使用导管交换器进行经皮扩张气管切开术

Percutaneous Dilatational Tracheostomy Using Tube Exchanger.

Ronen O1,2, Gurevich A3, Ivry S3, Altman E4, Kukuev E3.
1. From the Department of Otolaryngology, Head and Neck Surgery, Galilee Medical Center, Nahariya, Israel.
2. Azrieli Faculty of Medicine, Bar-Ilan University, Safed, Israel.
3. Department of Anesthesiology, Galilee Medical Center, Nahariya, Israel.
4. Surgery B, Galilee Medical Center, Nahariya, Israel.
Anesthesia & Analgesia: 2019 129 e45-e47

本文描述了一种使用 15F 导管交换器或 Eschmann 导管的改良经皮扩张气管切开术。这项对 1180 例使用该技术的回顾性研究显示，使用改良气管切开术是有效的，失败率仅 0.25%（3 例）。此外，该技术提供了额外的保护措施，它能在意外拔管的情况下快速将气管导管重新插入由交换导管引导的气管中。该技术不需要额外的特殊设施或装置（如支气管镜）。然而，该项目仍需要前瞻性研究来更好的明确此技术并发症的发生率。

（刘施雯 译 梁超、潘艳、薛张纲校）

We describe a modified technique for percutaneous dilatational tracheostomy using a 15F tube exchanger or Eschmann catheter. A retrospective review of 1180 procedures using this modified technique demonstrated it to be effective with a failure rate of only 0.25% (3 patients). Moreover, it provides an additional safeguard with the ability to rapidly reintroduce the endotracheal tube into the trachea guided by the exchange catheter in the event of accidental extubation during the procedure. This technique needs no additional special devices or equipment (eg, a bronchoscope). However, a prospective study is needed to better define its complication rate.

凝血因子 X 与活化凝血因子 VII 联合应用于稀释性凝血功能障碍

Prohemostatic Activity of Factor X in Combination With Activated Factor VII in Dilutional Coagulopathy.

Takeshita S1, Ogawa S1, Nakayama Y1, Mukai N1, Nakajima Y2, Mizobe T1, Sawa T1, Tanaka KA3.
Anesthesia & Analgesia: 2019 129 339-345

背景在复杂心脏手术中，重组活化因子 VII（rFVIIa）浓缩物可减少同种异体输血，但可能增加血栓栓塞并发症。活化凝血因子 VII（FVIIa）和因子 X（FX）（FVIIa/FX）(FVIIa:FX = 1:10）的混合物是血友病患者的新型旁路制剂。我们假设FX和FVII因子的组合可以改善如心脏手术中所见的获得性多因素凝血缺陷中的凝血酶生成（TG），并与其他在体外和体内稀释性血浆样本中使用的凝血因子浓缩物平行进行体外 FVIIa / FX 评估。

方法从 9 名健康志愿者和 12 名心脏手术患者收集血浆样品。我们使用体外 50%稀释血浆和体外循环后体内稀释血浆，通过血栓弹力测定法（ROTEM）和标准凝血测定法同时测量TG(凝血酶镜)。评估体外添加FVIIa / FX(0.35,0.7 和 1.4 μg/

mL，基于 FVIIa 水平），rFVIIa（1.4,2.8 和 6.4μg/mL），凝血酶原复合物浓缩物（0.3 国际单位）和 20％血浆置换时 TG 的情况。

结果在稀释血浆中，添加 FVIIa / FX 或 rFVIIa 缩短了时滞并增加了峰值 TG，但是 FVIIa / FX 在 0.35μg/mL 的效果比 rFVIIa 在 6.4μg/mL 时的效果更好。凝血酶原复合物浓缩物通过增加凝血酶原水平来增加峰值 TG，但未能缩短时滞。在用血浆替换 20％体积后，未观察到任何 TG 变量的改善。因子浓缩物的添加使凝血酶原时间/国际标准化比率标准化，但不进行血浆置换。在心脏病患者体外循环后的样本中可以观察到类似的 TG 模式。FVIIa / FX 在血栓弹力测定法上以浓度依赖性方式缩短凝血时间（CT）。血浆置换没有改善凝血时间，但血浆和 FVIIa / FX（0.35μg/mL）的组合比单独的 FVIIa / FX 更有效地缩短了凝血时间。

结论稀释性凝血病模型中，FVIIa 和 FX 的组合比单独使用 rFVIIa 或血浆更有效地改善凝血酶生成。FVIIa / FX 中所需的 FVIIa 剂量显着低于血友病患者旁路治疗期间报告的剂量（1.4-2.8μg/mL）。与单独使用 FVIIa / FX 相比，与血浆联合应用可以更有效地恢复凝血。用较少的 FVIIa 发挥促凝血活性在减少全身性血栓栓塞并发症方面可能是有利的。

（高璇 译 梁超、潘艳、薛张纲校）

BACKGROUND: Recombinant activated factor VII (rFVIIa) concentrate reduces allogeneic blood transfusions, but it may increase thromboembolic complications in complex cardiac surgery. The mixture of activated factor VII (FVIIa) and factor X (FX) (FVIIa/FX) (FVIIa:FX = 1:10) is a novel bypassing agent for hemophilia patients. We hypothesized that the combination of FX and FVIIa could improve thrombin generation (TG) in acquired multifactorial coagulation defects such as seen in cardiac surgery and conducted in vitro evaluation of FVIIa/FX in parallel with other coagulation factor concentrates using in vitro and in vivo diluted plasma samples.

METHODS: Plasma samples were collected from 9 healthy volunteers and 12 cardiac surgical patients. We measured TG (Thrombinoscope) using in vitro 50% dilution plasma and in vivo dilution plasma after cardiopulmonary bypass, in parallel with thromboelastometry (ROTEM) and standard coagulation assays. In vitro additions of FVIIa/FX (0.35, 0.7, and 1.4 μg/mL, based on the FVIIa level), rFVIIa (1.4, 2.8, and 6.4 μg/mL), prothrombin complex concentrate (0.3 international unit), and 20% plasma replacement were evaluated.

RESULTS: In diluted plasma, the addition of either FVIIa/FX or rFVIIa shortened the lag time and increased the peak TG, but the effect in lag time of FVIIa/FX at 0.35 μg/mL was more extensive than rFVIIa at 6.4 μg/mL. Prothrombin complex concentrate increased peak TG by increasing the prothrombin level but failed to shorten the lag time. No improvement in any of the TG variables was observed after 20% volume replacement with plasma. The addition of factor concentrates normalized prothrombin time/international normalized ratio but not with plasma replacement. In cardiac patients, similar patterns were observed on TG in

post-cardiopulmonary bypass samples. FVIIa/FX shortened clotting time (CT) in a concentration-dependent manner on CT on thromboelastometry. Plasma replacement did not improve CT, but a combination of plasma and FVIIa/FX (0.35 μg/mL) more effectively shortened CT than FVIIa/FX alone.
CONCLUSIONS: The combination of FVIIa and FX improved TG more efficiently than rFVIIa alone or plasma in dilutional coagulopathy models. The required FVIIa dose in FVIIa/FX was considerably lower than those reported during bypassing therapy in hemophilia patients (1.4-2.8 μg/mL). The combination of plasma could restore coagulation more efficiently compared to FVIIa/FX alone. Lesser FVIIa requirement to exert procoagulant activity may be favorable in terms of reducing systemic thromboembolic complications.

电子审计和反馈与积极的奖励提高麻醉供应商遵守基于条形码的药物安全系统
Electronic Audit and Feedback With Positive Rewards Improve Anesthesia Provider Compliance With a Barcode-Based Drug Safety System
Bowdle TA1, Jelacic S, Nair B, Zucker F, Bussey LS, Togashi K, Yang JT, Lang J.
1From the Department of Anesthesiology and Pain Medicine, University of Washington, Seattle, Washington.
Anesthesia & Analgesia: 2019 129 418-425

背景：我们在所有麻醉场所实施了之前描述的基于条形码的药物安全系统。在给药前，医生被要求使用我们的麻醉信息管理系统扫描注射器上的条形码，但是医生的依从率很低。我们研究了一个旨在提高扫描率的实施干预。
方法：我们使用麻醉信息管理系统和智能麻醉管理软件，对麻醉提供者的注射器用药进行了条形码扫描和非条形码扫描的量化。我们使用麻醉团队模型，其中主诊麻醉师与注册护士或住院医师配对。我们的系统确定了与特定药物管理相关的两个提供者，但没有区分哪些提供者实际管理药物。因此，每个特定案例的条形码扫描率被平均分配给两个提供者。基线扫描率是在 17 个月的时间内确定的。然后进行审计和反馈干预，包括每月通过电子邮件发送给各个供应商的业绩报告，以及为表现最好的员工颁发的咖啡礼品卡奖励。咖啡礼品卡只在干预的头 2 个月发放，而电子邮件的表现报告每月都在继续。咖啡卡奖被公诸于众。每月的电子邮件报告了单个麻醉提供者相对于其他提供者的表现排名顺序，但在其他方面是匿名的。基线扫描率与干预后 7 个月的扫描率进行比较。
结果：2014 年 11 月至 2017 年 3 月，我们收集了由 88 名麻醉医师、65 名注册麻醉护士、148 名住院医师执行的 60197 个病例。注射器给药的总数为 653,355。平均注射器条形码扫描表现从 2014 年 11 月至 2016 年 2 月的 8.7%提高到从 2016 年 9 月至 2017 年 3 月的 64.4%(P < .001)。个体之间的表现差异被标记出来，为从 0%到 100%的注射器扫描范围。一些人的表现表现出明显的随时间的振荡。与注册麻醉护士相比，住院医生的表现差异更大。
结论：从麻醉信息系统向提供者反馈单个提供者的表现数据，可以与其他措施一起使用，以改善表现。尽管平均表现有所改善，但个体之间的表现存在显著差异，有些个体的表现随着时间的推移出现了明显的波动。
（刘配配 译 梁超、潘艳、薛张纲校）

BACKGROUND: We implemented a previously described barcode-based drug safety system in all of our anesthetizing locations. Providers were instructed to scan the barcode on syringes using our Anesthesia Information Management System before drug administration, but the rate of provider adherence was low. We studied an implementation intervention intended to increase the rate of scanning.
METHODS: Using our Anesthesia Information Management System and Smart Anesthesia Manager software, we quantified syringe drug administrations by anesthesia providers with and without barcode scanning. We use an anesthesia team model in which an attending anesthesiologist is paired with a certified registered nurse anesthetist (CRNA) or a resident. Our system identified the pair of providers associated with a particular drug administration, but did not distinguish which providers actually administered the drug. Therefore, the rate of barcode scanning for a particular case was assigned to both providers equally. A baseline rate of scanning was established over a period of 17 months. An audit and feedback intervention was then performed that consisted of monthly performance reports sent by email to individual providers along with coffee gift card awards for top performers. The coffee gift cards were awarded in only the first 2 months of the intervention, while the email performance reports continued on a monthly basis. The coffee card awards were made public. The monthly emails reported the individual provider's rank order of performance relative to other providers, but was otherwise anonymous. The baseline rate of scanning was compared to the rate of scanning after the intervention for a period of 7 months.
RESULTS: From November 2014 to March 2017, we accumulated 60,197 cases performed by 88 attending anesthesiologists, 65 CRNAs, and 148 residents. The total number of syringe drug administrations was 653,355. Average scanning performance improved from 8.7% of syringe barcodes scanned during the baseline period from November 2014 to February 2016 to 64.4% scanned during the period September 2016 to March 2017 ($P < .001$). Variation in performance among individuals was marked, ranging from 0% to 100% of syringes scanned. The performance of some individuals showed marked oscillation over time. There was greater variation in performance attributable to residents than in performance attributable to CRNAs.
CONCLUSIONS: Feedback of individual provider performance data from the anesthesia information system to providers can be used in conjunction with other measures to improve performance. Despite improved average performance, there was marked variation in performance between individuals, and some individuals had marked oscillation of their performance over time.

测定 AnaConDa 的体积:在肺模型中评价一种新的小潮气量麻醉气体监测器。
.Halving the Volume of AnaConDa: Evaluation of a New Small-Volume

Anesthetic Reflector in a Test Lung Model

Bomberg, Hagen MD*; Meiser, Franziska MD*; Daume, Philipp MS*; Bellgardt, Martin MD†; Volk, Thomas MD*; Sessler, Daniel I. MD‡; Groesdonk, Heinrich V. MD*; Meiser, Andreas MD*

Anesthesia & Analgesia: 2019 129 371-379

背景:挥发性麻醉剂越来越多地应用于重症监护病房的镇静。最常见的给药系统是 AnaConDa-100 mL (ACD-100; Sedana Medical, Uppsala, Sweden)，这是一种反映了开放性回路中挥发性麻醉药物浓度的装置。AnaConDa-50 mL (ACD-50)是一种具有一半死腔的新装置。两种设备都能保留二氧化碳。因此，我们比较了两种装置的二氧化碳消除率和异氟醚的检测敏感度。

方法：将持续注入二氧化碳的试验肺以 500mL，10 次/分钟的潮气量进行通气。采用热湿式换热器(HME, 35ml)、ACD-100、ACD-50 等 3 种不同设备，在环境温度压力(ATP)、体温压力饱和(BTPS)、BTPS 中添加 0.4 Vol%异氟醚(ISO-0.4)、BTPS 中添加 1.2 Vol%异氟醚等 4 种不同的实验条件下，测量潮末二氧化碳分压(EtCO2)。在 3 个时间点(n = 150)记录每台设备和每种情况下的 50 次呼吸。为了确定设备的死腔量，我们调整了潮气量以维持每个设备的正常工作状态(n = 3)。然后，我们通过测量挥发速率从 0.5 到 20ml /h (n = 3)的异氟醚浓度来确定检测敏感度。

结果：与 ACD-50 和 HME 相比，ACD-100 的 EtCO2 始终大于后者(ISO-0.4，均值±标准差：ACD-100， 52.4 ± 0.8；ACD-50， 44.4 ± 0.8；HME,， 40.1 ± 0.4 mm Hg；EtCO2 均值差异[各自 95%置信区间]：ACD-100 - ACD-50， 8.0 [7.9-8.1] mm Hg， P < .001；ACD-100 - HME，12.3 [12.2-12.4] mm Hg，P < .001；ACD-50 - HME，4.3 [4.2-4.3] mm Hg，P <0.001)。ATP 组最大，BTPS 组最小，ISO-0.4 组和 1.2 Vol%异氟醚组最小。在使用异氟醚时，除了 ACD100mL 或 50 mL 的“检测死腔”外，添加 ACD-100 的“检测死腔”为 40 mL，添加 ACD-50 的“检测死腔”为 25 mL。ATP 作用下异氟醚反射最高。在 CO2 注入和异氟醚浓度为 0.4 Vol%左右的 BTPS 下，ACD-100 的检测效率为 93%，ACD-50 的检测效率为 80%

结论：在临床麻醉浓度下，ACD-50 对异氟醚的检测敏感度仍然足够，而对 CO2 的去除得到了改善。ACD-50 应该适用于潮气量低至 200 毫升的病人，即使是小潮气量病人也可以进行肺保护通气。

（何黄威 译 梁超、潘艳、薛张纲校）

BACKGROUND: Volatile anesthetics are increasingly used for sedation in intensive care units. The most common administration system is AnaConDa-100 mL (ACD-100; Sedana Medical, Uppsala, Sweden), which reflects volatile anesthetics in open ventilation circuits. AnaConDa-50 mL (ACD-50) is a new device with half the volumetric dead space. Carbon dioxide (CO2) can be retained with both devices. We therefore compared the CO2 elimination and isoflurane reflection efficiency of both devices.

METHODS:A test lung constantly insufflated with CO2 was ventilated with a tidal volume of 500 mL at 10 breaths/min. End-tidal CO2 (EtCO2) partial pressure was measured using 3 different devices: a heat-and-moisture exchanger (HME, 35 mL), ACD-100, and ACD-50 under 4 different experimental conditions: ambient temperature pressure (ATP), body temperature

pressure saturated (BTPS) conditions, BTPS with 0.4 Vol% isoflurane (ISO-0.4), and BTPS with 1.2 Vol% isoflurane. Fifty breaths were recorded at 3 time points (n = 150) for each device and each condition. To determine device dead space, we adjusted the tidal volume to maintain normocapnia (n = 3), for each device. Thereafter, we determined reflection efficiency by measuring isoflurane concentrations at infusion rates varying from 0.5 to 20 mL/h (n = 3), for each device.

RESULTS: EtCO2 was consistently greater with ACD-100 than with ACD-50 and HME (ISO-0.4, mean ± standard deviations: ACD-100, 52.4 ± 0.8; ACD-50, 44.4 ± 0.8; HME, 40.1 ± 0.4 mm Hg; differences of means of EtCO2 [respective 95% confidence intervals]: ACD-100 - ACD-50, 8.0 [7.9-8.1] mm Hg, P < .001; ACD-100 - HME, 12.3 [12.2-12.4] mm Hg, P < .001; ACD-50 - HME, 4.3 [4.2-4.3] mm Hg, P < .001). It was greatest under ATP, less under BTPS, and least with ISO-0.4 and BTPS with 1.2 Vol% isoflurane. In addition to the 100 or 50 mL "volumetric dead space" of each AnaConDa, "reflective dead space" was 40 mL with ACD-100 and 25 mL with ACD-50 when using isoflurane. Isoflurane reflection was highest under ATP. Under BTPS with CO2 insufflation and isoflurane concentrations around 0.4 Vol%, reflection efficiency was 93% with ACD-100 and 80% with ACD-50.

CONCLUSIONS: Isoflurane reflection remained sufficient with the ACD-50 at clinical anesthetic concentrations, while CO2 elimination was improved. The ACD-50 should be practical for tidal volumes as low as 200 mL, allowing lung-protective ventilation even in small patients.

在大鼠非创伤性出血性休克中，糖萼降解与血管屏障通透性增加无关。

Glycocalyx Degradation Is Independent of Vascular Barrier Permeability Increase in Nontraumatic Hemorrhagic Shock in Rats

Guerci, Philippe MD[*,†,‡]; Ergin, Bulent PhD[*,§]; Uz, Zuhre MD[*]; Ince, Yasin MSc[*]; Westphal, Martin MD, PhD[‖]; Heger, Michal PhD[¶]; Ince, Can PhD[*,§]

Anesthesia & Analgesia: 2019 129 598-607

背景：创伤性出血性休克或败血症性休克后糖萼缺如，以及不同的复苏液体，与血管屏障通透性增加有关，将导致组织水肿。在非创伤性出血性休克中，糖萼降解本身是否导致血管屏障通透性的改变仍值得怀疑。液体的组成也可以对糖萼脱落和血管屏障通透性有调节作用。我们假设，在第 n 个生理过程中，糖萼的脱落对血管屏障通透性的影响很小，并且液体的组成可以调节这些影响。

方法：全仪器化的白化大鼠接受压力控制的非创伤性出血性休克（平均动脉压 30 mm Hg）60 分钟。用醋酸盐林格式液、羟乙基淀粉溶液或 0.9%生理盐水对动物进行液体复苏，平均动脉压为 80 mmHg，并与假手术或非假性非创伤性出血性休克进行比较。在基线和液体复苏后 60 分钟测定糖萼脱落产物。用活体显微镜观察骨骼肌微循环。用 3 种荧光染料（40-500kDa 右旋糖酐和 70kDa 白蛋白）的血浆衰减、埃文斯蓝染料排斥、活体内荧光显微镜检查和组织水肿（湿/干重比）测定评估血管屏障通透性的变化。

结果：所有的糖萼脱落产物都因氮合酶而升级。n 组（g=-1668；95%可信区间

[CI]=-2336- -1001；p<0.0001)、平衡晶体（g=-964.2；95%可信区间[CI]=-1492- -436.4； p=0.0001）和羟乙基淀粉溶液（g=-1030；95%可信区间[CI]=-1594- -465.8； p=0.0001）的阳性率显著增加。实验组与对照组相比，在实验结束时，非依赖性非创伤性出血性休克（g=-923.1；95%可信区间[CI]=-1216- -630； P=0.0001）和平衡晶体（g=-1039；95%可信区间[CI]=-1332- -745.5；P=0.0001）或羟乙基淀粉溶液（g=-394.2；95%可信区间[CI]=-670.1- -118.3； P=0.0027）组的透明质酸水平较高。如显微术观察到的糖萼脱落导致微循环改变。与对照组相比，生理盐水组（g=4.092；95%可信区间[CI]=0.6195-7.564；P=0.016）和出血性休克组（g=5.022；95%可信区间[CI]=1.55-8.495；P=0.0024）的总血管密度以及灌注血管密度和平均流量指数均发生了变化。尽管内皮糖球降解，但由 4 种独立分析确定的血管屏障通透性仍保持完整，并在液体复苏后继续如此。

结论：氮合酶诱导糖萼脱落和微循环改变，而不改变血管屏障通透性。液体复苏部分恢复微循环，但不改变血管通透性。这些结果挑战了糖萼屏障对血管通透性的重要贡献这一概念。

(卢旭译梁超、潘艳、薛张纲校)

BACKGROUND: Glycocalyx shedding after traumatic hemorrhagic or septic shock, as well as different resuscitation fluids, has been causally linked to increased vascular barrier permeability (VBP) resulting in tissue edema. In nontraumatic hemorrhagic shock (NTHS), it remains questionable whether glycocalyx degradation in itself results in an alteration of VBP. The composition of fluids can also have a modulatory effect on glycocalyx shedding and VBP. We hypothesized that the shedding of the glycocalyx during NTHS has little effect on VBP and that the composition of fluids can modulate these effects.

METHODS: Fully instrumented Wistar-albino rats were subjected to a pressure-controlled NTHS (mean arterial pressure of 30 mm Hg) for 60 minutes. Animals were fluid resuscitated with Ringer's acetate, balanced hydroxyethyl starch (HES) solution, or 0.9% normal saline to a mean arterial pressure of 80 mm Hg and compared with shams or nonresuscitated NTHS. Glycocalyx shed products were determined at baseline and 60 minutes after fluid resuscitation. Skeletal muscle microcirculation was visualized using handheld vital microscopy. VBP changes were assessed using plasma decay of 3 fluorescent dyes (40- and 500-kDa dextran and 70-kDa albumin), Evans blue dye exclusion, intravital fluorescence microscopy, and determination of tissue edema (wet/dry weight ratio).

RESULTS: All glycocalyx shedding products were upgraded as a result of NTHS. Syndecan-1 significantly increased in NTHS (mean difference, -1668; 95% confidence interval [CI], -2336 to -1001; P < .0001), balanced crystalloid (mean difference, -964.2; 95% CI, -1492 to -436.4; P = .0001), and HES (mean difference, -1030; 95% CI, -1594 to -465.8; P = .0001) groups at the end of the experiment compared to baseline. Hyaluronan levels were higher at the end of the experiment in nonresuscitated NTHS (-923.1; 95% CI, -1216 to -630; P = .0001) and balanced crystalloid (-1039; 95% CI, -1332 to -745.5; P = .0001) or HES (-394.2; 95% CI, -670.1 to -118.3; P

= .0027) groups compared to controls. Glycocalyx shedding resulted in microcirculation alterations as observed by handheld video microscopy. Total vessel density was altered in the normal saline (mean difference, 4.092; 95% CI, 0.6195-7.564; P = .016) and hemorrhagic shock (mean difference, 5.022; 95% CI, 1.55-8.495; P = .0024) groups compared to the control group, as well as the perfused vessel density and mean flow index. Despite degradation of endothelial glycocalyx, VBP as determined by 4 independent assays remained intact and continued to be so following fluid resuscitation.
CONCLUSIONS: NTHS induced glycocalyx shedding and microcirculation alterations, without altering VBP. Fluid resuscitation partially restored the microcirculation without altering VBP. These results challenge the concept that the glycocalyx barrier is a significant contributor to VBP.

非心脏手术患者紧急超声心动图检查方案的发展

Development of a Rescue Echocardiography Protocol for Noncardiac Surgery Patients

Staudt GE, Shelton K.
Anesthesia & Analgesia. 2019 129 e37-40.

背景：在非心脏手术过程中发生血流动力学改变时，术中经食管超声心电图(TEE)是一种有效的诊断工具。然而，这种先进诊断工具的使用可能受到设备和接受培训的医生短缺的限制。创建紧急超声方案是为了提供进行救援 TEE 请求和实施的一项途径。作者所在机构于 2015 年 5 月制定了一项紧急超声方案并创建了一个正式的紧急超声服务（RES），同时还建立了一个认知辅助工具，该工具详细介绍了紧急超声方案，包括先前详细介绍的检查顺序、适应症、禁忌症和排除事件。
方法：收集在 2015 年 5 月 1 日至 2017 年 3 月 31 日的 22 个月期间由 RES 在非心脏手术中执行的所有术中接受 TEE 检查的患者名单，将病人归类为接受紧急或监测检查的病人。然后，分析接受了紧急检查的患者的临床数据，包括医疗记录、麻醉护理记录和超声心动图报告。收集的数据点包括人口数据（手术时的年龄、性别和 ASA 分类)、外科信息(外科服务和外科手术的类型)、紧急检查的适应症、TEE 检查结果、干预措施和出院的生存情况。通过对麻醉记录的回顾性审查进行干预措施的收集，实施的干预措施分为“管理上的改变”或“管理上的不改变”。如果符合以下标准之一的话，干预措施符合管理上的改变：1.药物使用的改变。2.液体管理的改变。3.新的或改变的外科手术程序。4.监护升级，如入住重症监护病房。
结果：研究对象 ASA 评级差异较大，但大部分都是 III 级（48 中例的 23 例）。手术方式各异，骨科手术和神经外科检查各占 14.5%（7/48），其次为血管外科，占 12.5%（6/48）。顽固性低血压是紧急 TEE 最常见的指征（47.9%），其次是心脏骤停（22.9%）和 ST 段改变（10.4%）。TEE 的发现分为 10 类。有些病例显示>1 项发现，占总数>48 项，额外发现百分比>100%。47.5%（48 例中的 23 名）病例符合这一最常见的结论。20.8%病例（48 例中的 10 例）显示左室较小，高动力

状态，舒张期充盈不足且心输出量低，被诊断为低血容量。紧急 TEE 后，72.9%的患者管理发生变化，部分患者采取了多种干预措施。

结论：随着具有特定指导方针、教育目标和人员管理的规范化发展，在非心脏手术血流动力学不稳定的情况下，紧急超声心动图可用于指导管理。

（牛芳芳 译　陈杰 校）

Background: Intraoperative transesophageal echocardiography (TEE) is a helpful diagnostic tool when hemodynamic compromise is encountered during noncardiac surgery. At our institution, a Rescue Echo Protocol was created to provide a structured means for requesting and performing a rescue TEE. At our institution, a Rescue Echo Protocol was created in May 2015 to enable access to TEE services in noncardiac operating rooms. Finally, to strengthen the educational component of our service, we created a cognitive aid detailing the Rescue Echo Protocol, including the examination sequence detailed earlier, indications, contraindications, and events to exclude.

Methods: Billing data were used to compile a list of all intraoperative TEEs that were performed by RES in noncardiac procedures over a 22-month period from May 1, 2015 to March 31, 2017. Anesthesia care records were reviewed, and patients were classifed as undergoing either a rescue or monitoring examination. Medical records, anesthesia care records, and echocardiographic reports were analyzed. Data points collected included demographic data (age at the time of surgery, sex, and ASA classifcation), surgical information (surgical service and type of surgical procedure), indication for rescue examination, TEE fndings, interventions performed, and survival to hospital discharge. Interventions were collected through retrospective review of anesthesia records. Performed interventions were further grouped into either “change in management” or “no change in management.” An intervention qualifed as a change in management if one of the following criteria was met: 1. Alteration in medication administration. 2. Change in fluid management strategy. 3. New or altered surgical procedure. 4. Escalation in the level of care, such as intensive care unit admission.

Results: There was wide range of ASA classifcations; however, the majority of patients was ASA III (23/48). A wide variety of surgical services were represented. Orthopedic surgery and neurosurgery each accounted for 14.5% (7/48) of examinations, followed by vascular surgery at 12.5% (6/48). The most common indication for rescue TEE was refractory hypotension (47.9%). This was followed by cardiac arrest (22.9%) and ST changes (10.4%). TEE findings were classifed into 10 categories. Some studies revealed >1 finding, with accounts for a count of >48 studies and an additive percentage of >100%. This was the most common conclusion, seen in 23 of 48 studies (47.5%). Hypovolemia was diagnosed by visualizing a small, hyperdynamic ventricle with inadequate diastolic flling and low estimated cardiac output, seen in 10 of 48 examinations (20.8%). The patients (72.9%)

had a change in management after rescue TEE, and some had multiple interventions.
Conclusions: With the development of a structured protocol with specifc guidelines, educational goals, and personnel management, rescue echocardiography may be used to guide management during times of hemodynamic instability in noncardiac surgery.

成人恶性高热易感患者与门诊手术中心：美国麻醉医师协会门诊麻醉学会和门诊手术监护委员会的立场声明

Malignant Hyperthermia–Susceptible Adult Patient and Ambulatory Surgery Center: Society for Ambulatory Anesthesia and Ambulatory Surgical Care Committee of the American Society of Anesthesiologists Position Statement

Urman, Richard D. MD, MBA*; Rajan, Niraja MD†; Belani, Kumar MBBS, MS‡; Gayer, Steven MD, MBA§; Joshi, Girish P. MBBS, MD, FFARCSI‖
Anesthesia & Analgesia: 2019 129 347-349
背景：在独立的门诊手术中心（ASC）中，对已知的恶性高热（MH）易感患者进行手术仍存在争议。本文阐述了成人恶性高热（MH）易感患者在独立门诊手术中心（ASC）中的安全麻醉监护。
方法：本研究探讨了恶性高热易感患者术前鉴别和预防，术中麻醉管理、术后监测以及恶性高热危象的处理措施。
结果：MH 易感性状态的确定应个体化且基于患者病史和体格检查。对于计划进行手术的 MH 易感患者，使用丹曲林进行术前预防并非正确。手术过程中应减少或防止 MH 易感患者接触挥发性麻醉剂。在围手术期间，必须警惕监测患者的 MH 体征和/或症状。麻醉后恢复室（PACU）应继续密切观察和监测。当发生恶性高热危象时，应立即使用丹曲林。
结论：假设采取了适当措施预防，识别和管理恶性高热，MH 易感患者就可以安全地在一个独立的门诊手术中心进行手术。要做到早发现、早治疗，并及时转运至有此类处理经验的重症监护部门，患者才能在 ASC 环境下安全度过 MH 危象。
（蒋涛 译 陈杰 校）
Background: Performing surgery in a patient with known susceptibility to malignant hyperthermia (MH) in a free-standing ambulatory surgery center (ASC) remains controversial. This document is concerned with the safe anesthetic care of adult malignant hyperthermia (MH)-susceptible patients in a free-standing ambulatory surgery center (ASC).
Methods: This study investigated preoperative identification and prevention, intraoperative anesthesia management, postoperative monitoring of MH-susceptible patients and treatment of MH crisis.
Results: Determination of MH susceptibility status should be individualized and based on the history and physical examination. The administration of preoperative prophylaxis with dantrolene is not indicated in MH-susceptible patients scheduled for surgery. MH-susceptible should be reduced or prevented from exposure to volatile anesthetics during surgery.Patients must be vigilantly monitored for

signs and/or symptoms of MH during the perioperative period.Close observation and monitoring should continue in the postanesthesia care unit (PACU). Dantrolene should be used immediately when malignant hyperthermia crisis occurs.

Conclusion： MH-susceptible patients can safely undergo procedures in a free-standing ASC assuming that proper precautions for preventing, identifying, and managing MH are taken. Patient survival from an MH crisis in an ASC setting requires early recognition, prompt treatment, and timely transfer to a facility with critical care capabilities.

关于正常气道患者面罩通气检查前后罗库溴铵早期和晚期给药的随机试验

Randomized Trial Comparing Early and Late Administration of Rocuronium Before and After Checking Mask Ventilation in Patients With Normal Airways

Se-Hee Min, MD,* Hyunjae Im, MD,† Bo Rim Kim, MD,* Susie Yoon, MD,* Jae-Hyon Bahk, MD, PhD,* and Jeong-Hwa Seo, MD, PhD*

Anesthesia & Analgesia: 2019 129 380-386

背景：在全身麻醉诱导期间，通常的做法是在保证提供面罩通气成功之后才给予肌松药。然而，这种方法的好处从未得到科学验证。因此，作者比较了在检查面罩通气之前和之后罗库溴铵的早期和晚期应用来研究面罩通气的效率和正常气道患者的气管插管时间。

方法：114 名患者随机接受在检查面罩通气之前（早期罗库溴铵组，n = 58）或之后（晚期罗库溴铵组，n = 56）静脉输注罗库溴铵。在面罩通气期间呼吸暂停后分别在 10,20,30,40,50 和 60 秒测量呼气潮气量（VT）。作者评估了面罩通气的难易程度，并记录了从呼吸暂停到气管插管的时间。主要结果是在呼吸暂停后 10,20,30,40,50 和 60 秒测量的面罩 VT 的平均值。主要的次要结果是从呼吸暂停到气管插管的时间。统计方法为 STATA。

结果：早期罗库溴铵组在呼吸暂停后 10,20,30,40,50 和 60 秒测量的面罩 VT 平均值比晚期罗库溴铵组药更大（552 ml/呼吸 [165 ml/呼吸]） vs 393 ml/呼吸 [165 ml/呼吸]，平均差异，160 ml/呼吸; 95%CI，98-221 ml/呼吸; $p<0.001$，非配对 t 检验）。因为在呼吸暂停后 10,20,30,40,50 和 60 秒测量的面罩 VT 中，时间和组之间的相互作用是显着的（$p<0.001$，线性混合效应模型），在 6 个时间点进行成对比较。在呼吸暂停后 10,20,30,40 和 50 秒两组间 VT 的差异显着（$p<0.001$，STATA 中的对比表述）。早期罗库溴铵组从呼吸暂停到气管插管的时间短于晚期罗库溴铵组(116 秒[42 秒] vs 195 秒[41 秒];平均差异,-79 秒; 95% CI，-96 至 - 64 秒，$p <0.001$)。

结论：在正常气道患者中检查面罩通气前早期给予罗库溴铵与在检查面罩通气之后晚期给予罗库溴铵相比，可提供更大的面罩 VT 和更快的气管插管。

（陈陈 译　陈杰 校）

Background: During induction of general anesthesia, it is common practice to delay neuromuscular blockade until the ability to deliver mask ventilation has been confirmed. However, the benefits of this approach have never been scientifically validated. We thus compared the early and

late administration of rocuronium before and after checking mask ventilation to investigate the efficiency of mask ventilation and the time to tracheal intubation in patients with normal airways.

Methods: Patients (n = 114) were randomized to receive IV rocuronium either before (early rocuronium group, n = 58) or after (late rocuronium group, n = 56) checking mask ventilation. Expiratory tidal volumes (VTs) were measured at 10, 20, 30, 40, 50, and 60 seconds after apnea during mask ventilation. We graded the ease of mask ventilation and measured the time from apnea to tracheal intubation. The primary outcome was the average of mask VTs measured at 10, 20, 30, 40, 50, and 60 seconds after apnea. The main secondary outcome was the time from apnea to tracheal intubation. STATA was used for statistical analysis.

Results: The average of mask VTs measured at 10, 20, 30, 40, 50, and 60 seconds after apnea was larger in the early rocuronium group than in the late rocuronium group (552 mL breath-1 [165 mL breath-1] vs 393 mL breath -1 [165 mL breath-1], mean difference, 160 mL breath-1; 95% CI, 98-221 mL breath-1; P < .001, unpaired t test). Because the interaction between time and group was significant in mask VTs measured at 10, 20, 30, 40, 50, and 60 seconds after apnea (P < .001, linear mixed effects model), pairwise comparisons were performed at the 6 time points. The differences in VTs between the groups were significant at 10, 20, 30, 40, and 50 seconds after apnea (P < .001 each, contrast statements in STATA). The time from apnea to tracheal intubation was shorter in the early rocuronium group than in the late rocuronium group (116 seconds [42 seconds] vs 195 seconds [41 seconds]; mean difference, -79 seconds; 95% CI, -96 to -64 seconds, P < .001).

Conclusions: The early administration of rocuronium before checking mask ventilation resulted in a larger mask VT and earlier tracheal intubation than the late administration of rocuronium after checking mask ventilation in patients with normal airways.

使用单次呼吸检测法比较 7 种不同传感器在检测非插管镇静志愿者的低呼吸频率方面的影响

Comparison of 7 Different Sensors for Detecting Low Respiratory Rates Using a Single Breath Detection Algorithm in Nonintubated , Sedated Volunteers

Sean Ermer, BS, Lara Brewer, PhD, Joe Orr, PhD, Talmage D. Egan, MD, and Ken Johnson, MD

Anesthesia & Analgesia: 2019 129 399-408

背景：有许多技术可用于监测非气管插管患者的呼吸频率，但目前尚无一种技术可成为标准，本研究主要目的是比较一种参照传感器信号（呼吸电感容积描记法）和七种替代传感器信号（经鼻二氧化碳检测计，鼻压力传感器，经口鼻热敏电阻，腹部加速度计，跨肺电阻抗法，围气管麦克风检测法，光电容积描记法）在评估

非插管、镇静仰卧位志愿者中所允许能检测到的低呼吸频率次数的一致性评价。每个传感器都采用基于单次呼吸检测法的统一方法以便比较。作者假设所有的传感器信号都能检测到参照传感器信号的低呼吸频率（〈8 次/分～12 次/分〉。

方法：志愿者接受瑞芬太尼和丙泊酚预设剂量的靶控输注来诱导低通气，采用相同阈值的检测算法对每个传感器的信号进行分析来计算呼吸频率。采用 Bland-Altman 一致性极限和误差率分析方法，对各传感器的性能和参照传感器进行比较。

结果：使用 Bland-Altman 一致性极限和误差率分析方法对加速度计和二氧化碳检测计的信号分析发现，它们是 7 个传感器的呼吸频率检测中一致性最高的（在 1.96*标准误），可检测的呼吸频率分别为-2.1－2.2 次/分和-2.52.7 次/分。与前两者相比，其他信号都表现出更宽的检出范围，其中最宽的为跨肺电阻抗法，为-7.8—7.4 次/分。腹部加速度计 95%的 Bland-Altman 数据点在-2～2 次/分呼吸频率范围内。二氧化碳检测计有 96%的 Bland-Altman 数据点在-2～2 次/分呼吸频率范围内。鼻压法、热敏电阻法、麦克风法均有 80%的数据点在-2～2 次/分内，阻抗法和光电容积描记法能检测到-2～2 次/分呼吸频率的数据点分别为 58%和 64%。

结论：一种统一的方法可以应用于各种传感器信号来估计自主呼吸、非插管、镇静志愿者的呼吸频率。然而，检测临床相关的低呼吸频率（<6 次/分）仍是一项技术挑战。通过作者分析，无一传感器能够有足够精度来检测缓慢的呼吸频率（参考信号在<±2 次/分）。在评估的传感器中，二氧化碳检测计和腹部加速度计可能是识别低通气和呼吸暂停最可靠的传感器。

（陈永辉 译　陈杰 校）

Background: Numerous technologies are used to monitor respiratory rates in nonintubated patients. No technology has emerged as the standard. The primary aim of this study was to assess the limits of agreement between a reference sensor signal (respiratory inductance plethysmography bands) and 7 alternative sensor signals (nasal capnometer, nasal pressure transducer, oronasal thermistor, abdominal accelerometer, transpulmonary electrical impedance, peritracheal microphone, and photoplethysmography) for measuring low respiratory rates in sedated, nonintubated, supine volunteers. A unifed approach based on a single breath detection algorithm was applied to each sensor to facilitate comparison. We hypothesized that all of the sensor signals would allow detection of low (<10 breaths per minute) respiratory rates to within ±2 breaths per minute of the reference sensor signal.

Methods: Volunteers received remifentanil and propofol infusions at selected target concentration pairs to induce depression of ventilation. Signals from each sensor were analyzed by an identical threshold-based detection algorithm to compute the breathing rate. Bland-Altman limits of agreement and error rate analyses were used to characterize the performance of each sensor compared to the reference sensor.

Results: The analysis of the accelerometer and capnometer signals, using Bland-Altman and error rate analyses, showed the highest breath rate agreement (1.96 × standard deviation) of the 7 sensors with -2.1 to 2.2

and -2.5 to 2.7 breaths per minute, respectively. All other signals exhibited wider limits of agreement, with impedance being the widest at -7.8 to 7.4 breaths per minute. For the abdomen accelerometer, 95% of Bland-Altman data points were within ±2 breaths per minute. For the capnometer, 96% of data points were within ±2 breaths per minute. Nasal pressure, thermistor, and microphone all had >80% of data points within ±2 breaths per minute. Impedance and photoplethysmograph signals had 58% and 64%, respectively.

Conclusions: A unifed approach can be applied to a variety of sensor signals to estimate respiratory rates in spontaneously breathing, nonintubated, sedated volunteers. However, detecting clinically relevant low respiratory rates (<6 breaths per minute) is a technical challenge. By our analysis, no single sensor was able to detect slow respiratory rates with adequate precision (<±2 breaths per minute of the reference signal). Of the sensors evaluated, capnometers and abdominal accelerometers may be the most reliable sensors for identifying hypopnea and central apnea.

激活脊髓原肌球蛋白 β 受体减轻大鼠神经病理性疼痛发挥内源性镇痛机制

Spinal Activation of Tropomyosin Receptor Kinase-B Recovers the Impaired Endogenous Analgesia in Neuropathic Pain Rats

Kato, Daiki MS*; Suto, Takashi MD, PhD*; Obata, Hideaki MD, PhD†; Saito, Shigeru MD, PhD*

Anesthesia & Analgesia: 2019 129 578-586

背景：内源性镇痛在控制疼痛状态方面起着重要作用,与健康个体相比,慢性疼痛患者内源性镇痛机制减弱。伤害性刺激诱导的镇痛作用（NSIA），作为内源性的镇痛指标，在脊神经结扎 6 周后的大鼠（SNL6W）体内是减弱的。最近对去甲肾上腺素能纤维缺失大鼠进行的一项研究表明，去甲肾上腺素能纤维对 NSIA 至关重要。据报道，脑源性神经营养因子增加了脊髓去甲肾上腺素能纤维。因此，本研究检测了脑源性神经营养因子受体 TrkB 活化对 SNL6W 大鼠受损的 NSIA 的作用。此外还检测了内源性镇痛对急性切口疼痛的影响。

方法：每天腹腔注射 7,8-二羟基黄酮（7,8-DHF，TrkB 激动剂，5 mg / kg）5 次后，在前爪中注射辣椒素（250 μg），30min 后测量左侧（对侧神经结扎）后爪的退缩阈值增量来检测 NSIA。 K252a（TrkB 拮抗剂，2 μg）鞘内施用 5d。Idazoxan（α 2 肾上腺素能受体拮抗剂，30 μg），阿托品（毒蕈碱拮抗剂，30 μg）和普萘洛尔（非选择性 β 肾上腺素受体拮抗剂，30 μg）在注射辣椒素前 15min 鞘内给药。采用微透析和免疫组织化学检测法来检测脊髓背角的去甲肾上腺素可塑性。在左侧（对侧神经结扎）进行后爪切口。通过单因素方差分析或双向重复测量方法分析数据，单因素方差分析，然后使用 Bonferroni 校正进行 Student t 检验。

结果：每天 5 次腹腔注射 7,8-DHF 可恢复 SNL6W 大鼠 NSIA 的减弱（n = 7，P = .002；评估疗效[95%CI]：62.9 [27.0-98.7] g），此效应可被 K252a 阻断（n = 6，P <.001; -57.8 [-78.3 至-37.2] g）。此效应也受到单次鞘内注射的 Idazoxan（n = 8，P <.001; -61.6 [-92.4 至-30.9] g）和阿托品 (n = 8, P = .003; -52.6 [-73.3 to -31.9] g)抑制，但不受

普萘洛尔抑制。此外，7,8-DHF 增加脊髓背角中的去甲肾上腺素能纤维和其所释放的去甲肾上腺素释放。并且，重复注射 7,8-DHF 可阻止 SNL6W 大鼠切口疼痛恢复延迟。

结论：TrkB 的脊髓激活可以通过提高肾上腺素能的可塑性来恢复减弱的内源性镇痛，从而缩短术后疼痛的时间。

（沙婷婷 译　陈杰 校）

Background: Although endogenous analgesia plays an important role in controlling pain states, chronic pain patients exhibit decreased endogenous analgesia compared to healthy individuals. In rats, noxious stimulus–induced analgesia (NSIA), which is an indicator of endogenous analgesia, diminished 6 weeks after spinal nerve ligation (SNL6W). A recent study in rats with deleted noradrenergic fbers demonstrated that the noradrenergic fbers were essential to NSIA. It has also been reported that brain-derived neurotrophic factor increased spinal noradrenergic fbers. Therefore, this study examined the effect of TrkB activation, which is the receptor for brain-derived neurotrophic factor, on impaired NSIA in SNL6W rats. In addition, we also examined the effect of endogenous analgesia on acute incisional pain.

Methods: After 5 daily intraperitoneal injections of 7,8-dihydroxyflavone (7,8-DHF, TrkB agonist, 5mg/kg), NSIA was examined by measuring the withdrawal threshold increment in the left (contralateral to nerve ligation) hindpaw at 30 minutes after capsaicin injection (250 μg) in the forepaw. K252a (TrkB antagonist, 2 μg) was administrated intrathecally for 5 days. Idazoxan (α2 adrenoceptor antagonist, 30 μg), atropine (muscarinic antagonist, 30 μg), and propranolol (nonselective β antagonist, 30 μg) were administered intrathecally for 15 minutes before capsaicin injection. Microdialysis and immunohistochemistry were performed to examine the noradrenergic plasticity in the spinal dorsal horn. A hindpaw incision was performed on the left (contralateral to nerve ligation) hindpaw. Data were analyzed by 1-way analyses of variance or 2-way repeatedmeasures 1-way analysis of variance followed by a Student t test with Bonferroni correction.

Results: Five daily intraperitoneal injections of 7,8-DHF restored the attenuated NSIA in SNL6W rats ($n = 7$, $P = .002$; estimated treatment effect [95% CI]: 62.9 [27.0–98.7] g), with this effect blocked by 5 daily intrathecal coadministrations of K252a ($n = 6$, $P < .001$; −57.8 [−78.3 to −37.2] g). This effect was also inhibited by a single intrathecal administration of idazoxan ($n = 8$, $P < .001$; −61.6 [–92.4 to −30.9] g) and atropine ($n = 8$, $P = .003$; −52.6 [–73.3 to −31.9] g), but not by propranolol. Furthermore, 7,8-DHF increased the noradrenergic fber in the spinal dorsal horn and the noradrenaline release in response to the capsaicin injection in the forepaw in SNL6W rats. In addition, repeated injections of 7,8-DHF prevented delayed recovery from incisional pain in SNL6W rats.

Conclusions: Spinal activation of TrkB may recover the attenuated endogenous analgesia by improving the adrenergic plasticity, thereby leading to prevention of pain prolongation after surgery.

异丙酚通过钙调蛋白依赖性蛋白激酶 II/AMPK/ATF5 信号轴调控神经干细胞的增殖和分化。

Propofol Regulates Neural Stem Cell Proliferation and Differentiation via Calmodulin-Dependent Protein Kinase II/AMPK/ATF5 Signaling Axis

Liang, Chao PhD; Du, Fang MD; Wang, Jiaxing PhD; Cang, Jing MD; Xue, Zhanggang MD

Anesthesia & Analgesia: 2019 129 608-617

背景：异丙酚可以引起发育中脑细胞退变，从而导致相关的长期学习或记忆损害。然而，异丙酚抑制神经干细胞在胚胎发育早期发育的分子机制尚且不明。本研究旨在明确异丙酚在抑制神经干细胞发育的作用，进一步探索其机制。

方法：首先，向怀孕大鼠腹腔内单次注射异丙酚，注射后 6h 抽取海马体 RNA 和胚胎大脑蛋白并检测神经元特异标志物的表达。其次，从老鼠胚胎脑的海马体中分离出原始神经干细胞，使用异丙酚处理，进行细胞活性、免疫染色和 transwell 试验。除此之外采用 RNA 测序，利用 q-逆转录聚合酶链式反应明确异丙酚对基因表达的调控。同时使用免疫印迹、小片段干扰 RNA（SiRNA）和荧光素酶测定来研究异丙酚在钙调蛋白依赖性蛋白激酶 II（CaMkII）、腺苷酸活化蛋白激酶（AMPK）、激活转录因子 5（ATF5）信号通路中的作用。

结果：研究结果表明，异丙酚治疗可以抑制神经干细胞的增殖、迁移和分化。RNA 测序显示异丙酚促使一组 Ca^{2+} 依赖基因的下游调节。后续的机制研究显示，异丙酚通过 CaMkII、氨基酸 485 位点的丝氨酸磷酸化（pS485）、AMPK、ATF5 信号通路调节神经干细胞的增殖、分化和迁移。

结论：本研究结果提示，异丙酚抑制神经干细胞的增殖，分化和迁移，而这些效应部分由 CaMkII、pS485、AMPK、ATF5 信号通路调节。

（刘碧莹 译 陈杰 校）

Background: Propofol can cause degeneration of developing brain cells and subsequent long-term learning or memory impairment. However, at the early stage of embryonic development, the molecular mechanism of propofol-induced inhibition in neural stem cells (NSCs) neurogenesis is still unclear. The aim of this study was to determine the role of propofol in NSCs neurogenesis and, more importantly, to explore the underlying mechanism.

Methods: First, a single intraperitoneal injection of propofol was performed in pregnant mice, and 6 hours after administration of propofol, the hippocampus RNA and the protein of the embryos' brains was extracted to analyze the expression of neuron-specifc markers. Second, the primary NSCs were isolated from the hippocampus of mouse embryonic brain and then treated with propofol for cell viability, immunostaining, and transwell assays; more importantly, we performed RNA sequencing (RNA-seq) and q-reverse transcription polymerase chain reaction assays to identify genes regulated by propofol; the Western blot, small interfering RNA

(SiRNA), and luciferase reporter assays were used to study the effects of propofol on calmodulin-dependent protein kinase (CaMk) II/5' adenosine monophosphate-activated protein kinase (AMPK)/activating transcription factor 5 (ATF5) signaling pathway.
Results: Our results indicated that propofol treatment could inhibit the proliferation, migration, and differentiation of NSCs. The results of RNA-seq assays showed that propofol treatment resulted in downregulation of a group of Ca2+-dependent genes. The following mechanism studies showed that propofol regulates the proliferation, differentiation, and migration of NSCs through the CaMkII/phosphorylation of serine at amino acid position 485 (pS485)/AMPK/ATF5 signaling pathway.
Conclusions: The results from study demonstrated that propofol inhibits the proliferation, differentiation, and migration of NSCs, and these effects are partially mediated by CaMkII/pS485/AMPK/ATF5 signaling pathway.

体外循环过程中的抗凝治疗与肝素抵抗：心血管麻醉医师协会会员调查 Anticoagulation Management and Heparin Resistance During Cardiopulmonary Bypass: A Survey of Society of Cardiovascular Anesthesiologists Members

Sniecinski, Roman M. MD, MSc*; Bennett-Guerrero, Elliott MD†; Shore-Lesserson, Linda MD‡

Anesthesia & Analgesia: 2019 129 e41-e44

我们调查了心血管麻醉医师协会成员关于体外循环中的抗凝及对肝素抵抗的态度。在550名受试者（占应答率的18.5%）中，74.9%（95%可信区间为71.3%-78.5%）根据经验按公斤体重使用了肝素剂量，70.7%（95%可信区间为 66.9%-74.5%）以激活凝血时间（ACT）400 或 480 秒作为开始体外循环的抗凝目标。值得注意的是，17.1%（95%可信区间为13.9%-20.2%）的受访者报告激活凝血时间目标低于2018年胸外科医师学会/心血管麻醉医师学会/美国体外技术学会指南建议的目标，或根本未能监测肝素的有效性。当遇到肝素抵抗时，54.2%的受试者(95%可信区间为50.0%-58.4%)将抗凝血酶复合物作为一线治疗手段。
We surveyed Society of Cardiovascular Anesthesiologists members regarding anticoagulation practices for cardiopulmonary bypass and attitudes on heparin resistance. Of 550 respondents (18.5% response rate), 74.9% (95% CI, 71.3%-78.5%) used empiric weight-based dosing of heparin, and 70.7% (95% CI, 66.9%-74.5%) targeted an activated clotting time of either 400 or 480 seconds to initiate cardiopulmonary bypass. Of note, 17.1% (95% CI, 13.9%-20.2%) of respondents reported activated clotting time targets lower than those recommended by recent 2018 Society of Thoracic Surgeons/Society of Cardiovascular Anesthesiologists/American Society of Extracorporeal Technology guidelines or failed to monitor heparin effects at all. When heparin resistance was encountered, 54.2% of respondents (95% CI, 50.0%-58.4%) administered antithrombin concentrates as a first-line therapy.
（吴洁译 李士通校）

在独立的门诊手术机构中接受癌症手术的阻塞性睡眠呼吸暂停患者的预后和安全性

Outcomes and Safety Among Patients With Obstructive Sleep Apnea Undergoing Cancer Surgery Procedures in a Freestanding Ambulatory Surgical Facility

Szeto, Betsy MPH*; Vertosick, Emily A. MPH†; Ruiz, Karin RT*; Tokita, Hanae MD*; Vickers, Andrew PhD†; Assel, Melissa MS†; Simon, Brett A. MD, PhD*; Twersky, Rebecca S. MD, MPH*

Anesthesia & Analgesia: 2019 129 360-368

背景：患有阻塞性睡眠呼吸暂停（OSA）的患者围手术期严重并发症的风险可能会增加。对于患有 OSA 的患者进行的门诊手术的适用性仍然存在争议，一些国家指导方针要求更多的证据来评估临床显著的结果。在本研究中，我们调查了 OSA 状态（STOP-BANG 量表风险，或早前已诊断的患者）与在独立门诊手术室接受癌症手术的患者的短期结果和安全性之间的关系。

方法：我们对所有在 Josie Robertson 手术中心进行手术的患者进行了回顾性分析，该中心是 Sloan Kettering 癌症纪念中心的独立式门诊手术中心。手术包括较复杂的通常患者需要延长恢复时间至过夜的门诊手术，如乳房切除术、甲状腺切除术、微创子宫切除术、前列腺切除术和肾切除术，以及其他典型的日间手术。单变量和多变量分析均用于评估 OSA 风险与手术后 30 天内转运到总院、急诊中心就诊和医院再入院（主要结果）以及住院时间和出院时间（次要结果）之间的关系。多变量模型根据年龄、美国麻醉师学会评分（ASA 评分）、机器人手术和麻醉方式（全身麻醉或监护性麻醉）进行了调整，并根据住院时间和出院时间的结果对手术开始时间进行了调整。采用 x 检验评估 OSA 风险与呼吸事件和使用器械保证通气之间的关系。

结果：在分析中的 5721 例患者中，526 例（9.2%）被诊断为 OSA，或有中度或高度 OSA 风险。在比较高风险或已确诊为 OSA 的患者与低或中度 OSA 风险的患者时，无论他们接受日间手术（P=0.2）还是门诊手术（P=0.3），我们并未发现其住院时长存在差异的证据。尽管高危或确诊 OSA 患者术后呼吸事件发生率高于中度风险患者（P=0.004），但两组之间的转院率并无显著差异（风险差异为 0.78%；95%CI 为-0.43%-2%；P=0.2）。在多变量分析中，没有证据表明在比较高危患者或确诊为高危患者时，急诊中心就诊率（调整后的风险差异为 1.4%；95%CI 为-0.68%-3.4%；P=0.15）或 30 天内再入院率（调整后的风险差异为 1.2%；95%CI 为-0.40%-2.8%；P=0.077）增加。根据上述一系列可信区间（CI），转院、再入院和就诊急诊中心的临床相关事件不可能增加。

结论：我们的研究结果有助于证明中度风险、高危或诊断为 OSA 的患者可以安全地接受日间和门诊肿瘤手术并不会增加住院时长或住院医疗负担，并同样可以避免不良的术后并发症。我们的研究结果支持几个国家 OSA 指南，重点关注术前识别 OSA 患者，以及用于围手术期管理和术后监测的临床路径。

（吴洁译 李士通校）

BACKGROUND: Patients with obstructive sleep apnea (OSA) may be at increased risk for serious perioperative complications. The suitability of ambulatory surgery for patients with OSA remains controversial, and several national guidelines call for more evidence that assesses clinically significant outcomes. In this study, we investigate the association between OSA status (STOP-BANG risk, or previously diagnosed) and short-term outcomes and safety for patients undergoing cancer surgery at a freestanding ambulatory surgery facility.

METHODS: We conducted a retrospective analysis of all patients having surgery at the Josie Robertson Surgery Center, a freestanding ambulatory surgery facility of the Memorial Sloan Kettering Cancer Center. Surgeries included more complex ambulatory extended recovery procedures for which patients typically stay overnight, such as mastectomy, thyroidectomy, and minimally invasive hysterectomy, prostatectomy, and nephrectomy, as well as typical outpatient surgeries. Both univariate and multivariable analyses were used to assess the association between OSA risk and transfer to the main hospital, urgent care center visit, and hospital readmission within 30 days postoperatively (primary outcomes) and length of stay and discharge time (secondary outcomes). Multivariable models were adjusted for age, American Society of Anesthesiologists score, robotic surgery, and type of anesthesia (general or monitored anesthesia care) and also adjusted for surgery start time for length of stay and discharge time outcomes. x tests were used to assess the association between OSA risk and respiratory events and device use.

RESULTS: Of the 5721 patients included in the analysis, 526 (9.2%) were diagnosed or at moderate or high risk for OSA. We found no evidence of a difference in length of stay when comparing high-risk or diagnosed patients with OSA to low- or moderate-risk patients whether they underwent outpatient (P = .2) or ambulatory extended recovery procedures(P = .3). Though a greater frequency of postoperative respiratory events were reported in high-risk or diagnosed patients with OSA compared to moderate risk (P = .004), the rate of hospital transfer was not significantly different between the groups (risk difference, 0.78%; 95% CI, -0.43% to 2%; P = .2). On multivariable analysis, there was no evidence of increased rate of urgent care center visits (adjusted risk difference, 1.4%; 95% CI, -0.68% to 3.4%; P = .15) or readmissions within 30 days (adjusted risk difference, 1.2%; 95% CI, -0.40% to 2.8%; P = .077) when comparing high-risk or diagnosed OSA to low- or moderate-risk patients. Based on the upper bounds of the CIs, a clinically relevant increase in transfers, readmissions, and urgent care center visits is unlikely.

CONCLUSIONS: Our results contribute to the body of evidence supporting that patients with moderate-risk, high-risk, or diagnosed OSA can safely undergo outpatient and advanced ambulatory oncology surgery without increased health care burden of extended stay or hospital admission and avoiding adverse postoperative outcomes. Our results support the adoption of several national OSA guidelines focusing on preoperative identification of patients with OSA and clinical pathways for perioperative management and postoperative monitoring

罗哌卡因在 2 个脂质体修饰体系中的临床前评价

Preclinical Evaluation of Ropivacaine in 2 Liposomal Modified Systems

Rennó, Carolina C. MSc*; Papini, Juliana Z. B. PhD*; Cereda, Cintia Maria Saia PhD†; Martinez, Elizabeth PhD†; Montalli, Victor Angelo PhD†; de Paula, Eneida PhD‡; Pedrazzoli Júnior, José PhD*; Calafatti, Silvana Aparecida PhD*; Tofoli, Giovana Radomille PhD†

Anesthesia & Analgesia: 2019 129 387-396

背景：我们的研究小组最近开发了离子梯度脂质体，并以内含 2%或 0.75%的罗哌卡因（RVC）的联合供体和受体的囊泡方式存在。为了寻找这种新型 RVC 药物在术后镇痛中的应用，我们评估了其产生的麻醉持续时间、药代动力学和以及其引起的组织反应。

方法：本研究中使用的制剂是 PH5.5 的含有醋酸钠缓冲液的大的多泡囊（LMVV），或以 LMVV 作为供体，以大的单泡囊（LUVs）作为受体，外部 PH 为 7.4 的联合体。Wistar 大鼠分为 6 组（n=6），分别给予 6 种不同配方的 RVC（LMVV RVC 0.75%，LMVV/LUVRVC 0.75%，LMVV RVC 2%，LMVV/LUVRVC2%，0.75%RVC，2%RVC_）0.4ml 行坐骨神经阻滞。为了验证麻醉效果，动物接受了疼痛压力测试，并监测了运动阻滞情况 。阻滞后 2 天和 7 天，对坐骨神经周围组织的组织病理学进行评估。将大鼠（n=6）后爪切口周边注射 6 种不同配方制剂后使用 von frey 动物测痛仪通过退缩反应测量机械性伤害高敏反应情况。最后，新西兰白兔（n=6）使用 6 种不同配方 RVC 制剂中的 1 种接受坐骨神经阻滞（3ml）。注射前（0 分钟）和注射后 15、30、45、60、90、120、180、240、300、360、420、480 和 540 分钟分别采集血样。采用三节四极质谱仪测定 RVC 血浆水平。

结果：与普通 RVC 溶液相比，所有脂质体配方的感觉阻滞持续时间和强度更长（$p<0.05$）。组织病理学显示阳性对照组（10%利多卡因）的毒性高于所有 RVC 配方（$p<0.05$）。后爪切口后，所有动物均表现出切口后超敏反应，脂质体制剂表现出更长的镇痛时间（$p<0.05$）。LMVV RVC0.75%比剩余的 RVC 0.75%的制剂达到最大浓度所需和平均停留时间的时间更长（$p<0.05$），因此，由于该脂质体系统的缓慢释放，LMVV 能够降低 RVC 的全身暴露量。

结论：由于脂质体缓慢释放 RVC，所有含有 0.75%RVC 的新型脂质体配方制剂都能够改变药代动力学并延长麻醉作用时间，而不会对局部组织产生明显的毒性作用。

（吴洁译 李士通校）

BACKGROUND: Our research group has recently developed liposomes with ionic gradient and in a combined manner as donor and acceptor vesicles containing ropivacaine (RVC; at 2% or 0.75%). Looking for applications of such novel formulations for postoperative pain control, we evaluated the duration of anesthesia, pharmacokinetics, and tissue reaction evoked by these new RVC formulations.

METHODS: The formulations used in this study were large multivesicular vesicle (LMVV) containing sodium acetate buffer at pH 5.5 or in a combined manner with LMVV as donor and large unilamellar vesicles (LUVs) as acceptor vesicles with an external pH of 7.4. Wistar rats were divided into 6 groups (n = 6) and received sciatic nerve block (0.4 mL) with 6 formulations of RVC (LMVVRVC0.75%, LMVV/LUVRVC0.75%, LMVVRVC2%, LMVV/LUVRVC2%, RVC 0.75%, and RVC 2%). To verify the anesthetic effect, the animals were submitted to the pain pressure test and the motor block was also monitored. Histopathology of the tissues surrounding the sciatic nerve region was also assessed 2 and 7 days after treatment. Rats (n = 6) were submitted to a hind paw incision, and mechanical hypersensitivity was measured via the withdrawal response using von Frey filaments after injection of the 6 formulations. Finally, New Zealand white rabbits (n = 6) received sciatic nerve block (3 mL) with 1 of the 6 formulations of RVC. Blood samples were collected predose (0 minutes) and at 15, 30, 45, 60, 90, 120, 180, 240, 300, 360, 420, 480, and 540 minutes after injection. RVC plasma levels were determined using a triple-stage quadrupole mass spectrometer.

RESULTS: Duration and intensity of the sensory block were longer with all liposomal formulations, when compared to the plain RVC solution (P < .05). Histopathological evaluation showed greater toxicity for the positive control (lidocaine 10%), when compared to all formulations (P < .05). After the hind paw incision, all animals presented postincisional hypersensitivity and liposomalformulations showed longer analgesia (P < .05). LMVVRVC0.75% presented higher time to reach maximum concentration and mean residence time than the remaining formulations with RVC 0.75% (P < .05), so LMVV was able to reduce systemic exposure of RVC due to slow release from this liposomal system.
CONCLUSIONS: All new liposomal formulations containing 0.75% RVC were able to change the pharmacokinetics and enhance anesthesia duration due to slow release of RVC from liposomes without inducing significant toxic effects to local tissues.

氧储备指数：新变量的验证

Oxygen Reserve Index: Validation of a New Variable

Vos, Jaap Jan MD, PhD*; Willems, Cornelis H. MD*; van Amsterdam, Kai MSc*; van den Berg, Johannes P. MD*; Spanjersberg, Rob*; Struys, Michel M. R. F. MD, PhD, FRCA*,†; Scheeren, Thomas W. L. MD, PhD*

Anesthesia & Analgesia: 2019 129 409-415

背景：在正常和高氧状态下，脉搏血氧饱和度通常大于97%，限制了其临床应用。新的氧储备指数（ORI），是一个在100-200 mm Hg压力范围内溶解于动脉血中氧分压（PaO2）的相对指标，可能实现获得对氧状态的额外监测。
方法：在这项前瞻性验证干预研究中，20 名健康志愿者通过密闭面罩呼吸标准化的范围从轻度缺氧（吸入氧分数为0.14）到高氧（吸入氧分数为1.0）浓度的氧气。用2个手指传感器，采用多波长脉冲共血氧法无创测量ORI。将这些ORI值（无单位值，范围为0.00-1.00）与测量的 PaO_2 值进行比较。重复测量相关分析用于评估 ORI/PaO_2 关系。采用四象限图评估ORI的趋势。计算受试者操作特性曲线下的面积，以评估对缺氧的预测（缺氧定义为低PaO2，<100 mm Hg）。
结果：在ORI敏感范围内，两个传感器的ORI和PaO2均呈强正相关（r=0.78和0.83；p<0.0001）。在这一范围内，PaO_2 的ORI趋势良好（一致率为94%）。PaO_2<100 mmHg的预测也很好，受试者工作特性曲线下面积为0.91%，敏感性为99%，特异性为82%。
结论：在这项前瞻性志愿者验证研究中，发现 PaO_2 和 ORI 之间存在强且正向的相关性，并且具有良好的趋势分析能力。基于这些数据，将来将ORI作为一种连续无创监测工具，可能是可靠的用于评估接受吸氧治疗患者的氧合状态的工具。
（吴洁译 李士通校）

BACKGROUND: Pulse oximetry-derived oxygen saturation is typically >97% in normoxia and hyperoxia, limiting its clinical use. The new Oxygen Reserve Index (ORi), a relative indicator of the partial pressure of oxygen dissolved in arterial blood (PaO2) in the range of 100-200 mm Hg, may allow additional monitoring of oxygen status.
METHODS: In this prospective validation intervention study, 20 healthy volunteers were breathing standardized oxygen concentrations ranging from mild hypoxia (fraction of inspired oxygen = 0.14) to hyperoxia (fraction of

inspired oxygen = 1.0) via a tight-fitting face mask. ORi was measured noninvasively by multiwavelength pulse co-oximetry using 2 finger sensors. These ORi values (unitless scale, 0.00-1.00) were compared with measured PaO2 values. Repeated-measurements correlation analysis was performed to assess the ORi/PaO2 relationship. ORi trending ability was assessed using a 4-quadrant plot. The area under the receiver operating characteristics curve was calculated to assess the prediction of hypoxia (low-ranged PaO2, <100 mm Hg).

RESULTS: Within the ORi-sensitive range, a strong positive correlation was found between ORi and PaO2 for both sensors (R = 0.78 and 0.83; P < .0001). ORi trending of PaO2 was good within this range (concordance rate = 94%). The prediction of PaO2 <100 mm Hg was also good, with an area under the receiver operating characteristics curve of 0.91 and 99% sensitivity and 82% specificity.

CONCLUSIONS: In this prospective volunteer validation study, a strong and positive correlation between PaO2 and ORi was found, together with a good trending ability. Based on these data, the future use of ORi as a continuous noninvasive monitoring tool for assessing oxygenation status in patients receiving supplemental oxygen might be supported.

不依赖于外周抗伤害性作用，抑制脂肪酸酰胺水解酶可改善神经病理性疼痛大鼠模型的抑郁样行为。

Inhibition of Fatty Acid Amide Hydrolase Improves Depressive-Like Behaviors Independent of Its Peripheral Antinociceptive Effects in a Rat Model of Neuropathic Pain

Jiang, Hai-xia MD[*,†]; Ke, Bo-wen PhD[*,‡]; Liu, Jin MD[*,‡]; Ma, Gang MD[§]; Hai, Ke-rong MD[‖]; Gong, De-ying PhD[‡]; Yang, Zheng PhD[¶]; Zhou, Cheng PhD[*,‡]

Anesthesia & Analgesia: 2019 129 587-597

背景：神经病理性疼痛常与抑郁症有关。通过脂肪酸酰胺水解酶（FAAH）抑制剂增强内源性大麻素可减轻动物模型中的神经病理性疼痛和由其应激诱导的抑郁样行为。然而，尚不清楚FAAH抑制剂是否能通过其抗强迫症的作用减轻神经病理性疼痛引起的抑郁。

方法：使用全身性FAAH抑制剂URB597（腹腔内注射5.8 mg/kg/d）或使用外周作用的FAAH抑制剂URB937（腹腔内注射1.6 mg/kg/d）(n=11-12)治疗成年雄性Wistar大鼠坐骨神经慢性收缩性损伤（CCI）。治疗从手术后第15天开始，持续15天。手术前和CCI后28天，通过Von Frey试验(Von Frey纤毛机械刺激针测痛仪)检查机械性退缩阈值。经15天治疗后，通过强迫游泳试验（FST）和新奇抑制摄食实验（NSF）评估抑郁样行为。采用液相色谱法和质谱法测定了海马中阿南达胺和 2-花生酰甘油酯的含量。采用免疫组化方法对新生细胞的增殖、分化和存活等海马神经发生进行了评价。

结果：CCI损伤后，大鼠出现明显的伤害性和抑郁性行为症状，表现为Von Frey试验中的持续性机械超敏反应，FST 中的静止时间显著延长（对照组：84.2±13.4 秒，CCI组:137.9±18.8 秒；P<0.001），并且持续时间延长。NSF 实验的进食时间延迟（对照组：133.4±19.4秒，CCI 组：234.9±33.5秒；P<0.001）。对于接受治疗的CCI大鼠，与安慰剂对照组相比，痛阈值增加了 urb597（3.1±1.0 vs 11.2±1.2 g；p<0.001）和 urb937（3.1±1.0 vs 12.1±1.3 g；p<0.001）。FST的固定时间减少了urb597（135.8±16.6 vs 85.3±17.2秒；p<0.001），而不是urb937（135.8±16.6 vs 129.6±17.8秒；p=0.78）。

URB597 使 NSF 实验的摄食潜伏期缩短(235.9±30.5 vs 131.8±19.8 秒;p<0.001),而 URB937 并无此效应（235.9±30.5 vs 232.2±33.2 秒; p=0.72)。同时，CCI 降低了海马中增殖细胞的数量,减少了新成熟神经元的存活率。URB597 而不是 URB937 治疗改善了这些细胞缺陷。

结论：FAAH 的抑制作用可以改善由其周围抗伤害作用的神经病变独立作用所引起的抑郁样行为。海马体的神经发生增强可能得益于 URB597 的抗抑郁作用。

（吴洁译 李士通校）

BACKGROUND: Neuropathic pain is often associated with depression. Enhancing endocannabinoids by fatty acid amide hydrolase (FAAH) inhibitors relieves neuropathic pain and stress-induced depressive-like behaviors in animal models. However, it is unclear whether FAAH inhibitor can relieve neuropathic pain-induced depression by or not by its antinociceptive effects.

METHODS: Adult male Wistar rats with chronic constriction injury (CCI) to the sciatic nerve were treated with the systemic FAAH inhibitor URB597 (5.8 mg • kg • day, intraperitoneally) or peripherally acting FAAH inhibitor URB937 (1.6 mg • kg • d, intraperitoneally; n = 11-12). The treatment was applied from the 15th day after surgery and continued for 15 days. Mechanical withdrawal threshold was examined by Von Frey test before surgery and on the 28th day after CCI. Depressive-like behaviors were evaluated by forced swimming test (FST) and novelty-suppressed feeding (NSF) after 15-day treatment. The levels of anandamide and 2-arachidonoylglycerol in hippocampus were examined by liquid chromatography and mass spectrometry. Hippocampal neurogenesis including proliferation, differentiation, and survival of newborn cells was assessed by immunohistochemistry.

RESULTS: After CCI injury, the rats developed significantly nociceptive and depressive-like behaviors, indicated by persistent mechanical hypersensitivity in Von Frey test, significantly prolonged immobility time in FST (sham: 84.2 ± 13.4 seconds versus CCI: 137.9 ± 18.8 seconds; P < .001), and protracted latency to feed in NSF (sham: 133.4 ± 19.4 seconds versus CCI: 234.9 ± 33.5 seconds; P < .001). For the CCI rats receiving treatment, compared to vehicle placebo group, pain threshold was increased by both URB597 (3.1 ± 1.0 vs 11.2 ± 1.2 g; P < .001) and URB937 (3.1 ± 1.0 vs 12.1 ± 1.3 g; P < .001). Immobility time of FST was reduced by URB597 (135.8 ± 16.6 vs 85.3 ± 17.2 seconds; P < .001) but not by URB937 (135.8 ± 16.6 vs 129.6 ± 17.8 seconds; P = .78). Latency to feed in NSF was also reduced by URB597 (235.9 ± 30.5 vs 131.8 ± 19.8 seconds; P < .001) but not by URB937 (235.9 ± 30.5 vs 232.2 ± 33.2 seconds; P = .72). Meanwhile, CCI decreased the number of proliferating cells and reduced survival of new mature neurons in hippocampus. URB597 but not URB937 treatment improved these cellular deficits.

CONCLUSIONS: Inhibition of FAAH can improve depressive-like behaviors induced by neuropathicpain independent of its peripheral antinociceptive action. Enhanced neurogenesis in hippocampus might contribute to the antidepressive effects of URB597.

分段回归和差异方法：评估医疗保健系统变化的影响

Segmented Regression and Difference-in-Difference Methods: Assessing the Impact of Systemic Changes in Health Care

Mascha, Edward J. PhD*,†; Sessler, Daniel I. MD†

Anesthesia & Analgesia: 2019 129 618-633

围术期的研究者和专业人员越来越多地试图评估系统性实践改变的实施是否比以往的常规做法更能改善预后。集群随机试验是评估系统实践变化的最佳实验设计，但往往不切实际难以；因此，研究者通常选择前后设计。在这个统计大循环中，我们首先讨论了前后设计固有的偏差，包括由于时间完全分开的周期造成的混淆、均值回归、霍桑效应及其他情况。其中许多偏差至少可以通过我们讨论的恰当的设计和分析得到部分解决。我们的重点是不需要同期对照组的中断时间序列的分段回归；我们还提出了包括差分、阶梯楔形和聚类随机化等备选设计方案。良好的分段回归需要在每个周期内有足够数量的时间点，以及一组潜在的混杂变量。该方法比较了干预前和干预后随时间的变化、干预开始时的结果差异以及干预观察到的趋势与无干预预测的趋势。不同方法之间的差异增加了一个并行控制，使得推理更加有力。如果做得好，尽管仍然需要假设和存在局限性，但所讨论的方法可以对干预的效果进行有力的推断。该方法通过一项中断时间序列研究来证明，在本项研究中，内科医师组成的成人医疗急救小组由麻醉医生负责，以期改善预后。

（吴洁译 李士通校）

Perioperative investigators and professionals increasingly seek to evaluate whether implementing systematic practice changes improves outcomes compared to a previous routine. Cluster randomized trials are the optimal design to assess a systematic practice change but are often impractical; investigators, therefore, often select a before-after design. In this Statistical Grand Rounds, we first discuss biases inherent in a before-after design, including confounding due to periods being completely separated by time, regression to the mean, the Hawthorne effect, and others. Many of these biases can be at least partially addressed by using appropriate designs and analyses, which we discuss. Our focus is on segmented regression of an interrupted time series, which does not require a concurrent control group; we also present alternative designs including difference-in-difference, stepped wedge, and cluster randomization. Conducting segmented regression well requires a sufficient number of time points within each period, along with a robust set of potentially confounding variables. This method compares preintervention and postintervention changes over time, divergences in the outcome when an intervention begins, and trends observed with the intervention compared to trends projected without it. Difference-in-difference methods add a concurrent control, enabling yet stronger inference. When done well, the discussed methods permit robust inference on the effect of an intervention, albeit still requiring assumptions and having limitations. Methods are demonstrated using an interrupted time series study in which anesthesiologists took responsibility for an adult medical emergency team from internal medicine physicians in an attempt to improve outcomes.