

doi: 10.3978/j.issn.2095-6959.2021.01.010

View this article at: <http://dx.doi.org/10.3978/j.issn.2095-6959.2021.01.010>

不同麻醉方式对小儿包皮环切术中术后麻醉镇痛效果及快速康复的作用

沈晓平, 宋杰

(南通大学第二附属医院麻醉科, 江苏 南通 226000)

[摘要] 目的: 探讨不同麻醉方式对小儿包皮环切手术术中、术后麻醉镇痛效果及术后快速康复的影响。方法: 从2018年1月至2019年3月在南通大学第二附属医院行包皮环切术的患儿共231例, 排除疾病、药物过敏、不同意参加研究以及局部麻醉无法配合的患儿共141例, 最终前瞻性纳入90例, 随机分为3组, 静脉麻醉联合罗哌卡因、利多卡因骶管阻滞组(I组)、静脉麻醉联合罗哌卡因骶管阻滞组(II组)、喉罩插管全身麻醉联合罗哌卡因骶管阻滞组(III组)。手术方法为传统切除缝合术。监测术中生命体征, 记录从麻醉诱导到手术开始时间、运动阻滞评分、麻醉后监测治疗室(post-anesthesia care unit, PACU)停留时间、记录术后各时点疼痛评分、术后镇痛给药次数、麻醉费用、住院时间等。结果: 3组患儿均按术前制订的麻醉方案进行, 麻醉效果满意, 术中生命体征平稳。I, II, III组手术时间分别为(30.23±6.22) min, (29.24±5.91) min, (29.94±5.59) min。从麻醉诱导到手术开始时间3组差异无统计学意义($P=0.58$)。I, II组术毕患儿送往PACU, III组术毕拔出喉罩后送往PACU。术中加用丙泊酚人数I, II组差异无统计学意义($P=0.573$), III组术中七氟烷维持(1.0%~1.5%)。术后PACU停留时间($P=0.458$)和住院时间($P=0.059$)组间差异无统计学意义; 术后使用镇痛药和术后疼痛评分差异无统计学意义($P>0.05$), 相对于II, III组, I组在术后30 min存在运动阻滞($P<0.001$)。三组术后恶心呕吐的发生率差异无统计学意义($P=0.455$), 术后III组有7例(23.3%)患儿出现苏醒期躁动、3例(10%)患儿出现分泌物增多。III组的麻醉费用比I, II两组高出近1倍。结论: 静脉麻醉复合罗哌卡因骶管阻滞用于小儿包皮环切术麻醉和术后镇痛效果佳, 不良反应少, 麻醉费用低, 加速患儿的术后康复。

[关键词] 骶管阻滞; 罗哌卡因; 包皮环切术; 镇痛; 加速康复外科

Effects of different anesthesia methods on analgesic during and after surgery and enhanced recovery after surgery for children with circumcision

SHEN Xiaoping, SONG Jie

(Department of Anesthesiology, Second Affiliated Hospital of Nantong University, Nantong Jiangsu 226000, China)

Abstract Objective: To explore the effects of different anesthesia methods on intraoperative and postoperative analgesia and

收稿日期 (Date of reception): 2019-11-29

通信作者 (Corresponding author): 宋杰, Email: songjie1004@sina.com

enhanced recovery after surgery in pediatric circumcision. **Methods:** From January 2018 to March 2019, a total of 231 children underwent circumcision in our hospital. A total of 141 children who were with certain disease, drug allergies, did not agree to participate in the study, and could not cooperate with local anesthesia were excluded in this study. Finally, 90 children undergoing circumcision in our hospital were prospectively enrolled. They were randomly divided into three groups: the intravenous anesthesia combined with ropivacaine and lidocaine sacral anesthesia group (group I), the intravenous anesthesia combined with ropivacaine sacral anesthesia group (group II), and the laryngeal mask anesthesia combined with ropivacaine sacral anesthesia group (group III). The surgical method was traditional resection and suture. The vital signs were monitored, the time from induction of anesthesia to the beginning of operation was recorded, the total times of analgesia postoperatively was calculated, and the pain score, motor block score, post-anesthesia care unit (PACU) stay, anesthesia cost and hospital stay were recorded. **Results:** The effect of anesthesia was satisfactory in all three groups, and the anesthesia method was not changed during the operation. The average operation time in group I, II and III was (30.23±6.22) min, (29.24±5.91) min, (29.94±5.59) min. There was no significant difference in the time from induction of anesthesia to the beginning of operation between the three groups ($P=0.58$). Children in groups I and II were sent to PACU after operation, while those in group III were sent to PACU after removal of laryngeal mask. There was no difference in propofol consumed during operation between group I and group II ($P=0.573$). Sevoflurane was maintained 1.0%–1.5% in group III. There was no difference between the postoperative PACU stay time ($P=0.458$) and hospital stay time ($P=0.059$). Compared with group II and III, group I had motor block at 30min after operation ($P<0.001$). No difference was found in postoperative nausea and vomiting between the three groups ($P=0.455$). There were seven patients (23.3%) with delirium, and 3 (10%) with increased excretions in group III. The cost of anesthesia in group III was nearly twice over those in group I and group II. **Conclusion:** Intravenous anesthesia combined with ropivacaine fistula block for pediatric circumcision can provide satisfactory anesthesia and postoperative analgesia, reduce complications and anesthesia cost, and promote the postoperative recovery of children.

Keywords analgesia; caudal block; circumcision; enhanced recovery after surgery; ropivacaine

目前, 多种麻醉镇痛方式在儿科手术中和术后镇痛中应用, 阿片类药物常用于成人术后镇痛, 但其呼吸抑制等不良反应限制了其在儿外科学术后镇痛中的应用^[1-2]。骶管阻滞是儿科会阴部手术的常用麻醉镇痛方式, 简单易行、安全有效、并发症少, 成功率高, 广泛用于术中术后镇痛^[3-4]。目前国外使用最广泛的是喉罩全身麻醉复合骶管阻滞^[4], 国内也有采用静脉全麻复合骶管阻滞的情况。单纯罗哌卡因骶管阻滞起效时间慢, 骶管加用利多卡因可以加快罗哌卡因的起效时间^[5-6]。但何种麻醉方式可以优化此类手术的麻醉效果、加快患儿术后康复仍不清楚。因此, 本研究通过三种不同麻醉镇痛方式, 研究其对包皮环切术患儿的术中术后麻醉镇痛效果、术中血流动力学情况、麻醉药物不良反应、麻醉后监测治疗室(post-anesthesia care unit, PACU) 停留时间及住院时间等, 以期获得麻醉效果佳、不良反应少、促进患儿术后快速

康复的最佳麻醉方式。

1 对象与方法

1.1 对象

本研究为前瞻性、随机对照试验(RCT), 收集2018年1月至2019年3月于南通大学第二附属医院行包皮环切术患儿共231例, 排除骶管阻滞禁忌(凝血异常、脊柱畸形)、心血管疾病、药物过敏、I型糖尿病、神经发育落后、患儿家长拒绝行骶管阻滞/喉罩插管或拒绝加入本研究及局部麻醉无法配合手术的病例共141例, 最终纳入90例行包皮环切术患儿, ASA I-II级, RCT纳入流程图见图1。本研究采用单盲法, 仅研究人员了解分组情况, 受试对象对分组情况未知。首先由1名研究人员产生随机序列, 再由另一名对本研究研究分组情况未知的工作人员确定其分组。最终将90例患儿

随机分为3组: I组(静脉麻醉+罗哌卡因复合利多卡因阻滞)、II组(静脉麻醉+单纯罗哌卡因阻滞)、III组(喉罩全麻+罗哌卡因阻滞), 每组各30例, 术前禁饮2 h、禁母乳4 h、禁配方奶和淀粉类食物6 h、禁食固体和脂类食物8 h。本研究经南通大学第二附属医院医学伦理委员会审核批准, 患儿家属均知情同意。

1.2 麻醉与手术方法

患儿入手术室后, 监测脉氧饱和度(SpO_2)、血压(BP)、心电图(ECG), 以乳酸林格液10 mL/kg静脉滴注。静脉麻醉诱导用药: 咪达唑仑0.1 mg/kg(最大用量不超过3 mg), 喷他佐辛0.5 mg/kg(最大用量不超过15 mg), 丙泊酚2 mg/kg。静脉用药麻醉后, 面罩吸入纯氧复合3%~5%的七氟烷, 喉罩插管全麻后1.0%~1.5%的七氟烷维持自主呼吸。骶管阻滞患者静脉麻醉诱导后或喉罩全麻后俯卧位, 无菌操作, 用5 cm长的22号针头骶裂孔穿刺进行骶管阻滞, 回抽无血无液体后注入局麻药。利多卡因浓度0.7%~1.0%, 罗哌卡因浓度0.2%~0.3% (1 mL/kg, 最大不超过23 mL/kg), 按最大不超过1 mL/kg骶管给药。I, II组患儿面罩给氧自主呼吸, III组患儿喉罩插管自主呼吸。心率小于基础值的20%为心动过缓, 静脉滴注阿托品0.01~0.02 mg/kg; 平均血压低于基础

值的20%为低血压, 给予平衡液快速滴注。

手术方法: 手术前夜及手术当日, 嘱患儿或其家属清洗局部, 清洁生殖器。麻醉后患儿取平卧位, 于背侧纵向将包皮切开, 以刀尖在包皮外板距冠状沟缘远端0.5 cm处划一切痕, 准备作为环切切口, 出血处使用电凝止血, 用细丝线在环形切口的背、腹、左、右各处缝合, 凡士林纱布环绕包皮切口处包扎。

1.3 观察指标与评分

观察并记录所有患儿麻醉诱导至手术开始时间; 麻醉前基础值(T1)、麻醉诱导后(T2)、手术开始即刻(T3)、术中15 min(T4)、术毕(T5)的血压、心率及苏醒及其躁动、恶心呕吐发生率; III组术毕至拔除喉罩出手术室的时间。术后PACU出现躁动患儿给予丙泊酚1 mg/kg^[7]。观察术后30 min, 2 h, 6 h, 24 h的镇痛评分、运动阻滞评分(改良Bromage法)、镇静评分及不良反应。同时记录三组患儿术中术后各时段的无创血压、心率、呼吸频率及血氧饱和度, 观察有无恶心呕吐、苏醒期躁动及呼吸道分泌物增加、呼吸抑制等不良反应。镇痛评分采用FLACC量表法(表1)。评价指标包括: 术后镇痛效果及镇痛药物的使用、术后运动阻滞Bromage评分、PACU停留时间和住院时间。

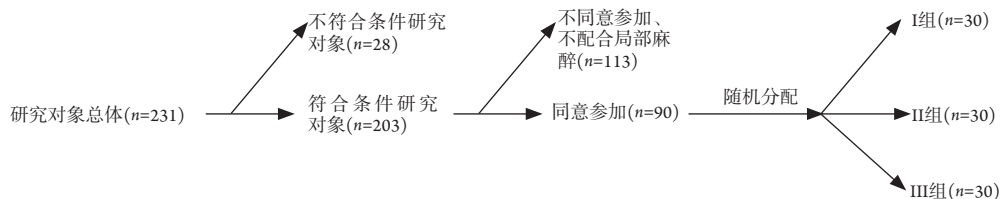


图1 受试者纳入流程图

Figure 1 Flowchart of subject inclusion

表1 FLACC评分量表

Table 1 FLACC scoring

项目	FLACC评分		
	0	1	2
脸	微笑或无特殊表情	偶尔出现痛苦表情, 皱眉, 不愿交流	经常或持续出现下颚颤抖或紧咬下颚
腿	放松或保持平常的姿势	不安, 紧张, 维持不舒服的姿势	踢腿或腿部拖动
活动度	安静躺着, 正常体位, 或轻松活动	扭动, 翻来覆去, 紧张	痉挛, 成弓形, 僵硬
哭闹	不哭(清醒或睡眠中)	呻吟, 啜泣, 偶尔诉痛	一直哭泣, 尖叫, 经常诉痛
可安慰性	无需安慰	偶尔抚摸拥抱和言语可以被安慰	难于被安慰

如果FLACC>3分, 给予对乙酰氨基酚塞肛或利多卡因乳胶涂抹。改良Bromage评分标准: 无运动神经阻滞为0级; 不能抬腿为1级; 不能弯曲膝部为2级; 不能弯曲踝关节为3级。

1.4 统计学处理

采用SPSS 22.0统计学软件进行数据分析。符合连续正态分布的计量资料以均数±标准差($\bar{x} \pm s$)表示, 非正态分布的计量资料采用中位数和四分位距表示, 组间差异分析采用非参数Kruskal Wallis检验。计数资料采用频数和频率表示, 采用卡方检验。 $P < 0.05$ 为差异有统计学意义。

2 结果

3组患儿均按分组完成相应的麻醉手术, 围术期无一例患儿退出试验。I组(8例, 26.7%)、II

组(10例, 30%)在术中加用丙泊酚人数方面的差异无统计学意义($P = 0.573$)。I, II组患儿术毕即送往PACU, 喉罩组术毕拔除喉罩后送往PACU, 术毕至拔除喉罩的平均时间为13 min。III组的术后恶心呕吐的发生率(6例, 16.7%)略高于I组(3例, 10%)和II组(2例, 6.7%), 但差异无统计学意义($P = 0.455$)。III组术后有7例患儿(23.3%)出现苏醒期躁动, 3例患儿(10%)出现呼吸道分泌物增多。三组患儿均未出现术后呼吸抑制情况。I, II, III组患儿麻醉费用平均为(1 196 ± 120)元、(1 157 ± 108)元、(2 244 ± 213)元。相对于I, II组, III组的麻醉费用增加近1倍。其他情况见表2~6。

2.1 3组一般临床资料比较

3组患儿年龄、体重、麻醉诱导至手术开始时间、手术时间等一般情况组间差异均无统计学意义(均 $P > 0.05$, 表2)。

表2 一般临床资料

Table 2 General clinical information

组别	年龄/岁	体重/kg	麻醉诱导至手术开始时间/min	手术时间/min
I组	7.35 ± 2.68	28.88 ± 9.87	17.25 ± 5.24	30.23 ± 6.22
II组	6.12 ± 3.48	25.81 ± 12.03	19.00 ± 5.31	29.24 ± 5.91
III组	6.19 ± 2.59	24.29 ± 12.72	20.06 ± 6.89	29.94 ± 5.59
P	0.280	0.160	0.158	0.586

表3 术中生命体征

Table 3 Intraoperative vital signs

组别	心率/ min^{-1}				
	T1	T2	T3	T4	T5
I组	95.33 ± 12.21	86.29 ± 12.40	78.92 ± 13.35	76.13 ± 14.45	79.46 ± 15.39
II组	99.71 ± 11.63	92.95 ± 9.90	87.29 ± 14.70	83.80 ± 18.91	86.38 ± 19.04
III组	99.50 ± 16.11	97.69 ± 13.995	94.25 ± 14.01	82.13 ± 17.29	84.19 ± 17.86
P	0.462	0.01	0.01	0.341	0.547

组别	平均动脉压/mmHg				
	T1	T2	T3	T4	T5
I组	76.53 ± 13.61	67.78 ± 9.16	65.21 ± 7.27	65.39 ± 8.40	66.56 ± 8.77
II组	71.35 ± 9.23	65.19 ± 8.13	63.21 ± 7.60	63.33 ± 9.20	65.27 ± 12.37
III组	73.09 ± 14.53	64.31 ± 11.19	60.77 ± 6.04	58.46 ± 7.63	63.98 ± 8.22
P	0.536	0.335	0.169	0.034	0.657

1 mmHg=0.133 kPa.

表4 术后镇痛评分及术后镇痛药使用次数

Table 4 Postoperative analgesic score and postoperative analgesics

组别	术后30 min	术后2 h	术后6 h	术后24 h	布洛芬	利多卡因乳胶
I组	0 (0, 0)	0 (0, 0)	1 (0, 3)	0 (0, 1)	2 (2, 2)	3 (2, 5)
II组	0 (0, 0)	0 (0, 0)	0.5 (0, 3)	0.5 (0, 3)	2 (2, 3.75)	3 (4, 6)
III组	0 (0, 0)	0 (0, 0)	1.5 (0, 3.25)	0 (0, 2)	2 (2, 3.25)	5 (3, 6.25)
P	0.249	0.977	0.835	0.677	0.088	0.232

数据用中位数和四分位距表示。

Data are expressed as median and interquartile range.

表5 术后运动阻滞Bromage评分

Table 5 Bromage score postoperatively

组别	术后30 min	术后2 h	术后6 h
I组	1 (1, 2)	0 (0, 0.75)	0 (0, 0)
II组	0 (0, 0)	0 (0, 0)	0 (0, 0)
III组	0 (0, 0)	0 (0, 0)	0 (0, 0)
P	<0.0001	0.156	1.000

数据用中位数和四分位距表示。

Data are expressed as median and interquartile range.

表6 PACU停留时间和住院时间

Table 6 PACU stay and length of stay

组别	PACU停留时间/min	住院时间/d
I组	21.50 ± 4.95	4.12 ± 1.69
II组	22.92 ± 9.20	3.95 ± 1.61
III组	22.67 ± 10.63	4.38 ± 1.71
P	0.458	0.260

2.2 术中不同时点的生命体征

三组患儿呼气末二氧化碳为35~45 mmHg, SpO₂在97%以上。基础值(T1)、麻醉诱导后(T2)、手术开始(T3)、手术15 min(T4)、术毕(T5)等不同时间点的心率、无创动脉平均压见表3。在T2, T3时间点, I, II组患儿心率较III组慢(P=0.010), 考虑其原因为喉罩插管的应激使III组患儿在这个时间点的心率相对较快。在T4时间点, III组患儿的血压较I, II组低(P=0.034), 考虑其原因为术中七氟烷对循环的抑制作用。PACU停留时间和住院时间见表3。

2.3 术后镇痛效果及镇痛药物的使用

3组间术后镇痛评分差异无统计学意义, 镇痛效果满意(表4)。

2.4 术后运动阻滞

I组患儿术后30 min仍有部分出现运动阻滞, 与II, III组比较, 差异有统计学意义(P<0.0001, 表5)。

2.5 PACU停留时间和住院时间

在PACU停留时间和住院时间方面, 三组组间差异均无统计学意义(表6)。

3 讨论

儿童疼痛很难表达清楚, 因此术中术后的多模式镇痛也在儿科手术中逐渐受到重视。全身麻醉是儿科麻醉中最常用的方法, 而骶管神经阻滞是儿科麻醉中最常用的区域麻醉方法, 简单易行、安全有效、成功率高, 广泛用于术中术后镇痛, 特别适合会阴区手术^[3]。喷他佐辛可以在静脉麻醉诱导中协同咪达唑仑增强其镇静作用, 同时具有一定的镇痛作用, 可以与咪达唑仑合用, 产生类似氯胺酮与咪达唑仑复合用药的效果^[8-9]。与吸入七氟烷镇静镇痛相比, 本研究应用的静脉麻醉配方在保持术中患儿的镇静镇痛的同时, 既保留了患儿的自主呼吸, 也减少了恶心呕吐、术后躁动和分泌物增加的发生率, 提高了围手术期患儿的麻醉舒适度。

罗哌卡因是一种酰胺类局麻药, 起效时间和维持时间与布比卡因类似, 但运动神经阻滞的发生和持续时间较短, 强度也较弱^[10]。与布比卡因、利多卡因相比, 罗哌卡因对椎间盘细胞的毒

性最低^[11]。罗哌卡因骶管阻滞不仅可以满足术中镇痛,也在术后的多模式镇痛中起重要作用。单纯罗哌卡因骶管阻滞起效时间较慢,而利多卡因复合罗哌卡因可以缩短单纯罗哌卡因的起效时间^[5-6]。本研究结果显示:骶管药物罗哌卡因复合利多卡因组在诱导至手术开始时间上与单纯罗哌卡因组的差异并没有统计学意义,术中术后的镇痛效果及不良反应中亦无明显区别。研究^[12]显示:利多卡因对肌腱细胞存在毒性,而罗哌卡因没有类似发现,故不建议常规在骶管阻滞的局麻药中加用利多卡因。

围手术期常规镇痛方案中,骶管神经阻滞是儿童加速康复外科(enhanced recovery after surgery, ERAS)镇痛标准方案的重要组成部分^[9]。骶管神经阻滞可以极大地减少阿片类镇痛药的使用和减轻炎症应激反应,加速患儿康复^[13]。多项RCT观察性研究^[14-16]表明:在上呼吸道感染的手术患儿中,相对于插管或喉罩,面罩吸氧自主呼吸的患儿出现术后呼吸道并发症的概率最少。研究^[2,9,17]表明:骶管阻滞麻醉在术中术后镇痛中效果明确,可以加快术后康复。骶管阻滞麻醉并发症少^[18],在区域阻滞中单次骶管阻滞最常见^[4]。有研究^[19]报道应用静脉麻醉复合骶管神经阻滞在小儿会阴部手术的镇痛中具有较好的疗效,积累了较多的经验。本研究未发现未控制气道的I, II组患儿术中鼻导管采样呼气末二氧化碳均在正常范围。

一项对600余例普外科与泌尿外科手术的患儿进行随访观察的研究^[7]发现:全麻术后很多患儿均存在疼痛,术后当天或术后1 d疼痛最显著。本研究结果显示:术后当天患儿最痛,轻至中度疼痛的患儿较多,24 h后疼痛逐渐缓解;麻醉诱导至手术开始时间喉罩全麻复合骶管组时间趋势上明显多于另外2组,术毕的喉罩拔管也增加了手术间的停留时间。即使静脉咪达唑仑和丙泊酚可以减少七氟烷的术后躁动发生率^[20],但该组患儿术后躁动的发生率仍居高不下,同时该麻醉方案显著增加了麻醉费用。ERAS目的是加速患儿康复、减少住院费用^[21]。因此,静脉全麻复合罗哌卡因骶管阻滞保证术中术后完善镇痛的同时降低麻醉费用加快手术室周转利用率,术后不良反应少,增加了患儿术后的舒适性,推进了此类手术的ERAS进程。

综上,静脉麻醉复合罗哌卡因骶管阻滞对小儿包皮环切术中、术后镇痛效果良好,不良反应少,同时减少了麻醉费用,是小儿包皮环切术ERAS较好的麻醉镇痛方式。

参考文献

1. Krane EJ, Weisman SJ, Walco GA. The National opioid epidemic and the risk of outpatient opioids in children[J]. *Pediatrics*, 2018, 142(2).
2. Gan TJ. Poorly controlled postoperative pain: prevalence, consequences, and prevention[J]. *J Pain Res*, 2017, 10: 2287-2298.
3. Hassan PF, Hassan AS, Elmetwally SA. Caudal analgesia for hypospadias in pediatrics: comparative evaluation of adjuvants dexamethasone and dexmedetomidine combination versus dexamethasone or dexmedetomidine to bupivacaine: a prospective, double-blinded, randomized comparative study[J]. *Anesth Essays Res*, 2018, 12(3): 644-650.
4. Polaner DM, Taenzer AH, Walker BJ, et al. Pediatric Regional Anesthesia Network (PRAN): a multi-institutional study of the use and incidence of complications of pediatric regional anesthesia[J]. *Anesth Analg*, 2012, 115(6): 1353-1364.
5. 张卫珍. 罗哌卡因混合利多卡因骶管麻醉在小儿外科的应用[J]. *实用儿科临床杂志*, 2008, 23(23): 1862-1863.
ZHANG Weizhen. Application of ropivacaine complex lidocaine for sacral canal blocking in pediatric operation[J]. *Journal of Applied Clinical Pediatrics*, 2008, 23(23): 1862-1863.
6. 黄振华, 左云霞. 利多卡因复合罗哌卡因骶管阻滞用于学龄期青春男性患儿阴茎手术[J]. *西部医学*, 2009, 21(6): 920-922.
HUANG Zhenhua, ZUO Yunxia. The effect of lidocaine and ropivacaine combinations in caudal block for penis operation in school-age and adolescent patients[J]. *Medical Journal of West China*, 2009, 21(6): 920-922.
7. van Hoff SL, O'Neill ES, Cohen LC, et al. Does a prophylactic dose of propofol reduce emergence agitation in children receiving anesthesia? A systematic review and meta-analysis[J]. *Paediatr Anaesth*, 2015, 25(7): 668-676.
8. Nakagawa S, Okamoto Y, Kodama Y, et al. Thiamylal plus pentazocine shows similar efficacy as ketamine plus midazolam for painful procedures in children with leukemia[J]. *J Pediatr Hematol Oncol*, 2018, 40(4): e263-e265.
9. Yoshioka S, Takedatsu H, Fukunaga S, et al. Study to determine guidelines for pediatric colonoscopy[J]. *World J Gastroenterol*, 2017, 23(31): 5773-5779.
10. 左云霞. 小儿术后镇痛专家共识[C]. 2010年中华医学会全国小儿麻醉学术年会暨中欧小儿麻醉交流会议论文集, 2010: 52-56.
ZUO Yunxia. Expert consensus on pediatric postoperative analgesia[C]. 2010 Chinese Academy of Pediatric Anesthesiology Annual Conference and China-Europe Pediatric Anesthesia Exchange Conference, 2010: 52-56.
11. Cai XY, Xiong LM, Yang SH, et al. Comparison of toxicity effects of ropivacaine, bupivacaine, and lidocaine on rabbit intervertebral disc

- cells in vitro[J]. *Spine J*, 2014, 14(3): 483-490.
12. Piper SL, Laron D, Manzano G, et al. A comparison of lidocaine, ropivacaine and dexamethasone toxicity on bovine tenocytes in culture[J]. *J Bone Joint Surg Br*, 2012, 94(6): 856-862.
 13. Chalmers DJ, Bielsky A, Wild TT, et al. Continuous local anesthetic infusion for children with spina bifida undergoing major reconstruction of the lower urinary tract[J]. *J Pediatr Urol*, 2015, 11(2): 72.e1-5.
 14. von Ungern-Sternberg BS, Boda K, Chambers NA, et al. Risk assessment for respiratory complications in paediatric anaesthesia: a prospective cohort study[J]. *Lancet*, 2010, 376(9743): 773-783.
 15. Tait AR, Burke C, Voepel-Lewis T, et al. Glycopyrrolate does not reduce the incidence of perioperative adverse events in children with upper respiratory tract infections[J]. *Anesth Analg*, 2007, 104(2): 265-270.
 16. Luce V, Harkouk H, Brasher C, et al. Supraglottic airway devices vs tracheal intubation in children: a quantitative meta-analysis of respiratory complications[J]. *Paediatr Anaesth*, 2014, 24(10): 1088-1098.
 17. Kendall MC, Alves LJC, Suh EI, et al. Regional anesthesia to ameliorate postoperative analgesia outcomes in pediatric surgical patients: an updated systematic review of randomized controlled trials[J]. *Local Reg Anesth*, 2018, 11: 91-109.
 18. Walker BJ, Long JB, Sathyamoorthy M, et al. Complications in pediatric regional anesthesia: an analysis of more than 100,000 blocks from the pediatric regional anesthesia network[J]. *Anesthesiology*, 2018, 129(4): 721-732.
 19. 袁惠芬, 郝复, 徐金龙, 等. 骶管麻醉在小儿上腹部及腹会阴手术中的应用[J]. *中华小儿外科杂志*, 1987, 8(2): 73-76.
YUAN Huifen, HAO Fu, XU Jinlong, et al. The use of caudal anesthesia for upper abdominal and abdominoperineal surgery in infants and children[J]. *Chinese Journal of Pediatric Surgery*, 1987, 8(2): 73-76.
 20. Borsos A, Lampe L, Balogh A, et al. Ovarian function after the menarche and hormonal contraception[J]. *Int J Gynaecol Obstet*, 1988, 27(2): 249-253.
 21. Cannesson M, Kain Z. Enhanced recovery after surgery versus perioperative surgical home: is it all in the name[J]. *Anesth Analg*, 2014, 118(5): 901-902.

本文引用: 沈晓平, 宋杰. 不同麻醉方式对小儿包皮环切术中术后麻醉镇痛效果及快速康复的作用[J]. *临床与病理杂志*, 2021, 41(1): 67-73. doi: 10.3978/j.issn.2095-6959.2021.01.010

Cite this article as: SHEN Xiaoping, SONG Jie. Effects of different anesthesia methods on analgesic during and after surgery and enhanced recovery after surgery for children with circumcision[J]. *Journal of Clinical and Pathological Research*, 2021, 41(1): 67-73. doi: 10.3978/j.issn.2095-6959.2021.01.010