doi: 10.13241/j.cnki.pmb.2019.17.038

丙泊酚复合芬太尼静脉复合全麻在老年主动脉夹层介入手术中的麻醉效果研究*

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摘要 目的：探讨老年主动脉夹层介入手术采用丙泊酚复合芬太尼静脉复合全麻对患者麻醉效果的影响。**方法：**选取2015年6月到2018年3月四川省攀枝花市中心医院麻醉科接诊的老年胸、腹主动脉夹层行介入手术治疗的患者76例作为研究对象，采用随机数字表法将患者分为观察组(38例)及对照组(38例)，观察组采用丙泊酚复合芬太尼静脉复合全麻，对照组采用丙泊酚静脉复合全麻，观察并比较两组患者循环功能指标[血压(DBP、SBP)、心率(HR)、平均动脉压(MAP)]、肺功能指标[呼吸频率(R)、呼气末二氧化碳($P_{ET}CO_2$)、血氧饱和度(SpO_2)、气道压力(PAW)]及麻醉效果[脑电双频指数(BIS)值、苏醒时间(术后自主呼吸恢复时间、睁眼时间、定向力恢复时间)、拔管时间的组间差异。**结果：**观察组术后苏醒时间(自主呼吸恢复时间、睁眼时间、定向力恢复时间)及拔管时间低于对照组($P<0.05$)。观察组R在T1~T5时间点均低于对照组($P<0.05$)，在T1时间点，观察组$P^{ET}CO_2$低于对照组，PAW高于对照组($P<0.05$)，观察组SpO_2在T3、T4高于对照组($P<0.05$)；观察组HR、SBP、DBP、MAP在T1~T3时间点均高于对照组($P<0.01$)。观察组患者的HR、MAP在不同时间点间比较无统计学意义($P>0.05$)。**结论：**采用丙泊酚复合芬太尼静脉复合全麻对于老年主动脉夹层介入手术患者，具有降低患者呼吸及循环功能影响的效果，具有更优的麻醉效果。

关键词：丙泊酚；芬太尼；老年；主动脉夹层；麻醉；肺功能；循环功能

中图分类号：R543.1；R614 **文献标识码：**A **文章编号：**1673-6273(2019)17-3379-05

Study on Anesthesia Effect of Propofol Combined with Fentanyl Intravenous Anesthesia in Elderly Patients Undergoing Interventional Aortic Dissection*

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ABSTRACT Objective: To investigate the effect of propofol combined with fentanyl intravenous anesthesia on anesthesia in elderly patients with undergoing interventional aortic dissection. **Methods:** From June 2015 to March 2018, 76 elderly patients with abdominal aortic dissection treated by interventional surgery were selected from Department of Anesthesiology, Panzhihua Central Hospital of Sichuan Province. Patients were randomly divided into observation group (n=38) and control group (n=38). The observation group was treated with propofol combined with fentanyl combined with general anesthesia, and the control group with propofol combined with general anesthesia. The difference of circulatory function[blood pressure (DBP, SBP), heart rate (HR), mean arterial pressure (MAP)], Lung function indexes [respiratory frequency(R), end-expiratory carbon dioxide ($P_{ET}CO_2$), blood oxygen saturation (SpO_2), airway pressure (PAW)] and anesthetic effect [bispectral index(BIS), anesthetic recovery time(Spontaneous respiratory recovery, Open your eyes, Directional force recovery)and extubation time were observed and compared. **Results:** The recovery time (Spontaneous respiratory recovery, Open your eyes, Directional force recovery) and extubation time of the observation group was lower than that of the control group ($P<0.05$), the R of the observation group was lower than that of the control group at the T1~T5 time point($P<0.05$). At T1 time point, The $P_{ET}CO_2$ of the observation group was lower than that of the control group, and the PAW was higher than that of the control group($P<0.05$), the SpO_2 of the observation group was higher than that of the control group at T3 and T4 ($P<0.05$). The HR, SBP, DBP, MAP of the observation group was higher than that of the control group at T1~T3 time point($P<0.05$), and there was no significant difference in HR and MAP between the observation group at different time points($P>0.05$). **Conclusion:** Propofal combined with fentanyl combined with general anes-

* 基金项目：四川省卫生计生委科研基金项目(16PJ171)

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(收稿日期：2018-12-28 接受日期：2019-01-23)

thesia can reduce respiratory and circulatory function of elderly patients with interventional surgery aortic dissection and has better anaesthesia effect.

Key words: Propofol; Fentanyl; Elderly; Aortic dissection; Anesthesia; Pulmonary function; Circulatory function

Chinese Library Classification(CLC): R543.1; R614 Document code: A

Article ID: 1673-6273(2019)17-3379-05

前言

主动脉夹层(aorta dissection;AD)是一种极为严重的大动脉疾病,其发病年龄多在 40 岁以上[1,2]。其主要治疗方式是介入治疗[3]。其麻醉主要采用全麻方式。但老年患者由于主动脉老化快,更容易伴发心律失常及肺内感染[4]。这就增加了介入手术的麻醉难度。不过,由于主动脉夹层的手术创伤小,可以在导管室进行,患者治疗的成功率高[5]。但术中虽然需要多次造影确定病灶,患者出现躁动及呛咳的发生率高[6]。临床常采用丙泊酚静脉复合全麻方式加以麻醉,但是由于丙泊酚属于短效麻醉药,对呼吸及循环系统均有抑制作用,可出现暂时性呼吸停止及血压降低,多以小剂量应用,难以满足临床需求[7]。而芬太尼属于强效麻醉镇痛药,副作用小,但其持续时间较短,同样无法满足临床需求[8]。因此,本研究采用临床对照研究方式,用以明确丙泊酚复合芬太尼静脉复合全麻用于主动脉夹层介入治疗患者的麻醉效果,现将结果报告如下。

1 资料与方法

1.1 一般资料

选取 2014 年 3 月到 2017 年 3 月四川省攀枝花市中心医院麻醉科进行主动脉夹层介入治疗手术并采用全身麻醉的患者 76 例作为主要观察对象,采用随机数字表法将患者分为观察组及对照组,每组 38 例,本研究经医院伦理委员会审议通过,入组患者术后对本研究内容均知情同意并签定知情同意书,采用前瞻性临床对照研究。纳入标准:① 经影像学检查及症状体征检查符合《主动脉夹层诊断与治疗规范中国专家共识》的相关诊断标准;② 符合美国麻醉医师协会(ASA)分级Ⅱ、Ⅲ级;③ 年龄 60~75 岁。剔除标准:① 严重心脑肝肾功能异常及对阿片类药物过敏或具有成瘾史;② 精神异常患者;③ 合并肺炎、支气管哮喘及极度贫血者;④ 对相关麻醉药物存在过敏史者。2 组患者性别、年龄、体质量、ASA 分级、术中出血量、手术时间、疾病类型及分型差异无统计学意义($P>0.05$),存在可比性。

表 1 两组患者一般情况对比

Table 1 Comparison of general conditions of 2 groups of patients

Variable		Observation group (n=38)	Control group(n=38)	x^2/t	P
Gender	Male	30(78.95)	32(84.21)	0.088	0.767
	Famale	8(21.05)	6(15.79)		
Age(year)		66.28± 4.22	67.73± 3.92	1.570	0.121
Body mass(kg)		63.87± 6.66	64.52± 6.69	0.424	0.673
ASA classification	Ⅱ	23(60.53)	24(63.16)	0.001	0.973
	Ⅲ	15(39.47)	14(36.84)		
Disease type	Thoracic aortic dissection	20(52.63)	22(57.89)	0.053	0.817
	Abdominal aortic dissection	18(47.37)	16(42.11)		
Operative time(min)		117.73± 16.96	115.69± 15.99	0.540	0.591
Intraoperative bleeding volume(ml)		156.51± 36.15	154.97± 35.99	0.186	0.853
Complicated disease	Diabetes mellitus	19(50.00)	20(52.63)	0.001	0.974
	Hypertension	22(57.89)	19(50.00)	0.072	0.788
	Coronary disease	23(60.53)	22(57.89)	0.001	0.973
Stanford typing	A	26(68.42)	25(65.79)	0.001	0.971
	B	12(31.58)	13(34.21)		
Troponin(pg/mL)		11.45± 8.72	12.06± 7.92	0.319	0.751

1.2 麻醉方法

观察组采用丙泊酚复合芬太尼静脉复合全麻方式。术前应用鲁米那 0.1 mg(生产厂家:批准文号)肌肉注射以及阿托品 0.5 mg(生产厂家:国药集团新疆制药有限公司;批准文号:国药准字 H65020081)肌肉注射。采用咪达唑仑 0.03 mg/kg(生产厂家:江苏恩华药业股份有限公司;批准文号:国药准字 H20031071);丙泊酚 2.03 mg/kg(生产企业:Fresenius Kabi Deutschland GmbH;批准文号:国药准字 J20171056)和芬太尼

2.5 mg/kg(生产厂家:江苏恩华药业股份有限公司;批准文号:国药准字 H20113508)罗库溴铵 50 mg(生产厂家:华北制药股份有限公司;批准文号:国药准字 H20103235)进行麻醉诱导。当手术结束时采用气管插管接呼吸机进行机械通气。潮气量设置为 8~12 mL/kg,维持呼吸频率 12~14 次 /min。以丙泊酚持续靶控输注 2.5~3.0 μg/mL、芬太尼 2 ng/mL,间断追加维库溴铵 2 mg/ 次(生产厂家:扬子江药业集团有限公司;批准文号:国药准字 H20066941) 用以麻醉维持。术中以硝普钠 0.5~3.0 μg/(kg·min)(生产厂家:开封康诺药业有限公司;批准文号:国药准字 H20054536) 微泵输注控制收缩压在 90~120 mmHg(1 mmHg=1.333 kPa)间,当血压过低时采用增加硝普钠输液速度或去氧肾上腺素 50 μg/ 次(生产厂家:上海禾丰制药有限公司;批准文号:国药准字 H31021175)。在支架释放前静注硝酸甘油 50~100 pg,使收缩压降至低于 90~100 mmHg,支架释放结束后采用减少降压药物及终止麻醉的方式,将收缩压上升至 100 mmHg 以上。主动脉造影时将呼吸机关闭暂停呼吸。当患者手术完成,苏醒期内能够自主呼吸、出现自主意识,血氧饱和度大于 99%将气管插管拔除。对照组采用丙泊酚静脉复合全麻方式。在麻醉诱导过程中采用咪达唑仑 0.03 mg/kg+ 丙泊酚 2.03 mg/kg+ 罗库溴铵 50 mg 进行麻醉诱导。在手术结束时采用丙泊酚靶控输注 2.5~3.0 μg/mL 间断追加维库溴铵 2mg/ 次。其余麻醉方法与观察组一致。

1.3 观察指标

全麻效果:采用脑电双频指数(BIS)监测患者麻醉深度,BIS 值在 85~100 为清醒、65~85 为镇静、40~65 为麻醉抑制、<40 为爆发抑制。记录患者术中 BIS 值。并对患者术后苏醒(① 自主呼吸恢复:能自行呼吸,并吞咽和咳嗽反射恢复,通气功能正常,呼吸频率在 12~30/min,$PaCO_2$ 正常或在术前水平。② 定向力恢复:患者能完成简单指令性动作,知道自身所处环境。③ 呼之睁眼:医护人员呼唤患者姓名时能够睁开双眼)时间及拔管时间进行统计。两组患者麻醉诱导前(T0)、麻醉诱导后即刻 3 min(T1)、手术开始即刻(T2)、支架释放前 3 min(T3)、支架释放即刻(T4)、术闭(T5)6 个时间点的肺功能指标:呼吸频率(R)、呼气末二氧化碳($P_{ET}CO_2$)、血氧饱和度(SpO_2)、气道压力(PAW)和循环功能指标:血压(DBP、SBP)、心率(HR)、平均动脉压(MAP)。

1.4 统计学方法

采用 SPSS 19.0 统计学软件进行数据处理, 循环功能指标和呼吸功能指标数据均采用均数± 标准差($\bar{x}\pm s$)表示,采用 t 检验及方差分析;麻醉不良事件采用率(%)表示,应用 χ^2 检验,以 $P<0.05$ 为差异具有统计学意义。

2 结果

2.1 两组患者麻醉效果比较

观察组患者的 BIS 值在术中均处于 40~65, 对照组存在 6 例患者术中短时间(<60 s)BIS 值>65 者,出现呛咳;但基本符合麻醉需求,手术能够顺利完成。观察组术后苏醒时间(自主呼吸恢复时间、睁眼时间、定向力恢复时间)及拔管时间低于对照组($P<0.05$),见表 2。

表 2 两组患者麻醉效果比较

Table 2 Comparison of anesthetic effect between two groups

Groups	n	Spontaneous respiratory recovery(min)	Open your eyes(min)	Directional force recovery(h)	Extubation time(min)
Observation group	38	14.82± 2.52	16.12± 3.51	17.35± 4.41	19.28± 6.87
Control group	38	15.93± 2.31	17.65± 2.37	21.23± 3.42	24.34± 3.12
t		2.006	2.227	4.286	4.134
P		0.049	0.029	0.000	0.000

2.2 两组患者呼吸功能指标比较

观察组 R 在 T1~T5 时间点均低于对照组($P<0.05$);在 T1 时间点,观察组 $P_{ET}CO_2$ 低于对照组,PAW 高于对照组($P<0.05$);观察组 SpO_2 在 T3、T4 时间点高于对照组($P<0.05$),见表 2。

表 3 两组患者呼吸功能指标比较($\bar{x}\pm s$)

Table 3 Comparison of respiratory function between two groups($\bar{x}\pm s$)

Groups	VARIABLE	T0	T1	T2	T3	T4	T5
OBSERVATION GROUP (N=38)	R (Time/min)	20.59± 2.18	10.50± 0.52*	10.93± 0.49*	11.25± 1.34*	12.34± 2.21*	14.50± 0.20*
	$P_{ET}CO_2$(mmHg)	33.50± 6.30	35.45± 6.43*	35.89± 6.42	36.17± 6.26	35.23± 7.26	34.50± 6.56
	PAW(cmH_2O)	8.05± 0.92	8.90± 1.44*	9.28± 1.96	9.30± 1.40	9.09± 2.20	8.74± 1.20
	SpO_2(%)	98.05± 1.92	96.90± 1.84	96.50± 1.84	96.74± 1.80*	96.23± 1.72*	97.39± 1.75
CONTROL GROUP(N=38)	R (Time/min)	21.42± 2.20	9.34± 1.34	9.24± 1.25	10.26± 2.31	11.32± 2.03	13.23± 1.06
	$P_{ET}CO_2$(mmHg)	33.60± 6.20	38.70± 6.34	37.52± 6.52	36.80± 6.34	35.27± 6.43	34.34± 6.20
	PAW(cmH_2O)	8.00± 0.90	7.45± 1.63	8.46± 2.03	9.33± 1.76	9.02± 1.28	8.80± 1.26
	SpO_2(%)	98.00± 1.90	96.45± 2.43	95.67± 2.76	93.20± 2.56	94.23± 3.20	96.72± 2.31

Note: compared with the control group, *$P<0.05$.

2.3 两组患者循环功能比较

观察组 HR、SBP、DBP、MAP 在 T1~T3 时间点均高于对照组($P<0.05$);观察组 HR、MAP 在不同时间点间比较差异无统计学意义($P>0.05$),见表 4。

表 4 两组循环功能的比较($\bar{x}\pm s$)

Table 4 Comparison of circulatory function between two groups

GROUPS	VARIABLE	T0	T1	T2	T3	T4	T5
OBSERVATION GROUP (N=38)	HR (Time/min)	73.16± 8.25	71.34± 9.34*	70.26± 9.31*	71.23± 8.96*	70.05± 8.52	72.11± 9.82
	SBP (mmHg)	136.00± 8.20	118.53± 9.44*	109.20± 7.34*	105.34± 9.20*	83.82± 7.03	103.25± 3.91
	DBP (mmHg)	77.05± 10.92	80.90± 11.74*	84.37± 8.92*	80.50± 10.84*	79.39± 9.28	76.74± 10.80
	MAP (mmHg)	111.16± 5.15	92.34± 2.34*	94.26± 0.31*	94.23± 0.66*	91.63± 8.54	94.42± 5.73*
CONTROL GROUP(N=38)	HR (Time/min)	73.67± 5.89	70.50± 3.52	68.25± 5.34	70.50± 8.20	68.42± 7.26	70.15± 10.23
	SBP (mmHg)	137.50± 12.30	111.93± 13.34	102.67± 12.26	95.50± 13.56	80.85± 6.93	102.52± 6.92
	DBP (mmHg)	77.00± 10.90	69.45± 11.43	71.39± 9.24	72.67± 10.76	74.23± 10.23	75.20± 10.56
	MAP (mmHg)	110.67± 5.89	90.50± 1.52	92.25± 2.34	81.50± 2.20	85.24± 1.38	90.24± 7.26

Note: compared with the control group, *P<0.05.

3 讨论

主动脉夹层是主动脉壁受到恶性高血压或外力引发的主动脉内膜撕裂,造成的高压血流自破裂口迅速进入主动脉中层的沿长轴分离的一种危急重症。临床上容易引发假腔内大出血、心脏压塞等重要器官缺血。其抢救时间窗较短。为了缩短主动脉夹层的抢救时间,其已经被纳入医院的生命绿色通道的常见疾病范畴,并逐步形成规范[9]。支架置入术被认为是主动脉修复方法的首选介入治疗方式[10]。而主动脉夹层介入治疗的麻醉效果直接决定了患者抢救的成功率[11]。由于主动脉夹层置入支架介入治疗需要反复进行影像学检查,明确置入效果,对患者的麻醉深度要求高,但由于老年患者本身伴发不同程度的基础疾病,对于麻醉的精度需求更高[12-14]。而单纯的气管插管全麻方式本就容易引起患者的呼吸道梗阻、肺不张等呼吸道受损情况,存在一定的安全性隐患,不能满足长时间手术或需要反复影像学检查的主动脉夹层患者的需求[15-17]。而且气管内插管、拔管过程以及进行主动脉造影都会引起机体的交感神经兴奋,出血一系列的血流动力学变化,造成全麻效果欠佳[18],引起患者再出血、甚至夹层穿孔等重症严重危及患者生命。主动脉夹层的病理机理尚未被完全掌握,多数学者认为:主动脉夹层的危险因素包括主动脉的血流动力学增加,通常是由于控制不好的高血压,以及可遗传的遗传变异[19-21]。更好的血流动力学指标控制能够给患者带来更有效的预后保障[22]。本研究的临床意义在于找出主动脉夹层介入治疗患者的更为优化的复合麻醉方式。临床上对于主动脉夹层的麻醉方式的研究较多,但多以主动脉夹层介入或手术治疗方式的研究为主,极少针对其麻醉过程的临床对照研究,这是本研究的新颖之处。

本研究选用丙泊酚复合芬太尼静脉复合全麻与丙泊酚静脉复合全麻的方式加以对比。丙泊酚作为具有起效迅速、麻醉时效短的安全性高的麻醉药品, 其非常适用于主动脉夹层患者,但由于手术对麻醉时间的需求较长,单纯复合丙泊酚不能满足临床需求,而丙泊酚与芬太尼联合能够起到降低丙泊酚用量,芬太尼作为超短效的阿片类药物,半衰期短,起效迅速,分解快且无体内蓄积,对主动脉夹层患者的呼吸和循环功能影响较小,减低了由于长时间手术及反复影像学检查对患者呼吸及血流动力学指标的影响。

本研究结果显示,观察组患者的术后苏醒时间(自主呼吸恢复时间、睁眼时间、定向力恢复时间)及拔管时间低于对照组,说明了丙泊酚复合芬太尼静脉复合全麻的术中术后麻醉效果更佳。而本研究发现,观察组 R 在 T1~T5 时间点均低于对照组($P<0.05$)。表明了采用丙泊酚复合芬太尼静脉复合全麻的患者的呼吸频率更为稳定;而且观察组 $P_{ET}CO_2$ 在 T1 时间点低于对照组($P<0.05$);表明了观察组患者的呼肺通气量更佳。由于呼气末二氧化碳是反映患者肺脏通气量状态的敏感指标,其升高意味着肺通气量不足。而对照组患者在 T1 时间点更高,证实对照组患者的肺通气量相对较差。观察组 PAW 在 T1 时间点高于对照组($P<0.05$);证实了观察组患者具有更高的气道压力,气道压力高有助于改善患者的呼吸功能,减少发生呼吸道阻塞。而对于循环功能观察发现,观察组 SpO_2 在 T3、T4 时间点高于对照组($P<0.05$);表明观察组患者的 SpO_2 在麻醉期的支架释放前后更高。某动物实验表明,丙泊酚和芬太尼协同作用能够避免气管拔管后病人呼吸机的不同步和低氧血症的发生[25]。这一本研究结果一致。同时,观察组 HR、SBP、DBP、MAP 在 T1~T3 时间点均高于对照组($P<0.05$),观察组患者的 HR、MAP 在不同时间点间比较无统计学意义($P>0.05$),证明采用丙泊酚复合芬太尼静脉复合全麻的患者具有更好的血流动力学稳定性,减少了主动脉夹层介入治疗患者发生呛咳体动的风险。分析其原因,丙泊酚静脉复合全麻,对于丙泊酚的用量必然增多,而麻醉麻醉诱导期间丙泊酚的药量增多后,丙泊酚靶控输注的量就会有所限制,当患者靶控输注的量不能满足临床需求时会出现短暂呛咳及体动,引发呼吸及循环功能指标变化。而采用丙泊酚复合芬太尼静脉复合全麻的方式,能够降低丙泊酚的用量,强化麻醉深度。而且动物实验表示,低浓度的芬太尼可有效地将丙泊酚减少到不含芬太尼的所有终点的一半或更少[23]。国内外相关研究证实,如 Huang RC 的研究也证实丙泊酚复合芬太尼的效果更为理想[24]。自麻醉诱导后至支架释放

前,采用丙泊酚复合芬太尼静脉复合麻醉的患者的心率、血压、平均动脉压的波动范围更小,有力的避免患者出现心率和血压的大范围波动[25]。有研究证实,丙泊酚和芬太尼复合的安全性和效果均让人满意,而且血流动力学情况能够帮助患者手术顺利进行[26]。Robleda G 等的研究显示,对于机械通气患者应用芬太尼联合丙泊酚具有不改变血液动力学指标的特点,其镇静镇痛效果更优[27]。从国内外对于主动脉夹层的研究方面来看,多数研究主要集中于其治疗方面,而对于麻醉用药的情况研究较少,由于主动脉夹层会伴发胸痛及严重的血流动力学改变,而在麻醉状态下,保障患者的血流动力学指标的波动范围少,能够改善患者预后[28-30]。而本研究也存在一定的不足之处,未进行术后肌钙蛋白结果对比,无法确认麻醉差异与患者预后效果间的联系。不过,由于麻醉后患者的预后情况差异较大,其对比结果可能存在很多的干扰因素,需要临床进一步研究加以确定。

综上所述,采用丙泊酚复合芬太尼静脉复合全麻对于老年主动脉夹层介入手术患者,具有减少对患者呼吸及循环功能影响,改善麻醉效果的作用。

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