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一項關於瑞芬太尼--丙泊酚聯合應用引起對食道檢查儀器的反應喪失、應答反應喪失、和/或發生重度呼吸抑制的研究

An Exploration of Remifentanil-Propofol Combinations That Lead to a Loss of Response to Esophageal Instrumentation, a Loss of Responsiveness, and/or Onset of Intolerable Ventilatory Depression

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背景：瑞芬太尼和丙泊酚被越來越多應用于保留自主呼吸病人的短時操作過程。在此情況，最好可以消除中度刺激引起的反應同時避免應答反應喪失（LOR）和重度呼吸抑制（IVD）。在這項研究中，我們探索了瑞芬太尼-丙泊酚複合應用時引起對食道檢查儀器（EI）的反應喪失、LOR、和/或發生 IVD 的效應部位濃度（Ces）。研究的次要目標是用這些資料來建立每種反應測量的回應面模型。我們假設（1）在大多數志願者中，選擇性的瑞芬太尼和丙泊酚效應部位濃度將會允許 EI 但會避免 LOR 和 IVD，並且（2）對這些反應的藥物相互作用是協同作用。
方法：24 名志願者接受了劑量逐步提高的的芬太尼和丙泊酚靶控注射，注射劑量範圍分別是 0 至 6.4 ng ·mL^{-1} 和 0 至 4.3 μg · mL^{-1}。在每個設置的靶濃度，記錄對插入鈍性探頭到食道中部（40cm）的反應、應答反應等級、呼吸頻率。通過這些資料，建立對 EI 反應的喪失和 IVD 的回應面模型並定性爲協同作用、相加作用或拮抗作用。應用一個之前已發表的 LOR 模型。
結果：在可能的 384 項評估中，志願者在 105 個預測的瑞芬太尼-丙泊酚效應部位濃度下對 EI 無反應；其中 30 個濃度時，志願者沒有 IVD；其中 30 個濃度，志願者沒有 LOR；其中 9 個濃度，志願者均沒有 IVD 和 LOR。但是，許多其他在相同濃度範圍以上的評估發生了 LOR 和/或 IVD。允許 EI 並避免 IVD 和/或 LOR 的瑞芬太尼-丙泊酚的效應部位濃度大約分別是 0.8 至 1.6 ng ·mL^{-1} 和 1.5 至 2.7 μg · mL^{-1} ，較小的範圍大約分別是 3.0 至 4.0 ng ·mL^{-1} 和 0.0 to 1.1 μg · mL^{-1}。EI 反應喪失和 IVD 的模型都表明瑞芬太尼和丙泊酚之間有協同作用。
結論：選擇性的瑞芬太尼-丙泊芬濃度組，尤其是高濃度的丙泊酚和低濃度的瑞芬太尼組，在保留自護呼吸的志願者中能夠消除對 EI 的反應同時避免 IVD。然而要同時消除對 EI 的反應並避免 LOR 和 IVD 是很難做到的。也許我們有必要承受一些鈍性探頭的不適感而不是一味的追求消除對 EI 的反應以避免 LOR 和 IVD。
（張怡譯 馬皓琳 李士通校）

BACKGROUND: Remifentanil and propofol are increasingly used for short-duration procedures in spontaneously breathing patients. In this setting, it is preferable to block the response to moderate stimuli while avoiding loss of responsiveness (LOR) and intolerable ventilatory depression (IVD). In this study, we explored selected effects of combinations of remifentanil-propofol effect-site concentrations (Ces) that lead to a loss of response to esophageal instrumentation (EI), LOR, and/or onset of IVD. A secondary aim was to use these observations to create response surface models for each effect measure. We hypothesized that (1) in a large percentage of volunteers, selected

remifentanil and propofol Ces would allow EI but avoid LOR and IVD, and (2) the drug interaction for these effects would be synergistic.
METHODS: Twenty-four volunteers received escalating target-controlled remifentanil and propofol infusions over ranges of 0 to 6.4 ng $\cdot mL^{-1}$ and 0 to 4.3 μg $\cdot$ mL^{-1}, respectively. At each set of target concentrations, responses to insertion of a blunt end bougie into the midesophagus (40 cm), level of responsiveness, and respiratory rate were recorded. From these data, response surface models of loss of response to EI and IVD were built and characterized as synergistic, additive, or antagonistic. A previously published model of LOR was used.
RESULTS: Of the possible 384 assessments, volunteers were unresponsive to EI at 105 predicted remifentanil-propofol Ces; in 30 of these, volunteers had no IVD; in 30, volunteers had no LOR; and in 9, volunteers had no IVD or LOR. Many other assessments over the same concentration ranges, however, did have LOR and/or IVD. The combinations that allowed EI and avoided IVD and/or LOR primarily clustered around remifentanil-propofol Ces ranging from 0.8 to 1.6 ng $\cdot mL^{-1}$ and 1.5 to 2.7 μg $\cdot$ mL^{-1}, respectively, and to a lesser extent approximately 3.0 to 4.0 ng $\cdot mL^{-1}$ and 0.0 to 1.1 μg $\cdot$ mL^{-1}, respectively. Models of loss of response to EI and IVD both demonstrated a synergistic interaction between remifentanil and propofol.
CONCLUSION: Selected remifentanil-propofol concentration pairs, especially higher propofol-lower remifentanil concentration pairs, can block the response to EI while avoiding IVD in spontaneously breathing volunteers. It is, however, difficult to block the response to EI and avoid both LOR and IVD. It may be necessary to accept some discomfort and blunt rather than block the response to EI to consistently avoid LOR and IVD.

評估 **Flotrac/vigileo** 新的軟體版本（**3.02** 版）並和以往肝硬化患者肝移植手術中的資料比較

Evaluation of a New Software Version of the FloTrac/Vigileo (Version 3.02) and a Comparison with Previous Data in Cirrhotic Patients Undergoing Liver Transplant Surgery

Gianni Biancofiore, MD*, Lester A. H. Critchley, MD†, Anna Lee, PhD†, Xiao-xing Yang, PhD†, Lucia M. Bindi, MD*, Massimo Esposito, MD*, Massimo Bisà, MD*, Luca Meacci, MD*, Roberto Mozzo, MD* and Franco Filipponi, MD*
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背景：在肝硬化患者進行肝移植手術時，可靠的心輸出量監測是非常有用的，因爲肝硬化合併有血管擴張和高心輸出狀態，稱爲肝硬化心肌病，這就會挑戰脈搏輪廓線心輸出量監測技術可靠性。儘管射血分數和心輸出量的升高是由於外周血管阻力低，但是長期耐受的肝硬化患者的心室收縮力還是會受損的。然而，肝硬化患者在手術時由於生理變化與手術應激可以代償。最近，我們發現 Flotrac/vigileo™無法在肝硬化患者移植手術中使用。對此，公司升級了他們的軟體。因此，我們需要

在同一環境中評估這一新的第三代（3.02 版）Flotrac/vigileo 計算軟體的準確性和可靠性。
方法：同時使用肺動脈導管進行快速灌注熱稀釋法和 Flotrac/vigileo(CI_V)進行脈搏輪廓線分析來監測心臟指數。在 21 例肝移植手術中，讀了移植期間和移植後共 10 個時間點的資料。將其與我們 2009 年使用第二代（1.10 版）軟體的研究資料進行了比較。
結果：我們的新資料表明 3.02 版軟體顯著減少了在低外周阻力狀態時對脈搏輪廓心輸出讀數偏差的不利影響，從而提高系統的整體精度和趨勢能力。回歸分析表明 CI_{TD} 和 CI_V 之間呈現中等相關性（r =0.67，95%置信區間爲 0.40－0.86）。Bland 和 Altman 分析表明，偏差爲 0.4 $L.min^{-1} \cdot m^{-2}$，百分比誤差爲 52%（95%置信區間爲 49%－55%）。新軟體的趨勢能力也得到了改進，但仍遠遠低於目前的基準。
結論：新版軟體（3.02 版）與以前的版本比較有了重大的改進，整體精度和趨勢能力更好。進一步的計算改進將會增加這一技術的可靠性，使其廣泛應用在高度複雜環境的肝硬化患者肝移植手術中。
（唐亮 譯 馬皓琳 李士通 校）
BACKGROUND: Reliable cardiac output monitoring is particularly useful in the cirrhotic patient undergoing liver transplant surgery, because cirrhosis of the liver is associated with a vasodilated and high output state, known as *cirrhotic cardiomyopathy*, that challenges the reliability of pulse contour cardiac output technology. The contractility of the ventricle in cirrhosis is impaired, which is tolerated even though the ejection fraction and cardiac output are elevated because of the low peripheral resistance. However, during surgery the cirrhotic patient can decompensate because of the physiological changes and stress of surgery. Recently, we showed that the FloTrac/Vigileo™ failed to perform in cirrhotic patients undergoing transplant surgery. In response, the company upgraded their software. Therefore, we have assessed the accuracy and reliability of this new third-generation (version 3.02) FloTrac/Vigileo algorithm software in the same setting.
METHODS: The cardiac index was measured simultaneously by single-bolus thermodilution (CI_{TD}), using a pulmonary artery catheter, and pulse contour analysis, using the FloTrac/Vigileo (CI_V). Readings were made at 10 time points during and after liver transplant surgery in 21 patients. Comparisons with data from our 2009 study, which used second-generation (version 01.10) software, were also made.
RESULTS: Our new data show that version 3.02 software significantly reduced the adverse effect on pulse contour cardiac output reading bias in low peripheral resistance states, and thus improves the overall precision and trending ability of the system. Regression analysis between CI_{TD} and CI_V showed that the correlation was moderate (r =0.67, 95% confidence interval, 0.40 to 0.86). The Bland and Altman analysis showed that bias was 0.4 $L.min^{-1} \cdot m^{-2}$, and the percentage error was 52% (95% confidence interval, 49% to 55%). Trending ability of the new software also was improved but was still well below the current benchmarks.
CONCLUSION: The new software (version 3.02) provided substantial improvements over the previous versions with better overall precision and trending ability. Further algorithm refinements will increase this technology's reliability to be extensively used in the highly complex setting of cirrhotic patients undergoing liver transplantation.

低流量麻醉工作站有無濕熱交換器對溫度和濕度的影響

The Temperature and Humidity in a Low-Flow Anesthesia Workstation With and Without a Heat and Moisture Exchanger

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背景：Dräger Primus 麻醉工作站有一個內置的加熱器用來加熱病人呼出的氣流。加熱後的呼出氣流經過鈉石灰罐的同時與新鮮氣流混合。一個濕熱交換器（HME）可用於進一步加熱和濕化吸入的氣體。在本研究中，我們測量了安裝或未安裝濕熱交換器的 Dräger Primus 麻醉工作站的吸入氣體溫度和濕度。
方法：30 名女性患者隨機分爲 2 組，分別由安裝或未安裝 HME 的 Dräger Primus 麻醉工作站輔助通氣。在患者與呼吸環路連接後 15、30、60、90 和 120 分鐘測量吸入氣體的溫度和濕度。
結果：經過 120 分鐘低流量輔助通氣後，安裝或未安裝 HME 的吸入氣體溫度分別爲 30℃ ± 2℃ 和 25℃ ± 1℃，組間差異具有統計學意義(P < 0.001)，95%置信區間(CI)爲 3.80℃ 至 6.40℃。安裝或未安裝 HME 的吸入氣體的絕對濕度分別爲 30 ± 2 $mgH_2O \cdot L^{-1}$ 和 20.5 ± 3.6 $mgH_2O \cdot L^{-1}$，組間差異具有統計學意義(P < 0.001)，95%置信區間(CI)爲 7.37℃ 至 13.03℃。
結論：當使用低流量新鮮氣體時，Primus 麻醉工作站可將吸入氣體部分濕化。插入一個 HME 可提高吸入氣體的濕度，使其接近生理值。
（劉伍 譯 馬皓琳 李士通 校）

BACKGROUND: The Dräger Primus anesthesia workstation has a built-in hotplate to heat the patient's exhaled gas. The fresh gas flow is mixed with the heated exhaled gas as they pass through the soda lime canister. A heat and moisture exchanger (HME) may also be used to further heat and humidify the inhaled gas. In this study we measured the temperature and humidity of the inhaled gas coming from the Dräger Primus with or without a HME.
METHODS: Thirty female patients were randomly divided into 2 groups and their lungs ventilated by the Primus Dräger anesthesia workstation with or without a HME. The humidity and temperature of the inhaled gas were measured 15, 30, 60, 90, and 120 minutes after connecting the patient to the breathing circuit.
RESULTS: After 120 minutes of ventilation with a low-flow breathing circuit, the temperatures of inhaled gas were 25℃ ± 1℃ and 30℃ ± 2℃ without and with HME, respectively, with a statistically significant difference between groups ($P < 0.001$) with 95% confidence interval (CI) of 3.80℃ to 6.40℃; and the absolute humidity values of the inhaled gas were 20.5 ± 3.6 $mgH_2O \cdot L^{-1}$ and 30 ± 2 $mgH_2O \cdot L^{-1}$ without and with HME, respectively, with a statistically significant difference between groups ($P < 0.001$) with 95% CI of 7.37℃ to 13.03℃.

CONCLUSIONS: The Primus anesthesia workstation partially humidifies the inspired gas when a low fresh gas flow is used. Insertion of an HME increases the humidity in inhaled gas, bringing it close to physiological values.

超聲評估妊娠期髂脊線的脊椎水準

Ultrasound Assessment of the Vertebral Level of the Intercristal Line in Pregnancy

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背景：眾所周知髂脊線最常穿過腰 4 脊柱棘突或者腰 4-5 間隙；然而據推測在妊娠期間由於過度腰椎前凸髂脊線位置較高。已有研究顯示臨床上依賴于應用髂脊線來估計脊椎水準常常是不準確的。我們假設，按照觸診的方法決定妊娠婦女髂脊線的脊椎水準高於超聲測得的水準。
方法：51 名足月妊娠患者入組。兩位有經驗的麻醉醫師按照觸診的方法對髂脊線的位置進行估計。另一個麻醉醫師在對臨床估計不知情的條件下應用超聲確定髂脊上緣在橫向和縱向平面的位置，然後識別腰椎水準。記錄臨床估計髂脊線穿過脊柱的脊椎水準，並且與超聲測得的髂脊上緣水準相比較。
結果：臨床估計髂脊線脊椎水準與超聲測量的一致率只有 14%（101 次中有 14 次，95%置信區間 8%，22%）。臨床估計高於超聲測量一個節段的比率爲 23%（101 次中有 23 次，95%置信區間 16%，32%），超過 1 個節段的比率爲 25%（101 次中有 25 次，單側 95%置信區間，＞18%）。臨床估計的分佈發現臨床醫生定位髂脊線在腰 3 或腰 3-4 間隙的比率爲 54%(101 次中有 54 次，95%置信區間 44%，63%)，在腰 2-3 或更高節段的比率爲 27%(101 次中有 27 次，單尾 95%置信區間＞20%)。
結論：應用超聲發現至少有 6%的足月產婦定位髂脊線解剖位置在腰 3 或更高。研究發現臨床估測比超聲探測的解剖學位置高大於等於 1 個節段的比率至少爲 40%。這種差異可能導致椎管內麻醉期間錯誤定位腰椎間隙，並增加神經損傷的風險。
（劉朝輝譯，馬皓琳，李士通校）

BACKGROUND: The intercristal line is known to most frequently cross the L4 spinous process or L4-5 interspace; however, it is speculated to be positioned higher during pregnancy because of the exaggerated lumbar lordosis. Clinical estimation of vertebral levels relying on the use of the intercristal line has been shown to often be inaccurate. We hypothesized that the vertebral level of the intercristal line determined by palpation would be higher than the level determined by ultrasound in pregnant women.
METHODS: Fifty-one term pregnant patients were recruited. Two experienced anesthesiologists performed estimates of the position of the intercristal line by palpation. Using ultrasound, another anesthesiologist who was blinded to the clinical estimates, determined the position of the superior border of the iliac crest in the transverse and

longitudinal planes and then identified the lumbar vertebral levels. The vertebral level at which the clinical estimates of the intercristal line crossed the spine was recorded and compared with the ultrasound-determined level of the superior border of the iliac crest. **RESULTS:** The clinical estimates of the spinal level of the intercristal line agreed with the ultrasound measurement 14% of the time (14 of 101; 95% confidence interval [CI]: 8%, 22%). The clinical estimates were 1 level higher than the ultrasound measurement 23% of the time (23 of 101; 95% CI: 16%, 32%) and >1 level higher 25% of the time (25 of 101; 1-tailed 95% CI: >18%). The distribution of the clinical estimates found clinicians locating the intercristal line at L3 or L3-4 54% of the time (54 of 101; 95% CI: 44%, 63%) and at L2-3 or higher 27% of the time (27 of 101; 1-tailed 95% CI: >20%). **CONCLUSION:** The anatomical position of the intercristal line was at L3 or higher in at least 6% of term pregnant patients using ultrasound. Clinical estimates were found to be ≥1 vertebral level higher than the anatomical position determined by ultrasound at least 40% of the time. This disparity may contribute to misidentification of lumbar interspaces and increased risk of neurologic injury during neuraxial anesthesia.

超聲引導對疼痛干預管理是否有優勢？一篇關於急性疼痛結果的綜述

Is Ultrasound Guidance Advantageous for Interventional Pain Management? A Review of Acute Pain Outcomes

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背景：超聲（US）引導下周圍神經阻滯已在全球範圍內得到廣泛應用。關於即時超聲視覺化技術較傳統的神經定位技術的優勢的報導大多是關於操作和技術阻滯相關的結果，而關於急性疼痛治療的相關結果則明顯較少報導。在本綜述中，我們比較了 US 引導與傳統神經定位技術對於急性疼痛干預管理和急性疼痛相關結果的作用。

方法：我們對 1990 年 1 月至 2011 年 1 月期間的 MEDLINE、EMBASE、循證醫學中心登記的對照臨床試驗做了系統檢索，檢索出關於比較評估 US 引導和傳統神經定位技術對急性疼痛及其相關結果的作用的隨機對照試驗。排除標準包括：納入實驗未報告以下至少一項急性疼痛的結果——疼痛程度、阿片類藥物使用量、感覺阻滯持續時間、首次需要止痛藥的時間。相關結果分類如下：患者相關結果（阿片類藥物相關副作用、患者滿意度、術後認知功能障礙）、麻醉相關結果（不必要的運動阻滯、周圍神經置管失敗、患病率、慢性疼痛的發生）、手術相關結果（再次入院、行走的能力），住院相關結果（住院時間、花費）。我們對於 US 引導治療急性疼痛的有前景的新穎應用也予以了討論。

結果：我們納入了比較 US 引導與或不與外周神經刺激器聯用、單用外周神經刺激器和應用解剖標誌技術的 23 項隨機對照試驗，共 1674 名患者。在 16 項評估了疼痛程度的研究中， 8 項報導了 US 引導帶來的改善，但是僅 1 項研究報導了 US 引導與對照組有大於 1 個區間的數值分級疼痛評分的差異性。8 項研究評估了感覺阻滯的持續時間，其中 3 項報導了 US 引導的阻滯持續時間延長。7 項研究評估了阿

片類藥物的使用量，其中 3 項報導了 US 引導組的使用量減少。3 項研究評估了首次需用鎮痛藥的時間，其中 2 項支援 US 引導技術。我們未發現 US 引導和傳統神經定位技術在其他相關結果上的差異性。我們未發現在任何結果上顯示 US 引導次於傳統的神經定位技術。非隨機的資料顯示 US 引導的腹橫肌平面的阻滯可能提供多於標準鎮痛治療的益處，但未與解剖學標誌定位阻滯技術相比。
結論：目前根據同時期的文獻報導沒有足夠的證據可用于定義 US 引導用於急性疼痛干預管理時與傳統神經定位技術比較對於急性疼痛及其相關結果的作用。
（毛祖旻 譯 馬皓琳 李士通 校）

BACKGROUND: Ultrasound (US) guidance for peripheral nerve blockade has gained popularity worldwide. The reported benefits of real-time sonographic visualization compared with traditional nerve localization techniques generally apply to procedural and technical block-related outcomes whereas acute pain–related outcomes are featured less prominently. In this review, we evaluated the effect of US guidance compared with traditional nerve localization techniques for interventional management of acute pain and acute pain–related outcomes.
METHODS: We performed a systematic search of MEDLINE, EMBASE, and the Cochrane Central Register of Controlled Clinical Trials (from January 1990 to January 2011) to identify randomized controlled trials evaluating the effects of US guidance on acute pain and related outcomes compared with traditional nerve localization techniques. Studies were excluded if they did not report at least one of the following acute pain outcomes: pain severity, opioid consumption, sensory block duration, and time to first analgesic request. Related outcomes were classified as follows: patient related (opioid-related adverse effects, patient satisfaction, postoperative cognitive deficit); anesthesia related (unwanted motor block, perineural catheter failure, morbidity, development of chronic pain); surgery related (hospital readmission, ability to ambulate); and hospital related (length of stay, cost). Promising novel applications of US guidance for acute pain management were also sought for discussion purposes.
RESULTS: We identified 23 randomized controlled trials, including 1674 patients, that compared US guidance with and without peripheral nerve stimulation with peripheral nerve stimulation alone or anatomical landmark techniques. Of the 16 studies that evaluated pain severity, 8 reported improvement with US guidance; however, only 1 study reported a difference between US guidance and the comparator of >1 interval on the numeric rating pain scale. Eight studies evaluated sensory block duration and 3 of these reported prolonged block duration with US guidance. Seven studies evaluated opioid consumption, of which 3 reported a reduction with US guidance. Three studies evaluated time to first analgesic request, of which 2 favored US guidance. We uncovered no significant differences between US guidance and traditional nerve localization techniques for any other related outcome. US guidance was not found to be inferior compared with traditional nerve localization techniques for any outcome. Nonrandomized data suggest that US-guided transversus abdominis plane blocks may offer analgesic benefit over standard analgesic therapy, but has not been compared with an anatomical landmark technique.
CONCLUSIONS: At present, there is insufficient evidence in the contemporary literature to define the effect of US guidance on acute pain and related outcomes

compared with traditional nerve localization techniques for interventional acute pain management.

大鼠剖腹手術後持續腹膜外輸注和全身給予不同劑量羅呱卡因的比較

A Comparison of Different Dosages of a Continuous Preperitoneal Infusion and Systemic Administration of Ropivacaine After Laparotomy in Rats

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介紹：爲了進一步解釋局麻藥傷口輸注的鎮痛作用中所涉及的作用機制，我們評估了開腹手術後和給予局麻藥後的體壁和內臟的敏感度以及炎症指數。不同劑量的羅呱卡因通過多孔的腹膜外導管或者全身連續輸注給大鼠。
方法：9 組接受剖腹手術或者模擬手術的大鼠接受 2 種注射：（1）通過腹膜外導管單次注射（羅呱卡因或者鹽水）或（2）肌肉注射（羅呱卡因或者鹽水）。接下來，腹膜外導管持續 24h 輸注（羅呱卡因或者鹽水），肌注每 8 小時一次。機械和內臟刺激後閾值在術後 48 小時內評估 3 次。用酶聯免疫吸附法測量全血培養中刺激產生的腫瘤壞死因數 α 和白細胞介素 1β。採用氣相色譜法測量血漿羅呱卡因濃度。
結果：腹膜外輸注高劑量羅呱卡因和全身性使用羅呱卡因同樣可防止對機械痛和內臟痛的敏感性改變，並導致更好的功能恢復。全身使用的鎮痛作用與抗炎作用相關。
結論：本研究表明，通過腹膜外輸注和全身性間斷注射給予高劑量羅呱卡因對於開腹手術後的機械痛和內臟痛的敏感性作用效果相近。而且，全身的使用與抗炎作用相關。關於腹膜外輸注高劑量羅呱卡因和全身性使用的優越性比較還需進一步的研究。
（安光惠譯 馬皓琳 李士通校）

INTRODUCTION: To further explain the mechanisms of action involved in the analgesic effect of a local anesthetic wound infusion, we evaluated parietal and visceral sensitivity as well as indices of inflammation after laparotomy and administration of a local anesthetic. Ropivacaine was administered at different dosages by a continuous infusion using a multiholed catheter in the preperitoneal position or systemically in rats.
METHODS: Nine groups of rats received 2 injections after laparotomy or sham surgery: (1) a bolus injection (ropivacaine or saline) via a preperitoneal catheter and (2) an IM injection (IM) (ropivacaine or saline). These injections were followed by a continuous infusion (ropivacaine or saline) in the preperitoneal catheter for 24 hours and 1 IM injection every 8 hours. Mechanical and visceral thresholds after stimulation were evaluated 3 times during the 48 hours after surgery. Stimulated production of tumor necrosis factor α, and interleukin 1β in whole-blood cultures were measured by enzyme-

linked immunosorbent assay. The ropivacaine plasma concentration was measured by gas chromatography.
RESULTS: Preperitoneal infusion of high doses of ropivacaine and systemic ropivacaine similarly prevented mechanical and visceral sensitivity alterations and led to a better functional recovery. The analgesic effect of systemic administration was associated with an anti-inflammatory effect.
CONCLUSION: In the current study, high-dose ropivacaine administered via a preperitoneal infusion or systemic boluses had the same effect on mechanical and visceral sensitivity after laparotomy. Moreover, systemic administration was associated with an anti-inflammatory effect. The merits of the comparable benefit of systemic and high-dose preperitoneal infusion of ropivacaine need to be confirmed with further studies.

嗎啡和芬太尼在大鼠嗅上皮的優先分佈後增強的鎮痛效應

Enhanced Analgesic Responses After Preferential Delivery of Morphine and Fentanyl to the Olfactory Epithelium in Rats

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背景：中樞性阿片類鎮痛藥（如嗎啡和芬太尼）是有效的，但藥物到達腦和中樞神經系統前的首過消除會產生延遲反應和副作用，從而常使其效應受限。通常認爲，經鼻腔給藥可直接進入腦和中樞神經系統，在治療學上有諸如起效快、全身濃度低等優點。鼻腔的嗅區涉及促進這一鼻到中樞神經系統直接轉移。如果能改善經嗅區給予的阿片類藥物的成分，那麼便可有更多藥物直接進入中樞神經系統，產生更好的療效。
方法：我們開發了一個加壓嗅覺投放（POD）裝置對 S-D 大鼠鼻腔嗅區進行連續、非侵襲性大量給藥。通過甩尾潛伏期試驗和血漿及中樞神經組織的藥物濃度分析，我們比較了阿片類藥物嗎啡和芬太尼在不同給藥途徑下（鼻腔嗅區 POD 裝置給藥、鼻腔呼吸區滴鼻給藥和經腹腔內注射全身性給藥）的分佈和效應。
結果：與滴鼻劑相比，通過 POD 給予嗎啡產生顯著更高的總體療效（效應-時間曲線下面積[$AUC_{效應}$]），且血漿藥物濃度（$AUC_{血漿}$）無顯著升高。POD 給予嗎啡產生 38%到 55%的鼻到中樞神經系統直接轉移。與鼻腔呼吸區給藥相比，POD 給予芬太尼產生更快（5 比 10 分鐘）且更強的鎮痛作用。與腹腔內注射和滴鼻給藥不同，通過 POD 裝置對鼻腔嗅上皮給予嗎啡和芬太尼後，均顯示出相應的順時針（血漿）比效應滯後現象，與鼻到中樞神經系統直接藥物轉移機制相一致。
結論：阿片類藥物在鼻腔嗅區的沉積可對藥物的分佈和藥效學作用產生顯著影響，因此在未來應該考慮經鼻給予阿片類藥物。
（陳彬彬譯 馬皓琳 李士通校）

BACKGROUND: Centrally acting opioid analgesics such as morphine and fentanyl are effective, but their efficacy is often limited by a delayed response or side effects resulting from systemic first pass before reaching the brain and the central nervous system (CNS). It is generally accepted that drugs applied to the nasal cavity can directly access the brain and the CNS, which could provide therapeutic advantages such as rapid onset and lower systemic exposure. The olfactory region of the nasal cavity has been implicated in

facilitating this direct nose-to-CNS transfer. If the fraction of opioid administered to the olfactory region could be improved, there could be a larger fraction of drug directly delivered to the CNS, mediating greater therapeutic benefit.
METHODS: We have developed a pressurized olfactory delivery (POD) device to consistently and noninvasively deposit a majority of drug on the olfactory region of the nasal cavity in Sprague-Dawley rats. Using the tail-flick latency test and analysis of plasma and CNS tissue drug exposure, we compared distribution and efficacy of the opioids morphine and fentanyl administered to the nasal olfactory region with the POD device or the nasal respiratory region with nose drops or systemically via intraperitoneal injection.
RESULTS: Compared with nose drop administration, POD administration of morphine resulted in a significantly higher overall therapeutic effect (area under the curve [over the time course] $[AUC]_{effect}$) without a significant increase in plasma drug exposure (AUC_{plasma}). POD of morphine resulted in a nose-to-CNS direct transport percentage of 38% to 55%. POD of fentanyl led to a faster (5 vs 10 minutes) and more intense analgesic effect compared with nasal respiratory administration. Unlike intraperitoneal injection or nose drop administration, both morphine and fentanyl given by the POD device to olfactory nasal epithelium exhibited clockwise (plasma) versus effect hysteresis after nasal POD administration, consistent with a direct nose-to-CNS drug transport mechanism.
CONCLUSIONS: Deposition of opioids to the olfactory region within the nasal cavity could have a significant impact on drug distribution and pharmacodynamic effect, and thus should be considered in future nasally administered opioid studies.

綜述：圍術期心臟舒張功能不全的評估

Review Article: Perioperative Assessment of Diastolic Dysfunction

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心臟的舒張功能是圍術期經食道超聲心動圖對心臟進行綜合評估的一部分。50%以上的接受心臟手術或高風險非心臟手術的患者會出現心臟舒張功能的異常，這也是發生術後不良預後的獨立預測因素。舒張功能不全可能是 50%心臟收縮功能正常的充血性心力衰竭患者的病因。對舒張功能的綜合評估需要全方位的、負荷依賴的多普勒技術。體液丟失及麻醉藥物可以對心肌舒張和順應性產生影響，使得多普勒評估心肌功能變得更爲複雜。更高端的多普勒技術，比如組織多普勒成像和血流傳播速度，能夠更精密的檢測左室舒張功能，分析舒張期各個特殊階段，鑒別異常來自心肌舒張還是順應性。此外，不同的多普勒推導比率可以估計左室充盈壓。當麻

醉狀態下接受手術的病人需要在經食道超聲心動圖評估左室舒張功能時，因其在手術室時與非臥床狀態時的血流動力學環境不同，故要求對診斷程式進行修正。（陸秉瑋　譯　陳傑　校）

Assessment of diastolic function should be a component of a comprehensive perioperative transesophageal echocardiographic examination. Abnormal diastolic function exists in >50% of patients presenting for cardiac and high-risk noncardiac surgery, and has been shown to be an independent predictor of adverse postoperative outcome. Normalcy of systolic function in 50% of patients with congestive heart failure implicates diastolic dysfunction as the probable etiology. Comprehensive evaluation of diastolic function requires the use of various, load-dependent Doppler techniques This is further complicated by the additional effects of dehydration and anesthetic drugs on myocardial relaxation and compliance as assessed by these Doppler measures. The availability of more sophisticated Doppler techniques, e.g., Doppler tissue imaging and flow propagation velocity, makes it possible to interrogate left ventricular diastolic function with greater precision, analyze specific stages of diastole, and to differentiate abnormalities of relaxation from compliance. Additionally, various Doppler-derived ratios can be used to estimate left ventricular filling pressures. The varying hemodynamic environment of the operating room mandates modification of the diagnostic algorithms used for ambulatory cardiac patients when left ventricular diastolic function is evaluated with transesophageal echocardiography in anesthetized surgical patients.

前腦特定的 γ-氨基丁酸 A 型受體 β3 亞基的基因敲除小鼠對異氟醚的遺忘效應有抵抗作用

Gamma-Aminobutyric Acid Type A Receptor β3 Subunit Forebrain-Specific Knockout Mice Are Resistant to the Amnestic Effect of Isoflurane

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背景：包括 γ -氨基的丁酸 A 型受體（$GABA_A$-Rs）的 β3 介導靜脈麻醉藥的作用，如制動和催眠。前腦目標區域敲除了 $GABA_A$-Rs 的 β3 亞基的實驗鼠對依託咪酯的催眠效果敏感性降低，表現爲測量時翻正反射消失。在這種條件性敲除下，由吸入麻醉藥產生的遺忘和制動作用尚未評估。

方法：作者通過對前腦選擇性 β3 條件敲除的實驗鼠及作爲對照的同窩出生鼠條件性恐懼的測試，來評估組間吸入性麻醉藥對傷害性刺激產生不動性的遺忘和最小肺泡濃度的差異，即不動性方面的差異。評估依託咪酯和異氟醚對條件恐懼的抑制，評估異氟醚的 MAC。

結果：依託咪酯對兩種基因型產生同樣的條件恐懼抑制。相對於同窩出生鼠，被敲除的實驗鼠表現出了對由異氟醚產生的條件恐懼抑制的抵抗力。在異氟醚 MAC 值方面，對照組和試驗組沒有不同。
結論：這些結果表明異氟醚而不是依託咪酯能抑制前腦與記憶相關的海馬區包含 $GABA_A$-Rs 的 β3 作用。
（孫曉瓊　譯　陳傑　校）
BACKGROUND: β3 containing γ–aminobutyric acid type A receptors ($GABA_A$-Rs) mediate behavioral end points of IV anesthetics such as immobility and hypnosis. A knockout mouse with targeted forebrain deletion of the β3 subunit of the $GABA_A$-R shows reduced sensitivity to the hypnotic effect of etomidate, as measured by the loss of righting reflex. The end points of amnesia and immobility produced by an inhaled anesthetic have yet to be evaluated in this conditional knockout.
METHODS: We assessed forebrain selective β3 conditional knockout mice and their littermate controls for conditional fear to evaluate amnesia and MAC, the minimum alveolar concentration of inhaled anesthetic necessary to produce immobility in response to noxious stimulation, to assess immobility. Suppression of conditional fear was assessed for etomidate and isoflurane, and MAC was assessed for isoflurane.
RESULTS: Etomidate equally suppressed conditional fear for both genotypes. The knockout showed resistance to the suppression of conditional fear produced by isoflurane in comparison with control littermates. Controls and knockouts did not differ in isoflurane MAC values.
CONCLUSIONS: These results suggest that β3 containing $GABA_A$-Rs in the forebrain contribute to hippocampal-dependent memory suppressed by isoflurane, but not etomidate.

CNAP™测得的脉压变异率对患者术中补液反应性的预测能力

The Ability of Pulse Pressure Variations Obtained with CNAP™ Device to Predict Fluid Responsiveness in the Operating Room

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背景：机械通氣患者呼吸相關脈壓（動脈壓力）變異率(ΔPP_{ART})能提示液體治療反應。 Infinity ® CNAP™SmartPod ® (Dräger Medical AG & Co., Lübeck, 德國) 系統提供無創連續動脈壓測量和近乎即時的壓力波形。本研究推測，CNAP 系統來源的呼吸相關脈壓變異率(ΔPP_{CNAP}) 和ΔPP_{ART}一樣，能預測全麻機械通氣患者的液體治療反應性。
方法： 35 例行血管手術全身麻醉誘導後的患者使用 6%羥乙基澱粉 130/0.4（500 毫升）進行擴容（VE），擴容前後記錄由 Vigileo™/ FloTrac™（Edwards Lifesciences, Irvine, CA）測量每搏輸出量（SV）、ΔPP_{ART}和ΔPP_{CNAP}資料。如 SV 擴容後增加≥15%，則受試者被認定爲有反應。

結果： 20 例患者有擴容反應，15 例無擴容反應。擴容前 ΔPP_{ART} and ΔPP_{CNAP} 之間的相關係數爲 R = 0.90（95%可信區間[CI] = 0.84-0.96，P <0.0001）。有擴容反應者的 ΔPP_{ART} and ΔPP_{CNAP} 數值在擴容之前顯著高於無反應患者($P < 0.0001$)。 擴容前 ΔPP_{ART} and ΔPP_{CNAP} 數值與擴容後 SV 增加百分比之間有顯著關係（分別爲，$r^2 = 0.50$; $P < 0.0001$ and $r^2 = 0.57$; $P < 0.0001$）。擴容前，ΔPP_{ART} 數值>10%區分有擴容反應患者與無擴容反應患者，靈敏度爲 90%（95%CI = 69%-99%），特異性爲 87%（95%CI = 60%-98%）。 ΔPP_{AR} 受試者特徵（ROC）曲線下面積爲 0.957 ± 0.035。擴容前， ΔPP_{CNAP} 數值> 11%區分有擴容反應患者與無擴容反應患者，靈敏度爲 85%（95%CI = 62%-97%），特異性爲 100%（95%CI = 78%-100%）。ΔPP_{CNAP}ROC 曲線下面積爲 0.942 ± 0.040。ΔPP_{ART} 和 ΔPP_{CNAP}ROC 曲線面積間無顯著差異。

結論：用 ΔPP_{CNAP} > 11%預測全麻下前負荷依賴的機械通氣患者有無擴容反應，其敏感性至少有 62%。

（陳毓雯　譯　陳傑　校）

BACKGROUND: Respiratory-induced pulse pressure variations obtained with an arterial line (ΔPP_{ART}) indicate fluid responsiveness in mechanically ventilated patients. The Infinity® CNAP™ SmartPod® (Dräger Medical AG & Co. KG, Lübeck, Germany) provides noninvasive continuous beat-to-beat arterial blood pressure measurements and a near real-time pressure waveform. We hypothesized that respiratory-induced pulse pressure variations obtained with the CNAP system (ΔPP_{CNAP}) predict fluid responsiveness as well as ΔPP_{ART} predicts fluid responsiveness in mechanically ventilated patients during general anesthesia.

METHODS: Thirty-five patients undergoing vascular surgery were studied after induction of general anesthesia. Stroke volume (SV) measured with the Vigileo™/FloTrac™ (Edwards Lifesciences, Irvine, CA), ΔPP_{ART}, and ΔPP_{CNAP} were recorded before and after intravascular volume expansion (VE) (500 mL of 6% hydroxyethyl starch 130/0.4). Subjects were defined as responders if SV increased by ≥15% after VE.

RESULTS: Twenty patients responded to VE and 15 did not. The correlation coefficient between ΔPP_{ART} and ΔPP_{CNAP} before VE was $r = 0.90$ (95% confidence interval [CI] = 0.84–0.96; $P < 0.0001$). Before VE, ΔPP_{ART} and ΔPP_{CNAP} were significantly higher in responders than in nonresponders ($P < 0.0001$). The values of ΔPP_{ART} and ΔPP_{CNAP} before VE were significantly correlated with the percent increase in SV induced by VE (respectively, $r^2 = 0.50$; $P < 0.0001$ and $r^2 = 0.57$; $P < 0.0001$). Before VE, a ΔPP_{ART} >10% discriminated between responders and nonresponders with a sensitivity of 90% (95% CI = 69%–99%) and a specificity of 87% (95% CI = 60%–98%). The area under the receiver operating characteristic (ROC) curve was 0.957 ± 0.035 for ΔPP_{ART}. Before VE, a ΔPP_{CNAP} >11% discriminated between responders and nonresponders with a sensitivity of 85% (95% CI = 62%–97%) and a specificity of 100% (95% CI = 78%–100%). The area under the ROC curve was 0.942 ± 0.040 for ΔPP_{CNAP}. There was no significant difference between the area under the ROC curve for ΔPP_{ART} and ΔPP_{CNAP}.

CONCLUSIONS: A value of ΔPP_{CNAP} >11% has a sensitivity of at least 62% in predicting preload-dependent responders to VE in mechanically ventilated patients during general anesthesia.

改變體表降溫的速度對於血管收縮和寒戰閾值的影響

The Effect of Altering Skin-Surface Cooling Speeds on Vasoconstriction and Shivering Thresholds

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背景：體核溫度和體表溫度對穩態體溫調節控制都有影響。動態體溫調節反應觸發對快速熱變化的強力的防禦反應。這些反應可能使體溫調節研究變得更加複雜，同時減慢了對低體溫治療的實施。本研究假設在較高的體表溫度水準，快速降溫比慢速或者中速降溫更容易引起血管收縮和寒戰。
方法：11 位健康志願者用加壓氣流或/和傳導冷卻的方法，隨機地以 3 種不同速度降低體表溫度。其中一天志願者接受慢速降溫 (≈2°C/h)，另外一天同時接受中速(≈4°C/h)和快速(≈6°C/h)降溫。血管內熱交換導管測量體核溫度。指尖血流速度≤0.25ml/min 定義爲血管收縮發生；氧耗持續增加≥25%定義爲寒戰發生。資料結果使用重複測量的方差分析方法，P< 0.05 表示差異顯著。
結果：志願者的平均年齡爲 25 ± 5 歲，身高爲 175 ± 7 cm，體重爲 63 ± 10 kg。實驗中體核溫度維持在 37 度左右。血管收縮時，慢速、中速以及快速降溫時其平均體表溫度分別爲 33.2℃ (95% CI: 32.0℃, 34.4℃), 33.5℃ (95% CI: 32.3℃, 34.7℃), and 33.0℃ (95% CI: 31.4℃, 34.6℃)。寒戰時，其體表溫度則分別爲 31.4℃ (95% CI: 30.3℃, 32.5℃), 31.5℃ (95% CI: 30.2℃, 32.8℃), and 30.7℃ (95% CI: 28.9℃, 32.5℃)。
結論：對於 3 種不同的降溫速度，開始發生血管收縮或寒戰時，其體表溫度相似。積極地體表降溫可以用於體溫調節研究以及指導治療性低體溫而沒有引起令人難以接受的體溫調節的防禦反應。
（張婷　譯　陳傑　校）

BACKGROUND: Both core and skin temperatures contribute to steady-state thermoregulatory control. Dynamic thermoregulatory responses trigger aggressive defenses against rapid thermal perturbations. These responses potentially complicate interpretation of thermoregulatory studies and could slow induction of therapeutic hypothermia. We thus tested the hypothesis that rapid external skin-cooling triggers vasoconstriction and shivering at higher mean skin temperatures than slow or moderate rates of skin cooling.
METHODS: Eleven healthy volunteers were cooled at 3 skin-cooling rates using forced air or/and conductive cooling in random order. One day volunteers received slow (≈2°C/h) skin cooling, and on another day, they received both medium (≈4°C/h) and fast (≈6°C/h) skin cooling. An endovascular heat-exchanging catheter maintained core temperature. Fingertip blood flow ≤0.25 mL/min defined onset of vasoconstriction; sustained ≥25% increase in oxygen consumption defined onset of shivering. Results were evaluated with repeated-measures analysis of variance, with $P < 0.05$ representing statistical significance.

RESULTS: Volunteers were 25 ± 5 years of age (mean ± SD), 175 ± 7 cm tall, and weighed 63 ± 10 kg. Core temperature remained constant (≈37°C) throughout each study day. At vasoconstriction, mean skin temperatures were 33.2℃ (95% confidence interval [CI]: 32.0℃, 34.4℃), 33.5℃ (95% CI: 32.3℃, 34.7℃), and 33.0℃ (95% CI: 31.4℃, 34.6℃) at slow, medium, and fast skin-cooling rates, respectively. Mean skin temperatures at shivering were also comparable: 31.4℃ (95% CI: 30.3℃, 32.5℃), 31.5℃ (95% CI: 30.2℃, 32.8℃), and 30.7℃ (95% CI: 28.9℃, 32.5℃), respectively.
CONCLUSIONS: Onset of vasoconstriction and shivering occurred at similar mean skin temperatures with all 3 cooling rates. Aggressive surface cooling can thus be used in thermoregulatory studies and for induction of therapeutic hypothermia without provoking dynamic thermoregulatory defenses.

應用辛伐他丁能減少大鼠的脊髓缺血再灌注損傷

Reduction of Spinal Cord Ischemia/Reperfusion Injury with Simvastatin in Rats

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背景：胸或胸腹主動脈手術會導致脊髓缺血及併發截癱。然而，預防脊髓缺血引起截癱的常規方法並不能提供全面的預防作用並可能導致其他副作用。作者假設辛伐他丁——近期已被證實對大腦缺血再損傷有神經保護作用的一種藥物，應用於脊髓缺血再損傷的大鼠模型同樣有神經保護作用。
方法：實驗大鼠隨機分爲三組：辛伐他丁組、對照組、假手術組，每組 6 只大鼠。在主動脈球囊阻斷前，對大鼠每日皮下注射辛伐他丁 10mg/kg 或對照藥物，並在再灌注後 24 小時再次注射辛伐他丁或對照藥物。對置入胸主動脈的 2F 大小 Fogarty 導管球囊充氣後引起大鼠脊髓缺血，並在 12 分鐘內維持近端平均動脈壓大約 40mmHg。假手術組同樣進行手術但不進行球囊充氣的操作。在缺血再灌注後 6-48 小時應用運動缺陷指數對大鼠後肢運動功能進行缺血損傷的評估。在缺血再灌注後 48 小時進行脊髓組織學評估。
結果：與對照組相比，辛伐他丁組在再灌注後 24 小時和 48 小時的運動缺陷指數有顯著改善。(P = 0.021 ，P = 0.023)。此外，辛伐他丁組的正常運動神經元要顯著多於對照組(P = 0.037)。辛伐他丁組的白質空泡形成體積也顯著小於對照組(P = 0.030)。
結論：應用辛伐他丁能減輕脊髓缺血再灌注大鼠的下肢運動功能障礙和組織病理學變化。
（趙嫣紅　譯　陳傑　校）
BACKGROUND: Surgery of the thoracic or thoracoabdominal aorta may cause spinal cord ischemia and subsequent paraplegia. However, conventional strategies for preventing paraplegia due to spinal cord ischemia provide insufficient protection and cause additional side effects. We hypothesized that simvastatin, a drug recently shown to

be neuroprotective against brain ischemia/reperfusion, would be neuroprotective in a rat spinal cord ischemia/reperfusion model.
METHODS: Rats were randomly assigned to simvastatin, vehicle, or sham-surgery (sham) groups (n = 6 per group). Simvastatin (10 mg/kg) or vehicle was administered subcutaneously once daily for 7 days before aortic balloon occlusion, and once at 24 hours after reperfusion. Spinal cord ischemia was induced by balloon inflation of a 2F Fogarty catheter in the thoracic aorta, and the proximal mean arterial blood pressure was maintained at 40 mm Hg for 12 minutes. The sham group received the same operation without inflation of the balloon. Ischemic injury was assessed by hindlimb motor function using the Motor Deficit Index score at 6 to 48 hours after ischemic reperfusion, and histological assessment of the spinal cord was performed 48 hours after reperfusion.
RESULTS: The Motor Deficit Index scores at 24 and 48 hours after reperfusion were significantly improved in the simvastatin group compared with the vehicle group (P = 0.021 and P = 0.023, respectively). Furthermore, there were significantly more normal motor neurons in the simvastatin group than in the vehicle group (P = 0.037). The percentage area of white matter vacuolation was significantly smaller in the simvastatin group than in the vehicle group (P = 0.030).
CONCLUSIONS: Simvastatin treatment can attenuate hindlimb motor dysfunction and histopathological changes in spinal cord ischemia/reperfusion injury in rats.

早期胸交感神經阻滯提高上肢神經病理性疼痛的療效

Early Thoracic Sympathetic Block Improves the Treatment Effect for Upper Extremity Neuropathic Pain

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背景：交感神經系統在介導多種神經病理性疼痛中發揮重要的作用。胸交感神經阻滯（thoracic sympathetic block，TSB）對上肢和胸部的神經病理性疼痛具有良好的治療作用。然而，未有研究評估過促進 TSB 治療作用的相關因素。本次研究評估了 TSB 產生良好預後作用的影響因素，並確定臨床上重要的影響預後的因素。
方法：對 51 位患者在 X 線引導下實施經皮 TSB，並採集每位患者的年齡、性別、體重指數、診斷、疼痛強度和症狀的持續時間。用 logistic 回歸計算每個變數的調整後的比值比和 95%置信區間。
結果：相比於症狀持續時間長於 1 年的患者，TSB 對持續時間小於或者等於 1 年的患者的療效更好（P=0.006，比值比，8.037，95%置信區間爲 1.808-35.729）。患者的年齡、性別、體重指數、診斷和 TSB 前患者的疼痛強度與 TSB 療效不相關。

結論：研究結果顯示，對於慢性疼痛綜合征的患者，早期 TSB 的療效更好。由此，早期 TSB 可應用於患有上肢慢性疼痛的患者。
(周姝婧　譯　陳傑　校)

BACKGROUND: The sympathetic nervous system has important roles in mediating many neuropathic pain conditions. A thoracic sympathetic block (TSB) is a useful therapeutic procedure for neuropathic pain in the upper extremities and thorax. However, no studies have examined the factors related to an improved therapeutic effect of TSB. In this study, we evaluated the influence of potential prognostic factors for a better TSB effect and identified clinically important prognostic factors.
METHODS: Percutaneous TSB was performed in 51 patients, under fluoroscopic guidance. Data collected for each patient included age, gender, body mass index, diagnosis, pain intensity, and symptom duration. The adjusted odds ratios and 95% confidence intervals for each variable were calculated by logistic regression.
RESULTS: TSB was more effective in patients with symptom durations of ≤1 year compared with >1 year (P = 0.006; odds ratio, 8.037; 95% confidence interval, 1.808–35.729). Patient age, gender, body mass index, diagnosis, and intensity of pre-TSB pain were not associated with TSB effectiveness.
CONCLUSION: The results showed that an earlier TSB produced a better outcome for patients with chronic pain syndrome. Thus, early TSB should be performed in patients with chronic pain in the upper extremities.

高壓氧療緩解慢性壓迫性損傷所致神經性疼痛，並減少腫瘤壞死因數α產生

Hyperbaric Oxygenation Therapy Alleviates Chronic Constrictive Injury–Induced Neuropathic Pain and Reduces Tumor Necrosis Factor-Alpha Production

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背景：慢性壓迫性損傷（CCI）後的痛覺過敏和痛覺異常的發展與腫瘤壞死因數（TNF）-α和白細胞介素（IL）-1β顯著增加有關。從理論上說，如果可以減少 TNF -α和/或 IL -1β的產生，就可以緩解神經性疼痛綜合征。最近，有建議表明高壓氧治療(HBOT)對於疼痛疾病中有治療作用。本研究旨在探討以下假說（1）CCI 誘導的神經性疼痛可能與 TNF -α和 IL -1β產生增加有關，（2）高壓氧治療可能能夠緩解 CCI 引起的神經性疼痛，以及（3）神經性疼痛的緩解可能與 TNF -α和/或 IL -1β產生減少相關。
方法：對雄性大鼠（體重 250-300 克）用氯胺酮和甲苯噻嗪行麻醉誘導。從股二頭肌暴露坐骨神經。手術組，在坐骨神經三個分叉部近端，4 根結紮線鬆散地系在神經周圍。在假手術組，同樣暴露坐骨神經但不進行結紮。通過 von Frey 細絲刺激

和丙酮傳播分別測試機械性痛覺異常和冷痛覺異常。 HBO 的大鼠（N = 18）每天一次暴露於 2.4 個大氣壓的純氧 1 小時。非 HBO（N = 18）和假手術大鼠（N = 6）被放置在高壓氧治療室呼吸空氣。用 ELISA 法檢測坐骨神經中的 TNF - α 和 IL -1 β 。用 Western blot 分析驗證組織勻漿中腫瘤壞死因數- α 蛋白的存在。

結果：CCI 後第 4 和第 7 天測量 CCI 誘發的顯著冷和機械性痛覺異常。HBO 大鼠中冷痛覺異常出現頻率顯著低於非 HBO 組。第 4 天和第 7 天的的比值分別爲 20％± 1.6％比 50％± 4.5％，和 40％± 4.6％比 70％±4.5％（F = 87.42，置信區間[HBO 和非 HBO 的差異] = 29.612 ± 8.781， 第 4 和第 7 天的 P <0.05）。與非 HBO 的大鼠相比，HBO 大鼠機械性痛覺異常的閾值顯著增加。第 4 天和第 7 天的比值分別爲 6.20 ± 0.9 VS 4.1 ± 1.0g 和 3.8.2 ± 0.5 VS 2.3 ± 0.4 g（F = 18.8，置信區間[HBO 和非 HBO 的差異] = 1.806 ± 1.171，第 4 和第 7 天的 P <0.05）。非 HBO 組大鼠 TNF - α 含量顯著高於假手術組大鼠，第 4 天（17.89 ± 0.83 比 10.66 ± 1.1 pg / mg 蛋白，P <0.05）和第 7 天（18.97 ± 1.57 比 9.09 ± 1.5 pg/mg 蛋白，P <0.05）。高壓氧治療後 TNF - α 含量顯著降低到的假手術大鼠組水準左右，第 4 天和第 7 天分別爲 10.94 ± 2.78 和 11.32 ± 2.98 pg / mg 蛋白水準（與非 HBO 組相比 P <0.05）。Western blot 分析證實大鼠坐骨神經勻漿中存在分子量爲 51 kDa 的蛋白質。於假手術組相比，非 HBO 的大鼠中 IL -1 β 含量也顯著增高，第 4 天和第 7 天分別爲（636 ± 74 VS 256 ± 31pg / mg 蛋白質，P <0.05）（687 ± 89 VS 288 ± 35pg / mg 蛋白，P <0.05）。在 HBO 大鼠中，高壓氧治療對 IL -1 β 含量沒有影響，第 4 天和第 7 天分別爲 671 ± 85pg / mg 蛋白和 672± 75pg / mg 蛋白（與非 HBO 的大鼠相比 P 不顯著）。

結論：這些資料表明，高壓氧治療能夠緩解 CCI 引起的神經性疼痛，並且抑制期間內源性腫瘤壞死因數- α 的產生，但對 IL -1 β 的產生沒有影響。腫瘤壞死因數- α 產生的減少，可能至少部分對於高壓氧治療的治療作用有一定作用。

(懷曉蓉　譯　陳傑　校)

BACKGROUND: The development of hyperalgesia and allodynia after chronic constrictive injury (CCI) is associated with significantly increased tumor necrosis factor (TNF)-α and interleukin (IL)-1β. Theoretically, if the production of TNF-α and/or IL-1β could be reduced, neuropathic pain syndrome may be alleviated. Recently, a beneficial effect of hyperbaric oxygenation therapy (HBOT) in the treatment of pain disorders has been suggested. Our present study was designed to examine the hypotheses that (1) CCI-induced neuropathic pain may be associated with increased production of TNF-α and IL-1β, (2) HBOT may alleviate CCI-induced neuropathic pain, and (3) the alleviated neuropathic pain may be associated with reduced production of TNF-α and/or IL-1β.

METHODS: Male rats (weighing 250–300 g) were anesthetized with ketamine and xylazine. The common sciatic nerve was exposed through the biceps femoris. Proximal to the sciatic's trifurcation, 4 ligatures were loosely tied around the nerve. In the sham group, an identical dissection was performed without ligation of the sciatic nerve. Mechanical allodynia and cold allodynia were tested by von Frey filament stimulation and the spread of acetone, respectively. HBO rats (*n* =18) were exposed to pure oxygen for 1 hour at 2.4 atm once a day. Non-HBO (*n* =18) and sham rats (*n* =6) were placed in the HBOT chamber breathing air. TNF-α and IL-1β in the sciatic nerve were assayed with ELISA. The presence of TNF-α protein in homogenates was verified by Western blot analysis.

RESULTS: CCI induced significant cold and mechanical allodynia as measured after CCI on days 4 and 7. The cold allodynia response frequency was significantly lower in HBO rats than in non-HBO rats. The values were 20% ± 1.6% vs 50% ± 4.5% on day 4 and 40% ± 4.6% vs 70% ± 4.5% on day 7 (F =87.42, confidence interval [for the difference between HBO and non-HBO]=29.612 ± 8.781, $P < 0.05$ for day 4 and day 7). The threshold of mechanical allodynia significantly increased in HBO rats compared with non-HBO rats. The values were 6.20 ± 0.9 vs 4.1 ± 1.0 g on day 4 and 3.8.2 ± 0.5 vs 2.3 ± 0.4 g on day 7 (F =18.8, confidence interval [for the difference between HBO and non-HBO]=1.806 ± 1.171, $P < 0.05$ for day 4 and day 7). TNF-α content was significantly higher in non-HBO rats than in sham rats on day 4 (17.89 ± 0.83 vs 10.66 ± 1.1 pg/mg protein, $P < 0.05$) and day 7 (18.97 ± 1.57 vs 9.09 ± 1.5 pg/mg protein, $P < 0.05$). HBOT significantly reduced TNF-α content to near the level in sham rats, which was 10.94 ± 2.78 and 11.32 ± 2.98 pg/mg protein on day 4 ($P < 0.05$ versus non-HBO) and 7 ($P < 0.05$ versus non-HBO), respectively. Western blot analysis confirmed the presence of proteins with molecular weights of 51 kDa in the rat sciatic nerve homogenates. IL-1β content was also significantly higher in non-HBO rats than in sham rats on day 4 (636 ± 74 vs 256 ± 31 pg/mg protein, $P < 0.05$) and on day 7 (687 ± 89 vs 288 ± 35 pg/mg protein, $P < 0.05$). HBOT had no effect on IL-1β content, which was 671 ± 85 pg/mg protein on day 4 and 672 ± 75 pg/mg protein on day 7 in HBO rats (P =not significant versus non-HBO rats).
CONCLUSION: These data show that HBOT alleviates CCI-induced neuropathic pain and inhibits endoneuronal TNF-α production, but not IL-1β in CCI-induced neuropathic pain. Reduced TNF-α production may, at least in part, contribute to the beneficial effect of HBOT.

新的三叉神經痛動物模型：大鼠眶下神經注入克痛寧

A New Animal Model of Trigeminal Neuralgia Produced by Administration of Cobra Venom to the Infraorbital Nerve in the Rat

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背景：建立嚴格類比三叉神經痛的特定類型特徵的實驗室動物模型可闡明三叉神經痛的機制。作者已經建立了注射克痛寧至眶下神經（ION）主幹的三叉神經痛實驗動物模型。
方法：選擇雄性 SD 大鼠，在眶下神經主幹注射克痛寧或者生理鹽水。手術後連續幾天都在眶下神經主幹區域進行機械性刺激。在雙側面部區域測量 90 天得到機械閾值。用伊文思藍染料測定眶下神經區域的血管通透性。

結果：克痛寧組大鼠在術後三天同側發生機械性疼痛，並在術後持續 60 天。對側眶下神經區域的機械閾值顯著下降，但術後只持續了約 30 天。對照組的機械閾值沒有變化。克痛寧組大鼠和對照組相比，伊文思藍染料滲出皮膚顯著增加（P<0.05）。
結論：克痛寧模型可以提供一個合理的模型來研究三叉神經痛的機制。
(黃丹　譯　陳傑　校)

BACKGROUND: Understanding the mechanism of trigeminal neuralgia may be elucidated by developing laboratory animal models that closely mimic the features of this specific type of neuropathic pain. We have developed an experimental animal model for trigeminal neuralgia using a technique of injecting cobra venom into the infraorbital nerve (ION) trunk.
METHODS: Male Sprague-Dawley rats were subjected to the administration of cobra venom or saline into the ION trunk. Mechanical stimuli were applied to the ION territory in consecutive days after surgery. Mechanical thresholds were measured over a 90-day period on the bilateral facial region. Vascular permeability in the ION territory was measured using Evans blue dye.
RESULTS: The cobra venom–treated rats developed mechanical allodynia 3 days after surgery that lasted for 60 days postoperatively at the ipsilateral side. The mechanical thresholds of the contralateral ION territory also showed a profound decrease but were sustained for only approximately 30 days. There was no change of mechanical thresholds in the control groups. The extravasation of Evans blue increased significantly in the skin after administration of cobra venom to the ION compared with control rats ($P < 0.05$).
CONCLUSION: The cobra venom model may provide a reasonable model for investigating the mechanism of trigeminal neuropathic pain.

簡報：術中小劑量氯胺酮可預防瑞芬太尼引起的麻醉後寒戰

Brief report: an intraoperative small dose of ketamine prevents remifentanil-induced postanesthetic shivering.

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將接受婦科開腹手術的患者隨機分成兩組，一組于麻醉誘導時給予 0.5mg/kg 氯胺酮，並以 0.3mg/kg/h 的速率持續輸注氯胺酮至手術結束（氯胺酮組，n=32），另一組則接受同等容量的生理鹽水（對照組，n=32）。通過靜脈注射異丙酚、恒速輸注瑞芬太尼（0.25ug/kg/min）及硬膜外給予羅呱卡因維持麻醉。對蘇醒後 30 分鐘內的麻醉後寒戰（PAS）進行評估。研究顯示，兩組患者的術中體溫較爲接近。但較對照組（n=12.38%，P=0.005）而言，氯胺酮組患者發生麻醉後寒戰的幾率明顯減少（n=2.6%）。故本研究推斷，在術後恢復早期，術中使用氯胺酮可預防瑞芬太尼引起的麻醉後寒戰
（范羽譯 薛張綱校）

Patients undergoing gynecological laparotomy were randomized to receive either 0.5 mg/kg ketamine at induction of anesthesia followed by an infusion of 0.3 mg/kg/h until

the end of surgery (ketamine group, n = 32), or an equivalent volume of normal saline (control group, n = 32). Anesthesia was maintained with IV propofol, a fixed infusion rate of remifentanil (0.25 μg/kg/min), and epidural ropivacaine. Postanesthetic shivering (PAS) was evaluated for 30 minutes after emergence. Intraoperative temperatures were similar between the 2 groups. The incidence of PAS was less frequent in the ketamine group (n = 2, 6%) compared with the control group (n = 12, 38%, P = 0.005). We conclude that, during the early recovery phase, intraoperative ketamine reduces remifentanil-induced PAS.

研究氯胺酮和瑞芬太尼與小鼠七氟醚麻醉的最低肺泡有效濃度及小鼠急性阿片耐受的相互影響

Ketamine and remifentanil interactions on the sevoflurane minimum alveolar concentration and acute opioid tolerance in the rat.

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背景：小劑量氯胺酮具有鎮痛和抗痛覺過敏的性質，被用來同阿片類藥物合用但也用於出現阿片類所致的痛覺過敏及阿片類耐受時。我們對氯胺酮及瑞芬太尼同小鼠七氟醚麻醉的 MAC 值的相互影響，以及氯胺酮是否可以阻斷急性阿片耐受進行了研究。

方法：用七氟醚麻醉大鼠，監測單獨給氯胺酮前後（10、20、40及80mgmg kg(-1)）或氯胺酮聯合瑞芬太尼(120 及 240 μg kg(-1) h(-1), 分別小劑量及大劑量)時七氟醚的 MAC 值.另有一組在開始瑞芬太尼注射後給予最低劑量氯胺酮。最後，用納洛酮檢測氯胺酮是否潛在作用于阿片受體。監測氣管內氣體樣本獲得 MAC 值，並鉗夾老鼠尾部產生超強刺激。通過側流氣體分析儀監測呼氣末麻醉氣體濃度。並應用方差分析進行統計分析。

結果：氯胺酮及瑞芬太尼呈劑量依賴性降低小鼠七氟醚麻醉的 MAC 值。此外對氯胺酮加用小劑量瑞芬太尼並不有助於 MAC 值的降低。然而大劑量瑞芬太尼通過次加性形式來加強氯胺酮降低 MAC 值的作用。然而，任何一種劑量的氯胺酮都不能阻斷瑞芬太尼的急性阿片類耐受的作用。最後，納洛酮阻斷了氯胺酮降低 MAC 值的作用。

結論：

發現對於降低老鼠七氟醚麻醉的 MAC 值，氯胺酮及瑞芬太尼彼此存在有次加作用。此外。氯胺酮不能阻斷阿片類耐受。這個結果的臨床意義在於減少未來的麻醉研究。

（侯文婷譯 薛張綱校）

BACKGROUND: Ketamine is used at low doses for its analgesic and antihyperalgesic properties when combined with opioids but also when opioid-induced hyperalgesia and tolerance appear. In this study we determined the interaction of ketamine and remifentanil on the minimum alveolar concentration (MAC) of sevoflurane in rats and to determine whether ketamine may block acute opioid tolerance (AOT).
METHODS: Male Wistar rats were anesthetized with sevoflurane, and the MAC was determined before and after ketamine administration (10, 20, 40, and 80 mg kg(-1) or saline) alone or combined with remifentanil (120 and 240 μg kg(-1) h(-1), low and high doses, respectively). One additional group received the lowest ketamine dose after starting a remifentanil infusion. Finally, naloxone was administered to determine the potential action of ketamine on opioid receptors. MAC was determined from intratracheal gas samples, and tail clamping was used as a supramaximal stimulus. End-tidal anesthetic concentrations were assayed using a side stream gas analyzer. Statistical analysis was performed with an analysis of variance.
RESULTS: Ketamine and remifentanil dose-dependently reduced the MAC. Adding the low dose of remifentanil to ketamine did not improve the MAC reduction, whereas the high dose of remifentanil enhanced ketamine reduction in a subadditive fashion. Nevertheless, ketamine was unable to block the development of AOT to remifentanil at either dose. Finally, naloxone blocked the MAC reduction produced by ketamine.
CONCLUSIONS:A subadditive effect between ketamine and remifentanil was found on the sevoflurane MAC reduction rats. In addition, ketamine was unable to block AOT. The clinical relevance of these findings should be elucidated in future studies to reduce anesthetic requirements.

機械通氣裝置對於壓力控制性通氣的影響：一項模肺研究

The effect of ventilator performance on airway pressure release ventilation: a model lung study.

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背景：將模肺連接在六種不同的機械通氣裝置上，每一種機械通氣裝置均採用不同的壓力控制模式進行機械通氣。我們測量了各種模式下呼氣相時的固有呼氣末正壓力間的差異，計算出吸氣及呼氣時的壓力時間乘積(PTP)作爲吸氣相時的呼吸做功指數。
方法：我們比較了六種不同的通氣裝置: Puritan-Bennett 840, Evita XL, Servo i, Avea, Hamilton G5 以及 Engström。設置持續25cm H2O正壓通氣和0cm H2O的呼氣壓力。呼氣時間從1秒開始以0.1秒的幅度遞減直至0.2秒，測量這一過程中的PEEPi。在吸氣相給予刺激誘發自主呼吸，潮氣量爲300ml，呼吸頻率爲30次每分鐘，而呼氣流速分別爲0.5升每秒，1升每秒以及1.5升每秒，此時測量和計算呼吸時的壓力時間乘積。

結果：在所有的通氣裝置中，隨著呼吸時間的一步步縮短，PEEPi值顯著升高(P<0.001)。在呼氣時間爲0.2秒時，Servo i的PEEPi數值爲9.4± 0.07 cm H(2)O 而Avea的PEEPi值爲15.7± 0.04 cm H(2)O。Servo i的吸氣壓力時間乘積顯著小於其他幾種通氣裝置(P<0.001)。當呼氣流速爲0.5升每秒和1升每秒時，Servo i和 Evita XL的呼氣壓力時間乘積小於其他幾種通氣裝置(P<0.001)。
結論：不同機械通氣裝置之間 PEEPi的值變化很大。在機械通氣裝置的吸氣相發生了自主呼吸時，不同的通氣裝置吸氣和呼氣所做的呼吸功也不同。
（黃劍譯 薛張綱校）

BACKGROUND: Using a model lung connected to six different ventilators, with each ventilator in the airway pressure release ventilation mode, we measured differences in intrinsic positive end-expiratory pressure (PEEPi) during the expiratory phase and calculated the inspiratory and expiratory pressure time product (PTP) as an index of work of breathing during the inspiratory phase.
METHODS: We compared 6 ventilators: Puritan-Bennett 840, Evita XL, Servo i, Avea, Hamilton G5, and Engström. With a constant inspiratory pressure level of 25 cm H(2)O and expiratory pressure level of 0 cm H(2)O, PEEPi was measured as the expiratory time was decremented from 1.0 second to 0.2 second in steps of 0.1 second. The inspiratory and expiratory PTPs were measured during the ventilator's inspiratory phase by simulating spontaneous breathing with a tidal volume of 300 mL, with a respiratory rate of 30 breaths/min and with expiratory flow rates of 0.5 L/s, 1.0 L/s, and 1.5 L/s.
RESULTS: In all ventilators, the progressive diminution of the expiratory time caused a significant increase in PEEPi (P< 0.001). With a 0.2-second expiratory time, PEEPi ranged from 9.4± 0.07 cm H(2)O for the Servo i to 15.7± 0.04 cm H(2)O for the Avea. The Servo i had a significantly lower inspiratory PTP than did the other ventilators (P< 0.001). When the expiratory flow rate was 0.5 L/s and 1.0 L/s, the expiratory PTP was lower with the Servo i and Evita XL than with the other ventilators (P< 0.001).
CONCLUSIONS: PEEPi varied significantly among ventilators. Inspiratory and expiratory work of breathing varied between ventilators when spontaneous breathing occurred during the ventilator's inspiratory phase.

一項隨機、開放性研究：關於磷異丙酚應用於重症監護病房行機械通氣患者的安全性及有效性研究

A Randomized, Open-Label Study of the Safety and Tolerability of Fospropofol for Patients Requiring Intubation and Mechanical Ventilation in the Intensive Care Unit

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背景：在重症監護病房，現有的用於機械通氣患者鎮靜誘導和維護的藥物有局限性。磷丙泊酚，異丙酚前體藥物，還沒有研究作爲一個在 ICU 設置的鎮靜。
方法：在這項隨機，開放性的試驗研究中，患者接受 3 個方案中的一個，最終鎮靜的目的是 Ramsay 鎮靜評分爲 2 至 5：（1）給予磷丙泊酚注射液負荷劑量，在病人出現煩躁時增加持續輸注速度（持續輸注/負荷劑量）（2）在病人出現煩躁時增加磷丙泊酚注射液持續輸注的速度（只持續輸注）（3）在病人出現煩躁時增加丙泊酚輸注液持續輸注的速度。
結果：60 名患者參與該藥物研究，包括在安全性和有效性分析。由於不良事件的發生率在兩組磷丙泊酚組相似，同時因爲這項研究並不能證明治療組間安全性方面是否有顯著差異，因此對兩個磷丙泊酚組的不良事件合併進行研究。在磷丙泊酚組，38 例中有 28 例（74％）出現了需要緊急治療的副作用，而異丙酚組的該事件爲 22 例中的 14 例（64％）。最常見的治療過程中出現的不良事件爲注射磷丙泊酚過程中出現的注射痛（21.1％）和噁心（13.2％）。兩名患者（在磷丙泊酚持續輸注/負荷劑量組及異丙酚組分別有一例）在研究期間出現低血壓，並將該事件解釋爲潛在的鎮靜相關的不良事件。不同試驗組在平均血漿甲酸水準方面沒有顯著差異。三組患者均有大於 90％的時間，保持 Ramsay 鎮靜分數 2 至 5。
結論：本試驗研究表明，磷丙泊酚，無論是持續輸注/負荷劑量或只持續輸注，患者都是能夠耐受的，並且對於重症監護病房中行機械通氣患者的短期誘導或維持鎮靜均爲有效的。
（劉玨瑩譯 薛張綱校）

Background: Current drugs for induction and maintenance of sedation in mechanically ventilated patients in the intensive care unit have limitations. Fospropofol, a prodrug of propofol, has not been studied as a sedative in the ICU setting.
Methods: In this randomized, open-label pilot study, patients received 1 of 3 regimens with a goal of maintaining a Ramsay Sedation Score of 2 to 5: (1) fospropofol IV infusion with a bolus and increased infusion rate for agitation events (infusion/bolus); (2) fospropofol IV infusion with an increased infusion rate for agitation events (infusion only); or (3) propofol IV infusion with an increased infusion rate for agitation events.
Results: Sixty patients received study drug and were included in the safety and efficacy analyses. Because incidence rates for adverse events were similar between fospropofol groups, and because the study was not powered to determine significant differences between treatment groups for safety variables, adverse events for both fospropofol groups were combined. In the fospropofol groups, 28 out of 38 patients (74%) experienced treatment-emergent adverse events in comparison with 14 out of 22 patients (64%) in the propofol group. The most common treatment-emergent adverse events with fospropofol were procedural pain (21.1%) and nausea (13.2%). Two patients (1 each in the fospropofol infusion/bolus and the propofol groups) experienced hypotension during the study as a potential sedation-related adverse event. Mean plasma formate levels were not significantly different among groups. Patients in all 3 treatment groups maintained Ramsay Sedation Scores of 2 to 5 for >90% of the time they were sedated.
Conclusion: This pilot study suggests that fospropofol, administered in either an infusion/bolus or infusion-only regimen, is tolerable and effective for short-term

induction and maintenance of sedation in mechanically ventilated intensive care unit patients.

全麻下開顱手術期間免疫細胞數量下降

Immune Cell Populations Decrease During Craniotomy Under General Anesthesia

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背景： 術後感染是神經外科重症監護醫學中常見和潛在致命的併發症。免疫損害是中樞神經系統手術後的感染和術後併發症的高危因素。我們研究的目的是探討開顱手術的患者在麻醉和手術中的免疫細胞的變化情況。
方法： 選取接受吸入全麻的開顱手術患者。收集麻醉前 30min，45min，60min，120min，血液樣本， 測定血液中性粒細胞，單核細胞和淋巴細胞計數、淋巴細胞亞群（T 細胞，誘導和輔助性 T 細胞，抑制和細胞毒性 T 淋巴細胞，自然殺傷細胞，細胞和 B 細胞）。隨著腫瘤壞死因數-α 和干擾素 γ 白細胞介素（IL）-2，IL - 4，IL - 6 和 IL - 10 的血漿濃度進行了測定。使用重複測量方差分析，由 Bonferroni 校正用 SPSS 13.0 軟體進行資料分析。
結果： 18 例患者，在這項研究中。神經麻醉過程中的免疫細胞計數的比較，我們發現，在麻醉誘導後 30 分鐘，中性粒細胞，單核細胞和淋巴細胞減少 18％（95％可信區間[CI]：11.0％-24.6％），34％（95 ％CI：16.2％-51.1％），和 39％（95％ CI：29.0％-48.9％）相比，麻醉前的水準。在拔管的中性粒細胞返回到基本水準。它還表明，自然殺傷細胞在麻醉期間顯著下降。外周血細胞因數的濃度沒有顯著改變。
結論： 我們的研究結果表明，麻醉和手術，打亂了開顱手術過程中的免疫系統的平衡，免疫細胞數量顯著減少在全身麻醉誘導後出現的。
（陸麗虹譯 薛張綱校）

BACKGROUND: Postoperative infections are common and potentially fatal complications in neurosurgical intensive care medicine. An impairment of immune function after central nervous system surgery is associated with higher risk of infection and postoperative complications. The aim of our study was to investigate how the immune cell population changes during the anesthesia process in patients undergoing craniotomy surgery.
METHODS: Patients undergoing craniotomy who had an inhaled general anesthetic were studied. Blood samples were collected before anesthesia and 30, 45, 60, 120, and 240 minutes after anesthesia began. Blood counts for neutrophils, monocytes, and lymphocytes were determined along with lymphocyte subpopulations (T cells, inducer and helper T cells, suppressor and cytotoxic T cells, natural killer cells, and B cells). Plasma concentrations of interleukin (IL)-2, IL-4, IL-6, and IL-10 were also measured along with tumor necrosis factor-α and interferon-γ. Data were analyzed by SPSS 13.0

software using repeated-measures analysis of variance followed by a Bonferroni correction.
RESULTS: Eighteen patients were enrolled in this study. In the comparison of the immune cell counts during neuroanesthesia, we found that at 30 minutes after anesthesia induction, neutrophils, monocytes, and lymphocytes decreased 18% (95% confidence interval [CI]: 11.0%-24.6%), 34% (95% CI: 16.2%-51.1%), and 39% (95% CI: 29.0%-48.9%) compared with their levels before anesthesia. At extubation the neutrophils returned to the base level. It also showed that natural killer cells decreased significantly during anesthesia. The concentration of cytokines in peripheral blood did not change significantly.
CONCLUSION: Our results showed that anesthesia and surgery upset the balance of the immune system during craniotomy, and a significant decrease in immune cell populations emerged after induction under general anesthesia.

對大鼠背根神經節應用脈衝射頻電流可調節神經損傷導致的觸痛覺過敏

Application of pulsed radiofrequency currents to rat dorsal root Ganglia modulates nerve injury-induced tactile allodynia.

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背景：報導稱對背根神經節(DRG)應用脈衝射頻(PRF)電流對明確的疼痛有緩解作用而不導致熱燒灼。在本實驗中，我們研究了對脊神經損傷相關的背根神經節(DRG)應用脈衝射頻(PRF)和在大鼠神經性疼痛模型中損傷誘導的行爲超敏反應的直接聯繫。
方法：神經損傷通過結紮成年雄性斯普拉格-道利鼠的 L5 左脊神經實施。當受傷大鼠發生觸痛覺過敏時，一組被指定對 L5 背根神經節(DRG)進行脈衝射頻(PRF)電流處理，另一組被指定對 L5 背根神經節(DRG)進行僞處理。在術前和指定的天數對試驗組和對照組使用 von Frey 纖毛測試對大鼠進行行爲測試。結果資料由線性混合模型進行分析來評價治療組間的總體差異和實驗天數間的總體差異。對治療後的 14 個實驗天中每天的配對基線差異得分計算出 Cohen's d 統計值，這些度量出的作用程度被用來描述性對比每組中隨著時間變化的恢復模式。
結果：脊神經損傷導致了左側(損傷側)足對 von Frey 纖毛刺激產生了行爲超敏反應(痛覺過敏)。混合線性模型顯示在處理後組間對照有顯著差異(P = 0.0079)，並且隨著時間過去，所有 12 個動物爪逃避閾值平均值均有顯著改變(P = 0.0006)。Cohen's d 評估顯示了脈衝射頻(PRF)治療後的動物展示了更好的恢復，相對於僞治療組在

脈衝射頻(PRF)治療後 14 天內有 10 天記錄到了更大的作用程度，且在第 8 到 10 天和 32 天后顯示了中到強效的治療後效果。

結論：研究結果支持對背根神經節(DRG)行脈衝射頻(PRF)可對大鼠神經損傷(脊神經結紮)誘導的觸痛覺過敏產生逆轉作用。這種痛覺過敏的逆轉提示非燒灼性脈衝射頻(PRF)通過調節背根神經節(DRG)可加速神經順上損傷誘導疼痛的恢復。

（任雲譯 薛張綱校）

BACKGROUND: Application of pulsed radiofrequency (PRF) currents to the dorsal root ganglia (DRG) has been reported to produce relief from certain pain states without causing thermal ablation. In this study, we examined the direct correlation between PRF application to DRG associated with spinal nerve injury and reversal of injury-induced behavioral hypersensitivity in a rat neuropathic pain model.

METHODS: Neuropathic lesioning was performed via left L5 spinal nerve ligation on male adult Sprague-Dawley rats. Once the injured rats had developed tactile allodynia, one group was then assigned to PRF treatment of the L5 DRG and another group was assigned to the sham treatment to the DRG. Behavioral testing was performed on both the control and treated paws using the von Frey filament test before the surgery and at indicated days. The resulting data were analyzed using a linear mixed model to assess the overall difference between the treatment groups and the overall difference among the study days. Cohen's d statistic was computed from paired difference-from-baseline scores for each of the 14 study days after treatment and these measures of effect size were then used to descriptively compare the recovery patterns over time for each study group.

RESULTS: Spinal nerve injury resulted in the development of behavioral hypersensitivity to von Frey filament stimulation (allodynia) in the hindpaw of the left (injury) side. Mixed linear modeling showed a significant difference between the treatment groups ($P = 0.0079$) and a significant change of paw withdrawal threshold means over time ($P = 0.0006$) for all 12 animals. Evaluation of Cohen's d (effect size) revealed that the PRF-treated animals exhibited better recovery and recorded larger effect sizes than the sham-treated animals on 10 of the 14 post-PRF treatment days and exhibited moderate-to-strong effects posttreatment at days 8 to 10 and at and beyond day 32.

CONCLUSION: Findings from this study support that PRF of the DRG causes reversal of nerve injury (spinal nerve ligation)-induced tactile allodynia in rats. This allodynia reversal indicates that nonablative PRF acting via modulation of the DRG can speed recovery in nerve injury-induced pain.

氯胺酮和加巴噴丁對於阿片類誘導的大鼠痛覺超敏的中位有效劑量: 一項它們相互作用的等輻射分析

The Median Effective Dose of Ketamine and Gabapentin in Opioid-Induced Hyperalgesia in Rats: An Isobolographic Analysis of Their Interaction

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背景:氯胺酮和加巴噴丁被認爲對於短期全身性應用阿片類藥物誘導的延遲性痛覺超敏具有預防作用。這種預防作用的機制被認爲在脊髓水準，通過氯胺酮對於NMDA 受體的拮抗作用和加巴噴丁對於一個特殊結合部位的作用而發揮作用。本研究中，我們試圖找出這兩種藥理學機制上相距甚遠的抗痛覺超敏藥物在阿片類誘導大鼠痛覺超敏模型中相互作用的機制。首先計算出這兩種藥物和其相互作用的中位有效劑量，運用單輻射分析來評價它們相互作用的本質。

方法：SD 大鼠中皮下注射芬太尼總量爲 240ug/kg（4 次，間隔 15 分鐘，每次 60ug/kg）誘導長時間的痛覺超敏。在首劑皮下注射芬太尼之前 30 分鐘皮下注射氯胺酮，或腹膜周圍注射加巴噴丁，或同時注射這兩種藥物。試驗日和注射後的第一天分別測試大鼠對於傷害性刺激的敏感度。給予每只特定大鼠的氯胺酮或加巴噴丁的劑量取決於同組的前一隻大鼠對於傷害性刺激的反應，運用來回技術。氯胺酮組和加巴噴丁組的首劑分別爲 10 mg/kg 和 300 mg/kg，調節的劑量爲每次 1 mg/kg 和 30 mg/kg。氯胺酮和加巴噴丁結合組的首劑劑量爲 5 mg/kg 和 150 mg/kg，調節的劑量不變。抗痛覺超敏的效能定義爲注射藥物後的第一天能完全抑制痛覺超敏。

結果：氯胺酮和加巴噴丁的中位有效劑量（中位數和 95%置信區間）分別爲 12.4 mg/kg (11.7–13.1 mg/kg) 和 296.3 mg/kg (283.5–309.1 mg/kg)。兩藥組合後的氯胺酮和加巴噴丁的中位有效劑量和 95%置信區間分別爲 4.3 mg/kg (3.7–4.6 mg/kg) 和 123.9 mg/kg (111.1–136.7 mg/kg)。

結論：單輻射分析法顯示氯胺酮和加巴噴丁結合使用對於抗痛覺超敏具有疊加（協同）作用。

（姚敏敏譯，薛張綱校）

BACKGROUND: Ketamine and gabapentin have been shown to prevent the delayed hyperalgesia induced by short-term use of systemic opioids. The mechanism of this action is believed to be likely at the spinal level, through an antagonism of the *N*-methyl-d-aspartate receptors for ketamine, and through a specific binding site for gabapentin. In this study, we sought to determine the nature of the interaction of these 2 mechanistically distinct antihyperalgesic drugs in a model of opioid-induced hyperalgesia in rats. The median effective antihyperalgesic doses of each drug and of their combination were first defined, to assess the nature of the interaction using an isobolographic analysis.

METHODS: Long-lasting hyperalgesia was induced in male Sprague Dawley rats with subcutaneous fentanyl (4 injections, 60 μg/kg per injection at 15-minute intervals) resulting in a total dose of 240 μg/kg. Subcutaneous ketamine, or intraperitoneal gabapentin, or their combination was administered 30 minutes before the first subcutaneous fentanyl injection. Sensitivity to nociceptive stimuli (von Frey filaments) was assessed on the day of the experiment and on the day after injections. The dose of ketamine and gabapentin received by a particular animal was determined by the response of the previous animal of the same group, using an up-and-down technique. Initial doses were 10 mg/kg and 300 mg/kg, with dose adjustment intervals of 1 mg/kg and 30 mg/kg, in the ketamine and gabapentin groups, respectively. The initial doses of ketamine and gabapentin were 5 mg/kg and 150 mg/kg, respectively, in the ketamine-gabapentin group, with the same dose adjustment intervals. Antihyperalgesic efficacy was defined as complete prevention of hyperalgesia on the day after drug injections.

RESULTS: The median effective antihyperalgesic doses (median value and 95% confidence interval) of ketamine and gabapentin were 12.4 mg/kg (11.7–13.1 mg/kg) and 296.3 mg/kg (283.5–309.1 mg/kg), respectively. The median effective antihyperalgesic dose of the combination was 4.3 mg/kg (3.7–4.6 mg/kg) for ketamine and 123.9 mg/kg (111.1–136.7 mg/kg) for gabapentin.
CONCLUSION: The isobolographic analysis demonstrated that the combination of the 2 drugs produces effective antihyperalgesia with a supraadditive (synergistic) action.

簡要報導：超聲的螯合劑與神經接觸：一項動物組織學研究

Brief report: ultrasound gel-nerve contact: an experimental animal histologic study.

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背景：超聲（US）引導下行神經阻滯需要使用螯合劑。在之後穿刺針進行穿刺時，有一部分螯合劑會粘附在針表面或進入針內，並將其帶入神經周圍組織或進入神經內。我們在動物身上進行這項實驗，目的是研究超聲使用的螯合劑接觸神經組織結構的影響因素。
方法：我們研究了九隻雄性比格犬。1 到 3 號犬爲對照組，4 到 9 號犬爲試驗組。對照組對雙側脛後神經進行解剖。傷口關閉後即刻對第一條狗的標本進行組織學檢查，24 小時後對第二條狗，48 小時後對第三條狗的標本進行檢查。對於試驗組，暴露雙側脛後神經，神經局部給予 2ml US 螯合劑，然後關閉傷口。24 小時時對一側的神經標本進行檢測，48 小時後檢測另一側。神經病理學家檢測神經標本，從而獲得神經炎症反應的證據。
結果：對照組的神經標本並沒有顯著的病理改變。試驗組 24 小時末的神經標本顯示神經周圍有輕度炎症改變並伴有多核白細胞的聚集。在 48 小時神經周圍有中度炎症改變，在 2 條狗身上發現淋巴細胞和巨噬細胞。所有的動物都出現了長期的神經功能缺陷，表現爲跛行。
結論：周圍神經接觸 US 螯合劑後的組織學改變均爲非特異性改變。然而關於 US 螯合劑對神經組織的影響尚有待於進一步研究。
（張月琪譯 薛張綱校）

BACKGROUND: Ultrasound (US) regional nerve block requires the use of gel applied over the skin. With subsequent needle insertion, some of the gel may adhere either on the shaft or within the needle lumen and may be carried to the perineural structures or intraneurally. We performed this experimental animal study to investigate the effects of US gel contact on the nerve histologic structure.
METHODS: Nine male beagle dogs were studied. Dogs 1 to 3 were the control group and dogs 4 to 9 were the study group. Bilateral posterior tibial nerves were dissected and exposed for the control group. Nerve specimens were obtained for histologic examination immediately for the first dog, at 24 hours for the second dog, and at 48 hours for the third

dog followed by wound closure. For the study group, bilateral posterior tibial nerves were exposed, and 2 mL US gel was applied locally directly on the nerve, followed by wound closure. Nerve specimens were excised at 24 hours from one side and at 48 hours from the other side. Nerve specimens were examined by a neuropathologist for evidence of nerve inflammation.
RESULTS: The control nerve specimens showed no significant pathology. Nerve specimens of the study group at the end of 24 hours of gel-nerve contact showed mild focal perineural inflammatory changes with clusters of polymorph leukocytes. At 48 hours, perineural moderate inflammatory changes with clusters of lymphocytes and macrophages were demonstrated in 2 animals. Long-term neurologic deficit in the form of limping was observed for all dogs.
CONCLUSION: Histologic features after perineural exposure to US gel are rather nonspecific and likely of no clinical significance. However, further studies are needed to determine the effect of US gel injection on intraneural tissues.