腦小血管而非大血管疾病，與心肺轉流期間腦自主調節受損有關：一項回顧性佇列研究

Cerebral Small Vessel, But Not Large Vessel Disease, Is Associated With Impaired Cerebral Autoregulation During Cardiopulmonary Bypass

A Retrospective Cohort Study

Nomura, Yohei, MD[*]; Faegle, Roland, MD[†]; Hori, Daijiro, MD[*]; Al-Qamari, Abbas, MD[‡]; Nemeth, Alexander J., MD[§,‖]; Gottesman, Rebecca, MD, PhD[†]; Yenokyan, Gayane, PhD[¶]; Brown, Charles, MD, MS[#]; Hogue, Charles W., MD[‡]

Anesthesia & Analgesia: 2018 127 1314–1322

背景：心肺轉流（CPB）期間腦血流（CBF）自主調節受損與中風和其他不良結局有關。心臟手術患者中普遍存在大動脈和小動脈的狹窄。我們假設大和/或小血管性腦動脈疾病與 CPB 期間受損的腦自主調節有關。

方法：回顧性佇列分析資料來自于 346 名在心肺轉流下接受心臟手術的病人，納入正在進行的自主調節監測前瞻性隨機臨床試驗，進行評估。研究方案包括由訓練有素的血管技術員術前通過經顱超聲（TCD）評估腦大動脈血流流速並在術後 3 至 5 天之間行腦磁共振成像（MRI）檢查。腦 MRI 圖像由一位元不瞭解自主調節資料的血管神經病學家盲法評估慢性腦白質的高信號（WMHI）。“大血管”腦血管病的定義是存在與腦大動脈狹窄相關的特徵性 TCD 改變。“小血管”腦血管病的定義是根據公認的 WMHI 評分方法。所有患者在手術期間均進行連續 TCD 自動調節監測。

結果：32.4%（112/346 例）的患者出現自動主調節受損。266 例患者中的 67 例（25.2%）術前經 TCD 有完整資料證實存在中到重度大血管狹窄。在調整後的分析中，女性（優勢比[OR]0.46；95%置信區間[CI]為 0.25-0.86；P=0.014）和 CPB 期間較高的平均溫度（OR 為 1.23；95%CI 為 1.02-1.475；P=0.029），而不是中到重度腦大動脈狹窄（P=0.406）與體外迴圈（CPB）期間自主調節受損有關。

在 119 例有腦 MRI 資料的患者中，42 例（35.3%）顯示證實存在 WMHI。小血管性腦血管疾病的發生與年齡、外周血管疾病史、術前血紅蛋白水準、術前鈣通道阻滯劑治療後 CBF 自身調節受損（OR 為 3.25；95%CI 為 1.21-8.71；P=0.019）有關。

結論：這些資料證實，受損的 CBF 自身調節在 CPB 期間普遍存在，並分別通過低血壓或高血壓影響患者導致腦的低灌注或高灌注。小血管，而不是大血管性的腦血管疾病，男性，CPB 期間較高的平均體溫似乎與自身調節受損有關。

（吳潔譯 李士通校）

BACKGROUND: Impaired cerebral blood flow (CBF) autoregulation during cardiopulmonary bypass (CPB) is associated with stroke and other adverse outcomes. Large and small arterial stenosis is prevalent in patients undergoing cardiac surgery. We hypothesize that large and/or small vessel cerebral arterial disease is associated with impaired cerebral autoregulation during CPB.
METHODS: A retrospective cohort analysis of data from 346 patients undergoing cardiac surgery with CPB enrolled in an ongoing prospectively randomized clinical trial of autoregulation monitoring were evaluated. The study protocol included preoperative transcranial Doppler (TCD) evaluation of major cerebral artery flow velocity by a trained vascular technician and brain magnetic resonance imaging (MRI) between postoperative days 3 and 5. Brain MRI images were evaluated for chronic white matter hyperintensities (WMHI) by a vascular neurologist blinded to autoregulation data. “Large vessel” cerebral vascular disease was defined by the presence of characteristic TCD changes associated with stenosis of the major cerebral arteries. “Small vessel” cerebral vascular disease was defined based on accepted scoring methods of WMHI. All patients had continuous TCD-based autoregulation monitoring during surgery.
RESULTS: Impaired autoregulation occurred in 32.4% (112/346) of patients. Preoperative TCD demonstrated moderate-severe large vessel stenosis in 67 (25.2%) of 266 patients with complete data. In adjusted analysis, female sex (odds ratio [OR], 0.46; 95% confidence interval [CI], 0.25–0.86; *P* = .014) and higher average temperature during CPB (OR, 1.23; 95% CI, 1.02–1.475; *P* = .029), but not moderate-severe large cerebral arterial stenosis (*P* = .406), were associated with impaired autoregulation during CPB. Of the 119 patients with available brain MRI data, 42 (35.3%) demonstrated WMHI. The presence of small vessel cerebral vascular disease was associated with impaired CBF autoregulation (OR, 3.25; 95% CI, 1.21–8.71; *P* = .019) after adjustment for age, history of peripheral vascular disease,

preoperative hemoglobin level, and preoperative treatment with calcium channel blocking drugs.
CONCLUSIONS: These data confirm that impaired CBF autoregulation is prevalent during CPB predisposing affected patients to brain hypoperfusion or hyperperfusion with low or high blood pressure, respectively. Small vessel, but not large vessel, cerebral vascular disease, male sex, and higher average body temperature during CPB appear to be associated with impaired autoregulation.

中劑量與標準劑量舒更葡糖鈉逆轉呱庫溴銨致神經肌肉深度阻滯的對比

Reversal of Deep Pipecuronium-Induced Neuromuscular Block With Moderate Versus Standard Dose of Sugammadex
A Randomized, Double-Blind, Noninferiority Trial
Tassonyi, Edömér, MD, PhD, DSc[*]; Asztalos, László, MD[*]; Szabó-Maák, Zoltán, MD[*]; Nemes, Réka, MD[*]; Pongrácz, Adrienn, MD, PhD[*]; Lengyel, Szabolcs, PhD, DSc[†]; Fülesdi, Béla, MD, PhD, DSc[*]
Anesthesia & Analgesia: 2018 127 1344–1350

背景：某些手術可能需要深度的神經肌肉阻滯（NMB）。在氣管拔管前逆轉這樣的深度阻滯是很有挑戰性的。由於抗膽鹼酯酶在深部阻滯中無效，因此建議用舒更葡糖鈉 4mg/kg 逆轉羅庫溴銨或維庫溴銨誘導的深度 NMB。然而，這一推薦劑量需要打開 2 小瓶 200mg 的舒更葡糖鈉，會導致用藥成本增加。因此，我們試圖尋求一種較便宜的誘導和逆轉深度 NMB 的方法。雖然目前尚無舒更葡糖鈉拮抗呱庫溴銨深度阻滯的最佳劑量，但已有對於中度阻滯的資料。因此，我們假設舒更葡糖鈉 2mg/kg 是逆轉呱庫溴銨深度阻滯的合適劑量，以使我們可以避免增加成本。在本研究中，我們比較了舒更葡糖鈉 2mg/kg 和標準劑量 4mg/kg 用於逆轉呱庫溴銨深度阻滯的效果。

方法：這是一項包括 50 例接受丙泊酚、七氟醚、芬太尼和呱庫溴銨全身麻醉患者的單中心，隨機，雙盲，平行分組的非劣效性研究。用加速度肌松監測儀（TOF 手錶 SX）進行神經肌肉監測。非劣性界限預先指定為逆轉時間的增加不超過 10%（對應於 1 分鐘的主要結果）。當塊自發地恢復到破傷風計數 1 後，患者隨機接

收 SuGAMDEX 2 或 4 mg/kg，並測量從注射到四（TOF）比率為 1 的列車的時間。主要結果是在特定患者中達到歸一化 TOF 比為 0.9 的時間。剩餘或復發的術後 NMB 是附加終點。

結果：每個病人恢復到 0.9 的標準化 TOF 比。2mg/kg 組逆轉時間為 1.73±1.03 分鐘(95%置信區間[CI],1.33～2.13;n=25),4mg/kg 組逆轉時間為 1.42±0.63 分鐘(平均±標準差)(95%CI,1.17～1.67;n=25)。兩組間逆轉時間的平均差異為 0.31 分鐘（95%CI，0.18～0.8），CI 的上限低於 1 分鐘的非劣性界限。術後未發生阻滯。

結論：舒更葡糖鈉 2mg/kg 逆轉呱庫溴銨造成的強直刺激後計數為 1 的神經肌肉阻滯效果不亞於 4mg/kg。舒更葡糖鈉對逆轉呱庫溴銨深度阻滯也有效果。

（吳潔譯 李士通校）

BACKGROUND: Certain surgical interventions may require a deep neuromuscular block (NMB). Reversal of such a block before tracheal extubation is challenging. Because anticholinesterases are ineffective in deep block, sugammadex 4 mg/kg has been recommended for the reversal of rocuronium- or vecuronium-induced deep NMB. However, this recommendation requires opening 2 vials of 200 mg sugammadex, which results in an increase in drug costs. Therefore, we sought a less expensive solution for the induction and reversal of deep NMB. Although the optimal dose of sugammadex for antagonism of deep block from pipecuronium has not been established, data pertaining to moderate block are available. Accordingly, we hypothesized that sugammadex 2 mg/kg would be a proper dose to reverse deep pipecuronium block, enabling us to avoid cost increases. In the present study, we compared sugammadex 2 mg/kg with the standard dose of 4 mg/kg for reversal of deep block from pipecuronium.

METHODS: This single-center, randomized, double-blind, 2 parallel-arms, noninferiority study comprised 50 patients undergoing general anesthesia with propofol, sevoflurane, fentanyl, and pipecuronium. Neuromuscular monitoring was performed with acceleromyography (TOF-Watch SX). Noninferiority margin was specified beforehand as an increase in reversal time of no >10% (corresponding to 1 minute for the primary outcome). When the block spontaneously recovered to posttetanic count 1, the patients randomly received sugammadex 2 or 4 mg/kg, and the time from the injection to the train-of-four (TOF) ratio of 1.0 was measured. Primary outcome was the time to achieve the normalized TOF ratio of 0.9 in a particular patient. Residual or recurrent postoperative NMB was additional end point.

RESULTS: Each patient recovered to the normalized TOF ratio of 0.9. In the 2 mg/kg group, reversal time was 1.73 ± 1.03 minutes (95% confidence interval [CI], 1.33–2.13; n = 25), and in the 4 mg/kg group, reversal time was 1.42 ± 0.63 minutes (mean ± standard deviation) (95% CI, 1.17–1.67; n = 25). The mean difference in reversal times between the 2 groups was 0.31 minutes (95% CI, −0.18 to 0.8), and the upper limit of CI was below the noninferiority margin of 1 minute. Postoperative block did not occur.
CONCLUSIONS: The effect of sugammadex 2 mg/kg was noninferior to that of 4 mg/kg in reversing posttetanic count-1 degree pipecuronium block. Sugammadex reversal of deep pipecuronium block appears to be effective.

超聲引導下頸部體表標誌的觸診練習可提高環甲膜體外觸診的準確性

Practice of Ultrasound-Guided Palpation of Neck Landmarks Improves Accuracy of External Palpation of the Cricothyroid Membrane

You-Ten, Kong Eric, MD, PhD[*,†]; Wong, David T., MD[*,‡]; Ye, Xiang Y., Msc[§]; Arzola, Cristian, MD[*,†]; Zand, Atoosa, MD[*,†]; Siddiqui, Naveed, MD, MSc[*,†]
Anesthesia & Analgesia: 2018 127 1377–1382

背景：超聲能準確識別環甲膜，但對於隨後的體外觸診準確性的影響尚不清楚。在本研究中，我們測試了麻醉參與人員使用超聲（US）引導和不使用超聲（US）引導下經外部觸診識別環甲膜中點位置的能力。

方法：在獲得倫理委員會批准和患者知情同意後，由麻醉住院醫師、研究員和執業麻醉助理組成的麻醉學參與人員對頸部體表標誌進行了教學指導。然後將參與者隨機分為兩組，分別在超聲引導下（US 組）和不在超聲波引導下（非 US[NUS]組）進行了頸部體表標誌的觸診訓練。在練習期結束後，每個參與者對 10 名志願者的頸部通過外部觸診來識別環甲膜，並標記了行環甲膜穿刺時的預期進針點(觸診點[PT])。每個志願者的環甲膜中點位置由獨立於研究小組之外的一員在超聲引導下預先使用隱形墨水進行了（US 點）標記。主要結果是準確率，即參與者所做嘗試中 PT 點到 US 點的距離≤5mm 所占的百分比。使用 Wilcoxon 秩和檢驗比較 NUS 組和 US 組主要結果的差別。還採用混合效應 logistic 回歸或混合效應線性模型來解釋聚類結果並調整潛在的混雜。

結果：15 名麻醉參與者被隨機分入 US 組（n=8）和 NUS 組（n=7）。兩組分別進行了 80 次和 61 次嘗試。US 組的準確率中位數大於 NUS 組（65%對 30%，P=0.025），PT-US 點間距離中位數小於 NUS 組（4.0 對 8.0mm，P=0.04）。調整後的平均 PT-US 點間距離 US 組短於 NUS 組（調整後的平均 95%CI 為 3.6[2.9-4.6]對 6.8[5.2-8.9]mm；P<0.001）。

結論：接受超聲引導下環甲膜定位觸診的麻醉參與者比未接受超聲引導下觸診的參與者能夠更好地僅使用盲法觸診來識別環甲膜。在超聲引導下觸診頸部體表標誌的練習改進了隨後單純通過觸診定位環甲膜的盲目定位法。

（吳潔譯 李士通校）

BACKGROUND: Ultrasonography can accurately identify the cricothyroid membrane; however, its impact on the subsequent accuracy of external palpation is not known. In this study, we tested the ability of anesthesia participants to identify the midpoint of the cricothyroid membrane using external palpation with and without ultrasound (US)-guided practice.

METHODS: Following institutional ethics approval and informed consent, anesthesia participants consisting of anesthesia residents, fellows, and practicing anesthesia assistants underwent didactic teaching on neck landmarks. The participants were then randomized to practice palpation of neck landmarks with US guidance (US group) or without ultrasonography (non-US [NUS] group). After the practice session, each participant identified the cricothyroid membrane using external palpation on the neck of 10 volunteers and marked the anticipated entry point for device insertion (palpation point [PT]). The midpoint of the cricothyroid membrane of each volunteer had been premarked with invisible ink using ultrasonography (US point) by a separate member of the research team. The primary outcome was the accuracy rate defined as the percentage of the attempts with the distance ≤5 mm measured from the PT to US point for the participant. The primary outcome was compared between NUS and US groups using Wilcoxon rank sum test. A mixed-effect logistic regression or mixed-effect linear model was also conducted for outcomes accounting for the clustering and adjusting for potential confounders.

RESULTS: Fifteen anesthesia participants were randomized to US (n = 8) and NUS (n = 7) groups. A total of 80 and 61 attempts were performed by the US and NUS groups, respectively. The median accuracy rate in the US group was higher than the NUS group (65% vs 30%; *P* = .025), and the median PT-US distance in the US group was shorter than in the NUS group (4.0 vs 8.0 mm; *P* = .04). The adjusted mean

PT-US distance in the US group was shorter compared to the NUS group (adjusted mean [95% CI], 3.6 [2.9–4.6] vs 6.8 [5.2–8.9] mm; $P < .001$).
CONCLUSIONS: Anesthesia participants exposed to practice with US-guided palpation of the cricothyroid membrane location were better able to identify the cricothyroid membrane using only blind palpation than participants without US-guided practice. Practice with US-guided palpation of neck landmarks improves subsequent blind localization of the cricothyroid membrane using palpation alone.

鼻尖抬高對經鼻氣管插管時氣管導管經過鼻孔通路順暢發生率的影響

Influence of Nasal Tip Lifting on the Incidence of the Tracheal Tube Pathway Passing Through the Nostril During Nasotracheal Intubation

A Randomized Controlled Trial

Kim, Hyerim, MD[*]; Lee, Jung-Man, MD, PhD[*]; Lee, Jiwon, MD, PhD[†]; Hwang, Jin-Young, MD, PhD[*,‡]; Chang, Jee-Eun, MD[*]; No, Hyun-Joung, MD[*]; Won, Dongwook, MD[*]; Choi, Seungeun, MD[§]; Min, Seong-Won, MD, PhD[*,‡]

Anesthesia & Analgesia: 2018 127 1421–1426

背景: 為了安全地行經鼻氣管插管而不造成中鼻甲損傷，氣管導管應該穿過位於下鼻甲下方緊靠鼻孔底部的下鼻道。本研究旨在評估抬高鼻尖對經鼻氣管插管期間預成型的 RAE 氣管導管通過下通道發生率的影響。

方法：患者被隨機分成“鼻尖抬高組”或“中位組”。對於鼻尖抬高組的患者，在誘導麻醉後將預製的鼻 RAE 導管插入鼻孔時，一個研究者將鼻尖向頭側方向拉。對於中立位組的病人，在鼻尖處於中立位置時插入一根導管。使用纖維鏡檢查每個患者氣管導管通過的路徑。比較兩組間導管通過下鼻道的發生率。同時評估鼻出血的發生率。

結果：86 名患者入組並完成研究流程。鼻尖抬高組氣管導管通過下鼻道的發生率（79.1%）顯著高於中立位組（51.2%）（相對危險度為 1.55；95%可信區間 1.11-2.15；P=0.007）。雖然鼻出血的發生率在兩組間沒有差別（18.6%對 32.6%，P=0.138），但是當氣管導管經下鼻道通過鼻腔時（14.3%）鼻出血的發生率低於

經上鼻道通過鼻腔的發生率（46.7%），而不管隨機分組是否調整了潛在的混淆變數（優勢比為 0.19；95%可信區間為 0.07-0.54；P=0.002）。

結論：在經鼻氣管插管期間，鼻尖抬高動作有助於引導預成型的鼻 RAE 導管進入下通道。

（吳潔譯 李士通校）

BACKGROUND: For safe nasotracheal intubation without middle turbinate injury, the tracheal tube should pass through the lower pathway, which is beneath the inferior turbinate and immediately above the nasal floor of the nostril. The purpose of this study was to assess the influence of nasal tip lifting on the incidence of passing preformed nasal Ring-Adair-Elwyn (RAE) tubes through the lower pathway during nasotracheal intubation.
METHODS: Patients were randomly assigned to a "nasal tip lifting group" or a "neutral group." For patients in the nasal tip lifting group, an investigator pulled the nasal tip in a cephalad direction when inserting a preformed nasal RAE tube into the nostril after induction of anesthesia. For patients in the neutral group, a tube was inserted with the nasal tip in a neutral position. The pathway by which the tube passed in each patient was identified using a fiberscope. The incidence of the tube passing through the lower pathway was compared between the 2 groups. The incidence of epistaxis was also evaluated.
RESULTS: Eighty-six patients were enrolled and completed the study protocol. The incidence of the tracheal tube passing through the lower pathway was significantly higher in the nasal tip lifting group (79.1%) than in the neutral group (51.2%) (relative risk, 1.55; 95% confidence interval, 1.11–2.15; *P* = .007). Although the incidence of epistaxis was not different between the groups (18.6% vs 32.6%; *P* = .138), it was lower when the tracheal tube passed nasal cavity through the lower pathway (14.3%) than the upper pathway (46.7%), regardless of the randomized group with adjustment for potentially confounding variables (odds ratio, 0.19; 95% confidence interval, 0.07–0.54; *P* = .002).
CONCLUSIONS: The nasal tip lifting maneuver helped to guide preformed nasal RAE tubes into the lower pathway during nasotracheal intubation.

麻醉期間的低液體挑戰：系統評價和 **Meta** 分析

Low Fluid Challenge During Anesthesia: A Systematic Review and Meta-analysis.
Messina, Antonio, PhD*; Pelaia, Corrado, MD†; Bruni, Andrea, MD†; Garofalo, Eugenio, MD†; Bonicolini, Eleonora, MD‡; Longhini, Federico, MD†; Dellara, Erica, MD§; Saderi, Laura, BSc‖; Romagnoli, Stefano, MD‡; Sotgiu, Giovanni, MD, FERS‖; Cecconi, Maurizio, MD, FRCA, FICM*; Navalesi, Paolo, MD, FERS†.

Anesthesia & Analgesia 2018 127:1353-1364.

背景：評估接受手術的患者的血容量狀態是麻醉醫生常規管理的一部分。該評估通常通過基於機械通氣期間的心肺相互作用的動態指數（如果可用）或通過施用液體衝擊（FC）來進行。 在手術期間使用液體衝擊來優化預定義的血液動力學目標，即所謂的目標導向治療（GDT），或校正血液動力學不穩定性（非 GDT）。

方法：在本系統評價中，我們考慮了採用目標導向治療或非目標導向治療的研究中的液體衝擊試驗的成分，以評估兩種方法之間是否存在差異。此外，我們進行了一項薈萃分析，以確定動態指標脈壓變化（PPV）和每搏輸出量（SV）變化（SVV）在預測液體反應性方面的有效性。

結果： 35 項非目標導向治療和 33 項目標導向治療研究符合納入標準，包括 5017 名患者。在絕大多數非目標導向治療和目標導向治療研究中，液體衝擊包括膠體給藥（分別為 85.7％和 90.9％）。在 29 項非目標導向治療研究中，輸注的膠體是 6％羥乙基澱粉（6％HES;該亞組的 96.6％）。在 20 項目標導向治療研究中，輸注的膠體是 6％HES（該亞組的 66.7％），而在 5 項研究中是明膠（該亞組的 16.7％），在 3 項研究中是未指明的膠體（該亞組的 10.0％），在 1 研究白蛋白（3.3％）或在另一項研究中，HES 6％和明膠（3.3％）。在非目標導向治療研究中，輸注的中位體積為 500 mL；輸注時間和血液動力學目標評估液體反應性缺乏標準化。在目標導向治療研究中，液體衝擊通常包括在 10 分鐘內（45.4％）施用 250mL 膠體（48.8％），目標是 SV 增加> 10％（57.5％）。僅在 60.6％的目標導向治療研究中，採用了安全限制。 脈壓變化合併曲線下面積（95％置信區間[CI]）為 0.86（0.80-0.92）。預測液體反應性的平均值（標準差）脈壓變化閾值為 10.5％（3.2）（範圍，8％-15％），而匯總（95％CI）敏感性和特異性為

0.80（0.74-0.85）和 0.83（0.73-）分別為 0.91）。曲線下的每搏輸出量變化合並面積（95％CI）為 0.87（0.81-0.93）。預測液體反應性的平均值（標準差）每搏輸出量閾值為 11.3％（3.1）（範圍，7.5％-15.5％），而匯總（95％CI）敏感性和特異性分別為 0.82（0.75-0.89）和 0.77（0.71-0.82）。

結論：液體衝擊的關鍵組成部分包括液體類型（膠體，通常為 6％HES），體積（分別在非目標導向治療研究和目標導向治療研究中為 500 和 250 mL）和輸注時間（10 分鐘）在手術室中非常標準化。 然而，脈壓變化和每搏輸出量變化的匯總靈敏度和特異性都是有限的。

（彭孟圓 譯 潘豔、薛張剛校）

BACKGROUND: Assessing the volemic status of patients undergoing surgery is part of the routine management for the anesthesiologist. This assessment is commonly performed by means of dynamic indexes based on the cardiopulmonary interaction during mechanical ventilation (if available) or by administering a fluid challenge (FC). The FC is used during surgery to optimize predefined hemodynamic targets, the so-called Goal-Directed Therapy (GDT), or to correct hemodynamic instability (non-GDT).
METHODS: In this systematic review, we considered the FC components in studies adopting either GDT or non-GDT, to assess whether differences exist between the 2 approaches. In addition, we performed a meta-analysis to ascertain the effectiveness of dynamic indexes pulse pressure variation (PPV) and stroke volume (SV) variation (SVV), in predicting fluid responsiveness.
RESULTS: Thirty-five non-GDT and 33 GDT studies met inclusion criteria, including 5017 patients. In the vast majority of non-GDT and GDT studies, the FC consisted in the administration of colloids (85.7% and 90.9%, respectively). In 29 non-GDT studies, the colloid infused was the 6% hydroxyethyl starch (6% HES; 96.6% of this subgroup). In 20 GDT studies, the colloid infused was the 6% HES (66.7% of this subgroup), while in 5 studies was a gelatin (16.7% of this subgroup), in 3 studies an unspecified colloid (10.0% of this subgroup), and in 1 study albumin (3.3%) or, in another study, both HES 6% and gelatin (3.3%). In non-GDT studies, the median volume infused was 500 mL; the time of infusion and hemodynamic target to assess fluid responsiveness lacked standardization. In GDT studies, FC usually consisted in the administration of 250 mL of colloids (48.8%) in 10 minutes (45.4%) targeting an SV increase >10% (57.5%). Only in 60.6% of GDT studies, a safety limit was adopted. PPV pooled area under the curve (95% confidence interval [CI]) was 0.86 (0.80-0.92). The mean (standard deviation) PPV threshold

predicting fluid responsiveness was 10.5% (3.2) (range, 8%-15%), while the pooled (95% CI) sensitivity and specificity were 0.80 (0.74-0.85) and 0.83 (0.73-0.91), respectively. SVV pooled area under the curve (95% CI) was 0.87 (0.81-0.93). The mean (standard deviation) SVV threshold predicting fluid responsiveness was 11.3% (3.1) (range, 7.5%-15.5%), while the pooled (95% CI) sensitivity and specificity were 0.82 (0.75-0.89) and 0.77 (0.71-0.82), respectively.
CONCLUSIONS: The key components of FC including type of fluid (colloids, often 6% HES), volume (500 and 250 mL in non-GDT studies and GDT studies, respectively), and time of infusion (10 minutes) are quite standardized in operating room. However, pooled sensitivity and specificity of both PPV and SVV are limited.

氨甲環酸在慢性腎功能不全患者于心臟手術中的應用

Tranexamic Acid Dosing for Cardiac Surgical Patients With Chronic Renal Dysfunction: A New Dosing Regimen.

Jerath, Angela, FRCPC, FANZCA, MBBS, BSc[*,†]; Yang, Qi Joy, MSc[‡]; Pang, K. Sandy, PhD[‡]; Looby, Nikita, MSc[§]; Reyes-Garces, Nathaly, MSc[§]; Vasiljevic, Tijana, BSc[§]; Bojko, Barbara, PhD[§]; Pawliszyn, Janusz, PhD[§]; Wijeysundera, Duminda, PhD, FRCPC[*,†]; Beattie, W. Scott, PhD, FRCPC[*,†]; Yau, Terrence M., PhD, FRCSC, MD, MSc, BA[‖]; Wąsowicz, Marcin, FRCPC, PhD, MD[*,†]
Anesthesia & Analgesia: 2018 127 1323–1332

背景：氨甲環酸（TXA）是一種常用的抗纖溶藥物，在心臟手術用於減少出血。多達 50%的心臟手術患者有慢性腎功能不全（CRD）。對於 CRD 患者使用 TXA 的最佳劑量的研究仍然很少。這很重要，TXA 在 CRD 患者中會堆積。高劑量的 TXA 與術後癲癇發作有關。本研究測量了心臟手術的 CRD 患者的血漿 TXA 濃度，用於藥物動力學建模和劑量調整建議。

方法：這項前瞻性佇列研究納入 48 例 1-5 期 CRD 患者，按照“腎臟病預後品質倡議”標準分類。低風險組接受簡單的主動脈大橋或單瓣膜修復/置換，並接受 50mg/kg 的 TXA。高危組接受二次，主動脈，多瓣膜或聯合手術，並接受了抗纖溶藥物試驗給藥方案的血液保護（負荷劑量 30 mg/kg，首劑量 2 mg/kg 後，以 16 毫克/千克/小時速度泵注）。主要結果辨認 TXA 清除和分佈體積的變化，這

為劑量調整提供了理論依據。描述性臨床結果為評估術後癲癇發作、失血、缺血性血栓併發症、住院死亡率和住院時間。

結果：TXA 濃度升高並持續超過治療閾值約 12 小時，在根據 CRD 嚴重程度區分的高危組 3-5 組。

結論：使用藥代動力學模型，我們提出了一個簡單的新 TXA 給藥方案，優化最大抗纖溶作用並避免過量給藥。

（龐豔蓉 譯 潘豔、薛張剛校）

BACKGROUND: Tranexamic acid (TXA) is a common antifibrinolytic agent used to minimize bleeding in cardiac surgery. Up to 50% cardiac surgical patients have chronic renal dysfunction (CRD). Optimal dosing of TXA in CRD remains poorly investigated. This is important as TXA is renally eliminated with accumulation in CRD. High TXA doses are associated with postoperative seizures. This study measures plasma TXA concentrations in CRD cardiac surgical patients for

pharmacokinetic modeling and dose adjustment recommendations.

METHODS: This prospective cohort study enrolled 48 patients with stages 1-5 CRD, classified by Kidney Disease Outcome Quality Initiative. Patients were separated into 2 treatment groups. A "low-risk" group underwent simple aortocoronary bypass or single-valve repair/replacement and received a 50 mg/kg TXA bolus. A "high-risk" group underwent redo, aortic, multiple valve or combination surgery and received the Blood Conservation Using Anti-fibrinolytics Trial dosing regimen (loading dose 30 mg/kg, infusion 16 mg/kg/h with 2 mg/kg in pump prime). Primary outcome identified changes in TXA clearance and distribution volume, which provided the rationale for dose

adjustment. Descriptive clinical outcomes assessed postoperative seizures, blood loss, ischemic-thrombotic complications, in-hospital mortality, and length of hospital stay.

RESULTS: TXA concentrations were elevated and sustained above the therapeutic threshold for approximately 12 hours in high-risk stages 3-5 groups, in accordance to CRD severity.

CONCLUSIONS: Using a pharmacokinetic model, we propose a simple new TXA dosing regimen that optimizes maximal antifibrinolysis and avoids excessive drug dosing.

加用新斯的明和阿托品常規治療硬膜外穿刺性頭痛：一項隨機對照試驗

Addition of Neostigmine and Atropine to Conventional Management of Postdural Puncture Headache:A Randomized Controlled Trial

Ahmed Abdelaal Ahmed Mahmoud, MD, FCAI,*† Amr Zaki Mansour, MD,‡ Hany Mahmoud Yassin, MD,§ Hazem Abdelwahab Hussein, MD,* Ahmed Moustafa Kamal, MD,‡ Mohamed Elayashy, MD, FCAI,‡ Mohamed Farid Elemady, MD,‡

Hany W. Elkady, MD,‡ Hatem Elmoutaz Mahmoud, MD,* Barbara Cusack, LRCP&SI, MB MCh, NUI, MCAI,† Hisham Hosny, MD,‡ and Mohamed Abdelhaq, MD‡
Anesthesia & Analgesia: 2018 127 1434–1439

背景：硬膜外穿刺性頭痛（PDPH）缺乏標準的循證治療。用新斯的明治療嚴重 PDPH 的患者促進了這項研究

方法：這項隨機對照雙盲研究比較了新斯的明和阿托品（n = 41）與生理鹽水安慰劑（n = 44）治療 PDPH，以及對 85 名水合和鎮痛藥患者的保守治療。 主要結果是干預後 6,12,24,36,48 和 72 小時的視覺類比評分≤3。 次要結果是需要硬膜外血液補丁，頸部僵硬，噁心和嘔吐。 患者接受新斯的明 20μg/ kg 和阿托品 10μg/ kg 或等體積的鹽水。

結果：在干預後的所有時間間隔，使用新斯的明/阿托品的視覺類比評分得分顯著優於（鹽水治療）。 新斯的明/阿托品組中沒有患者需要硬膜外血液補片，而安慰劑組為 7（15.9％）（P <.001）。 患者不需要> 2 劑新斯的明/阿托品。 頸部僵硬，噁心或嘔吐之間沒有組間差異。 新斯的明/阿托品組僅發生腹部痙攣，肌肉抽搐和膀胱亢進等併發症（P <.001）。

結論：新斯的明/阿托品僅在 2 次給藥後有效治療 PDPH。新斯的明可以通過脈絡叢，但不能通過血腦屏障。 兩種藥物的中樞作用均影響腦脊液分泌和腦血管張力，這是 PDPH 的主要病理生理變化。 結果與新斯的明活性的先前研究和臨床報告一致。

（許智鴻 譯 潘豔、薛張剛校）

BACKGROUND: Postdural puncture headache (PDPH) lacks a standard evidence-based treatment.A patient treated with neostigmine for severe PDPH prompted this study.

METHODS: This randomized, controlled, double-blind study compared neostigmine and atropine(n = 41) versus a saline placebo (n = 44) for treating PDPH in addition to

conservative management of 85 patients with hydration and analgesics. The primary outcome was a visual analog scale score of ≤3 at 6, 12, 24, 36, 48, and 72 hours after intervention. Secondary outcomes were the need for an epidural blood patch, neck stiffness, nausea, and vomiting. Patients received either neostigmine 20 μg/kg and atropine 10 μg/kg or an equal volume of saline.

RESULTS: Visual analog scale scores were significantly better (*P*< .001) with neostigmine/atropine than with saline treatment at all time intervals after intervention. No patients in the neostigmine/atropine group needed epidural blood patch compared with 7 (15.9%) in the placebo group (*P*< .001). Patients required no >2 doses of neostigmine/atropine. There were no between-group differences in neck stiffness, nausea, or vomiting. Complications including abdominal cramps, muscle twitches, and urinary bladder hyperactivity occurred only in the neostigmine/atropine group (*P*< .001).

CONCLUSIONS: Neostigmine/atropine was effective in treating PDPH after only 2 doses.Neostigmine can pass the choroid plexus but not the blood–brain barrier. The central effects of both drugs influence both cerebrospinal fluid secretion and cerebral vascular tone, which are the primary pathophysiological changes in PDPH. The results are consistent with previous studies and clinical reports of neostigmine activity.

剖宮產後神經軸性嗎啡和二乙醯嗎啡相關性呼吸抑制的系統評價

A Systematic Review Evaluating Neuraxial Morphine and Diamorphine-Associated Respiratory Depression After Cesarean Delivery

Nadir Sharawi, MBBS, FRCA, MSc,* Brendan Carvalho, MBBCh, FRCA,† Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA,‡ Lindsay Blake, MLIS, AHIP,§ Jill M. Mhyre, MD,‖ and Pervez Sultan, MBChB, FRCA, MD (Res)¶

From the *Department of Anesthesiology, University of Arkansas for Medical Sciences, Little Rock, Arkansas; †Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, California; ‡Department of Anesthesiology, Duke University School of Medicine, Durham, North Carolina; §UAMS Medical Library and ‖Department of Anesthesiology, University of Arkansas for Medical Sciences, Little Rock, Arkansas; and ¶Department of Anaesthesia, University College London Hospital, University College London, London, United Kingdom.

Anesthesia & Analgesia: 2018 127 1385–1395

剖宮產後椎管內使用阿片類物質引起的臨床顯著呼吸抑制（CSRD）的發生率尚不清楚。我們試圖回顧作者報告的呼吸抑制（ARD）的報導病例，以計算 CSRD 發生率。為了確定在接受剖宮產的產婦中，呼吸抑制繼發于椎管內使用嗎啡或二乙醯嗎啡，我們進行了 6 個資料庫的文獻檢索。計算了 CSRD 的“最高”

（確定的和可能的/可能的）和“最低”（肯定）的發生率。次要結果包括：（1）與當前使用劑量的椎管內阿片相關的 CSRD 的發生率，（2）每個研究自己的標準所定義的 ARD 發生率，（3）ARD 病例報告，和（4）麻醉封閉索賠專案資料庫在 1990 年到 2010 年間報告的 ARD 報告。我們對 78 篇文章和 18455 名接受椎管內嗎啡或二乙醯嗎啡剖宮產的產婦進行了鑒定。所有劑量的椎管內阿片類藥物引起的 CSRD 的最高和最低發生率分別為 8.67/10000（95%CI，4.20-15.16）和 5.96/10000（95%CI，2.23-11.28）。在使用臨床相關劑量的椎管內嗎啡治療的患者， CSRD 的最高和最低發生率分別為 1.63/10000（95%CI，0.62-8.77）和 1.08/10000（95%CI，0.24-7.22）。每篇論文定義的 ARD 發生率為 61/10000（95%CI，51-74）。一份已發表的 ARD 病例報告符合我們的納入標準，並且沒有來自封閉索賠資料庫分析的 ARD 病例。這些結果表明，在產科患者中，由椎管內使用嗎啡或二乙醯嗎啡引起的 CSRD 的發生率較低。

(湯潔 譯潘豔、薛張剛校)

The prevalence of neuraxial opioid–induced clinically significant respiratory depression (CSRD) after cesarean delivery is unknown. We sought to review reported cases of author-reported respiratory depression (ARD) to calculate CSRD prevalence. A 6-database literature search was performed to identify ARD secondary to neuraxial morphine or diamorphine, in parturients undergoing cesarean delivery. “Highest” (definite and probable/possible) and “lowest” (definite) prevalences of CSRD were calculated. Secondary outcomes included: (1) prevalence of CSRD associated with contemporary doses of neuraxial opioid, (2) prevalence of ARD as defined by each study’s own criteria, (3) case reports of ARD, and (4) reports of ARD reported by the Anesthesia Closed Claims Project database between 1990 and 2016. We identified 78 articles with 18,455 parturients receiving neuraxial morphine or diamorphine for cesarean delivery. The highest and lowest prevalences of CSRD with all doses of neuraxial opioids were 8.67 per 10,000 (95% CI, 4.20–15.16) and 5.96 per 10,000 (95% CI, 2.23–11.28), respectively. The highest and lowest prevalences of CSRD with the use of clinically relevant doses of neuraxial morphine ranged between 1.63 per 10,000 (95% CI, 0.62–8.77) and 1.08 per 10,000 (95% CI, 0.24–7.22), respectively. The prevalence of ARD as defined by each individual paper was 61 per 10,000 (95% CI, 51–74). One published case report of ARD met our inclusion criteria,

and there were no cases of ARD from the Closed Claims database analysis. These results indicate that the prevalence of CSRD due to neuraxial morphine or diamorphine in the obstetric population is low.

The Perioperative Management of Ascending Aortic Dissection

升主動脈夾層的圍術期處理

Gregory, Stephen H., MD[*]; Yalamuri, Suraj M., MD[†]; Bishawi, Muath, MD[‡]; Swaminathan, Madhav, MD, MMCi, FASE, FAHA[§]
Anesthesia & Analgesia: 2018 127 1302–1313

急性主動脈綜合征是一組涉及主動脈血管壁急性起病的獨特的病理性疾病且若不及時治療可潛在致死。此綜合征有≥95%以主動脈夾層為表現。相對於主動脈其他部位的夾層，升主動脈夾層是非常致命的，需要儘早和特殊的手術治療。升主動脈的外科修復手術給麻醉醫生帶來多重挑戰。圍術期有效的管理對於降低疾病的發病率和死亡率很重要。在此篇綜述中，作者回顧了升主動脈夾層手術的圍術期管理。術前討論應著重於評估、血流動力學管理和危險分層。術中部分需要除了考慮到麻醉管理、經食管超聲心動圖評估和凝血疾病等外，應包括可能影響麻醉管理的手術操作。

（陳冬芳 譯 陳傑 校 ）

Acute aortic syndromes are a distinct group of pathologies involving the wall of the aorta that present acutely and can be potentially fatal unless treated in a timely fashion. The syndrome is dominated by aortic dissections, which comprise ≥95% of all such presentations. Those involving the ascending aorta are particularly lethal and require specific and early surgical treatment compared to dissections involving other parts of the aorta. The surgical repair of an ascending aortic dissection presents multiple challenges to the anesthesiologist. Thoughtful management throughout the perioperative period is critical for minimizing the significant morbidity and mortality associated with this condition. In this narrative review, we provide an overview of the perioperative management of patients presenting for the surgical repair of an ascending aortic dissection. Preoperative discussion focuses on assessment, hemodynamic management, and risk stratification. The intraoperative section includes an overview of anesthetic management, transesophageal echocardiographic

assessment, and coagulopathy, as well as surgical considerations that may influence anesthetic management.

圍術期淺低溫和心肌損傷的關係：回顧性佇列分析

Mild Perioperative Hypothermia and Myocardial Injury ：A Retrospective Cohort Analysis

Schacham, Yehoshua N., MD[*,†]; Cohen, Barak, MD, MHA[*,‡]; Bajracharya, Gausan R., MD[*]; Walters, Michael, BS[*]; Zimmerman, Nicole, MS[*,§]; Mao, Guangmei, PhD[*,§]; Tanios, Marianne A., MD, MPH[*]; Sessler, Daniel I., MD[*]
Anesthesia & Analgesia: 2018 127 1335–1341

背景:本研究主要假設為非心臟手術患者術後 7 天的院內全因死亡和心肌損傷風險增加與術中食道溫度相關。次要暴露因素為時間加權的平均術中溫度和小於 37°C 的溫度範圍。

方法:作者將心肌損傷定義為心肌缺血導致術後第四代肌鈣蛋白 T≥0.03 ng / mL。採集克利夫蘭診所 2012 至 2015 年之間接受全麻下非心臟手術的住院患者術中食道溫度和術後肌鈣蛋白常規監測的資料。作者採用多變數 logistic 回歸檢測了患者最終術中食管溫度與不良事件之間經混雜因數校正後的相關性，用同樣的方法檢測了時間加權的平均術中溫度和小於 37°C 的溫度範圍。

結果:本研究共納入 2210 名患者。幾乎所有患者的最終食道溫度在 36°C-37°C 之間。其中，97 名(4.4%)患者發生了心肌損傷，7 名(0.3%)患者出院前死亡。患者的最終術中核心溫度與不良事件無相關性:每降低 1°C，OR 值為 0.91(95% CI 為 0.68-1.24)。同樣，次要暴露因素與綜合風險也無相關性。

結論:作者發現成人非心臟手術的死亡率與圍術期的輕度低體溫或心肌損傷並無相關性。然而，術終時患者的體溫範圍波動較小且主要局限于正常範圍(36-37°C)。目前仍需進一步研究溫度對心肌損傷的影響。

（錢佳紅 譯 陳傑 校）

BACKGROUND: We tested the primary hypothesis that final intraoperative esophageal temperature is associated with increased odds of a composite of in-hospital all-cause mortality and myocardial injury within 7 days after noncardiac surgery. Secondary exposures were time-weighted average intraoperative temperature and area <37°C threshold.
METHODS: Myocardial injury was defined by postoperative fourth-generation troponin T ≥0.03 ng/mL apparently due to cardiac ischemia. Data were extracted for inpatients who had noncardiac surgery with general anesthesia at the Cleveland Clinic between 2012 and 2015. All had esophageal temperature monitoring and routine postoperative troponin monitoring. We estimated the confounder-adjusted association between final intraoperative esophageal temperature and the collapsed composite with multivariable logistic regression. We similarly estimated associations with time-weighted average intraoperative temperature and area <37°C.
RESULTS: Two thousand two hundred ten patients were included. Nearly all final esophageal temperatures were 36°C–37°C. Ninety-seven patients (4.4%) had myocardial injury, and 7 (0.3%) died before discharge. Final intraoperative core temperature was not associated with the collapsed composite: odds ratio, 0.91 (95% confidence interval, 0.68–1.24) per 1°C decrease. Similarly, neither of the secondary exposures was associated with the composite outcome.
CONCLUSIONS: We did not observe an association between mild perioperative hypothermia and mortality or myocardial injury in adults having noncardiac surgery. However, the range of final intraoperative temperatures was small and largely restricted to the normothermic range (36°C–37°C). Trials are needed to further assess the effect of temperature on myocardial injury.

同通道濾器減少術後導管相關外周靜脈炎

In-Line Filtration Reduces Postoperative Venous Peripheral Phlebitis Associated With Cannulation

Villa, Gianluca, MD[*,†]; Chelazzi, Cosimo, MD, PhD[†]; Giua, Rosa, MD[*]; Tofani, Lorenzo, BS[‡]; Zagli, Giovanni, MD[†]; Boninsegni, Paolo, MD[†]; Pinelli, Fulvio, MD[†]; De Gaudio, A. Raffaele, MD[*,†]; Romagnoli, Stefano, MD, PhD[*,†]
Anesthesia & Analgesia: 2018 127 1367–1374

背景：外周靜脈置管是接受麻醉和手術患者的常規操作專案。靜脈輸液同時注入的顆粒物（例如，塑膠/玻璃/藥物顆粒）是外周靜脈炎的重要發病機制。這項研究目的是為了證明同通道濾器在減少短期外周血管置管相關的術後靜脈炎發生中的作用。

方法：此項對照研究納入 268 位手術患者，隨機分為同通道過濾組和標準管理組（NCT03193827），比較兩組患者在 48 小時內靜脈炎發生率（視覺靜脈炎定義為 VIP 評分≥2）以及靜脈炎的發作和嚴重程度以及拔管的原因。通過 Kaplan-Meier 曲線來比較同通道和非同通道濾器的靜脈置管的使用壽命。

結果：術後 48 小時兩組靜脈炎的發生率分別為 2.2%和 26.9%（差異，25%[95%CI 12%-36%],優勢比 0.05[0.01-0.15]）。非同通道濾器組的病人 VIP 評分高於同通道濾器組（P<0.01）。同通道濾器組的靜脈置管使用壽命高於非同通道濾器組（P=0.1）。其中同通道濾器組和非同通道濾器組術後 96 小時仍保留置管的人數分別為 64 人（47.8%）和 56 人（41.8%）。此時，同通道濾器組 100%的患者 VIP 得分<3，而非同通道濾器組只有 50%。同通道濾器是一項避免術後靜脈炎（風險比 0.05[95%CI 0.014-0.15]P<0.01）和拔管（風險比 0.7[95% CI 0.52-0.96]P=0.2）的保護性措施。

結論：同通道濾器是一項對外科患者進行外周靜脈置管期間避免術後靜脈炎和延長置管壽命的保護性措施。

（郭寶超 譯 陳傑 校）

BACKGROUND:Peripheral venous cannulation is an everyday practice of care for patients undergoing anesthesia and surgery. Particles infused with intravenous fluids (eg, plastic/glass/drugs particulate) contribute to the pathogenesis of peripheral phlebitis. The aim of this study is to demonstrate the efficacy of in-line filtration in reducing the incidence of postoperative phlebitis associated with peripheral short-term vascular access.

METHODS: In this controlled trial, 268 surgical patients were randomly assigned to in-line filtration and standard care (NCT03193827). The incidence of phlebitis (defined as visual infusion phlebitis [VIP] score, ≥2) within 48 hours was compared between the 2 groups, as well as the onset and severity of phlebitis and the reasons for removal of the cannula. The lifespan of venous cannulae was compared for the in-line filter and no-filter groups through a Kaplan-Meier curve.

RESULTS:The incidence of phlebitis within 48 hours postoperatively was 2.2% and 26.9% (difference, 25% [95% confidence interval {CI}, 12%–36%]; odds ratio, 0.05

[0.01–0.15]), respectively, for the in-line filter and no-filter groups (P < .001). From 24 to 96 hours postoperatively, patients in the no-filter group had higher VIP scores than those in in-line filter group (P < .001). Venous cannulae in the in-line filter group exhibited prolonged lifespan compared to those in the no-filter group (P = .01). In particular, 64 (47.8%) of cannulae in the in-line filter group and 56 (41.8%) of those in the no-filter group were still in place at 96 hours postoperatively. At the same time point, patients with a VIP score <3 were 100% in the in-line filter group and only 50% for the no-filter group. In-line filtration was a protective factor for postoperative phlebitis (hazard ratio, 0.05 [95% CI, 0.014–0.15]; P < .0001) and cannula removal (hazard ratio, 0.7 [95% CI, 0.52–0.96]; P = .02).
CONCLUSIONS:In-line filtration has a protective effect for postoperative phlebitis and prolongs cannula lifespan during peripheral venous cannulation in surgical patients.

Informed Consent in Pediatric Anesthesia

兒科麻醉的知情同意

Feinstein, Max M., MA[*]; Pannunzio, Anthony E., MD[†]; Lobell, Samuel, MD[‡]; Kodish, Eric, MD[§]
Anesthesia & Analgesia: 2018 127 1398–1405

小兒麻醉知情同意書由於其複雜的倫理、醫學和法律上的含糊不清通常給執業醫師帶來挑戰。病人作為未成年人的地位並不否定其參與決策過程的重要性，相對而言，更需要對年齡和發展作出微妙的評估，以便使病人適當參與進來。鑒於兒科知情同意在麻醉實踐和研究中的複雜性，瞭解關鍵利益相關者非常重要。本綜述中，作者搜索了 Medline、Cochrane 資料庫、PROSPERO 和 clinicaltrials.gov，研究涉及兒童麻醉知情同意書。納入和排除標準旨在選擇包含與知情同意相關問題作為主要結果的研究。從納入的研究中提取了以下資料:標題、作者、發表日期、研究類型、干預、資料收集方法、參與者類型(即，家長、兒科患者、麻醉提供者)、參與者數量、兒科患者年齡範圍、主要結果測量。一共有 22 篇文章被納入最終審查:小兒麻醉知情同意的研究跨越了知情同意的許多方面。父母的理解被研究最多(7/22 研究)，其次是父母的偏好(5/22 研究)和提供者相關的結果如與患者互動的時間、與知情同意相關的培訓數量的主觀報告、以及提供者對知情

同意過程的滿意度(5/22 研究)。與兒童患者本身有關的結果構成最小數量的研究，包括兒童焦慮(1/22)、兒童理解(1/22)和兒童拒絕(1/22)。在參與研究的人群中，父母是這些研究中最常見的研究物件(2719/3805 名研究物件，占所有研究物件的 71%)。兒童患者是調查兒童麻醉知情同意的研究中最不常涉及的受試者(493/3805，占所有受試者的 13%)。麻醉提供者和調查人員作為研究物件(593/3805，占所有研究物件的 16%)，涉及到一系列主題包括與患者交流的時間、與受訓者地位有關的知情同意書交談的性質、對知情同意書流程的滿意度以及知情同意書內容的優先順序。本綜述旨在總結小兒麻醉知情同意書的研究進展。

（羅琨 譯　陳傑 校）

Informed consent for pediatric anesthesia challenges practitioners to navigate complex ethical, medical, and legal ambiguities. A patient's status as a minor does not negate the importance of his or her participation in the decision-making process but, rather, necessitates a nuanced evaluation of age and development to involve the patient to an appropriate extent. Given the complexities involved with pediatric informed consent in anesthesia practice and research, it is important to understand the experience of key stakeholders involved. For this review, we searched Medline, the Cochrane database, PROSPERO, andClinicaltrials.gov for studies involving pediatric anesthesia informed consent. Inclusion and exclusion criteria were designed to select for studies that included issues related to informed consent as primary outcomes. The following data were extracted from included studies: title, authors, date of publication, study type, intervention, data collection method, participant type (ie, parent, pediatric patient, anesthesia provider), number of participants, pediatric patient age range, and primary outcome measures. Twenty-two articles were included for final review: studies of informed consent in pediatric anesthesia span many aspects of informed consent. Parental understanding has been studied most often (7/22 studies), followed by parental preferences (5/22 studies) and provider-related outcomes (5/22 studies) such as time spent interacting with patients, subjective reporting on amount of training related to informed consent, and provider satisfaction with the informed consent process. Outcomes pertaining to pediatric patients themselves constitute the smallest number of studies, including child anxiety (1/22), child understanding (1/22), and child refusal (1/22). Among the parties involved, parents have been most frequently identified as the subjects of these studies (2719/3805 subjects across all included studies, or 71% of all subjects). Pediatric patients are the least frequently involved subjects of studies that investigate informed consent in pediatric anesthesia (493/3805, or 13% of all subjects). Anesthesia providers and investigators have been

study subjects (593/3805, or 16% of all subjects) for a range of topics including time spent interacting with patient, nature of informed consent conversation in relation to trainee status, satisfaction with informed consent process, and priorities for informed consent content. The aim of the present narrative review is to summarize the work that has been done on informed consent for pediatric anesthesia.