

Table of Contents

June 2010

Cardiovascular Anesthesiology

[成年心臟手術病人的血漿中性粒細胞明膠酶相關脂質運載蛋白和術後急性腎損傷](#)

(於章傑譯 陳傑校)

Plasma Neutrophil Gelatinase-Associated Lipocalin and Acute Postoperative Kidney Injury in Adult Cardiac Surgical Patients

- Tjörvi E. Perry,
- Jochen D. Muehlschlegel,
- Kuang-Yu Liu,
- Amanda A. Fox,
- Charles D. Collard,
- Stanton K. Shernan,
- Simon C. Body,
- and for the CABG Genomics Investigators

Anesth Analg June 2010 110:1541-1547; published ahead of print April 30, 2010

[三維經食道超聲心動圖對於進行心臟手術的患者術中臨床管理是一個較大的進步：一篇核心綜述](#)

(胡豔譯 馬皓琳 李士通校)

Core Review: Three-Dimensional Transesophageal Echocardiography Is a Major Advance for Intraoperative Clinical Management of Patients Undergoing Cardiac Surgery: A Core Review

- Annette Vegas and
- Massimiliano Meineri

Anesth Analg June 2010 110:1548-1573; published ahead of print April 30, 2010

Anesthetic Pharmacology

[異丙酚減少了咪達唑侖的分佈和清除](#)

(黃劍譯 薛張綱校)

Propofol Reduces the Distribution and Clearance of Midazolam

- Bart Jan Lichtenbelt,
- Erik Olofsen,
- Albert Dahan,
- Jack W. van Kleef,
- Michel M. R. F. Struys,
- and Jaap Vuyk

Anesth Analg June 2010 110:1597-1606; published ahead of print April 30, 2010

[全麻藥的突觸前作用是大鼠海馬CA1區的突觸傳導頻率依賴性改變的原因](#)

(於章傑譯 陳傑校)

Presynaptic Actions of General Anesthetics Are Responsible for Frequency-Dependent Modification of Synaptic Transmission in the Rat Hippocampal CA1

- Koki Hirota,
- Rika Sasaki,
- Sheldon H. Roth,
- and Mitsuaki Yamazaki

Anesth Analg June 2010 110:1607-1613; published ahead of print April 30, 2010

Technology, Computing, and Simulation

[缺氧患者的術中呼吸機管理和通氣策略概述](#)

(劉伍翻譯，馬皓琳、李士通校正)

A Description of Intraoperative Ventilator Management and Ventilation Strategies in Hypoxic Patients

- James M. Blum,
- Douglas M. Fetterman,
- Pauline K. Park,
- Michelle Morris,
- and Andrew L. Rosenberg

Anesth Analg June 2010 110:1616-1622; published ahead of print April 12, 2010

Patient Safety

[線內篩檢程式是否應用于外周靜脈導管來預防輸液相關靜脈炎？隨機對照研究的系統回顧](#)

(姚敏敏譯 薛張綱校)

Should In-line Filters Be Used in Peripheral Intravenous Catheters to Prevent Infusion-Related Phlebitis? A Systematic Review of Randomized Controlled Trials

- Barbara S. Niël-Weise,
- Theo Stijnen,
- and Peterhans J. van den Broek

Anesth Analg June 2010 110:1624-1629; published ahead of print April 30, 2010

[乳房切除術中鎮痛藥是否影響乳房癌的復發？一項回顧性分析](#)

(唐穎譯 陳傑校)

Do Intraoperative Analgesics Influence Breast Cancer Recurrence After Mastectomy? A Retrospective Analysis

- Patrice Forget,
- Julie Vandenhende,
- Martine Berliere,
- Jean-Pascal Machiels,
- Benoît Nussbaum,
- Catherine Legrand,
- and Marc De Kock

Anesth Analg June 2010 110:1630-1635; published ahead of print April 30, 2010

[圍手術期對癌症手術後復發的作用](#)

(滕凌雅 譯 馬皓琳 李士通 校)

Review Article: The Role of the Perioperative Period in Recurrence After Cancer Surgery

- Antje Gottschalk,
- Sonal Sharma,
- Justin Ford,
- Marcel E. Durieux,
- and Mohamed Tiouririne

Anesth Analg June 2010 110:1636-1643; published ahead of print April 30, 2010

Critical Care, Trauma, and Resuscitation

[對於正常肺組織，小潮氣量和高呼氣末正壓機械通氣增加肺部炎症和呼吸機相關性肺損傷的發生](#)

(陳珺珺譯 薛張綱)

Low Tidal Volume and High Positive End-Expiratory Pressure Mechanical Ventilation Results in Increased Inflammation and Ventilator-Associated Lung Injury in Normal Lungs

- Caron M. Hong,
- Da-Zhong Xu,
- Qi Lu,
- Yunhui Cheng,
- Vadim Pisarenko,
- Danielle Doucet,
- Margaret Brown,
- Seena Aisner,
- Chunxiang Zhang,
- Edwin A. Deitch,
- and Ellise Delphin

Anesth Analg June 2010 110:1652-1660; published ahead of print January 26, 2010

[全氟化碳部分液體通氣中的通氣血流比值](#)

(張蕾譯 陳傑校)

Ventilation-Perfusion Ratio in Perflubron During Partial Liquid Ventilation

- Alexander-Wigbert K. Scholz,
- Balthasar Eberle,
- Claus P. Heussel,
- Matthias David,
- Marc D. Schmittner,
- Michael Quintel,
- Laura M. Schreiber,
- and Norbert Weiler

Anesth Analg June 2010 110:1661-1668; published ahead of print May 6, 2010

[呼氣末正壓通氣對麻醉狀態下成人頸內靜脈橫截面積的影響](#)

(王海濤譯 馬皓琳 李士通校)

Brief Report: Effects of Positive End-Expiratory Pressure on Internal Jugular Vein Cross-Sectional Area in Anesthetized Adults

- Kerry J. Hollenbeck,

- Bryan M. Vander Schuur,
- Matthew R. Tulis,
- Brian W. Mecklenburg,
- Cory P. Gaconnet,
- Scott C. Wallace,
- Eugenio Lujan,
- and Ivan K. Lesnik

Anesth Analg June 2010 110:1669-1673; published ahead of print April 12, 2010

Pediatric Anesthesiology

小兒面罩壓力控制通氣：壓力限制是多少？

(朱蘭芳譯，薛張綱校)

Facemask Pressure-Controlled Ventilation in Children: What Is the Pressure Limit?

- Sylvaine Lagarde,
- François Semjen,
- Karine Nouette-Gaulain,
- Françoise Masson,
- Maryline Bordes,
- Yves Meymat,
- and Anne-Marie Cros

Anesth Analg June 2010 110:1676-1679; published ahead of print April 30, 2010

新生兒高流量體外迴圈心臟手術後癲癇發作腦電圖

(陳靈科譯 陳傑校)

Electroencephalographic Seizures After Neonatal Cardiac Surgery with High-Flow Cardiopulmonary Bypass

- Dean B. Andropoulos,
- Eli M. Mizrahi,
- Richard A. Hrachovy,
- Stephen A. Stayer,
- Ann R. Stark,
- Jeffrey S. Heinle,
- Emmitt D. McKenzie,
- Heather A. Dickerson,

- Marcie R. Meador,
- and Charles D. Fraser, Jr.

Anesth Analg June 2010 110:1680-1685; published ahead of print April 30, 2010

Neuroscience in Anesthesiology and Perioperative Medicine

[麻醉醫師將如何上麻醉？神經外科操作方法的趨勢](#)

(唐李雋 譯 馬皓琳 李士通 校)

What Will Anesthesiologists Be Anesthetizing? Trends in Neurosurgical Procedure Usage

- Andrew B. Hughey,
- Maciej S. Lesniak,
- Sameer A. Ansari,
- and Steven Roth

Anesth Analg June 2010 110:1686-1697; published ahead of print February 8, 2010

General Article

[對於行肝切除患者圍手術期通過給予葡萄糖和胰島素（GIN治療術）來維持正常血糖](#)

(陳珺珺譯 薛張綱校)

Perioperative Glucose and Insulin Administration While Maintaining Normoglycemia (GIN Therapy) in Patients Undergoing Major Liver Resection

- Hiroaki Sato,
- Ralph Lattermann,
- George Carvalho,
- Tamaki Sato,
- Peter Metrakos,
- Mazen Hassanain,
- Takashi Matsukawa,
- and Thomas Schricker

Anesth Analg June 2010 110:1711-1718; published ahead of print April 7, 2010

Analgesia

Regional Anesthesia

[腰大肌肌溝阻滯和周圍神經置管穿刺前超聲成像以預測橫突及腰叢深度：一項前瞻性，觀察性研究](#)

(鄒巧群譯 陳傑校)

Prepuncture Ultrasound Imaging to Predict Transverse Process and Lumbar Plexus Depth for Psoas Compartment Block and Perineural Catheter Insertion: A Prospective, Observational Study

- Brian M. Ilfeld,
- Vanessa J. Loland,
- and Edward R. Mariano

Anesth Analg June 2010 110:1725-1728; published ahead of print April 12, 2010

[在行腋路臂叢神經阻滯時，肌皮神經是否確實在喙肱肌內走行？一項超聲學研究](#)

(黃麗娜 譯 馬皓琳 李士通 校)

Is the Musculocutaneous Nerve Really in the Coracobrachialis Muscle When Performing an Axillary Block? An Ultrasound Study

- Francis Remerand,
- Jacky Laulan,
- Claude Couvret,
- Michel Palud,
- Annick Baud,
- Stephane Velut,
- Marc Laffon,
- and Jacques Fusciardi

Anesth Analg June 2010 110:1729-1734; published ahead of print April 30, 2010

[超聲引導下胸段椎旁阻滯：一項屍體研究](#)

(陳珺珺譯 薛張綱校)

Ultrasound-Guided Thoracic Paravertebral Blockade: A Cadaveric Study

- Brian Cowie,
- Desmond McGlade,
- Jason Ivanusic,
- and Michael J. Barrington

Anesth Analg June 2010 110:1735-1739; published ahead of print April 30, 2010

[簡要報告：椎旁神經阻滯：一項系統性回顧](#)

(楊秋娟譯 陳傑校)

Brief Reports: Paravertebral Block for Anesthesia: A Systematic Review

- Prema Thavaneswaran,
- Glenda E. Rudkin,
- Rodney D. Cooter,
- Donald G. Moyes,
- Caryn L. Perera,
- and Guy J. Maddern

Anesth Analg June 2010 110:1740-1744; published ahead of print May 6, 2010

[神經刺激器觸發的運動反應可以預測一次成功的鎖骨上臂叢神經阻滯](#)

(姜旭暉譯，馬皓琳，李士通校)

Brief Reports: Nerve Stimulator Evoked Motor Response Predicting a Successful Supraclavicular Brachial Plexus Block

- Shahla Haleem,
- Ahsan K. Siddiqui,
- Hany A. Mowafi,
- Salah A. Ismail,
- and Qazi Ahsan Ali

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異丙酚減少了咪達唑侖的分佈和清除

Propofol Reduces the Distribution and Clearance of Midazolam

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背景：鎮靜劑量的咪達唑侖增加異丙酚血藥濃度約 25%。本研究評價異丙酚對於咪達唑侖藥代動力學的影響。

方法：8 名健康志願者被安排進行兩次隨機交叉研究。在 A 研究期間，志願者接受 0.035-0.05 毫克/公斤咪達唑侖，1 分鐘內靜脈注射，隨後以 0.035-0.05 毫克/公斤/小時的速度輸注 59 分鐘。在 B 研究期間，除注射咪達唑侖外，于咪達唑侖注射開始

前 15 分鐘至結束後 6 小時以靶控輸注異丙酚（靶濃度：0.6 或 1.0ug/ml）。在咪達唑侖注射結束後 6 小時採集動脈血標本分析異丙酚和咪達唑侖的濃度。運用 Akaike 資訊理論標準篩選模型，以非線性混合效應模型觀察異丙酚和血流動力學變化對於咪達唑侖藥代動力學的影響。

結果：在異丙酚平均血藥濃度為 1.2ug/ml 時，血漿咪達唑侖濃度比單一給藥時升高了 26.9%±9.4%。異丙酚（血藥濃度 1.2ug/ml）使咪達唑侖分佈的中央室容積從 5.37L 下降至 2.98L，消除清除率從 0.39L/min 降至 0.31L/min，快速分佈清除率從 2.77L/min 降至 2.11L/min。如將心率這一指標包括在內進一步改變了咪達唑侖的藥代動力學模型。

結論：異丙酚以濃度依賴的方式減少咪達唑侖的分佈和清除，此外，將心率作為共變數通過減少個體間差異改善了咪達唑侖的藥代動力學模型。

（黃劍譯 薛張綱校）

BACKGROUND: Midazolam, at sedative levels, increases blood propofol concentrations by 25%. We evaluated the reverse interaction and determined the influence of propofol on the pharmacokinetics of midazolam.

METHODS: Eight healthy male volunteers were studied on 2 occasions in a random crossover manner. During session A, volunteers received midazolam 0.035 to 0.05 mg · kg⁻¹ IV for 1 minute followed by an infusion of 0.035 to 0.05 mg · kg⁻¹ · h⁻¹ for 59 minutes. During session B, in addition to this midazolam infusion scheme, a target-controlled infusion of propofol (constant C_T: 0.6 or 1.0 µg · mL⁻¹) was given from 15 minutes before the start until 6 hours after termination of the midazolam infusion. Arterial blood samples for propofol and midazolam concentration analysis were taken until 6 hours after termination of the midazolam infusion. Nonlinear mixed-effect models examining the influence of propofol and hemodynamic variables on midazolam pharmacokinetics were constructed using Akaike's information-theoretic criterion for model selection.

RESULTS: In the presence of a mean blood propofol concentration of 1.2 µg · mL⁻¹, the plasma midazolam concentration was increased by 26.9% ± 9.4% compared with midazolam given as a single drug. Propofol (C_{blood}: 1.2 µg · mL⁻¹) reduced midazolam central volume of distribution from 5.37 to 2.98 L, elimination clearance from 0.39 to 0.31 L · min⁻¹, and rapid distribution clearance from 2.77 to 2.11 L · min⁻¹. Inclusion of heart rate further improved the pharmacokinetic model of midazolam.

CONCLUSIONS: Propofol reduces the distribution and clearance of midazolam in a concentration-dependent manner. In addition, inclusion of heart rate as a covariate improved the pharmacokinetic model of midazolam predominantly through a reduction in the intraindividual variability.

線內篩檢程式是否應用于外周靜脈導管來預防輸液相關靜脈炎？隨機對照研究的系統回顧

Should In-line Filters Be Used in Peripheral Intravenous Catheters to Prevent Infusion-Related Phlebitis? A Systematic Review of Randomized Controlled Trials

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背景：在這個系統回顧中，我們評價了線內篩檢程式在外周靜脈導管有關的輸液相關靜脈炎的作用。本研究為隨機對照研究的系統回顧和薈萃分析。運用 MEDLINE 和 Cochrane 資料庫收集 2009 年 8 月 10 日之前的資料。

方法：兩名研究者分別評價臨床試驗的品質並提取資料。運用隨機性效應模型綜合合格的靜脈炎患者的資料。運用雙變數 meta 分析模型進行 meta 回歸分析線內篩檢程式在控制組中對於發生靜脈炎危險的影響。研究證據的分級運用了 GRADE 分級（推薦等級的評估，制定和評價）。

結果：本系統回顧共收集了 11 個臨床對照研究（1633 個外周導管）對住院患者中線內篩檢程式對於靜脈炎發生率影響進行比較。不同的臨床試驗間靜脈炎的基線發生率在 23% 至 96% 之間。所有試驗的 meta 分析顯示線內篩檢程式降低了輸液相關靜脈炎的危險。（相對危險度，0.66；95% 置信區間，0.43-1.00）。然而這一優勢是不確定的，因為這些試驗在資料分析方面有嚴重的缺陷，meta 分析揭示了顯著的不能解釋的資料異質性（ $P < 0.0000$, $I^2 = 90.4\%$ ）。估計得出的優勢並不依賴於基線發生率。

結論：外周靜脈導管的線內篩檢程式並不推薦常規應用，因為這一益處的優勢不確定。

（姚敏敏譯 薛張綱校）

BACKGROUND: In this systematic review, we assessed the effect of in-line filters on infusion-related phlebitis associated with peripheral IV catheters. The study was designed as a systematic review and meta-analysis of randomized controlled trials. We used MEDLINE and the Cochrane Controlled Trial Register up to August 10, 2009.

METHODS: Two reviewers independently assessed trial quality and extracted data. Data on phlebitis were combined when appropriate, using a random-effects model. The impact of the risk of phlebitis in the control group (baseline risk) on the effect of in-line filters was studied by using meta-regression based on the bivariate meta-analysis model. The quality of the evidence was determined by using the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) method.

RESULTS: Eleven trials (1633 peripheral catheters) were included in this review to compare the effect of in-line filters on the incidence of phlebitis in hospitalized patients. Baseline risks across trials ranged from 23% to 96%. Meta-analysis of all trials showed that in-line filters reduced the risk of infusion-related phlebitis (relative risk, 0.66; 95% confidence interval, 0.43–1.00). This benefit, however, is very uncertain, because the trials had serious methodological shortcomings and meta-analysis revealed marked unexplained statistical heterogeneity ($P < 0.0000$, $I^2 = 90.4\%$). The estimated benefit did not depend on baseline risk.

CONCLUSION: In-line filters in peripheral IV catheters cannot be recommended routinely, because evidence of their benefit is uncertain.

對於正常肺組織，小潮氣量和高呼氣末正壓機械通氣增加肺部炎症和呼吸機相關性肺損傷的發生

Low Tidal Volume and High Positive End-Expiratory Pressure Mechanical Ventilation Results in Increased Inflammation and Ventilator-Associated Lung Injury in Normal Lungs

Caron M. Hong, MD, Da-Zhong Xu, MD, PhD, Qi Lu, MD, Yunhui Cheng, PhD, Vadim Pisarenko, MD, Danielle Doucet, MD, Margaret Brown, MSN, Seena Aisner, MD, Chunxiang Zhang, MD, PhD, Edwin A. Deitch, MD and Ellise Delphin, MD, MPH
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.Anesth Analg June 2010 110:1652-1660

背景：通過小潮氣量（VT）和低平台壓力機械通氣可以降低死亡率，並減少呼吸窘迫綜合症患者行機械通氣時間。在手術期間，保護正常肺組織的機械通氣策略可能會提高患者的預後。我們進行的動物試驗，分別比較了三種機械通氣策略對於正常肺組織的影響。我們比較了肺動力學，炎症介質，肺組織損傷情況。

方法：母豬隨機分成3組。H-VT/3組（n=6）機械通氣的潮氣量（VT）為15 mL/kg 預期體重（PBW）/呼氣末正壓（PEEP）為3 cm H₂O；L-VT/3組（n=6）的VT為6 mL/kg PBW/PEEP為3 cm H₂O；L-VT/10組（n=6）的VT為6 mL/kg PBW/PEEP為10 cm H₂O，機械通氣時間為8小時。分別監測血流動力學、氣道力學、動脈血氣以及炎症標誌物。支氣管肺泡灌洗液（BAL）用來進行分析炎症標誌物和蛋白質濃度。測定右下肺葉的特異性細胞因數基因表達。右下肺葉及右上肺葉進行組織學評價。

結果：相比於H-VT/3組和L-VT/3組，L-VT/10組在肺泡灌洗液中炎症介質的濃度是前者的6倍高壓（P < 0.001）。H-VT/3組和L-VT/3組在BAL中細胞因數含量相似。相比於L-VT/3組和L-VT/10組，H-VT/3組肺損傷分數較低。

結論：比較術中機械通氣策略，高PEEP的機械通氣可以導致炎症標誌物增加。低PEEP的炎症標誌物較低。高VT/低PEEP可以致較少組織學方面的肺損傷。

（陳珺珺譯 薛張綱）

BACKGROUND: Protective mechanical ventilation with low tidal volume (VT) and low plateau pressure reduces mortality and decreases the length of mechanical ventilation in patients with acute respiratory distress syndrome. Mechanical ventilation that will protect normal lungs during major surgical procedures of long duration may improve postoperative outcomes. We performed an animal study comparing 3 ventilation strategies used in the operating room in normal lungs. We compared the effects on pulmonary mechanics, inflammatory mediators, and lung tissue injury.

METHODS: Female pigs were randomized into 3 groups. Group H-VT/3 (n = 6) was ventilated with a VT of 15 mL/kg predicted body weight (PBW)/positive end-expiratory pressure (PEEP) of 3 cm H₂O, group L-VT/3 (n = 6) with a VT of 6 mL/kg PBW/PEEP of 3 cm H₂O, and group L-VT/10 (n = 6) with a VT of 6 mL/kg PBW/PEEP of 10 cm H₂O, for 8 hours. Hemodynamics, airway mechanics, arterial blood gases, and inflammatory markers were monitored. Bronchoalveolar lavage (BAL) was analyzed for inflammatory markers and protein concentration. The right lower lobe was assayed for

mRNA of specific cytokines. The right lower lobe and right upper lobe were evaluated histologically.

RESULTS: In contrast to groups H-VT/3 and L-VT/3, group L-VT/10 exhibited a 6-fold increase in inflammatory mediators in BAL ($P < 0.001$). Cytokines in BAL were similar in groups H-VT/3 and L-VT/3. Group H-VT/3 had a significantly lower lung injury score than groups L-VT/3 and L-VT/10.

CONCLUSION: Comparing intraoperative strategies, ventilation with high PEEP resulted in increased production of inflammatory markers. Low PEEP resulted in lower levels of inflammatory markers. High VT/low PEEP resulted in less histologic lung injury.

小兒面罩壓力控制通氣：壓力限制是多少？

Facemask Pressure-Controlled Ventilation in Children: What Is the Pressure Limit?

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背景：在這項研究中，我們依據年齡尋找確定為小兒提供充足和安全通氣而不帶來任何胃內充氣風險的吸氣壓力限值。

方法：前瞻性研究 100 名年齡從 1 天至 16 歲 ASA 分級 I–II 級擇期行全麻的小兒。全麻誘導後，對小兒的肺進行壓力控制通氣。開始時吸氣壓力為 10 cm H₂O，然後每次增加 5 cm H₂O，至最高值 25 cm H₂O。每次增加時，胃內充氣由上腹部聽診檢測。記錄年齡和體重。同時還記錄每次增加時的吸氣壓力、呼吸頻率、潮氣量、分鐘通氣量和胃內充氣的發生。

結果：78 明小兒發生胃內充氣。1 歲以內小兒 95% 發生胃內充氣，1 至 5 歲為 93%，大於 5 歲為 56% ($P = 0.001$)。發生胃內充氣的壓力閾值隨著年齡增加而增加：小兒年齡越小，壓力閾值越低。潮氣量隨著吸氣壓力增加，但當壓力 > 15 cm H₂O 後，潮氣量增加不明顯。

結論：發生胃內充氣的吸氣壓力閾值依據年齡而定。壓力在嬰兒是低的並隨著年齡增加。在大多數病例中，吸氣壓力 ≤ 15 cm H₂O 時可獲得合適的通氣而不發生胃內充氣。在此閾值之上增加吸氣壓力導致胃內充氣增加而潮氣量不變。

(朱蘭芳譯，薛張綱校)

BACKGROUND: In this study, we sought to determine the level of inspiratory pressures allowing adequate and safe ventilation without any risk of gastric insufflation (GI) in children according to age.

METHODS: One hundred children, aged 1 day to 16 years, ASA physical status I to II, scheduled for general anesthesia were studied prospectively. After induction of anesthesia, children's lungs were ventilated with pressure-controlled ventilation. The initial inspiratory pressure was 10 cm H₂O and was increased by steps of 5 cm H₂O, up to a maximum of 25 cm H₂O. At each step, GI was detected by epigastric auscultation. The

recorded data were age and weight. At each step, the inspiratory pressure, the respiratory rate, the expired tidal volume, the minute ventilation, and the occurrence of GI were also recorded.

RESULTS: GI occurred in 78 children. GI occurred in 95% of children younger than 1 year, in 93% of children aged 1 to 5 years, and 56% of children older than 5 years ($P = 0.001$). The pressure threshold at which GI occurred increased with age: the younger the child, the lower the GI pressure threshold. Tidal volume increased with inspiratory pressure, but at >15 cm H₂O, tidal volume did not change significantly.

CONCLUSION: The inspiratory pressure threshold at which GI can occur depends on age. It is low in infants and increases with age. In most cases, proper ventilation without GI was obtained with an inspiratory pressure ≤ 15 cm H₂O. Increasing inspiratory pressure above this threshold results in an increase in GI and no change in tidal volume.

對於行肝切除患者圍手術期通過給予葡萄糖和胰島素（GIN 治療術）來維持正常血糖

Perioperative Glucose and Insulin Administration While Maintaining Normoglycemia (GIN Therapy) in Patients Undergoing Major Liver Resection

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背景：儘管高血糖是公認的心臟手術的高危因素，但是在非心臟手術圍手術期血糖控制並沒有引起足夠重視。我們設計了這個試驗用以評估高血糖對肝切除術的影響，並驗證假設，即圍手術期給予葡萄糖和胰島素（GIN 治療術）來維持正常血糖優於傳統的單純使用胰島素控制血糖。

方法：患者隨機分為 GIN 治療組和標準治療組（對照組）。在 GIN 組，在手術過程中給予胰島素 $2\text{mU} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ 。在手術結束時，胰島素用量下降到 $1\text{mU} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ ，並持續使用 24 小時。20% 葡萄糖持續輸注，劑量更具血糖水準進行調整，維持血糖在 3.5 至 $6.1\text{mmol} \cdot \text{L}^{-1}$ 水準（ 63 - $110\text{mg} \cdot \text{dL}^{-1}$ ）。在標準治療組，術中及術後患者根據傳統的浮動計算法調節胰島素用量。計算血糖的平均值及標準差。為了評估每個患者的自身差異，計算了血糖的變異係數（CV）。當發生嚴重低血糖，即血糖 $2.2\text{mmol} \cdot \text{L}^{-1}$ ($40\text{mg} \cdot \text{dL}^{-1}$)，記錄該事件。主要結果是正常血糖水準的比例。

結果：我們研究了 52 例患者。GIN 組患者血糖水準始終維持在目標範圍內。GIN 組的平均血糖水準低於標準治療組（在手術過程中， $p < 0.01$ ；手術後， $p < 0.001$ ）。非糖尿病患者 19 例接受 GIN 治療，在手術期間 90.1% 的血糖測量值在目標水準，在術後 77.8% 的測量值在目標水準。7 名糖尿病患者接受 GIN 治療，術中 81.2% 的血糖值在目標水準，術後 70.5% 的血糖值在目標水準。19 名非糖尿病

患者接受標準治療，術中 37.4% 的血糖測量值在目標水準，術後 18.3% 的測量值在目標水準。7 名糖尿病患者接受標準治療，術中 4.3% 的血糖值達到目標，術後 2.9% 的血糖值達到目標。相比於標準治療組，GIN 組患者的血糖值的標準差及變異係數較小，特別是在非糖尿病患者手術後血糖控制方面（SD, $P < 0.001$; CV, $P = 0.027$ ）。GIN 組沒有病人在手術過程中出現嚴重的低血糖。1 例患者接受 GIN 治療的患者在術後重症監護室出現低血糖，但是沒有出現神經系統後遺症。
結論：GIN 療法應用於行肝切除手術患者，能夠有效控制血糖水準（臨床試驗，NCT00774098）。

（陳珺珺譯 薛張綱校）

BACKGROUND: Although hyperglycemia is a well-recognized risk factor in the context of cardiac surgery, the relevance of perioperative glycemic control for patients undergoing major noncardiac operations has received little attention. We designed this study to assess the hyperglycemic response to liver resection, and to test the hypothesis that perioperative glucose and insulin administration while maintaining normoglycemia (GIN therapy) provides glycemic control superior to that achieved by the conventional use of insulin.

METHODS: Patients were randomly assigned to GIN therapy or standard therapy (control group). In the GIN therapy group, insulin was administered at $2 \text{ mU} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ during surgery. At the end of surgery, the insulin infusion was decreased to $1 \text{ mU} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ and continued for 24 hours. Dextrose 20% was infused at a rate adjusted to maintain blood glucose within the target range of 3.5 to $6.1 \text{ mmol} \cdot \text{L}^{-1}$ (63 – $110 \text{ mg} \cdot \text{dL}^{-1}$). Patients in the standard therapy group received a conventional insulin sliding scale during and after surgery. The mean and SD of blood glucose as well as the percentage of blood glucose values within the target range were calculated. To evaluate intrasubject variability, the coefficient of variability (CV) of blood glucose was calculated for each patient. Episodes of severe hypoglycemia, i.e., blood glucose $< 2.2 \text{ mmol} \cdot \text{L}^{-1}$ ($40 \text{ mg} \cdot \text{dL}^{-1}$), were recorded. The primary outcome was the proportion of normoglycemic measurements.

RESULTS: We studied 52 patients. The mean blood glucose value in patients receiving GIN therapy always remained within the target range. The blood glucose levels were lower in the GIN therapy group than in the standard therapy group (during surgery, $P < 0.01$; after surgery, $P < 0.001$). In nondiabetic patients receiving GIN therapy ($n = 19$), target glycemia was achieved in 90.1% of the blood glucose measurements during surgery and in 77.8% of the measurements after surgery. In diabetic patients receiving GIN therapy ($n = 7$), target glycemia was achieved in 81.2% of the blood glucose measurements during surgery and in 70.5% of the measurements after surgery. In nondiabetic patients receiving standard therapy ($n = 19$), target glycemia was achieved in 37.4% of the blood glucose measurements during surgery and in 18.3% of the measurements after surgery. In diabetic patients receiving standard therapy ($n = 7$), target glycemia was achieved in 4.3% of the blood glucose measurements during surgery and in 2.9% of the measurements after surgery. The SD and CV of blood glucose were smaller in the GIN therapy group than in the standard therapy group, especially in nondiabetic patients after surgery (SD, $P < 0.001$; CV, $P = 0.027$). No patients receiving GIN therapy experienced severe hypoglycemia during surgery. One patient receiving GIN therapy

experienced hypoglycemia in the intensive care unit after surgery without neurological sequelae.

CONCLUSIONS: GIN therapy effectively provides normoglycemia in patients undergoing liver resection (clinicaltrials.gov, NCT00774098).

超聲引導下胸段椎旁阻滯：一項屍體研究

Ultrasound-Guided Thoracic Paravertebral Blockade: A Cadaveric Study

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背景：多種進路到達椎旁間隙用來胸部手術術後鎮痛。由於可直觀看到椎旁間隙、周圍結構和針的位置，超聲引導下局部麻醉有可提高成功率，並減少併發症。我們比較了屍體模型在超聲引導下單次和兩次穿刺行椎旁阻滯，與在一具屍體模型雙椎旁注射技術封鎖的超聲引導下，評價對照染料擴散範圍及導管位置。

方法：在 10 具新鮮屍體上，進行了 30 次椎旁注射和 20 次留置導管操作。通過線性感測器，在水平面通過超聲探頭確定椎旁間隙。使用面內針穿刺。使用苯胺對照染料，通過經穿刺針留置的導管，在 T6 – 7 單次注射 20ml，或雙次技術即 T3 – 4 和 T7 – 8 分別注射 10ml 該染料。然後解剖屍體來評估對照染料擴散的範圍及導管的位置。

結果：通過超聲，在每具屍體上很容易確定椎旁空間。在屍體椎旁軀體神經及交感神經周圍、肋間、硬膜外間隙可以看見對照染料。20 次中有 10 次造影劑超過了 3 – 4 個節段的椎旁間隙，並且單次注射和雙次注射沒有顯著差異。單次注射時對照染料擴散到肋間段的範圍跨越 4.5 個節段（範圍 2-10），而雙此注射時該範圍達到 6 個節段（範圍 2-8）（P = 0.03）。單次及雙次注射時，對照染料有 40% 擴散到硬膜外間隙。導管位於椎旁間隙占 60%，椎前間隙占 20% 和硬膜外間隙占 5%。

結論：通過超聲引導下使用面內針行胸段椎旁穿刺是很方便和可靠的。然而，由於椎旁間隙的差異，鎮痛的效果葉有差異。相比于單次注射，在不同節段行雙次穿刺由於可以沿肋間覆蓋更廣的範圍。使用面內針穿刺時，有 40% 的導管位置並不理想。

（陳珺珺譯 薛張綱校）

BACKGROUND: Multiple approaches to the paravertebral space have been described to produce analgesia after thoracic surgery. Ultrasound-guided regional anesthesia has the potential to improve efficacy and reduce complications via real-time visualization of the paravertebral space, surrounding structures, and the approaching needle. We compared a single- versus dual-injection technique for ultrasound-guided paravertebral blockade in a cadaver model, evaluating the spread of contrast dye and location of a catheter.

METHODS: Thirty paravertebral injections and 20 catheter placements were performed on 10 fresh cadavers. The paravertebral space was identified using an ultrasound probe in the transverse plane using a linear transducer. An in-plane needle approach was used. Using analine contrast dye, a single 20-mL injection at T6-7 on one side and a dual-injection technique of 10 mL at T3-4 and T7-8 on the contralateral side were performed on each cadaver, followed by insertion of a catheter through the needle. The cadaver was then dissected to evaluate spread of contrast dye and catheter location.

RESULTS: The paravertebral space was easily identified with ultrasound on each cadaver. Contrast dye was seen to surround somatic and sympathetic nerves in the paravertebral, intercostal, and epidural spaces. Contrast dye was present in 19 of 20 paravertebral spaces over 3 to 4 segments (range, 0–10) with no significant differences between single- and dual-injection techniques. Contrast dye spread more extensively across intercostal segments with 4.5 spaces (range, 2–10) covered with a single injection and 6 spaces (range, 2–8) covered with a dual-injection technique ($P = 0.03$). There was epidural spread of contrast in 40% of paravertebral injections in both single- and dual-injection techniques. Catheters were located in the paravertebral space (60%), prevertebral space (20%), and epidural space (5%).

CONCLUSIONS: Transverse in-plane ultrasound-guided needle insertion into the thoracic paravertebral space is both feasible and reliable. However, paravertebral spread of contrast is highly variable with intercostal and epidural spread likely contributing significantly to the analgesic efficacy. A dual-injection technique at separate levels seems to cover more thoracic dermatomes because of greater segmental intercostal spread (rather than paravertebral spread) than a single-injection approach. Catheters are located in nonideal positions in 40% of cases using this in-plane technique.

三維經食道超聲心動圖對於進行心臟手術的患者術中臨床管理是一個較大的進步：一篇核心綜述

Three-Dimensional Transesophageal Echocardiography Is a Major Advance for Intraoperative Clinical Management of Patients Undergoing Cardiac Surgery: A Core Review

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超聲心動圖是評價心臟結構和功能的關鍵評估工具。應用三維（3D）超聲心動圖顯影心臟結構得到了進一步進展。本文我們呈現了這種新出現的三維超聲的一些關鍵特徵，並對其尤其在即時三維經食道超聲心動圖上的應用進行綜述。

（胡豔譯 馬皓琳 李士通校）

Echocardiography is a key assessment tool for the evaluation of cardiac structure and function. The ability to image cardiac structures using 3-dimensional (3D) echocardiography is evolving. In this article, we present some of the key features of the emerging 3D technology and review its applications with an emphasis on real-time 3D transesophageal echocardiography.

缺氧患者的術中呼吸機管理和通氣策略概述

A Description of Intraoperative Ventilator Management and Ventilation Strategies in Hypoxic Patients

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背景：缺氧是麻醉患者的常見表現。儘管有很多方法介紹缺氧，但尚未證明麻醉醫生在面對缺氧病人時採取何種策略。研究發現肺保護性的通氣策略對於急性呼吸窘迫綜合征（ARDS）病人增加氧合及降低死亡率均有有利的效果。我們希望在由 PaO₂ 與吸入氧分數（FiO₂）的比值（P/F）定義的不同缺氧程度的麻醉患者中來描述通氣策略。

方法：我們對 2005 年 1 月 1 日至 2009 年 7 月 31 日之間所有實施的用全身麻醉藥的手術記錄進行回顧，除外心外科和胸外科手術，來評估對於 P/F 比值不同的病人採取的通氣設置。18 歲以上接受全身麻醉的病人均在研究範圍內。我們用 P/F >300、300 ≥ P/F > 200、200 ≥ P/F > 100、100 ≥ P/F 將動脈血氣（ABGs）分為 4 組。我們用標準預計體重(PBW)方程計算病人每公斤 PBW 的肺通氣量毫升數 (mL/kg PBW)。比較呼氣末正壓（PEEP）、吸氣壓峰值(PIPs)、FiO₂、氧飽和度 (SaO₂)和每公斤 PBW 的潮氣量毫升數。

結果：從 11445 例手術病例中取得的 28706 個動脈血氣分析符合入選標準，其中 19679 個 ABGs 來自 P/F >300 組，5364 個來自 300 ≥ P/F > 200 組，3101 個來自 200 ≥ P/F > 100 組以及 562 個來自 100 ≥ P/F 組。比較通氣策略發現差異有統計學顯著意義，但沒有臨床意義。潮氣量的範圍是 8.64 至 9.16，平均 PEEP 範圍在 2.5 至 5.5 cm H₂O 之間。各組之間在平均 FiO₂ 和 PIP 上有明顯差異，分別為 59% 至 91% 和 22 至 29 cm H₂O。

結論：對於 P/F 比值不同的患者，在 mL/kg PBW 和 PEEP 上採用相似的通氣策略。本研究的結果提示了麻醉醫生通常使用更高的 FiO₂ 和 PIP 來治療缺氧。平均 FiO₂ 和 PIP 顯著增大，其增大程度與 P/F 比相關。

（劉伍翻譯，馬皓琳、李士通校正）

BACKGROUND: Hypoxia is a common finding in the anesthetized patient. Although there are a variety of methods to address hypoxia, it is not well documented what strategies are used by anesthesiologists when faced with a hypoxic patient. Studies have identified that lung protective ventilation strategies have beneficial effects in both oxygenation and mortality in acute respiratory distress syndrome. We sought to describe the ventilation strategies in anesthetized patients with varying degrees of hypoxemia as defined by the Pao₂ to fraction of inspired oxygen (FiO₂) (P/F) ratio.

METHODS: We conducted a review of all operations performed between January 1, 2005, and July 31, 2009, using a general anesthetic, excluding cardiac and thoracic procedures, to assess the ventilation settings that were used in patients with different P/F ratios. Patients older than 18 years who received a general anesthetic were included. Four cohorts of arterial blood gases (ABGs) were identified with P/F >300, 300 ≥ P/F > 200,

$200 \geq P/F > 100$, $100 \geq P/F$. Using the standard predicted body weight (PBW) equation, we calculated the milliliters per kilogram (mL/kg PBW) with which the patient's lungs were being ventilated. Positive end-expiratory pressure (PEEP), peak inspiratory pressures (PIPs), Fio₂, oxygen saturation (Sao₂), and tidal volume in mL/kg PBW were compared.

RESULTS: A total of 28,706 ABGs from 11,445 operative cases met criteria for inclusion. There were 19,679 ABGs from the $P/F > 300$ group, 5364 ABGs from the $300 \geq P/F > 200$ group, 3101 ABGs from the $200 \geq P/F > 100$ group, and 562 ABGs from the $100 \geq P/F$ group identified. A comparison of ventilation strategies found statistical significance but clinically irrelevant differences. Tidal volumes ranged between 8.64 and 9.16 and the average PEEP varied from 2.5 to 5.5 cm H₂O. There were substantial differences in the average Fio₂ and PIP among the groups, 59% to 91% and 22 to 29 cm H₂O, respectively.

CONCLUSION: Similar ventilation strategies in mL/kg PBW and PEEP were used among patients regardless of P/F ratio. The results of this study suggest that anesthesiologists, in general, are treating hypoxemia with higher Fio₂ and PIP. The average Fio₂ and PIP were significantly escalated depending on the P/F ratio.

圍手術期對癌症手術後復發的作用

The Role of the Perioperative Period in Recurrence After Cancer Surgery

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有許多基礎科學資料支援了這個假設，即手術應激反應增加了癌症手術術中和術後癌症傳播和轉移的可能性。因此，癌症病人的麻醉管理可能潛在地影響長期的預後。臨床前資料表明有益措施包括誘導藥物的選擇（如丙泊酚）、儘量減少揮發性麻醉藥的使用及全身阿片類藥物和環氧合酶抑制劑的聯合使用。回顧性的臨床試驗表明，加用區域麻醉可能降低癌症手術後的復發。其他因素如輸血、溫度調節和他汀類藥物也可能影響長期預後。

（滕凌雅 譯 馬皓琳 李士通 校）

A wealth of basic science data supports the hypothesis that the surgical stress response increases the likelihood of cancer dissemination and metastasis during and after cancer surgery. Anesthetic management of the cancer patient, therefore, could potentially influence long-term outcome. Preclinical data suggest that beneficial approaches might include selection of induction drugs such as propofol, minimizing the use of volatile anesthetics, and coadministration of cyclooxygenase antagonists with systemic opioids. Retrospective clinical trials suggest that the addition of regional anesthesia might decrease recurrence after cancer surgery. Other factors such as blood transfusion, temperature regulation, and statin administration may also affect long-term outcome.

呼氣末正壓通氣對麻醉狀態下成人頸內靜脈橫截面積的影響

Effects of Positive End-Expiratory Pressure on Internal Jugular Vein Cross-Sectional Area in Anesthetized Adults

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我們在 45 名 ASA 體格狀態 I 級和 II 級成人中，驗證了呼氣末正壓通氣（PEEP）能否增加右側頸內靜脈（RIJV）橫截面積（CSA）。對所有病人進行標準化的靜脈液體推注、全麻誘導、氣管插管和機械通氣。我們使用超聲評估不使用 PEEP（對照）和使用 PEEP（10 cm H₂O）兩種情況下在水準仰臥位元右頸內靜脈的橫截面積。附加 PEEP 增加了 RIJV CSA $0.42 \pm 0.41 \text{ cm}^2$ （均值 \pm 標準差，中位數 0.34 cm^2 , $P < 0.001$ ），這些資料說明橫截面積平均增加了 41%。

（王海濤譯 馬皓琳 李士通校）

We tested whether positive end-expiratory pressure (PEEP) increases right internal jugular vein (RIJV) cross-sectional area (CSA) in 45 ASA physical status I and II adults. All patients received a standardized IV fluid bolus, induction of general anesthesia, tracheal intubation, and mechanical ventilation. We evaluated the CSA of the RIJV using ultrasound without PEEP (control) and with PEEP (10 cm H₂O) in the supine, level position. Addition of PEEP increased RIJV CSA $0.42 \pm 0.41 \text{ cm}^2$ (mean \pm SD, median 0.34 cm^2 , $P < 0.001$), which represented a 41% mean increase in CSA.

麻醉醫師將如何上麻醉？神經外科操作方法的趨勢

What Will Anesthesiologists Be Anesthetizing? Trends in Neurosurgical Procedure Usage

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背景：為了預測神經外科麻醉實踐的未來變化，我們檢驗了經常進行手術操作的神經外科領域內全國性的趨勢。

方法：我們用全國住院病人的樣本，對 1993 至 2007 年間近 20% 的美國醫院做隨機抽樣。基於國際疾病分類法第 9 版臨床修訂 (ICD-9-CM) 的操作碼，建立了手術神經外科的八大分類。我們列表顯示了總容量、平均住院時間和住院病人死亡率，計算了整個研究階段、最近五年和最近兩年的生長率。我們檢驗了 1993 到 2007 年最常見 ICD-9-CM 操作碼分類中每個神經外科種類的每年的容量。

結果：顱內血管內操作在整個研究期間（32%）、最近4年（29%）、最近2年（12%）有最高的複合年生長率。顱骨切開的血管手術在整個期間減少（-4.2%）。脊柱融合術在研究期間絕對增加最大（從1993年的54,000到2007年的350,000）。除顱骨切開血管手術以外的所有分類在整個研究階段住院時間縮短，伴隨複合年生長率從-1.2%（心室和膜的分流）到-6.6%（深度腦刺激）。顱內血管內操作的住院時間的生長率較血管手術在最近2年（14%比1.0%）和5年裏（5.6%比1.5%）均明顯提高。

結論：手術神經外科中最高容量的趨勢是脊柱融合術（以每年近12,000例的速度增長）、腫瘤或其他目的的顱骨切開術（以每年近2,700例的速度增長），但在分流術中則減少（以每年近3,000例的速度減少）。這些資料提示顱內血管內治療仍然相對罕見，但正在呈指數級增長，且住院時間正在增加，但住院病人死亡率在減少。本研究的結論受限於ICD-9-CM操作碼不嚴密的性質、我們使用的分類方案和全國住院病人樣本的抽樣方法。

（唐李雋 譯 馬皓琳 李士通 校）

BACKGROUND: To anticipate future changes to the practice of neuroanesthesia, we examined the nationwide trends in frequently performed operative neurosurgery.

METHODS: We used the Nationwide Inpatient Sample, a random sampling of approximately 20% of United States hospitals from 1993 to 2007. Eight categories of operative neurosurgery were developed, based on procedure codes from the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). We tabulated total volume, mean length of stay, and inhospital mortality and calculated growth rates over the entire period, the most recent 5-year period, and the most recent 2-year period. We examined annual volumes from 1993 to 2007 for each neurosurgical category for the most common ICD-9-CM procedure code within each category.

RESULTS: Intracranial endovascular procedures had the highest compound annual growth rate over the entire study period (32%), the most recent 4 years (29%), and the most recent 2 years (12%). Craniotomy for vascular surgery decreased over the entire period (-4.2%). Spinal fusion had the largest absolute increase over the study period (from 54,000 in 1993 to 350,000 in 2007). All categories except craniotomy for vascular surgery had decreased length of stay across the study period, with compound annual growth rates of -1.2% (ventricular and thecal shunt) to -6.6% (deep brain stimulation). Intracranial endovascular procedures had a much higher growth rate of length of stay than vascular surgery over the most recent 2-year (14% vs 1.0%) and 5-year periods (5.6% vs 1.5%).

CONCLUSIONS: The highest volume trends in operative neurosurgery are for spinal fusion (increasing at a rate of approximately 12,000 procedures/y), craniotomy for tumors and other purposes (increasing at a rate of approximately 2,700 procedures/y), and a decrease in shunts (decreasing at a rate of approximately 3,000 per year). The data suggest that intracranial endovascular treatment remains relatively rare, but it is growing exponentially, and lengths of stay are increasing, whereas inhospital deaths are decreasing. The conclusions of this study are limited by the imprecise nature of the ICD-9-CM procedure codes, the categorization scheme we used, and by the sampling methods of the National Inpatient Sample.

在行腋路臂叢神經阻滯時，肌皮神經是否確實在喙肱肌內走行？一項超聲學研究

Is the Musculocutaneous Nerve Really in the Coracobrachialis Muscle When Performing an Axillary Block? An Ultrasound Study

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背景：在描述腋路臂叢阻滯的參考教科書裏，尺神經、橈神經和正中神經位於包繞腋動脈的同一個鞘內。相反，肌皮神經被描述為位於鞘外的喙肱肌內。在最近的一項關於超聲引導腋路臂叢阻滯的病例報導中，提出肌皮神經伴行正中神經而位於該肌肉之外。本研究評價了在腋路臂叢阻滯中不典型的肌皮神經走行的發生率。

方法：所有入選的病人在 2006 年 12 月至 2008 年 12 月期間行超聲引導下的腋路臂叢神經阻滯。在進針之前，用超聲定位肌皮神經、正中神經、尺神經和橈神經。用神經刺激器確定非典型的神經定位。在注射局麻藥後，觀察肌皮神經和正中神經的解剖關係。

結果：在分析的 387 例阻滯麻醉中，肌皮神經位於喙肱肌外的有 83 例（占 22%）。其中有 22 例接近腋動脈（占 6%）。61 例肌皮神經和正中神經表現出共同的神經結構（占 16%）。在注射局麻藥後，61 例中有 16 例肌皮神經和正中神經表現出共同的主幹（占 26%），37 例表現出肌皮神經和正中神經分離（占 61%），正中神經分出兩根（包括或不包括分離的肌皮神經）的有 6 例（占 10%）。2 例不能確定（占 3%）。伴有非典型肌皮神經定位的 83 名患者的尺神經位置與那些伴有典型的肌皮神經定位的患者不同。

結論：在腋路臂叢神經阻滯時，有 1/5 的患者的肌皮神經位於喙肱肌外。在行腋路阻滯時，應當將這種非典型定位考慮進去，以避免反復的肌肉內刺穿。

(黃麗娜 譯 馬皓琳 李士通 校)

BACKGROUND: In reference textbooks describing axillary block, the ulnar, radial, and median nerves are located in a common sheath surrounding the axillary artery. In contrast, the musculocutaneous nerve is described as lying outside this sheath in the coracobrachialis muscle. In a recent case report of ultrasound-guided axillary block, the musculocutaneous nerve was joined to the median nerve outside this muscle. Our study evaluated the prevalence of atypical musculocutaneous nerve localizations during axillary block.

METHODS: All patients undergoing ultrasound-guided axillary block were included from December 2006 to December 2008. Before needle insertion, musculocutaneous, median, ulnar, and radial nerves were localized using ultrasound. Nerve stimulation confirmed atypical nerve localization. After injection of local anesthetics, musculocutaneous and median nerve anatomical relationships were observed.

RESULTS: The musculocutaneous nerve was outside the coracobrachialis muscle in 83 of the 387 analyzed blocks (22%). It was near the axillary artery in 22 cases (6%). The musculocutaneous and median nerves appeared as a common neural structure in 61 cases (16%). After local anesthetic injection, a common trunk persisted in 16 of 61 cases (26%), musculocutaneous and median nerves separated in 37 cases (61%), and 2 roots of the median nerve appeared (with or without a separated musculocutaneous nerve) in 6 cases (10%). Two cases (3%) remained undefined. Ulnar nerve location of the 83 patients with atypical musculocutaneous nerve position differed from the ones with a classical musculocutaneous nerve localization.

CONCLUSIONS: During axillary block, the musculocutaneous nerve is outside the coracobrachialis muscle in 1 of 5 patients. This atypical location should be considered during performance of axillary blockade to avoid repeated IM puncture.

神經刺激器觸發的運動反應可以預測一次成功的鎖骨上臂叢神經阻滯

Nerve Stimulator Evoked Motor Response Predicting a Successful Supraclavicular Brachial Plexus Block

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背景：我們檢測了神經刺激誘發的不同的運動反應預測鎖骨上臂叢神經阻滯的成功率。

方法：本次多中心觀察研究包括了 377 名病人。記錄每次阻滯中，0.25mA 的電流持續 2 毫秒時誘發的運動反應。注射 0.25% 的布比卡因 30 mL，觀察阻滯是否成功。

結果：共 317 名病人麻醉實施成功(84.1%)。當誘發的運動反應為病人同時屈曲第三和第四根指或者屈曲所有的四個手指（第二到第五根手指）無論有沒有拇指的對掌，成功率均是 100%。

結論：第三和第四根手指同時屈曲（無論有沒有其他手指發生屈曲）與鎖骨上臂叢神經阻滯最高的成功率有非常大的聯繫。

（姜旭暉譯，馬皓琳，李士通校）

BACKGROUND: We examined the success rate of supraclavicular brachial plexus block after the different evoked motor responses to nerve stimulation.

METHODS: This multicenter observational study included 377 patients. For each block, the evoked motor response elicited at 0.25 mA for 2 milliseconds was recorded, 30 mL bupivacaine 0.25% was injected, and the block was observed for success or failure.

RESULTS: Complete anesthesia occurred in 317 cases (84.1%). The success rate was 100% when the evoked motor response was simultaneous flexion of the third and fourth digits or flexion of all 4 digits (digits 2–5) with or without thumb opposition.

CONCLUSION: Simultaneous flexion of the third and fourth digits with or without other digits is associated with the highest success rate of supraclavicular brachial plexus block.

**成年心臟手術病人的血漿中性粒細胞明膠酶相關脂質運載蛋白和術後急性腎損傷
Plasma Neutrophil Gelatinase-Associated Lipocalin and Acute Postoperative
Kidney Injury in Adult Cardiac Surgical Patients.**

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背景：冠狀動脈旁路移植術（CABG）後急性腎損傷（AKI）增加術後併發症發生率和死亡率。作者猜測：在心肺轉流（CPB）後即刻測定的血漿中性粒細胞明膠酶相關脂質運載蛋白（NGAL），其含量增加可預測 CABG 術後的 AKI。

方法：在一項回顧性觀察研究中，作者使用多元 logistic 回歸分析 879 名 CABG 術後患者，考察 CPB 後測定血漿 NGAL 對預測 AKI（急性腎損傷定義為血肌酐值較術前增加 50% 以上）發生風險的價值。分析受試者工作特徵曲線（ROC）的曲線下面積（AUC）來評估術後血漿 NGAL 水準對 AKI 預測的敏感度、特異性和各界值。

結果：75 名患者（8.6%）發生術後 AKI。那些繼發 AKI 患者 CPB 後的血漿 NGAL 水準要高於那些非繼發者（AKI 患者: 268.8 ng/mL [207.5–459.5 ng/mL], 中位數 [四分位間距], vs 非 AKI 患者: 238.4 ng/mL [172.0–319.1 ng/mL]; $P < 0.001$ ），且在術後四天維持較高水準。理想的血漿 NGAL 界值在 CPB 後即刻為 353.5 ng/mL，此界值有 38.7% 敏感度、81.5% 特異性，對 AKI 的陽性預測值達到 16.3%。在我們多元回歸模型中，CPB 後血漿 NGAL 水準大於 353.5 ng/mL 與術後 AKI 發生有獨立相關性（相對危險度：2.3; 95% 可信區間：1.5–6.5; $P = 0.002$ ）。

結論：在行 CABG 術的成人患者中，儘管 CPB 後早期血漿 NGAL 水準增加與術後 AKI 發生相關，但此方法的敏感度較低。因此，在此類人群，早期血漿 NGAL 水準預測 AKI 價值有限。

（於章傑 譯 陳傑 校）

BACKGROUND: Acute kidney injury (AKI) after coronary artery bypass graft (CABG) surgery is associated with increased postoperative morbidity and mortality. We hypothesized that increased plasma neutrophil gelatinase-associated lipocalin (NGAL) measured immediately after separating from cardiopulmonary bypass (CPB) would predict AKI after CABG surgery.

METHODS: In a retrospective observational study, we examined the value of plasma NGAL measured after CPB for predicting the risk of developing AKI (defined as a $\geq 50\%$ increase in serum creatinine from preoperative levels) in 879 patients after CABG surgery using multivariable logistic regression. Area under the curve of receiver operating characteristic curves was analyzed to assess sensitivities, specificities, and cutoff points for postoperative plasma NGAL levels to predict AKI.

RESULTS: Seventy-five patients (8.6%) developed postoperative AKI. Plasma NGAL levels measured after CPB were higher in patients who subsequently developed AKI than in those who did not (AKI: 268.8 ng/mL [207.5–459.5 ng/mL], median [interquartile range], vs no AKI: 238.4 ng/mL [172.0–319.1 ng/mL]; $P < 0.001$) and remained higher through postoperative day 4. An optimal serum plasma NGAL cutoff of 353.5 ng/mL at the post-CPB time point had a sensitivity of 38.7%, specificity of 81.5%, and a positive predictive value of 16.3% for predicting AKI. In our multivariate regression model, post-CPB plasma NGAL levels >353.5 ng/mL were independently associated with postoperative AKI (odds ratio, 2.3; 95% confidence interval, 1.5–6.5; $P = 0.002$).

CONCLUSION: An early increase of post-CPB plasma NGAL is associated with AKI in adult patients undergoing CABG surgery, although the sensitivity is low. Therefore, assessing early plasma NGAL alone has limited utility for predicting AKI in this patient population.

全麻藥的突觸前作用是大鼠海馬 CA1 區的突觸傳導頻率依賴性改變的原因

Presynaptic Actions of General Anesthetics Are Responsible for Frequency-Dependent Modification of Synaptic Transmission in the Rat Hippocampal CA1.

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背景:在臨床麻醉中,術中強烈的外科應激偶爾可引起非預料的輕度麻醉效果。為了驗證這個假說,即神經傳入狀態可以通過中樞神經系統的突觸前變化而改變全身麻醉藥效應,作者調查全麻狀態下刺激頻率改變大鼠海馬突觸傳遞的機制。

方法:對 Schaffer 側枝-連合纖維行順向傳導刺激(測試脈衝),來誘發海馬 CA1 區錐體神經元的場群峰電位(PSs)。第二個放置在海馬槽區域的刺激電極是用來活化對 CA1 區域週期性抑制(預脈衝)。100–200 Hz 連續預脈衝刺激可啟動抑制性中間神經元突觸前末梢神經遞質(γ -氨基丁酸)的釋放和耗竭。

結果:使用預脈衝活化抑制性中間神經元後,靜脈麻醉藥(硫噴妥鈉和戊巴比妥)和吸入麻醉藥(七氟醚和異氟醚)減弱了測試脈衝引起的群體峰電位波幅。靜脈麻醉藥而不是吸入麻醉藥產生刺激頻率和使用依賴行的測試群峰電位的週期性抑制。無論是 GABA A 型激動劑還是 GABA 再攝取抑制劑都不能產生頻率依賴的改變。連續的預脈衝方案揭示靜脈麻醉藥,而不是吸入麻醉藥能加強 GABA 從突觸前末梢的釋放。

結論：靜脈麻醉藥，而不是吸入麻醉藥，加強含有 GABA 囊泡從突觸前末梢釋放。使用高頻刺激來耗竭活化的 GABA 池能在靜脈麻醉藥的存在下產生頻率依賴和使用依賴的週期性抑制。刺激頻率依賴的突觸傳導改變可能是全麻下靜脈麻醉藥應用後體動或鎮靜失敗的原因。

(於章傑 譯 陳傑 校)

BACKGROUND: In clinical anesthesia, robust surgical stress occasionally causes unintended light anesthesia during operation. To test the hypothesis that neural input condition could modify actions of general anesthetics as a result of presynaptic alteration in the central nervous system, we investigated the mechanisms by which the stimulus frequency modifies synaptic transmission of the rat hippocampus in the presence of general anesthetics.

METHODS: Field population spikes (PSs) of CA1 pyramidal neurons were elicited using orthodromic stimulation of Schaffer collateral-commissural fibers (test-pulse). A second stimulating electrode was placed in the region of the alveus hippocampi to activate recurrent inhibition of area CA1 (pre-pulse). The pre-pulses were applied as train stimuli (100–200 Hz) to activate release and then deplete the neurotransmitter (γ -aminobutyric acid [GABA]) at presynaptic terminals of inhibitory interneurons.

RESULTS: After the activation of inhibitory interneurons with pre-pulses, both IV (thiopental and pentobarbital) and volatile (sevoflurane and isoflurane) anesthetics attenuated the PS amplitudes elicited with test-pulses (test-PS). The IV anesthetics, but not the volatile drugs, produced stimulus frequency- and use-dependent recurrent inhibition of test-PSs. Neither a GABA type A agonist nor a GABA uptake inhibitor produced frequency-dependent modification. The pre-pulse train protocol revealed that IV anesthetics, but not volatile drugs, can enhance GABA release from presynaptic terminals.

CONCLUSIONS: IV anesthetics, but not volatile drugs, enhance the discharge of a readily releasable pool of GABA vesicles from presynaptic terminals. Depletion of an active pool of GABA after high-frequency stimuli would produce frequency- and use-dependent recurrent inhibition in the presence of IV anesthetics. The stimulus frequency-dependent modification of synaptic transmission might be responsible for the unsuccessful immobilization or hypnosis during general anesthesia after IV anesthetic administration.

乳房切除術中鎮痛藥是否影響乳房癌的復發？一項回顧性分析

Do Intraoperative Analgesics Influence Breast Cancer Recurrence After Mastectomy? A Retrospective Analysis.

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背景：術中鎮痛藥是否影響術後癌症復發尚不清楚。一些調查表明，阿片類藥物可能促使癌症復發，區域鎮痛和非甾體抗炎藥可能改善癌症預後。作者回顧性分析了一系列乳腺癌手術患者。

方法：本回顧性研究包括 327 例接受了乳房切除及腋窩淋巴結清掃術的乳癌患者。主要目的是比較使用不同術中鎮痛藥患者的癌症復發率。

結果：不論鎮痛藥的管理，圍術期特點、癌症的預後因素和手術長度都是類似的。單因素和多因素分析顯示術前給與酮咯酸癌症的復發率較低 ($P=0.019$)。其他鎮痛藥（舒芬太尼、氯胺酮和可樂定）在作者的研究中與顯著降低癌症復發率無關。

結論：本回顧性分析表明與其他鎮痛藥相比，酮咯酸的術中應用可降低乳腺癌復發的風險。

（唐穎 譯 陳傑 校）

BACKGROUND: Whether intraoperative analgesics have an impact on postoperative cancer recurrence is unknown. Some investigations suggest that the opioids could favor relapse and that regional analgesia and nonsteroidal antiinflammatory drugs could improve cancer prognosis. We retrospectively reviewed our series of breast cancer surgery patients.

METHODS: This retrospective study included 327 consecutive women who underwent mastectomy with axillary dissection for breast cancer. The main objective was to compare the incidence of cancer recurrence among patients who received different analgesics during surgery.

RESULTS: Perioperative characteristics, cancer prognostic factors, and the length of surgery were comparable regardless of the analgesics administered. Univariate and multivariate analyses showed a lower cancer recurrence rate when ketorolac was given before surgery ($P = 0.019$). Other analgesics (sufentanil, ketamine, and clonidine) were not associated with a significant reduction in cancer recurrence rates in our series.

CONCLUSION: This retrospective analysis suggests that intraoperative administration of ketorolac decreases the risk of breast cancer relapse compared with other analgesics.

全氟化碳部分液體通氣中的通氣血流比值

Ventilation-Perfusion Ratio in Perflubron During Partial Liquid Ventilation

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背景：氟-19 標記的功能性磁共振成像 (fMRI) 能夠映射以全氟化碳為介質的肺泡腔內的氧分壓。理論上來說，fMRI 檢測肺泡氧分壓可結合 Fick 原理，即通氣帶來的氧氣的吸入及灌注帶來的氧氣的運輸之間的品質平衡，為了量化肺區域的通氣血流比，測量混合靜脈血液和氧氣的吸入氧分數，這些在整個肺部都是相同的。此外，局部的呼末氧濃度和毛細血管氧含量，它們在不同的肺區域是不一致的，可以使用 fMRI 檢測的氧分壓來計算。作者研究了使用數值模擬技術，在以全氟化碳為介質的部分液體通氣中用它來量化局部的 VA/Q 比值。

方法：數值模擬方法用來分析 VA/Q 計算的敏感性，並與 Rizi 等人在 2004 年 (*Magn Reson Med* 2004;52:65–72) 提出的另一種方法相比較。該方法應用在進行液體通氣的 7 只麻醉的豬的實驗中。肺泡氧分壓以 19-氟標記全氟化碳顯示。呼吸氣體、動脈及混合靜脈血液樣本被提取用來量化氧分壓和含量。使用 Fick 原理，估計局部通氣血流比值。並且檢驗 VA/Q 的影響因素如重力（下肺或者上肺）、全氟化碳的濃度（全氟化碳 10 vs 20 mL/kg）和吸入氧濃度（0.4–1.0）。

結果：在數值模擬中，證明了 Fick 原理在 VA/Q 比值從 0.02 至 2.5 的範圍內是適用的。這個比值在 Rizi 等人發表的方法相一致。在實驗設置中，低平均 VA/Q 值在全氟化肺中出現（可信區間為 0.08–0.29，全氟化碳 20 mL/kg）。在這個劑量下，上肺的 VA/Q 比值（CI 0.18–0.39）高於下肺（CI 0.06–0.16; $P = 0.006$ ）。對於全氟化碳濃度或者吸入氧濃度的依賴程度不同，但均較小。

結論：研究結果表明，在全氟化肺中使用 fMRI 從局部氧分壓中推斷 VA/Q 是可行的。低 VA/Q 比值說明氧的運輸在全氟化肺中受到了顯著抑制。

（張蕾 譯 陳傑 校）

BACKGROUND: Functional magnetic resonance imaging (fMRI) of fluorine-19 allows for the mapping of oxygen partial pressure within perfluorocarbons in the alveolar space (PAO_2). Theoretically, fMRI-detected PAO_2 can be combined with the Fick principle approach, i.e., a mass balance of oxygen uptake by ventilation and delivery by perfusion, to quantify the ventilation-perfusion ratio (VA/Q) of a lung region: The mixed venous blood and the inspiratory oxygen fraction, which are equal for all lung regions, are measured. In addition, the local expiratory oxygen fraction and the end capillary oxygen content, both of which may differ between the lung regions, are calculated using the fMRI-detected PAO_2 . We investigated this approach by numerical simulations and applied it to quantify local VA/Q in the perfluorocarbons during partial liquid ventilation.

METHODS: Numerical simulations were performed to analyze the sensitivity of the VA/Q calculation and to compare this approach with another one proposed by Rizi et al. in 2004 (*Magn Reson Med* 2004;52:65–72). Experimentally, the method was used during partial liquid ventilation in 7 anesthetized pigs. The PAO_2 distribution in intraalveolar perflubron was measured by fluorine-19 MRI. Respiratory gas fractions together with arterial and mixed venous blood samples were taken to quantify oxygen partial pressure and content. Using the Fick principle, the local VA/Q was estimated. The impact of gravity (nondependent versus dependent) of perflubron dose (10 vs 20 mL/kg body weight) and of inspired oxygen fraction (FIO_2) (0.4–1.0) on VA/Q was examined.

RESULTS: In numerical simulations, the Fick principle proved to be appropriate over the VA/Q range from 0.02 to 2.5. VA/Q values were in acceptable agreement with the method published by Rizi et al. In the experimental setting, low mean VA/Q values were found in perflubron (confidence interval [CI] 0.08–0.29 with 20 mL/kg perflubron). At this dose, VA/Q in the nondependent lung was higher (CI 0.18–0.39) than in the dependent lung regions (CI 0.06–0.16; $P = 0.006$; Student *t* test). Differences depending on FIO_2 or perflubron dose were, however, small.

CONCLUSION: The results show that derivation of VA/Q from local PO₂ measurements using fMRI in perflubron is feasible. The low detected VA/Q suggests that oxygen transport into the perflubron-filled alveolar space is significantly restrained.

新生兒高流量體外迴圈心臟手術後癲癇發作腦電圖

Electroencephalographic Seizures After Neonatal Cardiac Surgery with High-Flow Cardiopulmonary Bypass

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背景：有報導稱新生兒體外迴圈心臟手術後 14% 到 20% 出現癲癇發作腦電圖。癲癇發作腦電圖和長時間深低溫停迴圈有關，導致不利長期的神經發展。在新生兒心臟手術前到術後 72 小時，作者用高流量體外迴圈和腦氧監測行視頻/腦電圖監測，以確定發生率，嚴重程度，和與癲癇發作腦電圖的相關因素。

方法：體外迴圈設定 150 mL/kg/min 流量，調整 pH 穩定，紅細胞壓積>30%，和高流量順行腦灌注，監測局部腦氧飽和度，並有局部腦氧飽和度<50%的治療方案，腦電圖評估癲癇發作。

結果：68 例患兒（36 個單心室和 32 個雙心室），共監測了 4824 小時。單心室組總咪唑安定的劑量是 2.4 mg/kg (1.0–2.7 mg/kg)，雙心室組為 1.3 mg/kg (1.0–2.7 mg/kg) ($P = 0.009$)。一例單心室病人術後有 2 次短暫癲癇發作腦電圖(1.5% 發生率; 95% 可信區間: 0.3%–7.9%)。單心室組病人術中腦氧飽和度下降的發生率高(腦氧飽和度 <45% for >240 minutes) (18 個單心室組 vs 0 個雙心室組病人， $P < 0.001$)。這種差異並不影響癲癇發作腦電圖的發生和其他腦電圖特徵。

結論：發作腦電圖在新生兒經歷高流量體外迴圈手術中並不多見。腦氧飽和度的下降並不影響腦電圖癲癇樣發作的發生。然而，苯二氮卓類藥可能在抑制術後因腦低氧血症而導致癲癇發作腦電圖中起作用。用這種麻醉藥和手術方案，這類人群中癲癇發作腦電圖是急性神經損傷的一個較差的替代指標。

(陳靈科 譯 陳傑 校)

BACKGROUND: Postoperative electroencephalographic (EEG) seizures are reported to occur in 14% to 20% of neonates after cardiac surgery with cardiopulmonary bypass (CPB). EEG seizures are associated with prolonged deep hypothermic circulatory arrest and with adverse long-term neurodevelopmental outcomes. We performed video/EEG monitoring before and for 72 hours after neonatal cardiac surgery, using a high-flow CPB

protocol and cerebral oxygenation monitoring, to ascertain incidence, severity, and factors associated with EEG seizures.

METHODS: The CPB protocol included 150 mL/kg/min flows, pH stat management, hematocrit >30%, and high-flow antegrade cerebral perfusion. Regional cerebral oxygen saturation (rSO₂) was monitored, with a treatment protocol for rSO₂ <50%. EEG was assessed for seizures.

RESULTS: Sixty-eight patients (36 single ventricle [SV] and 32 2-ventricle [2V]) were monitored for a total of 4824 hours. The total midazolam dose was 2.4 mg/kg (1.5–7.3 mg/kg) (median, 25th–75th percentile) for the SV group and 1.3 mg/kg (1.0–2.7 mg/kg) for the 2V group ($P = 0.009$). One SV patient experienced 2 brief EEG seizures postoperatively (1.5% incidence; 95% confidence interval: 0.3%–7.9%). The SV patients experienced a significant incidence of cerebral desaturation (rSO₂ <45% for >240 minutes total) perioperatively (18 of 36 SV vs 0 of 32 2V patients, $P < 0.001$). This difference did not affect electrographic seizure occurrence or other EEG characteristics.

CONCLUSIONS: EEG seizures are infrequent in neonates undergoing surgery with high-flow CPB. Cerebral desaturation did not affect EEG seizure occurrence; however, benzodiazepines may play a role in suppressing postoperative seizures caused by cerebral hypoxemia in this patient population. Using this anesthetic and surgical protocol, EEG seizures are a poor surrogate marker for acute neurological injury in this population.

腰大肌肌溝阻滯和周圍神經置管穿刺前超聲成像以預測橫突及腰叢深度：一項前瞻性，觀察性研究

Prepuncture Ultrasound Imaging to Predict Transverse Process and Lumbar Plexus Depth for Psoas Compartment Block and Perineural Catheter Insertion: A Prospective, Observational Study

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背景：所有廣泛使用的腰大肌肌溝阻滯或留置導管技術受到一相同的限制：體表進針點並不能精確提示腰叢深度，如果沒有被橫突或者腰叢所攔截，操作者就只能猜測何時可以停止穿刺針的前進。作者評估了超聲在進針前估測橫突的深度的精確度，以及腰大肌肌溝神經阻滯和周圍神經置管所需的實際的進針深度。

方法：在進針前，應用超聲測量脊柱線正前方橫突的深度。若橫突沒有位於脊柱線的正前方，則在此線略朝尾端即可找到突起。超聲探頭應保持在旁矢狀平面，並與皮膚垂直。隨後，移開超聲探頭，用一根與神經刺激儀相連的絕緣針定位於旁矢狀平面，並標記橫突（如果可碰到）以及腰叢的深度。然後再予置管。

結果：入選的 53 個病例中，50 例（占 94%）超聲所測到的橫突深度中位數為 5.0cm（椎體間距 4.5-5.5cm，範圍 3.5-7.5cm）。其中 27 例（占 54%）橫突定位於脊柱線正前方，在所有的病例中，橫突被穿刺針觸到（實際深度）與預計深度的（誤差）中位數為 0.5cm(0.0–1.0 cm; 0.0–1.0 cm)。在橫突被超聲定位的 50 個病例中，實際所測得的腰叢深度中位數為 7.5cm (7.0–8.5 cm; 5.0–9.5 cm), 並超過超聲所提示的橫突深度的中位數為 2.5 cm (2.0–3.0 cm; 0.2–4.0 cm)。脊柱線中外三分之二

與正中線以及經過髂後上棘的外側線的交點太靠外側，以致 50% 病例不能使穿刺針與橫突所接觸。但是，所有病例中探頭若朝正中線 0.75cm 則可使橫突顯現。

結論：對於腰大肌肌溝阻滯或置管，超聲成像下穿刺可精確測量橫突深度使誤差在 1cm 以內，如果腰叢與橫突間距在 3cm 以內，超聲可提供誤差 1cm 以內的腰叢深度預計值。

(鄒巧群 譯 陳傑 校)

BACKGROUND: All widely used psoas compartment block/catheter techniques have a common limitation: external landmarks do not accurately predict lumbar plexus depth, leaving practitioners to “guess” at what depth to stop advancing the placement needle when neither transverse process nor lumbar plexus is intercepted. We assessed the accuracy of ultrasound in estimating transverse process depth before needle insertion and prediction of actual needle-to-plexus intercept depth for psoas compartment nerve blocks and perineural catheter insertion.

METHODS: Before needle insertion, ultrasound was used to estimate the depth of the transverse process lying directly anterior to the intercrestal line. If a transverse process was not directly anterior to the intercrestal line, then the process immediately caudad to the line was imaged. The ultrasound transducer remained in the parasagittal plane, perpendicular to the skin. After this measurement, the transducer was removed, an insulated needle connected to a nerve stimulator inserted in the parasagittal plane, and the depth of both the transverse process (if contacted) and lumbar plexus noted. A perineural catheter was subsequently inserted.

RESULTS: Of 53 enrolled subjects, in 50 cases (94%), the transverse processes were identified by ultrasound at a median (interquartile; range) depth of 5.0 cm (4.5–5.5 cm; 3.5–7.5 cm). In 27 subjects (54%), a transverse process was positioned directly anterior to the intercrestal line, and in all of these subjects, the transverse process was intercepted with the block needle a median of 0.5 cm (0.0–1.0 cm; 0.0–1.0 cm) within the predicted depth. In all 50 subjects in whom the transverse processes were identified by ultrasound, the actual lumbar plexus depth measured with the needle was a median of 7.5 cm (7.0–8.5 cm; 5.0–9.5 cm), and the plexus depth was a median of 2.5 cm (2.0–3.0 cm; 0.2–4.0 cm) past the estimated transverse process depth by ultrasound. By ultrasound, the intersection of the middle and lateral thirds of the intercrestal line between the midline and a parallel line through the posterosuperior iliac spine was too lateral to permit needle–transverse process contact in 50% of the subjects. However, moving the transducer 0.75 cm toward the midline allowed for transverse process imaging in all subjects.

CONCLUSIONS: For psoas compartment blocks/catheters, prepuncture ultrasound imaging accurately predicts transverse process depth to within 1 cm, and if the lumbar plexus is estimated to be within 3 cm of the transverse process, ultrasound allows prediction of maximal lumbar plexus depth to within 1 cm.

簡要報告：椎旁神經阻滯：一項系統性回顧

Brief Reports: Paravertebral Block for Anesthesia: A Systematic Review

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背景：本文目的是通過回顧同類文獻評價胸部和腰部椎旁神經阻滯在外科手術麻醉中應用的安全性和有效性。並與全身麻醉或者其他局部麻醉技術相比較。

方法：搜索 2008 年 5 月以來的資料庫資訊，包括聯機醫學文獻分析和檢索系統，荷蘭醫學文摘，cochrane 圖書館。包含的研究都是經篩選的隨機對照試驗。包括 8 個隨機對照試驗，其中 6 組使用椎旁神經阻滯進行乳房手術，2 組使用椎旁神經阻滯進行疝修補術。

結果：各種研究結果的多樣化和評估標準的不同，使結論的可靠性受到限制。椎旁神經阻滯的失敗率≤13%，患者表示椎旁神經阻滯麻醉比全身麻醉舒適。有跡象表明椎旁神經阻滯的住院時間較全身麻醉短。椎旁神經阻滯比全身麻醉顯著減少噁心嘔吐的發生（相對風險：0.25，95%CI：0.13-0.50；P < 0.05），但可能帶來穿破胸膜和硬膜外廣泛阻滯的危險。

結論：根據目前資料，椎旁神經阻滯用於胸腰段的外科手術麻醉與全身麻醉相比，較少的術後疼痛，同時術後噁心嘔吐發生較少，且更為舒適。

（楊秋娟 譯 陳傑 校）

BACKGROUND: The objective of this review was to assess the safety and efficacy of thoracic and lumbar paravertebral blocks (PVBs) for surgical anesthesia through a systematic review of the peer-reviewed literature. PVBs for surgical anesthesia were compared with general anesthesia (GA) or other regional anesthetic techniques.

METHODS: We searched literature databases including MEDLINE, EMBASE, and The Cochrane Library up to May 2008. Included studies were limited to eligible randomized controlled trials. Eight randomized controlled trials were included in this review, 6 of which used PVBs for anesthesia during breast surgery, and 2 trials used PVB for anesthesia during herniorrhaphy.

RESULTS: The ability to obtain firm conclusions was limited by the diversity of outcomes and how they were measured, which varied across studies. The PVB failure rate was not >13%, and patients were more satisfied with PVB than with GA. There was some indication that PVB could achieve shorter hospital stays than GA. PVB for anesthesia substantially reduces nausea and vomiting in comparison with GA (relative risk: 0.25, 95% CI: 0.13–0.50; *P* < 0.05), although it does carry a risk of pleural puncture and epidural spread of local anesthetic.

CONCLUSIONS: In conclusion, based on the current evidence, PVBs for surgical anesthesia at the level of the thoracic and lumbar vertebrae are associated with less pain during the immediate postoperative period, as well as less postoperative nausea and vomiting, and greater patient satisfaction compared with GA.

