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**研究不停跳搭橋術中抑肽酶和高凝狀態之間關係的一項隨機臨床試驗**

**A Randomized Clinical Trial Investigating the Relationship Between Aprotinin and Hypercoagulability in Off-Pump Coronary Surgery**

Pranjal H. Desai, MD<sup>\*</sup>, Dinesh Kurian, BS<sup>\*</sup>, Nannan Thirumavalavan, BA<sup>\*</sup>, Sneha P. Desai, MD<sup>\*</sup>, Pluen Ziu, MD<sup>\*</sup>, Michael Grant, BS<sup>†</sup>, Charles White, MD<sup>‡</sup>, R. Clive Landis, PhD<sup>§</sup>, and Robert S. Poston, MD<sup>\*</sup>

From the <sup>\*</sup>Department of Cardiothoracic Surgery, Boston University School of Medicine, Boston, Massachusetts; Departments of <sup>†</sup>Surgery, and <sup>‡</sup>Radiology, University of Maryland, School of Medicine, Baltimore, Maryland; and <sup>§</sup>Edmund Cohen Laboratory for Vascular Research, Chronic Disease Research Center, University of the West Indies, Bridgetown, Barbados.

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**背景：**不停跳冠狀動脈旁路(OPCAB)手術與高凝狀態相伴隨，其中血小板凝血酶受體，即蛋白酶活化受體-1(PAR-1)，在隱靜脈搭橋中傳導了凝血酶爆發。抑肽酶，在心胸外科術中使用主要是因為它的抗纖維蛋白溶解的性質，也由於凝血酶節省了血小板 PAR-1 啟動。我們假定 PAR-1 拮抗的性質提供了 OPCAB 手術中抗血栓形成的益處。

**方法：**在 OPCAB 術中患者被隨機分為靜脈給予鹽水( $n = 38$ )或改良足量法的抑肽酶( $n = 37$ )。圍術期從冠狀竇、皮膚傷口、體循環抽取血液標本來分析凝血和血小板功能。主要心血管不良事件用在 24h 時獲取肌鈣蛋白 I (心肌梗死)、預放電電腦斷層掃描血管造影 (靜脈搭橋血栓形成) 和卒中臨床檢查來監測。

**結果：**OPCAB 術後即刻得到的冠狀竇血顯示抑肽酶組中啟動作用顯著減弱，判斷依據為血小板-白細胞螯合物形成減少( $P < 0.02$ )和血小板衍生的微粒減少( $P < 0.05$ )。抑肽酶組顯示了凝血酶 (而非二磷酸腺苷) 誘導的血小板聚集受到抑制( $P = 0.007$ )。抑肽酶顯著減少在冠狀竇而非皮膚切口的凝血酶產生 (用 F 1.2 級定義)。主要心血管不良事件在抑肽酶治療組患者中顯著減少(5.4%比 29.7%,  $P < 0.05$ )。抑肽酶通過紅細胞輸注的減少( $P < 0.04$ )和術後血液丟失的減少( $603 \pm 330$  比  $810 \pm 415$  mL,  $P < 0.004$ ) 還證明了其抗纖維蛋白溶解性質。

**結論：**本研究證明了抑肽酶通過減少凝血酶誘導的血小板啟動和隱靜脈搭橋中的凝血酶產生，及同時保持系統性止血和抗纖維蛋白溶解的益處，來保護 OPCAB 手術患者免于高凝狀態。這些結果支持對 OPCAB 術中抑肽酶和其他 PAR-1 拮抗物的進一步研究。

(唐李雋 譯 馬皓琳 李士通 校)

**BACKGROUND:** Off-pump coronary artery bypass (OPCAB) surgery is associated with a hypercoagulable state in which the platelet thrombin receptor, protease-activated receptor-1 (PAR-1), helps propagate a thrombin burst within saphenous vein grafts. Aprotinin, used in cardiothoracic surgery mainly for its antifibrinolytic properties, also spares platelet PAR-1 activation due to thrombin. We hypothesized that this PAR-1 antagonistic property provides an antithrombotic benefit during OPCAB surgery.

**METHODS:** Patients were randomly assigned to receive saline ( $n = 38$ ) or a modified full-dose regimen of aprotinin ( $n = 37$ ) IV during OPCAB surgery. Blood sampled perioperatively from the coronary sinus, skin wounds, and systemic circulation was analyzed to test coagulation and platelet function. Major adverse cardiovascular events were monitored by obtaining troponin I at 24 h (myocardial infarction), pre-discharge computed tomography angiography (vein graft thrombosis), and by clinical examination for stroke.

**RESULTS:** Coronary sinus blood obtained immediately after OPCAB surgery showed significantly less activation in the aprotinin group, as judged by reduced formation of platelet-leukocyte conjugates ( $P < 0.02$ ) and platelet-derived microparticles ( $P < 0.05$ ). The aprotinin group showed inhibition of platelet aggregation induced by thrombin ( $P = 0.007$ ) but not adenosine diphosphate. Thrombin generation, defined by F1.2 levels, was significantly reduced by aprotinin in the coronary sinus but not in skin wound incisions. Major adverse cardiovascular events were significantly reduced in aprotinin-treated patients (5.4% vs 29.7%,  $P < 0.05$ ). Aprotinin also demonstrated antifibrinolytic

properties through diminished red blood cell transfusion ( $P < 0.04$ ) and reduced blood loss postoperatively ( $603 \pm 330$  vs  $810 \pm 415$  mL,  $P < 0.004$ ).

**CONCLUSION:** This study demonstrates that aprotinin protects patients undergoing OPCAB surgery from a hypercoagulable state by diminishing thrombin-induced platelet activation and thrombin generation within saphenous vein grafts, while maintaining systemic hemostatic and antifibrinolytic benefits. These results support further investigation of aprotinin and other PAR-1 antagonists in OPCAB surgery.

### 兒童術中知曉發生率：兒童知曉和回憶評估

#### The Incidence of Intraoperative Awareness in Children: Childhood Awareness and Recall Evaluation

Shobha Malviya, MD\*, Jeffrey L. Galinkin, MD, FAAP†, Carolyn F. Bannister, MD, FAAP†, Constance Burke, BSN, RN\*, Jeannie Zuk, PhD, RN†, Mark Popenhagen, PsyD†, Samatha Brown, RN†, and Terri Voepel-Lewis, MSN, RN\*

From the \*Department of Anesthesiology at University of Michigan Health Systems, Ann Arbor, Michigan; †University of Colorado, Denver, Colorado; and ‡Emory University, Atlanta, Georgia.

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**背景：**已報導的麻醉下兒童知曉的發生率存在相當大的差異（0.2%-2.7%）。在這個前瞻性、觀察性、佇列研究中，我們評估了 1) 在三種情況下，兒童在全身麻醉期間的知曉發生率、2) 促使知曉的因素和 3) 知曉的短期心理學影響。

**方法：**研究包括了進行全身麻醉的 5-15 歲兒童，並且前瞻性地收集所有的圍術期資料（包括麻醉藥）。術後，使用半結構化問卷對兒童進行三次訪視。與兒童的醫護人員討論所有的可能或很可能知曉的病例，從而確定或否定其記憶。達到不同網點的研究者間的內部一致，並且由三個外部的訪視者對這些病例和其他的隨機選擇病例進行訪視。基於這個研究目的，把可能或很可能知曉定義為：內部一致和至少三分之二的外部訪視者之間意見相同的病例。

**結果：**1784 名兒童至少接受一次訪視。32 個病例至少被一個實體（內部意見一致或一個外部訪視者肯定）認定為可能或很可能知曉，其中的 14 個病例符合可能或很可能知曉的定義，使知曉發生率為 0.8%。有知曉的 14 個兒童中，有 6 個兒童（43%）記得在手術期間感到恐懼，有 3 個（21%）感到痛。該組中的 2 個兒童（14%）稱“如果不得不二次手術，會感到更加糟糕”。這與無回憶兒童（15%）的報告無明顯差異。術中知曉兒童無一需要心理學隨訪。內鏡檢查的操作有較高的知曉風險（相對危險度=4.5[置信區間 1.5—13.6]）。

**結論：**在這項研究中，儘管 0.8% 兒童經歷了可能或很可能知曉，但是並沒有兒童遭受了短期的心理學困擾。

（王海濤 譯 馬皓琳 李士通 校）

**BACKGROUND:** There is a considerable discrepancy between the reported incidences of awareness under anesthesia in children (0.2%–2.7%). In this prospective, observational, cohort study we evaluated 1) the incidence of awareness during general anesthesia in

children across three settings, 2) factors contributing to awareness, and 3) short-term psychological effects of awareness.

**METHODS:** Children (aged 5–15 yr) who underwent general anesthesia were included, and all perioperative data including anesthetic drugs were collected prospectively. Children were interviewed three times postoperatively using a semistructured questionnaire. All cases of possible or probable awareness were discussed with the child's care providers to confirm or refute the memories. Internal consensus among investigators across sites was reached, and these cases and a random selection of others were reviewed by three external reviewers. For the purpose of this study, possible/probable awareness was defined as cases with agreement between the internal consensus and at least two of the three external reviewers.

**RESULTS:** One thousand seven hundred eighty-four children completed at least one interview. Thirty-two cases were coded as possible or probable awareness by at least one entity (i.e., either the internal consensus or one of the external reviewers). Fourteen of these cases met the definition for possible/probable awareness, making the incidence of awareness 0.8%. Six of the 14 children with awareness (43%) remembered feeling scared during their surgery and three (21%) reported hurting. Two children in this group (14%) said they would feel worse if they had to have surgery again, which was not significantly different from reports of children with no recall (15%). None of the children with awareness required psychological follow-up. Endoscopic procedures were associated with a higher risk for awareness (relative risk = 4.5 [confidence interval 1.5–13.6]).

**CONCLUSIONS:** Although 0.8% of children experienced possible/probable awareness in this study, none experienced short-term psychological distress.

### 5-HT<sub>3A</sub> 和 5-HT<sub>3B</sub> 受體基因(*HTR3A* and *HTR3B*)內的變異會影響術後嘔吐的發生嗎?

#### Do Variations in the 5-HT<sub>3A</sub> and 5-HT<sub>3B</sub> Serotonin Receptor Genes (*HTR3A* and *HTR3B*) Influence the Occurrence of Postoperative Vomiting?

Henrik Rueffert, MD, Volker Thieme, MD, Jan Wallenborn, MD, Nicole Lemnitz, BA, Astrid Bergmann, BA, Kristina Rudlof, MD, Markus Wehner, MD, Derk Olthoff, MD, and Udo X. Kaisers, MD

From the Department of Anesthesiology and Intensive Care Medicine, Medical Faculty, University of Leipzig, Leipzig, Germany.

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**背景：**術後噁心和嘔吐是全麻令人不適的副作用。除了已知的危險因素（女性、非吸煙者、既往史以及阿片類）外，5-羥色胺受體系統對噁心嘔吐發展的遺傳性影響已經被反復提及。因此，在本試驗性研究中，我們探討了5-羥色胺受體亞單位A和B的基因(*HTR3A* 和 *HTR3B*)的遺傳性變型。

**方法：**我們採納了95例全麻後發生術後嘔吐(POV)的患者以及94例對照病例。在提取DNA後，篩查整個*TR3A*和*HTR3B*編碼區、5'側翼區以及外顯子/內含子分界的遺傳性變型。經鑒定的遺傳性變型與POV之間的相關性用邏輯回歸來判定。

**結果：**我們鑒定了 *HTR3A* 基因中的 16 個和 *HTR3B* 基因中的 19 個不同的變型。通過採用一個多變數邏輯回歸模型（其中也包括經典的危險因素），*HTR3A* 變型 t c1377A>G 有明顯較高的 POV 風險（比值比 [OR] 2.972; 95% 可信限 [CI] 1.466–6.021;  $P = 0.003$ ）。而 *HTR3B* 變型 c5+201\_+202delCA (OR 0.421; 95% CI 0.257–0.69;  $P = 0.001$ ) 和 c6-137C>T (OR 0.034; 95% CI 0.003–0.332;  $P = 0.004$ ) 有較低的 POV 風險。不過，所有明顯的遺傳性變型都位於各自基因的非編碼區。

**結論：***HTR3A* 和 *HTR3B* 基因中的遺傳性變型似乎與 POV 發展的不同危險相關。在 POV 多因素起源中它們的影響有多強，還需要在具有適當樣本數的額外研究中去探討。

（黃施偉 譯，馬皓琳 李士通 校）

**BACKGROUND:** Postoperative nausea and vomiting are unpleasant side effects of general anesthesia. Besides known risk factors (female gender, nonsmoker, history, and opioids), a genetic influence of the serotonin receptor system on the development of nausea and vomiting has repeatedly been proposed. In this pilot study, we therefore investigated the genes of the serotonin receptor subunits A and B (*HTR3A* and *HTR3B*) for genetic variants.

**METHODS:** We included 95 patients who had suffered from postoperative vomiting (POV) after general anesthesia and 94 control patients. After DNA isolation, the entire *HTR3A* and *HTR3B* coding regions, the 5' flanking regions, and exon/intron boundaries were screened for genetic variants. Correlation of identified genetic variants with POV was determined by logistic regression.

**RESULTS:** We identified 16 different variants in the *HTR3A* gene and 19 in the *HTR3B* gene. By using a multivariate logistic regression model that also included classical risk factors, the *HTR3A* variant c1377A>G was associated with a significantly higher risk (odds ratio [OR] 2.972; 95% confidence interval [CI] 1.466–6.021;  $P = 0.003$ ) and the *HTR3B* variants c5+201\_+202delCA (OR 0.421; 95% CI 0.257–0.69;  $P = 0.001$ ) and c6-137C>T (OR 0.034; 95% CI 0.003–0.332;  $P = 0.004$ ) were associated with a lower risk for POV. However, all significant genetic variants were located in noncoding regions of their gene.

**CONCLUSIONS:** Genetic variations in the *HTR3A* and *HTR3B* gene seem to be associated with the individual risk of developing POV. How strong their influence is within the multifactorial genesis of POV needs to be investigated in additional studies with an appropriate sample size.

### 圍手術期靜脈注射利多卡因對術後疼痛和免疫功能的影響

#### The Effect of Perioperative Intravenous Lidocaine on Postoperative Pain and Immune Function

Israel Z. Yardeni, MD\*, Benzion Beilin, MD\*, Eduard Mayburd, MD\*, Yuri Levinson, MD\*, and Hanna Bessler, PhD†

From the \*Department of Anesthesiology and †Research Institute, Rabin Medical Center, Hasharon Hospital, Sackler School of Medicine, Tel Aviv University, Israel.

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**背景：**手術相關性組織損傷導致傷害感受和炎症反應，伴隨促炎細胞因數生成增加。這些細胞因數可以誘導外周和中樞致敏，導致疼痛增強。最近一種常用的局部麻醉藥利多卡因被介紹作為圍術期疼痛管理技術的一部分。除了它的鎮痛效應，利多卡因還具有抗炎特性，能夠減少促炎細胞因數的向上調節。我們的研究集中在切皮前和術中靜脈注射利多卡因對術後疼痛的強度和免疫反應的影響。

**方法：**65 位擇期行經腹子宮切除的女性病人（ASA 評級 I-II 級）被收入本隨機、安慰劑對照研究。處理組的 32 個病人在手術開始前 20 分鐘起接受靜脈注射利多卡因，而對照組（33 例病人）接受等量的鹽水注入。兩組在術後均接受病人自控硬膜外鎮痛。在手術前、術後 24、48 和 72 小時分別取得血樣檢測白介素-1（IL-1）受體拮抗劑 IL-1ra 和 IL-6 的活體內細胞因數產生，以及淋巴細胞對植物凝血素-M 的促絲裂反應。使用 10cm 視覺類比評分對靜息和咳嗽後的疼痛強度進行評級。

**結果：**利多卡因+病人自控硬膜外鎮痛組病人術後 4 小時和 8 小時的疼痛較輕（視覺類比評分靜息時 4/3.7，咳嗽中 5.3/5，而安慰劑組靜息時 4.5/4.2 咳嗽中 6.1/5.3）。IL-1ra 和 IL-6 的活體內生成沒有顯著減少，但是對照組淋巴細胞對植物凝血素-M 的增殖反應維持得更好。

**結論：**本發現表明術前和術中靜脈注射利多卡因能改善術後即刻疼痛管理並減少收縮誘導的免疫學改變。

（顏濤譯，馬皓琳 李士通 校）

**BACKGROUND:** Surgery-associated tissue injury leads to nociception and inflammatory reaction, accompanied by increased production of proinflammatory cytokines. These cytokines can induce peripheral and central sensitization, leading to pain augmentation. Recently, a frequently used local anesthetic, lidocaine, was introduced as a part of a perioperative pain management technique. In addition to its analgesic effects, lidocaine has an antiinflammatory property, decreasing the upregulation of proinflammatory cytokines. We focused on the effects of preincisional and intraoperative IV lidocaine on pain intensity and immune reactivity in the postoperative period.

**METHODS:** Sixty-five female patients (ASA physical status I-II) scheduled for transabdominal hysterectomy were recruited to this randomized, placebo-controlled study. Thirty-two patients in the treatment group received IV lidocaine starting 20 min before surgery, whereas the control group (33 patients) received a matched saline infusion. Both groups received patient-controlled epidural analgesia during the postoperative period. Blood samples were collected before, 24, 48, and 72 h after surgery to measure *ex vivo* cytokine production of interleukin (IL)-1 receptor antagonist (IL-1ra) and IL-6, as well lymphocyte mitogenic response to phytohemagglutinin-M. A 10-cm visual analog scale was used to assess pain intensity at rest and after coughing.

**RESULTS:** Patients in the lidocaine + patient-controlled epidural analgesia group experienced less severe postoperative pain in the first 4 and 8 h after surgery (visual analog scale 4/3.7 at rest and 5.3/5 during coughing versus 4.5/4.2 and 6.1/5.3, respectively, in the placebo group). There was significantly less *ex vivo* production of IL-1ra and IL-6, whereas the lymphocyte proliferation response to phytohemagglutinin-M was better maintained than in the control group.

**CONCLUSION:** The present findings indicate that preoperative and intraoperative IV lidocaine improves immediate postoperative pain management and reduces surgery-induced immune alterations.

### ATP 敏感鉀通道在丙泊酚預處理腎缺血再灌注細胞模型中的作用

#### The Role of $K_{ATP}$ Channels on Propofol Preconditioning in a Cellular Model of Renal Ischemia-Reperfusion

Alexandra R. Assad, MD, PhD<sup>\*</sup>, João Marcos A. Delou, MS<sup>†</sup>, Leonardo M. Fonseca, MS<sup>†</sup>, Nivaldo R. Villela, PhD<sup>\*</sup>, José Hamilton M. Nascimento, PhD<sup>†</sup>, Nubia Verçosa, PhD<sup>\*</sup>, Anibal Gil Lopes, PhD<sup>†</sup>, and Márcia A.M. Capella, PhD<sup>†</sup>

From the <sup>\*</sup>Programa de Pós-Graduação em Cirurgia Geral—Setor de Anestesiologia, Hospital Universitario Clementino Fraga Filho, and <sup>†</sup>Instituto de Biofísica Carlos Chagas Filho, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil.

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**背景：**已有研究顯示丙泊酚（2,6-二異丙基苯酚）保護多種器官（包括腎）免於缺血再灌注（I-R）誘導的損傷。雖然丙泊酚可以影響非腎臟組織的三磷酸腺苷敏感鉀（ $K_{ATP}$ ）通道，但其保護腎臟細胞免除這種損傷的機制尚不清楚。在本研究中，我們探討了丙泊酚是否可以通過  $K_{ATP}$  通道這一通路，產生預處理保護腎臟的作用。

**方法：**先可逆地耗盡 LLC-PK1 細胞內 ATP（抗黴素 A），再給予細胞所需物質使其恢復 ATP 儲存，用這個模型在體外類比腎的缺血再灌注。使用溴化二甲噻唑-二苯四唑和台盼藍染料排除試驗分析評定細胞生存率。用鈣磷脂結合蛋白 V-異硫氰酸酯螢光素染色和流式細胞技術和免疫螢光技術觀察細胞的凋亡。在不同時間段開始丙泊酚處理：缺血前 1 或 24、只在缺血時或只在再灌注時。為研究丙泊酚保護作用的機制，在一些丙泊酚預處理實驗中使用了特異性的  $K_{ATP}$  抑制劑和激動劑。

**結果：**缺血再灌注 1 或 24 小時前或恢復的過程中，給予丙泊酚均能降低 LLC-PK1 細胞缺血再灌注損傷，但只在缺血時給予丙泊酚並沒有這種保護作用。丙泊酚預處理明顯可以保護 LLC-PK1 細胞免除缺血再灌注誘發的凋亡。丙泊酚的保護作用可以被格列本脲（一種肌漿 ATP 依賴的鉀通道阻滯劑）消除，被 5-hydroxidecanoic acid（一種線粒體 ATP 依賴的鉀通道阻滯劑）降低，但二氮嗪（一種選擇性 ATP 敏感鉀通道開放劑）對其沒有影響。

**結論：**丙泊酚保護細胞免於缺血再灌注引發的細胞凋亡。這種保護作用可能是由於丙泊酚預處理，而且至少部分是由  $K_{ATP}$  通道介導。

（張瑩譯 馬皓琳 李士通校）

**BACKGROUND:** Propofol (2,6-diisopropylphenol) has been shown to protect several organs, including the kidneys, from ischemia-reperfusion (I-R)-induced injury. Although propofol affects adenosine triphosphate-sensitive potassium ( $K_{ATP}$ ) channels in nonrenal tissues, it is still not clear by which mechanisms propofol protects renal cells from such damage. In this study, we investigated whether propofol induces renal preconditioning through renal  $K_{ATP}$  channels.



**METHODS:** A reversible ATP depletion (antimycin A) followed by restoration of substrate supply in LLC-PK1 cells was used as an *in vitro* model of renal I-R. Cell viability was assessed by dimethylthiazol-diphenyltetrazol bromide and trypan blue dye exclusion test assays. Apoptosis was evaluated by annexin V–fluorescein isothiocyanate staining by flow cytometry and immunofluorescence. Propofol treatments were initiated at various time intervals: 1 or 24 h before ischemia, only during ischemia, or only during reperfusion. To evaluate the mechanisms of propofol protection, specific  $K_{ATP}$  channel inhibitors or activators were used in some experiments during propofol pretreatment.

**RESULTS:** Propofol attenuated I-R injury on LLC-PK1 cells when present either 1 or 24 h before initiated I-R, and also during the recovery period, but not when added only during ischemia. Propofol pretreatment significantly protected LLC-PK1 from I-R-induced apoptosis. The protective effect of propofol was prevented by glibenclamide (a sarcolemmal ATP-dependent  $K^+$  channel blocker) and decreased by 5-hydroxidecanoic acid (a mitochondrial ATP-dependent  $K^+$  channel blocker), but it was not modified by diazoxide (a selective opener of ATP-sensitive  $K^+$  channel).

**CONCLUSION:** Propofol protected cells against apoptosis induced by I-R. This protection was probably due to a preconditioning effect of propofol and was, at least in part, mediated by  $K_{ATP}$  channels.

### 揮發性麻醉劑弱氧化應激所致的谷氨酸轉運蛋白-3 活性降低

#### Volatile Anesthetics Attenuate Oxidative Stress-Reduced Activity of Glutamate Transporter Type 3

Soon-Ae Lee, MD, PhD<sup>\*†</sup>, Jun-Gwon Choi, MD<sup>†</sup>, and Zhiyi Zuo, MD, PhD<sup>\*</sup>

From the \*Department of Anesthesiology, University of Virginia, Charlottesville, Virginia; †Department of Anesthesiology and Pain Medicine, Center for Liver Cancer, National Cancer Center; and ‡Department of Anesthesia and Pain Medicine, Ilsan Dongguk University Hospital, Goyang-si, Gyeonggi-Do, Republic of Korea.

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**背景：**揮發性麻醉劑增加谷氨酸轉運蛋白-3（也稱為興奮性氨基酸轉運蛋白-3，EAAT3，一種主要的興奮型氨基酸）的活性。除了谷氨酸外，EAAT3 也能夠攝取 L-半胱氨酸（合成谷胱甘肽的限速底物）。我們在先前的研究中發現氧化性應激能抑制谷氨酸誘導的 EAAT3 活性。本研究中我們力圖確定氧化應激能否降低 L-半胱氨酸誘導的 EAAT3 活性，以及這種降低能否被揮發性麻醉劑減弱。

**方法：**把大鼠 EAAT3 表達於爪蟾卵母細胞上。採用雙電極電壓鉗技術記錄 L-半胱氨酸及 L-谷氨酸誘導的膜電流。因為通過 EAAT 轉運底物是電源性的，所以電流峰值能夠定量反映所轉運的底物的總量。

**結果：**卵母細胞暴露於 5 mM 器官氧化劑叔丁基過氧化氫中 10 min，L-半胱氨酸誘導的 EAAT3 的  $V_{max}$  降低，但對  $K_m$  沒有影響。叔丁基過氧化氫能降低 L-半胱氨酸及 L-谷氨酸誘導的 EAAT3 活性，濃度 1% 至 3% 的揮發性麻醉劑異氟烷、七氟烷和地氟烷均能減弱這種降低。



**結論：**我們的研究結果顯示，氧化應激時揮發性麻醉劑能保護 EAAT3 轉運 L-半胱氨酸及 L-谷氨酸的功能，這可能是揮發性麻醉劑神經保護作用的一個機制。

(江繼宏 譯 馬皓琳 李士通 校)

**BACKGROUND:** Volatile anesthetics enhance the activity of glutamate transporter Type 3 (also called excitatory amino acid transporter Type 3, EAAT3), the major neuronal EAAT. In addition to glutamate, EAAT3 can also uptake l-cysteine, the rate-limiting substrate for the synthesis of glutathione. Our previous study showed that oxidative stress inhibited glutamate-induced EAAT3 activity. We determined whether oxidative stress would reduce l-cysteine-induced EAAT3 activity and whether this reduction would be attenuated by volatile anesthetics.

**METHODS:** Rat EAAT3 was expressed in *Xenopus* oocytes. l-glutamate- and l-cysteine-induced membrane currents were recorded using the 2-electrode voltage clamp technique. The peak current was quantified to reflect the amount of transported substrates because transport of substrates via EAATs is electrogenic.

**RESULTS:** Exposure of oocytes to 5 mM *tert*-butyl hydroperoxide, an organic oxidant, for 10 min reduced the  $V_{max}$ , but did not affect the  $K_m$ , of EAAT3 for l-cysteine. The volatile anesthetics isoflurane, sevoflurane, and desflurane at concentrations from 1% to 3% attenuated the *tert*-butyl hydroperoxide-reduced EAAT3 activity for l-glutamate and l-cysteine.

**CONCLUSIONS:** Our results suggest that volatile anesthetics preserve EAAT3 function to transport l-glutamate and l-cysteine under oxidative stress, which may be a mechanism for the neuroprotective effects of volatile anesthetics.

### 使用兩種中心實驗室分析儀在酸鹼診斷中 Stewart 參數的可重現性

#### The Reproducibility of Stewart Parameters for Acid-Base Diagnosis Using Two Central Laboratory Analyzers

Ba-Vinh Nguyen, MD<sup>\*†</sup>, Jean-Louis Vincent, MD, PhD<sup>†</sup>, Jean Baptiste Hamm, MD<sup>†</sup>, Jean-Hervé Abalain, PhD<sup>‡</sup>, Jean-Luc Carre, MD, PhD<sup>§</sup>, Emmanuel Nowak, PhD<sup>||</sup>, Mehdi Ould Ahmed, MD<sup>\*</sup>, Charles C. Arvieux, MD, PhD<sup>†</sup>, and Gildas Gueret, MD, PhD<sup>†</sup>

From the \*Department of Anesthesiology and Critical Care, Clermont Tonnerre Military Hospital, Brest, France; †Department of Anesthesiology and Critical Care, CHU, Brest, France; ‡Department of Intensive Care, Erasme Hospital, Université Libre de Bruxelles, Brussels, Belgium; §Department of Biochemistry and Molecular Biology, CHU, Brest, France; and ||INSERM CIC 0502, CHU, Brest, France.

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**背景：**酸鹼紊亂能用 Stewart-Fencl 方法解釋，包括計算表面強離子差

(SIDapp)、有效強離子差 (SIDeff) 和強離子間隙 (SIG)。這些計算需要檢測多個變數。我們假設因為檢測值的差異，用不同分析儀計算出的 SID 和 SIG 是不可重現的。

**方法：**這項前瞻性觀察性研究在生化實驗室進行，我們在超過 3 個月期間使用兩台自動化血液化學分析儀 LX20 (Beckman) 和 Modular (Roche) 連續分析了 179 份常規血樣。比較從兩台分析儀檢測和計算的參數。

**結果：**雖然測得值的相關性是滿意的，但是兩台分析儀間得出的計算值一致性限值有很大的差異 (SID<sub>app</sub>: 9.6 mEq/L, SID<sub>eff</sub>: 6.4 mEq/L, SIG: 11.7 mEq/L)，且分析儀間的相關性很弱 (SID<sub>app</sub>:  $r^2 = 0.54$ ，SIG:  $r^2 = 0.12$ )。

**結論：**Stewart-Fencel 方法解釋酸鹼狀態的結果由於使用不同的分析儀而不同。這種差異可能有重要的臨床和研究意義。

(王宏 譯，馬皓琳，李士通 校)

**BACKGROUND:** Acid-base derangements can be interpreted using the Stewart-Fencel approach, which includes calculation of the apparent strong ion difference (SID<sub>app</sub>), the effective SID (SID<sub>eff</sub>), and the strong ion gap (SIG). These calculations require the measurement of several variables. We hypothesized that the SID and SIG calculated by different analyzers would not be reproducible because of variability in the measured values.

**METHODS:** In this prospective observational study conducted in a biochemistry laboratory, we analyzed 179 routine blood samples from consecutive patients over a 3-mo period using two automated blood chemistry analyzers, the LX20 (Beckman) and the Modular (Roche). Measured and calculated parameters from the two analyzers were compared.

**RESULTS:** Although the correlation between measured values was satisfactory, there were large differences in the limits of agreement for calculated values (SID<sub>app</sub>: 9.6 mEq/L, SID<sub>eff</sub>: 6.4 mEq/L, and SIG: 11.7 mEq/L) and a weak correlation (SID<sub>app</sub>:  $r^2 = 0.54$  and SIG:  $r^2 = 0.12$ ) between the analyzers.

**CONCLUSIONS:** The results of the Stewart-Fencel approach for interpretation of acid-base status can vary according to the analyzer used. These differences may have important clinical and research implications..

### 在伊朗心臟手術患者中使用的物質及其對短期預後的影響

#### Substance Use Among Iranian Cardiac Surgery Patients and Its Effects on Short-Term Outcome

Mitra Azarasa, MD, Rasoul Azarfarin, MD, Ali Changizi, MD, and Azin Alizadehasl, MD

From the Cardiovascular Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

Anesth Analg 2009; 109:1553-1559

**背景：**我們評估伊朗西北部進行冠脈搭橋和瓣膜手術患者中使用物質的流行率。我們評估物質依賴和濫用的患者的術後併發症和住院死亡率。

**方法：**在這個前瞻性、觀察性研究中，我們對 600 名伊朗西北部三等教學醫院患者進行了術前訪視。根據 DSM-IV 標準來定義物質濫用和依賴。因為物質（煙草、

阿片和酒精) 依賴和濫用的術後併發症和住院死亡率與對照組沒有使用這些物質的對照患者進行比較。

**結果：**在 600 名患者中，吸煙的比例為 42.1% (以往吸煙的比例 26.0% 和現時吸煙者的比例 16.1%)，阿片使用的比例 12.0% (阿片濫用的比例 7.0% 和阿片依賴的比例 5.0%)，和酒精的飲用比例 8.1% (酒精濫用的比例 7.4% 和酒精依賴的比例 0.7%)。男性吸煙的比例 58.9% 而女性的比例 7.6% ( $P = 0.001$ )。術後心臟併發症在現時吸煙者(21.5%)和既往吸煙者(20.5%)與對照組(28.2%)之間沒有顯著性差異。肺部併發症在現時吸煙者(24.7%)和既往吸煙者(17.9%)與對照組(26.8%)之間也沒有顯著性差異( $P = 0.196$ )。然而在男性患者中，肺部併發症比例在現時吸煙者中高於對照組( $P = 0.044$ )。在阿片和酒精依賴和濫用者中，術後併發症與對照組沒有顯著性差異(所有  $P$  值  $>0.05$ )。這些物質的使用並沒有增加患者的住院死亡率。

**結論：**在伊朗西北部的心臟手術患者與西方國家相比，吸煙者的比例相對較低(女性非常低)，酒精的使用也是這樣。然而，阿片使用是那裡的兩倍。我們發現在男性吸煙者中的肺部併發症的比例較高，但是術後心肺併發症和住院死亡率在濫用阿片和酒精的患者中並沒有增加。

(唐亮 譯 馬皓琳 李士通 校)

**BACKGROUND:** We assessed the prevalence of substance use among patients undergoing coronary artery bypass graft and valve surgery in northwest Iran. We evaluated the postoperative complications and in-hospital mortality of patients with substance dependence and abuse.

**METHODS:** In this prospective, observational study, we interviewed 600 patients during the preoperative visit in a tertiary referral educational hospital in northwest Iran. The definition of substance abuse and dependence was according to DSM-IV criteria. Postoperative complications and in-hospital mortality of patients with substance (cigarette, opium, and alcohol) dependence and abuse were compared with those in control patients who did not use these substances.

**RESULTS:** In 600 studied patients, the prevalence of cigarette smoking was 42.1% (ex-smokers 26.0% and current smokers 16.1%), prevalence of opium use was 12.0% (opium abuse 7.0% and opium dependence 5.0%), and alcohol consumption was 8.1% (alcohol abuse 7.4% and alcohol dependence 0.7%). The prevalence of cigarette smoking was 58.9% in men and 7.6% in women ( $P = 0.001$ ). Postoperative cardiac complications in current smokers (21.5%) and ex-smokers (20.5%) were not significantly different from the control group (28.2%). Also, pulmonary complications were not different in current smokers (24.7%) and ex-smokers (17.9%) from the control group (26.8%;  $P = 0.196$ ). However, in men, pulmonary complications in current smokers were more prevalent than in the control group ( $P = 0.044$ ). In opium and alcohol dependents and abusers, postoperative complications were not statistically different from the control group (all  $P$  values  $>0.05$ ). No increase was observed regarding in-hospital mortality in patients with substance use.

**CONCLUSIONS:** In cardiac surgery patients in northwest Iran, the prevalence of cigarette smoking is relatively low (very low in women), as is alcohol use, compared with Western countries; however, opium use is twice as prevalent. We found higher pulmonary complication rates in men who smoked, but no increase in postoperative

cardiopulmonary complications and in-hospital mortality rates in patients who abused opium and consumed alcohol.

## 實驗性內毒素血症性休克中變力性藥物的運用：第二部分，比較左西孟旦和多巴酚丁胺

### Inotropic Support During Experimental Endotoxemic Shock: Part II. A Comparison of Levosimendan with Dobutamine

Dorij Cunha-Goncalves, MD<sup>\*</sup>, Valeria Perez-de-Sa, MD, PhD<sup>†</sup>, Anders Larsson, MD, PhD<sup>†</sup>, Johan Thörne, MD, PhD<sup>§</sup>, and Sten Blomquist, MD, PhD<sup>\*</sup>

From the <sup>\*</sup>Departments of Cardiothoracic Anesthesia and Intensive Care, and <sup>†</sup>Pediatric Anesthesia and Intensive Care, Lund University Hospital, Sweden; <sup>‡</sup>Department of Anesthesia and Critical Care, Uppsala University Hospital, Sweden; and <sup>§</sup>Department of Surgery, Helsingborg Hospital, Sweden.

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**背景：**我們比較了左西孟旦聯合去甲腎上腺素和多巴酚丁胺聯合去甲腎上腺素在內毒素血症性休克早期中維持全身和肝臟灌注的效果。

**方法：**將二十只小豬 ( $26.8 \pm 0.5$  kg) 連接流量探測器和導管來監測全身和區域性灌注情況，實驗方法與我們同事在同本期刊發表的論文中一致。兩隻小豬被剔除了，因為它們發生了外科合併症。用間接的熱量測定法測得氧耗量( $VO_2$ )。在儀器啟動後 1 小時，給予內毒素輸注 (大腸桿菌脂多糖  $2 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$ ) 300 分鐘。開始給予內毒素後 60 分鐘，對小豬進行了液體復蘇治療 (20 mL/kg 的右旋糖苷 70 灌注了)；120 分鐘時把這些小豬隨機分成三組 (每組六隻)：左西孟旦組 ( $25\text{--}50 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$ )、多巴酚丁胺組 ( $10\text{--}20 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ) 和對照組。當前兩組中小豬的平均動脈壓  $\leq 65$  mm Hg 時再加入去甲腎上腺素 ( $0.5\text{--}2 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ )。給予晶體液來維持充盈壓  $\geq$  基準值。數據被隨機分成兩個亞群：前組 (0-120 分鐘，所有動物) 和後組 (120-300 分鐘，三組)，並用方差分析進行分析。 $P < 0.05$  為差異具有統計學意義。

**結果：**在 120 分鐘時，心輸出量增加了 15% ( $P < 0.001$ )，全身血管阻力降低了 30% ( $P < 0.001$ )，平均動脈壓降低了 12.5% ( $P = 0.004$ )；肝動脈、腸系膜上動脈和門靜脈的血流量分別增加了 100% ( $P = 0.004$ )，60% ( $P < 0.001$ ) 和 20% ( $P < 0.001$ )。在 120-300 分鐘內對照組心輸出量和全身氧輸送量降低了 50% ( $P < 0.05$ )，左西孟旦組沒有變化，多巴酚丁胺組增高了 60% ( $P = 0.05$ )。對照組平均動脈壓 ( $P = 0.043$ ) 和氧耗量 ( $P = 0.001$ ) 降低了 20%。在 300 分鐘時門靜脈血流量對照組下降了 50%，左西孟旦組下降了 30% ( $P < 0.001$ )，因此多巴酚丁胺組較高 ( $P = 0.003$ )。肝臟和腸氧輸送量在左西孟旦組分別下降了 50% 和 30% ( $P < 0.001$ )，對照組分別降低了 70% 和 45% ( $P < 0.05$ )，因此區域性的氧輸送量在多巴酚丁胺組較高 ( $P < 0.05$ )。在多巴酚丁胺組，維持混合靜脈血和肝靜脈血氧飽和度；且肝靜脈血氧飽和度的值比其他兩組高 ( $P < 0.05$ )。雖然多巴酚丁胺組的動脈、門靜脈和肝靜脈乳酸鹽濃度沒有變化，但是左西孟旦組的這三個濃度值增加了兩倍 ( $P$  分別 = 0.020、0.020 和 0.034)。

**結論：**在液體復蘇的內毒素血症小豬中，無論左西孟旦聯合去甲腎上腺素還是多巴酚丁胺聯合去甲腎上腺素都能維持全身血流量、氧輸送量和氧耗量。但是只有多巴酚丁胺和去甲腎上腺素的組合可以維持門靜脈血流，從而保護了內臟和肝臟氧自身調節，穩定了乳酸濃度。

（姜旭暉譯，馬皓琳 李士通校）

**BACKGROUND:** We compared the association of levosimendan or dobutamine with norepinephrine for the maintenance of systemic and hepatosplanchnic perfusion during early endotoxemic shock.

**METHODS:** Twenty anesthetized pigs ( $26.8 \pm 0.5$  kg) were instrumented with flow probes and catheters to monitor systemic and regional perfusion as described in our companion article in this issue of the journal. Two animals were excluded because of surgical complications. Oxygen consumption ( $\text{VO}_2$ ) was measured by indirect calorimetry. Starting 1 h after instrumentation, an endotoxin infusion (*Escherichia coli* lipopolysaccharide,  $2 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$ ) was administered for 300 min. Sixty minutes after the start of endotoxin, the animals were fluid resuscitated (20 mL/kg dextran 70); at 120 min, they were randomized into three groups of six animals each: levosimendan ( $25\text{--}50 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$ ), dobutamine ( $10\text{--}20 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ), and control. In the first two groups, norepinephrine ( $0.5\text{--}2 \mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ) was added when mean arterial blood pressure (MAP)  $\leq 65$  mm Hg. Crystalloids were given to maintain filling pressures  $\geq$  baseline. The data were divided into two subsets: before (0–120 min, all animals) and after (120–300 min, three groups) randomization, and analyzed by analysis of variance.  $P < 0.05$  was considered significant.

**RESULTS:** At 120 min, cardiac output was 15% higher ( $P < 0.001$ ), systemic vascular resistance was 30% lower ( $P < 0.001$ ), and MAP decreased 12.5% ( $P = 0.004$ ); blood flow in the hepatic artery, superior mesenteric artery, and portal vein had increased by 100% ( $P = 0.004$ ), 60% ( $P < 0.001$ ), and 20% ( $P < 0.001$ ), respectively. Between 120 and 300 min, cardiac output and systemic oxygen delivery decreased 50% in control animals ( $P < 0.05$ ), remained unchanged in the levosimendan group, and increased 60% with dobutamine ( $P = 0.05$ ). MAP ( $P = 0.043$ ) and  $\text{VO}_2$  ( $P = 0.001$ ) decreased 20% in the control group. Portal vein flow decreased in the control (50%) and levosimendan (30%) groups ( $P < 0.001$ ) and was therefore higher in the dobutamine group ( $P = 0.003$ ) at 300 min. Hepatic and gut oxygen deliveries decreased in the levosimendan (50%, and 30%, respectively,  $P < 0.001$ ) and control groups (70% and 45%, respectively,  $P < 0.05$ ); thus, regional oxygen deliveries were greater in the dobutamine group ( $P < 0.05$ ). In this group, mixed venous and hepatic vein oxygen saturation were maintained; the latter variable was higher than in the other groups ( $P < 0.05$ ). Although unchanged with dobutamine, arterial ( $P = 0.020$ ), portal ( $P = 0.020$ ), and hepatic vein ( $P = 0.034$ ) lactate concentrations increased twofold with levosimendan.

**CONCLUSION:** In volume-resuscitated endotoxemic pigs, the association of either levosimendan or dobutamine with norepinephrine preserved systemic blood flow, oxygen delivery, and  $\text{VO}_2$ . However, only dobutamine-norepinephrine maintained portal blood flow, which was associated with preservation of splanchnic and hepatic oxygen homeostasis and stable lactate concentrations.

## 小劑量重比重布比卡因用於剖宮產腰硬聯合麻醉的隨機比較

### A Randomized Comparison of Low Doses of Hyperbaric Bupivacaine in Combined Spinal-Epidural Anesthesia for Cesarean Delivery

Serene Leo, MMED, Ban Leong Sng, MMED, FANZCA, Yvonne Lim, MMED, and Alex T. H. Sia, MMED

From the Department of Women's Anaesthesia, Kandang Kerbau Women's and Children's Hospital, Singapore.

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**背景：**我們這項研究的目的是在於研究鞘內 7mg、8mg 和 9mg 重比重布比卡因用於剖宮產腰硬聯合麻醉的阻滯特徵，從而闡明產生足夠感覺神經阻滯用於手術的基礎上，可以使低血壓、高位神經阻滯發生率及術中硬膜外添加量的需要最低化的最佳劑量。

**方法：**60 位選擇性剖宮產婦隨機分至三組。7、8、9 組產婦分別接受 7、8、9mg 重比重布比卡因鞘內注射。3 組產婦均在腰硬聯合麻醉開始時接受 100ug 嗎啡鞘內注射和羥乙基澱粉 15ml/kg 靜脈注射。無痛平面到達 T4 時手術開始。由一位不知情的醫生監測患者的阻滯特點和副作用。我們的初期結果為最高感覺神經阻滯平面。

**結果：**3 組患者在最高感覺神經阻滯平面間存在差異（7 組：中位數 T2（四分位距 T2-T3）；8 組：中位數 T2（T1-T2）；9 組：中位數 T1（C8-T2）； $P = 0.02$ ）。然而，三組間到達 T4 所需的時間相似。需要血管收縮藥的低血壓發生率三組間存在差異（7 組 30%，8 組 55%，9 組 70%； $P = 0.04$ ）。沒有患者發生阻滯不全。三組間新生兒情況無差異。

**結論：**最低劑量的重比重布比卡因（7mg）可以提供起效快且有效的剖宮產麻醉，並且比 8mg 和 9mg 組低血壓的發生率低。然而，由於麻醉持續時間較短，這僅在有硬膜外導管可以持續加藥加強阻滯的基礎上才可行。

（黃佳佳 譯 馬皓琳 李士通校）

**BACKGROUND:** The aim of our study was to investigate the block characteristics of intrathecal hyperbaric bupivacaine 7, 8, or 9 mg administered during combined spinal-epidural anesthesia for cesarean delivery and to elucidate the dose that produces adequate sensory blockade for surgery while minimizing the incidence of hypotension, high neuroblockade, and the need for intraoperative epidural supplementation.

**METHODS:** Sixty women presenting for elective cesarean delivery were randomly assigned to one of the 3 groups. Group 7 received intrathecal hyperbaric bupivacaine 7 mg, Group 8 received 8 mg, and Group 9 received 9 mg. Women in all 3 groups received intrathecal morphine 100 µg and IV hydroxyethyl starch 15 mL/kg at the time of initiation of combined spinal-epidural anesthesia. Surgery began when a sensory level of T4 was achieved. Patients were monitored for block characteristics and side effects by a blinded observer. Our primary outcome was the maximum cephalad sensory block height.



**RESULTS:** There was a difference in the maximum extent of cephalad sensory block among groups (Group 7: median T2 [interquartile range T2–T3]; Group 8: median T2 [T1–T2]; Group 9: median T1 [C8–T2];  $P = 0.02$ ). However, the time taken to reach T4 was similar in all 3 groups. The incidence of hypotension requiring vasopressors was different among groups (30% in Group 7, 55% in Group 8, and 70% in Group 9;  $P = 0.04$ ). No patient had inadequate anesthesia. Neonatal outcomes were similar in all 3 groups.

**CONCLUSION:** The lowest dose of hyperbaric bupivacaine (7 mg) provided equally rapid onset and effective anesthesia for cesarean delivery while reducing the incidence of hypotension compared with 8 and 9 mg. However, because of its shorter duration of anesthesia, it may be feasible only when the block can be reinforced using a functional epidural catheter.

### 子宮切除後應用加巴噴丁和氯胺酮用於急性和慢性疼痛的比較

#### A Comparison of Gabapentin and Ketamine in Acute and Chronic Pain After Hysterectomy

Huseyin Sen, MD<sup>\*</sup>, Ali Sizlan, MD<sup>†</sup>, Omer Yanarates, MD<sup>†</sup>, Hakan Emirkadi, MD<sup>\*</sup>, Sezai Ozkan, MD<sup>\*</sup>, Guner Dagli, MD<sup>\*</sup>, and Alparslan Turan, MD<sup>‡§</sup>

From the <sup>\*</sup>Department of Anesthesiology and Reanimation, Gülhane Military Medical Academy, Haydarpaşa Training Hospital, Üsküdar, İstanbul; <sup>†</sup>Department of Anesthesia and Reanimation, Gülhane Military Medical Academy, Ankara, Turkey; <sup>‡</sup>Department of Anesthesiology and Perioperative Medicine, University of Louisville, Louisville, Kentucky; and <sup>§</sup>Department of Outcomes Research, The Cleveland Clinic, Cleveland, Ohio.

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**背景：**加巴噴丁和氯胺酮是常用的鎮痛輔助藥，用於改善圍手術期疼痛管理。我們設計了這一雙盲、安慰劑對照的實驗，以驗證和比較應用加巴噴丁和氯胺酮對擇期全子宮切除術後的早期和慢性疼痛的預防作用。

**方法：**60 名行腹式全子宮切除術的病人隨機分入以下 3 組中的一組：對照組，口服安慰劑膠囊，推注加輸注生理鹽水；氯胺酮組，口服安慰劑膠囊，並在劃皮前靜脈推注氯胺酮 0.3 mg/kg，並以 0.05 mg·kg<sup>-1</sup>·h<sup>-1</sup> 的速度輸注氯胺酮直至手術結束；加巴噴丁組，口服加巴噴丁 1.2g，推注和輸注生理鹽水。麻醉技術是標準的，術後評價包括口訴言辭評分法評價疼痛和鎮靜、靜脈應用嗎啡、恢復品質的評價、腸功能恢復、正常活動恢復時間以及病人對疼痛管理的滿意度。手術後 1、3 和 6 個月，評價病人的慢性術後疼痛。

**結果：**相比於氯胺酮和對照組，加巴噴丁組的術後疼痛評分顯著較低，相比於對照組，兩個處理組病人自控術後鎮痛的嗎啡需要量明顯降低 ( $P < 0.001$ )。與對照組相比，氯胺酮組和加巴噴丁組總的病人自控鎮痛嗎啡用量分別減少 35% 和 42% ( $P < 0.001$ )。與對照組相比，氯胺酮組和加巴噴丁組病人對疼痛管理的滿意度顯著改善 ( $P < 0.001$ )。與氯胺酮組和對照組相比，加巴噴丁組切皮疼痛的發生率以及 1、3、6 月隨訪的相關疼痛評分顯著較低 ( $P < 0.001$ )。



**結論：**加巴噴丁和氯胺酮在改善早期疼痛管理和減少阿片類鎮痛藥的使用方面是相似的，但是，加巴噴丁更能預防術後 6 個月內的慢性疼痛。

（黃麗娜 譯 馬皓琳 李士通 校）

**BACKGROUND:** Gabapentin and ketamine are popular analgesic adjuvants for improving perioperative pain management. We designed this double-blind, placebo-controlled study to test and compare the preventive effects of perioperative ketamine and gabapentin on early and chronic pain after elective hysterectomy.

**METHODS:** Sixty patients undergoing abdominal hysterectomy were randomly assigned to 1 of the following 3 groups: control group received oral placebo capsules and bolus plus infusion of saline; ketamine group received oral placebo capsules and, before incision, 0.3 mg/kg IV bolus and 0.05 mg·kg<sup>-1</sup>·h<sup>-1</sup> infusion of ketamine until the end of surgery; and gabapentin group received oral gabapentin 1.2 g and bolus plus infusion of saline. The anesthetic technique was standardized, and the postoperative assessments included verbal rating scales for pain and sedation, IV morphine usage, quality of recovery assessment, recovery of bowel function, resumption of normal activities, and patient satisfaction with their pain management. Patients were questioned at 1, 3, and 6 mo after surgery for chronic postoperative pain.

**RESULTS:** Postoperative pain scores were significantly lower in the gabapentin group compared with the ketamine and control groups, and patient-controlled analgesia morphine use was significantly reduced in both treatment groups (versus control group) ( $P < 0.001$ ). Total patient-controlled analgesia morphine use was decreased by 35% and 42% in the ketamine and gabapentin groups, respectively, compared with the control group ( $P < 0.001$ ). Patient satisfaction with pain treatment was significantly improved in the ketamine and gabapentin groups compared with the control group ( $P < 0.001$ ). The incidence of incisional pain and related pain scores at the 1-, 3-, and 6-mo follow-up were significantly lower in the gabapentin group compared with the ketamine and control groups ( $P < 0.001$ ).

**CONCLUSION:** Gabapentin and ketamine are similar in improving early pain control and in decreasing opioid consumption; however, gabapentin also prevented chronic pain in the first 6 postoperative months.

### 胸段脊髓阻滯對有害電刺激大鼠後爪誘發的腰段脊髓 Fos 表達的影響

#### The Effect of a Thoracic Spinal Block on Fos Expression in the Lumbar Spinal Cord of the Rat Induced by a Noxious Electrical Stimulus at the Hindpaw

Janneke L. P. Giele, MSc<sup>\*</sup>, Anneke F. Nabers, MSc<sup>†</sup>, Jan G. Veening, PhD<sup>†</sup>, Jan van Egmond, PhD<sup>\*</sup>, and Kris C. P. Vissers, MD, PhD, FIPP<sup>\*</sup>

From the Departments of \*Anesthesiology, Pain and Palliative Medicine, and †Anatomy, Radboud University Nijmegen Medical Center, Nijmegen, The Netherlands.

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**背景：** 假設電刺激大鼠後爪誘發的腰段脊髓 Fos 表達，可能源于三個來源：受有害刺激直接感覺輸入、脊髓局部交互作用和脊髓上區域調製信號輸入。本實驗研究目的是通過消除脊髓上輸入來區分這些來源。

**方法：**因此，雄性 Wister 大鼠中胸段水準鞘內置管，注入局麻藥（布比卡因）產生脊髓阻滯作用。該胸段脊髓阻滯完全抑制傷害性刺激誘發的撤退反射。對脊髓 L4 水準所有板層中的 Fos 免疫反應性（Fos-IR）進行定量。

**結果：**傷害性刺激產生的同側脊髓背側角中的 Fos-IR 廣泛且強烈增加，主要集中在 I、II 和 V 板層。胸段脊髓阻滯明顯增加 V 板層中的 Fos-IR 的數量，但是對 I 和 II 板層中的 Fos-IR 沒有明顯影響。

**結論：**脊髓 V 板層 Fos-IR 增加可能是由於來自腦的疼痛調製下行機制被阻斷所造成的。目前已知的下行痛覺調控系統是 5-羥色胺系統，受水管周灰質調控。這個系統抑制淺表板層神經元。另一個非 5-羥色胺系統起源于前頂蓋前核。後者對脊髓淺表板層中的神經元有易化作用，而對 V 板層中的神經元有抑制作用。我們得出結論，這兩個系統可能均參與本模型中觀察到的外周傷害性刺激的作用。

（楊斌 譯 馬皓琳 李士通 校）

**BACKGROUND:** Fos expression in the lumbar spinal cord, resulting from a noxious electrical stimulus at the hindpaw, is hypothesized to originate from three sources: direct sensory input of the noxious stimulus, local interactions in the spinal cord, and input of modulating signals from supraspinal regions. Our aim in this study was to discriminate among these sources by eliminating the supraspinal input.

**METHODS:** Therefore, a spinal block was administered in male Wistar rats by administering a local anesthetic (bupivacaine) through an intrathecal catheter at the mid-thoracic level. This thoracic spinal block completely suppressed the noxious stimulation-induced withdrawal reflex that is normally elicited by electrical stimulus. Fos immunoreactivity (Fos-IR) was quantified in all laminae of the L4 segment of the spinal cord.

**RESULTS:** Noxious stimulation resulted in a general and strong increase in Fos-IR in the ipsilateral dorsal horn, mainly in Laminae I, II, and V. Thoracic spinal block caused a remarkable increase in the amount of Fos-IR in Lamina V, but had no significant effect on the Fos-IR in Laminae I and II.

**CONCLUSIONS:** The increase in Fos-IR in Lamina V may have resulted from the interruption of a pain-modulating descending mechanism from the brain. A known modulating descending mechanism is the serotonergic system, controlled by the periaqueductal gray. This system inhibits the neurons in the superficial laminae. Another nonserotonergic system originates in the anterior pretectal nucleus. The latter facilitates neurons in the superficial laminae, while neurons in Lamina V are inhibited. We conclude that both systems are probably involved in the observed effects of the peripheral noxious stimulation given in the present model.

**極低量納洛酮加入利多卡因或利多卡因-芬太尼合液延長腋路臂叢神經阻滯時間**

**An Ultra-Low Dose of Naloxone Added to Lidocaine or Lidocaine-Fentanyl Mixture Prolongs Axillary Brachial Plexus Blockade**

Ali Movafegh, MD, Behrang Nouralishahi, MD, Mustafa Sadeghi, MD, and Omid Nabavian, MD

From the Department of Anesthesiology and Critical Care, Dr. Ali Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran.

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**背景：**在這個前瞻、隨機、雙盲試驗中，評價極低量納絡酮加入利多卡因和芬太尼合液在腋路臂叢神經阻滯的起效時間和持續時間。

**方法：**112 例擇期在腋路臂叢神經阻滯下行前臂手術的患者，隨機分四組，分別接受 34mL1.5%利多卡因加 3mL 等張生理鹽水（對照組， $n = 28$ ）、34mL1.5%利多卡因加 2mL 芬太尼（100  $\mu\text{g}$ ）和 1mL 生理鹽水（芬太尼組， $n = 28$ ）、34mL1.5%利多卡因加 2mL 生理鹽水和 100 ng 納絡酮（納絡酮組， $n = 28$ ）或 34mL1.5%利多卡因加 2mL 芬太尼（100  $\mu\text{g}$ ）和 100ng(1 mL) 納絡酮（納絡酮加芬太尼組， $n = 28$ ）。所有患者都應用一種多重刺激技術。實施神經阻滯後，在 5、15 和 30 min 時記錄橈神經、正中神經、肌皮神經和尺神經的感覺和運動阻滯情況。感覺和運動神經阻滯的起效時間定義為最後一次注射分別到針刺反應完全消失和完全癱瘓的時間。感覺和運動神經阻滯的持續時間被認為是完全阻滯到術後出現首次疼痛和運動功能完全恢復的時間。

**結果：**納絡酮組（感覺起效時間  $15 \pm 3$ ，運動起效時間  $21 \pm 4$ ）和納絡酮加芬太尼組感覺和運動阻滯起效時間比對照組和芬太尼組長（感覺起效時間對照組  $10 \pm 3$  min，芬太尼組  $10 \pm 4$  min，納絡酮加芬太尼組  $17 \pm 3$  min，運動起效時間對照組  $15 \pm 5$  min，芬太尼組  $14 \pm 7$  min，納絡酮加芬太尼組  $17.3 \pm 3.4$  min， $P < 0.001$ ）。到術後首次疼痛時間和運動阻滯持續時間納絡酮組( $92 \pm 10$  和  $115 \pm 10$  min)和納絡酮加芬太尼組( $98 \pm 12$  和  $122 \pm 16$  min)明顯比對照組( $68 \pm 7$  和  $89 \pm 11$  min)和芬太尼組( $68 \pm 11$  和  $90 \pm 12$  min)延長( $P < 0.001$ )。術後首次疼痛時間納絡酮和納絡酮加芬太尼組明顯比對照組或芬太尼組長( $P < 0.001$ )。

**結論：**1.5%利多卡因中加入極低量納絡酮（不管是否加芬太尼）在腋路臂叢阻滯中都會延長到術後出現首次疼痛的時間和運動阻滯時間，但同時也延長起效時間。

（朱 慧譯 馬皓琳 李士通校）

**INTRODUCTION:** In this prospective, randomized, double-blind study, we evaluated the effect of an ultra-low dose of naloxone added to lidocaine and fentanyl mixture on the onset and duration of axillary brachial plexus block.

**METHODS:** One hundred twelve patients scheduled for elective forearm surgery under axillary brachial plexus block were randomly allocated to receive 34 mL lidocaine 1.5% with 3 mL of isotonic saline chloride (control group,  $n = 28$ ), 34 mL lidocaine 1.5% with 2 mL (100  $\mu\text{g}$ ) of fentanyl and 1 mL of isotonic saline chloride (fentanyl group,  $n = 28$ ), 34 mL lidocaine 1.5% with 2 mL saline chloride and 100 ng (1 mL) naloxone (naloxone group,  $n = 28$ ), or 34 mL lidocaine 1.5% with 2 mL (100  $\mu\text{g}$ ) of fentanyl and 100 ng (1 mL) naloxone (naloxone + fentanyl group,  $n = 28$ ). A multiple stimulation technique was used in all patients. After performing the block, sensory and motor blockades of radial, median, musculocutaneous, and ulnar nerves were recorded at 5, 15, and 30 min. The onset time of the sensory and motor blockades was defined as the time between the last injection and the total abolition of the pinprick response and complete paralysis, respectively. The duration of sensory and motor blocks was considered as the time

interval between the complete block and the first postoperative pain and complete recovery of motor functions.

**RESULTS:** Sensory and motor onset times were longer in the naloxone (sensory onset time:  $15 \pm 3$ , and motor onset time:  $21 \pm 4$ ) and naloxone + fentanyl group than control or fentanyl groups (sensory onset time:  $10 \pm 3$  min in control group,  $10 \pm 4$  min in fentanyl group, and  $17 \pm 3$  min in naloxone + fentanyl group, motor onset time:  $15 \pm 5$  min in control group,  $14 \pm 7$  min in fentanyl group, and  $17.3 \pm 3.4$  min in naloxone + fentanyl group) ( $P < 0.001$ ). The duration of time to first postoperative pain and motor blockade was significantly longer in the naloxone ( $92 \pm 10$  and  $115 \pm 10$  min) and naloxone + fentanyl groups ( $98 \pm 12$  and  $122 \pm 16$  min) than control ( $68 \pm 7$  and  $89 \pm 11$  min) and fentanyl groups ( $68 \pm 11$  and  $90 \pm 12$  min) ( $P < 0.001$ ). The time to first postoperative pain was significantly longer in the naloxone and naloxone + fentanyl groups than in the control or fentanyl groups ( $P < 0.001$ ).

**CONCLUSIONS:** The addition of an ultra-low dose of naloxone to lidocaine 1.5% solution with or without fentanyl solution in axillary brachial plexus block prolongs the time to first postoperative pain and motor blockade but also lengthens the onset time.

### 大鼠心肌再灌注期間緊急美沙酮治療通過 $\delta$ -阿片受體減少急性心肌梗塞的面積 Acute Methadone Treatment Reduces Myocardial Infarct Size via the $\delta$ -Opioid Receptor in Rats During Reperfusion

Eric R. Gross, MD, PhD<sup>\*</sup>, Anna K. Hsu, BS<sup>†</sup>, and Garrett J. Gross, PhD<sup>†</sup>

From the <sup>\*</sup>Department of Anesthesiology, Stanford University, Stanford, California; and <sup>†</sup>Department of Pharmacology and Toxicology, Medical College of Wisconsin, Milwaukee, Wisconsin.

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**背景：**美沙酮是阿片受體的激動劑，常用於急慢性疼痛的處理。本文作者擬確定美沙酮是否和嗎啡一樣，減少心肌梗塞面積並具有劑量依賴性，機制是否通過 $\delta$ 受體媒介。另外作者擬驗證心肌梗塞面積的減少是否因美沙酮的給予時機和誘發缺血的時程不同而不一。

**方法：**外科操作完成後，雄性 SD 大鼠分成三組，第一組分成幾小組，每一小組在缺血 30min 前分別給予美沙酮(0.03–3 mg/kg)或嗎啡 0.03–3 mg/kg)或生理鹽水（安慰劑），第一組動物在給予美沙酮(0.3 mg/kg)、嗎啡(0.3 mg/kg)、安慰劑之前可以給予 $\delta$ 受體的拮抗劑 naltrindole (5 mg/kg)，第二組分成幾小組，每一小組在再灌注 5min 之前或 10 秒鐘之後給予美沙酮(0.3 mg/kg)，這兩組的動物通過左降支動脈閉塞致心肌缺血 30min，然後再灌注 2 小時，第三組動物再灌注前 5min 給予安慰劑，美沙酮(0.03–3 mg/kg)，嗎啡 (0.03–3 mg/kg) 並接受通過左降支動脈閉塞致心肌缺血 45min 然後再灌注 2 小時，心肌梗塞的面積通過心肌組織氯化三苯染色法評估並以危險區域百分比（平均值 $\pm$ 標準差）來計算。

**結果：**在心肌梗塞之前給予美沙酮和嗎啡可以減少心肌梗塞面積，最有效的劑量為 0.3 mg/kg（美沙酮  $46\% \pm 1\%$ ,  $P < 0.001$ ，嗎啡  $47\% \pm 1\%$ ,  $P < 0.001$ ，安慰劑， $61\% \pm 1\%$ ，）。Naltrindole(5 mg/kg)阻斷美沙酮(0.3 mg/kg)和嗎啡(0.3 mg/kg)產生的心肌保護作用(naltrindole + 美沙酮,  $58\% \pm 1\%$ ，與美沙酮比  $P < 0.001$ ; naltrindole +

嗎啡,  $58 \pm 1\%$ , 與嗎啡比  $P < 0.001$ )。在再灌注 5 min 之前給予美沙酮(0.3 mg/kg)可以減少心肌梗塞的面積但 10 秒鐘後給藥無此效應。30min 缺血組和 45min 缺血組相比, 心肌缺血面積並沒有顯著的差異。缺血時間延長至 45min 將削弱美沙酮和嗎啡引起的心肌梗塞面積減少的作用。

**結論:** 上述研究表明: 美沙酮和嗎啡可以產生相似的通過 $\delta$ 受體媒介的減少心肌梗塞面積的效應並依賴缺血時程。

(劉世文 譯 陳傑 校)

**BACKGROUND:** Methadone is an opioid agonist often given to manage acute and chronic pain. We sought to determine whether methadone compared with morphine dose dependently reduces myocardial infarct size (IS) and whether the mechanism is  $\delta$ -opioid receptor mediated. Furthermore, we examined whether myocardial IS reduction varies with the timing of methadone administration or duration of induced ischemia.

**METHODS:** After surgical instrumentation, we divided male Sprague-Dawley rats into 3 sets. The first set was divided into groups, which received methadone (0.03–3 mg/kg), morphine (0.03–3 mg/kg), or water (placebo) 30 min before ischemia. Some animals of the first set also received the  $\delta$ -opioid antagonist naltrindole (5 mg/kg) before methadone (0.3 mg/kg), morphine (0.3 mg/kg), or placebo administration. The second set of animals was divided into groups that received methadone (0.3 mg/kg) 5 min before reperfusion or 10 s after reperfusion. These 2 sets of animals were subjected to 30 min of myocardial ischemia by left anterior descending coronary artery occlusion and then 2 h of reperfusion. The third set of animals received placebo, methadone (0.3 mg/kg), or morphine (0.3 mg/kg) 5 min before reperfusion and were subjected to 45 min of ischemia by left anterior descending coronary artery occlusion with 2 h of reperfusion. Myocardial IS was assessed by staining myocardial tissue with triphenyltetrazolium chloride and expressed as a percentage of the area at risk (mean  $\pm$  sem).

**RESULTS:** Methadone or morphine administered before ischemia reduced myocardial IS. The greatest effect was achieved at a dose of 0.3 mg/kg (methadone,  $46\% \pm 1\%$ ,  $P < 0.001$  and morphine,  $47\% \pm 1\%$ ,  $P < 0.001$  versus placebo,  $61\% \pm 1\%$ , respectively). Naltrindole (5 mg/kg) blocked methadone-induced (0.3 mg/kg) and morphine-induced (0.3 mg/kg) cardioprotection (naltrindole + methadone,  $58\% \pm 1\%$ ,  $P < 0.001$  versus methadone; and naltrindole + morphine,  $58\% \pm 1\%$ ,  $P < 0.001$  versus morphine). Methadone (0.3 mg/kg) reduced myocardial IS when given 5 min before reperfusion ( $46\% \pm 1\%$ ,  $P < 0.001$  versus placebo) but not 10 s after reperfusion ( $60\% \pm 1\%$ ,  $P = 0.675$  versus placebo). No significant myocardial IS differences were seen for placebo when comparing the 45-min ischemia group ( $64\% \pm 1\%$ ) with the 30-min ischemia group ( $60\% \pm 1\%$ ,  $P = 0.069$ ). The longer ischemia time of 45 min abrogated methadone-induced IS reduction ( $64\% \pm 2\%$ ,  $P = 0.867$  versus 45-min ischemia placebo group) and morphine-induced IS reduction ( $65\% \pm 1\%$ ,  $P = 0.836$  versus 45-min ischemia placebo group).

**CONCLUSIONS:** These findings demonstrate that methadone and morphine produce similar myocardial IS-sparing effects that are  $\delta$ -opioid receptor mediated and that are dependent on the duration of myocardial ischemia.

智障兒童的雙頻指數 (BIS) 值偏低

Lower Bispectral Index Values in Children Who Are Intellectually Disabled

Abraham J. Valkenburg, MSc<sup>\*†</sup>, Tom G. de Leeuw, MD<sup>†</sup>, Dick Tibboel, MD, PhD<sup>\*</sup>, and Frank Weber, MD<sup>†</sup>

From the Departments of \*Pediatric Surgery, and †Anesthesiology, Erasmus University Medical Center–Sophia Children’s Hospital, Rotterdam, The Netherlands.

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**背景：**很少有針對智障兒童的 BIS 監測資料。癲癇樣腦電活動，潛在的病理基礎，以及抗驚厥/解痙治療等都可影響 BIS 的監測。作者這一研究目的是比較智障兒童與對照組 4 個不同麻醉階段的 BIS 值；第二個目的是探討智障兒童和對照組兒童在意識和無意識時的 BIS 值的差異。

**方法：**18 名智障兒童和 35 名對照組兒童，年齡 2-13 歲間。在整個手術過程中監測 BIS 值，重要事件和常規生命體征。用 BIS 值來區分有意識和無意識的狀態，以特徵工作曲線表示。

**結果：**智障兒童組 BIS 值中位數（四分位數範圍）各期均顯著低於正常兒童組，分別為清醒期（72 [48-77] vs 97 [84-98]， $P < 0.001$ ）；麻醉維持期（34 [21-45] vs 43 [33-52]， $P = 0.02$ ）；復蘇期（59 [36-68] vs 73 [64-78]， $P = 0.009$ ）。清醒狀態時兩組間 BIS 特徵曲線不同。智障兒童組，BIS 值區別有意識和無意識狀態，低於正常臨界值 28 個百分點。

**結論：**作者建議麻醉醫生應注意智障兒童的 BIS 值可能較低，應避免在無意中誤判智障兒童的意識狀態。新的多中心研究必須規範化評估智障患者有無意識的最佳方法和確認他們的智力殘疾的具體病因。

（葉樂譯 陳傑校）

**BACKGROUND:** Very few data are available on the use of bispectral index (BIS) monitoring in children who are intellectually disabled. Epileptiform electroencephalogram activity, underlying cerebral pathology, or anticonvulsant/spasmolytic therapy might influence BIS monitoring.

Our aim in this exploratory study was to first compare BIS values at 4 different stages of anesthesia between intellectually disabled children and controls. Our second aim was to investigate the discriminative properties of BIS between consciousness and unconsciousness for intellectually disabled children and for controls.

**METHODS:** Eighteen intellectually disabled children and 35 control children, aged 2–13 yr, were included. BIS values, landmark events, and standard monitoring values of vital functions were recorded throughout the whole procedure. The performance of BIS in distinguishing between a conscious and unconscious state was assessed from receiver operating characteristic curves.

**RESULTS:** Median (interquartile range) BIS values for the intellectually disabled group were significantly lower than those for controls in the awake state (72 [48–77] vs 97 [84–98],  $P < 0.001$ ), during stable intraoperative anesthesia (34 [21–45] vs 43 [33–52],  $P = 0.02$ ), and during return of consciousness (59 [36–68] vs 73 [64–78],  $P = 0.009$ ). The discriminative properties of the BIS monitor for the state of consciousness were comparable between the 2 groups according to the receiver operating characteristic curves. Nevertheless, the optimal cutoff BIS value for discrimination between conscious and unconscious state was 28 points lower for the intellectually disabled group.



**CONCLUSIONS:** We advise anesthesiologists to be alert to possible lower BIS values in intellectually disabled children. There is a risk that they will inadvertently misinterpret the state of consciousness in intellectually disabled children. New multicenter studies must find the optimal manner of evaluating (un)consciousness in intellectually disabled patients with documented and confirmed specific etiologies of their intellectual disability.

**腸鏡檢查鎮靜後的早期認知功能障礙：異丙酚加咪唑安定和/或芬太尼的影響**

**Early Cognitive Impairment After Sedation for Colonoscopy: The Effect of Adding Midazolam and/or Fentanyl to Propofol**

Usha Padmanabhan, MBBS, FANZCA<sup>\*</sup>, Kate Leslie, MBBS, MD, MEpi, FANZCA<sup>\*†</sup>, Audrey SingYi Eer<sup>\*</sup>, Paul Maruff, PhD<sup>‡§</sup>, and Brendan S. Silbert, MBBS, FANZCA<sup>||¶</sup>

From the <sup>\*</sup>Department of Anaesthesia and Pain Management, Royal Melbourne Hospital;

<sup>†</sup>Department of Pharmacology, University of Melbourne; <sup>‡</sup>CogState Ltd; <sup>§</sup>Centre for

Neuroscience, University of Melbourne; <sup>||</sup>Centre for Anaesthesia and Cognitive Function,

Department of Anaesthesia, St. Vincent's Hospital; and <sup>¶</sup>Department of Surgery,

University of Melbourne, Melbourne, Australia.

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**背景：**，產生最少的認知功能障礙和腸鏡檢查過程中提供最佳操作條件的鎮靜藥物的組合尚未確定。作者試圖確定擇期門診結腸鏡檢查單獨使用異丙酚的認知功能損害是否低於異丙酚聯合咪唑安定和/或芬太尼麻醉後對認知功能的影響。

**方法：**擇期門診結腸鏡成人患者200例隨機接受單獨使用異丙酚；異丙酚加咪唑安定；或異丙酚-咪唑安定-芬太尼或異丙酚-芬太尼四種方法之一的鎮靜。認知功能的基礎值測定採用電腦化 CogState 測驗(Cogstate™, Melbourne, Australia)，然後鎮靜。在程式中，記錄鎮靜藥物劑量，鎮靜深度（通過雙頻指數和觀察員的警覺性評估/鎮靜評分），併發症以及可處理的資料。詢問患者被立即從鎮靜中叫醒的認知情況，並且在患者出院再次進行認知測試。記錄恢復的時間，恢復的品質和護理的滿意度。

**結果：**在異丙酚加輔助藥組，84例接受芬太尼50μg（25-100）（中位數[範圍]）和57例接受咪唑安定2mg（0.5-10）。病人出院時認知功能不如基準水準。該兩組在出院和基礎之間認知功能的變化組間無顯著差異。出院時，18.5%的患者認知功能受損的程度相當於血液中含有0.05%酒精濃度。異丙酚加咪唑安定和/或芬太尼比單獨使用異丙酚能產生較好的手術鎮靜條件，並與較短的程式時間相關聯。兩組在恢復時間，喚醒、夢境，恢復品質和病人對護理的滿意度也相似。應用咪唑安定大於2mg 是出院時出現認知功能障礙的預測因數。

**結論：**在擇期的門診腸鏡手術時，患者出院時普遍存在認知功能障礙。異丙酚加咪唑安定和/或芬太尼鎮靜並沒有比單獨使用異丙酚產生更嚴重的認知功能障礙。此外，添加輔助藥使結腸鏡檢查更輕鬆且不增加併發症的發生率或是延長早期恢復時間。

（張磊 譯 陳傑 校）

**BACKGROUND:** The sedative drug combination that produces minimal cognitive impairment and optimal operating conditions during colonoscopy has not been determined. We sought to determine if the use of propofol alone results in less cognitive



impairment at discharge than the use of propofol plus midazolam and/or fentanyl in patients presenting for elective outpatient colonoscopy.

**METHODS:** Two hundred adult patients presenting for elective outpatient colonoscopy were randomized to receive propofol alone or propofol plus midazolam, and/or fentanyl for IV sedation. Baseline cognitive function was measured using the computerized CogState test battery (Cogstate™, Melbourne, Australia) before sedation. During the procedure, sedative drug doses, depth of sedation (via the bispectral index and observer's assessment of alertness/sedation score), complications, and treatability were recorded. Patients were interviewed about recall immediately after emerging from sedation, and cognitive testing was repeated at hospital discharge. Recovery times, quality of recovery, and satisfaction with care were also recorded.

**RESULTS:** In the propofol plus adjuvants group, 84 patients received fentanyl 50 µg (25–100) (median [range]) and 57 patients received midazolam 2 mg (0.5–10). Patients' cognitive function at discharge was worse than their performance at baseline. However, the changes in cognitive function between discharge and baseline were not significantly different between the two groups. At discharge, 18.5% of patients were cognitively impaired to an extent equivalent to a blood-alcohol concentration of 0.05%. Sedation with propofol plus midazolam and/or fentanyl produced better operating conditions than sedation with propofol alone and was associated with shorter procedure times. Recovery times, recall, dreaming, quality of recovery, and patient satisfaction with care were similar between the groups. Administration of >2 mg of midazolam was a predictor of impaired cognitive function at discharge.

**CONCLUSIONS:** Significant cognitive impairment was common at discharge from elective outpatient colonoscopy. However, the addition of midazolam and/or fentanyl to propofol sedation did not result in more cognitive impairment than the use of propofol alone. Furthermore, the use of adjuvants improved the ease of colonoscopy without increasing the rate of complications or prolonging early recovery times..

最大限度預測概率  $P_K$  作為可變半參數方法來估計血漿效應室平衡率  $ke_0$

**Maximizing Prediction Probability  $P_K$  as an Alternative Semiparametric Approach to Estimate the Plasma Effect-Site Equilibration Rate Constant  $k_{e0}$**

Richard K. Ellerkmann, MD, DESA<sup>\*</sup>, Joergen Bruhn, MD<sup>†</sup>, Martin Soehle, MD, DESA<sup>\*</sup>, Michael Kehrer, Cand. Med.<sup>\*</sup>, Andreas Hoeft, MD<sup>\*</sup>, and Sascha Kreuer, MD<sup>‡</sup>

From the <sup>\*</sup>Department of Anesthesiology and Intensive Care Medicine, University of

Bonn, Bonn, Germany; <sup>†</sup>Department of Anesthesia, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands; and <sup>‡</sup>Department of Anesthesiology and Intensive Care Medicine, University of Saarland, Homburg/Saar, Saarland, Germany. Anesth Analg 2009 109: 1470-1478.

**背景：** $k_{e0}$  值是確定血漿或呼氣末和效應室之間（例如，大腦）藥物濃度平衡的一級反應速率常數。參數和半參數方法已被用於估算單獨的  $k_{e0}$  值和描述藥物回應曲線。在這項研究中，作者引進新的半參數方法，通過最大限度預測概率  $P_K$  計算異氟醚，七氟醚，地氟醚的  $ke_0$  值。

**方法：**擇期 45 例前列腺癌根治術的資料進行分析。腰椎硬膜外置管後，病人接受瑞芬太尼和異丙酚進行麻醉誘導。此後，開始硬膜外鎮痛，異氟醚，七氟醚或地氟

醚（各 15 例）用以維持無意識狀態。至少 45 分鐘後，呼氣末濃度呈現 0.5 到 2 個 MAC 值之間的不同值。通過優化預測概率  $P_K$  ( $P_K$ -based  $k_{e0}$ ) 或最小化在該區間的滯後回線 (area-based  $k_{e0}$ ) 估計每個患者單獨的  $k_{e0}$  值。資料取平均值±標準差。

**結果：**兩種半參數方法產生類似的  $k_{e0}$  值：異氟醚為  $0.18 \pm 0.06 \text{ min}^{-1}$  (PK based) 和  $0.15 \pm 0.04 \text{ min}^{-1}$  (area based)，七氟醚為  $0.17 \pm 0.08 \text{ min}^{-1}$  (PK based) 和  $0.16 \pm 0.11 \text{ min}^{-1}$  (area based)。地氟醚的  $k_{e0}$  值則是 PK based:  $0.30 \pm 0.17 \text{ min}^{-1}$ ; area based:  $0.32 \pm 0.25 \text{ min}^{-1}$ ，均顯著高於異氟醚和七氟醚。

**結論：**最大限度預測概率  $P_K$  估計  $k_{e0}$  值似乎是一有前途的方法，可作一研究的基礎。

(舒慧剛 譯 陳傑 校)

**BACKGROUND:** The  $k_{e0}$  value is the first order rate constant determining the equilibration of drugs between plasma or end-tidal concentration and effect-site (e.g., brain) concentration. Parametric and semiparametric approaches have been used for estimating individual  $k_{e0}$  values and describing the drug-response curve. In this study, we introduce a new semiparametric approach calculating  $k_{e0}$  values for isoflurane, sevoflurane, and desflurane by maximizing the prediction probability  $P_K$ .

**METHODS:** Data from 45 patients scheduled for a radical prostatectomy were analyzed. After lumbar epidural catheterization, patients received remifentanyl and propofol solely for induction of anesthesia. Thereafter, epidural analgesia was initiated, and isoflurane, sevoflurane, or desflurane (15 patients each) was added to maintain unconsciousness. At least 45 min later, end-tidal concentrations were varied between 0.5 and 2 minimum alveolar anesthetic concentration. We estimated an individual  $k_{e0}$  value for each patient by optimizing the prediction probability  $P_K$  ( $P_K$ -based  $k_{e0}$ ) or by minimizing the area within the hysteresis loop (area-based  $k_{e0}$ ). Data are mean  $\pm$  sd.

**RESULTS:** Both semiparametric approaches led to comparable  $k_{e0}$  values with  $0.18 \pm 0.06 \text{ min}^{-1}$  ( $P_K$  based) and  $0.15 \pm 0.04 \text{ min}^{-1}$  (area based) for isoflurane and  $0.17 \pm 0.08 \text{ min}^{-1}$  ( $P_K$  based) and  $0.16 \pm 0.11 \text{ min}^{-1}$  (area based) for sevoflurane.  $k_{e0}$  values for desflurane ( $P_K$  based:  $0.30 \pm 0.17 \text{ min}^{-1}$ ; area based:  $0.32 \pm 0.25 \text{ min}^{-1}$ ) were significantly higher than for isoflurane and sevoflurane.

**CONCLUSION:** Maximizing the prediction probability  $P_K$  for estimating  $k_{e0}$  seems to be a promising method that researchers could use on an exploratory basis.

#### 丙泊酚通過蛋白激酶 C 依賴的通路抑制腦缺血/複氧的星形膠質細胞模型中水通道-4 的表達

#### Propofol Inhibits Aquaporin 4 Expression Through a Protein Kinase C-Dependent Pathway in an Astrocyte Model of Cerebral Ischemia/Reoxygenation

Sheng-Mei Zhu, MD, PhD, Xiao-Xing Xiong, MS, Yue-Ying Zheng, MS, and Cai-Fei Pan, MS

From the Department of Anesthesiology, The First Affiliated Hospital, School of Medicine, Zhejiang University, Hangzhou, People's Republic of China.

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**背景：**水通道-4 (AQP4) 在維持中樞神經系統的水平衡方面發揮關鍵作用，其功能障礙可能導致腦水腫。以前的研究表明異丙酚可能通過防止腦水腫來參與神經保

護。在這項研究中，作者驗證異丙酚對腦水腫的影響並評估其在人工培養的缺氧缺糖（ODG）的大鼠星形膠質細胞模型中的神經保護作用。並評估異丙酚對 AQP4 的表達和蛋白激酶 C（PKC）的可能作用途徑。

**方法：**皮層星形膠質細胞暴露於缺氧缺糖的無氧密室裡。星形膠質細胞經過 6h 的 OGD 暴露後再進行 24h 的再氧合。在該模型的 OGD 階段給予異丙酚。通過光學顯微鏡評估細胞形態學變化。星形膠質細胞的生存能力的評估是通過測量 3 - (4,5 - 甲基偶氮基) - 2,5 - 聯苯四唑的溴吸光度（光密度值）和受損的星形膠質細胞釋放的乳酸脫氫酶的百分比。通過 Western blot 分析法評估 AQP4 的表達。為了研究異丙酚對 AQP4 的表達可能的影響機制，培養的星形膠質細胞用 PKC 啟動劑進行預處理 24h，即用 12 - O 型佛波 13 酯分別對異丙酚治療前/OGD 6 小時/複氧 24 每小時進行預處理。

**結果：**通過 3 - (4,5 - 甲基偶氮基) - 2,5 - 聯苯四唑溴測試發現星形膠質細胞活力在 OGD 約 4 h 後開始下降，暴露 6 小時後下降至 60%。當 OGD 6 小時後再進行 24 小時的在氧合，細胞的活力進一步下降。在暴露 6 小時後 AQP4 的表達減弱，但進入 24 小時的複氧過程中，它的表達卻發生逆轉，超過了基準水準。乳酸脫氫酶測試表明異丙酚能劑量依賴性降低細胞的死亡 ( $P < 0.05$ )，10 $\mu$ M 的異丙酚能顯著的降低經過 6 小時 OGD 和 24 小時再氧合處理的星形膠質細胞中 AQP4 的表達水準 ( $P < 0.01$ )。在 OGD 前長期（24 小時）的 12 - O 型佛波 13 酯預處理大大扭轉了異丙酚對 AQP4 的表達水準的影響 ( $P < 0.01$ )。

**結論：**在 OGD 情況下，異丙酚具有神經保護作用並且能下調在 OGD/複氧情況下培養的大鼠星形膠質細胞模型中 AQP4 的表達水準。PKC 途徑的啟動可能會妨礙異丙酚的作用。

（丁俊雲 譯 陳傑 校）

**BACKGROUND:** Aquaporin 4 (AQP4) plays a key role in maintaining water balance in the central nervous system, and its dysfunction may lead to brain edema. Previous studies have suggested that propofol may be involved in neuroprotection by preventing brain edema. In this study, we examined the effects of propofol on edema and assessed its neuroprotective actions in an oxygen and glucose deprivation (OGD) model of cultured rat astrocytes. We assessed the effects of propofol on AQP4 expression and the possible role of the protein kinase C (PKC) pathway on this effect.

**METHODS:** Neocortical astrocytes were exposed to OGD in an anaerobic chamber. After 6 h of OGD exposure, astrocytes were subsequently subjected to 24 h of reoxygenation. Propofol was added during the OGD phase of the model. Cell morphology was assessed by light microscopy. Astrocyte viability was assessed by measuring 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide absorbency (optical density value) and the percentage of lactate dehydrogenase released by injured astrocytes. AQP4 expression was evaluated with Western blot analysis. To investigate the possible mechanism of propofol's effects on AQP4 expression, cultured astrocytes were pretreated for 24 h with the PKC activator, 12-O-tetradecanoylphorbol 13-acetate, before the propofol treatment/OGD 6 h/reoxygenation 24 h.

**RESULTS:** We found by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide testing that astrocyte viability began to decrease after about 4 h of OGD exposure and decreased to 60% after 6 h of OGD. When 6 h of OGD was followed by 24 h of

reoxygenation, cell viability was further decreased. AQP4 expression was attenuated after 6 h of OGD exposure but was reversed and exceeded baseline levels after 24 h of reoxygenation. Propofol dose-dependently reduced cell death assessed by lactate dehydrogenase test ( $P < 0.05$ ), and 10  $\mu\text{M}$  propofol significantly down-regulated AQP4 expression in astrocytes after 6 h of OGD followed by 24 h of reoxygenation ( $P < 0.01$ ). Prolonged (24 h) pretreatment with the phorbol ester, 12-O-tetradecanoylphorbol 13-acetate before OGD significantly reversed the effect of propofol on AQP4 expression ( $P < 0.01$ ).

**CONCLUSION:** Propofol, administered during OGD, provided neuroprotective effects and down-regulated AQP4 expression in the OGD/reoxygenation model of cultured rat astrocytes. Activation of the PKC pathway may block the effects of propofol.

### 肥胖病人在腹腔鏡減肥手術過程中預防肺不張的通氣策略

#### Intraoperative Ventilatory Strategies for Prevention of Pulmonary Atelectasis in Obese Patients Undergoing Laparoscopic Bariatric Surgery

Hesham F. Talab, MD\*, Ibrahim Ali Zabani, MBBS, FRCP, PEMBA, FACPE\*, Hassan Saad Abdelrahman, MD\*, Waleed L. Bukhari, MD†, Irfan Mamoun, MD‡, Majed A. Ashour, MD†, Bakr Bin Sadeq, MD§, and Sameh Ibrahim El Sayed, MD||

From the Departments of \*Anesthesiology, †General Surgery, ‡Radiology, §Biostatistics, and ||Cardiothoracic Surgery, King Faisal Specialist Hospital & Research Centre, Jeddah, Saudi Arabia.

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**背景：**全麻誘導後常發生肺不張，持續到術後，可能導致術後嚴重的併發症和額外的護理支出。有報導稱腹腔鏡手術與術後肺不張發生率的增加相關。資料顯示全麻期間，肥胖病人比非肥胖病人有更高的肺不張發生的風險。預防肺不張對每個患者都很重要，但是對於肥胖的病人尤其重要。

**方法：**隨機收集 66 例體重指數在 30-50  $\text{kg}/\text{m}^2$  行腹腔鏡減肥手術的患者，並根據呼氣末正壓的應用分成 3 組。呼氣末壓力為 0 (ZEEP)組( $n = 22$ )插管後潮氣量機控呼氣末持續 7-8 秒。呼氣末壓力為 5 的組( $n = 22$ )插管後潮氣量機控呼氣末持續 7-8 秒應用壓力為 5  $\text{cm H}_2\text{O}$ 。呼氣末壓力為 10 的組( $n = 22$ )插管後潮氣量機控呼氣末持續 7-8 秒應用壓力為 10  $\text{cm H}_2\text{O}$ 。其他可變因素（例如：麻醉劑，和手術方式）相同。術中和術後在復蘇室測定心率，無創平均動脈壓，動脈血氧飽和度，和肺泡動脈氧分壓梯度。記錄在復蘇室的停留時間和無創面罩通氣(100%  $\text{Fio}_2$ )時間或者重新插管率。通過術前胸片和離開復蘇室時胸片來評估肺不張。

**結果：**應用呼氣末正壓為 10  $\text{cm H}_2\text{O}$  患者在術中和術後在復蘇室都有更好的氧合，通過胸片評估有更低的肺不張評分，相比無呼氣末壓力和呼氣末壓力為正壓 5  $\text{cm H}_2\text{O}$  的組有更少的術後肺部併發症。三組病人中沒有證據顯示有氣壓性創傷。

**結論：**肥胖病人腹腔鏡減肥手術，術中肺容量控制通氣應用 PEEP 10  $\text{cm H}_2\text{O}$  能有效的預防肺不張和更好的氧合，縮短復蘇室的停留時間和手術後期間更低的肺部併發症。

(陳靈科譯 陳傑校)

**BACKGROUND:** Atelectasis occurs regularly after induction of general anesthesia, persists postoperatively, and may contribute to significant postoperative morbidity and

additional health care costs. Laparoscopic surgery has been reported to be associated with an increased incidence of postoperative atelectasis. It has been shown that during general anesthesia, obese patients have a greater risk of atelectasis than nonobese patients. Preventing atelectasis is important for all patients but is especially important when caring for obese patients.

**METHODS:** We randomly allocated 66 adult obese patients with a body mass index between 30 and 50 kg/m<sup>2</sup> scheduled to undergo laparoscopic bariatric surgery into 3 groups. According to the recruitment maneuver used, the zero end-expiratory pressure (ZEEP) group ( $n = 22$ ) received the vital capacity maneuver (VCM) maintained for 7–8 s applied immediately after intubation plus ZEEP; the positive end-expiratory pressure (PEEP) 5 group ( $n = 22$ ) received the VCM maintained for 7–8 s applied immediately after intubation plus 5 cm H<sub>2</sub>O of PEEP; and the PEEP 10 group ( $n = 22$ ) received the VCM maintained for 7–8 s applied immediately after intubation plus 10 cm H<sub>2</sub>O of PEEP. All other variables (e.g., anesthetic and surgical techniques) were the same for all patients. Heart rate, noninvasive mean arterial blood pressure, arterial oxygen saturation, and alveolar-arterial Pao<sub>2</sub> gradient (A-a Pao<sub>2</sub>) were measured intraoperatively and postoperatively in the postanesthesia care unit (PACU). Length of stay in the PACU and the use of a nonrebreathing O<sub>2</sub> mask (100% Fio<sub>2</sub>) or reintubation were also recorded. A computed tomographic scan of the chest was performed preoperatively and postoperatively after discharge from the PACU to evaluate lung atelectasis.

**RESULTS:** Patients in the PEEP 10 group had better oxygenation both intraoperatively and postoperatively in the PACU, lower atelectasis score on chest computed tomographic scan, and less postoperative pulmonary complications than the ZEEP and PEEP 5 groups. There was no evidence of barotrauma in any patient in the 3 study groups.

**CONCLUSIONS:** Intraoperative alveolar recruitment with a VCM followed by PEEP 10 cm H<sub>2</sub>O is effective at preventing lung atelectasis and is associated with better oxygenation, shorter PACU stay, and fewer pulmonary complications in the postoperative period in obese patients undergoing laparoscopic bariatric surgery.

### 一種中心靜脈持續輸注給藥的體外分析：多管設計與埠選擇的影響

#### **An *In Vitro* Analysis of Central Venous Drug Delivery by Continuous Infusion: The Effect of Manifold Design and Port Selection**

David R. Moss, MD<sup>\*</sup>, Karsten Bartels, MD<sup>\*</sup>, Gregory L. Peterfreund, BA<sup>\*</sup>, Mark A. Lovich, MD, PhD<sup>†</sup>, Nathaniel M. Sims, MD<sup>\*</sup>, and Robert A. Peterfreund, MD, PhD<sup>\*</sup>

From the <sup>\*</sup>Department of Anesthesia and Critical Care, Massachusetts General Hospital; and <sup>†</sup>Department of Anesthesiology and Pain Medicine, Caritas St. Elizabeth's Medical Center, Boston, Massachusetts.

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**背景：**中心靜脈導管廣泛用於麻醉和重症監護。多管通道允許同步管理中心靜脈導管多種藥物共同注射。這種多管通道的結構有很大差別。在這項研究中，作者定量比較了持續的藥物輸注模型中，傳統的多通道開關與微量輸注通道的藥物釋放動力學，以儘量減少無效容積。

**方法：**在重症監護病房常用注射泵低流量輸注鹽載體溶液（10ml/h），通過多管通道連接到一個標準的三腔 16#導管。該模型將甲基藍（3ml/h）加入傳統多通道開



關的第一，第二，第四開關或微量輸注管的 2 個位置之一，是一種儘量減少無用體積的新設計。收集每分鐘藥物流出量，用分光光度計定量分析開始至結束時的液體量。

**結果：**傳統的四通道開關的埠之間開始和結束時間顯著不同。微量輸注通道的 2 個埠之間有差異，但不顯著。在微量輸注通道兩個埠產生的輸入動力與 4 開關通道最下游的埠相似。每種通道的動態資料與無用體積之間有良好的相關性。

**結論：**使用傳統的多通道開關，埠選擇極大地影響連續注射藥物輸送動力。這個發現在一定程度上支持了一個觀點，就是最關鍵的輸液應加入最接近病人的通道埠。微量輸注埠選擇不太重要，其動力比多通道開關的第二和第四埠迅速。微量輸注通道具有更少的無用容積，減少不必要的藥物釋放延遲及更精確控制藥物持續輸注。

（唐穎 譯 陳傑 校）

**BACKGROUND:** Central venous catheters are used extensively in anesthesia and critical care. Multiport manifolds allow for simultaneous administration of multiple medication infusions into a common central venous catheter lumen. The structures of such manifolds vary considerably. In this study, we quantitatively compared, in a laboratory model of continuous drug infusion, the drug delivery dynamics of a traditional stopcock manifold and a microinfusion manifold constructed to minimize dead volume.

**METHODS:** A syringe pump infused a saline carrier solution at a low flow rate frequently used in an intensive care unit (10 mL/h) through a multiport manifold connected to the 16-gauge lumen of a standard 16-cm triple-lumen catheter. The model drug methylene blue (3 mL/h) joined the carrier flow at the first, second, or fourth stopcock of a traditional manifold or 1 of 2 positions in a microinfusion manifold, a new device designed to minimize dead volume. Effluent samples were collected every minute for quantitative spectrophotometric analysis of delivery onset and offset.

**RESULTS:** Onset and offset times differed significantly among individual ports of the traditional 4-stopcock manifold. There was also a significant difference between the 2 ports of the microinfusion manifold, but this was less pronounced. Both ports of the microinfusion manifold yielded delivery dynamics that were similar to the most downstream port of the 4-stopcock manifold. There was good correlation between dynamic data and dead volume for each of the manifolds.

**CONCLUSIONS:** Using a traditional stopcock manifold, port selection significantly affects drug delivery dynamics for continuous infusions. The findings provide quantitative support for the concept that the most critical infusion should join the system at the manifold port closest to the patient. Port selection was less important for the microinfusion manifold and dynamics were faster compared with the second and fourth ports of the stopcock manifold. The smaller dead volumes of the microinfusion manifold minimize unwanted delays in drug delivery onset and offset allowing more precise control over drug delivery by continuous infusion.

美國圍術期失明的流行率：1996-2005 脊柱外科、整形外科、心外科和普外科的 10 年研究

**The Prevalence of Perioperative Visual Loss in the United States: A 10-Year Study from 1996 to 2005 of Spinal, Orthopedic, Cardiac, and General Surgery**



Yang Shen, MA, MS\*, Melinda Drum, PhD<sup>†‡</sup>, and Steven Roth, MD<sup>†</sup>

From the \*Pritzker School of Medicine, and Departments of †Anesthesia and Critical Care, and ‡Health Studies, The University of Chicago, Chicago, Illinois.

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**背景：**圍術期失明發生於非眼科手術是極罕見卻不可輕視的潛在併發症，但是它的發生率在普通住院手術病人中尚無明確。作者收集了全美國範圍內的住院病人來衡量美國八大常見非眼科手術中圍術期失明的發生率。

**方法：**該研究包括 1996-2005 年全美範圍內的 560 多萬各類手術病人，有膝關節成形術、膽囊切除術、臀部/股骨手術治療、脊柱融合術、闌尾切除術、直腸切除術、椎板切除術、冠脈搭橋術、心臟瓣膜手術。圍術期失明的定義使用國際疾病分類法、第九版本、缺血性視神經病變的臨床修改版、皮質盲、視網膜血管阻塞來評估。一元和多元的分析潛在風險因素。

**結果：**心臟手術和脊柱融合手術的圍術期失明率最高。全美圍術期失明率心臟手術為 8.64/10000，脊柱融合術為 3.09/10000，相比之下闌尾切除術只有 0.12/10000。經歷心臟手術、脊柱融合術、整形外科手術的病人缺血性視神經病變、視網膜血管阻塞或皮質盲的風險增加。未滿 18 歲的人較易得皮質盲，因此圍術期失明對於他們來說風險最大，而 50 歲以上的人主要是視神經缺血性病變和視網膜血管阻塞。可能引起圍術期失明的其他因素有男性、Charlson 合併症指數、貧血、輸血。醫院手術量的上升不會增加患病風險。從 1996 年到 2005 年 10 年研究期間，圍術期失明有整體下降的趨勢。

**結論：**研究結果證實了臨床猜測：心臟手術和脊柱融合手術的圍術期失明率發生較高，本研究首次發現了這個綜合症在下肢關節置換術的病人也有較高的發生率。1996 年到 2005 年，美國圍術期失明的流行率在八大常見外科手術中有所降低。男性病人和某些合併症患者 POVL 風險較高意味目前風險因素並未改變。本研究結論受到資料精確性的限制，比如術中資料缺乏和不能通過出院資料中診斷編碼來證實。

（楊秋娟 譯 陳傑 校）

**BACKGROUND:** Perioperative visual loss (POVL) accompanying nonocular surgery is a rare and potentially devastating complication but its frequency in commonly performed inpatient surgery is not well defined. We used the Nationwide Inpatient Sample to estimate the rate of POVL in the United States among the eight most common nonocular surgeries.

**METHODS:** More than 5.6 million patients in the Nationwide Inpatient Sample who underwent principal procedures of knee arthroplasty, cholecystectomy, hip/femur surgical treatment, spinal fusion, appendectomy, colorectal resection, laminectomy without fusion, coronary artery bypass grafting, and cardiac valve procedures from 1996 to 2005 were included. Rates of POVL, defined as any discharge with an International Classification of Diseases, Ninth Revision, Clinical Modification code of ischemic optic neuropathy (ION), cortical blindness (CB), or retinal vascular occlusion (RVO), were estimated. Potential risk factors were assessed by univariate and multivariable analyses.

**RESULTS:** Cardiac and spinal fusion surgery had the highest rates of POVL. The national estimate in cardiac surgery was 8.64/10,000 and 3.09/10,000 in spinal fusion. By

contrast, POVL after appendectomy was 0.12/10,000. Those undergoing cardiac surgery, spinal fusion, and orthopedic surgery had a significantly increased risk of developing ION, RVO, or CB. Patients younger than 18 yr had the highest risk for POVL, because of higher risk for CB, whereas those older than 50 yr were at greater risk of developing ION and RVO. Other significant positive predictors for some diagnoses of POVL were male gender, Charlson comorbidity index, anemia, and blood transfusion. There was no increased risk associated with hospital surgical volume. During the 10 yr from 1996 to 2005, there was an overall decrease in POVL in the procedures we studied.

**CONCLUSIONS:** The results confirm the clinical suspicion that the risk of POVL is higher in cardiac and spine fusion surgery and show for the first time a higher risk of this complication in patients undergoing lower extremity joint replacement surgery. The prevalence of POVL in the eight most commonly performed surgical operations in the United States has decreased between 1996 and 2005. Increased odds of POVL with male gender and comorbidity index indicate that some risk factors for POVL may not presently be modifiable. The conclusions of this study are limited by factors affecting data accuracy, such as lack of data on the intraoperative course and inability to confirm the diagnostic coding of any of the discharges in the database.

三種可視喉鏡的比較：在病態肥胖病人插管時應用 Macintosh 喉鏡片可以減少導引管芯的應用，但不能代替

#### **A Comparison of Three Videolaryngoscopes: The Macintosh Laryngoscope Blade Reduces, but Does Not Replace, Routine Stylet Use for Intubation in Morbidly Obese Patients**

Ralph Maassen, MD<sup>\*†</sup>, Ruben Lee, BE<sup>†</sup>, Boukje Hermans, MD<sup>\*†</sup>, Marco Marcus, MD, PhD<sup>†</sup>, and André van Zundert, MD, PhD, FRCA<sup>\*§</sup>

From the \*Department of Anesthesiology, Catharina Hospital, Eindhoven; †Department of Anesthesiology, University Hospital, Maastricht; ‡Department of Biomechanical Engineering, Mechanical, Materials and Maritime Engineering, Delft University of Technology, Delft, The Netherlands; and §Department of Anesthesiology, University Hospital, Ghent, Belgium.

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**背景：**有不少廠家生產的可視喉鏡（VLSs）有不同的規格、使用者介面和幾何形狀。與臨床相關的是要知道鏡片的相對功能。在肥胖病人身上，聲門和氣管插管的可視性經常有困難（非常），新的視頻技術，可提供更好的功能和性能。雖然有許多直接喉鏡氣管插管都是不插管芯的，但是在可視喉鏡（VLSs）下插管建議使用管芯。在這項研究中，作者在接受擇期手術的病態肥胖病人身上比較 3 種可視喉鏡（VLSs），同時測試是否可不使用管芯插管。

**方法：**在連續 150 例成人病態肥胖患者中（體重指數大於 35 kg/m<sup>2</sup>）隨機選擇接受一種可視喉鏡（VLS）：GlideScope®, Storz® V-Mac™, and McGrath®。取得直接喉鏡聲門可視的最佳期，隨後，用各自的可視喉鏡（VLS），完成病人的氣管插管。常規評估操作前（e.g., Mallampati grade）和操作中（Cormack-Lehane grade）困難插管的等級，以及插管時因插管時間，嘗試次數和主觀困難程度。

**結果：**全部 3 種 VLSs 測試提供了一個與傳統的直接喉鏡同等或更好的聲門直視視野。必要的插管嘗試次數在各種可視喉鏡（VLSs）中有顯著不同（GlideScope 平均  $2.6 \pm 1.0$  次, Storz 平均  $1.4 \pm 0.7$  次, and McGrath 平均  $2.9 \pm 0.9$  次）。平均插管時間分別為  $33 \pm 18$  s（GlideScope）,  $17 \pm 9$  s（Storz）和  $41 \pm 25$  s（McGrath）。

**結論：**在這項研究中，與其他兩種測試設備相比，與 Macintosh 鏡片搭配的可視喉鏡（Storz VLS）有一較好的總體滿意度評分、插管時間、插管嘗試次數以及需要的額外輔助設備應用等。

（張蕾 譯 陳傑 校）

**BACKGROUND:** Many manufacturers are producing videolaryngoscopes (VLSs) with differing specifications, user interfaces, and geometry. It is clinically relevant to know the relative performance of the blades. Visualization of the glottis and intubation are often problematic in (extremely) obese patients, and the new video technology may offer better functionality and performance. Although many tracheal intubations with direct laryngoscopy are performed with an unstyletted endotracheal tube, it is recommended to use a stylet for intubation using videolaryngoscopy. In this study, we compared 3 VLSs in morbidly obese patients undergoing intubation for elective surgery and tested whether it is feasible to intubate the tracheas of morbidly obese patients without using a stylet.

**METHODS:** One hundred fifty consecutive adult morbidly obese patients (body mass index  $>35$  kg/m<sup>2</sup>) were randomly selected to receive one of 3 VLSs: GlideScope®, Storz® V-Mac™, and McGrath®. Direct laryngoscopy scored the best possible view of the glottis; subsequently, the respective VLS was used, and the patient's trachea was intubated. Common preprocedural (e.g., Mallampati grade) and intra-procedural (Cormack-Lehane grade) metrics of intubation difficulty were measured, as well as the dependent variables of intubation time, number of attempts, and subjective difficulty.

**RESULTS:** All 3 VLSs tested offered an equal or better view of the glottis compared with traditional direct laryngoscopy. The number of attempts necessary to intubate the trachea differed significantly among VLSs (average  $2.6 \pm 1.0$  attempts for the GlideScope,  $1.4 \pm 0.7$  for the Storz, and  $2.9 \pm 0.9$  for the McGrath VLS). The average intubation times were  $33 \pm 18$  s for the GlideScope,  $17 \pm 9$  s for the Storz, and  $41 \pm 25$  s for the McGrath VLS.

**CONCLUSIONS:** In this study, the VLS with the Macintosh blade (Storz VLS) had a better overall satisfaction score, intubation time, number of intubation attempts, and necessity of extra adjuncts, compared with the 2 other tested devices.

### 非創傷重症監護病人的遲發性呼吸機相關肺炎

#### Late-Onset Ventilator-Associated Pneumonia in Nontrauma Intensive Care Unit Patients

Arnaud Gacouin, MD\*, Nicolas Barbarot, MD\*, Christophe Camus, MD\*, Sylvain Salomon, MD\*, Sonia Isslame, MD\*, Sophie Marque, MD\*, Sylvain Lavoué, MD\*, Pierre-Yves Donnio, PhD†, Rémi Thomas, MD\*, and Yves Le Tulzo, MD\*

From the \*Service des maladies infectieuses et réanimation médicale, and †Laboratoire de bactériologie, Hôpital Pontchaillou, Rennes Cedex 9, France.

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**背景：**大多數對遲發性呼吸機相關肺炎（VAP）的相關因素的收集研究是通過研究

創傷性危重病人而實現的。因腸內營養（EN）的影響而增加發生 VAP 的危險性已經被提出。在這項研究中，通過這些病人，作者評估了非創傷危重病人罹患 VAP 的相關因素，並確定是否早期營養促進遲發性呼吸機相關肺炎的發生。

**方法：**作者在一所有 21 張 ICU 床位大學醫院進行了前瞻性觀察性研究。

**結果：**為期 28 個月 361 例持續 6 天或以上機械通氣（MV）的氣管插管成年病人接受了研究。76 例病人（占 21%）被證實有遲發性 VAP，因其肺泡灌洗液中至少存在一種微生物且濃度 $\geq 10^4$  菌落/mL。回收組織液中，革蘭陰性桿菌占 75%，金黃色葡萄球菌占 21%。遲發性 VAP 各獨立因素是通過對以下方面的多因素分析而得，包括：簡化急性生理學評分 II 評分（優勢比：1.021，95% 的置信區間 [CI]：1.005-1.038， $P = 0.01$ ），機械通氣的頭五天急性呼吸窘迫綜合症的發生率（優勢比：1.98；95% CI 為：1.05-3.67； $P = 0.04$ ），以及氣管導管型號 $\geq 7.5$ （優勢比：2.06；95% CI 為：1.88-3.90； $P = 0.03$ ）。行機械通氣者 48 h 內腸內營養後不是引起遲發性 VAP 的影響因素。

**結論：**非創傷患者人群，早期腸內營養與遲發性 VAP 沒有相關性。在這些病人中，機械通氣的前五天中疾病的嚴重程度似乎與遲發性 VAP 相關。此外，我們的結果表明，氣管導管 $\geq 7.5$  號的病人與氣管導管  $< 7.5$  號的病人相比，（前者）發生 VAP 的危險性更大。

（鄒巧群譯 陳傑校）

**BACKGROUND:** Most studies designed to determine the factors associated with the acquisition of late-onset ventilator-associated pneumonia (VAP) were performed in critically ill trauma patients. The impact of enteral nutrition (EN) on the risk of acquiring VAP has been discussed. In this study, we assessed factors associated with late-onset VAP in nontrauma patients and determined whether nutrition provided early was associated with development of late-onset VAP in this population.

**METHODS:** We performed a prospective observational cohort study in a 21-bed polyvalent intensive care unit in a university hospital.

**RESULTS:** Three hundred sixty-one intubated adult patients with a duration of mechanical ventilation (MV) of 6 days or more were admitted over a 28-mo period. Late-onset VAP was confirmed in 76 patients (21%) by the presence of at least one microorganism at a concentration  $\geq 10^4$  colony-forming units/mL on the bronchoalveolar lavage. Gram-negative bacilli represented 75% and *Staphylococcus aureus* 21% of recovered organisms. Factors independently associated with late-onset VAP by multivariate analysis included a high simplified acute physiology score II score (odds ratio: 1.021; 95% confidence interval [CI]: 1.005–1.038;  $P = 0.01$ ), development of acute respiratory distress syndrome during the first 5 days of MV (odds ratio: 1.98; 95% CI: 1.05–3.67;  $P = 0.04$ ), and size of the endotracheal tube  $\geq 7.5$  (odds ratio: 2.06; 95% CI: 1.88–3.90;  $P = 0.03$ ). EN started within 48 h of MV onset was not associated with a higher risk for late-onset VAP.

**CONCLUSION:** In our nontrauma patient population, early EN was not associated with development of late-onset VAP. In this population, severity of the disease during the first 5 days of MV seemed to be associated with late-onset VAP. In addition, our results suggest that the risk of late-onset VAP is higher in patients with a tube size  $\geq 7.5$  than in patients with a tube size  $< 7.5$ .

## 噴他佐辛與昂丹司瓊對治療剖宮產病人鞘內注射嗎啡引起的瘙癢症的比較——隨機對照試驗

### A Randomized Controlled Trial of Pentazocine Versus Ondansetron for the Treatment of Intrathecal Morphine-Induced Pruritus in Patients Undergoing Cesarean Delivery

Decha Tamdee, MSc<sup>\*</sup>, Somrat Charuluxananan, MD, MSc, FRCAT<sup>†</sup>, Yodying Punjasawadwong, MD, M.Med.Sc., FRCAT<sup>†</sup>, Chamaiporn Tawichasri, MSc<sup>\*</sup>, Jayanton Patumanond, MD, MPH, DSc<sup>\*</sup>, and Pin Sriprajittichai, MD, MSc, FRCAT<sup>†</sup>

From the <sup>\*</sup>Ph.D. Program in Clinical Epidemiology, Faculty of Medicine, Chiang Mai University, Chiang Mai; <sup>†</sup>Department of Anesthesiology, Faculty of Medicine, Chulalongkorn University, Bangkok; and <sup>‡</sup>Department of Anesthesiology, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand.

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**背景** 昂丹司瓊對鞘內注射嗎啡引起的瘙癢症有效。有證據表明κ阿片受體有止癢作用。噴他佐辛是κ阿片受體激動劑，同時有部分激動μ受體的功能。因此作者進行了一項隨機雙盲試驗旨在比較噴他佐辛與昂丹司瓊對治療剖宮產病人鞘內注射嗎啡引起的瘙癢症的止癢效果。

**方法** 208名已經鞘內注射嗎啡並引起瘙癢的臨產婦隨機分成兩組：靜脈注射噴他佐辛15mg( $n=104$ )和昂丹司瓊4mg( $n=104$ )。給藥5分鐘後評價止癢效果（不癢或輕微瘙癢）和其他副作用，觀察4小時內病人瘙癢復發情況。

**結果** 15min治療效果噴他佐辛組（96.1%）高於昂丹司瓊組（80.8%）（差異95%可信區間：7.0%，23.8%； $P=0.001$ ）。4小時內中重度瘙癢復發率噴他佐辛組（12.0%）低於昂丹司瓊組（32.1%）（ $P=0.001$ ）。兩組噁心/嘔吐、鎮靜、戰慄、疼痛評分、注射點疼痛比較無顯著差異。未發現呼吸抑制。

**結論** 噴他佐辛15mg對於治療鞘內注射嗎啡引起的瘙癢症的療效優於昂丹司瓊4mg，且前者復發率更低，副作用輕微。

（李潺譯 陳傑校）

**BACKGROUND:** Ondansetron is effective for the treatment of intrathecal morphine-induced pruritus. There is evidence that κ-opioid receptor agonists have antipruritic activity. Pentazocine is an agonist of κ-opioid receptors and partial agonist at μ-opioid receptors. We therefore performed a randomized, double-blind trial to compare the efficacy of pentazocine and ondansetron for the treatment of pruritus associated with intrathecal injection of morphine in patients undergoing cesarean delivery.

**METHODS:** Two hundred eight parturients who developed moderate to severe pruritus after the administration of intrathecal morphine were randomly allocated to 2 groups: IV pentazocine 15 mg ( $n=104$ ) and IV ondansetron 4 mg ( $n=104$ ). The successful treatment of pruritus (no or mild pruritus) and other adverse effects were determined 15 min after study drug administration, and patients were observed for recurrence of pruritus for 4 h.

**RESULTS:** The treatment success rate at 15 min was higher in the pentazocine group (96.1%) than in the ondansetron group (80.8%) (95% confidence interval of difference: 7.0%, 23.8%;  $P=0.001$ ). The recurrence rate of moderate to severe pruritus within 4 h



after treatment in the pentazocine group (12.0%) was lower than in the ondansetron group (32.1%) ( $P = 0.001$ ). There were no significant differences between groups in nausea/vomiting, sedation, shivering, pain scores, and pain at injection site. No respiratory depression was observed.

**CONCLUSIONS:** Pentazocine 15 mg is superior to ondansetron 4 mg for the treatment of intrathecal morphine-induced pruritus and has a lower recurrence rate. The side effects after treatment are mild.

### 開顱術後病人加巴噴丁作為預防性抗驚厥藥物的鎮痛效果：一項前瞻性隨機研究

#### The Analgesic Effect of Gabapentin as a Prophylactic Anticonvulsant Drug on Postcraniotomy Pain: A Prospective Randomized Study

Hatice Türe, MD<sup>\*</sup>, Murat Sayin, MD<sup>\*</sup>, Geysu Karlikaya, MD<sup>†</sup>, Canan Aykut Bingol, MD<sup>†</sup>, Bora Aykac, MD<sup>\*</sup>, and Uğur Türe, MD<sup>†</sup>

From the Departments of \*Anesthesiology and Intensive Care, †Neurology, and ‡Neurosurgery, Ye Ditepe University School of Medicine, Istanbul, Turkey.

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**背景：**作為一種抗驚厥藥物，加巴噴丁對於急性術後疼痛也有鎮痛作用。然而，對於行開顱手術的病人，給予預防性使用加巴噴丁這種抗癲癇藥物的鎮痛效果尚不明確。在這項研究中，作者對於小腦幕上腫瘤切除行開顱手術的病人，預防性給予加巴噴丁這種抗癲癇作用藥物，同時評估該藥對急性術後疼痛的術後療效。

**方法：**80 例因小腦幕上腫瘤切除行開顱手術的病人被隨機分成 2 組。G 組病人 (n=40) 接受口服加巴噴丁 (3\*400mg) 治療，P 組病人 (n=40) 接受口服苯妥英鈉 (3\*100mg) 治療，兩組病人都使用標準麻醉方法。麻醉中以異丙酚和瑞芬維維持。使用嗎啡行病人自控鎮痛，同時測定疼痛水準。並記錄抗癲癇相關副作用，麻醉藥用量，麻醉和手術時間維持，拔管時間，術後疼痛評分，嗎啡用量以及鎮靜評分。

**結果：**G 組 37 例病人，P 組 38 例病人完成了這項研究。G 組的術前階段，1 例病人有嚴重乏力症狀，1 例病人有嚴重的眩暈，另一個病人更改了手術過程。34 例病人的血漿加巴噴丁的平均水準示 34umol/L (範圍 23-51umol/ml)。P 組病人，1 例病人在術前退出了該研究，1 例病人術後有暫時性的神經症狀。

兩個組的人口統計資料和麻醉平均時間和手術時間相似。G 組的異丙酚、瑞芬維總量 (1847±548mg/3034±1334ug) 比 P 組用藥總量 (2293±580mg/4287±1282ug) 明顯減少 ( $P=0.01$ )。然而，P 組的拔管時間 (4.5±2min) 比 G 組的 (16.6±22min) 提前 ( $P<0.001$ )。在 15min、30min、1h 時 P 組疼痛評分明顯高於 G 組 ( $P<0.001$ )。P 組的嗎啡總量也明顯高於 G 組 (33±17mg vs 24±19mg) ( $P=0.01$ )。在 15min、30min、1h、2h 的 G 組鎮靜評分明顯高於 P 組 ( $P<0.001$ )。

**結論：**對於小腦幕上腫瘤切除行開顱手術的病人，給予加巴噴丁對於急性術後疼痛是有效的。它同時也能減少術後鎮痛藥物的用量。然而，它也可能導致一些副作用，比如拔管延遲和增加術後鎮靜。

(張婷譯 陳傑校)

**BACKGROUND:** Gabapentin is an anticonvulsant drug that has analgesic properties for acute postoperative pain. However, the analgesic effect of gabapentin as an antiepileptic



prophylactic drug on patients undergoing craniotomy is unclear. In this study, we evaluated the postoperative effectiveness of gabapentin on acute postoperative pain when it is used for antiepileptic prophylaxis in patients undergoing craniotomy for supratentorial tumor resection.

**METHODS:** Eighty patients undergoing craniotomy for supratentorial tumor resection were randomly assigned into two groups. Patients in Group G ( $n = 40$ ) received oral gabapentin (3 x 400 mg), and patients in Group P ( $n = 40$ ) received oral phenytoin (3 x 100 mg) for 7 days before the operation and postoperatively. An identical anesthesia protocol was performed for both the groups. Anesthesia was maintained with propofol and remifentanyl infusion. Patient-controlled analgesia with morphine was used, and pain levels were measured. The antiepileptic-related side effects, anesthetic consumption, duration of anesthesia and surgery, tracheal extubation time, postoperative pain scores, morphine consumption, and sedation scores were recorded.

**RESULTS:** Thirty-seven patients in Group G and 38 patients in Group P completed the study. During the preoperative period in Group G, one patient had severe fatigue, one had severe dizziness, and one patient's surgical procedure was changed. The median plasma levels of gabapentin were 34  $\mu\text{mol/mL}$  (range, 23-51  $\mu\text{mol/mL}$ ) in 34 patients. In Group P, one patient withdrew from the study preoperatively and one developed transient neurological symptoms postoperatively.

The demographic data and mean duration of anesthesia and surgery were similar in both the groups. The total propofol and remifentanyl consumption in Group G ( $1847 \pm 548 \text{ mg}/3034 \pm 1334 \mu\text{g}$ ) was significantly less than that of Group P ( $2293 \pm 580 \text{ mg}/4287 \pm 1282 \mu\text{g}$ ) ( $P = 0.01$ ). However, tracheal extubation could be done earlier in Group P ( $4.5 \pm 2 \text{ min}$ ) than in Group G ( $16.6 \pm 22 \text{ min}$ ) ( $P < 0.001$ ). Pain scores were significantly higher in Group P at 15 min, 30 min, and 1 h ( $P < 0.001$ ). The total morphine consumption was also significantly higher in Group P ( $33 \pm 17 \text{ mg}$  vs  $24 \pm 19 \text{ mg}$ ) ( $P = 0.01$ ). The postoperative sedation scores were significantly higher in Group G at 15 min, 30 min, 1 h, and 2 h ( $P < 0.001$ ).

**CONCLUSIONS:** The administration of gabapentin to patients undergoing craniotomy for supratentorial tumor resection was effective for acute postoperative pain. It also decreased analgesic consumption after surgery. However, it may lead to side effects such as delayed tracheal extubation and increased sedation postoperatively.

### 反復椎旁注射局麻藥和類固醇注射預防急性帶狀皰疹神經痛的療效

#### The Effectiveness of Repetitive Paravertebral Injections with Local Anesthetics and Steroids for the Prevention of Postherpetic Neuralgia in Patients with Acute Herpes Zoster

Genlin Ji, MD, Jiyuan Niu, MD, Yuxiang Shi, MD, Lichao Hou, MD, PhD, Yan Lu, MD, PhD, and Lize Xiong, MD, PhD

From the Pain Clinic, Department of Anesthesiology, Xijing Hospital, Fourth Military Medical University, Xi'an, China.

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**背景：**帶狀皰疹神經痛（PHN）的治療在臨床疼痛中仍然是一個挑戰。在隨機對照研究中，作者評估了椎旁反復注射局麻藥和類固醇對預防急性皰疹後神經痛的有效性。

**方法：**132 名 1-7 天出疹後確診為急性帶狀皰疹的患者被隨機分配接受任一標準治療（口服抗病毒藥物和鎮痛藥）。標準療法附加椎旁反復注射法，每週注射 10 毫升 0.25% 布比卡因和 40 毫克甲強龍混合液 48 小時。選取 1，3，6，12 個療程作為效果評估時間點。主要判斷標準是每個療程後組內帶狀皰疹引起的疼痛和/或異常疼痛患者比率。對意向治療患者進行統計分析。

**結果：**完成 1 年的跟蹤治療的患者有 113 例。在一個療程結束後椎旁注射組 13% 的患者口述有帶狀皰疹神經痛，標準治療組則有 45% 患者口述有疼痛

（ $P < 0.001$ ）。3，6，和 12 個療程後，椎旁注射組帶狀皰疹神經痛的發生率仍在顯著低於標準組。兩組生活品質的改善在時間節點時無顯著差異。

**結論：**反復椎旁注射麻醉藥與類固醇阻滯並輔以阿昔洛韋和鎮痛藥的標準治療 PHN 的療效顯著優於單獨標準化治療。

（陳毓雯 譯 陳傑 校）

**BACKGROUND:** The treatment of postherpetic neuralgia (PHN) continues to be a challenge in clinical pain management. In this randomized, controlled study, we assessed the effectiveness of repetitive paravertebral injections with local anesthetics and steroids for the prevention of PHN in patients with acute herpes zoster.

**METHODS:** One hundred thirty-two patients with acute herpes zoster diagnosed 1–7 days after the onset of the rash were randomly assigned to receive either standard therapy (oral antivirals and analgesics) or standard therapy with additional repetitive paravertebral injections of a mixture of 10 mL 0.25% bupivacaine and 40 mg methylprednisolone acetate every 48 h for a week. Efficacy was evaluated at 1, 3, 6, and 12 mo after the end of the treatments. The primary end point was the proportion of patients with zoster-associated pain and/or allodynia 1 mo after inclusion. Statistical analysis was performed based on the intent-to-treat population.

**RESULTS:** One hundred thirteen patients completed the 1-yr follow-up. At 1 mo posttherapy, 13% of patients in the paravertebral group reported zoster-related pain, compared with 45% in the standard group ( $P < 0.001$ ). At 3, 6, and 12 mo posttherapy, the incidence of PHN was still significantly lower in the paravertebral group than in the standard group. The quality of life improved in both groups at each follow-up time point with no significant difference between groups.

**CONCLUSION:** Repetitive paravertebral anesthetic block in combination with steroids plus standard treatment with acyclovir and analgesics significantly reduced the incidence of PHN than the standard treatment alone.

術前貧血與 N-B 型蛋白促尿鈉肽的關係在預測血管外科手術患者術後心血管事件上的有效性

### The Interrelationship Between Preoperative Anemia and N-Terminal Pro-B-Type Natriuretic Peptide: The Effect on Predicting Postoperative Cardiac Outcome in Vascular Surgery Patient

Dustin Goei, MSc\*, Willem-Jan Flu, MD<sup>†</sup>, Sanne E. Hoeks, MSc<sup>†</sup>, Wael Galal, MD<sup>†</sup>, Martin Dunkelgrun, MD, PhD\*, Eric Boersma, PhD<sup>†</sup>, Ruud Kuijper, MD\*, Jan-Peter van Kuijk, MD<sup>†</sup>, Tamara A. Winkel, MD\*, Olaf Schouten, MD, PhD\*, Jeroen J. Bax, MD, PhD<sup>§</sup>, and Don Poldermans, MD, PhD\*

From the Departments of \*Vascular Surgery, †Cardiology, and ‡  
Anesthesiology, Erasmus Medical Center, Rotterdam; and §Department of  
Cardiology, Leiden University Medical Center, Leiden, The Netherlands.  
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**介紹：**N-B 型蛋白促尿鈉肽（NT-proBNP）可用於預測血管外科手術患者不良心血管事件的發生。然而，一些情況可能會影響這一預測的價值，其中包括貧血。這項研究，我們就是要評估 NT-proBNP 對血管外科手術患者不良心血管事件的預測價值是否會受到貧血的影響。

**方法：**在血管外科手術前已獲知了 666 位元患者詳盡的心血管系統病史、心超報告、血紅蛋白和 NT-proBNP 水準。貧血的定義為，男性血清血紅蛋白<13g/dL，女性<12g/dL。於術後 1、3、7、30 天以及任何有臨床指標的情況下，監測肌鈣蛋白 T 和 12 導聯心電圖。研究的主要終點包括術後 30 天內斯與心血管事件，非致死性心肌梗塞以及肌鈣蛋白 T 釋放。利用受試者特徵曲線分析法來得出用於預測研究重點的 NT-proBNP 最佳終截值。利用多變遞減分析法來獲得 NT-proBNP 在預測非貧血與貧血患者術後心血管事件發生的額外價值。

**結果：**術前有 206 位患者（31%）被證實有貧血。血紅蛋白水準與 NT-proBNP 水準呈反向相關（ $\beta$  相關係數 = -2.242； $P=0.025$ ）。預測研究重點的 NT-proBNP 最佳終截值是 350pg/mL。經臨床心血管風險因數調整，貧血（相對比率[OR]1.53；95%可信區間[CI]：1.07-2.99）和 NT-proBNP 水準增高（相對比率 4.09；95%可信區間：2.19-7.64）都是預測術後心血管事件的獨立風險因素。然而在貧血患者組，NT-proBNP 水準增高卻無法用於預測心血管不良事件的風險（相對比率 2.16；95%可信區間：0.90-5.21）。

**結論：**血管外科手術患者術後心血管事件風險增高與貧血及 NT-proBNP 獨立相關。對於貧血患者而言，NT-proBNP 的預測價值減弱。

（單嘉琪譯 薛張綱校）

**INTRODUCTION:** N-terminal pro-B-type natriuretic peptide (NT-proBNP) predicts adverse cardiac outcome in patients undergoing vascular surgery. However, several conditions might influence this prognostic value, including anemia. In this study, we evaluated whether anemia confounds the prognostic value of NT-proBNP for predicting cardiac events in patients undergoing vascular surgery.

**METHODS:** A detailed cardiac history, resting echocardiography, and hemoglobin and NT-proBNP levels were obtained in 666 patients before vascular surgery. Anemia was defined as serum hemoglobin <13 g/dL for men and <12 g/dL for women. Troponin T measurements and 12-lead electrocardiograms were performed on postoperative days 1, 3, 7, and 30 and whenever clinically indicated. The primary end point of the study was the composite of 30-day postoperative cardiovascular death, nonfatal myocardial infarction, and troponin T release. Receiver operating characteristic curve analysis was used to assess the optimal cutoff value of NT-proBNP for the prediction of the composite end

point. Multivariable regression analysis was used to assess the additional value of NT-proBNP for the prediction of postoperative cardiac events in nonanemic and anemic patients.

**RESULTS:** Anemia was present in 206 patients (31%) before surgery. Hemoglobin level was inversely related with the NT-proBNP levels ([beta] coefficient = -2.242; P = 0.025). The optimal predictive cutoff value of NT-proBNP for predicting the composite cardiovascular outcome was 350 pg/mL. After adjustment for clinical cardiac risk factors, both anemia (odds ratio [OR] 1.53; 95% confidence interval [CI]: 1.07-2.99) and increased levels of NT-proBNP (OR 4.09; 95% CI: 2.19-7.64) remained independent predictors for postoperative cardiac events. However, increased levels of NT-proBNP were not predictive for the risk of adverse cardiac events in the subgroup of anemic patients (OR 2.16; 95% CI: 0.90-5.21).

**CONCLUSIONS:** Both anemia and NT-proBNP are independently associated with an increased risk for postoperative cardiac events in patients undergoing vascular surgery. NT-proBNP has less predictive value in anemic patients. (C) 2009 by International Anesthesia Research Society.

### 兒童麻醉誘導反應的行為學分析

#### **Behavioral analysis of children's response to induction of anesthesia.**

Jill MacLaren Chorney, PhD\*, and Zeev N. Kain, MD, MBA<sup>†‡§</sup>

From the \*Department of Anesthesiology, Dalhousie University and the Division of Pediatric Anesthesiology, IWK Health Centre, Halifax, Nova Scotia, Canada; †Department of Anesthesiology and Perioperative Care, University of California, Irvine, California; ‡Department of Pediatrics, Children's Hospital of Orange County, Orange, California; and § Department of Psychiatry, Yale University, New Haven, Connecticut  
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**背景：**已證實，兒童在接受麻醉誘導時會感到窘迫，但人們卻對這些兒童所表現出的特定行為的普遍性知之甚少。

**方法：**使用觀測者 XT 軟體及經審定的修訂版圍手術期兒童-成人醫療程式交互量表對 293 名門診擇期手術患兒的數位視聽記錄進行編碼。運用多次逐秒的資料記錄捕捉麻醉誘導期間患兒的行為學變化。

**結果：**超過 40% 的 2-10 歲兒童在麻醉誘導期間表現出窘迫行為，其中 17% 的患兒顯露出巨大痛苦，同時超過 30% 的兒童在誘導期間存在抵抗麻醉醫師的行為。麻醉誘導過程中患兒的窘迫和非窘迫行為可劃分為四類形態：急性窘迫、預期窘迫、早期調節行為及進程參與。年長患兒在早期調節行為和進程參與方面擁有較高得分，相反，年幼患兒在急性窘迫方面得分更高。患兒的預期窘迫形態並未顯出年齡差異。憑藉形態學評分間的相互關係（誘導全程與前往手術室途中），行為形態的建構效度可有效評估麻醉誘導期間患兒的焦慮狀態。

**結論：**接受麻醉的兒童可表現出一系列窘迫或非窘迫行為。現已發現，患兒前往手術室途中的一些表現與其在麻醉誘導過程中較少出現窘迫行為相關。上述資料可提供成為觀察兒童潛在調節行為的第一項檢查，但仍需更多詳細的序貫分析來驗證這些行為的特定功能。

(范羽譯 薛張綱校)

**BACKGROUND:** It is documented that children experience distress at anesthesia induction, but little is known about the prevalence of specific behaviors exhibited by children.

**METHOD:** Digital audiovisual recordings of 293 children undergoing outpatient elective surgery were coded using Observer XT software and the validated Revised Perioperative Child-Adult Medical Procedure Interaction Scale. Multiple pass second-by-second data recording was used to capture children's behaviors across phases of anesthesia induction.

**RESULTS:** More than 40% of children aged 2-10 yr displayed some distress behavior during induction with 17% of these children displaying significant distress and more than 30% of children resisting anesthesiologists during induction. Children's distress and nondistress behaviors displayed four profiles over the course of anesthesia induction: Acute Distress, Anticipatory Distress, Early Regulating Behaviors, and Engagement with Procedure. Older children had higher scores on early regulating and engagement profiles whereas younger children had higher scores on Acute Distress. There were no differences across age in children's Anticipatory Distress. Construct validity of behavior profiles was supported via correlations of profile score (overall and on the walk to the operating room) with a validated assessment of children's anxiety at induction.

**CONCLUSIONS:** Children undergoing anesthesia display a range of distress and nondistress behaviors. A group of behaviors was identified that, when displayed on the walk to the operating room, is associated with less distress at anesthesia induction. These data provide the first examination of potentially regulating behaviors of children, but more detailed sequential analysis is required to validate specific functions of these behaviors.

### 小劑量3mg左布比卡因加10ug芬太尼選擇性脊麻用於婦科門診腔鏡檢查

#### **Low-dose 3 mg levobupivacaine plus 10 microg fentanyl selective spinal anesthesia for gynecological outpatient laparoscopy**

Jesus de Santiago, DESA, MD\*, Javier Santos-Yglesias, MD\*, Jorge Giron, MD\*, Francisco Montes de Oca, MD<sup>†</sup>, Alejandro Jimenez, PhD<sup>‡</sup>, and Pilar Diaz, PhD<sup>§</sup>

From the \*Departments of Anesthesiology, and †Gynaecology, Hospital USP La Colina, SC de Tenerife; ‡Research Unit Hospital Universitario de Canarias - University of La Laguna; and §Department of Pharmacy, Hospital Universitario Nuestra Señora de La Candelaria, SC de Tenerife, Tenerife, Spain.

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**背景：**利多卡因選擇性脊麻用於短小婦科門診腔鏡檢查非常有效。我們比較了左布比卡因-芬太尼與利多卡因-芬太尼分別用於短小婦科門診腔鏡檢查時的術中麻醉效果，麻醉恢復時間以及患者的滿意程度。

**方法：**本研究為雙盲。52名欲接受輸卵管結紮術的健康婦女隨機分為2組。組I接受鞘內注射2%的利多卡因10mg+10ug芬太尼，組II鞘內注射0.5%的左布比卡因3mg+10ug芬太尼。兩組均用無菌水稀釋至總量3ml後推注。術中監測以下指標：麻醉起效時間，麻醉鎮痛的補充量，鎮靜深度，手術操作條件及偶爾出現的血流動力學波動情況。術後測試患者的運動阻滯、本體感覺、振動覺、輕觸覺及Romberg's試驗以評價患者是否能夠安全地麻醉後蘇醒室並且可以自己走回去。給予麻醉藥物後5，10，15分鐘測試感覺阻滯水準，並且之後每15分鐘測試一次直至手術結束。感覺神經阻斷消退有25分鐘的時間差被認為是與臨床相關。

**結果：**起效時間與手術操作條件在2組間具有可比性。沒有需要改為全身麻醉的病例。所有病人均可安全離開麻醉後蘇醒室。組I 27(18-45)分鐘後可以下肢可以移動而組II則需要30(18-56)分鐘(P=0.24)。脊麻完全消退時間組I為93(65-120)分鐘，組II為105(78-150)分鐘(P=0.019)。然而兩組在可離院時間上沒有顯著性差異，分別為185(150-300)與188(125-300)(P=0.62)。總體的患者滿意度在兩組間也具有可比性。

**結論：**左布比卡因3mg+10ug芬太尼可代替10mg利多卡因+10ug芬太尼用於短小手術的脊麻。具有與其相當的感覺阻滯消退時間，良好的手術操作條件以及患者滿意程度。

(黃劍譯 薛張綱校)

**BACKGROUND:** Lidocaine selective spinal anesthesia has been effective for short-duration gynecological outpatient laparoscopy. We compared the intraoperative effectiveness, anesthetic recovery times, and patient satisfaction after levobupivacaine-fentanyl versus lidocaine-fentanyl spinal anesthesia during short-duration gynecological laparoscopy.

**METHODS:** In this double-blind study, 52 healthy women scheduled to undergo tubal sterilization were randomly assigned to receive either intrathecal 10 mg lidocaine 2% plus 10 microg fentanyl (Group I) or intrathecal 3 mg levobupivacaine 0.5% plus 10 microg fentanyl (Group II), each solution made to a total volume of 3 mL with sterile water. The following variables were monitored intraoperatively: anesthesia onset time, need for anesthesia-analgesia supplementation, depth of sedation, surgical conditions, and occurrence of hemodynamic events. After surgery, motor block, proprioception, vibration sense, light touch, and Romberg's test were performed to evaluate whether the patients could bypass the postanesthesia care unit and be allowed to walk by themselves. Sensory block level was determined at 5, 10, and 15 min after anesthetic injection, and then every 15 min until resolution was complete. A difference of 25 min in sensory block resolution time was considered clinically relevant.

**RESULTS:** Onset time and intraoperative conditions were comparable in both groups. No patient required general anesthesia to complete surgery. All patients from both groups bypassed the postanesthesia care unit. Ambulation took place after 27 (18-45) min in Group I and 30 (18-56) min in Group II (P = 0.24). Complete regression of spinal anesthesia occurred after 93 (65-120) min in Group I and 105 (78-150) min in Group II (P = 0.019); however, no differences were observed in time for home discharge 185 (150-



300) min in Group I and 188 (125-300) min in Group II (P = 0.62). Global patient satisfaction was comparable between both groups.

**CONCLUSIONS:** Levobupivacaine 3 mg plus 10 microg fentanyl may be used as a suitable alternative to 10 mg lidocaine plus 10 microg fentanyl for spinal anesthesia of short duration. It achieved a clinically equivalent time for resolution of sensory block, similar intraoperative conditions, and comparable patient satisfaction..

### 七氟醚和丙泊酚在給氧條件下對鼠的葡萄糖代謝的影響

#### **The effects of sevoflurane and propofol on glucose metabolism under aerobic conditions in fed rats.**

Kitamura T, Ogawa M, Kawamura G, Sato K, Yamada Y.

Takayuki Kitamura, MD, Makoto Ogawa, MD, Gaku Kawamura, MD, Kanako Sato, MD, and Yoshitsugu Yamada, MD, PhD

From the Department of Anesthesiology, Faculty of Medicine, The University of Tokyo, Bunkyo-ku, Tokyo, Japan.

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**背景：**最近研究報告外科手術中的高血糖是手術死亡和術後併發症的獨立風險因素。揮發性麻醉劑，例如七氟醚，會削弱葡萄糖分解，有可能會導致外科手術中發生高血糖。然而，靜脈麻醉劑，例如丙泊酚，對葡萄糖代謝影響的研究還很貧乏。因此，我們通過給氧的實驗鼠比較七氟醚和丙泊酚對葡萄糖代謝的影響。

**方法：**我們首先測定了接受 S 形結腸開口術的鼠在七氟醚、七氟醚/丁丙諾啡、丙泊酚和丙泊酚/丁丙諾啡麻醉下時血糖的變化。然後我們對經葡萄糖管理之後的清醒鼠、七氟醚麻醉鼠以及丙泊酚麻醉鼠的血糖變化進行血糖變化的測定。

**結果：**七氟醚麻醉鼠行 S 形結腸開口術後血糖水準明顯升高，並且其升高不能通過丁丙諾啡預防。丙泊酚麻醉鼠在高麻醉劑量下行 S 形結腸開口術後血糖無變化，但在低劑量及中間劑量的麻醉下血糖會有輕微的升高，這輕微的升高可由丁丙諾啡完全預防。但是經葡萄糖管理的鼠在七氟醚麻醉下血糖的變化比清醒鼠的更好，而丙泊酚麻醉下的鼠則類似於清醒鼠。

**結論：**在手術期間，七氟醚和七氟醚/丁丙諾啡麻醉下可觀察到高血糖症，而丙泊酚和丙泊酚/丁丙諾啡麻醉下血糖水準相對穩定。但是七氟醚可增加葡萄糖的不耐受，丙泊酚對葡萄糖耐受性無影響。我們推測丙泊酚的這個特點對本項研究中觀察到的穩定的葡萄糖代謝至少起了部分作用。本項研究的結果證實了七氟醚和丙泊酚對葡萄糖代謝的影響有著明顯區別。

(李瑩譯 薛張綱校)

**BACKGROUND:** Recent studies reported that intraoperative hyperglycemia is an independent risk factor for mortality and morbidity related to surgery. Volatile anesthetics, such as sevoflurane, impair glucose use, suggesting their possible contributions to intraoperative hyperglycemia. However, the effects of IV anesthetics, such as propofol, on glucose metabolism are poorly understood. Thus, we compared the effects of sevoflurane and propofol on glucose metabolism under aerobic conditions in fed rats.

**METHODS:** We first examined changes in blood glucose levels in rats undergoing sigmoid colostomy under sevoflurane, sevoflurane/buprenorphine, propofol, and propofol/buprenorphine anesthesia. We then examined changes in blood glucose levels after glucose administration using awake rats, rats under sevoflurane anesthesia, and rats under propofol anesthesia.

**RESULTS:** Blood glucose levels increased markedly after sigmoid colostomy under sevoflurane anesthesia; the marked increases could not be prevented by the coadministration of buprenorphine. Under propofol anesthesia, blood glucose levels did not change after sigmoid colostomy at the highest dose, but increased slightly at the lowest and intermediate doses; the slight increases were completely prevented by the coadministration of buprenorphine. Whereas changes in blood glucose levels after glucose administration in rats under sevoflurane anesthesia were significantly greater than those in awake rats, the changes in rats under propofol anesthesia were similar to those in awake rats.

**CONCLUSIONS:** During surgery, hyperglycemia was observed under sevoflurane and sevoflurane/buprenorphine anesthesia, but blood glucose levels were relatively stable under propofol and propofol/buprenorphine anesthesia. Whereas sevoflurane exaggerates glucose intolerance, propofol has no significant effects on glucose tolerance. We speculate that this feature of propofol contributes, at least in part, to the stable glucose metabolism during surgery observed in this study. The results of this study confirm the marked difference in the effects of sevoflurane and propofol on glucose metabolism.

### 異氟醚誘導的翻正反應和呼吸改變受 RGS 蛋白調控

#### Isoflurane-Induced Changes in Righting Response and Breathing Are Modulated by RGS Proteins

Eduardo E. Icaza, BS<sup>\*</sup>, Xinyan Huang, PhD<sup>†</sup>, Ying Fu, PhD<sup>†</sup>, Richard R. Neubig, MD, PhD<sup>†</sup>, Helen A. Baghdoyan, PhD<sup>\*†</sup>, and Ralph Lydic, PhD<sup>\*</sup>

From the Departments of <sup>\*</sup>Anesthesiology, and <sup>†</sup>Pharmacology, University of Michigan, Ann Arbor, Michigan.

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**背景：**近期研究顯示 G 蛋白偶聯受體，尤其是連接於  $G_{\alpha_1}$  上的可能與麻醉反應有關。G 蛋白信號轉導調節 (RGS) 蛋白與  $G_{\alpha_1}$  結合使之活化來抑制信號轉導。敲入對 RGS 不敏感的  $G_{\alpha_{12}}$  G184S ( $G_{\alpha_{12}}$  GS) 等位元基因小鼠顯示出增強的  $G_{\alpha_{12}}$  信號轉導，並提供了全麻中觀察  $G_{\alpha_{12}}$  信號轉導和 RGS 蛋白的新途徑。

**方法：**我們用異氟醚麻醉了  $G_{\alpha_{12}}$  GS/GS 純合子小鼠和野生型小鼠 (WT)，計數它們失去及恢復翻正反應的時間 (秒)。在異氟醚麻醉恢復期，兩組小鼠的呼吸以體積描記法計算得出。

**結果：** $G_{\alpha_{12}}$  GS/GS 小鼠失去翻正反應的時間顯著少於野生型，恢復翻正反應的時間顯著多於野生型。在異氟醚麻醉恢復期， $G_{\alpha_{12}}$  GS/GS 小鼠顯示出更為顯著的呼吸抑制。Poincaré 分析顯示與野生型小鼠相比，GS/GS 小鼠的呼吸變異度變小。

**結論：** RGS 蛋白調控的  $G_{\alpha_{12}}$  信號轉導改變覺醒的喪失和恢復，以及呼吸中狀態依賴的改變。

(姚敏敏譯 薛張綱校)

**BACKGROUND:** Recent evidence suggests that G protein-coupled receptors, especially those linked to  $G_{\alpha_i}$ , contribute to the mechanisms of anesthetic action. Regulator of G protein signaling (RGS) proteins bind to activated  $G_{\alpha_i}$  and inhibit signal transduction. Genomic knock-in mice with an RGS-insensitive  $G_{\alpha_{12}}$  G184S ( $G_{\alpha_{12}}$  GS) allele exhibit enhanced  $G_{\alpha_{12}}$  signaling and provide a novel approach for investigating the role of  $G_{\alpha_{12}}$  signaling and RGS proteins in general anesthesia.

**METHODS:** We anesthetized homozygous  $G_{\alpha_{12}}$  GS/GS and wild-type (WT) mice with isoflurane and quantified time (in seconds) to loss and resumption of righting response. During recovery from isoflurane anesthesia, breathing was quantified in a plethysmography chamber for both lines of mice.

**RESULTS:**  $G_{\alpha_{12}}$  GS/GS mice required significantly less time for loss of righting and significantly more time for resumption of righting than WT mice. During recovery from isoflurane anesthesia,  $G_{\alpha_{12}}$  GS/GS mice exhibited significantly greater respiratory depression. Poincaré analyses show that GS/GS mice have diminished respiratory variability compared with WT mice.

**CONCLUSION:** Modulation of  $G_{\alpha_{12}}$  signaling by RGS proteins alters loss and resumption of wakefulness and state-dependent changes in breathing.

## 兩個中心實驗室酸鹼診斷的 Stewart 參數的再現性

### The Reproducibility of Stewart Parameters for Acid-Base Diagnosis Using Two Central Laboratory Analyzers

Ba-Vinh Nguyen, MD\* , Jean-Louis Vincent, MD, PhD , Jean Baptiste Hamm, MD , Jean-Hervé Abalain, PhD , Jean-Luc Carre, MD, PhD , Emmanuel Nowak, PhD||, Mehdi Ould Ahmed, MD\*, Charles C. Arvieux, MD, PhD , and Gildas Gueret, MD, PhD

From the \*Department of Anesthesiology and Critical Care, Clermont Tonnerre Military Hospital, Brest, France; Department of Anesthesiology and Critical Care, CHU, Brest, France; Department of Intensive Care, Erasme Hospital, Université Libre de Bruxelles, Brussels, Belgium; Department of Biochemistry and Molecular Biology, CHU, Brest, France; and ||INSERM CIC 0502, CHU, Brest, France.

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**背景：**酸鹼平衡可以使用 Stewart-Fencl 方法來解釋，該方法包含了表觀強離子差 (SIDapp)，有效強離子差 (SIDeff)，和強離子間隙 (SIG) 的計算。這些計算要求測量若干個變數。我們假定 SID 和 SIG 通過不同的方法計算不會由於測量值的可變性而再現。

**方法：**這個在生化實驗室裡進行的前瞻性研究中，我們分析了 3 個月內一系列病人的 179 個常規血液樣本，分別使用了兩種自動血液化學分析儀：LX20 (Beckman) 和 Modular (Roche)。兩種分析儀的測量和計算參數進行了比較。

**結果：**雖然兩種測量值的相關性令人滿意，但是兩者計算值一致性的極限存在很大的差距 (SIDapp: 9.6 mEq/L, SIDeff: 6.4 mEq/L, and SIG: 11.7 mEq/L) 和弱相關性 (SIDapp:  $r^2 = 0.54$  and SIG:  $r^2 = 0.12$ )。

**結論：**用 Stewart-Fencl 方法的結果來解釋酸鹼狀態可以根據使用分析儀的不同而發生變化。這些差距可能有重要的臨床和研究意義。

(俞佳譯 薛張綱校)

**BACKGROUND:** Acid-base derangements can be interpreted using the Stewart-Fencl approach, which includes calculation of the apparent strong ion difference (SIDapp), the effective SID (SIDeff), and the strong ion gap (SIG). These calculations require the measurement of several variables. We hypothesized that the SID and SIG calculated by different analyzers would not be reproducible because of variability in the measured values.

**METHODS:** In this prospective observational study conducted in a biochemistry laboratory, we analyzed 179 routine blood samples from consecutive patients over a 3-mo period using two automated blood chemistry analyzers, the LX20 (Beckman) and the Modular (Roche). Measured and calculated parameters from the two analyzers were compared.

**RESULTS:** Although the correlation between measured values was satisfactory, there were large differences in the limits of agreement for calculated values (SIDapp: 9.6 mEq/L, SIDeff: 6.4 mEq/L, and SIG: 11.7 mEq/L) and a weak correlation (SIDapp:  $r^2 = 0.54$  and SIG:  $r^2 = 0.12$ ) between the analyzers.

**CONCLUSIONS:** The results of the Stewart-Fencl approach for interpretation of acid-base status can vary according to the analyzer used. These differences may have important clinical and research implications..

## 環狀軟骨壓迫導致下咽喉部壓縮：食管位置無相關性

### **Cricoid Pressure Results in Compression of the Postcricoid Hypopharynx: The Esophageal Position Is Irrelevant**

Mark J. Rice, MD\*, Anthony A. Mancuso, MD†, Charles Gibbs, MD\*, Timothy E. Morey, MD\*, Nikolaus Gravenstein, MD\*, and Lori A. Deitte, MD†

From the Departments of \*Anesthesiology, and †Radiology, University of Florida College of Medicine, Gainesville, Florida.

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**背景：**Sellick 將環狀軟骨壓迫描述為捏環狀軟骨與頸椎之間的食管。最近一項研究顯示在環狀軟骨壓迫下，超過 90% 以上的時候食管位置橫向移動，質疑了這個模型的效果。我們設計這個實驗來精確定義 Sellick 模型的解剖並調查其效果。

**方法：**24 名未鎮靜的成人志願者行頸部磁共振檢查給予或不給予環狀軟骨壓迫。在環狀軟骨壓迫時衡量環後咽部，氣道壓縮度和側向位移的環狀環。回顧相關解剖。

**結果：**下嚥（而非食道）位於環狀軟骨環背面並被環狀軟骨壓迫這一措施壓縮。遠端下嚥，環狀軟骨水準的消化道，被環狀軟骨環充填而非移位。有環狀軟骨壓迫，下嚥平均前後直徑減少了 35%，這壓縮，即使是環狀軟骨環壓向外側椎體仍然存在。

**結論：**食管的位置與移動與環狀軟骨壓迫在防止胃食管返流的效果無相關性。下嚥與環狀軟骨一起移動，形成一個解剖單位。這個關係對於環狀軟骨壓迫的效果和可靠性是至關重要的。磁共振顯示壓迫消化道與環狀軟骨相對錐體中線和側向移動是一起發生的。

（張玥琪譯，薛張綱校）

**BACKGROUND:** Sellick described cricoid pressure (CP) as pinching the esophagus between the cricoid ring and the cervical spine. A recent report noted that with the application of CP, the esophagus moved laterally more than 90% of the time, questioning the efficacy of this maneuver. We designed this study to accurately define the anatomy of the Sellick maneuver and to investigate its efficacy.

**METHODS:** Twenty-four nonsedated adult volunteers underwent neck magnetic resonance imaging with and without CP. Measurements were made of the postcricoid hypopharynx, airway compression, and lateral displacement of the cricoid ring during the application of CP. The relevant anatomy was reviewed.

**RESULTS:** The hypopharynx, not the esophagus, is what lies behind the cricoid ring and is compressed by CP. The distal hypopharynx, the portion of the alimentary canal at the cricoid level, was fixed with respect to the cricoid ring and not mobile. With CP, the mean anteroposterior diameter of the hypopharynx was reduced by 35% and the lumen likely obliterated, and this compression was maintained even when the cricoid ring was lateral to the vertebral body.

**CONCLUSIONS:** The location and movement of the esophagus is irrelevant to the efficiency of the Sellick's maneuver (CP) in regard to prevention of gastric regurgitation into the pharynx. The hypopharynx and cricoid ring move together as an anatomic unit. This relationship is essential to the efficacy and reliability of Sellick's maneuver. The magnetic resonance images show that compression of the alimentary tract

occurs with midline and lateral displacement of the cricoid cartilage relative to the underlying vertebral body.

### 實驗性中毒性休克中的強心支持：第一部分.左西孟旦對內臟灌注的影響

#### Inotropic support during experimental endotoxemic shock: part I. The effects of levosimendan on splanchnic perfusion.

Doris Cunha-Goncalves, MD\*, Valeria Perez-de-Sa, MD, PhD<sup>†</sup>, Edgars Grins, MD\*, Peter L. Dahm, MD, PhD<sup>†</sup>, Johan Thörne, MD, PhD<sup>§</sup>, and Sten Blomquist, MD, PhD\*

From the \*Departments of Cardiothoracic Anesthesia and Intensive Care, and <sup>†</sup>Pediatric Anesthesia and Intensive Care, Lund University Hospital; <sup>‡</sup>Department of Anesthesia and Intensive Care, Ystad Hospital; and <sup>§</sup> Department of Surgery, Helsingborg Hospital, Sweden.

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**背景：**感染性休克可引起內臟高灌注。我們假設左西孟旦能改善中毒性休克期間全身和肝臟的血流灌注。

**方法：**對 16 只麻醉好的實驗用豬(31.4 +/- 3.4 kg)進行頸靜脈、頸動脈、肺動脈（溫度稀釋法）、肝門靜脈和肝靜脈插管，用來監測血流動力學和採集血樣。在肝門靜脈、肝動脈和腸系膜上動脈(SMA)附近放置超聲血流探測儀。在給於 30 mL/kg 右旋糖酐 70 的基礎上，所有動物在實驗期間應靜脈給於 10 mL x kg(-1) x h(-1)的液體。以 2 microg x kg(-1) x h(-1)的速度持續向豬體內輸注內毒素 300 分鐘，在開始輸注 100 分鐘後，隨機將豬分為實驗組和對照組，前者接受左西孟旦(50 microg x kg(-1) x h(-1), n = 8)，後者接受安慰劑(n = 8)。為評估內毒素血症的獨立因素，將所有的資料在隨機分組前放在同一組中。對資料進行方差分析並以均數加減標準差來表示。

**結果：**在開始輸注內毒素 90 分鐘後，全組資料顯示全身血管阻力(SVR, 2526 +/- 203 to 1946 +/- 122 dyn x s x cm(-5), P = 0.003) 和平均動脈壓(MAP, 109 +/- 6 to 84 +/- 3 mm Hg, P < 0.05)均有降低，但同時心率(66 +/- 4 to 98 +/- 8 bpm)和肺動脈契壓(MPAP, 20 +/- 1 to 38 +/- 2 mm Hg)升高，P < 0.001。心輸出量(CO, 3.4 +/- 0.2 L/min)和全身氧氣的輸送(414 +/- 33 mL/min)無改變，但腸系膜上動脈的血流(575 +/- 34 to 392 +/- 38 mL/min)和肝門靜脈的血流(881 +/- 62 to 568 +/- 39 mL/min)均降低，P < 0.001。雖然肝動脈血流增加(36 +/- 8 to 219 +/- 38 mL/min)，但消化道(114 +/- 11 to 84 +/- 7 mL/min)和肝臟(94 +/- 11 to 67 +/- 8 mL/min)的氧氣輸送降低，P < 0.05。在輸注內毒素 300 分鐘後，實驗組的 MPAP (39 +/- 3 vs 49 +/- 2 mm Hg, P = 0.025), SVR (2158 +/- 186 vs 3069 +/- 370 dyn x s x cm(-5), P = 0.052)和 MAP (55 +/- 9 vs 87 +/- 9 mm Hg, P < 0.001)均較對照組顯著降低。兩組動物的 CO，門靜脈和肝動脈血流均減少(P < 0.001)。在 300 分鐘時，左西孟旦組的均值分別為 2.0 +/- 0.4 L/min, 390 +/- 83 mL/min, and 36 +/- 12 mL/min。腸系膜上動脈的血流僅在左西孟



且組減少(432 +/- 40 to 320 +/- 78 mL/min, P < 0.001), 但內臟氧氣的輸送在兩組均有降低, 左西孟旦組為 85 +/- 12 to 63 +/- 12 mL/min, P < 0.001, 對照組為 83 +/- 6 to 59 +/- 3 mL/min, P = 0.03。

**結論:** 用實驗豬建立中毒性休克模型, 在適當的液體復蘇的同時給于左西孟旦可防止遠期肺動脈契壓的升高, 維持較低的全身血管阻力。然而, 對於心排量和平均動脈壓的降低無明顯改善。左西孟旦既無法阻止休克的進展, 也不能改善肝臟血流的灌注。

(張釗譯 薛張綱校)

**BACKGROUND:** Septic shock may cause splanchnic hypoperfusion. We hypothesized that levosimendan would improve systemic and hepatosplanchnic perfusion during endotoxemic shock.

**METHODS:** In 16 anesthetized pigs (31.4 +/- 3.4 kg), a jugular vein, a carotid artery, the pulmonary artery (thermodilution), the portal vein, and a hepatic vein were cannulated for hemodynamic monitoring and blood sampling. Ultrasonic flowprobes were placed around the portal vein, the hepatic artery, and the superior mesenteric artery (SMA). In addition to 30 mL/kg of dextran 70 given before baseline, all animals received 10 mL x kg(-1) x h(-1) of IV fluids throughout the experiment. An endotoxin infusion (2 microg x kg(-1) x h(-1)) was given for 300 min; 100 min after the start of endotoxin, the pigs were randomized to receive levosimendan (50 microg x kg(-1) x h(-1)), n = 8) or placebo (n = 8). To evaluate the isolated effects of endotoxemia, all data before randomization were pooled into one group. Data were analyzed by analysis of variance and presented as mean +/- sem.

**RESULTS:** Endotoxemia (t = 90 min, pooled data) decreased systemic vascular resistance (SVR, 2526 +/- 203 to 1946 +/- 122 dyn x s x cm(-5), P = 0.003) and mean arterial blood pressure (MAP, 109 +/- 6 to 84 +/- 3 mm Hg, P < 0.05), whereas heart rate (66 +/- 4 to 98 +/- 8 bpm), and mean pulmonary arterial pressure (MPAP, 20 +/- 1 to 38 +/- 2 mm Hg) increased (P < 0.001). Cardiac output (CO, 3.4 +/- 0.2 L/min) and systemic oxygen delivery (414 +/- 33 mL/min) were unchanged, but blood flows in the SMA (575 +/- 34 to 392 +/- 38 mL/min) and the portal vein (881 +/- 62 to 568 +/- 39 mL/min) decreased (P < 0.001). Although hepatic arterial blood flows increased (36 +/- 8 to 219 +/- 38 mL/min), gut (114 +/- 11 to 84 +/- 7 mL/min) and hepatic (94 +/- 11 to 67 +/- 8 mL/min) oxygen deliveries decreased (P < 0.05). At t = 300 min, the levosimendan group showed lower MPAP (39 +/- 3 vs 49 +/- 2 mm Hg, P = 0.025), lower SVR (2158 +/- 186 vs 3069 +/- 370 dyn x s x cm(-5), P = 0.052), and lower MAP (55 +/- 9 vs 87 +/- 9 mm Hg, P < 0.001) than the control group. In both groups, CO, portal vein, and hepatic arterial blood flows decreased (P < 0.001); the mean values for the levosimendan group at t = 300 min were 2.0 +/- 0.4 L/min, 390 +/- 83 mL/min, and 36 +/- 12 mL/min, respectively. SMA blood flow decreased only in the levosimendan group (432 +/- 40 to 320 +/- 78 mL/min, P < 0.001), whereas gut oxygen delivery decreased in the levosimendan (85 +/- 12 to 63 +/- 12 mL/min, P < 0.001) and in the control (83 +/- 6 to 59 +/- 3 mL/min, P = 0.03) groups.

**CONCLUSION:** Levosimendan administered after the establishment of endotoxemic shock to pigs receiving moderate fluid resuscitation prevented further increases in MPAP and maintained a low SVR. There were, however, no improvements in CO, MAP

decreased, and levosimendan neither prevented the development of circulatory shock nor improved hepatosplanchnic perfusion.

### 異氟烷預處理改善內毒素誘導大鼠急性肺損傷並降低死亡率

#### Isoflurane Preconditioning Ameliorates Endotoxin-Induced Acute Lung Injury and Mortality in Rats

Isoflurane Preconditioning Ameliorates Endotoxin-Induced Acute Lung Injury and Mortality in Rats

Qi Fang Li, MD, PhD, Ye Sen Zhu, MD, Hong Jiang, MD, PhD, Hui Xu, MD, and Yu Sun, MD

From the Department of Anesthesiology, Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China.

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**背景：**異氟烷預處理對內毒素誘導的嚴重急性肺損傷肺致炎因數和存活率的影響未得到過系統的研究，我們觀察預先給予異氟烷對脂多糖誘導的大鼠急性肺損傷的影響。

**方法：**250-300g 的雄性 Sprague-Dawley 大鼠隨機分為 4 組：純氧預處理腹腔內注射生理鹽水組；異氟烷預處理組；純氧預處理腹腔注射脂多糖組和異氟烷預處理腹腔內注射脂多糖組。內毒素由腹腔內注射脂多糖產生。注射脂多糖前吸入 1.4% 的異氟烷 30 分鐘。然後觀察大鼠 6 小時，監測動脈壓、心率和血氣。急性肺損傷的嚴重程度由肺的濕/幹比、滲出物伊文思藍染色和組織學檢查評估。對肺的 NO、NTF- $\alpha$ 、IL-1 $\beta$  和 IL-6 的水準也進行測量。另外，統計存活率並測定誘生一氧化氮合酶(iNOS)基因的表達。

**結果：**脂多糖引發嚴重的系統性低血壓和急性肺損傷，急性肺損傷程度、肺功能損害以及肺 NO, TNF- $\alpha$ , IL-1 $\beta$  和 IL-6 的增加可以證明之一點。異氟烷預處理可以減輕系統性低血壓和急性肺損傷的發展，也能減少脂多糖誘導的肺內硝酸鹽/亞硝酸鹽和致炎因數的釋放，並改善重症敗血症大鼠的存活率。脂多糖導致 iNOS 基因表達上調而異氟烷預處理可以減少基因表達。

**結論：**異氟烷預處理能減少肺致炎因數的釋放，降低重症敗血症的死亡率。早期的保護作用可能有部分通過抑制 iNOS-NO 途徑的活性介導。

(朱蘭芳譯 薛張剛校)

**BACKGROUND:** The effects of isoflurane pretreatment on pulmonary proinflammatory cytokines and survival in severe endotoxin-induced acute lung injury (ALI) have not been studied systemically. We investigated the effect of preadministration of isoflurane on ALI induced by lipopolysaccharide (LPS) in rats.

**METHODS:** Male Sprague-Dawley rats weighing 250-300 g were randomly assigned to 1 of 4 groups: sham rats (injected intraperitoneally [IP] with saline) pretreated with vehicle (100% O<sub>2</sub>) (sham-vehicle); sham rats pretreated with isoflurane (sham-ISO); LPS rats (injected IP with LPS) pretreated with vehicle (vehicle-LPS); and LPS rats pretreated

with isoflurane (ISO-LPS). Endotoxemia was induced by IP injection of LPS. Isoflurane 1.4% was administered 30 min before LPS injection. The animals were then observed for 6 h. We monitored arterial blood pressure, heart rate, and blood gas. The extent of ALI was evaluated by lung wet/dry ratio, Evans blue dye extravasation, and histologic examination. We also measured pulmonary nitric oxide (NO), tumor necrosis factor (TNF)- $\alpha$ , interleukin (IL)-1 $\beta$ , and IL-6 levels. In addition, survival statistics and pulmonary inducible NO synthase (iNOS) gene expression were also determined.

**RESULTS:** LPS caused systemic hypotension and severe ALI, as evidenced by the increases in the extent of ALI, impairment of pulmonary functions, and increases in pulmonary NO, TNF- $\alpha$ , IL-1 $\beta$ , and IL-6. Isoflurane preconditioning mitigated systemic hypotension and the development of ALI. Isoflurane preconditioning also attenuated the LPS-induced increases in pulmonary nitrate/nitrite and proinflammatory cytokine release and improved survival of rats with severe sepsis. The expression of iNOS was upregulated by LPS and reduced by isoflurane pretreatment.

**CONCLUSIONS:** Isoflurane preconditioning can attenuate pulmonary proinflammatory cytokine release and decrease the mortality induced by severe sepsis. Early protection seems to be mediated partly through inhibition of iNOS-NO pathway activation.

### 輕度低溫不會長期影響小鼠局部缺血的神經再生

#### Mild Hypothermia Has No Long-Term Impact on Postischemic Neurogenesis in Rats

Irina Lasarzik, MD\*, Uta Winkelheide, DVM\*, Serge C. Thal, MD\*, Natascha Benz, MD\*, Matthias Lörcher, MD\*, Antje Jahn-Eimermacher, Dipl Math†, Christian Werner, MD, PhD\*, and Kristin Engelhard, MD, PhD\*

From the \*Department of Anesthesiology, and †Institute of Medical Biostatistics, Epidemiology and Informatics, Medical Center of the Johannes Gutenberg-University, Mainz, Germany.

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**背景：**治療性低溫可以改善局部缺血部位的功能，這與缺血後神經再生有關。我們研究了是否輕度低溫可以長期增加局部缺血處的神經再生。

**方法：**70 只雄性 Sprague Dawley 小鼠通過七氟醚麻醉後隨機分為下述治療組：類比手術控制常溫下缺氧，局部缺血時低溫，局部缺血後低溫。同時研究了 15 只實驗小鼠的神經發生作為資料。通過雙測頸動脈阻塞及低血壓狀態製造前腦缺血模型。在常溫組，顱骨膜溫度維持在 37.5 °C。低溫組維持在顱骨膜溫度 33°C 保持 45 分鐘。所有的小鼠接受 5-溴-2-去氧尿苷治療 7 天。28 天后分析了組織病理學損傷情況及海馬的 5-溴-2-去氧尿苷正相關的神經元。

**結果：**低溫沒有影響固有的神經再生。不論顱骨膜溫度如何，大腦缺血均增加了新神經元的數量。缺血開始前開始 45 分鐘的低體溫可以消除海馬 CA1 和 CA3 區域的損傷量至 <10%，但是和常溫相比，缺血開始後的低溫並沒有降低神經損傷。

**結論：**缺血過程中及缺血後低體溫均不能增加缺血導致的內源性神經再生。缺血過程中低體溫可以降低海馬的損傷，而缺血後低溫並不能預防組織病理學損傷。這表明，大腦缺血後 28 天，輕度缺血後低溫並不能顯著增加缺血後神經元的數量，並且不能影響組織病理學損傷的嚴重程度。

(陳琚琚譯 薛張綱校)

**BACKGROUND:** Postischemic improvement of functional outcome by therapeutic hypothermia may be related to cerebral regeneration by postischemic neurogenesis. We investigated whether mild peri-ischemic hypothermia leads to a long-term increase in postischemic neurogenesis.

**METHODS:** Seventy male sevoflurane-anesthetized Sprague Dawley rats were randomly assigned to the following treatment groups: normothermic ischemia, intraischemic hypothermia, and postischemic hypothermia with corresponding sham-operated controls. Fifteen naive rats were investigated as reference for natural neurogenesis. Forebrain ischemia was induced by bilateral common carotid artery occlusion and hemorrhagic hypotension. In normothermic groups, the pericranial temperature was maintained at 37.5°C. Animals in the hypothermic groups were cooled to a pericranial temperature of 33°C for 45 min. All animals received 5-bromo-2-deoxyuridine for 7 days. Histopathological damage and 5-bromo-2-deoxyuridine-positive neurons of the hippocampus were analyzed after 28 days.

**RESULTS:** Hypothermia had no impact on natural neurogenesis. Cerebral ischemia increased the number of new neurons regardless of pericranial temperature. Forty-five minutes of hypothermia beginning before ischemia diminished hippocampal injury to <10% in the CA1 and CA3 regions, whereas 45 min of postischemic hypothermia beginning after reperfusion did not reduce neuronal injury compared with normothermia.

**CONCLUSIONS:** Neither intraischemic nor postischemic hypothermia affected the ischemia-induced increase in endogenous neurogenesis. Intraischemic hypothermia reduced hippocampal damage, whereas postischemic hypothermia as applied here did not prevent formation of histopathological injury. This indicates that, 28 days after cerebral ischemia, postischemic neurogenesis is not significantly increased by mild peri-ischemic hypothermia and not affected by the severity of histopathological damage.

### 比較 2007 年與 1992 年在急性疼痛方面的臨床試驗，研品質有所提高，而不是數量 **Increase in Quality, but Not Quantity, of Clinical Trials in Acute Pain: 1992 Versus 2007**

Mark D. Reeves, MBBS, FANZCA

From the Department of Anaesthesia, North West Regional Hospital, Burnie, Tasmania, Australia.

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背景：近 15 年來，每年在最影響的 6 本麻醉雜誌發表的關於成年患者術後急性疼痛的臨床試驗的數量略有變化，從每年 16% (95% 置信區間：12-20) 下降至每年 11% (95% 置信區間：9-15)。但是 2007 年發表的 70% 文章在研究方法的品質有所提高，表現在分析效能，盲法及特異性終點選擇方面。研究的興趣也從單一軸索鎮痛變化為多模式鎮痛。

(陳琚琚譯 薛張綱校)

The annual number of published clinical trials in acute postoperative pain in adults has changed little in 15 yr and, as a fraction of all clinical trials published in the six highest impact journals in anesthesiology, has actually decreased from 16% (95% confidence

interval: 12-20) to 11% (95% confidence interval: 9-15). However, the methodological quality of reports has improved, with explicit statements on power analysis, allocation concealment, and specification of primary end points exceeding 90% of reports in 2007. There has been a shift in hypothesis interests away from neuraxial analgesia and toward multimodal analgesia.

分別通過超聲引導下和神經刺激，比較使用 1.5% 甲呱卡因應用於臀下徑路坐骨神經阻滯的最小有效麻醉容量

### The Effects of Ultrasound Guidance and Neurostimulation on the Minimum Effective Anesthetic Volume of Mepivacaine 1.5% Required to Block the Sciatic Nerve Using the Subgluteal Approach

Giorgio Danelli, MD, Daniela Ghisi, MD, Andrea Fanelli, MD, Andrea Ortu, MD, Elisa Moschini, MD, Marco Berti, MD, Stefanie Ziegler, MD, and Guido Fanelli, MD  
From the Department of Anesthesiology, Intensive Care and Pain Therapy, University Hospital, Parma, Italy.

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**背景：**我們為了驗證如下假設：在臀下徑路行坐骨神經阻滯時，相比於神經刺激，使用超聲引導可以減少 1.5% 甲呱卡因的最小有效麻醉容量(MEAV<sub>50</sub>)。

**方法：**術前用藥及單次股神經阻滯後，60 名行膝內窺鏡手術需坐骨神經阻滯的患者隨機分為兩組：神經刺激( $n = 30$ )或超聲引導( $n = 30$ )。在超聲引導組，坐骨神經定位於坐骨粗隆和大轉子之間。在神經刺激組，肌肉的反應（足趾屈或內翻）被電刺激(1.5 mA, 2 Hz, 0.1 ms，維持 $\leq 0.5$  mA)引出。每個患者局麻藥的用量逐步遞增或減少，用量基於前一名病人的反應情況，初始劑量為 12ml。獨立的觀察者評估針刺覺及運動完全消失的發生：前一患者注射後 20min 觀察陽性及陰性應答情況，後一患者減少或增加 2ml 用量。

**結果：**坐骨神經阻滯在超聲引導組的平均 MEAV<sub>50</sub> 為 12ml (95% 置信區間[CI], 10–23 mL)，神經刺激組為 19 mL (95% CI, 15–23 mL)( $P < 0.001$ )。在超聲引導組，95% 病例有效劑量為 14 mL (95% CI, 12–17 mL)；神經刺激組的 95% 有效劑量為 29 mL (95% CI, 25–40 mL)( $P = 0.008$ )。

**結論：**相比於神經刺激下坐骨神經阻滯，超聲引導下使用 1.5% 甲呱卡因的 MEAV<sub>50</sub> 的劑量可減少 37%。

(陳珺珺譯 薛張綱校)

**BACKGROUND:** We tested the hypothesis that ultrasound (US) guidance may reduce the minimum effective anesthetic volume (MEAV<sub>50</sub>) of 1.5% mepivacaine required to block the sciatic nerve with a subgluteal approach compared with neurostimulation (NS).

**METHODS:** After premedication and single-injection femoral nerve block, 60 patients undergoing knee arthroscopy were randomly allocated to receive a sciatic nerve block with either NS ( $n = 30$ ) or US ( $n = 30$ ). In the US group, the sciatic nerve was localized between the ischial tuberosity and the greater trochanter. In the NS group, the appropriate muscular response (foot plantar flexion or inversion) was elicited (1.5 mA, 2 Hz, 0.1 ms) and maintained to  $\leq 0.5$  mA. The volume of the injected local anesthetic was varied for consecutive patients based on an up-and-down method, according to the response of the previous patient. The initial volume was 12 mL. An independent observer evaluated the



occurrence of complete loss of pinprick sensation and motor block: positive or negative responses within 20 min after the injection determined a 2-mL decrease or increase for the next patient, respectively.

**RESULTS:** The mean MEAV<sub>50</sub> for sciatic nerve block was 12 mL (95% confidence interval [CI], 10–23 mL) in Group US and 19 mL (95% CI, 15–23 mL) in Group NS ( $P < 0.001$ ). The effective dose in 95% of cases was 14 mL (95% CI, 12–17 mL) in Group US and 29 mL (95% CI, 25–40 mL) in Group NS ( $P = 0.008$ ).

**CONCLUSIONS:** US provided a 37% reduction in the MEAV<sub>50</sub> of 1.5% mepivacaine required to block the sciatic nerve compared with NS.

### 創傷小鼠行電刺療法對脾 Th1/Th2 細胞因數 mRNA 表達和 T 細胞絲裂原活化蛋白激酶信號傳導通路的影響

#### The Effects of Electroacupuncture on Th1/Th2 Cytokine mRNA Expression and Mitogen-Activated Protein Kinase Signaling Pathways in the Splenic T Cells of Traumatized Rats

Kun Wang, MD, Huaxing Wu, MD, Guonian Wang, MD, Mingming Li, MD, Zhaodi Zhang, MD, and Guangying Gu, MD

From the Department of Anesthesiology, The Third Clinical Hospital, Harbin Medical University, Harbin, China.

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**背景：**手術創傷可以導致術後免疫抑制，從而增加感染的風險。電針療法可以止痛，從而調節免疫狀態。然而電針療法產生的免疫調節的機制並不是很清楚。因此我們研究電針療法後 T 輔助細胞(Th)1/Th2 產生細胞因數及 mRNA 的表達，從而評估電針療法產生免疫調節的機制。

**方法：**24 只小鼠隨機分為 4 組：對照組，創傷 (T)，創傷 (T) + 假電針刺 (EA) 和 T + EA。EA 分別在術後 30 分鐘、術後 1 到 5 天每天一次行足三裡 (ST36) 和闌尾點 (Extra37) 針刺穴位。測定脾 T 細胞及其產物 IL-2，干擾素 $\gamma$ ，IL-4 和 IL-10 的 mRNA 表達。此外還測定了絲裂原活化蛋白激酶的活性和 DNA 結合 NF- $\kappa$ B 和啟動蛋白 (AP)-1 的活性。

**結果：**在術後第 1 天到第 5 天，相比於創傷組，T+EA 的撤藥的域值和潛伏期顯著增加，第 1 天為 (撤藥域值:  $5.8 \pm 0.7$  vs  $3.0 \pm 0.7$  g; ; 撤藥潛伏期:  $7.0 \pm 0.8$  vs  $4.5 \pm 0.5$  s;  $P < 0.001$ )，第 5 天為 ( $9.0 \pm 0.6$  vs  $5.5 \pm 0.6$  g;  $12.0 \pm 1.3$  vs  $7.0 \pm 0.8$  s;  $P < 0.001$ )。在術後第三天，創傷小鼠 Th1 產生的細胞因數 (IL-2 和干擾素 $\gamma$ ) 及脾 T 細胞的 mRNA 表達顯著減少 ( $P < 0.001$ , 創傷組 vs 對照組)，而 Th2 產生的細胞因數 (IL-4 和 IL-10) 及 mRNA 表達增加 ( $P < 0.001$ )。同時伴隨細胞外調節蛋白激酶 (ERK) 1/2, p38, NF- $\kappa$ B 和 AP-1 活性的降低 ( $P < 0.001$ , 創傷組 vs 對照組)。給予 EA 可以增加 Th1 細胞因數蛋白質及 mRNA 的表達，抑制 Th2 細胞因數及 mRNA 的表達 ( $P < 0.05$ , T + EA 組 vs 創傷組)，並可以增加 ERK1/2, p38, NF- $\kappa$ B 和 AP-1 的活性 ( $P < 0.001$ , T + EA 組 vs 創傷組)。



**結論：**EA 可以在蛋白質可 mRNA 水準調節脾 Th1 和 Th2 產生的細胞因數間的平衡，至少在一段時間與 ERK1/2, p38, NF- $\kappa$ B 和 AP-1 信號通路傳導有關。這些發現提示 EA 可以改善手術創傷造成的免疫抑制。

(陳珺珺譯 薛張綱校)

**BACKGROUND:** Surgical trauma contributes to postoperative immune suppression, which is associated with an increased susceptibility to subsequent infections.

Electroacupuncture (EA) can alleviate pain and exert immunoregulatory effects.

However, the mechanism underlying the immunomodulation effects of EA is not fully elucidated. Therefore, we investigated the effects of EA on T helper (Th)1/Th2 cytokine production and mRNA expression and evaluated the signaling regulatory mechanism of EA effects.

**METHODS:** Rats were divided into four groups ( $n = 24$  each): control, trauma, trauma (T) + sham EA, and T + EA. EA was applied to Zusanli (ST36) and Lanwei (Extra37) acupoints at 20 min after surgery for 30 min, and then performed once a day on postoperative days 1–5. Splenic T cells were isolated and the production and mRNA expression of interleukin (IL)-2, interferon- $\gamma$ , IL-4, and IL-10 were assayed. The activation of mitogen-activated protein kinase and the DNA binding activity of nuclear factor (NF)- $\kappa$ B and activator protein (AP)-1 were examined.

**RESULTS:** Paw withdrawal threshold and paw withdrawal latency were significantly increased in the T + EA group compared with the trauma group from postoperative day 1 (paw withdrawal threshold:  $5.8 \pm 0.7$  vs  $3.0 \pm 0.7$  g; paw withdrawal latency:  $7.0 \pm 0.8$  vs  $4.5 \pm 0.5$  s;  $P < 0.001$ ) to day 5 ( $9.0 \pm 0.6$  vs  $5.5 \pm 0.6$  g;  $12.0 \pm 1.3$  vs  $7.0 \pm 0.8$  s;  $P < 0.001$ ). Th1 cytokine (IL-2 and interferon- $\gamma$ ) production and mRNA expression in splenic T cells of traumatized rats were significantly decreased on postoperative day 3 ( $P < 0.001$ , trauma group versus control group), whereas Th2 cytokine (IL-4 and IL-10) production and mRNA expression were increased ( $P < 0.001$ ). This was accompanied with a significant depression in the activity of extracellular-regulated protein kinase1/2, p38, NF- $\kappa$ B, and AP-1 ( $P < 0.001$ , trauma group versus control group). EA administration increased Th1 cytokine protein and mRNA expression, suppressed Th2 cytokine protein and mRNA expression ( $P < 0.05$ , T + EA group versus trauma group), and increased the activity of ERK1/2, p38, NF- $\kappa$ B, and AP-1 ( $P < 0.001$ , T + EA group versus trauma group).

**CONCLUSIONS:** EA regulates a balance between Th1 and Th2 cytokines at protein and mRNA levels in splenic T cells, and, at least in part, involves the signaling pathways of ERK1/2, p38, NF- $\kappa$ B, and AP-1. The findings suggest that EA may improve immune suppression after surgical trauma.