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右美托咪定骶管阻滞剂量差异对儿童包皮环切术后的镇痛效果比较

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[摘要] 目的: 比较不同剂量的右美托咪定骶管阻滞对儿童包皮环切术后镇痛的临床疗效差异, 探讨右美托咪定的适宜剂量。方法: 选取江苏省淮安市妇幼保健院120例接受包皮环切术患儿, 依据随机原则分为: 0.25%罗哌卡因骶管阻滞组(R组), 在R组基础上+1 $\mu\text{g}/\text{kg}$ 右美托咪定骶管阻滞组(DR1组), 在R组基础上+2 $\mu\text{g}/\text{kg}$ 右美托咪定骶管阻滞组(DR2组), 在R组基础上+0.5 $\mu\text{g}/(\text{kg}\cdot\text{h})$ 右美托咪定静脉泵注组(DVR组)。分别在苏醒时、术后2, 4, 6, 12, 16, 24 h的7个时间点进行FLACC(Face, Legs, Activity, Crying, Consolability)评分; 记录4组患儿手术时间、苏醒时间、苏醒时躁动评分、镇痛时间; 比较4组术中不良事件和术后并发症发生率。结果: 4组患儿手术时间差异无统计学意义($P>0.05$); 苏醒时间R组与DR1组最短, DR2组次之, DVR组最长($P<0.05$); 躁动评分DVR组与DR2组最短, DR1组次之, R组最长($P<0.05$); 镇痛时间R组最短, DR1组与DVR组次之, DR2组最长($P<0.05$)。苏醒时及术后2, 24 h的FLACC评分4组比较均无统计学意义($P>0.05$); 术后4, 6, 12, 16 h的FLACC评分, DR1, DR2, DVR 3组明显低于R组(均 $P<0.05$), DR2组FLACC评分最低(均 $P<0.05$), 而DR1组与DVR组FLACC评分比较差异均无统计学意义(均 $P>0.05$)。DVR组易发生血流动力学不稳定, R组易发生需镇痛补救情况。结论: 2 $\mu\text{g}/\text{kg}$ 剂量右美托咪定复合罗哌卡因骶管阻滞对儿童包皮环切术后镇痛效果最好, 苏醒期间躁动少, 血流动力学稳定。

[关键词] 右美托咪定; 骶管麻醉; 儿童; 包皮环切; 镇痛

Comparison of the analgesic effects of caudal block with different doses of dexmedetomidine on postoperative analgesia after pediatric circumcision

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Abstract **Objective:** To compare the effects of caudal block with different doses of dexmedetomidine on postoperative

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analgesia after pediatric circumcision and to determine the suitable dosage of dexmedetomidine. **Methods:** A total of 120 children received with circumcision in Jiangsu Huai'an Maternity and Children Hospital were chosen and divided into 4 groups randomly, which were group R (received with 0.25% ropivacaine by sacral block), group DR1 (received with 1 $\mu\text{g}/\text{kg}$ dexmedetomidine and 0.25% ropivacaine by sacral block), group DR2 (received with sacral block by 2 $\mu\text{g}/\text{kg}$ dexmedetomidine and 0.25% ropivacaine) and group DVR (received by 0.5 $\mu\text{g}/\text{kg}$ dexmedetomidine and 0.25% ropivacaine by syringe pumps). Each group had 30 cases. The FLACC (Face, Legs, Activity, Crying, Consolability) scores of 4 groups were recorded at waking time, post-operation 2nd, 4th, 6th, 12th, 16th, 24th h respectively. The indexes of operation time, waking time, the restlessness score and the analgesic time were compared among four groups. The adverse events and the incidence of postoperative complications were compared among four groups. **Results:** The indexes of operation time were no different among four groups ($P>0.05$). The waking time of group R and group DR1 was the shortest, and the group DR2 was the medial and the group DRV was the longest ($P<0.05$). The FLACC scores of group DRV and group DR2 were shortest, and the group DR1 was the medial and the group R was the longest ($P<0.05$). The analgesic time of group R were shortest, and the group DR1 and the group DVR was the medial and the group DR2 was the longest ($P<0.05$). The FLACC scores of four groups at the waking time, post-operation 2nd and 24th h were no different among four groups ($P>0.05$). At the time-points of post-operation 4th, 6th, 12th and 16th h, the FLACC scores of group DR1, group DR2 and group DVR were lower than of group R (all $P<0.05$), and the FLACC scores of group DR2 were lowest (all $P<0.05$), but the FLACC scores of group DR1 and group DVR were no different ($P>0.05$). The hemodynamics indexes of group DVR was more unstable, and the need for analgesia remedies mainly occurred in group R. **Conclusion:** The caudal block with the dosage of 2 $\mu\text{g}/\text{kg}$ dexmedetomidine combined with ropivacaine on postoperative analgesia after pediatric circumcision can gain the best analgesic effect and less restlessness and the stable hemodynamics.

Keywords dexmedetomidine; sacral canal anesthesia; children; circumcision; analgesia

包皮环切术是小儿泌尿外科常见手术, 手术部位神经丰富敏感, 良好的术后镇痛、镇静能促进伤口愈合, 右美托咪定兼具有镇静、镇痛作用, 无呼吸抑制^[1]。骶管阻滞为特殊椎管内麻醉, 操作简便, 镇痛效果良好, 但是单次局部麻醉(以下简称局麻)药阻滞维持时间短^[2]。研究^[3]报道: 右美托咪定混合局麻药用于椎管内麻醉能安全有效地延长局麻药的作用时间, 已被用于成人椎管内麻醉和外周神经阻滞, 但用于小儿骶管阻滞的报道较少。鉴于此, 本研究采用前瞻、随机的研究方法, 比较不同剂量的右美托咪定复合罗哌卡因骶管阻滞用于包皮环切术患儿, 探寻合适的骶管阻滞使用剂量。

1 对象与方法

1.1 对象

选择 2016 年 06 月至 2017 年 10 月期间在淮安市妇幼保健院择期行包皮环切术患儿 120 例, 年龄 4~7(5.7 \pm 0.9) 岁, 体重 16~24 kg, 美国麻醉医师协会 (American Society of Anesthesiologists, ASA)

分级 I 或 II 级。患儿监护人均签署研究知情同意书。本研究通过江苏省淮安市妇幼保健院医学伦理委员会审核。排除标准: 对所用药用有过敏史; 存在凝血功能障碍、脊柱疾病、骶管闭合以及神经系统疾病等; 穿刺部位感染; 合并有发育不良、先天性心脏疾病、过度肥胖、严重肝肾功能障碍。

1.2 方法

采用随机数字表法, 将纳入病例随机分为 4 组, 每组 30 例, 分别为: 0.25% 罗哌卡因骶管阻滞组 (R 组), 1 $\mu\text{g}/\text{kg}$ 右美托咪定 +0.25% 罗哌卡因骶管阻滞组 (DR1 组), 2 $\mu\text{g}/\text{kg}$ 右美托咪定 +0.25% 罗哌卡因骶管阻滞组 (DR2 组), 0.25% 罗哌卡因骶管阻滞 +0.5 $\mu\text{g}/(\text{kg}\cdot\text{h})$ 右美托咪定静脉泵注组 (DVR 组)。4 组患者在年龄、体重指数等一般基础情况差异无统计学意义 ($P>0.05$)。

1.2.1 麻醉方法

常规术前准备, 无术前用药。入室后开放静脉通路, 常规监测心电图、血氧饱和度 (SPO₂)、心率 (heart rate, HR)、血压、平均动脉压 (mean

arterial pressure, MAP)。面罩吸入 8% 七氟烷 (氧流量 8 L/min) 使患儿入睡, 待患儿入睡后调整七氟醚吸入浓度为 3% (氧流量 2 L/min) 至手术结束。

各组患儿均在巡回护士协助下左侧卧胸膝位, 于上下骶骨角连线中点进行穿刺, 穿刺针垂直进入皮肤, 进入皮下后向尾部倾斜, 与皮肤呈 30~45° 进针, 刺破骶尾韧带时有突破感, 回抽无血无脑脊液, 注入各组药物 1 mL/kg (最大量 20 mL), DVR 组患儿静脉泵注右美托咪定 0.5 μ g/(kg·h) 至患儿苏醒。提睾反射消失后开始手术。

1.2.2 观察方法及评价指标

1.2.2.1 疼痛程度评价

本研究采用 FLACC (Face, Legs, Activity, Crying, Consolability) 评分法评价疼痛程度, 分别从面部表情、腿部活动、躯体活动、哭闹、可否安慰等 5 个指标进行评估, 每项指标 0~2 分, 总分值 10 分, 分值越高表明疼痛越严重。分别在苏醒时、术后 2, 4, 6, 12, 16, 24 h 共 7 个时间点对患儿进行 FLACC 评分, 以 FLACC 评分 \geq 4 分为术后疼痛标准, 记录时间点并给予芬太尼 0.5~1.0 μ g/kg 作为补救镇痛措施。

1.2.2.2 躁动评分评价

本研究采用 4 级躁动评分法对苏醒后患儿进行躁动评分: 1 级为安静、合作、无躁动; 2 级为焦虑、激动, 但可安抚; 3 级为轻度躁动、哭闹, 不能安抚; 4 级为严重躁动, 定向力障碍, 不能合作。

1.2.2.3 围手术期临床指标

记录手术时间、苏醒时间 (手术结束到唤醒睁眼时间); 记录麻醉开始前 (T0)、提睾反射消失时 (T1)、手术结束即刻 (T2)、术后 30 min (T3) 的 HR, MAP, SPO₂。

1.2.2.4 术后不良反应

记录患儿术后不良反应的发生情况, 包括心动过缓、苏醒延迟、低血压或高血压、恶心呕吐、低氧血症及低血压。其中心动过缓定义为 HR 低于相应年龄的最低值, 静脉给予阿托品 0.01~0.02 mg/kg; 苏醒延迟定义为停止使用麻醉药 30 min 呼之不应; 低血压定义为 MAP 降低幅度超过基础值的 30%, 静脉给予麻黄碱 0.5 mg/kg; 高血压定义为 MAP 高于 90 mmHg (1 mmHg=0.133 kPa), 静脉给予舒芬太尼 0.1 μ g/kg; 心动过速定义为 HR 高于 120 次/min; 低氧血症定义为 SPO₂<95%。

1.3 统计学处理

采用 SPSS 19.0 统计软件进行数据分析, 计量

资料以均数 \pm 标准差 ($\bar{x} \pm s$) 表示, 4 组间比较采用 ANOVA 检验, 组与组间比较采用 SNK 检验; 计数资料以率表示, 组间比较采用 χ^2 检验。以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 4 组围手术期指标的比较

4 组手术时间差异无统计学意义 ($P > 0.05$), 而苏醒时间、躁动评分及镇痛时间均有显著差异 ($P < 0.05$, 表 1)。苏醒时间: R 组、DR1 组比较差异无统计学意义 ($F=0.069, P=0.854$), 均较 DR2 组、DVR 组苏醒时间短 (均 $P < 0.001$); DR2 组较 DVR 组苏醒时间短 ($F=5.533, P < 0.001$)。苏醒躁动评分: DR1, DR2, DVR 3 组躁动评分均较 R 组低 ($F=3.296, 3.418, 3.463, P=0.016, 0.004, 0.002$), 而 DR1, DR2, DVR 3 组之间两两比较差异均无统计学意义 (均 $P > 0.05$)。镇痛时间: R 组较 DR1, DR2, DVR 3 组明显缩短 ($F=7.663, 16.497, 7.808$, 均 $P < 0.001$), 其中 DR2 组镇痛时间最长, 与 DR1, DVR 组比较均有显著性 ($F=8.833, 8.689$, 均 $P < 0.001$), 而 DR1 与 DVR 组无显著差异 ($F=0.144, P=0.766$)。

2.2 4 组各时间点 FLACC 评分比较

苏醒时及术后 2, 24 h 的疼痛评分 4 组比较均无统计差异 ($P > 0.05$); 术后 4, 6, 12, 16 h 疼痛评分比较, DR1, DR2, DVR 3 组明显低于 R 组 (均 $P < 0.05$), DR2 组疼痛评分最低 (均 $P < 0.05$), 而 DR1 组与 DVR 组 FLACC 评分比较差异均无统计学意义 (均 $P > 0.05$, 表 2)。

2.3 4 组不良反应及术后并发症比较

术中不良反应主要包括心动过缓、低血压、高血压等血流动力学不稳定情况, 且主要发生于 DVR 组, 与 R, DR1, DR2 3 组比较差异有统计学意义 (均 $P < 0.01$)。术后并发症主要有恶心、呕吐, DR2 组发生率最低, 但和 DR1 组比较差异无统计学意义 ($P > 0.01$), 均低于 R 组和 DVR 组 (均 $P < 0.01$), R 组与 DVR 组之间比较差异无统计学意义 ($P > 0.01$)。需镇痛补救的情况主要发生于 R 组, 与 DR1, DR2, DVR 比较差异有统计学意义 (均 $P < 0.01$), DR2 组发生率最低, 显著低于 R, DR1 和 DVR 组 (均 $P < 0.01$, 表 3)。患儿均未出现苏醒延迟、运动阻滞及低氧血症等症状。

表1 4组患儿围手术期临床指标比较($n=30, \bar{x} \pm s$)Figure 1 Comparison of the perioperative clinical indexes among four groups ($n=30, \bar{x} \pm s$)

组别	手术时间/min	苏醒时间/min	苏醒躁动评分	镇痛时间/min
R组	25.2 ± 2.7	6.8 ± 0.7	1.5 ± 0.5	363.6 ± 54.0
DR1组	25.2 ± 2.6	6.8 ± 0.8 ^{&}	1.2 ± 0.5*	823.2 ± 76.2 ^{*&}
DR2组	25.3 ± 2.7	8.3 ± 1.0 ^{*#}	1.1 ± 0.3*	1 353.6 ± 103.2 ^{*#}
DVR组	25.0 ± 2.7	13.9 ± 1.7 ^{*#&}	1.1 ± 0.3*	832.2 ± 90.6 ^{*&}
F	0.072	6.243	3.315	5.981
P	0.813	<0.001	0.014	<0.001

与R组相比, * $P<0.05$; 与DR1组相比, # $P<0.05$; 与DR2组相比, & $P<0.05$ 。

Compared with group R, * $P<0.05$; compared with group DR1, # $P<0.05$; compared with group DR2, & $P<0.05$.

表2 4组不同时间点FLACC评分比较($\bar{x} \pm s$)Figure 2 Comparison of FLACC scores at different time-points among the 4 groups ($\bar{x} \pm s$)

组别	苏醒时	2 h	4 h	6 h	12 h	16 h	24 h
R组	1.4 ± 0.7	1.0 ± 0.9	2.3 ± 0.8	3.9 ± 0.9	4.3 ± 0.7	3.6 ± 0.8	1.3 ± 0.9
DR1组	1.2 ± 0.8	0.9 ± 0.7	1.1 ± 0.7 ^{*&}	1.3 ± 0.8 ^{*&}	2.5 ± 0.8 ^{*&}	2.6 ± 0.9 ^{*&}	1.2 ± 0.7
DR2组	1.0 ± 0.9	0.8 ± 0.7	0.7 ± 0.6 ^{*#}	0.7 ± 0.6 ^{*#}	0.7 ± 0.6 ^{*#}	0.7 ± 0.6 ^{*#}	1.0 ± 0.8
DVR组	1.1 ± 0.8	0.8 ± 0.7	0.9 ± 0.8*	1.7 ± 0.9 ^{*&}	2.4 ± 0.6 ^{*&}	2.5 ± 0.9 ^{*&}	1.3 ± 0.7
F	1.026	2.216	3.973	4.226	5.929	5.881	2.327
P	0.108	0.079	0.023	0.019	<0.001	<0.001	0.063

与R组相比, * $P<0.05$; 与DR1组相比, # $P<0.05$; 与DR2组相比, & $P<0.05$ 。

Compared with group R, * $P<0.05$; compared with group DR1, # $P<0.05$; compared with group DR2, & $P<0.05$.

表3 各组术中不良反应及术后并发症发生率的比较($n=30$)Figure 3 Comparison of adverse events and the incidence of postoperative complications among four groups ($n=30$)

组别	心动过缓/%	低血压/%	高血压/%	恶心呕吐/%	补救镇痛/%
R组	0.0	0.0	0.0	20.0 ^{*&}	23.3 ^{*&}
DR1组	3.3	0.0	0.0	13.3 [*]	10.0 ^{*&}
DR2组	6.7	3.3	0.0	10.0*	3.3 ^{*#}
DVR组	50.0 ^{*#&}	16.7 ^{*#&}	10.0 ^{*#&}	16.7 [*]	13.3 ^{*#}
F	18.239	11.224	10.662	5.432	6.991
P	<0.001	<0.001	<0.001	0.002	<0.001

与R组相比, * $P<0.05$; 与DR1组相比, # $P<0.05$; 与DR2组相比, & $P<0.05$ 。

Compared with group R, * $P<0.05$; compared with group DR1, # $P<0.05$; compared with group DR2, & $P<0.05$.

3 讨论

包皮环切手术术后镇痛是小儿手术常见问题, 但镇痛药物会产生呼吸抑制、恶心呕吐等不良反应, 导致术后疼痛不能规范治疗, 而良好术后镇

痛镇、静效果能促进伤口愈合, 减少术后并发症^[4]。本研究采取骶管阻滞为特殊椎管内麻醉, 操作简便, 成功率高, 镇痛效果良好, 可有效避免硬膜外导管脱出、阻滞平面异常导致的镇痛失败^[2]。临床小儿骶管阻滞一般采用单次给药, 即使应用

长效局麻药如罗哌卡因,其阻滞持续时间仍较短,常需要补救镇痛措施。因此寻找适宜的麻醉药物进行骶管阻滞是目前临床研究的热点。

右美托咪定椎管内应用能产生剂量依赖性的镇静和镇痛效应,作用时间较长,能明显减少术后麻醉性镇痛药,在儿科患者中使用广泛。临床研究^[1,5-6]证实:右美托咪定可用于小儿骶管阻滞,亦能起镇静和镇痛作用,同时有局麻样效应。研究^[7-8]显示:在小儿围术期镇痛管理中,骶管注射右美托咪定 $2\mu\text{g}/\text{kg}$ 较单纯罗哌卡因的镇痛时间可显著延长, $1\mu\text{g}/\text{kg}$ 右美托咪定骶管阻滞具有可明显减少苏醒期躁动、血流动力学稳定、苏醒快等优点,且属较低剂量。同时右美托咪定能明显减少术后麻醉性镇痛药物使用^[9]。右美托咪定联合使用罗哌卡因骶管阻滞,在显著延长镇痛时间的同时,亦可产生良好的镇静效应^[10-11]。但目前对儿童包皮环切手术后镇痛骶管注射用右美托咪定剂量以及是否需要罗哌卡因联用均无统一论。

本研究的研究对象为4~7岁的患儿,对疼痛不能正确描述,因此采用FLACC评分法,从而客观地评价了患儿的术后疼痛程度。本研究结果显示:使用罗哌卡因复合右美托咪定麻醉方案的患儿镇痛时间较单纯罗哌卡因骶管阻滞患儿明显延长,且镇痛时间随着骶管用右美托咪定的剂量增大而延长,其中 $2\mu\text{g}/\text{kg}$ 右美托咪定组大部分患儿无术后疼痛不适感、无需镇痛补救,镇痛作用明显优于静脉用右美托咪定,亦体现了右美托咪定的镇痛作用呈剂量依耐性特点。使用 $1\mu\text{g}/\text{kg}$ 右美托咪定复合罗哌卡因与单用罗哌卡因骶管阻滞相比,能有效预防苏醒期躁动,减少术后并发症,与静脉应用右美托咪定相比血流动力学更稳定,较 $2\mu\text{g}/\text{kg}$ 右美托咪定骶管阻滞苏醒期更短,这一结果与既往研究结果^[12-13]相一致。此外,罗哌卡因复合右美托咪定麻醉的患儿较单纯罗哌卡因骶管阻滞的患儿苏醒时躁动明显减少,但与右美托咪定的剂量和使用方法无区别,这与既往国外研究结论^[14]相符。值得注意的是,骶管阻滞患儿术后苏醒时间随着右美托咪定的剂量增加而延长,其中静脉应用右美托咪定的患儿苏醒时间最长。本研究中 $2\mu\text{g}/\text{kg}$ 与 $1\mu\text{g}/\text{kg}$ 右美托咪定复合罗哌卡因患儿心动过缓发生率不高,血流动力学较稳定,这也证实右美托咪定有稳定血流动力学的作用。

综上所述,在儿童包皮环切术后镇痛采用右美托咪定复合罗哌卡因骶管注射明显优于单纯罗哌卡因骶管阻滞,以 $2\mu\text{g}/\text{kg}$ 右美托咪定剂量效果

最好,可减少苏醒期间躁动,血流动力学稳定,不良反应发生率亦较低。然而本研究选择儿童病例数仍偏少,且排除了心肺功能异常的患儿,因此患儿包皮环切术前的右美托咪定骶管用剂量的确定仍需要进一步研究探讨。

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