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超快通道麻醉联合 BIS 监测对心脏手术患者的效果及安全性 *

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摘要 目的:探究超快通道麻醉辅助脑电双频指数(Bispectral index,BIS)监测对行心脏手术患者认知功能障碍的影响和安全性。**方法:**选取 2014 年 1 月 -2017 年 1 月于我院进行心脏手术的 59 例患者为研究对象,按照随机数字表法将其分为实验组(29 例)和对照组(30 例)。其中,对照组患者实施心脏超快通道麻醉,实验组患者实施心脏超快通道麻醉辅助 BIS 监测。术后 6 个月,使用韦氏成人智力量表对两组麻醉前后认知功能障碍情况进行比对,并比较两组术后 6 个月内并发症的发生率。**结果:**(1)两组术后 6 个月时智力测试得分对比差异无统计学意义(P>0.05),各指数间对比差异也无统计学意义(P>0.05);(2)实验组患者术后 6 个月内并发症发生率较对照组显著降低(P<0.05)。**结论:**与单独使用超快速通道的患者相比,行全身麻醉心脏手术患者使用超快速通道麻醉辅助 BIS 监测麻醉及单用超快速通道对患者认知功能障碍的影响相当,但前者的安全性明显高于后者。

关键词:超快速通道麻醉;脑电双频指数监测;心脏手术;认知功能障碍;并发症

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Oprative Effect and safety of Ultrafast Channel Anesthesia - assisted BIS Monitoring on the Patients Undergoing Cardiac Surgery*

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ABSTRACT Objective: To investigate the effects of ultrafast anesthesia-assisted BIS monitoring on cognitive dysfunction and the security in patients undergoing cardiac surgery. **Methods:** 59 patients undergoing cardiac surgery in our hospital from January 2014 to January 2017 were selected as experimental subjects and divided into experimental group (n=29) and control group (n=30) according to random number table method. Among them, the control group underwent cardiac ultra-fast channel anesthesia, the experimental group underwent cardiac ultra-fast channel anesthesia assisted BIS monitoring. The Webster's Adult Intelligence Scale was used to compare the cognitive dysfunction before and after anesthesia. The incidence of complications within 6 months after surgery was compared between the two groups. **Results:** (1) There was no significant difference in intelligence test scores between the two groups at 6 months after operation (P>0.05), and there was no significant difference between each index (P>0.05); (2) The incidence of postoperative complications in the experimental group was significantly lower than that in the control group (P<0.05). **Conclusions:** Compared with the patients using only the ultra-fast channel, the effect of BIS monitoring anesthesia assisted by the ultra-fast channel anesthesia in patients undergoing general anesthesia and the effect of using only the ultra-fast channel anesthesia on the cognitive dysfunction of patients was similar, but the safety of the former was significantly higher than that of the latter.

Key words: Ultra-fast channel anesthesia; BIS monitoring; Cardiac surgery; Cognitive dysfunction; Complications

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前言

外科手术患者一般需要全身麻醉,但是全麻会对患者的中枢神经系统产生一定的影响,尤其是老年患者,极易出现认知功能障碍,严重影响患者的生活质量和预后[1-3]。心脏手术具有涉及系统广、危险性高、操作难度大等特点,一般需要在全麻条件下进行,而麻醉剂的选择和剂量一直是医学工作者关注的重点[4-6]。近年的研究显示动物实施全身麻醉会加快其神经细胞的凋亡,抑制其神经网络的形成,干扰其远期感觉及行为能力,而反复、大量使用麻醉剂更是会短时间内造成大量神经细胞死亡[7,8]。现阶段,有学者提出是否可以采取少量、单次或短时间的给药方式来降低麻醉剂对机体神经细胞的损伤,另有学者提出在此基础上实施脑电双频谱指数(Bispectral index, BIS)监测可以较好地反映麻醉深度和大脑皮质功能状态,有利于控制麻醉药物的使用,起到降低并发症发生率的效果[9-11]。本研究结果显示对实施心脏手术的患者而言,采取超快通道麻醉辅助 BIS 监

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测的方式能够降低麻醉剂对认知功能障碍的影响,同时有利于降低并发症的发生率,结果报道如下。

1 资料与方法

1.1 一般资料

选取 2014 年 1 月 -2017 年 1 月于我院进行心脏手术的患者 59 例,按照随机数字表法将其分为实验组(n=29,心脏超快通道麻醉)和对照组(n=30,心脏超快通道麻醉 +BIS 监测)。其中,实验组男性 15 例,女性 14 例,年龄最小 45 岁,最大 70 岁,平均年龄(53.26± 1.71)岁,体重 53-66 kg,平均体重(63.73± 3.26)kg,房间隔缺损修补术 14 例,室间隔缺损修补术 15 例,对照组男性 15 例,女性 15 例,年龄最小 43 岁,最大 71 岁,平均年龄(53.09± 1.82)岁,体重 54-67kg,平均体重(64.06± 2.96)kg,房间隔缺损修补术 16 例,室间隔缺损修补术 14 例,两组患者麻醉分级均为 I-II 级,且一般资料具有可比性。

纳入标准:(1)诊断为心脏病且需进行手术治疗;(2)意识清晰;(3)病历资料齐全;(4)依从性较好;(5)患者及家属对本次调研过程、方法、原理清楚明白并签署知情同意书。

排除标准:(1)合并家族认知功能异常者;(2)合并中枢神经系统疾病者;(3)合并其他器质性疾病如高血压、肾衰竭等;(4)合并凝血障碍者;(5)合并精神疾患者。

剔除标准:(1)调研期间死亡者;(2)患者要求终止调研者。

1.2 方法

两组患者术前准备阶段使用方法一致,患者进入手术室后由护理人员建立静脉通路,滴注乳酸钠林格注射液,使用心电监护仪对患者生命体征进行监测,均于术前静注阿托品防治术中分泌物过多;而后对照组患者使用七氟烷进行诱导麻醉,静注芬太尼、爱可松,术中采用经鼻气管持续给予七氟烷进行麻醉维持,转机后调整七氟烷浓度,开房上下腔静脉,恢复机械通气,停止静脉麻醉剂及肌松药,待手术结束关闭胸腔后,医师手法诱导患者恢复自主呼吸,停用机械通气,术后常规抗菌治疗;实验组患者在对照组基础上加用 BIS 监测,当患儿进入手术室后,使用柯惠脑电双频指数麻醉深度检测仪(型号 BIS-EEG-VISTA,美国生产)对患者 BIS 值进行检测,在初次使用丙泊酚时即开始监测,当患者 BIS 值下降到 50 后,停止注射丙泊酚,术中根据 BIS 值对麻醉药的注入进行调整,维持读数在 45-55 之间,并使用心电监护仪对患者血压、心率进行监测;术后两组患者护理方法一致,于术后 6 个月时对患者的认知功能及并发症发生情况进行比较。

1.3 观察指标

认知功能情况采用韦氏成人智力量表。统计并记录两组患者术后 6 个月内的并发症诸如呼吸抑制、心律失常、胸前区疼痛等的发生率。

1.4 统计学方法

使用 SPSS22.0 对数据实施分析,计数资料(并发症发生率)以率(%)的形式表示,组间比较采用卡方检验,计量资料(智力测评得分)以($\bar{x}\pm s$)的形式表示,组间比较采用 t 检验,以 P<0.05 为差异有统计学意义。

2 结果

2.1 两组术后智力测评得分的比较

两组患者智力测试总分对比差异无统计学意义(P>0.05),各指数间对比差异也无统计学意义(P>0.05)。

表 1 两组患者术后 6 个月智力测评得分的对比($\bar{x}\pm s$)

Table 1 Comparison of intellectual assessment scores of patients between two groups at six months after operation($\bar{x}\pm s$)

Groups	n	Total intelligence quotient	Speech comprehension index	Intuitive Reasoning Index	Working memory index	Machining Speed Index	General Capability Index	Cognitive efficiency index
Experimental group	29	112.62± 8.26	110.25± 3.64	112.97± 10.15	106.45± 6.29	109.62± 5.26	115.21± 8.56	111.56± 5.21
Control group	30	111.95± 7.59	111.58± 2.97	113.09± 9.85	108.01± 5.96	111.53± 4.96	114.95± 8.69	110.96± 6.27
t	-	0.628	0.549	0.632	0.268	0.159	0.627	0.961
P	-	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

2.2 两组并发症发生率的比较

实验组患者术后 6 个月内并发症发生率较对照组显著降低(P<0.05)。

表 2 两组患者术后并发症发生率的对比[例(%)]

Table 2 Comparisons of the incidence of postoperative complications between the two groups[n(%)]

Groups	n	Respiratory depression	Arrhythmia	Anterior chest pain	Incidence rate
Experimental group	29	2(6.90)	3(10.34)	6(20.69)	11(37.93)
Control group	30	3(10.00)	7(23.33)	8(26.67)	18(60.00)
x^2	-	-	-	-	1.692
P	-	-	-	-	<0.05

3 讨论

目前,全麻药在外科手术中的应用已逐渐趋于成熟,七氟烷、芬太尼等药物具有起效快、使用方便等优点,在手术中使用

频率较高[12-14]。全麻药一般为 N- 甲基 -D- 天冬酰胺(NMDA)受体拮抗剂和 γ- 氨基丁酸 A 型受体(GABAA)激动剂，人体中 NMDA 与学习记忆具有密切联系，因而麻醉药的使用会对神经细胞产生一定损伤，严重影响患者的认知功能，尤其是老年患者[15-17]。心脏手术是所有手术类型中风险最大的手术，手术均采用全麻，术后 1 周患者认知功能障碍的发病率极高，严重延长了患者的住院时间和生活质量[18-21]。因此有效的控制麻醉的药物剂量和麻醉的时间，实时监测麻醉的深度，有利于减少并发症的发生。超快通道麻醉是在快速通道麻醉基础上实施的麻醉技术，该技术将各类麻醉手段相糅合，充分利用其优势，在手术结束缝皮时停止使用肌松剂及麻醉药，利用药物残留效应完成操作，这样一方面能够减少药物使用量，另一方面也能够缩短患者拔管时间。有学者通过对 200 例行心脏手术患者进行分组处理的方式，就超快通道麻醉在该术中的应用效果进行了探究，结果显示，心脏手术中应用超快通道麻醉镇痛、镇静效果显著，能够减少术中血流动力学波动，减轻手术对患者心肌的刺激，同时可减轻机体炎症刺激，缩短住院时间，促进术后恢复[22-26]。因此，超快通道麻醉具有积极意义。BIS 是近些年新兴的对麻醉深度进行监测的方法之一，其使施术者对患者的实时状态可直接观测，进而调整给药速率及剂量，有利于预防过度给药的发生，同时还能够降低麻醉药物用量[27,28]。

本研究就超快通道麻醉辅助 BIS 监测对行心脏手术患者的认知功能障碍进行了探究，结果显示单独应用超快通道麻醉的对照组患者远期认知功能障碍与使用联合检测的实验组差异不明显，分析原因可能是由于麻醉剂中含有大量的 NMDA 受体抑制剂，而 NMDA 与机体的远期记忆能力息息相关，因而使用麻醉剂可能对造成患者术后记忆受损，而近些年的动物研究指出，神经损伤具有一定的 " 可逆性 "，因而少量七氟烷会对患者神经造成 " 延迟损伤效应 "，即当时表现出损伤，而后逐渐恢复，因而远期对比两组智力评测得分并无显著差异。本研究实验组术后 6 个月内并发症发生率显著低于对照组，说明联合麻醉能够减少术后呼吸抑制、心律失常和胸前区疼痛等并发症的发生情况，主要原因联合 BIS 监测能够监测大脑皮质的功能状态对患者的意识消失及恢复、术中知晓和体动的发生做出较灵敏的预测，指导麻醉，减少药物用量，缩短苏醒时间，有效的减少麻醉药物对患者的神经损伤，因此减少术后并发症的发生率[29,30]。

总而言之，与单独使用超快速通道的患者相比，行全身麻醉心脏手术患者使用超快速通道麻醉辅助 BIS 监测麻醉及单用超快速通道对患者认知功能障碍的影响相当，但前者的安全性明显高于后者。

参 考 文 献(References)

[1] Hong Y, Lu Z, Ye M, et al. Early postoperative recovery in operating room after desflurane anesthesia combined with Bispectral index (BIS) monitoring and warming in lengthy abdominal surgery: a randomized controlled study[J]. BMC Anesthesiology, 2018, 18(1): 110

[2] Chiang M H, Wu S C, Hsu S W, et al. Bispectral index (BIS) and non-BIS anesthetic protocols on postoperative recovery outcomes: a systematic review and meta-analysis [J]. Minerva anestesiologica, 2017, 84(2): 216-228

[3] Iodice F G, Giuseppina T, Emanuele R, et al. Multimodal diaphragmatic monitoring in pediatric cardiac surgery [J]. Pediatric Anesthesia, 2018, 28(5): 475-476

[4] Hughes C G, Patel M B, Jackson J C, et al. Surgery and Anesthesia Exposure Is Not a Risk Factor for Cognitive Impairment After Major Noncardiac Surgery and Critical Illness [J]. Annals of Surgery, 2017, 265(6): 1126-1133

[5] Yundan P, Jiaojiao N, Gang Q, et al. Perioperative safety of Tibetan children with congenital heart disease undergoing cardiac surgery and anesthesia in low-altitude area [J]. Journal of Central South University, 2017, 42(11): 1288-1292

[6] Timea B, Csaba L, Zoltan V, et al. Cost-effectiveness of anesthesia maintained with sevoflurane or propofol with and without additional monitoring: a prospective, randomized controlled trial [J]. BMC Anesthesiology, 2018, 18(1): 100

[7] Sakai W, Yoshikawa Y, Hirata N , et al. Effect of remifentanil during cardiopulmonary bypass on incidence of acute kidney injury after cardiac surgery[J]. Journal of Anesthesia, 2017, 31(6): 895-902

[8] Chapman M, Johnson D, Ryu R , et al. Questioning the conventional wisdom on the hazards of vancomycin: thrombotic risk may not be intrinsic to the drug[J]. Anesthesiology, 2017, 28(2): S137-S137

[9] Aykut U, Mahmut A, Murat B, et al. Efficacy of bispectral index monitoring for prevention of anestheticawareness and complications during oocyte pick-up procedure [J]. Turkish Journal of Medical Sciences, 2017, 47(5): 1583-1589

[10] Casteleiro-Roca José-Luis, Calvo-Rolle José, Méndez Pérez Juan, et al. Hybrid Intelligent System to Perform Fault Detection on BIS Sensor During Surgeries[J]. Sensors, 2017, 17(12): 179

[11] Zhu J, Zhang X R, Yang H. Effects of combined epidural and general anesthesia on intraoperative hemodynamic responses, postoperative cellular immunity, and prognosis in patients with gallbladder cancer: A randomized controlled trial[J]. Medicine, 2017, 96(10): e6137

[12] Cao Y H, Chi P, Zhao Y X , et al. Effect of bispectral index-guided anesthesia on consumption of anesthetics and early postoperative cognitive dysfunction after liver transplantation: An observational study[J]. Medicine, 2017, 96(35): e7966

[13] Rüsch Dirk, Christian A, Leopold E, et al. Bispectral index to guide induction of anesthesia: a randomized controlled study [J]. BMC Anesthesiology, 2018, 18(1): 66

[14] Nakhli M S, Kahloul M, Guizani T, et al. Intravenous lidocaine as adjuvant to general anesthesia in renal surgery [J]. Libyan Journal of Medicine, 2018, 13(1): 1433418

[15] Yu Y N, Doctor F, Fan S Z, et al. An Adaptive Monitoring Scheme for Automatic Control of Anaesthesia in dynamic surgical environments based on Bispectral Index and Blood Pressure [J]. Journal of Medical Systems, 2018, 42(5): 95

[16] Lim B G, Lee I O, Kim Y S, et al. The utility of bispectral index monitoring for prevention of rocuronium-induced withdrawal movement in children: A randomized controlled trial [J]. Medicine, 2017, 96(2): e5871

[17] Kanazawa S, Oda Y, Maeda C, et al. Electroencephalographic effect of age-adjusted 1 MAC desflurane and sevoflurane in young, middle-

aged, and elderly patients[J]. Journal of Anesthesia, 2017, 31(5): 744-750

[18] Kayser S, Bewernick B H, Soehle M, et al. Degree of Postictal Suppression Depends on Seizure Induction Time in Magnetic Seizure Therapy and Electroconvulsive Therapy [J]. Journal of Ect, 2017, 33 (3): 167-175

[19] Chakrabarti D, Surve R M, Bs D, et al. Intraoperative aberrant bispectral index values due to facial nerve monitoring [J]. Journal of Clinical Anesthesia, 2017, 37(Complete): 61-62

[20] Karube N, Ito S, Sako S, et al. Sedative effects of oral pregabalin premedication on intravenous sedation using propofol target-controlled infusion[J]. Journal of Anesthesia, 2017, 31(4): 1-7

[21] Song S Y, Kwak S G, Kim E . Effect of a mother's recorded voice on emergence from general anesthesia in pediatric patients: study protocol for a randomized controlled trial[J]. Trials, 2017, 18(1): 430

[22] Cui Q, Peng Y, Liu X, et al. Effect of anesthesiadepth onpostoperative clinical outcome in patients with supratentorial tumor (DEPTH): study protocol for a randomized controlled trial[J]. Bmj Open, 2017, 7(9): e016521

[23] Som A, Maitra S, Bhattacharjee S, et al. Goal directed fluid therapy decreases postoperative morbidity but not mortality in major non-cardiac surgery: a meta-analysis and trial sequential analysis of randomized controlled trials [J]. Journal of Anesthesia, 2017, 31(1): 66-81

[24] Adachi K, Toyama H, Kaiho Y, et al. The impact of liver disorders on perioperative management of reoperative cardiac surgery: a retrospective study in adult congenital heart disease patients [J]. Journal of Anesthesia, 2017, 31(2): 170-177

[25] Gabriel R A, Sztain J F, A'Court, Alison M, et al. Postoperative mortality and morbidity following non-cardiac surgery in a healthy patient population[J]. Journal of Anesthesia, 2017, 32(1): 112-119

[26] Braghiroli K S, Braz, José R. C, Rocha B, et al. Perioperative and anesthesia-related cardiac arrests in geriatric patients: a systematic review using meta-regression analysis [J]. Scientific Reports, 2017, 7 (1): 2622

[27] Ram M, Lavie A , Lev S , et al. Cardiac hemodynamics before, during and after elective cesarean section under spinal anesthesia in low-risk women[J]. Journal of Perinatology, 2017, 37(7): 793-799

[28] Bukovnik N, Markota A, Velnar T, et al. Therapeutic hypothermia and inhalation anesthesia in a patient with severe pneumococcal meningitis and secondary cardiac arrest [J]. The American Journal of Emergency Medicine, 2017, 35(4): 665.e5-665.e6

[29] Cohen M A, Stuart G M, Veyckemans F. Delivery of anesthesia for children with Mucopolysaccharidosis Type III (Sanfilippo syndrome): a review of 86 anesthetics [J]. Pediatric Anesthesia, 2017, 27 (4): 363-369

[30] Steinhauser J, Wespi P, Kwiatkowski G, et al. Assessing the influence of isoflurane anesthesia on cardiac metabolism using hyperpolarized [1-\r13\r, C]pyruvate[J]. NMR in Biomedicine, 2018, 31(2): e3856

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[14] 王思博, 刘亢丁, 杨弋, 等. 中国偏头痛患者右向左分流阳性率及分流类型 - 一项全国多中心研究 [J]. 中国卒中杂志, 2018, 13 (3): 251-256

[15] Rau JC, Dodick DW. Other Preventive Anti-Migraine Treatments: ACE Inhibitors, ARBs, Calcium Channel Blockers, Serotonin Antagonists, and NMDA Receptor Antagonists [J]. Curr Treat Options Neurol, 2019, 21(4): 17

[16] Deen M, Christensen CE, Hougaard A, et al. Serotonergic mechanisms in the migraine brain-a systematic review [J]. Cephalalgia, 2017, 37(3): 251-264

[17] 伍广伟, 刘礼敖, 王盂杰, 等. 封堵治疗卵圆孔未闭并发不同类型偏头痛 47 例[J].安徽医药, 2019, 23(9): 1808-1811

[18] Folsom AR, Lutsey PL, Misialek JR, et al. A prospective study of migraine history and venous thromboembolism in older adults [J]. Res Pract Thromb Haemost, 2019, 3(3): 357-363

[19] 叶青, 林百喜, 周婵娟, 等. 平均血小板体积与卵圆孔未闭并偏头痛患者视觉先兆的关系[J].实用医学杂志, 2017, 33(3): 437-439

[20] Harriott AM, Strother LC, Vila-Pueyo M, et al. Animal models of migraine and experimental techniques used to examine trigeminal sensory processing[J]. J Headache Pain, 2019, 20(1): 91

[21] 任丽, 朱婷, 张艳林, 等. 慢性偏头痛动物实验模型研究进展[J]. 中国临床神经科学, 2018, 26(3): 332-335

[22] Arngrim N, Schytz HW, Britze J, et al. Migraine induced by hypoxia: an MRI spectroscopy and angiography study [J]. Brain, 2016, 139(3): 723-737

[23] Britze J, Arngrim N, Schytz HW, et al. Hypoxic mechanisms in primary headaches[J]. Cephalalgia, 2017, 37(4): 372-384

[24] 林攀, 黄志珍, 卢珍友, 等. 对比增强经颅多普勒超声对偏头痛与右向左分流相关性的福建地区单中心研究 [J]. 中风与神经疾病杂志, 2017, 34(9): 826-829

[25] Spence JD. Migraine, shear stress, and platelet serotonin [J]. Headache, 2013, 53(3): 552

[26] Sadrameli SS, Gadhia RR, Kabir R, et al. Patent Foramen Ovale in Cryptogenic Stroke and Migraine with Aura: Does Size Matter [J]. Cureus, 2018, 10(8): e3213

[27] Gasparini CF, Smith RA, Griffiths LR, et al. Genetic and biochemical changes of the serotonergic system in migraine pathobiology[J]. J Headache Pain, 2017, 18(1): 20

[28] Nyberg J, Gustavsson S, Linde M, et al. Cardiovascular fitness and risk of migraine: a large, prospective population-based study of Swedish young adult men[J]. BMJ Open, 2019, 9(8): e029147

[29] 王松龄, 刘福贵, 王爱凤. 从疏肝活血法论治偏头痛 [J]. 新中医, 2017, 49(8): 171-172

[30] Bidot S, Biotti D. Migraine with visual aura [J]. J Fr Ophtalmol, 2016, 39(6): 554-559