·临床研究·

老年心脏瓣膜置换术中应用瑞马唑仑对患者脏器功能的保护作用研究

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【摘 要】 **目的** 探讨瑞马唑仑在老年心脏瓣膜置换术中的应用效果及其对脏器功能的保护作用。**方法** 前瞻性选取2023年1月至2025年1月山西省运城市中心医院收治的130例行择期心脏瓣膜置换术的老年患者为研究对象。根据随机数字表法将患者分为研究组(采用瑞马唑仑行麻醉诱导及维持)及对照组(采用丙泊酚行麻醉诱导及维持),各65例。记录两组患者麻醉诱导前(T0)、插管时(T1)、切皮时(T2)及锯胸骨时(T3)的血流动力学参数[平均动脉压(MAP)、心率(HR)];分别于术前及术后3 d采集患者外周静脉血,检测肝、肾功能及心肌损伤标志物水平;记录患者术中及术后麻醉相关不良反应以及术中镇静效果。采用SPSS 27.0统计软件进行数据分析。根据数据类型,组间比较分别采用独立样本t检验、χ^2检验、Fisher确切概率法或连续矫正卡方检验,组内比较采用配对t检验。**结果** 研究组T0~T3时间点的MAP依次为(94.15±6.48)、(88.15±7.73)、(79.36±7.46)、(80.33±8.04) mmHg(1 mmHg=0.133 kPa),对照组依次为(95.03±8.11)、(77.54±7.91)、(74.39±7.49)、(76.98±7.15) mmHg。研究组T0~T3时间点的HR依次为(80.39±7.25)、(81.39±6.98)、(69.43±7.29)、(75.82±7.33) times/min,对照组依次为(81.05±8.83)、(74.17±7.49)、(64.35±6.87)、(68.04±7.04) times/min。研究组及对照组围术期不同时间点MAP及HR波动差异均有统计学意义(均$P<0.05$),且研究组T1、T2、T3时间点MAP及HR水平均高于对照组,差异均有统计学意义(均$P<0.05$)。与术前相比,两组术后3 d尿氮素、谷草转氨酶(AST)、N末端B型利钠肽前体、肌钙蛋白I(CTnI)及肌酸激酶同工酶水平均上升($P<0.05$);对照组术后3 d血肌酐(SCr)较术前上升,估算肾小球滤过率(eGFR)水平较术前下降($P<0.05$);研究组手术前后SCr、eGFR无明显改变($P>0.05$)。且研究组术后3 d SCr、AST及CTnI水平低于对照组,差异均有统计学意义($P<0.05$)。研究组术中低血压以及注射痛发生率低于对照组,差异均有统计学意义(均$P<0.05$)。两组术中诱导期和维持期补救患者占比以及镇静成功率比较,差异均无统计学意义(均$P>0.05$)。**结论** 瑞马唑仑应用于老年瓣膜置换术中的镇静效果良好,在减小患者围术期血流动力学波动,保护各脏器功能以及减少术中不良反应中均具有良好价值。

【关键词】 老年人;心脏瓣膜置换术;瑞马唑仑;脏器功能;术后谵妄
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Predictive effect of remimazolam on organ function in elderly patients undergoing cardiac valve replacement

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【**Abstract**】 **Objective** To investigate the effect of remimazolam in elderly patients undergoing cardiac replacement and its protective effect on organ function. **Methods** Prospectively, a total of 130 elderly patients undergoing elective cardiac valve replacement admitted to Yuncheng Central Hospital from January 2023 to January 2025 were enrolled as study subjects. The patients were divided into a study group (using remimazolam for anesthesia induction and maintenance) and control group (using propofol for anesthesia induction and maintenance) by a random number table method, with 65 cases in each group. Hemodynamic parameters [mean arterial pressure (MAP) and heart rate (HR)] were recorded in the two groups before anesthesia induction (T0), during intubation (T1), during skin incision (T2), and during sternal sawing (T3). Peripheral venous blood was collected before surgery and at day 3 after surgery to assess liver and kidney function and myocardial injury markers. The intraoperative and postoperative anesthesia-related adverse reactions and intraoperative sedation effectiveness were recorded. SPSS 27.0 was used for data processing. According to the data type, independent sample t test, χ^2, Fisher's exact test, or continuity-corrected *Chi*-square test, was performed for intergroup comparisons,

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and paired *t* test was used for intragroup comparisons. **Results** MAP values in the study group at T0-T3 were (94.15±6.48), (88.15±7.73), (79.36±7.46), and (80.33±8.04) mmHg (1 mmHg=0.133 kPa), respectively; in the control group, they were (95.03±8.11), (77.54±7.91), (74.39±7.49), and (76.98±7.15) mmHg, respectively. HR values in the study group at T0-T3 were (80.39±7.25), (81.39±6.98), (69.43±7.29), and (75.82±7.33) beats/min, respectively; in the control group, they were (81.05±8.83), (74.17±7.49), (64.35±6.87), and (68.04±7.04) beats/min, respectively. MAP and HR fluctuations at different perioperative time points were statistically significant in both groups ($P<0.05$), MAP and HR levels in the study group were significantly higher than those in the control group at T1, T2, and T3 ($P<0.05$). Compared with preoperative levels, levels of blood urea nitrogen, aspartate aminotransferase (AST), N-terminal pro-B-type natriuretic peptide, cardiac troponin I (CTnI), and creatine kinase isoenzyme-MB increased in both groups at day 3 after surgery ($P<0.05$). In control group, serum creatinine (SCr) at day 3 after surgery was significantly higher and estimated glomerular filtration rate (eGFR) was significantly lower than those before surgery ($P<0.05$). No significant changes in SCr and eGFR were observed in the study group before and after surgery ($P>0.05$). SCr, AST, and CTnI levels in the study group were significantly lower than those in the control group at day 3 after surgery, with statistically significant differences ($P<0.05$). The incidence rates of intraoperative hypotension and injection pain were lower in study group than those in control group ($P<0.05$). There were no statistical differences in the proportions of remedial cases during induction and maintenance or in sedation success rate between the two groups in intraoperative ($P>0.05$). **Conclusion** Remimazolam has a good sedation effect in elderly patients undergoing valve replacement and is valuable in reducing perioperative hemodynamic fluctuations, protecting organ functions and reducing intraoperative adverse reactions.

【Key words】 aged; cardiac valve replacement; remimazolam; organ function; postoperative delirium

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瓣膜置换术是老年心脏瓣膜病患者的主要治疗方法,但患者手术时通常已出现血流动力学异常、心脏收缩和舒张功能障碍以及心功能储备降低等表现,加之年龄较高,手术麻醉耐受力普遍降低,对临床麻醉管理的要求更高[1]。同时,心脏外科手术本身存在较高的脏器损伤相关并发症风险,是影响患者预后的重要因素,因此,脏器保护是当前麻醉学的研究重点[2]。麻醉药物的选择及精准调控在保护脏器功能、提高手术安全性、改善老年心脏瓣膜置换术患者预后中具有重要意义。瑞马唑仑是新型苯二氮䓬类药物,在支气管镜及消化内镜检查中应用较多。2020年,日本首次批准瑞马唑仑用于全身麻醉,但其在心脏手术中相关应用研究较少[3]。瑞马唑仑具有心血管抑制作用轻、镇静效果好的特点,且有研究显示,瑞马唑仑在麻醉中显示出一定的器官及系统保护功效[4],但其在心脏手术中的应用价值尚待研究。因此,本研究旨在探讨瑞马唑仑在老年心脏瓣膜置换术中对患者脏器功能的保护作用,现报道如下。

1 对象与方法

1.1 研究对象

前瞻性选取2023年1月至2025年1月山西省运城市中心医院收治的130例行择期心脏瓣膜置换术的老年患者为研究对象。其中男性62例,女性68例;年龄60~79(65.01±4.02)岁。采用随机数字表法将患者分为研究组($n=65$)及对照组($n=65$)。(1)纳入标准:年龄≥60岁;择期行心脏瓣膜置换术;认知清楚、沟通能力良好。(2)排除标准:受试药物过敏;左心室射血分数<30%,存在严重心功能障碍;严重肝肾功能障碍;严重心绞痛、心律失常。采用PASS15.0软件计算样本量,根据预实验结果,研究组及对照组患者经麻醉诱导丧失意识时平均动脉压(mean arterial pressure, MAP)分别为(86.45±5.79)mmHg(1 mmHg=0.133 kPa)及(77.65±6.96)mmHg,检验效能$1-\beta=0.8$,$\alpha=0.05$,考虑到20%释放率,最后计算得出每组需患者65例。本研究经山西省运城市中心医院伦理委员会批准(2023伦理临研116号),参与者均知情且同意。研究符合《赫尔辛基宣言》。

1.2 方法

1.2.1 麻醉处理 (1)麻醉前准备:麻醉术前禁食禁饮,进入手术室后常规监测心电图、血氧饱和度,连接麻醉深度监测仪,开放外周静脉通路,局部麻醉下行桡动脉穿刺置管,连续监测动脉血压,将患者稳定至少5 min后的血流动力学参数作为麻醉诱导前的基础值,面罩去氧给氮后行麻醉诱导。(2)麻醉诱导:研究组经静脉推注瑞马唑仑(江苏恒瑞医药股份有限公司,国药准字H20217078)0.1~0.3 mg/kg,对照组经静脉推注丙泊酚(江苏恩华药业股份有限公司,国药准字H20123137)1.0~2.5 mg/kg。当患者改良警觉/镇静评分量表(modified observer assessment of alertness/sedation scale, MOAA/S)得分为0分时,给予

舒芬太尼 0.5 μg/kg,罗库溴铵 1 mg/kg。待镇痛、镇静及肌松效果达标后行气管插管,连接呼吸机。(3)麻醉维持:研究组持续泵注瑞马唑仑 0.5 mg/(kg·h),对照组持续泵注丙泊酚 4 mg/(kg·h)。医师根据患者麻醉深度调整顺式阿曲库铵及瑞芬太尼用量,脑电双频指数维持在 40~60。研究组患者该期间若出现镇静不足表现,则加用咪达唑伦,改用丙泊酚维持麻醉。分别在皮肤消毒后、转流即刻、转流后每小时及复温时、复温后每小时追加舒芬太尼 1 μg/kg。连续监测体温并维持在 36.0℃~37.0℃,体外循环期间体温维持在 32℃~34℃。(4)术中处理:若研究组患者在麻醉诱导期间存在使用瑞马唑仑至最大剂量 0.3 mg/kg情况,或对照组患者存在丙泊酚使用至最大剂量 2.5 mg/kg 时,仍存在 MOAA/S 评分>0 分的情况,则向研究组患者追加瑞马唑仑 0.05 mg/(kg·次),向对照组患者追加丙泊酚 0.5 mg/(kg·次),两组追加次数均控制在 3 次以内,若镇静深度仍不够,则加用咪达唑伦进行补救诱导。诱导期间 MAP<60 mmHg视为低血压,给予去氧肾上腺素 50 μg 静脉注射,心率(heart rate, HR)<45 次/min 视为心动过缓,给予阿托品0.25 mg静脉注射。围术期期间,出现 HR>100 次/min、MAP>100 mmHg,则追加枸橼酸舒芬太尼注射液 0.3~0.5 μg/kg;若只出现 HR>100 次/min,则静脉注射艾司洛尔 0.3~0.6 mg/kg;若只出现 MAP>100 mmHg 则静脉泵入硝酸甘油 0.3~1.5 μg/(kg·min)。麻醉医师选择合适的血管活性药物,维持血流动力学稳定。

1.2.2 观察指标 (1)记录患者麻醉诱导前(T0)、插管时(T1)、切皮时(T2)、锯胸骨时(T3)的血流动力学参数,包括 MAP 及 HR。(2)术前及术后 3 d,采集患者外周静脉血检测肝肾功能指标及心肌损伤标志物,包括尿氮素(blood urea nitrogen, BUN)、血肌酐(serum creatinine, SCr)及估算肾小球滤过率(estimated glomerular filtration rate, eGFR)等肾功能指标,谷丙转氨酶(alanine aminotransferase, ALT)、谷草转氨酶(aspartate aminotransferase, AST)等肝功能指标,N 末端 B 型利钠肽前体(N-terminal pro-B-type natriuretic peptide, NT-proBNP)、肌钙蛋白 I(cardiac troponin I, CTnI)及肌酸激酶同工酶 MB(creatine kinase isoenzyme-MB, CK-MB)等心肌损伤标志物。(3)统计患者术中(麻醉诱导至锯胸骨后 5 min内)不良反应(包括心动过缓、心动过速、低血压、高血压、注射痛等)及术后不良反应(包括谵妄、呕吐、苏醒期躁动)。其中术后谵妄采用重症监护室意识模糊评估法[5]评估,苏醒期躁动采用 Ramsay 镇静躁动评分法[6]评估。(4)统计患者镇静有效性,符合以下3 条即镇静成功:全身麻醉诱导期间不加用其他镇静药物,且药物补救<3 次;全身麻醉维持期间不加用其他麻醉药物;患者无术中知晓。

1.3 统计学处理

采用 SPSS 27.0 统计软件进行数据分析。计量资料以均值±标准差($\bar{x}\pm s$)表示,先进行重复测量方差分析检验时间因素效应及处理因素效应,有统计学意义者再进行组间独立样本 t 检验或组内配对 t 检验。计数资料以例数(百分率)表示,组间比较采用χ^2检验、Fisher 确切概率法或连续矫正卡方检验。P<0.05 为差异有统计学意义。

2 结 果

2.1 两组患者术前及术中资料

两组患者术前及术中资料比较,差异均无统计学意义(均 P>0.05;表 1)。

2.2 两组患者围术期血流动力学指标

重复测量方差分析显示,不同检测时间及组间的 MAP 及 HR 水平比较,差异均有统计学意义(P<0.05),且两者之间有交互作用(P<0.001;表 2)。

两组 T1、T2、T3 MAP 均较同组 T0 基线水平下降,且研究组 T1、T2、T3 MAP 水平均高于对照组,差异均有统计学意义(P<0.05)。研究组 T2、T3 HR 较 T0 明显下降,对照组 T1、T2、T3 HR 水平均较 T0 明显下降,且研究组 T1、T2、T3 HR 水平均高于对照组,差异均有统计学意义(均P<0.05;表 3)。

2.3 两组患者手术前后脏器功能指标

与术前相比,两组患者术后 3 d 的 BUN、AST、NT-proBNP、CTnI 及 CK-MB 水平均显著上升(P<0.05);ALT 水平均无明显改变(P>0.05)。对照组术后 3 d SCr 较术前上升,eGFR 水平较术前下降(P<0.05);而研究组手术前后 SCr、eGFR 无明显改变(P>0.05)。研究组术后 3 d SCr、AST 及 CTnI 水平低于对照组,差异均有统计学意义(均 P<0.05;表 4)。

2.4 两组患者术中及术后不良反应

研究组术中低血压及注射痛发生率低于对照组,差异均有统计学意义(均 P<0.05);其余指标比较,差异均无统计学意义(均 P>0.05;表 5)。

2.5 两组患者术中镇静效果

两组患者诱导期和维持期补救患者占比以及镇静成功率比较,差异均无统计学意义(均 P>0.05;表 6)。

表1 两组患者术前及术中资料比较

Table 1 Comparison of preoperative and intraoperative data between two groups ($n=65$)

Item	Study group	Control group	χ^2/t	P value
Gender[n(%)]			0.123	0.725
Male	32(49.23)	30(46.15)		
Female	33(50.77)	35(53.85)		
Age(years, $\bar{x}\pm s$)	64.78±4.51	65.15±4.39	0.474	0.636
BMI(kg/m^2, $\bar{x}\pm s$)	23.15±3.46	22.84±3.37	0.517	0.606
Underlying disease[n(%)]				
Diabetes mellitus	5(7.69)	4(6.15)	0.000	1.000*
Hypertension	16(24.62)	13(20.00)	0.400	0.527
Coronary heart disease	15(23.08)	12(18.46)	0.421	0.517
Arrhythmia	33(50.77)	35(53.85)	0.123	0.725
Respiratory disease	10(15.38)	8(12.31)	0.258	0.612
ASA grading[n(%)]			0.099	0.753
Ⅱ	5(7.69)	6(9.23)		
Ⅲ	60(92.31)	59(90.77)		
NYHA grading[n(%)]			0.582	0.748
Ⅱ	8(12.31)	10(15.39)		
Ⅲ	47(72.31)	43(66.15)		
Ⅳ	10(15.38)	12(18.46)		
LVEF(%, $\bar{x}\pm s$)	60.33±4.59	61.24±4.84	1.100	0.273
Surgical time(min, $\bar{x}\pm s$)	216.45±15.98	221.12±16.25	1.652	0.101
Aortic crossclamp time(min, $\bar{x}\pm s$)	53.15±4.93	54.43±5.11	1.453	0.149
CPB time(min, $\bar{x}\pm s$)	84.46±12.15	85.03±11.74	0.272	0.786
Type of surgery[n(%)]			0.634	0.728
Univalve	5(7.69)	3(4.62)		
Multivalve	40(61.54)	43(66.15)		
Valve+MAZE	20(30.77)	19(29.23)		
Minimum intraoperative temperature(℃, $\bar{x}\pm s$)	34.23±3.87	34.18±4.19	0.071	0.944
Minimum intraoperative Hct(%, $\bar{x}\pm s$)	25.63±5.53	24.98±5.74	0.657	0.512
Intraoperative placement of IABP[n(%)]	29(44.62)	32(49.23)	0.278	0.598

BMI: body mass index; ASA: American Society of Anesthesiologists; NYHA: New York Heart Association; LVEF: left ventricular ejection fraction; CBP: cardiopulmonary bypass; Hct: hematocrit; IABP: intra-aortic balloon pump. * Continuous correction *Chi*-square test.

表2 两组患者MAP及HR的重复测量方差分析结果

Table 2 Results of repeated measures analysis of variance of MAP and HR in two groups

Item	MAP			HR		
	Time effect	Group effect	Time-group interaction effect	Time effect	Group effect	Time-group interaction effect
SS	266.48	293.45	166.65	199.16	176.15	125.58
MS	136.78	188.65	79.84	146.57	153.69	61.11
F	139.44	216.79	165.11	146.15	133.69	114.16
P value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

MAP: mean arterial pressure; HR: heart rate.

表3 两组患者围术期血流动力学指标比较

Table 3 Comparison of perioperative hemodynamic indicators between two groups ($n=65$, $\bar{x}\pm s$)

Group	MAP(mmHg)						HR(times/min)					
	T0	T1	T2	T3	*F*	*P* value	T0	T1	T2	T3	*F*	*P* value
Study	94.15±6.48	88.15±7.73*	79.36±7.46*	80.33±8.04*	57.094	<0.001	80.39±7.25	81.39±6.98	69.43±7.29*	75.82±7.33*	37.150	<0.001
Control	95.03±8.11	77.54±7.91*	74.39±7.49*	76.98±7.15*	98.845	<0.001	81.05±8.83	74.17±7.49*	64.35±6.87*	68.04±7.04*	60.366	<0.001
t	0.683	7.734	3.790	2.510			0.466	5.717	4.089	6.172		
P value	0.496	<0.001	<0.001	0.013			0.642	<0.001	<0.001	<0.001		

MAP: mean arterial pressure; HR: heart rate. 1 mmHg=0.133 kPa. Compared with T0, * $P<0.05$.

表 4 两组患者手术前后脏器功能指标比较

Table 4 Comparison of organ function indicators between two groups before and after operation ($n=65$, $\bar{x}\pm s$)

Item	Study group	Control group	t	P value
BUN(mmol/L)				
Before surgery	6.34±1.85	6.75±1.97	1.223	0.224
3d after surgery	9.25±2.29**	9.71±2.84**	1.017	0.311
SCr(μmol/L)				
Before surgery	72.37±12.36	72.69±10.89	0.157	0.876
3d after surgery	73.26±10.36	76.87±7.79**	2.245	0.027
eGFR[ml/(min·1.73m^2)]				
Before surgery	91.37±15.47	91.84±13.84	0.183	0.855
3d after surgery	90.64±13.85	87.66±13.97**	1.221	0.224
ALT(U/L)				
Before surgery	25.37±5.41	26.13±4.85	0.843	0.401
3d after surgery	26.11±6.19	26.23±5.81	0.114	0.909
AST(U/L)				
Before surgery	26.35±5.15	27.11±5.43	0.819	0.415
3d after surgery	53.56±7.73**	66.84±7.95**	9.656	<0.001
NT-proBNP(pg/ml)				
Before surgery	1 548.15±345.35	1 584.15±374.17	0.570	0.570
3d after surgery	2 337.69±483.41**	2 463.29±463.54**	1.512	0.133
CTnI(ng/ml)				
Before surgery	0.04±0.01	0.03±0.01	0.991	0.324
3d after surgery	1.33±0.32**	1.49±0.29**	2.987	0.003
CK-MB(μg/L)				
Before surgery	2.26±0.58	2.33±0.63	0.659	0.511
3d after surgery	19.87±3.44**	20.29±3.51**	0.689	0.492

BUN: blood urea nitrogen; SCr: seaum creatinine; eGFR: estimated glomerular filtration rate; ALT: alanine aminotransferase; AST: aspartate aminotransferase; NT-proBNP: N-terminal pro-B-type natriuretic peptide; CTnI: cardiac troponin I; CK-MB: creatine kinase isoenzyme-MB. Compared with before surgery, * $P<0.05$, ** $P<0.01$.

表 5 两组患者术中及术后不良反应比较

Table 5 Comparison of intraoperative and postoperative adverse reactions between two groups [$n=65$, $n(\%)$]

Group	Intraoperative					Postoperative		
	Bradycardia	Tachycardia	Hypotension	Hypertension	Injection pain	Postoperative delirium	Vomiting	Agitation during recovery
Study	6(9.23)	2(3.08)	18(27.69)	3(4.62)	1(1.54)	7(10.77)	2(3.08)	1(1.54)
Control	9(13.85)	1(1.54)	33(50.77)	6(9.23)	15(23.08)	6(9.23)	5(7.69)	4(6.15)
χ^2	0.678	0.000	7.260	0.478	13.969	0.086	0.604	0.832
P value	0.410	1.000*	0.007	0.490*	<0.001	0.770	0.437*	0.362*

* Continuous correction *Chi*-square test.

表 6 两组患者术中镇静效果比较

Table 6 Comparison of intraoperative sedation effects between two groups [$n=65$, $n(\%)$]

Group	Number of remedial cases during induction period	Number of remedial cases during maintenance period	Success rate of sedation
Study	0(0.00)	0(0.00)	65(100.00)
Control	2(3.08)	1(1.54)	63(96.92)
χ^2	0.508		0.508
P value	0.476*	1.000#	0.476*

* Continuous correction *Chi*-square test; # Fisher's exact probability test.

3 讨 论

丙泊酚是心脏手术最常用的麻醉药物,具有麻醉起效快、镇静效果好、苏醒快等优势,但丙泊酚对心血管系统的抑制作用较强。瑞马唑仑是新型苯二氮䓬类药物,随着对其研究的不断发展及新适应证的获批,瑞马唑仑逐渐应用于全身麻醉的诱导与维持。但瑞马唑仑是否能代替丙泊酚,成为心脏手术的理想麻醉药物,仍需大量临床实验加以验证。

本研究结果发现,研究组及对照组患者麻醉诱导期间 MAP 及 HR 均较诱导前明显下降,这与麻醉引起血流动力学波动相关,但研究组患者插管、切皮及锯胸骨时 MAP 及 HR 水平均高于对照组,提示瑞马唑仑有利于维持老年心脏瓣膜置换术患者术中血流动力学的稳定性,与何孟林等[7]研究结论相似,这与瑞马唑仑对心肌收缩力及外周血管病阻力的影响轻微有关。该药无活性代谢产物,且不依耐肝肾清除,可避免药物蓄积所造成的循环抑制,从而维持血流动力学稳定。

脏器功能保护是麻醉领域的重要研究内容,

随着心脏外科手术技术以及体外循环设备的不断更新,心脏外科手术安全性提高,但术后脏器损伤相关并发症依旧常见[8]。而麻醉是影响围术期脏器功能的重要因素,麻醉药物种类及麻醉方式可通过免疫调节、抗氧化、抑制促炎因子释放等途径参与脏器损伤[9,10]。有研究指出,瑞马唑仑具有一定的脏器保护功效[11]。本研究中,应用瑞马唑仑的研究组患者术后3 d SCr、AST、CTnI水平均低于对照组,提示研究组患者术后肾功能、肝功能以及心肌功能损伤更小,证实瑞马唑仑的脏器保护作用。考虑可能原因为,与丙泊酚的依赖肝肾清除不同,瑞马唑仑通过非特异性组织酯酶分解,能有效缓解肝肾负担,进而发挥肝肾保护作用[12]。且瑞马唑仑主要通过降低自主神经系统兴奋性,减少儿茶酚胺类及皮质醇等应激激素分泌,降低个体应激反应以发挥镇静效果,从而有效维持心血管稳定性,保护心肌功能[13]。但瑞马唑仑对脏器功能保护的其他作用机制尚不清楚,有研究表示,瑞马唑仑可能通过抗炎、抗凋亡以及减轻应激反应,发挥脏器功能[14]。除此之外,本研究还发现研究组患者术中低血压发生率更低,这也在一定程度上减少了因低血压使用血管活性药物的频率,进而进一步减少对脏器的不良影响。

接受心脏手术者是术后谵妄的高危人群,而苯二氮䓬类药物可能造成术后认知及神经功能损伤[15]。本研究发现,研究组术后谵妄发生率与对照组比较差异无统计学意义($P>0.05$),提示瑞马唑仑并不会增加心脏瓣膜置换术患者术后谵妄发生风险,与韩萍等[16]研究结论一致。此外,研究组患者术中注射痛发生率也更低,提示瑞马唑仑在心脏瓣膜置换术中具有较高的安全性及舒适性。在对比药物的镇静效果中发现,两组麻醉诱导期及维持期应用补救措施的患者数相当,麻醉成功率比较差异无统计学意义,提示瑞马唑仑的镇静效果良好。

综上,瑞马唑仑应用于老年瓣膜置换术中的镇静效果良好,在减小患者围手术期血流动力学波动、保护术后脏器功能方面均具有良好价值,且瑞马唑仑能降低术中低血压及注射痛发生率,同时不增加患者术后谵妄发生率。但本研究所有患者均来源于同一所医院,且样本量较小,所得结论可能存在一定的偏倚,后续研究可针对以上不足进行改进。

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