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**小肝細胞癌經皮射頻消融術中麻醉方法對腫瘤復發的影響**

**The Effects of Anesthetic Technique on Cancer Recurrence in Percutaneous Radiofrequency Ablation of Small Hepatocellular Carcinoma**



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**背景：**有回顧性研究報導稱腫瘤的分型決定了區域麻醉是否利於腫瘤復發。我們研究了在小肝細胞癌（HCC）經皮射頻消融術（RFA）中的麻醉方法和腫瘤復發之間的關係。

**方法：**我們回顧了 1999 年 8 月至 2008 年 12 月間接受經皮射頻消融術治療的小肝細胞癌患者的醫療記錄。我們將接受硬膜外麻醉的患者與接受全麻的患者進行了比較。選擇無瘤生存率和總生存率作為研究終點，用 Kaplan-Meier 法進行評估，並用多變數 Cox 比例風險模型和有逆概率加權以調整傾向分數的轉換模型來比較。

**結果：**硬膜外組與全麻組相比，使用 Cox 回歸模型分析的無瘤生存率危害比為 3.66（95% 置信區間 2.59–5.15;  $P < 0.001$ ），用逆概率加權來調整傾向分數的分析為 4.31（95% 置信區間 2.24–8.29;  $P < 0.001$ ）。硬膜外組與全麻組相比，使用 Cox 回歸模型分析的總生存率危害比為 0.77（95% 置信區間 0.50–1.18;  $P = 0.232$ ），在用逆概率加權來調整傾向分數的分析中為 1.26（95% 置信區間 0.81–1.97;  $P = 0.312$ ）。

**結論：**本回顧分析顯示全麻下使用 RFA 治療小 HCC 可以降低腫瘤復發的風險。未發現麻醉方法對總生存率有影響。需要進行前瞻性隨機試驗來評價這種關聯。

（劉伍 譯 馬皓琳 李士通 校）

**BACKGROUND:** Retrospective studies report that the benefit of regional anesthesia on cancer recurrence may depend on the specific tumor type. We compared the association between anesthetic technique and cancer recurrence in patients undergoing percutaneous radiofrequency ablation (RFA) of small hepatocellular carcinoma (HCC).

**METHODS:** We retrospectively reviewed medical records of patients with small HCC treated with RFA between August 1999 and December 2008. Patients receiving epidural anesthesia were compared with a group given general anesthesia. The end points were recurrence-free survival and overall survival, which were assessed using the Kaplan-Meier technique and compared using a multivariate Cox proportional hazards regression model and an alternative model with inverse probability weights to adjust for propensity score.

**RESULTS:** The hazard ratio for recurrence-free survival in the epidural anesthesia group compared with the general anesthesia group was 3.66 (95% confidence interval [CI], 2.59–5.15;  $P < 0.001$ ) in the Cox regression model and 4.31 (95% CI, 2.24–8.29;  $P < 0.001$ ) in the analysis adjusted for propensity score with inverse probability weights. The hazard ratio for overall survival in the epidural anesthesia group compared with the general anesthesia group was 0.77 (95% CI, 0.50–1.18;  $P = 0.232$ ) in the Cox regression model and 1.26 (95% CI, 0.81–1.97;  $P = 0.312$ ) in the analysis adjusted for propensity score with inverse probability weights.

**CONCLUSIONS:** This retrospective analysis suggests that treatment of small HCC by RFA under general anesthesia is associated with reduced risk of cancer recurrence. No effect of anesthetic technique on overall survival is detected. Prospective, randomized trials to evaluate this association are warranted.

在心臟毒性濃度下右旋、外消旋和左旋布比卡因立體結構與膜磷脂的特定相互作用

## **R(+)-, Rac-, and S(-)-Bupivacaine Stereostructure-Specifically Interact with Membrane Lipids at Cardiotoxicity Relevant Concentrations**

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局部麻醉藥的對映異構體與膜磷脂在臨床相關濃度下相互作用是否不同仍然存有疑問。我們比較了布比卡因立體異構體對含有心磷脂和膽固醇的仿生膜的作用。布比卡因與仿生膜在心臟毒性濃度 5 $\mu$ M 相互作用，效力為左旋異構體<外消旋異構體<右旋異構體，與它們的心臟毒性排名一致。隨著藥物濃度減少，這些差異變得更大，也許能解釋與先前所報導的布比卡因立體異構體毒性效力不一致的原因。與生物膜的相互作用理論可能對局部麻醉藥毒性效應模式有部分貢獻。

(瞿亦楓 譯 馬皓琳 李士通 校)

It remains questionable whether local anesthetics can interact with membrane lipids at clinically relevant concentrations to show the difference between enantiomers. We compared the effects of bupivacaine stereoisomers on biomimetic membranes containing cardiolipin and cholesterol. Bupivacaine interacted with the membranes at cardiotoxic 5  $\mu$ M with the potency being S(-)-enantiomer < racemate < R(+)-enantiomer, which agreed with the rank order of their cardiotoxicity. Such differences became greater with decreasing drug concentrations, possibly explaining the inconsistent cardiotoxic potencies of bupivacaine stereoisomers reported previously. The interactivity with biomembranes may in part contribute to the mode of toxic action of local anesthetics.

## **中斷和恢復載液流動對藥品品質流率的影響：對一個死腔非常小的輸液器的體外研究**

### **The Impact on Drug Mass Flow Rate of Interrupting and Resuming Carrier Fluid Flow: An In Vitro Study on a Very Low Dead-Space Volume Infusion Set**

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**背景：**停止和恢復載液的流動，可能會導致藥物品質流率潛在的具有危險性的暫態波動。我們比較了兩套輸液裝置，一套死腔很小，一套死腔稍大，在停止和恢復載液流動期間藥物的運輸情況。

**方法：**評估兩個輸液器，它們都具有抗反流閥，連接到血管導管上，死腔分別為 6.185ml 和 0.071ml。兩套實驗方案：（1）載液流速為 90ml/h, 伴隨去甲腎上腺素輸注流速 7ml / h，（2）載液流速 350ml/h 伴隨去甲腎上腺素輸注流速 65 mL / h。兩套實驗方案中，載液停止並且半小時後重新開啓。用紫外分光光度法測定流出的去甲腎上腺素濃度。從實驗的品質流率曲線下面積與理論的暫態品質流率曲線下面積比計算流動變化效率。

**結果：**在兩種流速條件下，兩套輸液器的流動變化效率在停止載液流動後 10 分鐘和重新開啓後 10 分鐘的過程中有明顯差別。主要的現象是停止載體流動後藥物濃度突然下降和重新開啓後藥物濃度暫時性的突然升高。死腔很小的輸液裝置給藥的變化明顯比標準裝置要小，即使在流速較高時。

**結論：**使用非常小死腔的輸液裝置減少了停止和恢復載液流動造成的給藥波動。

（安光惠 譯 馬皓琳 李士通 校）

**BACKGROUND:** Stopping and resuming carrier fluid flow can lead to potentially dangerous transient disturbances in drug mass flow rate. We compared the impact of 2 infusion sets, one with very low dead-space volume and the other with greater dead-space volume, on the amount of drug delivered during stop-and-go carrier fluid flows.

**METHODS:** Two infusion sets, both with antireflux, connected to an angiocatheter and with dead-space volumes of 6.185 mL and 0.071 mL, respectively, were assessed. Two protocols were studied: carrier fluid flow of 90 mL/h associated with noradrenaline infused at 7 mL/h and carrier fluid flow of 350 mL/h with a noradrenaline infusion flow of 65 mL/h. During both protocols, the carrier fluid was stopped and resumed at the same rate 30 minutes later. Effluent noradrenaline concentration was measured using UV spectrophotometry. Flow change efficiency was calculated from the ratio of the area under the experimental mass flow rate curve to the area under the theoretical instantaneous mass flow rate curve.

**RESULTS:** For both flow rate conditions, flow change efficiency was significantly different for the 2 infusion sets during the 10-minute period after stopping carrier fluid flow and the 10-minute period after restarting it. The major phenomena were sudden decreases in drug delivery after stopping carrier flow and sudden, temporary increases when it was resumed. The very low dead-space volume infusion set resulted in significant reduction in changes in drug delivery compared with the standard set, even at high flow rates.

**CONCLUSION:** The use of a very low dead-space volume set attenuates disturbances in drug delivery caused by interrupting and resuming carrier fluid flow.

### 聲門外通氣道的發展：關於其歷史、應用和成功實踐技巧的綜述

#### Evolution of the Extraglottic Airway: A Review of Its History, Applications, and Practical Tips for Success

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1981 年，喉罩導氣管的發展是聲門外通氣道（EGA）獲得普及和認可的重要第一步。本綜述中的術語“聲門外”指不涉及喉的通氣道，包括聲門上方的通氣道。雖然術語“聲門外”較為寬泛，包括氣管切開插管等通氣道，但是術語“聲門上”則不包括眾多含聲門下部件的裝置，且對於現代裝置的討論而言範圍過於狹窄。EGA 在實踐中應用廣泛，現有多種裝置以滿足日漸擴大的應用需求。本綜述旨在闡明新老 EGA 裝置的當前狀態，並舉例說明各種裝置的用途。特別強調特殊情況下 EGA 的應用，比如產科、兒科、院前和非傳統的“手術室外”裝置。探討了 EGA 在處理困難氣道中的作用。EGA 裝置可在無法進行面罩通氣和氣管插管的情況下促進通氣，因此拯救了無數生命。就傳統而言，困難氣道的處理取決於成功的氣管插管。EGA 則產生了一種示範性的轉變，將處理困難氣道的重

點從氣管插管轉向通氣和氧合。EGA 裝置已被證明是有用的氣管插管輔助裝置；尤其是 EGA 裝置和光纖導芯的聯合應用，是處理困難氣道的有效方法。

雖然實用，EGA 也確實存在缺點。比如，它們典型地對胃內容物返流誤吸的保護作用不如套囊氣管導管。儘管 EGA 設計上的改進已嘗試解決這一問題，然而胃內容物吸入的風險持續存在。EGA 套囊壓力過高與潛在發病率的聯繫逐漸得到公認。EGA 在臨床實踐中的廣泛成功和採納是氣道管理和麻醉管理的重大改革。雖然 EGA 的作用已經充分確立，使用者仍須知道每種裝置特有的長處與局限性，並且明白在一種新裝置被研究透徹之前，所有的指導資料都是有限的。

（陳彬彬譯 馬皓琳 李士通校）

The development of the laryngeal mask airway in 1981 was an important first step toward widespread use and acceptance of the extraglottic airway (EGA). The term *extraglottic* is used in this review to encompass those airways that do not violate the larynx, in addition to those with a supraglottic position. Although the term *extraglottic* may be broad and include airways such as tracheostomy tubes, the term *supraglottic* does not describe a large number of devices with subglottic components and is too narrow for a discussion of modern devices. EGAs have flourished in practice, and now a wide variety of devices are available for an ever-expanding array of applications. In this review we attempt to clarify the current state of EGA devices new and old, and to illustrate their use in numerous settings. Particular attention is paid to the use of EGAs in special situations such as obstetric, pediatric, prehospital, and nontraditional “out of the operating room” settings. The role of the EGA in difficult airway management is discussed. EGA devices have saved countless lives because they facilitate ventilation when facemask ventilation and tracheal intubation were not possible. Traditionally, difficult airway management focused on successful tracheal intubation. The EGA has allowed a paradigm shift, changing the emphasis of difficult airway management from tracheal intubation to ventilation and oxygenation. EGA devices have proved to be useful adjuncts to tracheal intubation; in particular, the combination of EGA devices and fiberoptic guidance is a powerful technique for difficult airway management. Despite their utility, EGAs do have disadvantages. For example, they typically do not provide the same protection from pulmonary aspiration of regurgitated gastric material as a cuffed tracheal tube. The risk of aspiration of gastric contents persists despite advances in EGA design that have sought to address the issue. The association between excessive EGA cuff pressure and potential morbidity is becoming increasingly recognized. The widespread success and adoption of the EGA into clinical practice has revolutionized airway management and anesthetic care. Although the role of EGAs is well established, the user must know each device's particular strengths and limitations and understand that limited data are available for guidance until a new device has been well studied.

### 一項非甾體類抗炎藥在小兒術後疼痛方面應用的薈萃分析

#### **A Meta-Analysis of the Use of Nonsteroidal Antiinflammatory Drugs for Pediatric Postoperative Pain**

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**背景：**阿片類藥物在小兒術後應用的副作用已被廣泛關注。已有研究顯示非甾體類抗炎藥能夠有效地降低術後疼痛，然而，它們在阿片類藥物用量的節約效應上仍存在爭議。在這個薈萃分析中，我們研究了小兒術後應用非甾體類抗炎藥對阿片類藥物的節約效益。

**方法：**綜合檢索使用非甾體類抗炎藥和阿片類藥物作為嬰幼兒圍手術期鎮痛藥物臨床試驗的文獻。評價阿片類用量、疼痛程度、術後噁心、嘔吐、尿瀦留的發生情況。研究患者在麻醉後監護室和術後24小時的上述情況。結合每個試驗的資料匯總後計算混合比值比（ORs）或標準化平均差（SMD）和95%置信區間。

**結果：**分析27個隨機對照試驗，圍術期使用非甾體類抗炎藥可以減少術後麻醉後監護室及24小時內阿片類藥物的用量，（SMD 分別= -0.66 [-0.84, -0.48]和-0.83 [-1.11, -0.55]），降低在麻醉後監護室中的疼痛程度（SMD = -0.85 [-1.24, -0.47]），並減少術後24小時噁心嘔吐情況（OR = 0.75 [0.57-0.99]）。非甾體類抗炎藥不能降低術後24小時疼痛程度（OR = 0.56 [0.26-1.2]）和麻醉後監護室內噁心嘔吐的發生率（OR = 1.02 [0.73-1.44]）。根據非甾體類抗炎藥應用的時機（術中或術後）、手術的類型，或者合併使用對乙醯氨基酚進行亞組分析，除了發現術後24小時的疼痛程度和噁心嘔吐的發生率分別受合用對乙醯氨基酚和手術的類型的影響，未顯示這些因素對研究的預後有任何其他影響。

**結論：**本薈萃分析表明圍術期使用非甾體類藥物可以減少兒童術後阿片類的用量和噁心嘔吐。

（許辛 譯 馬皓琳 李士通 校）

**BACKGROUND:** Opioid side effects are a great concern during the postoperative period in children. Nonsteroidal antiinflammatory drugs (NSAIDs) have been shown to effectively decrease postoperative pain, but their opioid-sparing effect is still controversial. In this present meta-analysis, we investigated the postoperative opioid-sparing effect of NSAIDs in children.

**METHODS:** A comprehensive literature search was conducted to identify clinical trials using NSAIDs and opioids as perioperative analgesic compounds in children and infants. Outcomes measured were opioid consumption, pain intensity, postoperative nausea and vomiting (PONV), and urinary retention. All outcomes were studied during postanesthesia care unit (PACU) stay and the first 24 postoperative hours. Data from each trial were combined to calculate the pooled odds ratios (ORs) or standardized mean difference (SMD) and their 95% confidence interval.

**RESULTS:** Twenty-seven randomized controlled studies were analyzed. Perioperative administration of NSAIDs decreased postoperative opioid requirement (both in the PACU and during the first 24 postoperative hours; SMD = -0.66 [-0.84, -0.48] and -0.83 [-1.11, -0.55], respectively), pain intensity in the PACU (SMD = -0.85 [-1.24, -0.47]), and PONV during the first 24 postoperative hours (OR = 0.75 [0.57-0.99]). NSAIDs did not decrease pain intensity during the first 24 postoperative hours (OR = 0.56 [0.26-1.2]) and PONV during PACU stay (OR = 1.02 [0.73-1.44]). Subgroup analysis according to the timing of NSAID administration (intraoperative versus postoperative), type of surgery, or coadministration of paracetamol did not show any influence of these factors on the studied outcomes except the reduction of pain intensity and the incidence of PONV during the first 24 postoperative hours, which were influenced by the coadministration of paracetamol and the type of surgery, respectively.

**CONCLUSION:** This meta-analysis shows that perioperative NSAID administration reduces opioid consumption and PONV during the postoperative period in children.

## 圍術期單次劑量酮咯酸給藥用於預防術後鎮痛：一項對隨機試驗的薈萃分析

### Perioperative Single Dose Ketorolac to Prevent Postoperative Pain: A Meta-Analysis of Randomized Trials

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**背景：**應用非阿片類止痛藥物的預防性鎮痛方案被認為是改善術後疼痛同時最小化阿片類藥物副作用的一種方法。酮咯酸是一種被頻繁應用於術後鎮痛的非甾體類抗炎藥。然而，對於全身性單次劑量酮咯酸給藥用於預防術後疼痛的最佳給藥劑量和途徑尚未闡明。我們總結了一定數量的系統性綜述來評估圍術期單次劑量的酮咯酸給藥用於術後鎮痛的功效。

**方法：**我們遵循了 PRISMA 聲明準則。我們進行了廣泛搜索來鑒別評估單次劑量酮咯酸全身性給藥用於術後鎮痛和阿片類藥物用量的隨機對照試驗。應用了隨機效應模式進行薈萃分析。通過 30 毫克和 60 毫克劑量組的合併研究來評估酮咯酸的劑量效應。應用 Egger 回歸來檢測漏斗形曲線的不對稱性。根據全身性給藥途徑(靜脈給藥比肌肉注射)和給藥時間(切皮前比切皮後)的子群分析來評價是否存在異質性。

**結果：**本研究包含了有 782 個受試者的 13 項隨機臨床試驗。聯合效應的(95%可信區間)顯示酮咯酸組與安慰劑組相比在早期靜息疼痛方面有差異，加權均數差為-0.64 (-1.11 到-0.18)，但是對於晚期靜息疼痛沒有差異，為-0.29 (-0.88 到 0.29) 總結分數(0-10 量表)。60 毫克組的阿片類藥物用量減少，其靜脈嗎啡當量的均數(95%可信區間)為-1.64 毫克(-2.90 到-0.37 毫克)。通過肌肉注射給藥與通過靜脈給藥相比，酮咯酸組與安慰劑組在減少阿片類藥物用量的效應更明顯，靜脈嗎啡當量的均數(95%可信區間)為-2.13 毫克(-4.1 到-0.21 毫克)。60 毫克組術後噁心嘔吐發生率減少，比值比(95%可信區間)為 0.49 (0.29-0.81)。

**結論：**單次劑量全身性酮咯酸給藥是多模式術後鎮痛中的一種有效手段。應用酮咯酸改進術後鎮痛還可以減少術後噁心嘔吐的發生。60 毫克劑量在術後鎮痛方面有顯著利益，但是缺乏現有證據表明 30 毫克劑量在術後鎮痛方面有顯著利益。

(張怡譯 馬皓琳 李士通校)

**BACKGROUND:** Preventive analgesia using non-opioid analgesic strategies is recognized as a pathway to improve postoperative pain control while minimizing opioid-related side effects. Ketorolac is a nonsteroidal antiinflammatory drug frequently used to treat postoperative pain. However, the optimal dose and route of administration for systemic single dose ketorolac to prevent postoperative pain is not well defined. We performed a quantitative systematic review to evaluate the efficacy of a single dose of perioperative ketorolac on postoperative analgesia.

**METHODS:** We followed the PRISMA statement guidelines. A wide search was performed to identify randomized controlled trials that evaluated the effects of a single dose of systemic ketorolac on postoperative pain and opioid consumption. Meta-analysis was performed using a random-effects model. Effects of ketorolac dose were evaluated by pooling studies into 30- and 60-mg dosage groups. Asymmetry of funnel plots was examined using Egger regression. The presence of heterogeneity was assessed by subgroup analysis according to the route of systemic administration (IV versus IM) and the time of drug administration (preincision versus postincision).

**RESULTS:** Thirteen randomized clinical trials with 782 subjects were included. The weighted mean difference (95% confidence interval [CI]) of combined effects showed a difference for ketorolac over placebo for early pain at rest of  $-0.64$  ( $-1.11$  to  $-0.18$ ) but not at late pain at rest,  $-0.29$  ( $-0.88$  to  $0.29$ ) summary point (0–10 scale). Opioid consumption was decreased by the 60-mg dose, with a mean (95% CI) IV morphine equivalent consumption of  $-1.64$  mg ( $-2.90$  to  $-0.37$  mg). The opioid-sparing effects of ketorolac compared with placebo were greater when the drug was administered IM compared with when the drug was administered IV, with a mean difference (95% CI) IV morphine equivalent consumption of  $-2.13$  mg ( $-4.1$  to  $-0.21$  mg). Postoperative nausea and vomiting were reduced by the 60-mg dose, with an odds ratio (95% CI) of 0.49 (0.29–0.81).

**CONCLUSIONS:** Single dose systemic ketorolac is an effective adjunct in multimodal regimens to reduce postoperative pain. Improved postoperative analgesia achieved with ketorolac was also accompanied by a reduction in postoperative nausea and vomiting. The 60-mg dose offers significant benefits but there is a lack of current evidence that the 30-mg dose offers significant benefits on postoperative pain outcomes.

### 蛛網膜下腔應用不含防腐劑的 S(+)-氯胺酮對狗脊髓和腦膜的效果

#### The Effects of Subarachnoid Administration of Preservative-Free S(+)-Ketamine on Spinal Cord and Meninges in Dogs

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**背景：** N-甲基-D-天冬氨酸受體拮抗劑氯胺酮及其對映異構體 S(+)-氯胺酮被注射到硬膜外腔和蛛網膜下腔來處理急性術後疼痛和緩解神經性疼痛綜合征。在本研究中我們評估了在臨床實踐中單次常用劑量不含防腐劑的 S(+)-氯胺酮對狗脊髓和腦膜的效果。

**方法：** 在麻醉下（靜脈注射依託醚脂 2 mg/kg 和芬太尼 0.005 mg/kg）16 只狗（6 到 15 kg）隨機接受腰段（L5/6）鞘內注射 0.9% 生理鹽水（對照組）或 S(+)-氯胺酮 1 mg/kg<sup>-1</sup>（氯胺酮組）。所有劑量都按照 1 mL 容量注射 10 秒。相應的注射液濃度範圍從 0.6% 到 1.5%。在 21 天的臨床觀察後殺死動物；取出脊髓、馬尾根和腦膜，用光學顯微鏡進行組織學檢測。組織用來檢測脫髓鞘（Masson 三色），神經元死亡（蘇木素和曙紅）和星形膠質細胞活化（神經膠質原纖維性酸性蛋白）。

**結果：** 在對照組或氯胺酮組的動物中，我們都沒有發現脊髓組織或腦膜的臨床和組織學改變。

**結論：** 單劑量鞘內注射 1 mg/kg<sup>-1</sup> 無防腐劑的 S(+)-氯胺酮在單個穿刺點蛛網膜下腔注射的濃度範圍為 6 到 15 mg/mL，在本實驗模型中並未產生組織學改變。

（劉朝輝譯，馬皓琳，李士通校）

**BACKGROUND:** The *N*-methyl-D-aspartate receptor antagonist ketamine and its active enantiomer, S(+)-ketamine, have been injected in the epidural and subarachnoid spaces to treat acute postoperative pain and relieve neuropathic pain syndrome. In this study we evaluated the

effects of a single dose of preservative-free S(+)-ketamine, in doses usually used in clinical practice, in the spinal cord and meninges of dogs.

**METHODS:** Under anesthesia (IV etomidate (2 mg/kg) and fentanyl (0.005 mg/kg), 16 dogs (6 to 15 kg) were randomized to receive a lumbar intrathecal injection (L5/6) of saline solution of 0.9% (control group) or S(+)-ketamine 1 mg/kg<sup>-1</sup> (ketamine group). All doses were administered in a volume of 1 mL over a 10-second interval. Accordingly, injection solution ranged from 0.6% to 1.5%. After 21 days of clinical observation, the animals were killed; spinal cord, cauda equina root, and meninges were removed for histological examination with light microscopy. Tissues were examined for demyelination (Masson trichrome), neuronal death (hematoxylin and eosin) and astrocyte activation (glial fibrillary acidic protein).

**RESULTS:** No clinical or histological alterations of spinal tissue or meninges were found in animals from either control or ketamine groups.

**CONCLUSION:** A single intrathecal injection of preservative-free S(+)-ketamine, at 1 mg/kg<sup>-1</sup> dosage, over a concentration range of 6 to 15 mg/mL injected in the subarachnoid space in a single puncture, did not produce histological alterations in this experimental model.

### 一種少見的臂叢解剖變異：單神經束變異

#### **A Rare Anatomical Variation of the Brachial Plexus: Single Cord Anomaly**

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臂叢的解剖學變異對於區域麻醉及上肢手術操作可能有重要作用。雖然罕見，但在 90 名印度男性屍體的臂叢解剖中發現了 4 例臂叢的融合的單一神經束。該 4 例均表現為與通常的從神經幹分成股再合成各神經束的模式相背離。這些單一的神經束不是典型的圍血管排列而是處於腋動脈的一側。臂叢的融合的單一神經束可能比先前所認為的要多，但對於神經阻滯的操作或成功的影響仍為未知。

(毛祖旻 譯 馬皓琳 李士通 校)

Anatomical variations of the brachial plexus may be important in regional anesthesia and upper limb procedures. A fused single cord of the brachial plexus, although considered rare, was discovered in 4 Indian male cadavers during the dissection of 90 brachial plexuses. All 4 cases demonstrated deviation from the usual pattern starting at the division of trunks continuing to the formation of cords. The location of these single cords was lateral to the axillary artery instead of the typical perivascular relationship. A fused single cord of brachial plexus might be more common than previously thought. The impact on the performance or success of blockade remains unknown.

### 異丙酚對於高血糖導致的臍靜脈內皮細胞功能紊亂有保護作用

#### **Propofol Protects Against High Glucose-Induced Endothelial Dysfunction in Human Umbilical Vein Endothelial Cells**

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**背景：**高糖血症導致內皮細胞功能紊亂是通過使過氧亞硝酸鹽介導的內皮型一氧化氮合酶解偶聯起作用的。丙泊酚被報導能夠改善高糖血症誘導的內皮細胞功能紊亂的情況。然而，它的作用機制至今不甚明瞭。我們推測丙泊酚可以通過減少過氧亞硝酸鹽濃度，增加偶聯的一氧化氮合成酶，從而改善高糖血症誘導的內皮細胞功能紊亂。

**方法：**人臍靜脈內皮細胞在30mM濃度的葡萄糖培養基中培養三天后，再在不同濃度的丙泊酚（0.2,1,5及25 $\mu$ m）中分別培養（0.5，1,2和4h）。在平行試驗中，用5mM濃度的葡萄糖培養基中培養三天。通過測量分析硝酸還原酶來測量一氧化氮的產量，及鐵細胞色素 C 及二氫乙啶螢光分析超氧陰離子的產生，那些對30mM 血糖誘導組產生一氧化氮及超氧陰離子最大效應的治療應用於今後的基礎信號轉導途徑研究，而總蛋白 NOS 二聚體與單體的表達，eNOS 對絲氨酸1177的磷酸化，誘導型一氧化氮合成酶總蛋白，誘導型一氧化氮二聚體及單體合酶的表達，過氧亞硝酸鹽陰離子和鳥苷三磷酸環化水解酶 I 都是通過 Western blot 技術測定的。四氫生喋啶水準可通過液相色譜及光譜法測定的

**結果：**與5mM 血糖組相比，30mM 血糖組顯著地減少60%的一氧化氮（ $P < 0.001$ ）及增加175%超氧化物歧化酶（ $P = 0.0026$ ）產生，這倆組都能夠被不同濃度的異丙酚抑制且呈時間相關性。同時在30mM 血糖組中總 eNOS 蛋白表達增加，然而 eNOS 的二聚體與單體比（ $P = 0.0001$ ）及 eNOS 磷酸化（ $P < 0.001$ ）都減少。丙泊酚對30mM 血糖誘導組的 eNOS 蛋白表達沒有影響反而恢復了 eNOS 二聚體與單體的比率及增加了 eNOS 磷酸化作用，在30mM 血糖誘導組中超氧化物歧化酶積累作用會被 eNOS 抑制因數鹽酸鹽所抑制，而且與5mM 血糖組治療相比，30mM 血糖組減少 BH<sub>4</sub>的水準（ $P = 0.0001$ ），但增加過氧亞硝酸基陰離子的水準（ $P = 0.0003$ ），此效應能夠被異丙酚逆轉（分別為  $P = 0.0045$ ,  $P < 0.001$ ,  $P = 0.0001$  vs 30 mM 血糖組）

**結論：**丙泊酚有利於 30mM 的血糖對人臍靜脈內皮細胞產生一氧化氮減少及超氧化物增加，其機制可能是抑制過氧亞硝酸鹽介導 BH<sub>4</sub> 減少和恢復過氧亞硝酸鹽介導一氧化氮合酶偶聯

（鄧利兵譯 薛張綱校）

**BACKGROUND:** Hyperglycemia, via peroxynitrite-mediated endothelial nitric oxide synthase (eNOS) enzymatic uncoupling, induced endothelial dysfunction. Propofol has been reported to improve high glucose - induced endothelial dysfunction. However, its mechanisms of action remain unclear. We hypothesized that propofol could improve hyperglycemia-induced endothelial dysfunction by decreasing the peroxynitrite level and thus restoring eNOS coupling.

**METHODS:** At the end of 3 days of incubation in medium with 30 mM glucose, human umbilical vein endothelial cells were treated with different concentrations (0.2, 1, 5, and 25  $\mu$  M) of propofol for different times (0.5, 1, 2, and 4 hours). In parallel experiments, cells were cultured in 5 mM glucose for 3 days as a control. Nitric oxide (NO) production was measured with a nitrate reductase assay. Superoxide anion ( $O_2^-$ ) accumulation was measured with the reduction of ferricytochrome c and dihydroethidine fluorescence assay. The treatment that had maximal effect on 30 mM glucose - induced NO production and  $O_2^-$  accumulation was applied in the following studies to examine the underlying signaling pathways. eNOS total protein,

eNOS dimer and monomer expression, eNOS phosphorylation at Ser<sup>1177</sup>, inducible NO synthase total protein, inducible NO synthase dimer and monomer expression, peroxynitrite, and guanosine triphosphate cyclohydrolase I expression were measured by Western blot. Tetrahydrobiopterin (BH<sub>4</sub>) level was measured with liquid chromatography – mass spectrometry.

**RESULTS:** Compared with 5 mM glucose treatment, 30 mM glucose significantly decreased NO production by 60% ( $P < 0.001$ ) and increased O<sub>2</sub><sup>-</sup> accumulation by 175% ( $P = 0.0026$ ), which were both attenuated by propofol in a concentration- and time-dependent manner. Compared with 5 mM glucose treatment, total eNOS protein expression was increased by 30 mM glucose ( $P < 0.001$ ), whereas the ratio of eNOS dimer/monomer ( $P = 0.0001$ ) and eNOS phosphorylation ( $P < 0.001$ ) were decreased by 30 mM glucose. Propofol did not affect 30 mM glucose – induced total eNOS protein expression, but restored the ratio of eNOS dimer/monomer ( $P = 0.0005$ ) and increased eNOS phosphorylation ( $P < 0.001$ ). 30 mM glucose – induced O<sub>2</sub><sup>-</sup> accumulation was inhibited by the eNOS inhibitor hydrochloride. Furthermore, compared with 5 mM glucose treatment, 30 mM glucose decreased the BH<sub>4</sub> level ( $P = 0.0001$ ) and guanosine triphosphate cyclohydrolase I expression ( $P < 0.001$ ), whereas it increased peroxynitrite level ( $P = 0.0003$ ), which could all be reversed by propofol ( $P = 0.0045$ ,  $P < 0.001$ ,  $P = 0.0001$  vs 30 mM glucose treatment, respectively).

**CONCLUSIONS:** Propofol has beneficial effects on 30 mM glucose – induced NO reduction and O<sub>2</sub><sup>-</sup> accumulation in human umbilical vein endothelial cells. This may be mediated through inhibiting peroxynitrite-mediated BH<sub>4</sub> reduction, and restoring eNOS coupling.

### 非接觸式心電檢測系統的可靠性和準確性

#### The Reliability and Accuracy of a Noncontact Electrocardiograph System for Screening Purposes

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**背景：**心電圖（ECG）需要電極片接觸到皮膚，並且經常必須脫掉衣服。對心電檢測來說在普通的椅子中裝入電容耦合式電極是一個合理的選擇。我們針對在椅墊中嵌入電極的心電圖進行了可靠性及準確性的評估。

**方法：**在一間麻醉誘導室，一間心內科門診病房，和一間心內科日間病房，兩位獨立的臨床醫生就來自皮膚電極的心電記錄和來自椅墊嵌入的電容耦合式電極的心電記錄進行了對照。我們分析了資料來比較對於心律失常診斷的敏感性和特異性。

**結果：**心電記錄結果來自于 107 位元病人。電容耦合式電極對心率的測定是準確的，但是人為移動使得 P 波和 T 波的辨別不是非常可靠。對於體重較輕的病人，衣服中含有混合纖維的病人，以及衣著潮濕的病人，信號品質是很差的。

**結論：**用電容耦合式電極心電圖來檢測心率及一些心律失常是準確的。對於術前檢測，在檢查椅中嵌入電容耦合式電極是一種很有前景的手段。若想使電容耦合式電極取代皮膚電極，還必須改進人爲因素造成的問題。

（方昕譯 薛張綱校）

**BACKGROUND:** Electrocardiography (ECG) requires the application of electrodes to the skin and often necessitates undressing. Capacitively coupled electrodes embedded in a normal chair would be a rational alternative for ECG screening. We evaluated the reliability and accuracy of ECG electrodes imbedded in a chair cushion.

**METHODS:** Two independent clinicians compared ECG recordings obtained using skin electrodes with recordings obtained using capacitively coupled electrodes that were embedded in a chair cushion in an anesthesiology premedication room, a cardiology outpatient ward, and a cardiology day ward. We analyzed the data to compare the sensitivity and specificity for the diagnosis of cardiac arrhythmias.

**RESULTS:** ECG recordings were obtained from 107 patients. Heart rate was accurately measured using the capacitively coupled electrodes, but motion artifacts made the identification of P and T waves unreliable. Signal quality was poor for patients with low body weight, patients wearing clothing containing mixed fibers, and patients wearing sweaty shirts.

**CONCLUSIONS:** Heart rate was accurately measured, and some cardiac arrhythmias were correctly diagnosed using capacitive ECG electrodes. Capacitive electrodes embedded into an examination chair are a promising tool for preoperative screening. Improved artifact reduction algorithms are needed before capacitive electrodes will replace skin electrodes.

### 對全麻插管患者在導絲引導下鼻胃管置入：一項前瞻性隨機對照研究

#### **Esophageal guidewire-assisted nasogastric tube insertion in anesthetized and intubated patients: a prospective randomized controlled study.**

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**背景：**幾乎所有進行腹部手術病人都有置入胃管（NGT）的指征，目的是爲了術中和術後的胃腸減壓以及術後的經胃管營養。胃管由非強化的聚合塑膠材料製成，在置入的時候非常容易彎曲打卷。這往往造成我們盲插胃管或是用各種技術輔助置入胃管時的置管困難。我們假定對於全麻插管的患者置胃管時，相比于頭部屈曲、側頸部加壓的置管手法，在喉部手動向前推進胃管的手法能夠顯著的提高一次置管成功率。

**方法：**我們將 480 位行全麻肌松的成年患者隨機的分成了實驗組：使用喉部手動向前推進手法置入帶有導絲的鼻胃管（組 1）和對照組：頭部屈曲、側頸部加壓的置管手法置入鼻胃管（組 2）。用胃管彎曲打卷率、操作相關的鼻出血和咽部出血率以及中度和嚴重併發症的發生率來評估首次和二次（和總體）置管成功率（和失敗率）

**結果：**組 1 的首次置管成功率是 99.2%，而組 2 僅有 56.7%（ $P < 0.001$ ）。即首次置管失敗率是組 1 的 0.8%和組 2 的 43.3%（ $P < 0.001$ ，首次置管失敗率的絕對危險度下降（ARR）=42.5%，95%可信區間[CI]=36.0%-49.9%；需要治療的病人數（NNT）=2.95% 可信區間

=2-3；首次置管失敗率的相對危險度下降（RRR）=98.1%，95%可信區間=92.3%-95.5%）。組1胃管置入的平均時間明顯縮短（55秒對比組2的60秒）； $P < 0.001$ ，均數差的95%可信區間=3.2-6.8秒。組1的胃管彎曲/打卷、出血、中度損傷事件發生率也顯著降低。

**結論：**對於全麻插管患者，相比于對照組，使用喉部手動向前推進胃管的手法位置入有導絲引導的鼻胃管，其首次置管的成功率更高。這項技術相比傳統置管技術也有助於降低操作相關損傷率和操作時間。

（郭晨躍譯 薛張綱校）

**BACKGROUND:** Nasogastric tube (NGT) insertion is indicated almost routinely in patients undergoing abdominal surgery to decompress the stomach intraoperatively and postoperatively, and to allow postoperative tube feeding. NGTs are made of nonreinforced polymer plastic materials and are prone to kinking and coiling during insertion. This often poses difficulty in blind NGT placement or placement assisted by variously described techniques. We hypothesized that esophageal guidewire-assisted NGT insertion with manual forward laryngeal displacement can significantly improve the first-attempt success rate over the technique of head flexion and lateral neck pressure during its insertion in anesthetized and tracheally intubated patients.

**METHODS:** Four hundred eighty adult patients presenting for abdominal surgery under general anesthesia with neuromuscular relaxation were randomized to an experimental technique of esophageal guidewire with manual forward displacement of the larynx (group 1) or a control technique of head flexion and lateral neck pressure (group 2) for insertion of the NGT. The success rates (and failure rate) of the first and second attempts (and overall) were assessed along with the incidence of coiling and kinking of the NGT, procedure-related nasal bleeding and pharyngeal bleeding, and the incidence of moderate and life-threatening complications.

**RESULTS:** The first-attempt success rate was 99.2% in group 1 compared with 56.7% in group 2 ( $P < 0.001$ ). Thus, the first-attempt failure rate was 0.8% in group 1 compared with 43.3% in group 2 ( $P < 0.001$ , absolute risk reduction of first-attempt failure rate = 42.5%, 95% confidence interval [CI] = 36.0%-49.9%; numbers needed to treat = 2, 95% CI = 2-3; relative risk reduction of first-attempt failure rate = 98.1%, 95% CI = 92.3%-99.5%). The median time required to insert the NGT was significantly shorter in group 1 (55 vs 60 seconds);  $P < 0.001$ , 95% CI for the difference in means = 3.2 to 6.8 seconds. The incidences of kinking/coiling, bleeding, and moderate injuries were significantly lower in group 1.

**CONCLUSIONS:** Esophageal guidewire-assisted insertion with manual forward laryngeal displacement technique most frequently resulted in correct positioning of the NGT in anesthetized and tracheally intubated patients after the first attempt. This technique is also associated with a lower incidence of procedure-related injuries and is less time-consuming than conventional insertion techniques.

研究對於腰麻下行剖宮產的產婦使用苯腎對產婦血流動力學影響以及其對產婦和胎兒結局的影響

**a review of the impact of phenylephrine administration on maternal hemodynamics and maternal and neonatal outcomes in women undergoing cesarean delivery under spinal anesthesia.**

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對於腰麻下剖腹產患者，苯腎可以有效治療由於腰麻導致的低血壓。以往對於產婦，首選的血管收縮藥為麻黃碱，而現在選用苯腎者逐漸增多。大量研究表明，苯腎可以改善胎兒的酸鹼狀態，預防性使用苯腎可以降低低血壓的發生率，副作用也較小。該綜述強調：相比麻黃碱，苯腎對產婦血流動力學（心律，血壓，心排量）參數改善以及降低術中噁心嘔吐的發生率更有效。除了預防性使用苯腎，該綜述也討論了對於已出現低血壓後使用苯腎的效果。文章還比較了苯腎與麻黃素對子宮胎盤灌注、胎兒的酸鹼狀態、Apgar 評分等結果的影響。同時也要討論了苯腎的最適劑量。

（韓敘譯 薛張綱校）

Phenylephrine is effective for the management of spinal anesthesia-induced hypotension in parturients undergoing cesarean delivery under spinal anesthesia. While ephedrine was previously considered the vasopressor of choice in obstetric patients, phenylephrine is increasingly being used. This is largely due to studies suggesting improved fetal acid-base status with the use of phenylephrine as well as the low incidence of hypotension and its related side effects with prophylactic phenylephrine regimens. This review highlights the effects of phenylephrine compared with ephedrine on maternal hemodynamics (arterial blood pressure, heart rate, and cardiac output), and occurrence of intraoperative nausea and vomiting. The impact of the administration of phenylephrine as a bolus for the treatment of established hypotension compared with its administration as a prophylactic infusion is discussed. This article also reviews the impact of phenylephrine compared with ephedrine on uteroplacental perfusion, and fetal outcomes such as neonatal acid-base status and Apgar scores. The optimum dosing regimen for phenylephrine administration is also discussed.

**後顱窩顱內手術後經靜脈病人自控鎮痛的功效：一項前瞻性，隨機對照試驗。**

**The efficacy of intravenous patient-controlled analgesia after intracranial surgery of the posterior fossa: a prospective, randomized controlled trial.**

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**背景：**後顱窩手術常常會產生強烈的術後疼痛。然而，這種疼痛因為人們擔心使用阿片類藥物可能會掩蓋術後神經系統檢查和/或產生高碳酸血症而很少得到治療。在這項前瞻性，隨機對照試驗中，我們試圖確定靜脈病人自控鎮痛（PCA）與傳統的經靜脈護士按需管理（PRN）治療相比是否能減少後顱窩神經外科手術術後疼痛。

**方法：**擇期行後顱窩手術的 80 例患者（年齡範圍，18-82 歲），隨機接受術後護士每 30 分鐘按需經靜脈給予芬太尼 25 至 50 微克或經 PCA 給予 0.5 微克/千克/劑量，一次極量為 50 微克，鎖定時間為 15 分鐘（4 個劑量/小時）。我們測量疼痛（數值評定量表，0-10），記錄患者鎮痛藥使用情況，鎮靜狀態（Ramsay 鎮靜量表和格拉斯哥昏迷量表），呼吸情況，血流動力學狀態，及每小時不良事件的發生情況。

**結果：**65 例患者完成了研究。其中，31 例患者接受靜脈 PCA 鎮痛，34 例患者接受 PRN 鎮痛。病人的人口統計資料兩組間沒有差異。PCA 組患者休息時疼痛的報導較少，（平均[95%可信區間：3.7[3.0, 4.4]和 5.2[4.5, 5.8]，P= 0.003），並比 PRN 組患者獲得更多的芬太尼（平均 95%的置信區間：54.8[42.1, 67.6 和 29.9[24.2, 35. 7]  $\mu$ g/h，P= 0.002，）。兩組在副作用方面無差異且均無鎮痛治療不良事件發生。

**結論：**靜脈 PCA 和 PRN 治療相比能減少後顱窩手術後的疼痛。我們還需要更大規模的研究，以確定這個病患族群使用靜脈 PCA 的安全性。

(賀盼譯 薛張綱校)

**BACKGROUND:** Surgery of the posterior fossa often produces intense postoperative pain. However, this pain is infrequently treated because of concern that opioid administration may mask the postoperative neurologic examination and/or produce hypercarbia. In this prospective, randomized controlled trial, we sought to determine whether IV patient-controlled analgesia (PCA) would lead to reductions in postoperative pain after neurosurgical procedures of the posterior fossa compared with conventional IV nurse-administered as-needed (PRN) therapy.

**METHODS:** Eighty patients (age range, 18-82 years) undergoing elective posterior fossa surgery were randomized to receive postoperative IV fentanyl PRN 25 to 50  $\mu$ g every 30 minutes or via PCA 0.5  $\mu$ g/kg/dose, with a maximal dose limit of 50  $\mu$ g, and 15-minute lockout (4 doses/hour). We measured pain (Numerical Rating Scale, 0-10), analgesic use, sedation (Ramsay Sedation Scale and Glasgow Coma Scale), respiration, hemodynamics, and adverse events hourly.

**RESULTS:** Sixty-five patients completed the study. Thirty-one patients received IV PCA and 34 received PRN analgesia. Patient demographics did not differ between groups. Patients in the PCA group reported less pain at rest (mean [95% confidence interval]: 3.7 [3.0, 4.4] vs 5.2 [4.5, 5.8], P = 0.003) and received more fentanyl (mean [95% confidence interval]: 54.8 [42.1, 67.6] vs 29.9 [24.2, 35.7]  $\mu$ g/h, P = 0.002) than those in the PRN group. There were no differences in side effects and no adverse events related to analgesic therapy.

**CONCLUSIONS:** IV PCA use resulted in reduction in postoperative pain compared with PRN analgesic therapy after surgery of the posterior fossa. Larger studies will be required to determine the safety of IV PCA in this patient population.

對辣椒素敏感的感覺神經元，催產素可以抑制細胞膜去極化導致的細胞內鈣離子濃度增加：一種外周鎮痛作用機制

### **Oxytocin Inhibits the Membrane Depolarization-Induced Increase in Intracellular Calcium in Capsaicin Sensitive Sensory Neurons: A Peripheral Mechanism of Analgesic Action**

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**背景：**腰椎鞘內注射催產素在人類和大鼠會產生鎮痛作用。經典理論是，催產素受體結合 G 蛋白，增加肌醇-3 - 磷酸的生產，導致神經元興奮。迄今大量的研究表明催產素在脊髓內作用於 A-氨基丁酸的中間神經元來產生鎮痛作用。這樣的說法或許會讓我們產生疑問，催產素是否也會通過調節高電壓門控鈣通道而影響初級感覺的傳導，如在大腦中的作用。

**方法：**對成年大鼠背根神經節細胞進行急性分離和培養，通過螢光顯微鏡觀察指示細胞內鈣在指示劑上的變化。對短暫存在的 KCl 膜外去極化的濃度進行了測定，並對這些影響進行了藥理學研究。同樣也對神經結紮後受損的背根神經節細胞進行研究。

**結果：**催產素對細胞內鈣的膜去極化產生濃度依賴性抑制，催產素比加壓素受體的選擇性拮抗劑的封鎖效果更有效。催產素誘導抑制細胞辣椒素，當內部鈣的毒胡蘿蔔素的儲存耗盡時。催產素產生類似的脊神經結紮動物細胞的抑制作用。

**結論：**這些資料表明，鞘內注射催產素部分是通過減少中樞傷害性感受器興奮性神經遞質釋放來產生鎮痛作用。

(胡曉清譯 薛張綱校)

**BACKGROUND:** Lumbar intrathecal injection of oxytocin produces antinociception in rats and analgesia in humans. Classically, oxytocin receptors couple to stimulatory G proteins, increase inositol-3-phosphate production, and result in neuronal excitation. Most work to date has focused on a spinal site of oxytocin to excite  $\bar{A}$ -aminobutyric acid interneurons to produce analgesia. Here we ask whether oxytocin might also affect primary sensory afferents by modulating high voltage-gated calcium channels, such as it does in the brain.

**METHODS:** Dorsal root ganglion cells from adult rats were acutely dissociated and cultured, and changes in intracellular calcium determined by fluorescent microscopy using an indicator dye. The effects of oxytocin alone and in the presence of transient depolarization from increased extracellular KCl concentration were determined, and the pharmacology of these effects were studied. Cells from injured dorsal root ganglion cells after spinal nerve ligation were also studied.

**RESULTS:** Oxytocin produced a concentration-dependent inhibition of the increase in intracellular calcium from membrane depolarization, an effect blocked more efficiently by oxytocin- than vasopressin-receptor selective antagonists. Oxytocin-induced inhibition was present in cells responding to capsaicin, and when internal stores of calcium were depleted with thapsigargin. Oxytocin produced similar inhibition in cells from animals with spinal nerve ligation.

**CONCLUSIONS:** These data suggest that oxytocin produces antinociception after intrathecal delivery in part by reducing excitatory neurotransmitter release from the central terminals of nociceptors.

### 相對於頸總動脈分叉平面的頸上神經節定位熱圖

#### **Brief report: a heat map of superior cervical ganglion location relative to the common carotid artery bifurcation.**

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**背景：**當星狀神經節阻滯難以施行或屬於其禁忌證時，尋找頸上神經節的確切解剖定位來進行局部神經阻滯是很困難的。

**方法：**我們對 60 例防腐屍體標本進行了頸上神經節部位的解剖。用多元回歸分析的方法來確定是否屍體標本自身特性預示著頸上神經節與頸總動脈分叉處的距離以及頸上神經節的寬度及面積。這些回歸的基礎上，我們通過統計學方法用假色繪製了關於頸上神經節及頸總動脈分叉處的偽色統計熱圖。

**結果：**這種統計性模型可明顯預示著頸上神經節-頸總動脈分叉處的距離 ( $P=0.01$ ) 和頸上神經節的大小 ( $P=0.02$ )。

**結論：**本研究發現頸總動脈分叉處對於神經阻滯中定位頸上神經節是一個很好的標誌。  
(李麗紅譯 薛張綱校)

**BACKGROUND:** Determining the superior cervical ganglion's precise anatomical location for local anesthetic block, when stellate block is not feasible or is contraindicated, is difficult.

**METHODS:** We dissected the superior cervical ganglion in 60 embalmed cadaveric specimens. Multiple regressions determined whether subject characteristics predicted the distance between the superior cervical ganglion and common carotid artery bifurcation and the superior cervical ganglion dimensional width and area. Based on these regressions, we mapped the ganglion and common carotid artery bifurcation using a pseudocolor statistical heat map.

**RESULTS:** The statistical model significantly predicted the superior cervical ganglion–common carotid artery bifurcation distance ( $P = 0.01$ ), and the superior cervical ganglion dimensional width ( $P = 0.02$ ).

**CONCLUSION:** This study determined that the common carotid artery bifurcation is a good landmark for localizing the superior cervical ganglion for anesthetic block.

#### 齧齒動物的代謝綜合征模型中異氟烷和七氟烷最低肺泡有效濃度的測定

#### Determination of Minimum Alveolar Concentration for Isoflurane and Sevoflurane in a Rodent Model of Human Metabolic Syndrome

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**背景：**病態肥胖可影響吸入麻醉藥的藥代動力學和藥效動力學作用，這可能導致給藥不當。本研究假設肥胖顯著影響異氟烷和七氟烷的最低肺泡有效濃度 (MAC)。為了檢驗這一假設，本研究通過對先天低需氧能力者 (LCR) 和高需氧能力者 (HCR) 建立齧齒動物的人體代謝綜合征模型。LCR 大鼠肥胖，表現與人體代謝綜合征相同的特徵，並表現出低強度耐力。相反，HCR 大鼠具有較高的強度耐力，有更好的心血管功能和整體健康的特點。

**方法：**對雄性和雌性 LCR ( $n = 10$ ) 和 HCR ( $n = 10$ ) 大鼠行氣管內插管，機械通氣並以異氟醚或七氟醚維持麻醉。採用交叉法測定 MAC; 通過夾尾進行感覺刺激。在連續夾尾之前和之間存在一個 30 分鐘的平衡期。雙尾參數檢驗 (非配對  $t$  檢驗) 和非參數檢驗 (Mann-Whitney 檢驗) 用於比較 LCR 和 HCR 大鼠之間的 MAC。資料記錄為平均值  $\pm$  標準差，並提供 95% 置信區間。P 值  $< 0.05$  被認為有統計學意義。

**結果：**LCR 大鼠的異氟醚 MAC 值 ( $1.52\% \pm 0.13\%$ )，與之前報導正常大鼠異氟醚 MAC 值 ( $1.51\% \pm 0.12\%$ ) 相似。HCR 大鼠的異氟醚 MAC 值 ( $1.90\% \pm 0.19\%$ ) 顯著高於 LCR 大鼠 ( $1.52\% \pm 0.13\%$ ) ( $P = 0.0001$ )。LCR 和 HCR 大鼠之間的七氟醚 MAC 值沒有顯著不同，並且與之前報導的正常大鼠的七氟醚 MAC 值 ( $2.4\% \pm 0.30\%$ ) 相似。性別對異氟醚或七氟醚的 MAC 值沒有影響。



**結論：**通過對齧齒動物的代謝綜合症模型 MAC 測量發現，肥胖以及相關的合併症不影響吸入麻醉藥的需求。相反，高有氧能力與異氟醚較高的 MAC 有關，且可能是給藥過少的一個危險因素。

(龔寅 譯 陳傑 校)

**BACKGROUND:** Morbid obesity affects the pharmacokinetics and pharmacodynamics of anesthetics, which may result in inappropriate dosing. We hypothesized that obesity significantly alters the minimum alveolar concentration (MAC) for isoflurane and sevoflurane. To test this hypothesis, we used a rodent model of human metabolic syndrome developed through artificial selection for inherent low aerobic capacity runners (LCR) and high aerobic capacity runners (HCR). The LCR rats are obese, display phenotypes homologous to those characteristic of human metabolic syndrome, and exhibit low running endurance. In contrast, HCR rats have high running endurance and are characterized by improved cardiovascular performance and overall health.

**METHODS:** Male and female LCR ( $n = 10$ ) and HCR ( $n = 10$ ) rats were endotracheally intubated and maintained on mechanical ventilation with either isoflurane or sevoflurane. A bracketing design was used to determine MAC; sensory stimulation was induced by tail clamping. An equilibration period of 30 minutes was provided before and between the consecutive tail clamps. Two-tailed parametric (unpaired  $t$  test) and nonparametric (Mann–Whitney test) statistics were used for the comparison of MAC between LCR and HCR rats. The data are reported as mean  $\pm$  SD along with the 95% confidence interval. A  $P$  value of  $<0.05$  was considered statistically significant.

**RESULTS:** The MAC for isoflurane in LCR rats ( $1.52\% \pm 0.13\%$ ) was similar to previously reported isoflurane-MAC for normal rats ( $1.51\% \pm 0.12\%$ ). The HCR rats showed a significantly higher isoflurane-MAC ( $1.90\% \pm 0.19\%$ ) than did the LCR rats ( $1.52\% \pm 0.13\%$ ) ( $P = 0.0001$ ). The MAC for sevoflurane was not significantly different between LCR and HCR rats and was similar to the previously published sevoflurane-MAC for normal rats ( $2.4\% \pm 0.30\%$ ). There was no influence of sex on the MAC of either isoflurane or sevoflurane.

**CONCLUSION:** Obesity and associated comorbidities do not affect anesthetic requirements as measured by MAC in a rodent model of metabolic syndrome. By contrast, high aerobic capacity is associated with a higher MAC for isoflurane and may be a risk factor for subtherapeutic dosing.

靜脈補液可引起基於導電率的紅細胞壓積即時檢驗儀的系統偏倚

### **Intravenous Fluids Cause Systemic Bias in a Conductivity-Based Point-of-Care Hematocrit Meter**

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**背景：**即時檢驗設備(POC)依靠測定全血的電導率來測量紅細胞壓積。本研究假設常用的靜脈輸液可獨立改變血液導電率，並干擾紅細胞壓積的測定。

**方法:** 用生理鹽水、乳酸林格氏液、羥乙基澱粉、或血漿將人類全血稀釋到預定的紅細胞壓積值。每次稀釋都測量電導率和紅細胞壓積 (i-STAT® 法和 spun 法)。在另外的試驗中測定異丙酚和肝素在這些變數上的影響。

**結果:** 無論何種稀釋液，導電率隨著稀釋量的增加而增加。導電率斜率大小從小到大依次為血漿, 羥乙基澱粉, 乳酸林格氏液和生理鹽水。此外斜率各不相同(所有  $P < 0.0001$ )，而使用 i-STAT 法測得的 94.2% 紅細胞壓積值 ( $n = 211$  of 224)，較 spun 法更低。用血漿、生理鹽水、乳酸林格氏液以及羥乙基澱粉稀釋分別引起  $-2.7\%$  ( $-6.9/1.4$ )、 $-4.6\%$  ( $-7.3/-2.0$ )、 $-4.8\%$  ( $-7.8/-1.7$ ) 以及  $-2.0\%$  ( $-5.6/1.9$ ) 的偏倚 (Bland-Altman 協議限制)。對於輸血界限為 30% 時的 Cohen  $\kappa$  協議值 (第 5–第 95 置信區間) 為 0.90 (所有值, 0.85–0.95), 0.25 (紅細胞壓積  $< 30\%$ , 0.02–0.48) 以及 0.21 (紅細胞壓積 18%–30%, 0.01–0.42)。臨床相關濃度的異丙酚和肝素對於導電率和紅細胞壓積影響很小。

**結論:** 使用常用靜脈補液進行血液稀釋後，全血導電率的測量受到影響，且使用基於此原理的 POC 裝置測得紅細胞壓積較 spun 法測得的數值更低。故當存在血液稀釋時，應謹慎對待基於導電率的紅細胞壓積即時檢驗儀的結果。

(俞劼晶 譯 陳傑 校)

**BACKGROUND:** Point-of-care (POC) devices measuring hematocrit rely on determination of electrical conductivity of whole blood. We hypothesized that some frequently administered IV fluids independently alter blood conductivity and confound hematocrit determination.

**METHODS:** Whole human blood was diluted to predetermined hematocrit values with normal saline, lactated Ringer solution, hetastarch, or plasma. Electrical conductivity and hematocrit (i-STAT® and spun methods) were measured at each dilution. In separate experiments, the effects of propofol and heparin were noted on these variables.

**RESULTS:** Greater dilution significantly increased conductivity irrespective of diluent type. The magnitude of the conductivity slopes increased in order for plasma, hetastarch, lactated Ringer solution, and normal saline dilution. Moreover, each slope varied from every other slope (all  $P < 0.0001$ ), and 94.2% of hematocrit values measured by i-STAT ( $n = 211$  of 224) were less than those for the spun method. Dilution with plasma, normal saline, lactated Ringer solution, and hetastarch caused bias (Bland-Altman limits of agreement) of  $-2.7\%$  ( $-6.9/1.4$ ),  $-4.6\%$  ( $-7.3/-2.0$ ),  $-4.8\%$  ( $-7.8/-1.7$ ), and  $-2.0\%$  ( $-5.6/1.9$ ), respectively. The Cohen  $\kappa$  agreement values (5th–95th confidence interval) for a transfusion trigger of 30% were 0.90 (all values, 0.85–0.95), 0.25 (hematocrit  $< 30\%$ , 0.02–0.48), and 0.21 (hematocrit 18%–30%, 0.01–0.42). Clinically relevant concentrations of propofol and heparin had minimal effects on electrical conductivity or hematocrit determination.

**CONCLUSIONS:** Dilution of blood with frequently used IV solutions affects whole blood conductivity determinations and thereby decreases hematocrits measured by a POC device relying on this method as compared with spun hematocrit. Conductivity-based hematocrit POC devices should be cautiously interpreted when hemodilution is present.

## 圍術期吸入高氧在降低手術部位感染中的作用：Meta 分析

### The Role of Perioperative High Inspired Oxygen Therapy in Reducing Surgical Site Infection: A Meta-Analysis

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**背景：**由於隨機對照研究所報導的結果大相逕庭，用高氧血症來預防外科手術部位感染其效果不明。這次系統性回顧的目的是決定圍術期高氧血症是否能降低手術部位的感染。

**方法：**本研究使用 National Library of Medicine's MEDLINE, Cochrane Collaboration's CENTRAL,和 EMBASE 資料庫進行資料搜索。所納入的研究限於對成人進行的隨機對照實驗，內容明確包含了高氧和低氧或對照之間的比較以及對於圍術期感染的評估。使用 Cochrane Collaboration's RevMan 5.0.25 版本 (Cochrane Collaboration, Oxford, UK) 得出主要結果（手術部位感染）的彙集估計相對危險度和其 95% 信任區間。通過隨機效應模型計算相對危險度。

**結果：**此次研究分成 7 個試驗，共納入 2728 位病人，其中有 1358 位患者被隨機分配至高氧血症組，另 1370 位患者至對照組。高氧血症組的彙集感染率為 15.5%，而對照組為 17.5%。高氧血症對於手術部位感染的優勢比為 0.85（95% 可信區間：0.52，1.38）

（ $P=0.51$ ），但是 2 個亞組分析（全身麻醉和結直腸手術）結果顯示出了高氧療法對於降低術後感染的益處。

**結論：**根據此次 Meta 分析，未發現圍術期高氧療法對預防手術部位感染有益。兩亞組實驗（全身麻醉和結直腸手術）出現了陽性結果即高氧血症降低術後感染。需要對這一結果作進一步的研究。

（範逸辰 譯 陳傑 校）

**BACKGROUND:** The clinical role of hyperoxia for preventing surgical site infection remains uncertain because randomized controlled trials on this topic have reported disparate results. Our objective in this systematic review was to determine whether perioperative hyperoxia reduces surgical site infection.

**METHODS:** An electronic search was conducted using the National Library of Medicine's MEDLINE, Cochrane Collaboration's CENTRAL, and EMBASE databases. Included studies consisted of randomized controlled trials in an adult population with a clearly defined comparison of high oxygen versus low oxygen or control, and with a documented assessment for perioperative infection. Pooled estimates for odds ratios (ORs) with 95% confidence intervals were obtained for our primary outcome (surgical site infection) using the Cochrane Collaboration's RevMan version 5.0.25 (Cochrane Collaboration, Oxford, UK). ORs were calculated using a random effects model.

**RESULTS:** The literature search ultimately yielded 7 trials, enrolling 2728 patients, that were included in the analysis. There were 1358 patients randomly assigned to hyperoxia and 1370 to control. The pooled infection rate in the hyperoxia group was 15.5% versus 17.5% in the control group. Hyperoxia resulted in an OR of 0.85 for surgical site infection (95% confidence interval: 0.52, 1.38) ( $P = 0.51$ ). However, 2 subgroup analyses (general anesthesia and colorectal surgery trials) showed a benefit for high inspired oxygen therapy of decreasing surgical site infection.

**CONCLUSIONS:** Perioperative high inspired oxygen therapy overall was not found to be beneficial for preventing surgical site infection based on this meta-analysis. The positive results of 2 subgroup analyses (general anesthesia and colorectal surgery trials) suggest a benefit for hyperoxia in decreasing surgical site infection. Additional studies are needed to further investigate this intervention.

## 簡報：膠體液對離體腎近端小管上皮細胞的影響

### Brief Report: The Effects of Colloid Solutions on Renal Proximal Tubular Cells In Vitro

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腎功能衰竭是危重病人常見的併發症。膠體，如羥乙基澱粉（HES）、明膠或白蛋白等常用於血容量的復蘇，但越來越多報導認為膿毒症患者應用膠體可引起腎毒性的副作用。因此，本實驗研究膠體（HES130/0.4, Voluven®）、明膠（Gelafundin®）、人血白蛋白和晶體液（Sterofundin® ISO）對人腎小管細胞（HK-2）活力的影響。使用膠體液（0.1%–4%）和相同容量的晶體液（Sterofundin® ISO）培養 HK-2 細胞。21 小時後，EZ4U 法（染料 XTT 法）測量 HK-2 細胞的活力。應用 HES130/0.4 可使細胞活力呈現濃度依賴性下降（0.5% HES 時  $86.80\% \pm 10.79\%$ ，4% HES 時下降為  $24.02\% \pm 4.27\%$ ）。人血白蛋白（>1.25%）及明膠（>1%）也呈現對 HK-2 細胞的不良影響。有趣的是，相對於氯化鈉對照組，低濃度人血白蛋白和晶體液 Sterofundin ISO 有細胞保護作用。綜上所述，高濃度的人工和天然膠體對事先無炎症刺激的 HK-2 細胞呈現有害的影響，HES130/0.4 呈現出的有害影響最大，而晶體 Sterofundin ISO 對細胞有保護作用。

（滕凌雅 譯 陳傑 校）

Renal failure is a common complication of critically ill patients. Colloids such as hydroxyethyl starch (HES), gelatin, or albumin are regularly used for intravascular volume resuscitation, but there are increasing reports about the nephrotoxic side effects of synthetic colloids in septic patients. Therefore, we investigated the influence of colloids (HES130/0.4 (Voluven®), gelatin (Gelafundin®), human albumin, and the crystalloid Sterofundin® ISO on cell viability of human proximal tubular (HK-2) cells. HK-2 cells were incubated with colloids (0.1%–4%) and with equivalent volumes of the crystalloid solution Sterofundin ISO. After 21 hours, cell viability of HK-2 cells was measured by EZ4U assay (dye XTT). Application of HES130/0.4 decreased cell viability significantly in a concentration-dependent manner ( $86.80\% \pm 10.79\%$  by 0.5% HES down to  $24.02\% \pm 4.27\%$  by 4% HES). Human albumin (>1.25%) as well as gelatin (>1%) also showed deleterious effects on HK-2 cells. Interestingly, in lower concentrations, human albumin and the crystalloid solution Sterofundin ISO were cytoprotective in comparison with the NaCl control. In conclusion, synthetic and natural colloids showed a harmful impact on HK-2 cells in higher concentrations without any prior proinflammatory stimulus. HES130/0.4 exhibited the most distinctive harmful impact, whereas the application of crystalloid Sterofundin ISO revealed cytoprotective effects.

## 異氟醚與地氟醚對人認知功能的影響

### The Effects of Isoflurane and Desflurane on Cognitive Function in Humans

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**背景：**術後認知功能障礙（POCD）的病因仍有待明確。異氟醚，而非地氟醚可導致神經毒性。然而，這些效應帶來的功能性後果尚未評估。本佇列研究目的在於確定異氟醚與地氟醚對人類認知功能的影響。

**方法：**本研究物件分為腰麻下行下肢或腹部手術組（S，N = 15），腰麻複合地氟醚麻醉組（SD，N = 15），腰麻複合異氟醚麻醉組（SI，N = 15）。一名對麻醉方案未知的觀察者在術前、術後1周對每例患者進行認知測試。由這些測試得出的評分來判定是否為POCD。

**結果：**研究物件共45例，24例男性和21例女性。受試者平均年齡為 $69.0 \pm 1.9$ 歲。年齡等其他特徵無顯著差異性。認知功能減退的平均數在S,SD,和SI組分別為1.13, 1.07和1.40。SI組術後POCD發生率為27%，明顯高於S組(0%) $P = 0.028$ （三者間比較），SD組術後發生率為0%。

**討論：**本佇列研究結果表明，異氟醚與地氟醚對術後認知功能的影響可能不同，需進行更大樣本量和更長隨訪時間的後續研究。

（陳毓雯 譯 陳傑 校）

**BACKGROUND:** The etiology of postoperative cognitive decline (POCD) remains to be determined. Anesthetic isoflurane, but not desflurane, may induce neurotoxicity. However, the functional consequences of these effects have not been assessed. We therefore performed a pilot study to determine the effects of isoflurane and desflurane on cognitive function in humans.

**METHODS:** The subjects included patients who had lower extremity or abdominal surgery under spinal anesthesia alone (S, n = 15), spinal plus desflurane anesthesia (SD, n = 15), or spinal plus isoflurane anesthesia (SI, n = 15) by randomization. Each of the subjects received cognitive tests immediately before and 1 week after anesthesia and surgery administered by an investigator who was blinded to the anesthesia regimen. POCD was defined using the scores from each of these tests.

**RESULTS:** We studied 45 subjects, 24 males and 21 females. The mean age of the subjects was  $69.0 \pm 1.9$  years. There was no significant difference in age and other characteristics among the treatment arms. The mean number of cognitive function declines in the S, SD, and SI groups was 1.13, 1.07, and 1.40, respectively. POCD incidence after SI (27%), but not SD (0%), anesthesia was higher than that after S (0%),  $P = 0.028$  (3-way comparison).

**CONCLUSION:** These findings from our pilot study suggest that isoflurane and desflurane may have different effects on postoperative cognitive function, and additional studies with a larger sample size and longer times of follow-up testing are needed.

### 全膝置換術患者圍術期腦脊液神經遞質的變化：一項隨機試驗

#### Cerebrospinal Fluid Neurotransmitter Changes During the Perioperative Period in Patients Undergoing Total Knee Replacement: A Randomized Trial

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**背景：**全膝置換術對患有骨關節炎的患者有頗多好處，但急性術後疼痛很嚴重且難以處理。儘管已開展一些人體研究，脊髓神經遞質在這種劇烈疼痛中起的作用尚不明確。本研究組完成了首個術後（例如：全膝置換術）脊髓神經遞質變化的前瞻性臨床研究。另外，也證明了圍術期使用臨床允許劑量的抗痛覺敏感藥物是否調整了患者脊髓在神經遞質的濃度。

**方法：**所有患者均接受腰椎穿刺，獲得腦脊液後測定基礎神經遞質濃度。椎管內留置導管進行脊髓麻醉下標準全膝置換術，術後行連續脊髓鎮痛。分別從留置的脊髓導管，留取置管後 2,4,8,12,24,32 小時的腦脊液樣本。分別測樣本中的去甲腎上腺素，P 物質，降鈣素基因相關肽（CGRP）以及谷氨酸的濃度。術前用 SF-36 表（36 項簡明健康調查量表）評價。術後 32 小時，每隔 4 小時進行數位疼痛分級法評估，記錄椎管內鎮痛藥用量。此項隨機，雙盲，安慰劑對照研究將患者分為 3 組（每組 16 人）：安慰劑組，單劑給普瑞巴林組（術前注射 150mg）和多次給予普瑞巴林組（術前注射 150mg，12 以及 24 小時後再注射），測定抗痛覺敏感藥（如普瑞巴林）對脊髓神經遞質的影響。

**結果：**48 名患者隨機分為 3 個圍術期處理組。44 名患者成功留取多個樣本的腦脊液。術前軀體疼痛增加（術前採用 SF-36 評估）與腦脊液中去甲腎上腺素的升高有關（ $P = 0.044$ ）。與術前數值比較，安慰劑組的去甲腎上腺素在置管 2 小時和 4 小時濃度降低（ $P < 0.005$ ），但單劑量和多劑量組，濃度下降的趨勢分別持續到了置管 12 小時和 24 小時（ $P < 0.001$ ）。三組 2 小時的腦脊液中 P 物質水平均達到峰值，之後回到基線。和基礎值相比，安慰劑組的 CGRP 水準只在置管 32 小時的樣本中下降，但在兩組普瑞巴林處理組中，腦脊液中的 CGRP 濃度從置管 4 小時到 32 小時均有下降。只有安慰劑組的腦脊液中谷氨酸濃度從置管 4 小時到 32 小時與基線相比均下降。三組長于置管後 32 小時的腦脊液樣本中的神經遞質濃度沒有差異。安慰劑組中，早期的疼痛數位分級法的曲線下面積（AUC）與腦脊液中去甲腎上腺素濃度的曲線下面積正性相關（ $R=0.67, P=0.0088$ ），但其他神經遞質與疼痛數字分級結果無關。腦脊液中神經遞質濃度和術後鎮痛藥物使用也沒有聯繫。

**結論：**圍術期，有四種脊髓神經遞質隨時間有明顯的濃度變化。腦脊液中 P 物質因為手術影響上升很快，而去甲腎上腺素濃度呈下降趨勢。使用臨床允許劑量的普瑞巴林對脊髓神經遞質的濃度可能沒有調節作用。

（陸秉璋 譯 陳傑 校）

**BACKGROUND:** Total knee replacement (TKR) is of enormous benefit to patients with osteoarthritis of the knee; however, the acute postoperative pain can be severe and difficult to

manage. The role of major spinal cord neurotransmitters in this acute postoperative period is not clear, although there are a few studies in humans. We performed the first prospective clinical study undertaken to delineate the changes in the spinal neurotransmitters after a surgery such as TKR. Furthermore, we also determined whether antihyperalgesic drugs at clinically acceptable doses modulate spinal neurotransmitter concentrations in patients during the perioperative period.

**METHODS:** All patients had a spinal needle placed in the lumbar region and cerebrospinal fluid (CSF) obtained for baseline measurement of the neurotransmitters. An intrathecal catheter was then placed for spinal anesthesia for standard TKR and for continuous spinal postoperative analgesia. The spinal catheter was also used postoperatively to sample CSF at 2, 4, 8, 12, 24, and 32 hours after catheter placement. CSF samples were assayed for norepinephrine, substance P, calcitonin gene-related peptide (CGRP), and glutamate concentrations. SF-36 (36-item Short Form Health Survey) was measured preoperatively. Numerical rating scale (NRS) pain scores and intrathecal analgesic consumption were recorded postsurgery at 4-hour intervals for 32 hours. We performed a randomized, placebo-controlled, double-blind trial with 3 drug groups ( $n = 16$  per group): placebo; single-dose pregabalin (150 mg administered before surgery); and multidose pregabalin (150 mg administered presurgery and 12 and 24 hours later), to determine the effect of an antihyperalgesic drug such as pregabalin on spinal neurotransmitters.

**RESULTS:** Forty-eight patients were randomly assigned to the 3 perioperative treatment groups, and multiple CSF samples were successfully obtained from 44 patients. Before surgery, increased bodily pain (from preoperative SF-36 measure) was correlated with increased CSF norepinephrine concentration ( $P = 0.044$ ). Compared with presurgery values, norepinephrine levels were lower in the placebo group at the 2- and 4-hour time points ( $P < 0.005$ ) whereas in the single and multidose groups, the reduction ( $P < 0.001$ ) continued until 12 and 24 hours, respectively. Substance P CSF levels had an early peak value (at 2 hours) in all 3 groups, and then returned to baseline. Compared with baseline value, the CGRP CSF levels only decreased at the 32-hour time point in the placebo group, but in both pregabalin groups, CGRP levels decreased over the 4- to 32-hour period. In the placebo group only, CSF glutamate decreased over 4 to 32 hours compared with presurgery values. However, there was no difference in the CSF neurotransmitter concentrations among the 3 treatment groups over the 32-hour sampling period. In the placebo group, the early NRS pain score area under the curve, AUC [0–12 hours], was positively correlated ( $R = 0.67$ ,  $P = 0.0088$ ) with the CSF norepinephrine concentration AUC [12–24 hours], but none of the other neurotransmitters was correlated with the NRS. None of the CSF neurotransmitter concentrations correlated with postoperative analgesic consumption.

**CONCLUSION:** In the perioperative period, the concentration changes of the 4 spinal neurotransmitters have a distinct time course. CSF substance P seems to increase very rapidly with surgical intervention, whereas the CSF norepinephrine concentration tends to decrease. At clinical doses, pregabalin does not seem to modulate these spinal neurotransmitter concentrations.

一項關於微創髖關節成形術術後連續囊外注射 0.3%羅呱卡因與連續傷口處局部注射嗎啡用於病人自控鎮痛比較的前瞻，隨機，雙盲，安慰劑對照研究

**Continuous Epicapsular Ropivacaine 0.3% Infusion After Minimally Invasive Hip Arthroplasty: A Prospective, Randomized, Double-Blinded, Placebo-Controlled Study Comparing Continuous Wound Infusion with Morphine Patient-Controlled Analgesia**

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**背景：**此項研究探索微創人工髖關節成形術術後傷口處局部連續注射 0.3%羅呱卡因對止痛效果以及嗎啡用量的影響。

**方法：**76 例患者納入此項前瞻性的雙盲研究中。患者在腰麻下行擇期微創髖關節成形術。在囊外放置一根長 15cm 帶側孔導管，由外科醫生完成這項操作。患者在傷口關閉前隨機接受 0.3%羅呱卡因 20ml (R 組) 或 0.9%生理鹽水 20 毫升 (P 組) 局部單次傷口內注射。術後 48 小時予連續泵注 0.3%羅呱卡因或安慰劑 8 mL/h。向所有病人提供靜脈嗎啡自控鎮痛。分別在 48 小時的研究期間內記錄嗎啡的用量、靜息和運動時的疼痛度、總體和游離羅呱卡因血漿濃度。術後隨訪 3 個月。

**結果：**人口學資料和手術相關資料兩組相似。在術後第一個 48 小時內平均嗎啡用量 R 組顯著低於在 P 組：45.4±9.5 比 69.7±9.6 ( $P < 0.001$ )。術後第一個 24 小時內平均減少了 14.4mg (95%可信區間[CI]12.6-16.1) 和第二個 24 小時內減少了 20.8mg (95%CI 為 19.1-22.4)。靜息和運動疼痛評分中的 R 組 ( $P < 0.0001$ ) 更低。R 組病人的平均滿意度相對基礎值 (95%CI 15.9-29.6) 增加 22.7%。R 組總體和游離羅呱卡因血漿濃度均低於局麻藥中毒濃度。R 組游離的羅呱卡因濃度在 T<sub>24</sub>和 T<sub>48</sub>時分別為 0.14 和 0.11 μg/mol/L。術後 3 個月內，兩組髖關節疼痛和鎮痛藥的消耗量相似，但 R 組經觀察在傷口觸摸不適 (31.2; 95% CI 為 27.7%-34.7%) 和加壓不適 (24; 95% CI 為 20.1-27.9) 方面的發生率顯著減少 ( $P < 0.0001$ )

**結論：**微創髖關節置換術術後連續囊外傷口輸注 0.3%羅呱卡因有效減少嗎啡消耗量和改善術後鎮痛品質。這項技術的益處可持續至術後三個月。

(孫曉瓊 譯 陳傑 校)

**BACKGROUND:** In this study, we investigated the impact of a continuous wound infusion with ropivacaine 0.3% on pain and morphine consumption after minimally invasive hip arthroplasty.

**METHODS:** Seventy-six consecutive patients scheduled for elective minimally invasive hip replacement using spinal anesthesia were prospectively included in this double-blind study. Epicapsular placement of a 15-cm fenestrated catheter was performed by the surgeon. Patients were randomized to receive either 20 mL ropivacaine 0.3% (R-group) or 20 mL NaCl 0.9% (P-group) applied into the wound as a bolus before wound closure. A continuous infusion of either ropivacaine 0.3% or placebo was then infused at 8 mL/h for 48 hours after surgery with an elastomeric pump. Morphine IV-patient-controlled analgesia was offered to all patients. Morphine consumption, pain at rest and with motion, and total and unbound ropivacaine plasma concentration were recorded during the 48-hour study period. Postoperative follow-up was performed at 3 months.

**RESULTS:** Demographic and surgical data were similar in both groups. Mean morphine consumption was significantly lower in the R-group than in the P-group during the first 48 postoperative hours: 45.4 ± 9.5 vs 69.7 ± 9.6 ( $P < 0.0001$ ). There was a mean reduction of 14.4 mg for the first 24 postoperative hours (95% confidence interval [CI] 12.6 to 16.1) and 20.8 mg for the next 24 hours (95% CI 19.1 to 22.4). Pain scores at rest and with motion were lower in the R-group ( $P < 0.0001$ ). Mean patient satisfaction increased 22.7% from baseline (CI 95% 15.9 to 29.6) in the R-group. Total and unbound ropivacaine plasma concentrations were below toxic levels in the R-group. The free ropivacaine concentration was 0.14 and 0.11 μg/mol/L at T<sub>24</sub> and



T<sub>48</sub>, respectively, in the R-group. At 3 months postoperatively, hip pain and analgesic consumption were similar, but a significant reduction in wound discomfort to touch (31.2; 95% CI 27.7 to 34.7) and pressure (24; 95% CI 20.1 to 27.9) was observed in the R-group ( $P < 0.0001$ ).

**CONCLUSIONS:** Continuous epicapsular wound infusion with ropivacaine 0.3% after minimally invasive hip replacement is an efficient technique for reducing morphine consumption and improving the quality of postoperative analgesia. The beneficial effects of this technique are still present 3 months after surgery.