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多极血凝集监测仪 (Multiplate[®])测定体外循环患者低温和鱼精蛋白诱导的血小板功能障碍 Point-of-Care Assessment of Hypothermia and Protamine-Induced Platelet Dysfunction with Multiple Electrode Aggregometry (Multiplate[®]) in Patients Undergoing Cardiopulmonary Bypass

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背景：体外循环（CPB）之后出现凝血疾病较为常见，且血小板功能障碍是失血过多的主要原因。低温可能会加剧血小板功能障碍。本研究通过多极血凝集监测仪（Multiplate®；Verum Diagnostica GmbH, Munich, Germany）测定来评估深低温期间及之后血小板功能。

方法：20例因慢性肺动脉高压拟行肺动脉内膜切除术的患者需在体外循环期间降温至20°C，此深低温停循环模式便于手术操作。在体外循环期间及之后共12个时间点对全血细胞样本进行血小板凝集功能进行分析。分别在患者即时体温（AUC-CT）和复温至37°C（AUC-37）状态下，通过凝血酶受体激发血小板凝集（TRAPtest）。此外，经鱼精蛋白20 µg（0.067 µg/µL）进行体外培养2min后，在2个时间点检测样本的血小板凝集功能。结果用曲线下面积（AUC）表示。

结果：低温导致血小板凝集功能显著下降，随着体温降至20°C时AUC-CT也到达最低点--20.5（95%置信区间CI 8.9-32.1）。当体温≤28°C时，AUC-CT与基础值（92.8, 95% CI 82.5-103.1）存在显著差异（ $P < 0.001$ ），然而AUC-37的变化仅在最低温时较为显著（59.4, 95% CI 41.3-77.4）。当复温至36°C，AUC-CT和AUC-37分别恢复至67.6（95% CI 53.9-81.3）和71.1（95% CI 52.5-

90.8）。从28°C开始降温至升温到达24°C期间（包括28°C和24°C），AUC-CT平均值显著低于AUC-37平均值；降温时AUC-CT和ACU-

37之间的体温关系显著不同（回归系数4.7 [95% CI 4.2-5.2] vs 1.3 [95% CI 0.7-1.9]； $P < 0.0001$ ）。在给予鱼精蛋白后，平均凝集AUC均显著下降，分别为38.2（95% CI -27.9 -

-48.5； $P < 0.001$ ）和44.5（95% CI -58.5 - -30.5； $P < 0.001$ ）。同样当给予肝素后和CPB结束时，离体样本加入鱼精蛋白可导致平均凝集分别下降35.1（95% CI -71.0-0.8； $P = 0.055$ ）和56.5（95% CI -94.5 - -18.5； $P = 0.005$ ）。

结论：通过多极血凝集监测仪

（Multiplate）来评估血小板凝集功能，发现全身深低温时其受到严重影响。复温后凝集功能部分恢复，且与CPB期间血小板凝集功能普遍下降截然不同。鱼精蛋白同样可在活体或离体状态下显著降低血小板凝集。

（黄萍 译 陈杰 校）

BACKGROUND: Coagulopathy is common after cardiopulmonary bypass (CPB), and platelet dysfunction is frequently considered to be a major contributor to excessive bleeding. Exposure to hypothermia may exacerbate the platelet function defect. We assessed platelet function during and after deep hypothermia with multiple electrode aggregometry (Multiplate®; Verum Diagnostica GmbH, Munich, Germany).

METHODS: Twenty adult patients undergoing pulmonary endarterectomy for chronic pulmonary hypertension were cooled on CPB to 20°C and deep hypothermic arrest was used to facilitate surgery. We analyzed platelet aggregation in whole blood samples at 12 measuring points during and after the procedure. Platelet aggregation was stimulated via the thrombin receptor (TRAPtest) at the patient's actual body temperature (AUC-CT) and after rewarming the samples to 37°C (AUC-37). In addition, we tested samples at 2 time points after 2 minutes of in

vitro incubation with 20 µg protamine (0.067 µg/µL). Results are expressed as area under the aggregation curve (AUC).

RESULTS: Cooling resulted in a marked decrease of platelet aggregation to a minimum AUC-CT of 20.5 (95% confidence interval [CI] 8.9–32.1) at 20°C body temperature. AUC-CT was significantly different from baseline (92.8, 95% CI 82.5–103.1) for temperatures of $\leq 28^\circ\text{C}$ ($P < 0.001$), whereas the change in AUC-37 only became significant at the lowest body temperature (59.4, 95% CI 41.3–77.4). After rewarming to 36°C, AUC-CT and AUC-37 had recovered to 67.6 (95% CI 53.9–81.3) and 71.7 (95% CI 52.5–90.8), respectively. The mean AUC-CT was significantly lower than the mean AUC-37 from cooling at 28°C to warming at 24°C inclusive, and the relationship with temperature during cooling was significantly different between AUC-CT and AUC-37 (regression coefficients 4.7 [95% CI 4.2–5.2] vs 1.3 [95% CI 0.7–1.9]; $P < 0.0001$). After administration of protamine, mean aggregation decreased significantly for both measurements by 38.2 (95% CI –27.9 to –48.5; $P < 0.001$) and 44.5 (95% CI –58.5 to –30.5; $P < 0.001$), respectively. Similarly, adding protamine in vitro resulted in a decrease of mean aggregation by 35.1 (95% CI –71.0 to 0.8; $P = 0.055$) when measured after administration of heparin, and 56.5 (95% CI –94.5 to –18.5; $P = 0.005$) at the end of CPB.

CONCLUSION: Platelet aggregation, assessed by multiple electrode aggregometry (Multiplate), was severely affected during deep, whole-body hypothermia. This effect was partially reversible after rewarming, and was distinct from a general decline of platelet aggregation during CPB. Protamine also caused a significant decrease in platelet aggregation in vivo and in vitro.

技术交流：来自外科磁性手术单对心脏起搏器的磁性干扰

Technical Communication: Magnetic Interference of Cardiac Pacemakers from a Surgical Magnetic Drape

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无菌磁性手术单被频繁用于需要在无菌区固定金属器械的手术。磁性区域可能潜在影响心血管植入性电子仪器如起搏器和植入除颤仪的功能。本研究评估磁性手术单对起搏器功能的潜在磁性干扰。共50例患者在心脏门诊就诊时，将一块含有70个磁铁的手术单近中心部分放置于他们的起搏器之上，在证实起搏器出现磁性干扰后，将手术单向尾侧拉，每次3cm直至干扰消失。如果无干扰，则将手术单折叠置于起搏器上方。同时检测维持对起搏器的磁性干扰所需要的磁铁数量。在47例患者中观察到存在对起搏器的磁性干扰（94%）：35例的手术单不需折叠而12例手术单经折叠。手术单未经折叠就发生磁干扰的患者体重比那些没有磁干扰的患者小（ 68 ± 15 kg和 81 ± 19 kg; $P = 0.016$ ）。54%患者起搏器磁性干扰在手术单向尾侧移动3cm后消失。在向尾侧移动15cm后，没有起搏器出现磁性干扰。磁性手术单可能导致心脏起搏器出现磁干扰，而干扰在手术单向尾侧拉15cm后消失。磁干扰可能更容易在低体重病人中发生，在对装有心血管植入性电子仪器的病人使用磁性手术单时应该仔细检测心率和心电图，注意有无非同步起搏的发生。

(瞿亦枫 译 陈杰 校)

Sterile magnetic drapes are frequently used during surgery to hold metal instruments on the sterile field. Magnetic fields may potentially interfere with the function of cardiovascular implantable electronic devices such as pacemakers and implantable cardioverter defibrillators. In this study, we evaluated the potential magnetic interference of magnetic drapes on pacemaker function. A magnetic drape with 70 magnets was placed with its approximate center over the pacemaker of 50 patients during their visit to the cardiology clinic. In those pacemakers that demonstrated magnetic interference, the drape was pulled caudally in 3-cm increments until the interference ceased. If there was no interference, the drape was folded in 2 over the pacemaker. The number of magnets necessary to maintain magnetic interference with the pacemaker was also tested. Magnetic interference was observed in the pacemakers of 47 (94%) patients: 35 with the unfolded drape and another 12 with the folded drape. Patients whose pacemakers had interference with the unfolded drape weighed less (68 ± 15 kg vs 81 ± 19 kg; $P = 0.016$) than those who had no interference. In 54% of patients, magnetic interference ceased when the drape was pulled 3 cm caudally and at 15 cm, no pacemaker had magnetic interference. Magnetic drapes may cause magnetic interference with cardiac pacemakers, and this interference ceases at a caudal distance of 15 cm. Magnetic interference seems more likely in patients with lower body weight. Careful monitoring of the pulse and electrocardiogram for asynchronous pacing activity should be considered when magnetic drapes are used in patients with cardiovascular implantable electronic devices.

在丙泊酚-瑞芬太尼麻醉过程中复合变异指数对标准化伤害刺激的反应

The Response of the Composite Variability Index to a Standardized Noxious Stimulus During Propofol-Remifentanyl Anesthesia

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背景：最近复合变异指数（CVI）被用于对伤害进行量化研究。该指数衍生自脑电双频指数（sBIS）和肌电图（SEMG）的标准差值。本研究主要目的为比较一个伤害性刺激前后CVI的变化。次要目的为考察瑞芬太尼对CVI的影响，并测试了在不同瑞芬太尼浓度情况下CVI预测伤害性刺激后病人体动的能力。此外在伤害性刺激后，比较CVI与其他临床变量（BIS，sBIS，sEMG，心率[HR]和收缩压[BP_{sys}]）的增幅差异。

方法：24名无心脏疾病史的患者纳入研究。使用靶控输注丙泊酚进行麻醉诱导。在增加或减少瑞芬太尼效应室浓度($C_{e,remi}$)状态下，对尺神经应用一个标准化的伤害性电刺激（50 HZ，70mA，30s）。研究CVI，BIS，sBIS，HR和收缩压值的基线和受刺激后的变化。使用预测概率（PK）来评价伤害性刺激后各参数对体动的预测能力。

结果：在瑞芬太尼的效应室浓度为0,1,2或者3ng/ml时，给予一个伤害性刺激后所有参数（除了收缩压）均显著增加。刺激后最高参数值与体动之间的相关性表现如下：心率 $P_K = 0.81$ ，肌电图 $P_K = 0.78$ ，复合变异指数 $P_K = 0.72$ （复合变异指数两两差异不显著）。 Δ 肌电或 Δ CVI（刺激后参数值减去基线值）与体动之间的相关性（ P_K 分别 =

0.76和0.75) 较 Δ HR与体动间的相关性 ($P_K=0.53$) 更高 (分别为: $P = 0.008$ 和 $P = 0.01$)。ROC分析表明 Δ CVI和 Δ SEMG的体动阈值分别为 >0.39 (敏感度0.71, 特异性0.74) 和 > 0.31 (敏感度0.68, 特异性0.78)。

结论: 在可接受的敏感度和特异性前提下, Δ sEMG和 Δ CVI应用于瘫痪患者有助于识别镇痛不足。神经阻滞对CVI的深远影响有待进一步研究。

(郑华容 译 陈杰 校)

BACKGROUND: Recently the Composite Variability Index (CVI) was developed to quantify nociception. This index is derived from the standard deviations (s) of the Bispectral Index (sBIS) and the electromyogram (sEMG). The primary aim of our study was to compare CVI before and after a noxious stimulus. As secondary end points, we investigated the influence of remifentanil on the CVI and tested the ability of the CVI to indicate patient movement after a noxious stimulus under changing remifentanil concentrations. Furthermore, we measured the increase in CVI after a noxious stimulus in comparison to other clinical variables (BIS, sBIS, sEMG, heart rate [HR], and systolic blood pressure [BP_{sys}]).

METHODS: Twenty-four patients without a history of cardiac disease were investigated. Anesthesia was induced with propofol administered by target-controlled infusion. A standardized noxious electrical stimulus was applied (50 Hz, 70 mA, 30 seconds) to the ulnar nerve at increasing or decreasing remifentanil effect-compartment concentrations ($C_{e,remi}$). Changes in baseline and poststimulus CVI, BIS, sBIS, sEMG, HR, and BP_{sys} were investigated. Parameters' ability to indicate movement after a noxious stimulus was evaluated with the prediction probability (P_K).

RESULTS: All investigated parameters (except BP_{sys}) increased significantly after a noxious stimulus at 0, 1, 2, or 3 $ng \cdot mL^{-1} C_{e,remi}$. The association between poststimulus maximal parameters and movement were $P_K = 0.81$ for HR, $P_K = 0.78$ for sEMG, and $P_K = 0.72$ for CVI (pairwise difference to CVI statistically nonsignificant). The association between Δ sEMG or Δ CVI (poststimulus value minus baseline value) and movement was significantly higher ($P_K = 0.76$ and 0.75 , respectively) compared with Δ HR ($P_K = 0.53$) ($P = 0.008$ and $P = 0.01$, respectively). Receiver operating characteristic analysis revealed a threshold value for movement for Δ CVI of >0.39 (sensitivity of 0.71, specificity of 0.74) and for Δ sEMG of >0.31 (sensitivity of 0.68, specificity of 0.78).

CONCLUSION: In paralyzed patients, Δ sEMG and Δ CVI might help identify inadequately low levels of analgesia with an acceptable sensitivity and specificity. The impact of profound neuromuscular block on the CVI should be investigated in further studies.

通过Fastrach型喉罩使用VivaSight Single

Lumen™进行气管插管的可行性研究：一项50例的初步报告

A Feasibility Study Using the VivaSight Single Lumen™ to Intubate the Trachea Through the Fastrach Laryngeal Mask Airway: A Preliminary Report of 50 Cases

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背景：VivaSight Single

Lume™(SL)是一种新型气管导管，在其末端有摄像机和光源用于持续观察气道。此项研究验证使用VivaSight SL通过Fastrach型喉罩(FT-LMA)进行气管插管的可行性。

方法：50名正常气道，拟在全麻下行择期手术，需气管插管的患者被纳入研究。插入FT-LMA后一旦通气量足够，则在可视条件下将VivaSight SL通过FT-

LMA插入气管。以下标准用于对喉部暴露情况进行评分：1级：勺状软骨和声门完全可见；2级：会厌，勺状软骨或声门开放部分可见，声带结构难以观察；3级：仅能看见一个开放的暗区；4级：不能看到喉部任何部分。

结果：49例患者中首次尝试就成功置入FT-LMA。研究中仅一例因2次置入FT-LMA尝试通气失败而被剔除。49例成功完成VivaSight-SL插管（95%可信区间为0.89—0.99），47例在首次尝试时成功（95%可信区间为0.83—0.98），2例在第二次尝试时成功。使用FT-LMA建立有效通气所需时间为 28.8 ± 5 秒（均数±标准差）。VivaSight-SL

是否正确插入通过直视隆突来确认。从拿起VivaSight-SL进行插管至呼末二氧化碳出现的时间定义为成功气管插管时间为 45 ± 7 秒。将VivaSight-SL沿FT-

LMA所建立的通道插入气管时，插管条件如下：18例患者为1级可见，18例为2级，4例为3级，9例为4级。

结论：通过FT-LMA行VivaSight-SL气管插管具有高（单次）成功率，使得这项技术具有前景和可行性。
（诸琳婕 译 陈杰 校）

BACKGROUND: The VivaSight Single Lumen™ (SL) is new endotracheal tube with a video camera and a light source in the tip allowing continuous visual observation of the airway. In this study, we checked the feasibility of endotracheal intubation with a VivaSight-SL through the Fastrach Laryngeal Mask Airway® (FT-LMA).

METHODS: We studied 50 patients with normal airways, scheduled for elective surgery during general anesthesia requiring endotracheal intubation. The FT-LMA was inserted and once adequate ventilation was achieved, the VivaSight-SL was passed through the FT-LMA into the trachea under visual control. The following criteria were used to score the laryngeal view: grade 1: full view of the arytenoids and glottis; grade 2: epiglottis, arytenoids or glottic opening are partly visible, the structure of cords is difficult to see; grade 3: dark areas indicating an open space; and grade 4: no part of the larynx can be identified.

RESULTS: The FT-LMA was placed successfully in 49 patients at the first attempt. One patient was excluded from the study after 2 failed attempts to ventilate with the FT-LMA. All 49 patients were successfully intubated with the VivaSight-SL, (95% confidence interval [CI] 0.89–0.99), 47 patients at the first attempt (95% CI, 0.83–0.98) and 2 patients at the second attempt. (95% CI, 0.004–0.13). The time to achieve an effective airway with the FT-LMA was 15.4 ± 6 (mean \pm SD) seconds. The time to achieve a laryngeal view with the VivaSight-SL was 28.8 ± 5 seconds. Correct position of the VivaSight-SL was confirmed with visualization of the carina. Time of successful intubation with VivaSight-SL from picking up the VivaSight-SL to observing a end-tidal CO₂ curve was 45 ± 7 seconds. After introducing the VivaSight-SL through the intubating channel of the FT-LMA, a grade 1 view was obtained in 18 patients, grade 2 in 18 patients, a grade 3 in 4 patients, and grade 4 in 9 patients.

CONCLUSION: The high first-attempt intubation success rate using the VivaSight-SL to intubate the trachea through a FT-LMA makes this technique an attractive and promising concept.

套囊充气法对喉镜直视下经鼻插管的辅助作用：三种气管导管的比较

Cuff Inflation-Supplemented Laryngoscope-Guided Nasal Intubation: A Comparison of Three Endotracheal Tubes

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背景：经鼻插管时，软气管导管比硬PVC导管更难以在口咽部进行引导。套囊充气法在经鼻盲插管中被用于引导PVC管进入喉部入口，但该方法在喉镜直视下经鼻插管却未经尝试。本研究评估套囊充气法对三种不同硬度的气管导管在经鼻插管中的引导作用。同时评估和比较了在套囊充气法辅助喉镜直视下经鼻插管时这些导管的操纵性和鼻腔损伤的发生率。

方法：162名接受经鼻气管插管的成人按导管类型随机被分为传统PVC（n=54），钢丝加强型（WR; n=54），或尖端硅树脂/钢丝加强型（SWR; n=54）三组。插管难度分别在从鼻腔进入口咽部，从口咽部进入喉入口（套囊充气法，如需要）及从喉入口进入气管三个阶段进行评估。另一非知情观察者评估鼻腔损伤发生率。

结果：所有导管都被成功插入气管，162例中的71例可以在套囊不充气的情况下将导管从口咽部插入喉部入口，剩下91例无法在套囊不充气情况下将导管送入喉部入口，而其中86例采用套囊充气法后则成功。因此，总共157例在采用套囊充气法情况下使导管插入喉入口（总成功率[157]和非套囊充气法成功率[71]差异的95%可信区间是53%[45%-61%]）。剩下的5例不得不在Magill钳帮助下将导管插入。SWR管的鼻出血发生率最低（比率差异95%可信区间），SWR对PVC为27%[8-45%]，SWR对WR为20%[1-38%]，WR对PVC为7%[-12-26%]）

结论：套囊充气技术均能改善三种不同硬度的气管导管在喉镜直视下经鼻插管的成功率，在套囊充气技术的帮助下，在经鼻插管的操纵性和减少鼻腔损伤方面，SWR导管似乎比PVC和WR导管更具优势。

（詹恺诞 译 陈杰 校）

BACKGROUND: Softer endotracheal (ET) tubes are more difficult to navigate in the oropharynx than the stiffer polyvinyl chloride (PVC) tubes during nasotracheal intubation (NTI). Cuff inflation has been used to guide PVC tubes into the laryngeal inlet during blind NTI, but it has not been tested when performing NTI under direct laryngoscopic guidance. We assessed the role of cuff inflation in improving oropharyngeal navigation of 3 ET tubes of varying stiffness during direct laryngoscope-guided NTI. Simultaneously, we also assessed and compared the nasotracheal navigability and incidence of nasal injury with these ET tubes during cuff inflation-supplemented, laryngoscope-guided NTI.

METHODS: One hundred sixty-two adults were randomized to undergo NTI with either a conventional PVC ($n = 54$), wire reinforced (WR; $n = 54$) or a silicone-tipped WR (SWR; $n =$

54) ET tube. Ease of insertion of these tubes was assessed during passage from nose into oropharynx, from oropharynx into laryngeal inlet aided by cuff inflation if needed, and from laryngeal inlet into trachea. Nasal morbidity was assessed by a blinded observer.

RESULTS: All ET tubes could be inserted into the trachea. Seventy-one of 162 ET tubes could be inserted from the oropharynx into the laryngeal inlet without cuff inflation. Eighty-six of the remaining 91 tubes that did not enter the laryngeal inlet without cuff inflation could be inserted when using the cuff inflation technique. Thus, a total of 157 ET tubes could be inserted into the laryngeal inlet with cuff inflation (95% confidence interval of difference of proportions between total number of tubes passed [157] and those without cuff inflation [71]: 53% [45%–61%]). The remaining 5 tubes had to be inserted with the help of Magill forceps. The incidence of epistaxis was lowest with the SWR tube (difference of proportions [95% confidence interval] SWR versus PVC 27% [8%–45%]; SWR versus WR 20% [1%–38%]; WR versus PVC 7% [–12% to 26%]).

CONCLUSIONS: The cuff inflation technique consistently improved the oropharyngeal insertion of the 3 ET tubes of varying stiffness during direct laryngoscope-guided NTI. Supplemented with the cuff inflation technique, the SWR ET tube seems to be better than the PVC and WR ET tubes in terms of complete nasotracheal navigability and less perioperative nasal injury.

在一私立医院进行的硬膜外镇痛与腰硬联合镇痛的随机对照比较:分娩时第一,第二产程时的疼痛评分

Randomized Controlled Comparison of Epidural Analgesia and Combined Spinal-Epidural Analgesia in a Private Practice Setting: Pain Scores During First and Second Stages of Labor and at Delivery

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背景:

到目前为止还没有对腰硬联合(CSE)镇痛在私立医院中应用情况的前瞻性评估,并且只有很少的研究关注于分娩第二产程中的疼痛缓解。这次随机对照实验比较了在一家繁忙的私立妇产医院接受CSE(腰硬联合)镇痛或传统硬膜外镇痛的产妇在分娩第一产程及第二产程时的口述疼痛评分。

方法:

要求行分娩镇痛的健康足月产妇接受硬膜外或腰硬联合镇痛。0.125%布比卡因与2ug/ml的芬太尼共15ml用于硬膜外镇痛;鞘内注射布比卡因3.125mg以及芬太尼5ug用于腰硬联合麻醉。随后,这两组病人使用含有0.125%布比卡因及芬太尼(2ug/ml)的硬膜外镇痛泵用进行自控镇痛。在产程的第一阶段结束时及分娩结束即刻,用0分到10分的口述疼痛评分评估“典型”疼痛。

结果:数据来源于389例接受硬膜外镇痛的产妇和402例接受CSE(腰硬联合)镇痛的产妇。在CSE(腰硬联合)组,典型口述疼痛评分在第一产程低于硬膜外组(平均:1.4分vs1.9分; $P < 0.001$; 99.5%置信区间[CI]为: -0.92到

-0.14)。CSE组与硬膜外组在第二产程的疼痛评分分别为1.7与1.9 ($P = 0.17$; 99.5% CI为: -0.82到0.28), 在分娩即刻时评分相同均为2.0 ($P = 0.77$; 99.5% CI为: -0.73到0.59)

。与硬膜外组 (25.6%) 相比, CSE组中较少产妇接受了硬膜外追加剂量 (16.4%) : $P = 0.002$; 99.5% CI为:

-17.0%到-1.0%。硬膜外导管更换的比例在CSE组为1.2%, 硬膜外组为2% ($P = 0.39$; 99.5% CI为-3.3%到1.8%)。

结论: 对比于传统的硬膜外分娩镇痛, CSE镇痛提供了更好的第一产程镇痛, 尽管在CSE组有少部分产妇接受了硬膜外追加剂量。

(王苑 译 陈杰 校)

BACKGROUND: There has been no prospective evaluation of combined spinal-epidural (CSE) analgesia in a private practice setting and few studies have focused on pain relief during the second stage of labor and at delivery. In this randomized controlled trial, we compared verbal pain scores during the first and second stages of labor and at delivery in women receiving CSE or traditional epidural analgesia at a busy private maternity hospital.

METHODS: Healthy, term parturients received epidural or CSE analgesia for labor pain upon request. Epidural analgesia was initiated with 0.125% bupivacaine plus 2 $\mu\text{g/mL}$ fentanyl, 15 mL; CSE analgesia was initiated with intrathecal plain bupivacaine 3.125 mg plus 5 μg fentanyl. Thereafter, patient-controlled epidural analgesia with 0.125% bupivacaine plus 2 $\mu\text{g/mL}$ fentanyl was used for maintenance analgesia in both groups. The primary outcome was an assessment of “typical” pain, using a verbal rating pain score from 0 to 10, made at the end of the first stage of labor and shortly after delivery.

RESULTS: Data from 398 epidural and 402 CSE subjects were analyzed. The typical verbal rating pain score during the first stage was lower in the CSE group (mean: 1.4 vs 1.9; $P < 0.001$; 99.5% confidence interval [CI] for difference: -0.92, -0.14). Pain scores during the second stage of labor (1.7 vs 1.9; $P = 0.17$; 99.5% CI for difference: -0.82, 0.28) and at delivery (2.0 vs 2.0; $P = 0.77$; 99.5% CI for difference: -0.73, 0.59) were the same between groups. Fewer patients received an epidural top-up dose in the CSE group (16.4% vs 25.6%; $P = 0.002$; 99.5% CI for difference: -17.0%, -1.0%). Epidural catheters were replaced in 1.2% CSE vs 2% in the epidural group ($P = 0.39$; 99.5% CI for difference: -3.3%, 1.8%).

CONCLUSIONS: Compared with traditional epidural labor analgesia, CSE analgesia provided better first-stage analgesia despite fewer epidural top-up injections by an anesthesiologist.

全麻下行机械通气的肺部健康患者潮气量复张/过度通气的监测

Detection of Tidal Recruitment/Overdistension in Lung-Healthy Mechanically Ventilated Patients Under General Anesthesia

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背景：容量依赖的单室模型（VDSCM）已用于鉴定接受机械通气的急性肺损伤患者的肺过度膨胀。这项观察性研究评估VDSCM在鉴定由潮气量（VT）和呼气末正压（PEEP）引起的潮气量复张/过度膨胀方面的作用。

方法：15名（ASA I–

II）择期行乳房整形手术的全麻患者，以容量控制通气（VCV）的方式进行机械通气，设置Vt为8 mL·kg⁻¹，PEEP为0 cm

H₂O。在这些设置下，通气模式在VCV或压力控制通气模式（PCV）间随机调换，PEEP相继从0 cmH₂O调整到5 cmH₂O，再到10 cmH₂O，每5分钟调节一次。之后，PEEP降至0 cmH₂O。VT增加到10 mL·kg⁻¹，并且保持分钟潮气量不变，PEEP也相继增加至5 cmH₂O和10 cmH₂O。连续记录气道压力 and 气流量，并且在考虑或不考虑流量依赖情况下与VDSCM相匹配。用衍生自VDSCM的膨胀指数（%E₂）来评估潮气量和PEEP引起的肺复张/过度膨胀。%E₂正负值分别提示潮气量过度膨胀或补潮气量复张。另外，计算线性呼吸系统顺应性。将每个不同的PEEP值，VT设置，通气模式前提下的各参数间进行对比，考虑或者不考虑流量依赖的回归模型采用配对样本的Wilcoxon符号秩和检验（*P* <

0.05）。使用Bonferroni方法校正多重比较。评估嘈杂变量的相关改变用来作为优化模型的指数。

结果：在几乎所有的实验条件下，包括流量依赖参数的VDSCM明显改善预计嘈杂变量（11.2 to

71.4，95%置信区间下限的最小值和上限的最高值）。在相似的VT和PEEP水平，当流量依赖包含在回归模型中时，VCV和PCV之间没有发现%E₂差异。和VCV模式相比，忽略系统性的流量依赖参数导致了PCV的%E₂的低估（所有*P* <

0.02）。在既定的VT下，PEEP为0 cm

H₂O时%E₂为阴性，并且随着PEEP的上升而明显上升，在PEEP为5 cm

H₂O时%E₂几乎为0。在既定的PEEP水平，%ET明显随着VT的增加而增加。

结论：衍生自流量依赖的VDSCM的膨胀指数，似乎能确认由VT和PEEP引起的潮气量复张/过度膨胀，且与拥有健康肺的麻醉患者的流量波形无关。

（马霄雯 译 陈杰 校）

BACKGROUND: The volume-dependent single compartment model (VDSCM) has been applied for identification of overdistension in mechanically ventilated patients with acute lung injury. In this observational study we evaluated the use of the VDSCM to identify tidal recruitment/overdistension induced by tidal volume (Vt) and positive end-expiratory pressure (PEEP) in lung-healthy anesthetized subjects.

METHODS: Fifteen patients (ASA physical status I–II) undergoing general anesthesia for elective plastic breast reconstruction surgery were mechanically ventilated in volume-controlled ventilation (VCV), with Vt of 8 mL·kg⁻¹ and PEEP of 0 cm H₂O. With these settings, ventilatory mode was randomly adjusted in VCV or pressure-controlled ventilation (PCV) and PEEP was sequentially increased from 0 to 5 and 10 cm H₂O, 5 min per step. Thereafter, PEEP was decreased to 0 cm H₂O, Vt increased to 10 mL·kg⁻¹ and, keeping minute ventilation constant, PEEP was similarly increased to 5 and 10 cm H₂O. Airway pressure and flow were continuously recorded and fitted to the VDSCM with or without considering flow-dependencies. A “distension index” (%E₂) derived from the VDSCM was used to assess Vt and PEEP-induced recruitment/overdistension. Positive and negative values of %E₂ suggest tidal overdistension or tidal recruitment, respectively. In addition, the linear respiratory system elastance was calculated.

Comparisons among variables at each PEEP value, Vt setting, ventilatory mode, and regression model considering or not considering flow-dependencies were performed with the Wilcoxon-sign rank test for paired samples ($P < 0.05$). Multiple comparisons were corrected with the Bonferroni method. The relative change in the estimated noisy variance was used as an index of the goodness of fit of the models.

RESULTS: VDSCM including the flow-dependent parameter significantly improved estimated noisy variance in almost all experimental conditions (11.2 to 71.4, smallest of the lower and highest of the upper 95% confidence intervals). No differences in %E₂ were observed between VCV and PCV, at comparable Vt and PEEP levels, when flow-dependencies were included in the regression model. The negligence of the flow-dependent parameter systematically led to an underestimation of %E₂ in PCV compared to VCV mode (all $P < 0.02$). At a given Vt, %E₂ was negative at a PEEP of 0 cm H₂O and significantly increased with PEEP, being almost 0 at a PEEP of 5 cm H₂O. At a given level of PEEP, %E₂ significantly increased with Vt.

CONCLUSIONS: The distension index %E₂, derived from the VDSCM considering flow-dependencies, seems able to identify tidal recruitment/overdistension induced by Vt and PEEP independent of flow waveform in healthy lung-anesthetized patients.

有氧和阻力锻炼诱导的抗伤害过程中中枢和外周 α_2 肾上腺素受体的差异

Differential Involvement of Central and Peripheral α_2 Adrenoreceptors in the Antinociception Induced by Aerobic and Resistance Exercise

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背景: 数项研究已经验证了锻炼诱导抗伤害作用；然而，这种效果的详细机理并没有被很好的理解。因此，作者研究了大鼠和小鼠由锻炼产生抗伤害作用的 α_2 肾上腺素受体 (α_2 -ARs) 变化。

方法: 雄性Wistar大鼠进行了急性有氧 (AA) 和急性阻力锻炼，而 α_2A/α_2C -Ars基因敲除小鼠及其野生型小鼠也进行了AA。

结果: 在经过该方案锻炼后，大鼠和野生型小鼠的疼痛阈值提高了（不包括基因敲除小鼠）。该效果可以被如下药物逆转：育亨宾，一种非选择性 α_2 -Ars拮抗剂（4 mg/kg, 皮下注射）；萝芙素，一种选择性（4 mg/kg, 皮下注射）；BRL 44408，一种选择性（4 mg/kg, 皮下注射）；胍乙啶，一种选择性肾上腺素传导神经的传导抑制剂（30 mg/kg, 腹腔注射）。此外，当鞘内注射或者侧脑室注射给药时，育亨宾不会改变锻炼诱导的镇痛效果。另外，AA和急性阻力锻炼后大鼠脑内的 α_2 -Ars表达不会改变。

结论: 这些结果暗示了有氧和阻力锻炼诱导的抗伤害作用为外周 α_2 -Ars效应。

（孙晓琼 译 陈杰 校）

BACKGROUND: Several studies have demonstrated antinociception induced by exercise; however, the specific mechanisms for this effect are not well understood. Thus, we investigated the involvement of α_2 -adrenergic receptors (α_2 -ARs) in the antinociceptive effect produced by exercise in rats and mice.

METHODS: Male Wistar rats performed acute aerobic (AA) and acute resistance exercise protocols, and male α_2A/α_2C -ARs knockout mice and their wild-type mice were also submitted to AA.

RESULTS: After the exercise protocols, the nociceptive threshold of rats and wild type was increased, (except in knockout mice). This effect was reversed by yohimbine, a nonselective α 2-ARs antagonist (4 mg/kg, subcutaneously [s.c.]); rauwolscine, a selective α 2C-ARs antagonist (4 mg/kg, s.c.); BRL 44408, a selective α 2A-ARs antagonist (4 mg/kg, s.c.) and guanethidine, a selective inhibitor of transmission in adrenergic nerves (30 mg/kg, intraperitoneal). Furthermore, when given intrathecally or intracerebroventricularly, yohimbine did not alter antinociception induced by exercise protocols. In addition, α 2-ARs expression in rat brains did not change after AA and acute resistance exercise.

CONCLUSION: These results suggest a peripheral involvement of α 2-ARs in the antinociception induced by aerobic and resistance exercise.

简报：0.1%罗哌卡因和0.2%罗哌卡因分别在肩部手术后连续肌间沟注射的随机比较研究
Brief Report: A Randomized Comparison of Ropivacaine 0.1% and 0.2% for Continuous Interscalene Block After Shoulder Surgery

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背景：目前还不清楚罗哌卡因用于肩部手术后连续肌间沟注射的最佳浓度。

方法：56名患者在肩部手术后接受0.1%罗哌卡因或者0.2%罗哌卡因连续48小时的神经注射。评估疼痛评分作为主要终点，同时用追加镇痛药、罗哌卡因的消耗、运动阻滞、副作用和病人的满意度作为次要终点。

结果：在注射期间疼痛评分均无统计学差异；然而，接受0.1%罗哌卡因组在第一个24小时（64%比28%， $P=0.022$ ）追加镇痛的消耗要稍高一些。其他次要终点在统计学上无意义。

结论：这些结果表明0.2%罗哌卡因在肩部手术后第一个24小时的连续肌间沟注射比0.1%罗哌卡因提供了更有效的镇痛。

（孙荔莉 译 陈杰 校）

BACKGROUND: The optimal concentration of ropivacaine for continuous interscalene block after shoulder surgery is currently unknown.

METHODS: Fifty-six patients received a perineural infusion of either ropivacaine 0.1% or 0.2% for 48 hours after shoulder surgery. We assessed pain scores as primary end points and supplemental analgesia, ropivacaine consumption, motor block, side effects, and patient satisfaction as secondary end points.

RESULTS: Pain scores were not statistically different during the infusion periods; however, supplemental analgesia consumption was higher in the group receiving ropivacaine 0.1% during

the first 24 hours (64% vs 28%, $P = 0.022$). Other secondary end points were statistically inconclusive.

CONCLUSIONS: These results suggest that ropivacaine 0.2% provides more effective analgesia than ropivacaine 0.1% during the first 24 hours for continuous interscalene block after shoulder surgery.

脑电双频谱指数与呼末麻醉浓度指导在快通道心脏手术拔管时间上的作用对比

The impact of bispectral index versus end-tidal anesthetic concentration-guided anesthesia on time to tracheal extubation in fast-track cardiac surgery.

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背景：一直以来，都有报道证实根据脑电双频谱指数（BIS）的提示拔管能缩短气管拔管时间。然而，目前还没有试验把通过BIS来提示拔管的作用与通过呼末麻醉浓度（ETAC）指示拔管的作用进行对比。我们假设在快通道心脏手术患者中，通过BIS指导的拔管时间相比通过ETAC指导的拔管时间有明显的缩短。

方法：这项研究的患者来自单个机构，它是通过大量、多中心的“BIS和麻醉气体减少重吸收”（BAG-RECALL）临床试验比较分别通过BIS和ETAC指导麻醉的患者术后意识这项研究的副实验。接受心脏手术的患者被随机分为BIS组（ $n=361$ ）和ETAC组（ $n=362$ ）分别指导麻醉。挥发性麻醉剂滴定浓度，保持在BIS值在40-60之间（BIS组）；或是根据年龄调整的最低肺泡浓度在MAC0.7-1.3（ETAC组）。在ETAC组中，麻醉医生接受BIS值的盲法。在这项副研究中，气管拔管时间在两组间相比较。Cox回归曲线对可能的瞬时拔管时间进行预测。

结果：两组患者气管拔管时间无明显差异（优势比为1.04，95%可信区间〔0.88-1.23〕， $P=0.643$ ）。此外，按此方法分组并没有影响瞬时拔管时间（ $P=0.433$ ）。降低瞬时拔管预测值的因素包括高体重指数（ $P=0.001$ ）、高EuroSCORE（ $P=0.015$ ）、手术类型复杂（ $P=0.034$ ）以及手术在夜间完成（ $P=0.03$ ）。

结论：与基于ETAC的麻醉管理相比，在接受快通道心脏手术的患者中基于BIS的麻醉管理并不能明显提前气管拔管的时间。患者的自身特点和围术特征相较于ETAC和BIS监测来说更能决定拔管时间。

(郭晨跃译 薛张纲校)

BACKGROUND: Bispectral Index (BIS)-guided anesthesia administration has been reported to reduce the time to tracheal extubation. However, no trials have compared the ability of BIS guidance to promote earlier tracheal extubation relative to guidance by end-tidal anesthetic concentration (ETAC). We hypothesized that BIS-guided anesthesia would result in earlier tracheal extubation compared with ETAC-guided anesthesia in fast-track cardiac surgery patients.

METHODS: This study consisted of patients at a single institution who were enrolled in the larger, multicenter BIS or Anesthesia Gas to Reduce Explicit Recall (BAG-RECALL) clinical

trial that compared rates of postoperative awareness for patient whose anesthetic was guided by BIS versus ETAC. Patients undergoing cardiac surgery were randomized to BIS (n = 361) or ETAC (n = 362) guided anesthesia. Volatile anesthetic was titrated either to maintain a BIS value of 40 to 60 (BIS group), or an age-adjusted minimum alveolar concentration of 0.7 to 1.3 (ETAC group). In the ETAC group, anesthesiologists were blinded to the BIS values. In this substudy, time to tracheal extubation was compared between groups. Cox regression identified predictors affecting the instantaneous probability of tracheal extubation.

RESULTS: Time to tracheal extubation was not significantly different between groups (odds ratio 1.04, 95% confidence interval, 0.88-1.23, P = 0.643). In addition, group assignment did not influence the instantaneous probability of tracheal extubation (P = 0.433). Predictors decreasing the instantaneous probability of tracheal extubation included higher body mass index (P = 0.001), higher logistic EuroSCORE (P = 0.015), complex surgery type (P = 0.034), and surgery completion in the evening (P = 0.03).

CONCLUSIONS: Compared with management based on ETAC, anesthetic management based on BIS guidance does not strongly increase the probability of earlier tracheal extubation in patients undergoing fast-track cardiac surgery. The decision to extubate the trachea is more influenced by patient characteristics and perioperative course than the assignment to BIS or ETAC monitoring.

简报：比较评估局麻药低共熔化合物与辣椒素化合物减轻静脉穿刺注射痛的效果

Brief report: a comparative evaluation of local application of the combination of eutectic mixture of local anesthetics and capsaicin for attenuation of venipuncture pain.

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背景: 局部应用辣椒素和局麻药的低共熔混合物 (EMLA) 被认为都可减轻静脉穿刺痛, 输注辣椒后, 局麻药的叔铵和季铵衍生物可延长或显著的阻滞痛觉感受器特异受体。假设: 辣椒素和EMLA混合物比单独应用二者效果好, 混合液二者成分更低, 副作用更少。

方法: 120人等分4组。对照组给予润滑霜; EMLA组给予EMLA膏; 辣椒素组给予Myolaxin膏 (成分: 油性树脂辣椒素=0.75%辣椒素, 樟脑, 树脂等); 混合组给予EMLA+Myolaxin。麻醉师用相关药膏在穿刺区周围10平方厘米区域匀涂, 穿刺一小时前透明敷贴覆盖药膏区及穿刺区; 后移去敷贴18G穿刺针穿刺, 疼痛视觉评分判断疼痛程度, 0为无痛, 10分为最痛。P小于0.05有意义。

结果: 对照组0分无痛人数为0,0/30; EMLA组32%, 9/28, 95% 可信区间为 12%-57%, P = 0.0025; 辣椒素组(30%, 9/30, 10%-53%, P = 0.0031); EMLA+辣椒素组(47%, 14/30, 25%-69%, P < 0.0001)。

结论: EMLA和辣椒素混合物与分别应用二者的镇痛效果相同; 结论还需要更大样本验证。

(韩叙译 薛张纲校)

BACKGROUND: Topical capsaicin and eutectic mixture of local anesthetics (EMLA) have been found to be equally effective in minimizing the pain of venipuncture. After the injection of

capsaicin, both tertiary amine local anesthetics and their quaternary ammonium derivatives can elicit a prolonged and predominantly sensory/nociceptor selective block. We hypothesized that the combined application of capsaicin and EMLA will be more effective than their individual effect, and lower concentrations of individual drugs in this mixture may also be associated with reduced side effects.

METHODS: One hundred twenty patients were randomized into 4 equal groups. The control group received plain lubricant cream; the EMLA group received EMLA cream; the capsaicin group received Myolaxin ointment (containing oleoresin capsaicin equivalent to capsaicin 0.075% w/w, methylsalicylate IP 20% w/w, menthol IP 10% w/w, camphor USP 5% w/w, and eucalyptus oil IP 5% w/w); and the EMLA + capsaicin group received EMLA cream and Myolaxin ointment mixed in equal amounts. An anesthesiologist applied the cream to a 10-cm(2) area (site of venous cannulation) on the dorsum of the nondominant hand of the patient 1 hour before venipuncture and covered the area with an occlusive transparent dressing. Venipuncture was performed with an 18-gauge cannula after removing the dressing. Venipuncture pain was graded by the patient on a 0 to 10 visual analog scale, where 0 means no pain and 10 means worst imaginable pain. P values (after correction for multiple comparisons) of <0.05 were considered significant.

RESULTS: The incidence of no pain on venous cannulation (primary end point) was 0% in the control group (0/30). The incidence of no pain were significantly higher in the EMLA group (32%, 9/28, 95% corrected confidence interval for the difference 12%-57%, $P = 0.0025$), capsaicin group (30%, 9/30, 10%-53%, $P = 0.0031$), and EMLA + capsaicin groups (47%, 14/30, 25%-69%, $P < 0.0001$). Severity of venipuncture pain as assessed by visual analog scale median (interquartile range) was lower in the EMLA + capsaicin group 1 (2) compared with other groups 3 (1), 1.5 (3), and 1.5 (3) for control, EMLA, and capsaicin, respectively ($P < 0.001$, $P = 0.04$, and $P = 0.04$, respectively).

CONCLUSION: We observed that the combination of capsaicin and EMLA in a low concentration is as effective in managing venous cannulation as when applied as an individual drug alone. Larger studies with varying concentration of capsaicin and EMLA are recommended to more fully evaluate the potential advantages.

异氟醚麻醉在体内基因调控的微阵列分析：一个新的方法来识别潜在的预处理机制。

**Microarray analyses of genes regulated by isoflurane anesthesia in vivo:
a novel approach to identifying potential preconditioning mechanisms.**

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背景：虽然全身麻醉被确认为有潜力使患者在手术过程中意识消失，但是暴露也可导致细胞损伤和保护的结果。至于后者，延迟麻醉药预处理是一种进化上保守的生理反应，它可能对许多组织缺血再灌注损伤具有保护作用。虽然我们不知道延迟预处理需要蛋白质从头合成，但是麻醉调节基因的知识是不完整的。在这项研究中，我们使用预处理的保守性质来分析3组不同的大鼠组织中差异表达的基因。我们假设，我们可以在多种组织中选择那些调节基因，我们可以开发一个集中的候选基因，它们可能参与延迟麻醉药预处理。

方法：用2%易氟烷与98%空气混合物麻醉年轻的成年雄性大白鼠90分钟。麻醉剂暴露后，立即将动物处死，取出肝，肾，心脏提取所有RNA。用大鼠寡核苷酸基因序列决定基因表达差异。我们通过分析序列数据来选择在多种组织中具有显著调节作用的基因。

结果：一个临床相关的暴露于异氟醚的所有3种组织显示存在不同的调控基因。协调调控基因的分析产生了一个集中的34种潜在候选基因系列的一些本体论，包括调节炎症反应，调节细胞凋亡，调节离子梯度和维护能源途径。

结论：对协同调控基因通过使用分析的方法，我们能够产生一个可能与未来预处理研究有关的有趣的候选基因的集中列表。

(贺盼 译 薛张纲校)

BACKGROUND: Although general anesthetics are recognized for their potential to render patients unconscious during surgery, exposure can also lead to long-term outcomes of both cellular damage and protection. As regards the latter, delayed anesthetic preconditioning is an evolutionarily conserved physiological response that has the potential for protecting against ischemic injury in a number of tissues. Although it is known that delayed preconditioning requires de novo protein synthesis, knowledge of anesthetic-regulated genes is incomplete. In this study, we used the conserved nature of preconditioning to analyze differentially regulated genes in 3 different rat tissues. We hypothesized that by selecting those genes regulated in multiple tissues, we could develop a focused list of gene candidates potentially involved in delayed anesthetic preconditioning.

METHODS: Young adult male Sprague-Dawley rats were anesthetized with a 2% isoflurane/98% air mixture for 90 minutes. Immediately after anesthetic exposure, animals were euthanized and liver, kidney, and heart were removed and total RNA was isolated. Differential gene expression was determined using rat oligonucleotide gene arrays. Array data were analyzed to select for genes that were significantly regulated in multiple tissues.

RESULTS: All 3 tissues showed differentially regulated genes in response to a clinically relevant exposure to isoflurane. Analysis of coordinately regulated genes yielded a focused list of 34 potential gene candidates with a range of ontologies including regulation of inflammation, modulation of apoptosis, regulation of ion gradients, and maintenance of energy pathways.

CONCLUSIONS: Through using an analysis approach focusing on coordinately regulated genes, we were able to generate a focused list of interesting gene candidates with potential to enable future preconditioning studies.

技术交流：使用笑气时TaperGuard™气管导管囊内压力增加小于Hi-Lo导管：一项气管模型的研究。

Technical Communication: The TaperGuard™ Endotracheal Tube Intracuff Pressure Increase Is Less Than That of the Hi-Lo™ Tube During Nitrous Oxide Exposure: A Model Trachea Study.

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背景：对新开发的锥形套囊与传统的圆柱袖口的密封效果进行了对比研究。在这项研究中，我们比较袖口方面的差异，通过观察两者暴露在笑气中气囊内压力的增加情况。

方法：两种类型的袖口使用的模型气管连接到机械肺的测试：高容量，低血压袖带（Mallinckrodt公司的Hi-

LO（TM），Covidien公司，都柏林，爱尔兰）和锥形袖（Mallinckrodt公司TaperGuardTM）。囊内压力设定在20厘米水柱，测量压力的增加，机械通气使用过程中使用浓度占66%笑气。暴露在笑气中，囊内压力分别在5，10，15，30，45和60分钟后被记录。

结果：在暴露于笑气中的第15分钟时，高容量，低压力袖口的气囊内压力显著高于锥形袖口的压力（2-重复测量的方差分析， $P < 0.0001$ 内部直径的ID 7.0和7.5毫米， $P = 0.0004$ 为ID8.0毫米， $P =$

0.0013为ID8.5毫米），并且在相互作用的时间和袖口类型上也有显著的统计学差异（ $P < 0.0001$

ID的7.0，7.5，8.0，和8.5毫米）。各组的平均袖压力的差异在暴露于笑气中10分钟后是-18.5（SE，1.4；99%可信区间，-22.8至-14.2， $P < 0.0001$ ）为ID

7.5毫米。圆锥气管内管袖口密封气管隆突侧用更少的凹陷。袖口上表面的凹陷可能增加表面积为笑气扩散。因此，较少的凹陷就会减少表面积，从而减少笑气的扩散。

结论：在使用笑气的全身麻醉中，锥形气管导管气囊内压力增加低于传统的高容量，低压力袖口导管。在笑气的浓度达到66%时，气囊内压力在两种类型导管中均可迅速增高，因此建议连续或者频繁监测。

（胡晓清译 薛张纲校）

BACKGROUND: Studies have compared sealing effects of the newly developed tapered endotracheal tube cuff with the conventional cylindrical cuff. In this study, we compared the difference between cuffs with regard to the increase in intracuff pressure during nitrous oxide (N₂O) exposure.

METHODS: Two types of cuffs were studied using a model trachea connected to a mechanical test lung: high-volume, low-pressure cuff (Mallinckrodt Hi-Lo(TM), Covidien, Dublin, Ireland) and tapered cuff (Mallinckrodt TaperGuardTM, Covidien). The intracuff pressure was set at 20 cm H₂O, and the increase in pressure was measured during mechanical ventilation using 66% N₂O. Intracuff pressures were recorded after 5, 10, 15, 30, 45, and 60 minutes of exposure to N₂O.

RESULTS: The intracuff pressure recorded during the first 15 minutes of N₂O exposure in high-volume, low-pressure cuffs was significantly higher than tapered cuffs (2-way repeated-measures analysis of variance, $P < 0.0001$ for internal diameters [IDs] 7.0 and 7.5 mm, $P = 0.0004$ for ID 8.0 mm, $P = 0.0013$ for ID 8.5 mm), and there were also statistically significant differences regarding interaction of time and cuff type ($P < 0.0001$ for IDs 7.0, 7.5, 8.0, and 8.5 mm). The difference in mean cuff pressures among groups after 10 minutes of N₂O exposure was -18.5 (SE, 1.4; 99% confidence interval, -22.8 to -14.2; $P < 0.0001$) for ID 7.5 mm. Tapered endotracheal tube cuffs sealed the trachea with fewer dimples on the carina side of the cuff. Dimples on the cuff surface probably increase the surface for N₂O diffusion. Therefore, fewer dimples result in a smaller surface area through which N₂O can diffuse.

CONCLUSION: During general anesthesia with N₂O, the intracuff pressure of tapered endotracheal tube cuffs did not increase as rapidly as it did in conventional high-volume, low-

pressure cuffs. The pressure in both types of cuffs increased rapidly when exposed to 66% N(2)O, and hence continuous or frequent monitoring is recommended.

容量依赖的顺应性：调节开放性肺呼气末正压的一项有用的参数

Volume-independent elastance: a useful parameter for open-lung positive end-expiratory pressure adjustment.

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背景：一项全肺替换后减少PEEP的试验用来调节包含呼气末时最低的PEEP（开放性肺的PEEP）。对于潮气量接近0，最小PEEP时呼吸系统的顺应性理论上相当于压力容量环数学拐点时的压力，似乎是符合递减PEEP试验中开放性肺的PEEP。然而，PEEP是与潮气量相关，且随着潮气量的减少而增加的。为了避免这个依赖性，我们计划用二阶模式，容量依赖的顺应性有利于设置开放性PEEP。

方法：递减PEEP试验中压力容量环和肺复张在24只急性肺损伤的Wistar大鼠中以6ml/kg和12ml/kg的潮气量，包括腹腔内注射和腹腔内滴注大肠杆菌内毒素。在8只控制动物中，在PEEP试验后通过外科手术取出了前胸壁，这一提议反复使用。气道压和流量持续地获得，通过线性单室模型和容量依赖的顺应性模式得以满足。每个模式中，最小PEEP时呼吸系统的顺应性和容量依赖的顺应性得以认定并且与每个数学拐点比较。最小容量依赖的顺应性PEEP和最小PEEP时呼吸系统的顺应性在数学拐点是通过对偏置和紧密来进行评估的。而配对t检验与对照组前后胸壁切除和不同的Vt组内，组间比较进行配对t检验。所有P值是通过Bonferroni过程多重比较来修正的。

结果：所有实验组中，PEEPminErs，但不PEEPminE1的，呈下降趋势，为Vt增加。展出在MIP和PEEPminE1之间的差异在MIP和PEEPminErs的之间的差异（P <0.001）相比，在较低的偏置。PEEPminE1是始终显著高于在PEEPminErs（7.7比3.8，P <0.001），更好地接近MIP（7.7和7.3厘米H2O在低Vt，P = 0.04，7.8和7.1厘米H2O与P <0.001高Vt）。

结论：PEEPminE1可以更好地识别肺开放PEEP独立地调整后的Vt的，并且可以是一个实用的，更个性化的方法的PEEP滴定。

(孙莉萍译 薛张纲校)

BACKGROUND: A decremental positive end-expiratory pressure (PEEP) trial after full lung recruitment allows for the adjustment of the lowest PEEP that prevents end-expiratory collapse (open-lung PEEP). For a tidal volume (Vt) approaching zero, the PEEP of minimum respiratory system elastance (PEEP(minErs)) is theoretically equal to the pressure at the mathematical inflection point (MIP) of the pressure-volume curve, and seems to correspond to the open-lung PEEP in a decremental PEEP trial. Nevertheless, the PEEP(minErs) is dependent on Vt and decreases as Vt increases. To circumvent this dependency, we proposed the use of a second-order model in which the volume-independent elastance (E1) is used to set open-lung PEEP.

METHODS: Pressure-volume curves and a recruitment maneuver followed by decremental PEEP trials, with a V_t of 6 and 12 mL/kg, were performed in 24 Wistar rats with acute lung injury induced by intraperitoneally injected ($n = 8$) or intratracheally instilled ($n = 8$) *Escherichia coli* lipopolysaccharide. In 8 control animals, the anterior chest wall was surgically removed after PEEP trials, and the protocol was repeated. Airway pressure (P_{aw}) and flow (F) were continuously acquired and fitted by the linear single-compartment model ($P_{aw} = R_{rs} \cdot F + E_{rs} \cdot V + PEEP$, where R_{rs} is the resistance of the respiratory system, and V is volume) and the volume-dependent elastance model ($P_{aw} = R_{rs} \cdot F + E_1 + E_2 \cdot V \cdot V + PEEP$, where $E_2 \cdot V$ is the volume-dependent elastance). From each model, PEEPs of minimum E_{rs} and E_1 (PEEP(minE1)) were identified and compared with each respective MIP. The accuracy of PEEPminE1 and PEEPminErs in estimating MIP was assessed by bias and precision plots. Comparisons among groups were performed with the unpaired t test whereas a paired t test was used between the control group before and after chest wall removal and within groups at different V_t s. All P values were then corrected for multiple comparisons by the Bonferroni procedure.

RESULTS: In all experimental groups, PEEPminErs, but not PEEPminE1, tended to decrease as V_t increased. The difference between MIP and PEEPminE1 exhibited a lower bias compared with the difference between MIP and PEEPminErs ($P < 0.001$). The PEEPminE1 was always significantly higher than the PEEPminErs (7.7 vs 3.8, $P < 0.001$) and better approached MIP (7.7 vs 7.3 cm H₂O with $P = 0.04$ at low V_t , and 7.8 vs 7.1 cm H₂O with $P < 0.001$ at high V_t).

CONCLUSIONS: PEEPminE1 better identifies the open-lung PEEP independently of the adjusted V_t , and may be a practical, more individualized approach for PEEP titration.

高选择性 β_1 受体拮抗剂导致大鼠血液稀释后脑灌注呈剂量依赖性减少

Treatment with a Highly Selective β_1 Antagonist Causes Dose-Dependent Impairment of Cerebral Perfusion After Hemodilution in Rats

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背景: 急性 β 阻滞与不良预后之间存在正向剂量依赖性, 包括中风和死亡。急性失血增加这些不良事件的发生率。为了研究急性失血和 β 阻滞所致风险的相关性, 动物实验研究表明, 急性 β 阻滞剂减少血液稀释后的脑灌注。通过检验假设, 我们扩展了这些结果, 特异性 β_1 阻滞剂(奈必洛尔)导致在血液稀释期间剂量依赖性脑缺氧。

方法: 大鼠和小鼠麻醉后, 在血液稀释至血红蛋白浓度60克/升前, 随机接受安慰剂或奈必洛尔(1.25或2.5毫克/公斤)静脉注射。血液稀释前后监测药物浓度、心率(HR)、心输出量(CO)、局部脑血流量(Rcbf, 激光多普勒)和脑微血管氧分压(PBrO₂)。Western blot测定内皮型一氧化氮合酶(NOS), 神经元型NOS(nNOS), 诱导型NOS, 缺氧诱

导因子 (HIF) - 1α 。HIF - α 表达还使用HIF-(ODD)-

荧光素酶小鼠模型评估。数据进行方差分析， $P < 0.05$ 有意义，所有分析采用校正 P 值。

结果：奈必洛尔治疗导致剂量依赖的血药浓度。在安慰剂组，血液稀释后CO和rCBF ($P < 0.010$)增加，PBrO₂降低至 45.8 ± 18.7 mm Hg (校正 $P < 0.001$; 95% CI 29.4–

69.7)。同等剂量后奈必洛尔降低HR，而且减弱CO对血液稀释的反应($P <$

0.012)。低剂量奈必洛尔并未改善rCBF或在血液稀释后进一步降低PBrO₂。高剂量奈必洛尔减弱rCBF对血液稀释的反应，并引起PBrO₂进一步降低至 28.4 ± 9.6 mm Hg (校正 $P =$

0.019; 95% CI 17.4–42.7)。所有剂量的奈必洛尔都增加NOS蛋白水平。血液稀释后在高剂量奈必洛尔组中，脑组织HIF-

1α ，诱导型一氧化氮合酶，和nNOS蛋白水平与脑缺氧诱导因子荧光素酶活性升高 ($P < 0.032$)。

结论：我们的数据表明：奈必洛尔导致脑组织氧分压下降和缺氧蛋白反应 (HIF-

1α 和nNOS) 增加，反应血液稀释后脑氧输送呈剂量依赖性下降。血液稀释后低剂量奈必洛尔治疗并没有导致组织缺氧恶化，对HR和CO的影响也差不多。这些数据支持这一假设：高度特异性 β_1 受体拮抗剂进行 β -阻断导致血液稀释时剂量依赖性的急性脑灌注减少。

(郁玲玲译 薛张纲校)

BACKGROUND: Acute β -blockade has been associated with a dose-dependent increase in adverse outcomes, including stroke and mortality. Acute blood loss contributes to the incidence of these adverse events. In an attempt to link the risks of acute blood loss and β -blockade, animal studies have demonstrated that acute β -blockade impairs cerebral perfusion after hemodilution. We expanded on these findings by testing the hypothesis that acute β -blockade with a highly β_1 -specific antagonist (nebivolol) causes dose-dependent cerebral hypoxia during hemodilution.

METHODS: Anesthetized rats and mice were randomized to receive vehicle or nebivolol (1.25 or 2.5 mg/kg) IV before hemodilution to a hemoglobin concentration near 60 g/L. Drug levels, heart rate (HR), cardiac output (CO), regional cerebral blood flow (rCBF, laser Doppler), and microvascular brain Po₂ (PBrO₂, G2 Oxyphor) were measured before and after hemodilution. Endothelial nitric oxide synthase (NOS), neuronal NOS (nNOS), inducible NOS, and hypoxia inducible factor (HIF)- 1α were assessed by Western blot. HIF- α expression was also assessed using an HIF-(ODD)-luciferase mouse model. Data were analyzed using analysis of variance with

significance assigned at $P < 0.05$, and corrected P values are reported for all post hoc analyses.

RESULTS: Nebivolol treatment resulted in dose-specific plasma drug levels. In vehicle-treated rats, hemodilution increased CO and rCBF ($P < 0.010$) whereas PBrO₂ decreased to 45.8 ± 18.7 mm Hg (corrected $P < 0.001$; 95% CI 29.4–69.7). Both nebivolol doses comparably reduced HR and attenuated the CO response to hemodilution ($P < 0.012$). Low-dose nebivolol did not impair rCBF or further reduce PBrO₂ after hemodilution. High-dose nebivolol attenuated the rCBF response to hemodilution and caused a further reduction in PBrO₂ to 28.4 ± 9.6 mm Hg (corrected $P = 0.019$; 95% CI 17.4–42.7). Both nebivolol doses increased brain endothelial NOS protein levels. Brain HIF- 1α , inducible NOS, and nNOS protein levels and brain HIF-luciferase activity were increased in the high-dose nebivolol group after hemodilution ($P < 0.032$).

CONCLUSIONS: Our data demonstrate that nebivolol resulted in a dose-dependent decrease in cerebral oxygen delivery after hemodilution as reflected by a decrease in brain tissue Po₂ and an increase in hypoxic protein responses (HIF- 1α and nNOS). Low-dose nebivolol treatment did not

result in worsened tissue hypoxia after hemodilution, despite comparable effects on HR and CO. These data support the hypothesis that acute β -blockade with a highly β_1 -specific antagonist causes a dose-dependent impairment in cerebral perfusion during hemodilution.

麻醉药对乳腺癌术后慢性疼痛的影响。

The effects of anesthetics on chronic pain after breast cancer surgery.

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背景：乳腺癌术后慢性疼痛的发生率及预测因素已被广泛研究。因为它负面影响病人的日常生活中，应制定方法以防止和减少慢性疼痛及其严重程度。我们以往的研究表明，丙泊酚麻醉对瑞芬太尼引起的痛觉过敏具有抗痛觉过敏作用，并且与七氟醚相比，它能减少急性疼痛。在这项研究中，我们假设，丙泊酚能防止乳腺癌术后的慢性疼痛及急性疼痛的发展和严重程度。

方法：我们对2007年3月至2008年12月间接受乳腺癌手术的175名女性（丙泊酚组n = 86，七氟醚组n =

89）进行回顾性研究。年龄分布为20至65岁。2011年7月对患者进行电话随访。分析丙泊酚和七氟醚两组之间慢性疼痛的发病率，严重程度和持续时间。严重程度分为轻度、中度和重度疼痛。慢性疼痛持续时间分为3组，各间隔1年时间。此外，还确定了与乳腺癌术后慢性疼痛的发病率及严重程度相关的危险因素。

结果：与丙泊酚组相比，乳腺癌术后的慢性疼痛更可能发生在七氟醚组（95%置信区间[CI]为1.146-1.809，P =

0.007）。在患有慢性疼痛的患者中，七氟醚和异丙酚两组间的严重程度（95%CI 0.516-7.419）及持续时间（95%CI 0.106-

1.007）无明显差异。慢性疼痛发展的预测因素为年纪轻（95%CI 0.907-0.992，P = 0.021），行腋窝淋巴结清扫术（95%CI 1.204-1.898，P =

0.003），术后24小时吗啡消费量（95%CI 1.004-1.116，P = 0.036）和七氟醚（95%CI 1.146-1.809，P = 0.007）。术后24小时吗啡用量越多，慢性疼痛越是严重（95%CI 1.001-1.379，P = 0.049）。

结论：这项研究表明，与七氟醚麻醉相比，丙泊酚麻醉下的乳腺癌术后慢性疼痛的发病率较低。然而，在慢性疼痛的严重程度和持续时间上丙泊酚组与七氟醚组没有显著的差别。需要进一步的前瞻性研究来证实这些具有争论的结果的真实性。

（周玲译 薛张纲校）

BACKGROUND: The incidence and predictive factors for chronic pain after breast cancer surgery have been widely studied. Because it negatively affects patients' daily lives, methods to prevent and reduce chronic pain and its severity should be developed. Our previous study showed that propofol anesthesia has an antihyperalgesic effect under remifentanyl-induced hyperalgesia and reduced acute pain compared with sevoflurane anesthesia. In this study, we

investigated the hypothesis that propofol would prevent the development and severity of chronic pain after breast cancer surgery, as in acute pain.

METHODS: A retrospective study was conducted with 175 women (n = 86 in the propofol group and n = 89 in the sevoflurane group) aged 20 to 65 years who underwent breast cancer surgery between March 2007 and December 2008. Patients were followed up by telephone in July 2011. Analysis included incidence, severity, and duration of chronic pain between propofol and sevoflurane groups. Severity was categorized into mild, moderate, and severe pain. Duration of chronic pain was also divided into 3 categories by 1-year time interval. Risk factors associated with the incidence and severity of chronic pain after breast cancer surgery were also identified.

RESULTS: Chronic pain after breast cancer surgery was more likely to occur in the sevoflurane group compared with the propofol group (95% confidence interval [CI] 1.146-1.809, P = 0.007). Among patients with chronic pain, neither the severity (95% CI 0.516-7.419) nor duration (95% CI 0.106-1.007) differed between patients receiving sevoflurane and propofol. Younger age (95% CI 0.907-0.992, P = 0.021), axillary lymph node dissection (95% CI 1.204-1.898, P = 0.003), 24-hour postoperative morphine consumption (95% CI 1.004-1.116, P = 0.036), and sevoflurane (95% CI 1.146-1.809, P = 0.007) were predictive factors for the development of chronic pain. Higher 24-hour postoperative morphine consumption (95% CI 1.001-1.379, P = 0.049) increased the severity of chronic pain.

CONCLUSIONS: This study showed that propofol anesthesia was associated with a lower incidence of chronic pain after breast cancer surgery than sevoflurane anesthesia. However, propofol did not have a significant effect on severity and duration of chronic pain. Further prospective studies are needed to confirm the validity of these provocative findings.

钙/钙调蛋白依赖的蛋白激酶II在1型和2型糖尿病模型大鼠疼痛相关行为的表达

Expression of Calcium/Calmodulin-Dependent Protein Kinase and Pain-Related Behavior in Rat Models of Type 1 and Type 2 Diabetes

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背景： 目前发现，外周神经和背根神经节在实验中的易激惹的糖尿病神经病变早期阶段存在异常。钙/钙调蛋白依赖激酶II型（CaMKII）因其在钙平衡中的作用可能在糖尿病神经病变中有调节能力。

方法： I型糖尿病模型（DM1）由55mg/kg链脲佐菌素诱导而成，DM2由低量链脲佐菌素（35

mg/kg）和高脂饮食诱导形成。疼痛相关行为由热刺激及机械刺激分析。在糖尿病大鼠诱

导两周及两月后对其实施安乐死，使用免疫荧光技术分析CaMKII及其同工酶在背段神经根的表达。

结果：两种类型的糖尿病模型均成功诱导形成并经检测为高血糖证实。在糖尿病诱导后DM1大鼠在2周内疼痛相关行为明显增加，而DM2大鼠却无明显增加。DM1大鼠总CaMKII及其 α 磷酸化同工酶的表达均增加同时伴有疼痛相关行为。DM1大鼠总CaMKII的表达及 α , β , γ , 和 δ 型同工酶的表达及其所有分析酶在DM2大鼠中无改变。

结论：我们的发现可能表明，CaMKII较早的参与了DM1的传输的伤害，但在DM2上未有该发现。CaMKII可能是糖尿病一个合适的药理学目标靶点。

(杨琰译 薛张纲校)

BACKGROUND: Abnormalities in peripheral nerves and dorsal root ganglia are noticed in the early stage of experimentally provoked diabetic neuropathy. Enzyme calcium/calmodulin-dependent protein kinase II (CaMKII) may have a modulating role in diabetic neuropathy because of its role in calcium homeostasis.

METHODS: A model of type 1 diabetes mellitus (DM1) was induced with 55 mg/kg of the streptozotocin and for DM2 induction a combination of high-fat diet and low-dose streptozotocin (35 mg/kg) was used. Pain-related behavior was analyzed using thermal and mechanical stimuli. Two weeks and 2 months after induction of diabetes rats were euthanized, and the expression of CaMKII and its isoforms in the dorsal root ganglia were analyzed using immunofluorescence.

RESULTS: Both types of diabetes were successfully induced, as confirmed by hyperglycemia. Increased pain-related behavior became evident in DM1 rats in 2 weeks after diabetes induction, but not in DM2 rats. The expression of total CaMKII and the phosphorylated α isoform of CaMKII increased in DM1 animals concurrently with pain-related behavior. Expression of α , β , γ , and δ isoforms in DM1 animals and expression of total CaMKII and all of its analyzed isoforms in DM2 animals remained unchanged.

CONCLUSIONS: Our findings may indicate involvement of CaMKII in transmission of nociceptive input early in DM1, but not in DM2. CaMKII may be a suitable pharmacological target for diabetic neuropathy.

单次剂量应用抗凝血酶作为晚期肝硬化重症患者连续肾替代疗法中的潜在可选择的抗凝剂：一项回顾性数据分析

Single-Dose Application of Antithrombin as a Potential Alternative Anticoagulant During Continuous Renal Replacement Therapy in Critically Ill Patients with Advanced Liver Cirrhosis: A Retrospective Data Analysis

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背景：充分抗凝是进行有效连续肾替代疗法（CRRT）的前提。然而，对于晚期肝硬化的重症患者而言，由于并存出血功能障碍，这一目标难以达到。因此，有必要评价备选的抗凝剂。

方法：在本项回顾性研究中，我们分析了2006至2008年间收入内科重症监护病房的16名晚期肝硬化伴急性肾损伤的重症患者的37份CRRT数据，入组的患者在CRRT过程中以单

次剂量的抗凝血酶（AT）或连续低剂量肝素作为唯一抗凝药。主要结果评价为单个CRRT过滤器的寿命。

结果：13个用于单次剂量AT抗凝患者（ $n = 6$ ）的CRRT过滤器和24个用于连续低剂量肝素抗凝患者（ $n = 10$ ）的CRRT过滤器的数据可采用。AT组单个过滤器的平均寿命显著长于肝素组（ 45 ± 29 小时[95%可信区间27–62小时]比 26 ± 23 小时[95%可信区间16–36小时]; $P = 0.03$ ），但患者个体的过滤器平均寿命两组相近似（中位数[第25–第75百分位数]30小时[21–59小时]比28小时[17–70小时]; $P = 0.79$ ）。

结论：我们的数据提示，对于晚期肝硬化重症患者，CRRT过程中单次应用AT抗凝或许可作为连续低剂量肝素抗凝的替代方法。但证实此发现尚需进行进一步的对照试验。

（陈彬彬 译，马皓琳、李士通 审校）

BACKGROUND: Adequate anticoagulation is essential to achieve efficient and cost-effective continuous renal replacement therapy (CRRT). However, in critically ill patients with advanced liver cirrhosis, this goal is challenging because of the concomitant bleeding disorder. Therefore, the evaluation of alternative anticoagulants is necessary.

METHODS: In this retrospective study, we analyzed data of 37 CRRTs in 16 critically ill patients with advanced liver cirrhosis and acute kidney injury admitted to a medical intensive care unit between 2006 and 2008 and included patients undergoing CRRT with either single doses of antithrombin (AT) or continuous low-dose heparin as a sole anticoagulant. The primary outcome measure was lifetime of single CRRT filters.

RESULTS: Data were available for 13 CRRT filters for patients anticoagulated with single doses of AT ($n = 6$), and 24 CRRT filters for patients anticoagulated continuously with low-dose heparin ($n = 10$). Means of single-filter lifetimes were significantly higher in the AT group compared with the heparin group (45 ± 29 hours [95% confidence interval 27–62 hours] vs 26 ± 23 hours [95% confidence interval 16–36 hours]; $P = 0.03$), whereas mean filter lifetimes of individual patients were comparable (median [25th–75th percentile] 30 hours [21–59 hours] vs 28 hours [17–70 hours]; $P = 0.79$).

CONCLUSIONS: Our data suggest that anticoagulation with single doses of AT may be an alternative to continuously administered low-dose heparin in critically ill patients with advanced liver cirrhosis during CRRT. However, additional controlled trials are necessary to confirm our findings.

一项经食道超声心动图技术用来定位肾脏及监测肾灌注

A Transesophageal Echocardiography Technique to Locate the Kidney and Monitor Renal Perfusion

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通过超声监测肾动脉多普勒血流速度指数、阻力指数和搏动指数可能有助于预测肾功能障碍。然而,这样的监测已经在术后重症监护室中间断地由经皮超声完成。在手术室,经食

道超声心动图（TEE）是可代替经皮超声获得肾灌注指数的方法。然而，使用TEE定位右肾很困难。我们提议用新技术来定位左肾，以我们的经验这是简单易行的。我们相信，从经胃的左心室短轴视图开始，左转来定位腹主动脉，沿着它到左肾动脉的起源处可能有助于比以前介绍的技术更快地定位左肾。我们还提议在手术进行时用TEE进行的一项新技术来监测这些多普勒指数。

（王晓莉 译 马皓琳 李士通 校）

Monitoring the renal arterial Doppler flow velocity indices, the resistive index and pulsatility index, with ultrasound may help predict renal dysfunction. However, such monitoring has been done intermittently by transcutaneous ultrasound in the postoperative intensive care setting. In the operating room, transesophageal echocardiography (TEE) is an alternative to transcutaneous ultrasound for obtaining indices of renal perfusion. However, it is difficult to locate the right kidney using TEE. We propose a new technique to locate the left kidney that, in our experience, is simple and easy to perform. We believe, starting from a transgastric left ventricular short-axis view, turning left to locate the abdominal aorta, and following it to the origin of the left renal artery may help locate the left kidney faster than previously described techniques. We also propose a new technique to monitor these Doppler indices using TEE during the intraoperative period.

吡咯依托咪酯相似体碳依托咪脂有效地抑制人类5-HT_{3A}受体的功能：与依托咪酯比较以及对于致呕吐性的潜在影响

The Pyrrole Etomidate Analog Carboetomidate Potently Inhibits Human 5-HT_{3A} Receptor Function: Comparisons with Etomidate and Potential Implications for Emetogenesis

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背景：5-羟色胺的3型（5-

HT₃）受体是兴奋性的离子通道，属于配体门控离子通道的半胱氨酸环家族。它们与机体的恶心、呕吐相关，而它们的拮抗剂在临床上被用作止吐药。我们先前报道了进展的依托咪酯的一个新颖的吡咯相似体，（*R*）-乙基-1-（1-苯乙基）-1*H*-吡咯-2-羧酸乙酯（碳依托咪脂），其中保留了依托咪酯合乎需要的麻醉和血流动力学性能，但缺乏其对促肾上腺皮质激素刺激的类固醇合成的强效抑制作用。此外，与依托咪酯不同的是，碳依托咪脂可强效抑制烟碱型乙酰胆碱受体。因为烟碱型乙酰胆碱和5-HT₃受体有高度同源性，我们假设碳依托咪脂也可有效抑制5-HT₃受体，这对药物的致吐性活动有潜在的重要意义。在目前的研究中，我们观察和比较碳依托咪脂和依托咪酯对5-HT_{3A}受体的调制作用。

方法：5-

HT₃受体在人胚胎肾细胞上异源性表达。我们通过一个耦合到压电元件的多通道表面灌流移液器给予药物，并采用膜片钳技术以全细胞式或膜外面向外式记录电流。

结果：碳依托咪脂和依托咪酯抑制整体由5-HT_{3A}受体介导的电流，半抑制浓度分别为1.9 μM（95%可信区间 [CI] = 1.4-2.7 μM）和25 μM（95% CI = 17-37 μM）。这些值可以与相应的催眠浓度5.4 μM和2.3

μM 相比较。这种抑制在峰值电流的幅度和脱敏率反映出催眠作用。减少电流峰值的半抑制浓度分别为碳依托咪脂 $34 \mu\text{M}$ (95% CI = 24-48 μM) 和依托咪酯 $171 \mu\text{M}$ (95% CI = 128-228 μM)。减少脱敏时间常数的半抑制浓度分别为碳依托咪脂 $3.5 \mu\text{M}$ (95% CI = 2.4-5.1 μM) 和依托咪脂 $36 \mu\text{M}$ (95% CI = 21-59 μM)。

结论：与依托咪酯相反，碳依托咪脂在催眠浓度可抑制5-HT_{3A}受体介导的电流。这种抑制作用主要是脱敏率提高造成的结果。由于碳依托咪脂有效地抑制了5-HT_{3A}受体，它的致吐性可能比依托咪脂更低。

(余亦南 译 马皓琳 李士通 校)

BACKGROUND: 5-Hydroxytryptamine type 3 (5-HT₃) receptors are excitatory ion channels belonging to the cys-loop family of ligand-gated ion channels. They are involved in nausea and vomiting and their antagonists are used clinically as antiemetic drugs. We previously reported the development of a novel pyrrole analog of etomidate, (*R*)-ethyl 1-(1-phenylethyl)-1*H*-pyrrole-2-carboxylate (carboetomidate), which retains etomidate's desirable anesthetic and hemodynamic properties, but lacks its potent inhibitory effect on adrenocorticotrophic hormone-stimulated steroid synthesis. Also in contrast to etomidate, carboetomidate potently inhibits nicotinic acetylcholine receptors. Because nicotinic acetylcholine and 5-HT₃ receptors are highly homologous, we hypothesized that carboetomidate might also potently inhibit 5-HT₃ receptors with potentially important implications for the drug's emetogenic activity. In the current studies, we investigated and compared modulation of 5-HT_{3A} receptors by carboetomidate and etomidate.

METHODS: 5-HT₃ receptors were heterologously expressed in human embryonic kidney cells. Drugs were applied with a multichannel superfusion pipette coupled to piezoelectric elements, and currents were recorded from cells in either the whole-cell or excised outside-out patch configuration of patch-clamp recordings.

RESULTS: Carboetomidate and etomidate inhibited integrated 5-HT_{3A} receptor-mediated currents with respective half-inhibitory concentrations of 1.9 μM (95% confidence interval [CI] = 1.4–2.7 μM) and 25 μM (95% CI = 17–37 μM). These values may be compared with respective hypnotic concentrations of 5.4 and 2.3 μM . This inhibition reflected hypnotic effects on peak current amplitudes and desensitization rates. Half-inhibitory concentrations for reducing peak current amplitudes were 34 μM (95% CI = 24–48 μM) for carboetomidate and 171 μM (95% CI = 128–228 μM) for etomidate. Half-inhibitory concentrations for reducing the desensitization time constant were 3.5 μM (95% CI = 2.4–5.1 μM) for carboetomidate and 36 μM (95% CI = 21–59 μM) for etomidate.

CONCLUSIONS: In contrast to etomidate, carboetomidate inhibits 5-HT_{3A} receptor-mediated currents at hypnotic concentrations. This inhibition is primarily the result of enhancing the rate of desensitization. Because carboetomidate potently inhibits 5-HT_{3A} receptors, it may be less emetogenic than etomidate.

有丁酰胆碱酯酶基因K变异体的患者对琥珀酰胆碱的反应

Response to Succinylcholine in Patients Carrying the K-Variant of the Butyrylcholinesterase Gene

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背景：琥珀酰胆碱通常很快被丁酰胆碱酯酶代谢掉，但丁酰胆碱酯酶的遗传性变异体可能会延长其作用持续时间。**K**变异体是丁酰胆碱酯酶基因中最常见的突变，存在于25%的高加索人中。目前尚未很好地研究过**K**变异体对琥珀酰胆碱作用持续时间的重要性。我们的假设是具有**K**变异体基因型杂合子的患者中琥珀酰胆碱的作用持续时间比正常基因型（野生型）的患者延长。

方法：我们选入70名接受琥珀酰胆碱1 mg/kg用于行快速顺序诱导的成年手术患者。使用尺神经刺激和加速度仪来行神经肌肉监测。琥珀酰胆碱的作用持续时间定义为到四个成串刺激的第一个肌颤搐恢复到90%的时间（ T_1 90%）。用DNA分析检测丁酰胆碱酯酶的活性和丁酰胆碱酯酶**K**和**A**变异体的存在。

结果：

38名患者存在野生型丁酰胆碱酯酶，21名患者杂合了**K**变异体。有杂合**K**变异体的患者的 T_1

90%的均值（标准差）是11.6（3.5）分钟，较野生型基因患者的9.5（2.7）分钟显著延长（ $P=0.023$ ），差值的均值（95%可信区间）是2.1（0.3—

4.0）分钟。杂合**K**变异体患者的丁酰胆碱酯酶活性是5978

U/L，显著低于野生型基因患者的7703U/L（ $P=0.0045$ ）。

结论：我们得出结论，有杂合**K**变异体等位基因患者的琥珀酰胆碱的作用持续时间较野生型基因患者几乎延长了4分钟，但是这个差异相对于所有患者之间恢复时间的广泛变异性和重叠而言却是小的。

（方斌 译 马皓琳 李士通校）

BACKGROUND: Succinylcholine is usually metabolized quickly by the butyrylcholinesterase enzyme (BChE) but genetic variants of BChE may prolong the duration of action. The Kalow (K) variant is the most common mutation in the butyrylcholinesterase gene (*BCHE*), being present in 25% of Caucasians. The significance of the K-variant for the duration of action of succinylcholine has not been well studied. Our hypothesis was that the duration of action of succinylcholine would be prolonged in patients heterozygous for the K-variant genotype compared with the normal genotype (wild-type).

METHODS: We included 70 adult surgical patients who received succinylcholine 1 mg/kg for rapid sequence induction. Neuromuscular monitoring was performed using ulnar nerve stimulation and acceleromyography. Duration of action of succinylcholine was defined as the time to 90% recovery of first twitch in train-of-four (T_1 90%), BChE activity was determined, and the presence of *BCHE* K and A (atypical) variants were determined using DNA analysis.

RESULTS: The wild-type *BCHE* was present in 38 patients, and 21 were heterozygous for the K-variant. Mean (SD) T_1 90% in patients heterozygous for the K-variant, 11.6 (3.5) minutes, was longer than in patients with the wild-type genotype, 9.5 (2.7) minutes ($P = 0.023$), with a mean (95% confidence interval) difference of 2.1 (0.3–4.0) minutes. Patients heterozygous for the K-variant had a BChE activity of 5978 U/L compared with 7703 U/L in the wild-type group ($P = 0.0045$).

CONCLUSION: We conclude that the mean duration of action of succinylcholine is prolonged for the patient heterozygous for the K-variant allele by at most 4 minutes relative to the wild-

type, but this difference is small relative to the wide variability and overlap in recovery times among all patients.

重力驱动的微孔点滴静脉输注在“完全开放”流动过程中传输的药物和液体容量

Medication and Volume Delivery by Gravity-Driven Micro-Drip Intravenous Infusion: Potential Variations During “Wide-Open” Flow

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背景：重力驱动的微孔点滴输注装置可以通过调节每分钟滴数来控制给药剂量。当滚轮调节器完全开放时，滴注室中液体的流动应该是连续不断的液体柱而不是离散可数的液滴。我们假设处于这种“完全开放”状态时，输入的药物剂量因依赖于微孔点滴设备的外在因素而很难预测。我们在一个离体的实验室模型上进行实验来研究不同的临床相关条件下液体处于完全开放流动时输入的量。

方法：接通生理盐水袋的微孔点滴输液器在远端连接一个高流量的旋塞，旋塞再连接一个垂直方向的静脉内导管（14-22号）。盐水袋的弯液面要高于出口60—

120cm。在所有的试验中输液器的滚轮调节器都是完全开放的，使滴注室的液体流动成连续不断的液体柱。在每个条件下测量四次1分钟里的液体流量。为了模拟载体流量的阻力效应，我们用一个定量输液泵通过一个载体载体静脉输液器来输送不同流率的生理盐水到一个带“背驮式”微孔点滴输液器。我们也比较了3个不同厂家的微孔点滴输液器的液体传输。

结果：在完全开放状态下重力驱动的静脉液体输注量因输液导管大小和液量高度的不同，其变化有2.9倍的差距（95%的可信区间为2.84—

2.96）。带旋塞和导管的微孔点滴输液器的模型总阻力因流率不同而不同。背驮式微孔点滴输液器随着载体流量从0增加到1998ml/min，输入的液量减少了29.7%±0.8%（均数±标准误）。3个不同厂家的微孔点滴输液器的输液特性相似。

结论：通过实验室模拟重力驱动的微孔点滴输液器在完全开放下的临床情况，我们得出：液体输注率（药物和/或容量输入）的大差距变化取决于导管的大小、液量的高度、以及载体流量等外在因素。多变的阻力意味着在微孔点滴输注模型中液体的非层流流量很难做数学上的预测。这些发现支持以下观点：使用机械泵取代重力驱动的微孔点滴法可以提高静脉输液尤其是血管活性药输注的精确性和安全性。

（王慧娟译 马皓琳 李士通校）

BACKGROUND: Gravity-driven micro-drip infusion sets allow control of medication dose delivery by adjusting drops per minute. When the roller clamp is fully open, flow in the drip chamber can be a continuous fluid column rather than discrete, countable, drops. We hypothesized that during this “wide-open” state, drug delivery becomes dependent on factors extrinsic to the micro-drip set and is therefore difficult to predict. We conducted laboratory experiments to characterize volume delivery under various clinically relevant conditions of wide-open flow in an in vitro laboratory model.

METHODS: A micro-drip infusion set, plugged into a bag of normal saline, was connected to a high-flow stopcock at the distal end. Vertically oriented IV catheters (gauges 14–22) were connected to the stopcock. The fluid meniscus height in the bag was fixed (60–120 cm) above the outflow point. The roller clamp on the infusion set was in fully open position for all experiments resulting in a continuous column of fluid in the drip chamber. Fluid volume delivered in 1 minute was measured 4 times with each condition. To model resistive effects of carrier flow, volumetric infusion pumps were used to deliver various flow rates of normal saline through a carrier IV set into which a micro-drip infusion was “piggybacked.” We also compared delivery by micro-drip infusion sets from 3 manufacturers.

RESULTS: The volume of fluid delivered by gravity-driven infusion under wide-open conditions (continuous fluid column in drip chamber) varied 2.9-fold (95% confidence interval, 2.84–2.96) depending on catheter size and fluid column height. Total model resistance of the micro-drip with stopcock and catheter varied with flow rate. Volume delivered by the piggybacked micro-drip decreased up to $29.7\% \pm 0.8\%$ (mean \pm SE) as the carrier flow increased from 0 to 1998 mL/min. Delivery characteristics of the micro-drip infusion sets from 3 different manufacturers were similar.

CONCLUSIONS: Laboratory simulation of clinical situations with gravity-driven micro-drip infusion sets under wide-open flow conditions revealed that infusion rate (drug and/or volume delivery) can vary widely depending on extrinsic factors including catheter size, fluid column height, and carrier flow. The variable resistance implies nonlaminar flow in the micro-drip model that cannot be easily predicted mathematically. These findings support the use of mechanical pumps instead of gravity-driven micro-drips to enhance the precision and safety of IV infusions, especially for vasoactive drugs.

剖宫产手术抗生素预防性应用中的不统一：一项麻醉医师的全国调查

Unwarranted Variability in Antibiotic Prophylaxis for Cesarean Section Delivery: A National Survey of Anesthesiologists

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背景：美国妇产科协会最新的指南推荐在剖宫产手术切皮前即刻预防性使用抗生素。本研究的目的即以全美麻醉医师为样本来测试和描述此指南的执行相关情况。

方法：我们随机邀请美国麻醉医师协会的部分成员 ($n=1000$) 完成了一项网上调查。

结果：在1052名 (10.5%) 提供完整可供分析的信息的应答者中, 63.5% (95% CI 60.6%~66.3%, $n=668$) 报告了切皮前预防性使用抗生素作为监护标准应用于计划剖宫产。28% ($n=229$) 的医师同意麻醉医师必须对预防性使用抗生素的时机负主责。在多因素模型中, 不同医院类型 (社区医院比教学医院, 62%比70%, $P=0.004$)、地域 (西部比东南部, 70%比59%, $P=0.01$;西部比西南部, 70%比58%, $P=0.02$) 以及应答者对于合适的切皮前使用时机的意见 (80%的受试者主张常规切皮前给药, 17%主张常规在断脐后给药, 47%主张随从产科医师的意愿, 43%认为需要更多的信息) (所有比较 $P<0.001$) 对

于切皮前预防性应用抗生素存在显著差异。在该模型中，最大的区别因子为应答者关于合适的切皮前给药时机的认识（受试者工作特征曲线下面积变化=0.13比其余的 ≤ 0.02 ）

结论：对当前剖宫产预防性抗生素给药指南的遵守不统一。教育的开展、监管的实施和过程的改进应针对不遵守当前指南的麻醉医师所在地。

（王赞 译 马皓琳 李士通 校）

BACKGROUND: Current guidelines from the American College of Obstetricians and Gynecologists recommend antibiotic prophylaxis for cesarean delivery immediately before incision. The purpose of this study was to measure and describe correlates of adherence to these guidelines in a sample of United States anesthesiologists.

METHODS: We invited a random sample of the membership of the American Society of Anesthesiologists ($n = 10,000$) to complete an online survey.

RESULTS: Of 1052 respondents (10.5%) with complete information for analysis, 63.5% (95% confidence interval 60.6%, 66.3%, $n = 668$) reported preincision prophylaxis as the standard of care for scheduled cesarean delivery. Twenty-eight percent ($n = 299$) agreed that the anesthesiologist should take primary responsibility for prophylaxis timing. In a multivariable model, significant variability in preincision prophylaxis was noted for hospital type (community versus teaching, 62% vs 70%, $P = 0.004$), region (West versus Southeast, 70% vs 59%, $P = 0.01$; West versus Southwest, 70% vs 58%, $P = 0.02$), and respondents' belief in appropriate preincision timing (those endorsing routine preincision administration [80%], routine after cord clamp administration [17%], at the discretion of the obstetrician [47%], and the belief that more information was needed [43%]) ($P < 0.001$ all comparisons). Respondents' belief about appropriate preincision timing was the strongest discriminator in the model (change in area under the receiver operating characteristic curve = 0.13 vs ≤ 0.02 for all others).

CONCLUSION: Adherence with current prophylactic antibiotic administration guidelines for cesarean delivery is not uniform. Education initiatives, regulatory maneuvers, and process improvement should be targeted at sites where anesthesiologists do not comply with current guidelines.

成人心脏手术患者中脑近红外光谱监测与神经功能预后的关系：一篇系统性综述

Cerebral Near-Infrared Spectroscopy Monitoring and Neurologic Outcomes in Adult Cardiac Surgery Patients: A Systematic Review

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背景：近红外光谱在心脏手术中被用来监测脑灌注的充分性。在本篇系统性综述里，我们评估了可用的成年患者的数据来确定（1）在心脏手术中脑血氧定量的减低是否与脑卒中、术后认知功能障碍（POCD）或谵妄有关，以及（2）针对纠正脑血氧定量减低的措施是否能够改善神经功能的预后。

方法：我们搜索了PubMed、Cochrane和

Embase数据库，从起始到2012年1月31日，没有语言限制。还检查了每篇文章的参考文献

。如果文章没有原始数据（例如综述、评述），或没有在等同于综述类的杂志上发表全文（例如只有摘要）将被排除在外。首先筛选识别出的摘要，然后由两位独立的研究人员审阅合格文章的全文。对于合格的文章，我们记录了研究对象的数量、手术类型和神经功能研究终点的诊断标准。

结果：我们找出了符合入选标准的13篇病例报告、27篇观察性研究和2篇前瞻性随机干预试验。病例报告和2篇观察性研究包含的无对照证据表明局部的脑氧饱和度（ $rScO_2$ ）监测可以被用来识别心肺转流中的插管错位。9篇观察性研究中的6篇报道了急性 $rScO_2$ 降低与POCD之间的关联，其中POCD的测定基于简易精神状态检查（ $n=3$ 项研究）或更详细的认知功能测试（ $n=6$ 项研究）。两项回顾性研究报道了 $rScO_2$ 降低与术后脑卒中或I型和II型术后神经功能损伤的关系。观察性研究有很多限制，包括样本量小、评估只能在术后即刻进行以及不能进行风险调整。两项随机研究评估了用于治疗术中 $rScO_2$ 减低的干预的疗效，但是其中一项研究方案执行性较差。另外一项研究显示，干预治疗 $rScO_2$ 减低与不进行干预相比，主要器官损伤较少，ICU住院时间较短。

结论：心脏手术尤其在主动脉手术中 $rScO_2$ 的减低或许可以识别出心肺转流中插管错位。只有低级别的证据表明心脏手术中低 $rScO_2$ 导致术后神经功能的并发症，并且数据不足以表明通过干预措施改善 $rScO_2$ 的减低能够防止脑卒中或POCD。

（张怡 译 马皓琳 李士通校）

BACKGROUND: Near-infrared spectroscopy is used during cardiac surgery to monitor the adequacy of cerebral perfusion. In this systematic review, we evaluated available data for adult patients to determine (1) whether decrements in cerebral oximetry during cardiac surgery are associated with stroke, postoperative cognitive dysfunction (POCD), or delirium; and (2) whether interventions aimed at correcting cerebral oximetry decrements improve neurologic outcomes.

METHODS: We searched PubMed, Cochrane, and Embase databases from inception until January 31, 2012, without restriction on languages. Each article was examined for additional references. A publication was excluded if it did not include original data (e.g., review, commentary) or if it was not published as a full-length article in a peer-reviewed journal (e.g., abstract only). The identified abstracts were screened first, and full texts of eligible articles were reviewed independently by 2 investigators. For eligible publications, we recorded the number of subjects, type of surgery, and criteria for diagnosis of neurologic end points.

RESULTS: We identified 13 case reports, 27 observational studies, and 2 prospectively randomized intervention trials that met our inclusion criteria. Case reports and 2 observational studies contained anecdotal evidence suggesting that regional cerebral O_2 saturation ($rScO_2$) monitoring could be used to identify cardiopulmonary bypass cannula malposition. Six of 9 observational studies reported an association between acute $rScO_2$ desaturation and POCD based on the Mini-Mental State Examination ($n = 3$ studies) or more detailed cognitive testing ($n = 6$ studies). Two retrospective studies reported a relationship between $rScO_2$ desaturation and stroke or type I and II neurologic injury after surgery. The observational studies had many limitations, including small sample size, assessments only during the immediate postoperative period, and failure to perform risk adjustments. Two randomized studies evaluated the efficacy of interventions for treating $rScO_2$ desaturation during surgery, but adherence to the protocol was poor in one. In the other study, interventions for $rScO_2$ desaturation were associated with less major organ injury and shorter intensive care unit hospitalization compared with nonintervention.

CONCLUSIONS: Reductions in rScO₂ during cardiac surgery may identify cardiopulmonary bypass cannula malposition, particularly during aortic surgery. Only low-level evidence links low rScO₂ during cardiac surgery to postoperative neurologic complications, and data are insufficient to conclude that interventions to improve rScO₂ desaturation prevent stroke or POCD.

离体大鼠坐骨神经利多卡因吸收和清除动力学

Kinetics of Uptake and Washout of Lidocaine in Rat Sciatic Nerve In Vitro

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背景：临床上用于外周神经阻滞而注射的局部麻醉药的效价和效能很大程度上取决于神经药物吸收的速度。然而，因为通过血管系统扩散到周围组织以及去除是体内利多卡因总体分布的重要因素，所以必须研究去除那些干扰因子的真正的药物/神经组织相互作用的动力学。

方法：吸收：我们将有鞘或去鞘离体大鼠坐骨神经暴露于[¹⁴C]-

利多卡因0到180分钟后取出，然后分析神经和鞘内的利多卡因含量。清除：我们将离体神经浸泡于[¹⁴C]-

利多卡因内60分钟，然后置于无利多卡因的溶液内0到30分钟，并评估在不同时间取出的样本内药物含量。实验变量包括神经外膜鞘、利多卡因的浓度、pH、CO₂-碳酸氢盐的存在以及培养持续时间的影响。

结果：利多卡因的平衡吸收随培养时间、浓度以及非离子形式中的分子分数的增加而增加。虽然吸收率不受药物浓度的影响，但因神经外膜鞘的存在而大约减半，同时清除率却减慢得较少。使用碳酸氢盐-

CO₂缓冲液或非碳酸氢盐缓冲液将pH从6.8到7.4的轻微碱化能够增强神经吸收，而且可到相同程度。利多卡因的清除在高浓度短时间培养后比低浓度长时间培养后吸收的等量利多卡因更快。

结论：利多卡因进入神经的过程不同于自由扩散，而是通过有轻微障碍的神经外膜鞘。考虑到在体外快速进入与在体内小得多且短暂的含量测量相比，利多卡因与神经在外周阻滞时达到平衡似乎不太可能。

(唐莹 译 李士通 马皓琳 校)

BACKGROUND: The potency and efficacy of local anesthetics injected clinically for peripheral nerve block depends strongly on the rate of neural drug uptake. However, because diffusion into surrounding tissues and removal by the vascular system are major factors in the overall distribution of lidocaine in vivo, true kinetics of drug/neural tissue interactions must be studied in the absence of those confounding factors.

METHODS: Uptake: Ensheathed or desheathed isolated rat sciatic nerves were exposed to [¹⁴C]-lidocaine for 0 to 180 minutes and then removed and the lidocaine content of nerve and sheath analyzed. Washout: Isolated nerves were soaked in [¹⁴C]-lidocaine for 60 minutes and then placed in lidocaine-free solution for 0 to 30 minutes, with samples removed at different times to assess the drug content. Experimental variables included the effects of the ensheathing epineurium, lidocaine concentration, pH, presence of CO₂-bicarbonate, and incubation duration.

RESULTS: The equilibrium uptake of lidocaine increased with incubation time, concentration, and the fraction of molecules in the nonionized form. The uptake rate was unaffected by drug concentration, but was about halved by the presence of the epineurial sheath, with the washout rate slowed less. Slight alkalization, from pH 6.8 to pH 7.4, by bicarbonate-CO₂ buffer or a nonbicarbonate buffer, enhanced the neural uptake, and to the same degree. The washout of lidocaine was faster after shorter incubations at high concentrations than when equal amounts of lidocaine were taken up after long incubations at low lidocaine concentrations.

CONCLUSION: Lidocaine enters a nerve by a process other than free diffusion, through an epineurial sheath that is a slight obstacle. Given the rapid entry in vitro compared with the much smaller and transient content measured in vivo, it seems highly unlikely that lidocaine equilibrates with the nerve during a peripheral blockade.

疱疹后神经痛的鼠类模型中真皮层去神经支配的严重程度与机械性异常性疼痛和痛觉过敏的发展之间的联系

Association of Denervation Severity in the Dermis with the Development of Mechanical Allodynia and Hyperalgesia in a Murine Model of Postherpetic Neuralgia

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背景：疱疹后神经痛（PHN）是带状疱疹的一种常见并发症，而且会遗留神经病理性疼痛的具有挑战性的情况。异常性疼痛作为疱疹后神经痛的一个显著特点，会扩散到最初的皮疹面积以外的区域。在本研究中，我们通过使用PHN的鼠类模型研究了皮肤去神经支配与疱疹后异常性疼痛和痛觉过敏发展之间的联系。

方法：使用雌性C57BL/6j小鼠。将单纯疱疹病毒1型(HSV1)

接种于单侧小腿，这一区域主要是受

L3背根神经节（DRG）神经元支配。在带状疱疹样皮损愈合后，将小鼠按照在同侧后肢足底方面的机械性异常性疼痛和痛觉过敏的表现来分类。用一种蛋白基因产物的抗体(PGP9.5)将布满伤痕的腰（受L2-4 DRG神经元支配）和同侧足底（受L3-5 DRG神经元支配）的皮肤切片进行了免疫染色。分析在表皮和真皮中对PGP9.5有免疫反应（IR）的数量，用于皮肤神经支配的定量。

结果：在有疤痕的腰皮肤的表皮，有PGP9.5 -

IR特性的个体内平均数量在接种HSV1的小鼠中明显减少。有疤痕皮肤的表皮中PGP9.5 - IR的个体内最大和平均数量在有和没有疱疹后异常性疼痛和痛觉过敏的小鼠之间没有显著差异。在有疤痕的腰皮肤的真皮层，有疱疹后异常性疼痛和痛觉过敏的小鼠的PGP9.5 - IR个体内最大和平均数量显著下降，但这不适用于没有这些症状的小鼠。HSV1的接种使真皮和表皮中有PGP9.5 -

IR特性的个体内最低数量显著减少。HSV1接种使接种侧表皮中有PGP9.5 -

IR特性的个体内平均数目显著减少，但真皮不受影响。

结论：本研究结果表明，有疤痕的皮肤真皮去神经支配的严重程度与疱疹后异常性疼痛敏和痛觉过敏的发展相关，它们的发展会超出最初的皮疹面积的边缘。有疤痕的和刺激性皮肤的表皮神经密度的下降可能和疱疹后异常性疼痛和痛觉过敏没有关联。

（赵晓 译 马皓琳 李士通校）

BACKGROUND: Postherpetic neuralgia (PHN) is a common complication of herpes zoster and remains a challenging condition of neuropathic pain. Allodynia, a prominent feature of PHN, extends beyond the margins of the initial rash area. In the present study, we investigated the association between cutaneous denervation and the development of postherpetic allodynia and hyperalgesia by using a murine model of PHN.

METHODS: Female C57BL/6j mice were used. Herpes simplex virus type-1 (HSV1) was inoculated on the unilateral shin, a region that is predominantly innervated by L3 dorsal root ganglion (DRG) neurons. After the zoster-like skin lesions healed, mice were classified by the presence of mechanical allodynia and hyperalgesia in the plantar aspect of the ipsilateral hindpaw. Scarred lumbar (innervated by L2-4 DRG neurons) and the ipsilateral plantar (innervated by L3-5 DRG neurons) skin sections were immunostained with an antibody against protein gene product (PGP)9.5. The number of PGP9.5-immunoreactive (IR) profiles in the epidermis and dermis were analyzed for quantification of cutaneous innervation.

RESULTS: In the epidermis of the scarred lumbar skin, the intraindividual mean number of PGP9.5-IR profiles was significantly decreased in mice inoculated with HSV1. The intraindividual maximum and mean numbers of PGP9.5-IR profiles in the epidermis of the scarred skin were not significantly different between mice with and without postherpetic allodynia and hyperalgesia. In the dermis of the scarred lumbar skin, the intraindividual maximum and mean numbers of PGP9.5-IR profiles were significantly decreased in mice with postherpetic allodynia and hyperalgesia, but not in mice without these symptoms. The intraindividual minimum number of PGP9.5-IR profiles in the dermis and epidermis was significantly decreased by HSV1 inoculation. HSV1 inoculation significantly decreased the intraindividual mean number of PGP9.5-IR profiles in the epidermis, but not dermis, of the plantar skin on the inoculated side.

CONCLUSIONS: The present results suggest that the severity of dermal denervation in the scarred skin is associated with the development of postherpetic allodynia and hyperalgesia that extend beyond the margins of the initial rash area. The decrease of epidermal nerve density in the scarred and stimulation skins may not be associated with postherpetic allodynia and hyperalgesia.