. The pharmacokinetic characteristics of intranasal ketorolac tromethamine in children have not been characterized. Our objective of this study was to determine the pharmacokinetics of a single intranasal dose of ketorolac in adolescent patients.

METHODS: Twenty surgical patients, ages 12 to 17 years, were enrolled. After surgery, subjects received intranasal ketorolac 15 mg (weight \( \leq 50 \) kg) or 30 mg (weight >50 kg) using a proprietary administration system. Blood samples were obtained for ketorolac assay at baseline (within 15 minutes before the dose) and at 0.5, 1, 2, 3, 4, 6, 8, 12, and 24 hours after the dose. A population analysis was undertaken using nonlinear mixed-effects models. Parameter estimates were standardized to a 70-kg person.

RESULTS: The intranasal dosing in adolescents was well tolerated with minimal adverse effects. A 1-compartment model with first-order absorption and elimination was satisfactory to describe time-concentration profiles. Population parameter estimates (between subject variability) were clearance (CL/F) 2.05 L/h (60.5%), volume of distribution (V/F) 15.2 L (32.4%), absorption half-life (t\(_{1/2}\)abs) 0.173 hour (25.0%). Time to peak concentration (Tmax) was 52 minutes (SD 6 minutes).

CONCLUSION: Administration of ketorolac by the intranasal route resulted in a rapid increase in plasma concentration and may be a useful therapeutic alternative to IV injection in adolescents because plasma concentrations attained with the device are likely to be analgesic (investigational new drug no. 62,829).
多數病人會出現收縮壓急劇降低。我們研究的目的是（1）確認動脈內注射維拉帕米對腦血管痙攣病人平均動脈壓（MAP）和心率（HR）的影響；（2）確定不同維拉帕米劑量對平均動脈壓和心率變化的影響。我們假設（1）選擇性的動脈內注射維拉帕米治療腦血管痙攣與平均動脈壓降低和心率增快有關，（2）平均動脈壓和心率的變化與使用的維拉帕米劑量呈線性相關。方法：我們預先研究了患有血管痙攣需行腦血管造影術且可能行動脈內注射維拉帕米治療的病例。所有病例均給予一個全身麻醉藥。術中連續監測動脈有創血壓和心率，並且每隔10秒記錄資料。我們鑑定了注射維拉帕米前後最低平均動脈壓和最快心率。用重複計量多元回歸分析確定動脈內注射維拉帕米與平均動脈壓和心率的變化之間的相關性，並調整潛在混雜因素（體重，術前升壓藥的使用和注射前平均動脈壓）。以修正係數和95%可信區間形式報告資料。結果：我們收錄了20個病例，共行46次動脈內注射維拉帕米。在我們的多變數模型基礎上，我們觀察到每次動脈內注射5mg維拉帕米，平均動脈壓平均下降3.5mmHg（95% CI −5.0 to −2.0, P < 0.001）。動脈內注射維拉帕米後無論經未校準分析還是校準分析後顯示心率平均無顯著性變化（每次動脈內注射5mg維拉帕米，心率無顯著意義地增加0.4次/分，95% CI −1.6 to 2.4, P = 0.70）。

結論：全麻下，動脈內注射維拉帕米使其進入腦內動脈能降低平均動脈壓但是通常的患者心率無變化。需行進一步研究以確定這些結果的臨床意義。

BACKGROUND: Vasospasm after subarachnoid hemorrhage is a common and potentially life-threatening complication. Treatment of vasospasm may include intraarterial (IA) injections of verapamil into the cerebral vasculature. Clinical experience suggests that the average patient experiences an acute reduction in systemic blood pressure after IA verapamil. Our study objective was to (1) identify the effects of IA injection of verapamil on mean arterial blood pressure (MAP) and heart rate (HR) in patients with cerebral vasospasm and (2) determine the effect of verapamil dose on change in MAP and HR. We hypothesized that (1) selective IA injection of verapamil for treatment of cerebral vasospasm is associated with a reduction in MAP and an increase in HR and (2) the change in MAP and HR are linearly related to the dose of verapamil administered.

METHODS: We prospectively studied subjects with vasospasm scheduled for cerebral angiography with possible IA injection of verapamil. All subjects were given a general anesthetic. Invasive arterial blood pressure and HR were monitored continuously and recorded at 10-second intervals throughout the procedure. We identified the lowest MAP and highest HR before and after verapamil injection. The association between IA verapamil and change in MAP and HR was determined using repeated-measures multivariate regression analysis, adjusting for potential confounding factors (weight, preoperative vasopressor use, and preinjection MAP). Data are reported as adjusted coefficients and 95% confidence intervals (CI).

RESULTS: We included 20 subjects who underwent a total of 46 injections of IA verapamil. On the basis of our multivariate model, on average, each 5 mg of IA verapamil was associated with a 3.5 mm Hg reduction in MAP (95% CI −5.0 to −2.0, P < 0.001). HR was not significantly altered by IA verapamil on both unadjusted and adjusted analyses (nonsignificant increase of 0.4 beats per minute for each 5 mg of IA verapamil, 95% CI −1.6 to 2.4, P = 0.70).
CONCLUSIONS: Under general anesthesia, injection of IA verapamil into cerebral arteries reduces MAP but does not change HR in the average patient. Further research is required to determine the clinical significance of these results.

運動訓練減輕大鼠坐骨神經慢性縮窄性損傷後的神經性疼痛和細胞因數表達

Exercise Training Attenuates Neuropathic Pain and Cytokine Expression After Chronic Constriction Injury of Rat Sciatic Nerve

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background:運動對神經性疼痛造成影響的關鍵機制仍然不是很清楚。我們研究了體育鍛煉是否可以調節坐骨神經慢性縮窄性損傷後的功能恢復以及熱休克蛋白72 (Hsp72)、腫瘤壞死因子α(TNF-α)和白細胞介素-1β(IL-1β)的表達。

方法: 雄性SD大鼠被分為7組，分別為:對照組、假手術組(SO)、進行游泳或踏車運動的假手術組(SOSE或SOTE)、慢性縮窄性損傷組(CCI)，進行游泳或踏車運動的CCI組(CCISE或CCITE)。我們記錄了體重、熱縮足反射潛伏期和機械刺激縮足閾值，同時還記錄了Hsp72、TNF-α和IL-1β在坐骨神經中的表達。

結果: 對照組和SO組大鼠的體重比SOSE、SOTE、CCI、CCISE和CCITE組大鼠的體重要重。在慢性縮窄性損傷後第21天，進行游泳或踏車運動的CCI組大鼠的熱縮足反射潛伏期和機械刺激縮足閾值明顯比沒有運動的CCI組大鼠的要長。在慢性縮窄性損傷後第21天, CCISE和CCITE組大鼠的坐骨神經的Hsp72表達比CCI組高，而TNF-α或IL-1β水準比CCI組低。

結論: 這些結果表明，漸進式的運動訓練可以減輕坐骨神經慢性縮窄性損傷後的神經性疼痛，同時減少TNF-α和IL-1β的過度表達，並增加HSP72的表達。

（張怡譯馬皓琳李士通校）

BACKGROUND: The underlying mechanism of exercise on neuropathic pain is not well understood. We investigated whether physical exercise regulates the functional recovery and heat shock protein 72 (Hsp72), tumor necrosis factor-α (TNF-α), and interleukin-1β (IL-1β) expression after chronic constriction injury (CCI) of the sciatic nerve.

METHODS: Male Sprague–Dawley rats were divided into 7 groups: control, sham operated (SO), SO with swimming or treadmill exercise (SOSE or SOTE), CCI, CCI with swimming or treadmill exercise (CCISE or CCITE). We recorded body weight, thermal withdrawal latency,
and mechanical withdrawal threshold as well as Hsp72, TNF-α, and IL-1β expression in sciatic nerve.

RESULTS: The body weights in the control and SO groups were heavier than those in the SOSE, SOTE, CCI, CCISE, and CCITE groups. CCI rats with swimming or treadmill exercise showed significant increase in thermal withdrawal latency and mechanical withdrawal threshold when compared with CCI rats without exercise on day 21 after CCI. Both CCISE and CCITE groups demonstrated greater Hsp72 expression and lower TNF-α or IL-1β level than did the CCI group in sciatic nerve on day 21 after CCI.

CONCLUSIONS: These results suggest that progressive exercise training decreases peripheral neuropathic pain as well as TNF-α and IL-1β overproduction and increases HSP72 expression after CCI of the sciatic nerve.

大鼠鞘內注射阿替美唑可增加嗎啡的鎮痛作用

Intrathecal Atipamezole Augments the Antinociceptive Effect of Morphine in Rats

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背景：阿片類鎮痛藥對治療慢性疼痛有效，但存在嚴重不良反應，比如產生耐藥性和依賴性。α2腎上腺素激動劑和μ阿片受體激動劑在脊髓鎮痛中有協同增強和交叉耐受作用，而α2腎上腺素拮抗劑有引起傷害感受的作用。然而，有文獻報導，蛛網膜下腔內給予超低劑量的α2腎上腺素拮抗劑反而能促進阿片類藥物的鎮痛作用。新的資料提示，功能性μ阿片-α2腎上腺素能受體複合物一說可能有助於解釋α2腎上腺素拮抗劑的這一神奇效應。本研究評估了低劑量阿替美唑（一種非選擇性α2腎上腺素拮抗劑）對全身性和椎管內注射嗎啡的鎮痛作用和耐受性的影響。

方法：在雄性 S-D 大鼠用熱板試驗、甩尾試驗和壓痛試驗評估鎮痛效果。誘導全身性和脊髓阿片耐受 4 天。研究鞘內和皮下注射阿替美唑對嗎啡介導的急性鎮痛作用和既有嗎啡耐受的影響。

結果：全身性和椎管內注射研究劑量（皮下注射 0.03、0.3、3μg/kg 或鞘內注射 0.1、1、10ng）的阿替美唑本身並不產生鎮痛作用。甩尾試驗提示，鞘內聯合應用嗎啡和 1ng 阿替美唑在給予試驗用藥後 30 分鐘可增加急性脊髓嗎啡的鎮痛作用。此外，甩尾試驗還提示鞘內注射 10ng 阿替美唑在給予試驗用藥後 30 分鐘可減少之前建立的嗎啡耐受。但皮下注射阿替美唑對嗎啡的全身鎮痛作用無明顯影響，也不減少嗎啡耐受。

結論：椎管內同時聯合應用低劑量阿替美唑，可增強嗎啡對未做過試驗的大鼠和嗎啡耐受大鼠的鎮痛作用。μ阿片受體和α2A 腎上腺素受體形成異二聚體導致的功能上的改變和交
BACKGROUND: Opioid analgesics are effective in the treatment of chronic pain, but they have serious adverse effects such as development of tolerance and dependence. Adrenergic $\alpha_2$ agonists and $\mu$-opioid receptor agonists show synergistic potentiation and cross-tolerance in spinal analgesia, whereas $\alpha_2$-adrenergic antagonists have shown pronociceptive effects. However, at ultralow doses, spinal $\alpha_2$-adrenergic antagonists have been reported to paradoxically enhance opioid antinociception. New data have suggested a functional $\mu$-opioid-$\alpha_2$-adrenoceptor complex, which may help in interpreting the paradoxical effect of the $\alpha_2$-adrenergic antagonists. In the present study we assessed the effects of low doses of atipamezole, a nonselective $\alpha_2$-adrenergic antagonist, on both systemic and spinal morphine antinociception and tolerance.

METHODS: Antinociception was assessed in male Sprague-Dawley rats using hotplate, tail-flick, and paw pressure tests. Spinal or systemic opioid tolerance was induced for 4 days. The effects of both intrathecal and subcutaneous atipamezole on acute morphine-induced antinociception and established morphine tolerance were studied.

RESULTS: Systemic or spinal atipamezole itself did not produce antinociception at the doses studied (subcutaneous 0.03, 0.3, 3 $\mu$g/kg or intrathecal 0.1, 1, 10 ng). The combined administration of spinal morphine and 1 ng of atipamezole increased the antinociceptive effect of acute spinal morphine 30 minutes after the administration of test drugs in the tail-flick test. Furthermore, 10 ng of intrathecal atipamezole attenuated established morphine tolerance 30 minutes after the administration of test drugs in the tail-flick test. However, subcutaneous atipamezole had no significant effect on systemic morphine antinociception, and it did not attenuate morphine tolerance.

CONCLUSIONS: Spinal coadministration of low doses of atipamezole augmented the antinociceptive effect of morphine in naïve and tolerant rats. Heterodimerization of $\mu$-opioid- and $\alpha_2\alpha_2$-adrenoceptors with consequent changes in function and interaction could explain these results. This also suggests an interesting explanation for the variability in opioid response and tolerance in patients experiencing stress or having an increased noradrenergic tone due to other causes, e.g., drugs.

Factor XIII and Tranexamic Acid But Not Recombinant Factor VIIa Attenuate Tissue Plasminogen Activator-Induced Hyperfibrinolysis in Human Whole Blood.

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背景：纖溶亢進是一種因凝血機能和血小板消耗進而出血的病理狀況。而 XIII 因數及凝血酶啓動的纖溶抑制物在保護血塊被溶解方面扮演的重要角色。我們實驗假設 XIII 因數的濃度、凝血原複合物的濃度、重組凝血因數 VIIa 及氨甲環酸對纖溶都有一定程度的抑制和血小板有助於抗纖維蛋白溶解作用。

方法：釆自13名健康志願者的枸鹽酸化全血樣本，加入重組組織型纖溶酶原啓動物的濃度（最終溶度為 100 ng · mL⁻¹）使血液發生纖溶亢進。為了評估纖溶抑制情況，所有試驗分別分為 FXIII-A₂B₂ 試劑組 (0.42 U · mL⁻¹)、PCC 試劑組 (0.42 U · mL⁻¹)、rFVIIa 試劑組 (最終濃度 1.6 μg · mL⁻¹)、TA 試劑組 (最終濃度 0.33 mg · mL⁻¹) 及生理鹽水空白組。經過45至60分鐘的體外啓動實驗後，再用旋轉血栓彈性測定法分析凝血功能。此外，通過添加細胞鬆弛素 D 以此來檢測在無血小板作用時，血凝塊的形成情況。

結果：由重組組織型纖溶酶原啓動物誘發的纖溶組 (CLI 為45時：中值為 78%; 72/85.5, 25th/75th 百分數)，FXIII 組 (90%; 82.5/96, P = 0.025)，PCC 組 (89%; 74/91, P = 0.0465) 及 TA 組 (90%; 89/92, P = 0.001) 明顯對 CLI 減少很小；同樣 CLI 為60時，出現增加的組為 FXIII 組 (66%; 33/90.5, P = 0.017) 和 TA 組 (84%; 70.5/90, P = 0.0305) 而 FXIII 及 rFVIIa 在 CLI45 和 CLI60 為 (TA: 89%; 84.5/96, P = 0.01，PCC: 55%; 29.5/60, P = 0.0405)，相對比 r-tPA 空白組為 (CLI45: 59%; 40.5/72.5 ，CLI60: 10%; 0/30)

結論：在用全血樣本血栓彈力測量實驗中，僅僅氨甲環酸，纖維蛋白穩定因數 (XIII 因數) 和凝血酶原複合物抑制重組組織型纖溶酶原啓動物誘發的纖溶亢進活動，而 rFVIIa 則沒有此作用。同樣，我們發現外源的 FXIII 起作用需要依靠有功能的血小板參與

BACKGROUND: Hyperfibrinolysis is a pathological state that often results in depletion of coagulation factors and platelets and can contribute to bleeding. Factor XIII (FXIII) and thrombin activatable fibrinolysis inhibitor have key roles in protecting clots against fibrinolysis.

We tested the hypotheses that FXIII concentrate, prothrombin complex concentrate (PCC), recombinant factor VIIa (rFVIIa), and tranexamic acid (TA) inhibit fibrinolysis to different degrees, and that platelets contribute to antifibrinolysis.

METHODS: Hyperfibrinolysis was induced by addition of recombinant tissue plasminogen activator (r-tPA) (final concentration: 100 ng · mL⁻¹) to citrated whole blood obtained from 13 healthy volunteers. To assess inhibition of fibrinolysis, we added to the assays FXIII-A₂B₂ (0.42 U · mL⁻¹), PCC (0.42 U · mL⁻¹), rFVIIa (final concentration: 1.6 μg · mL⁻¹), TA (final concentration: 0.33 mg · mL⁻¹), or saline. Coagulation was analyzed by rotational thromboelastometry (ROTEM®) using the clot lysis index (CLI) after 45 and 60 minutes in extrinsically activated assays, with (FIBTEM®) and without (EXTEM®) inhibition of platelet function by cytochalasin D.

RESULTS: After r-tPA–evoked fibrinolysis (CLI45: median 78%; 72/85.5, 25th/75th percentile), FXIII (90%; 82.5/96, P = 0.025), PCC (89%; 74/91, P = 0.0465), and TA (94%; 92/96, P = 0.001) but not rFVIIa (79%; 72/86.5, P = 1.0) significantly attenuated the decrease in CLI. Similarly, CLI60 increased only with FXIII (66%; 33/90.5, P = 0.017) and TA (90%; 89/92, P = 0.001) compared with r-tPA alone (21%; 7/59). After abolition of platelet function by
cytochalasin D, only TA (95%; 89/97.5, \( P = 0.0025 \)) and PCC (84%; 70.5/90, \( P = 0.0305 \)) but not FXIII or rFVIIa significantly increased CLI45 and CLI60 (TA: 89%; 84.5/96, \( P = 0.01 \) and PCC: 55%; 29.5/60, \( P = 0.0405 \)) compared with r-tPA alone (CLI45: 59%; 40.5/72.5 and CLI60: 10%; 0/30).

CONCLUSION: In thromboelastometric assays using whole blood, only TA, FXIII, and PCC significantly inhibited r-tPA–evoked hyperfibrinolysis whereas rFVIIa had no effect. We also found that the effects of exogenous FXIII were dependent on the presence of functional platelets.

The Variability of Response to Propofol Is Reduced When a Clinical Observation Is Incorporated in the Control: A Simulation Study

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BACKGROUND: When using a target-controlled infusion of propofol to produce sedation, the operator assumes that the individual patient’s pharmacokinetic parameters match those in the control system so that the specified effect-site target is achieved, and that the specified target is appropriate for the individual patient’s sensitivity. These inaccuracies cascade, and this produces error in the desired level of sedation, termed “target error.” To address this issue, we designed a
control system that incorporates the operator's observation of loss of responsiveness to determine patient sensitivity. Our hypothesis was that this control system would reduce the impact of pharmacokinetic parameter error and uncertainty in sensitivity on the system's target error.

METHODS: A novel control system was implemented that produces a slow transition in the probability of loss of responsiveness, providing the operator with greater resolution to observe the time of this transition. The system uses the time of this transition to infer the effect-site concentration associated with loss of responsiveness, and the infusion sequence necessary to maintain this concentration. We used computer simulation to generate a population of 10,000 patients with randomly distributed pharmacokinetic parameters and sensitivity to propofol, and compared the target error of our system with that of a target-controlled infusion system targeting the effect-site concentration associated with 50% probability of loss of responsiveness.

RESULTS: Our system exhibited a target error of $-0.75\% \pm 8.96\%$, compared with $0\% \pm 27.6\%$ for target-controlled infusion, reducing the variability in achieving the specified target by a factor of 3.1 compared with target-controlled infusion, which was significant at $P < 0.0001$.

CONCLUSIONS: Our system reduces the impact of biological variability by including the operator in the control loop. The utility of this approach in clinical practice will require further evaluation.

### Acute kidney injury after lung resection surgery: incidence and perioperative risk factors

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**背景**：術後急性腎損傷(AKI)發生在多種手術中，它與圍術期患者發病率和死亡率相關。但我們對於肺葉切除術後的 AKI 發生沒有進行充分的研究。在本次研究中，我們確認了術後 AKI 的發病率、高危因素以及術後 AKI 與肺葉切除術患者預後的關係。

**方法**：我們自2006年1月至2010年3月在三級監護學術中心對接受肺葉切除的患者進行了回顧性的觀察研究。術後 AKI 的診斷建立在術後72小時急性腎損傷網(AKIN)標準。我們使用邏輯回歸模型來確立圍術期因素與術後72小時 AKI 風險之間的關係。我們還研究了術後 AKI 與患者預後（包括死亡率、住院天數以及再次插管的需求）間的關係。
BACKGROUND: Postoperative acute kidney injury (AKI) is associated with increased perioperative morbidity and mortality in a variety of surgical settings, but has not been well studied after lung resection surgery. In the present study, we defined the incidence of postoperative AKI, identified risk factors, and clarified the relationship between postoperative AKI and outcome in patients undergoing lung resection surgery.

METHODS: A retrospective, observational study of patients who underwent lung resection surgery between January 2006 and March 2010 in a tertiary care academic center was conducted. Postoperative AKI was diagnosed within 72 hours after surgery based on the Acute Kidney Injury Network creatinine criteria. Logistic regression was used to model the association between perioperative factors and the risk of AKI within 72 hours after surgery. The relationship between postoperative AKI and patient outcome including mortality, days in hospital, and the requirement of reintubation was investigated.

RESULTS: A total of 1129 patients (pneumonectomy n = 71, bilobectomy n = 30, lobectomy n = 580, segmentectomy n = 35, wedge resection/bullectomy n = 413) were included in the final analysis. Patients were an average of 61 years (SD 15) and 50% were female. AKI was diagnosed in 67 patients (5.9%) based on Acute Kidney Injury Network criteria (stage 1, n = 59; stage 2, n = 8; and stage 3, n = 0) within 72 hours after surgery, and only 1 patient required renal replacement therapy. Multivariate analysis demonstrated an independent association between postoperative AKI and hypertension (adjusted odds ratio [OR] 2.0, 95% confidence interval [CI]: 1.1-3.8), peripheral vascular disease (OR 4.4, 95% CI: 1.8-10), estimated glomerular filtration rate (OR 0.8, 95% CI: 0.69-0.93), preoperative use of angiotensin II receptor blockers (OR 2.2, 95% CI: 1.1-4.4), intraoperative hydroxyethyl starch administration (OR 1.5, 95% CI: 1.1-2.1), and thoracoscopic (versus open) procedures (OR 0.37, 95% CI: 0.15-0.90). Development of AKI was associated with increased rates of tracheal reintubation (12% vs 2%, P < 0.001), postoperative mechanical ventilation (15% vs 3%, P < 0.001), and prolonged hospital length of
stay (10 vs 8 days, P < 0.001). There was no difference in mortality between the 2 groups (3% vs 1%, P = 0.12).

CONCLUSIONS: Preoperative risk factors for AKI after lung resection surgery overlap with those established for other surgical procedures. Perioperative management seems to influence the risk of AKI after lung resection; in particular, the use of synthetic colloids may increase the risk, whereas thoracoscopic procedures may decrease the risk of AKI. Early postoperative AKI is associated with respiratory complications and prolonged hospitalization.

食管多普勒對兒童腎臟動脈血流速度和血流指數測量

Transesophageal Doppler measurement of renal arterial blood flow velocities and indices in children.

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BACKGROUND: Doppler-derived renal blood flow indices have been used to assess renal pathologies. However, transesophageal ultrasonography (TEE) has not been previously used to assess these renal variables in pediatric patients. In this study, we (a) assessed whether TEE allows adequate visualization of the renal parenchyma and renal artery, and (b) evaluated the concordance of TEE Doppler-derived renal blood flow measurements/indices compared with a standard transabdominal renal ultrasound (TAU) in children.

METHODS: This prospective cohort study enrolled 28 healthy children between the ages of 1 and 17 years without known renal dysfunction who were undergoing atrial septal defect device closure in the cardiac catheterization laboratory. TEE was used to obtain Doppler renal artery blood velocities (peak systolic velocity, end-diastolic velocity, mean diastolic velocity, resistive index, and pulsatility index), and these values were compared with measurements obtained by TAU. Concordance correlation coefficient (CCC) was used to determine clinically significant agreement between the 2 methods. The Bland-Altman plots were used to determine whether these 2 methods agree sufficiently to be used interchangeably. Statistical significance was accepted at P ≤ 0.05.

RESULTS: Obtaining 2-dimensional images of kidney parenchyma and Doppler-derived measurements using TEE in children is feasible. There was statistically significant agreement between the 2 methods for all measurements. The CCC between the 2 imaging techniques was 0.91 for the pulsatility index and 0.66 for the resistive index. These coefficients were sensitive to outliers. When the highest and lowest data points were removed from the analysis, the CCC between the 2 imaging techniques was 0.62 for the pulsatility index and 0.50 for the resistive index. The 95% confidence interval (CI) for pulsatility index was 0.35 to 0.98 and for resistive index was 0.21 to 0.89. The Bland-Altman plots indicate good agreement between the 2 methods; for the pulsatility index, the limits of agreement were -0.80 to 0.53. The correlation of the size of the measurement and the mean difference in methods (-0.14; 95% CI = -0.28, 0.01) was not statistically significant (r = 0.31, P = 0.17). For the resistive index, the limits of agreement were -0.22 to 0.12. The correlation of the size of the measurement and the mean difference in methods (-0.05; 95% CI = -0.09, -0.01) was not statistically significant (r = 0.10, P = 0.65).

CONCLUSION: This study confirms the feasibility of obtaining 2-dimensional images of kidney parenchyma and Doppler-derived measurements using TEE in children. Angle-independent TEE Doppler-derived indices show significant concordance with those derived by TAU. Further studies are required to assess whether this correlation holds true in the presence of renal pathology. This technique has the potential to help modulate intraoperative interventions.
Based on their impact on renal variables and may prove helpful in the perioperative period for children at risk of acute kidney injury.

Medical intelligence article: ventilation of neck breathers undergoing a diagnostic procedure or surgery
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Receiving sedation while undergoing a diagnostic procedure or general anesthesia for surgery is challenging for neck breathers including laryngectomees. Unfortunately, most medical personnel including nurses, medical technicians, surgeons, and anesthesiologists caring for laryngectomees before, during, and after surgery are not familiar with their unique anatomy, how they speak, and how to manage their airways during and after the operation. Methods to improve the care are discussed. Educating medical personnel about these issues can improve the care of neck breathers.

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Background: Nonsteroidal anti-inflammatory drugs are currently the most commonly used analgesics in postoperative pain. In this study, we examined the long-lasting anti-inflammatory effect of an implanted analgesic hydrogel in a rat model of postoperative pain.

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Background: Nonsteroidal anti-inflammatory drugs are currently the most commonly used analgesics in postoperative pain. In this study, we examined the long-lasting anti-inflammatory effect of an implanted analgesic hydrogel in a rat model of postoperative pain.
方法：將一塊鎮痛藥浸潤的水凝膠在手術結束時植入大鼠的蹠肌下。用馮弗雷纖維測試術前和術後兩周機械刺激的縮足反射閾值。酮洛芬的術後鎮痛效果以免疫組化結果評估，通過免疫組化檢測脊髓內神經膠質細胞啓動及 OX-42 和磷酸化 p38MAPK 表達。

結果：術後一周，植入酮洛芬浸潤的水凝膠組表現出持續鎮痛作用。另一種用於超前鎮痛的非甾體類抗炎藥紮托洛芬，與酮洛芬浸潤的水凝膠發揮協同作用，表現出更強的鎮痛效果。術後第三天，植入酮洛芬水凝膠組的神經膠質細胞啓動減弱。

結論：酮洛芬在大鼠術後疼痛模型上一周內降低機械刺激高敏反應是有效的。植入非甾體類抗炎藥浸潤的水凝膠可作爲術後長期鎮痛的一種有效方法。

（郁玲玲譯 薛張綱校）

BACKGROUND: The administration of nonsteroidal anti-inflammatory drugs (NSAIDs) is the most common nonopioid analgesic currently used for postoperative pain management. We tested the sustained analgesic effect of ketoprofen emanating from a biodegradable gelatin hydrogel in a rat model of postoperative pain.

METHODS: A sheet of analgesic-infiltrated hydrogel was inserted below the plantaris muscle at the end of surgery. Mechanical thresholds were measured by use of von Frey filaments before and 2 weeks after the operation. The effect of ketoprofen on the postoperative pain was also assessed immunohistochemically by assessing microglial activation in the spinal cord with anti-OX-42 and phosphorylated p38 mitogen-activated protein kinase antibodies.

RESULTS: Implantation of ketoprofen-infiltrated gelatin hydrogel exerted a sustained analgesic effect for 1 week after the operation. Preemptive analgesia with zaltoprofen, another NSAID, produced an additive analgesic effect in conjunction with the ketoprofen-infiltrated hydrogel. Microglial activation was attenuated by the treatment with ketoprofen-infiltrated hydrogel on day 3 after the incision.

CONCLUSIONS: These results demonstrate that ketoprofen was effective in reducing mechanical hypersensitivity for 1 week in a rat model of postoperative pain and that the implantation of NSAID-infiltrated gelatin hydrogel may serve as a useful analgesic method for the long-term relief of patients after surgery.

減少外周神經阻滯中局部麻醉藥的鈉含量：生理鹽水和 5% 葡萄糖的比較評價——一項隨機雙盲對照試驗

Reduction in Sodium Content of Local Anesthetics for Peripheral Nerve Blocks: A Comparative Evaluation of Saline with 5% Dextrose—A Randomized Controlled Double-Blind Study

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背景：目前市售的局部麻醉藥是用生理鹽水稀釋而製成，具有較高的鈉含量。已有研究暗示，神經周圍的鈉濃度高時，能通過阻止和/或延緩神經阻滯從而拮抗局部麻醉劑的鎮痛效果。目前還沒有相關報導稱5％葡萄糖注射在神經組織周圍時會造成任何短期或長期的傷害。在這項研究中，我們前瞻性地比較和評估了用這兩種溶劑稀釋局部麻醉時的阻滯特性。

方法：準備行上肢手術的患者隨機分組，用0.5％羅呱卡因（1％羅呱卡因用5％葡萄糖或生理鹽水進行稀釋）行腋路臂叢神經阻滯。每5分鐘行運動和感覺阻滯的測試，共進行30分鐘。術後24小時和7天進行電話隨訪，術後3天、10天和或14天至28天外科隨訪時記錄副作用、病人的滿意度、阻滯消失的時間。有任何神經損傷時則隨訪至消失。主要結果是感覺神經阻滯的起效時間。

結果：這項研究共招募了五百五十例患者。葡萄糖組的完全感覺阻滯的平均時間為18.3±6.1分鐘，生理鹽水組為22.5±6.4分鐘（P<0.001，95％置信區間的平均差異3.0-5.4分鐘）。5例患者發生臨床上的神經損傷（組間無統計學差異）。

結論：用5％葡萄糖稀釋的羅呱卡因在腋路臂叢神經阻滯中起效較早。

周玲譯 薛張綱校

BACKGROUND: Commercially available local anesthetic drugs when diluted with normal saline have high sodium content. High perineural sodium concentration has been implicated in antagonizing the analgesic effects of local anesthetics by preventing and/or delaying neural blockade. Five percent dextrose is not known to cause any short- or long-term injury when injected around neural tissue. In this study, we prospectively compared and evaluated block characteristics when local anesthetic drug was diluted with these 2 different agents.

METHODS: Patients scheduled for upper limb surgery were randomly assigned to receive axillary brachial plexus block with 0.5% ropivacaine (1% diluted with either 5% dextrose or normal saline). Motor and sensory block were tested every 5 minutes for 30 minutes. Postoperatively, a telephone interview was conducted after 24 hours and 7 days along with surgical follow-up at days 3, 10, and/or 14 to 28 days to document side effects, patient satisfaction, and time for block resolution. Any nerve deficits were followed until resolution. The primary outcome was time to onset of sensory nerve block.

RESULTS: Five hundred fifty patients were recruited for this study. The mean time to complete sensory block was 18.3 ± 6.1 minutes in the dextrose group and 22.5 ± 6.4 minutes in the saline group (P < 0.001, 95% confidence interval for mean difference 3.0-5.4 minutes). There were 5 patients with clinical nerve deficits (no statistical difference between groups).

CONCLUSIONS: Dilution with 5% dextrose provides earlier onset of axillary brachial plexus block with ropivacaine.