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喉罩通气下七氟醚全凭吸入麻醉在小儿先天性心脏病介入手术的 临床麻醉效果*

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摘要 目的:探讨喉罩通气下七氟醚全凭吸入麻醉在小儿先天性心脏病介入手术的临床麻醉效果。**方法:**选取 2017 年 4 月~2019 年 5 月期间我院收治的行先天性心脏病介入手术患儿 98 例,根据随机数字表法将其分为对照组($n=49$)和研究组($n=49$)。对照组给予氯胺酮诱导,全凭丙泊酚维持,面罩吸氧;研究组给予全凭七氟醚诱导、维持,喉罩通气。比较两组患儿麻醉前(T0)、切皮前(T1)、切皮后 1 min(T2)、切皮后 30 min(T3)、术后(T4)的血流动力学指标[平均动脉压(MAP)、心率(HR)]及应激反应指标[血糖、皮质醇],记录两组患儿手术时间、麻醉诱导时间、术后苏醒时间等围术期指标情况。记录两组围术期不良反应发生情况。**结果:**研究组手术时间、麻醉诱导时间、术后苏醒时间均短于对照组($P<0.05$)。两组 T0 时间点血糖、MAP、皮质醇、HR 比较差异无统计学意义($P>0.05$);对照组 T1~T4 时间点 MAP、血糖、皮质醇、HR 均较 T0 升高($P<0.05$);研究组 T1~T4 时间点血糖、MAP、皮质醇、HR 与 T0 时间点比较无差异($P>0.05$);研究组 T1~T4 时间点血糖、MAP、皮质醇、HR 低于对照组($P<0.05$)。两组不良反应发生率比较无差异($P>0.05$)。**结论:**小儿先天性心脏病介入手术中应用喉罩通气下七氟醚全凭吸入麻醉,诱导迅速且安全、术后苏醒快、手术时间短,可有效维持血流动力学稳定,减少应激反应。

关键词:七氟醚;先天性心脏病;全凭吸入;小儿;喉罩通气;介入手术;麻醉

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Anesthesia Effect of Sevoflurane Inhalation Under Laryngeal Mask Ventilation in Children with Congenital Heart Disease*

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ABSTRACT Objective: To investigate the effect of sevoflurane inhalation anesthesia under laryngeal mask ventilation in children with congenital heart disease. **Methods:** From April 2017 to May 2019, 98 children with congenital heart disease who underwent interventional surgery in our hospital were selected, They were divided into control group ($n=49$) and study group ($n=49$) according to the method of random number table. The control group was induced by ketamine, maintained by propofol and inhaled oxygen by mask, the study group was induced and maintained by sevoflurane and ventilated by laryngeal mask. The hemodynamic indexes(mean arterial pressure (MAP), heart rate (HR)) and stress response indexes (blood glucose, cortisol) of the two groups of children before anesthesia (T0), before skin cutting (T1), 1 min after skin cutting (T2), 30 min after skin cutting (T3), and after surgery (T4) were compared. The perioperative indicators of the two groups, such as operative time, anesthesia induction time, postoperative wake time and others of the two groups were recorded. Adverse reactions in the two groups were recorded perioperative period. **Results:** The operation time, anesthesia induction time and postoperative wake time of the study group were shorter than those of the control group($P<0.05$). There was no significant difference in blood glucose, MAP, cortisol and HR between the two groups at time point T0($P>0.05$). The MAP, blood glucose, cortisol and HR of the control group at T1-T4 time point were higher than those of T0 ($P<0.05$). The blood glucose, MAP, cortisol and HR of the study group at T1-T4 time point had no statistical significance compared with T0 time point ($P>0.05$). The blood glucose, MAP, cortisol and HR of the study group at T1-T4 time point were lower than those of the control group at T0 time point ($P<0.05$). There was no significant difference in the incidence of adverse reactions between the two groups ($P>0.05$). **Conclusion:** Sevoflurane under laryngeal mask ventilation can be induced quickly and safely, and the postoperative recovery time is short. It can effectively maintain hemodynamic stability and reduce stress response.

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前言

先天性心脏病是指在胚胎发育时期由于心脏及大血管的形成障碍或发育异常,进而引起心脏解剖结构异常,或者是婴儿出生后应自动关闭的通道未能闭合而导致的畸形^[1,2]。目前临床针对先天性心脏病的治疗多以介入手术为主,介入治疗创伤小、恢复快、效果好,已得到临床的广泛认可^[3-5]。以往常用的麻醉方式为静脉注射氯胺酮,但该麻醉药物在控制患儿麻醉深度时存在一定困难,且存在循环兴奋性以及分离麻醉效果等不足^[6-8]。喉罩通气是介于面罩和气管插管之间一种新型通气方式,适用于肌松要求不高的短小手术^[9]。七氟醚具有对循环抑制轻、麻醉深度易调节、诱导快、苏醒快等有点,在儿童全麻方面效果显著^[10]。本研究通过探讨喉罩通气下七氟醚全凭吸入麻醉在小儿先天性心脏病介入手术的临床麻醉效果,以期临床先天性心脏病介入手术时的麻醉方案提供数据支持。

1 资料与方法

1.1 基础资料

于2017年4月~2019年5月选取98例行先天性心脏病介入手术患儿,纳入标准:(1)术前均诊断为先天性心脏病者;(2)均具备手术指征;(3)无喉罩通气禁忌症者;(4)临床资料完整,患儿家属知情同意。排除标准:(1)术前肝肾功能异常者;(2)合并免疫缺陷、感染、凝血功能障碍者;(3)因各种原因无法配合研究治疗者;(4)伴有心力衰竭、呼吸道感染等合并症者。根据随机数字表法将其分为研究组、对照组,各49例,其中对照组女23例,男26例,年龄4~13岁,平均 (7.29 ± 0.74) 岁;体质质量指数 $14.3 \sim 18.5 \text{ kg/m}^2$,平均 $(16.24 \pm 1.16) \text{ kg/m}^2$;室间隔缺损者19例,房间隔缺损者16例,动脉导管未闭者14例。研究组男27例,女22例,年龄4~11岁,平均 (6.86 ± 0.74) 岁;体质质量指数 $14.1 \sim 17.8 \text{ kg/m}^2$,平均 $(15.72 \pm 1.03) \text{ kg/m}^2$;室间隔缺损者17例,房间隔缺损者18例,动脉导管未闭者14例。两组一般资料对比未见统计学差异($P > 0.05$)。

1.2 方法

患儿术前禁食6h,禁饮4h,入室后建立静脉通路,常规监测心率(Heart rate, HR)、平均动脉压(Mean arterial pressure, MAP)等指标。研究组患儿麻醉诱导采用面罩吸入2 L/min纯氧下8%浓度七氟醚(国药准字:H20173177,河北一品制药股份有限公司)1 min,随后吸入5%浓度七氟醚3 min,当睫毛反射消失后,根据患儿个人体重情况置入相应大小的喉罩,喉罩置入前需涂2%利多卡因乳膏,以减少咽喉部刺激。连接麻醉机,压力设置为5~8 mmHg,潮气量10 mL/kg,频率20~26次/min,呼气末二氧化碳35~45 mmHg。术中麻醉维持3%~5%七氟醚,新鲜气流量0.8~1 L/min,手术结束时即停止麻醉用药。对照组患儿麻醉诱导采用氯胺酮(国药准字:H32025255,江苏恒瑞医药股份有限公司)6 mg/kg,肌内注射,随后采用丙泊酚(国药准字:H19990281,西安力邦制药有限公司)5~10 mg/kg·h持续泵注维持,保留自主呼吸,面罩给氧2 L/min,手术结束时停用丙泊酚。两组患儿手术结束时均送至复苏室复苏,研究组患儿待其清醒后,恢复正常自主呼吸后,血氧饱和度 $>95\%$ 即可拔除喉罩。

1.3 观察指标

(1)记录两组患儿麻醉前(T0)、切皮前(T1)、切皮后1 min(T2)、切皮后30 min(T3)、术后(T4)的MAP、HR。(2)记录两组患儿手术时间、麻醉诱导时间、术后苏醒时间等围术期指标情况。(3)记录两组围术期不良反应发生情况。(4)于T0~T4时间点各抽取患儿肘静脉血2ml,采用美国贝克曼DXC800全自动生化分析仪检测血糖、皮质醇水平。

1.4 统计学方法

采用SPSS25.0软件进行统计分析。计数资料以率的形式表示,采用卡方检验。计量资料以均值 $\pm$ 标准差($\bar{x} \pm s$)的形式表示,采用t检验。以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 围术期指标比较

研究组麻醉诱导时间、手术时间、术后苏醒时间均短于对照组($P < 0.05$);详见表1。

表1 两组围术期指标比较($\bar{x} \pm s$)

Table 1 Comparison of perioperative indicators between the two groups($\bar{x} \pm s$)

Groups	Operation time(min)	Anesthesia induction time(s)	Postoperative wake time(min)
Control group(n=49)	29.45 $\pm$ 1.26	240.60 $\pm$ 14.34	26.15 $\pm$ 2.26
Study group(n=49)	24.46 $\pm$ 0.93	121.51 $\pm$ 10.24	17.46 $\pm$ 3.41
t	22.305	47.309	14.869
P	0.000	0.000	0.000

2.2 血流动力学指标比较

两组T0时间点HR、MAP比较无差异($P > 0.05$);研究组T1~T4时间点HR、MAP与T0时间点比较无差异($P > 0.05$);研

究组T1~T4时间点MAP、HR低于对照组($P < 0.05$);对照组T1~T4时间点HR、MAP均较T0升高($P < 0.05$);详见表2。

表 2 两组血流动力学指标比较($\bar{x} \pm s$)Table 2 Comparison of hemodynamic indexes between the two groups($\bar{x} \pm s$)

Groups	Time points	HR(beats/min)	MAP(mmHg)
Control group (n=49)	T0	104.75± 10.63	81.48± 7.48
	T1	127.46± 11.34 ^a	88.43± 10.54 ^a
	T2	130.79± 9.56 ^a	89.73± 9.69 ^a
	T3	128.41± 11.37 ^a	88.75± 8.39 ^a
	T4	125.71± 9.52 ^a	87.72± 10.69 ^a
Study group (n=49)	T0	104.48± 8.42	81.09± 9.53
	T1	105.75± 10.23 ^b	82.03± 10.24 ^b
	T2	106.72± 12.16 ^b	82.96± 9.33 ^b
	T3	107.37± 10.71 ^b	83.27± 10.48 ^b
	T4	106.42± 11.87 ^b	82.24± 9.57 ^b

Note: Compared with T0, ^a $P<0.05$; compared with the control group, ^b $P<0.05$.

2.3 两组应激反应指标比较

两组 T0 时间点血糖、皮质醇比较无差异($P>0.05$);对照组 T1~T4 时间点血糖、皮质醇均较 T0 升高 ($P<0.05$); 研究组

T1~T4 时间点血糖、皮质醇与 T0 时间点比较差异无统计学意义 ($P>0.05$); 研究组 T1~T4 时间点血糖、皮质醇低于对照组 ($P<0.05$); 详见表 3。

表 3 两组应激反应指标比较($\bar{x} \pm s$)Table 3 Comparison of stress response indexes between the two groups($\bar{x} \pm s$)

Groups	Time points	Blood glucose(mmol/L)	Cortisol(nmol/L)
Control group (n=49)	T0	5.69± 0.34	205.77± 13.94
	T1	8.39± 0.27 ^a	298.79± 15.62 ^a
	T2	8.27± 0.40 ^a	230.11± 16.87 ^a
	T3	8.19± 0.32 ^a	231.95± 15.97 ^a
	T4	8.17± 0.27 ^a	232.90± 17.02 ^a
Study group (n=49)	T0	5.72± 0.46	206.86± 11.31
	T1	5.89± 0.33 ^b	207.24± 13.42 ^b
	T2	5.93± 0.28 ^b	208.53± 11.37 ^b
	T3	5.88± 0.23 ^b	208.34± 13.54 ^b
	T4	5.84± 0.26 ^b	207.38± 11.23 ^b

Note: Compared with T0, ^a $P<0.05$; compared with the control group, ^b $P<0.05$.

2.4 两组不良反应情况比较

对照组术后出现皮疹 1 例,胃肠道不适 2 例,头晕恶心 1 例,肝功能异常 2 例,不良反应发生率为 12.24%(6/49);研究组术后出现皮疹 2 例,胃肠道不适 2 例,头晕恶心 2 例,肝功能异常 3 例,不良反应发生率为 18.37%(9/49);两组不良反应发生率组间比较无统计学差异($\chi^2=0.708$, $P=0.400$)。

3 讨论

介入手术术后创伤小,恢复迅速,常用于先天性心脏病的治疗^[11,12]。小儿先天性心脏病介入手术的麻醉管理主要在于保持呼吸通畅,维持血流动力学稳定,减少机体刺激^[13,14]。由于介入手术在心导管室内进行,为避免放射伤害等原因,麻醉医生不会一直待在患儿身边,通常主要通过心电图监测指标和经验进行麻醉深度的控制^[15,16]。若麻醉过浅,患儿无法受控影响手术进

行;若麻醉过深,可导致呼吸抑制,延长苏醒时间。氯胺酮为非巴比妥类静脉麻醉剂,镇痛、镇静作用显著,丙泊酚具有镇静效果佳、苏醒迅速等优点,故上述两种药物常用于介入手术的治疗,但氯胺酮易增加口咽分泌物,提高咽喉部反应性,受刺激时易导致喉痉挛,同时氯胺酮还可加重患儿心脏负荷^[17-19],所以临床上急需一种更为安全有效的麻醉方式。喉罩是维持气道的新型麻醉器,无喉头及气管的机械性刺激;七氟醚血气分配系数低,几乎不会刺激呼吸道,全凭吸入麻醉可安全有效地应用于小儿浅表手术^[20,21];但有关喉罩通气下七氟醚全凭吸入麻醉应用于小儿先天性心脏病介入手术的有效性仍需进一步的研究以证实。

本次研究结果中,对照组患儿术中血流存在一定波动,可能与氯胺酮内源性儿茶酚胺释放增多、内在拟交感兴奋作用有关。而研究组患儿的血流动力学可维持稳定,且手术时间、麻醉

诱导时间、术后苏醒时间均短于对照组。分析其原因,小儿由于心输出量较大,组织血液循环较为丰富,血气分配系数相对成人较低,而七氟醚血气分配系数为 0.69,吸入七氟醚后可迅速达到脑组织,刺激性小,患儿易接受,诱导时间短,清醒快,麻醉深度易控制;加之喉罩的放置不需要肌松药,插入前均采用利多卡因乳膏均匀涂抹喉罩,利于喉罩顺利插入,减少喉罩刺激,对血流动力学的影响同样较小;在血流动力学较为稳定的前提下,利于术者实施手术操作,缩短手术时间^[22-24]。手术作为一种刺激性操作,常常可使患儿产生不同程度的应激反应,而术中、术后的有效处理均可有效控制机体应激反应,其中麻醉药物的选择亦至关重要^[25]。血糖、皮质醇均可作为机体应激反应的参考指标,本次研究结果中对照组术中血糖、皮质醇存在一定波动,而研究组的血糖、皮质醇较为稳定,提示喉罩通气下七氟醚全凭吸入麻醉可有效抑制机体应激反应,这可能与七氟醚可通过抑制交感神经,减少冲动递质传递,并具有一定的镇痛作用有关^[26,27]。另喉罩通气下七氟醚全凭吸入麻醉用药安全性较好,未增加不良反应发生率,这可能是喉罩通气下麻醉药物吸入性进入人体,可提高药物利用率,进而减少药物用量,有利于患儿术中生命体征的平稳;同时七氟醚对小儿食管下段括约肌张力影响较为轻微,可防止反流误吸,保证其安全性^[28-30]。

综上所述,小儿先天性心脏病介入手术中应用喉罩通气下七氟醚全凭吸入麻醉,诱导迅速、术后苏醒快、手术时间短,可有效维持血流动力学稳定,减少应激反应,且用药安全性好。

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