·临床研究·

非心脏手术中临时起搏器植入后的起搏比例对心功能的影响

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【摘 要】 **目的** 探讨非心脏手术中临时起搏器(TPM)植入后的起搏比例对心功能的影响。**方法** 回顾性分析2012年6月至2017年6月宝鸡市中心医院心血管内科非心脏手术中植入TPM患者200例,依据右心室起搏比例分为高搏组128例和低搏组72例,比较2组患者并发症、术前和术后1 d心率(HR)、心脏指数(CI)、左心室射血分数(LVEF)、肌酸激酶同工酶MB(CKMB)、肌钙蛋白T(TnT)、氨基末端脑钠肽前体(NT-proBNP)以及房颤发生率。采用SPSS 22.0统计软件对数据进行分析。组间比较采用t检验、方差分析、χ^2检验或Z检验。**结果** 高搏组和低搏组患者手术并发症发生率分别为4.69%(6/128)和6.94%(5/72),差异无统计学意义($P>0.05$)。高搏组患者术后1 d相比术前HR、CI和LVEF水平降低,CKMB、TnT和NT-proBNP水平升高,差异有统计学意义($P<0.05$)。高搏组患者术后1 d相比低搏组患者HR[(62.47±6.51) *vs* (69.43±7.24) beats/min]、CI[(2.45±0.30) *vs* (3.86±0.42) L/(min·m^2)]和LVEF[(35.12±3.55)% *vs* (39.94±4.11)%]水平降低,CKMB[(46.87±5.43) *vs* (38.32±4.16)U/L]、TnT[(86.45±9.05) *vs* (68.02±7.36)ng/L]和NT-proBNP[(275.12±30.24) *vs* (228.31±29.57)ng/L]水平升高,差异具有统计学意义($P<0.05$)。高搏组新发房颤发生率为7.81%(10/128),低搏组无新发房颤发生,差异有统计学意义($\chi^2=4.391$, $P=0.045$)。**结论** 非心脏手术中植入TPM后≤50%起搏比例可有效保持患者心功能稳定,有利于避免术后新发房颤的发生。

【关键词】 心脏起搏器;心脏功能;起搏比例
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Frequency of pacing by temporary pacemaker and its effects on the cardiac function in the non-cardiac surgery

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【**Abstract**】 **Objective** To investigate frequency of pacing by temporary pacemaker and its effects on the cardiac function in the non-cardiac surgeries. **Methods** A total of 200 patients were selected who had undergone non-cardiac surgeries with TPM in Baoji Central Hospital from June 2012 to June 2017. Based on the frequency of right ventricular pacing (RVP), all the patients were divided into high-pacing group (>50%, $n=128$) and low-pacing group (≤50%, $n=72$). The two groups were then compared in complications, heart rate (HR) 1 day pre- and post-operatively, cardiac index (CI), left ventricular ejection fraction (LVEF), creatine kinase isoenzyme MB (CKMB), troponin T (TnT), amino-terminal pro-brain natriuretic peptide (NT-proBNP) and atrial fibrillation. SPSS statistics 22.0 was used for data analysis, and Student's t test, ANOVA, Chi-square test or Z test for comparison. **Results** The incidence of complications was 4.69% (6/128) in the high-pacing group against 6.94% (5/72) in the low-pacing group, with no significant difference between the two groups ($P>0.05$). The levels of HR, CI and LVEF were significantly lower 1 day postoperatively than preoperatively, and the levels of TnT and NT-proBNP were significantly higher 1 day postoperatively in the high-pacing group than in the low-pacing group ($P<0.05$). Compared with the low-pacing group, the high-pacing group had lower HR[(62.47±6.51) *vs* (69.43±7.24) beats/min], CI[(2.45±0.30) *vs* (3.86±0.42) L/(min·m^2)], and LVEF[(35.12±3.55)% *vs* (39.94±4.11)%], but higher CKMB[(46.87±5.43) *vs* (38.32±4.16)U/L], TnT[(86.45±9.05) *vs* (68.02±7.36)ng/L] and NT-proBNP[(275.12±30.24) *vs* (228.31±29.57)ng/L] ($P<0.05$). An incidence of new atrial fibrillation of 7.81% (10/128) in the high-pacing group was significantly higher than that of 0.00% (0/72) in the low-pacing group ($\chi^2=4.391$, $P=0.045$). **Conclusions** Low frequency of pacing (≤50%) by TPM can effectively maintain stable cardiac function in the patients undergoing non-cardiac surgery, helping to avoid the occurrence of postoperative new-onset atrial fibrillation.

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随着麻醉、药物和手术研究进展,越来越多合并缓慢性心律失常患者开始接受相关疾病的外科治疗,但该人群对手术和麻醉耐受力差,常易加重心律失常,甚至心跳骤停而死亡,从而增加手术风险[1]。而临时起搏器(temporary pacemaker, TPM)可用于缓慢性心律失常的临时抢救或预防性治疗,右心室心尖部是TPM电极最常用的部位,具有安置电极简便、尖端易固定等优点,可有效协助完善患者的心功能,保证手术顺利进行[2]。但近年相关研究报道显示,右心室起搏比例与起搏器植入患者的心功能变化有关,但其对非心脏手术植入TPM患者心功能的影响研究报道较少[3]。为此本研究回顾性分析了非心脏手术中植入TPM后高和低起搏比例的患者,探讨起搏比例对患者心功能的影响。

1 对象与方法

1.1 研究对象

回顾性分析2012年6月至2017年6月宝鸡市中心医院心血管内科非心脏手术中植入TPM患者200例,依据右心室起搏比例分为高搏组128例和低搏组72例。纳入标准:(1)经临床症状、心动图、心电图、阿托品试验、运动平板试验等检查确认患者合并缓慢性心律失常;(2)年龄>18岁、无精神疾病病史;(3)就诊前1个月未服用β受体阻滞剂及其他减慢心率药物;(4)有晕厥、窦性停搏、交界性逸搏等TPM植入指征。排除标准:(1)恶性肿瘤;(2)随访资料收集不完整;(3)肝、脑、肾等严重器官功能障碍疾病。

1.2 方法

1.2.1 TPM植入 患者麻醉后,根据《中华医学会心电生理和起搏分会指南》[4]采用Seldinger穿刺法选择左锁骨下静脉入路置入6F动脉鞘管,调整TPM(Medtronic5318,美国)。心脏电生理刺激仪(苏州市东方电子仪器厂DF-5A)电极至右心室心尖部起搏,体外检查是否漏气后将电极导管尾部的正负极与TPM连接并开启起搏器,调整起搏参数,起搏阈值<1V固定电极,模式为心室按需起搏,起搏电压3.0 V,感知灵敏度1.6 mV,脉宽0.5 ms,起搏频率60次/min,术中连续心电图监测直至稳定心室起搏夺获,如起搏心电图为电轴左偏则提示右心室心尖部起搏,推送导管0.5~1.0 cm;如起搏心电图为电轴不偏则提示右心室流出道起搏。术中和术后常规起搏心电图、连续心电描记监测和观察起搏器的工作情况并记录起搏比例,术后待患者恢复清醒状态、病情稳定后,拔除临时起搏电极,其中起搏比例>50%为高搏,≤50%为低搏[5]。

1.2.2 观察指标 并发症包括TPM一次成功植入和起搏情况,电极脱位、穿刺点感染、局部血肿等TPM植入相关并发症。心功能指标包括心率(heart rate, HR)、心脏指数(cardiac index, CI)、左心室射血分数(left ventricular ejection fraction, LVEF)。血清学指标包括肌酸激酶同工酶MB(creatine kinase isoenzyme MB, CKMB)、肌钙蛋白T(troponin T, TnT)、氨基末端脑钠肽前体(amino-terminal pro-brain natriureticpeptid, NT-proBNP)。不良心脏事件包括心脏停搏、恶性心律失常和心力衰竭等,并于患者出院后通过电话、复诊等方式随访6个月,通过24 h动态心电图记录新发房颤情况。

1.3 统计学处理

采用SPSS 22.0统计软件对数据进行分析。计量资料用均数±标准差($\bar{x} \pm s$)表示,组间比较采用t检验和方差分析。计数资料用百分率表示,组间比较用χ^2检验和Z检验。$P<0.05$为差异有统计学意义。

2 结 果

2.1 2组患者基线资料比较

2组患者性别、年龄、心律失常类型、麻醉方式、高血压、糖尿病、手术时间、术中出血量等差异无统计学意义($P>0.05$;表1)。

2.2 2组患者手术并发症比较

2组患者均一次成功植入和起搏TPM且均无心脏停搏、恶性心律失常、心力衰竭等围术期不良心脏事件发生,高搏组和低搏组患者手术并发症发生率分别为4.69%(6/128)和6.94%(5/72),差异无统计学意义($P>0.05$;表2)。

2.3 2组患者HR、CI、LVEF比较

低搏组患者术前术后1 d HR、CI和LVEF差异无统计学意义($P>0.05$)。高搏组患者术后1 d HR、CI和LVEF明显低于术前,差异有统计学意义($P<0.05$)。2组患者术前HR、CI和LVEF差异无统计学意义($P>0.05$)。高搏组患者术后1 d HR、CI和LVEF明显低于低搏组患者,差异具有统计学意义($P<0.05$)。具体见表3。

表1 2组患者基线资料比较

Talle 1 Comparison of baseline data between two groups

Item	High pacing group (n=128)	Low pacing group (n=72)	$\chi^2/t/Z$	P value
Gender(male/female, n)	68/60	38/34	0.234	0.903
Age (years, $\bar{x}\pm s$)	72.5±6.6	72.1±6.5	0.385	0.796
Type of arrhythmia[n(%)]			0.689	0.624
Sinus bradycardia	88(68.75)	58(80.56)		
Conduction block	34(26.56)	10(13.88)		
Atrial fibrillation with long intermission	6(4.69)	4(5.56)		
Anaesthesia[n(%)]			0.852	0.482
Local anesthesia	14(10.94)	8(11.11)		
Lumbar anesthesia	28(21.88)	16(22.22)		
General anesthesia	86(67.18)	48(66.67)		
Hypertension[n(%)]	50(39.06)	29(40.28)	0.358	0.821
Diabetes mellitus[n(%)]	25(19.53)	14(19.44)	0.368	0.813
Operation time (min, $\bar{x}\pm s$)	70.52±7.52	70.05±7.43	0.289	0.868
Intraoperative bleeding(ml, $\bar{x}\pm s$)	758.21±76.21	760.35±77.54	0.105	0.952
Operation[n(%)]			0.750	0.567
Orthopaedics	52(40.63)	31(43.05)		
General surgery	38(29.69)	20(27.78)		
Urological surgery	26(20.31)	15(20.83)		
Gynaecological surgery	12(9.37)	6(8.33)		
Pacing site[n(%)]			0.365	0.803
Apical apex of right ventricle	70(54.69)	40(55.56)		
Right ventricular outflow tract	58(45.31)	32(44.44)		
eGFR[ml/(min·1.73 m^2), $\bar{x}\pm s$]	66.58±6.87	66.25±6.82	0.682	0.631

eGFR: estimated glomerular filtration rate

表2 2组患者手术并发症比较

Table 2 Comparison of complications between two groups [n(%)]

Group	n	Electrode dislocation	Puncture point infection	Local hematoma
High pacing	128	1(0.78)	3(2.34)	2(1.56)
Low pacing	72	1(1.39)	2(2.78)	1(1.39)
χ^2		0.172	0.036	0.009
P value		0.678	0.850	0.923

表3 2组患者HR、CI、LVEF比较

Table 3 Comparison of HR, CI, LVEF between two groups ($\bar{x}\pm s$)

Group	n	HR(beats/min)		CI[L/(min·m^2)]		LVEF(%)	
		Preoperation	1 d after operation	Preoperation	1 d after operation	Preoperation	1 d after operation
High pacing	128	70.12±7.71	62.47±6.51*#	3.96±0.24	2.45±0.30*#	40.12±4.28	35.12±3.55*#
Low pacing	72	70.01±7.59	69.43±7.24	3.92±0.22	3.86±0.42	40.28±4.32	39.94±4.11

HR: heart rate; CI: cardiac index; LVEF: left ventricular ejection fraction. Compared with preoperation, *P<0.05; compared with low pacing group, #P<0.05

2.4 2组患者CKMB、TnT、NT-proBNP比较

低搏组患者术前术后1 d CKMB、TnT和NT-proBNP差异无统计学意义(P>0.05)。高搏组患者术后1 d CKMB、TnT和NT-proBNP高于术前,差异有统计学意义(P<0.05)。2组患者术前CKMB、TnT和NT-proBNP差异无统计学意义(P>0.05)。高搏组患者术后1 d CKMB、TnT和NT-proBNP明显高于低搏组患者,差异具有统计学意义(P<0.05;表4)。

2.5 2组患者随访结果比较

随访6个月期间,高搏组新发房颤发生率为7.81%(10/128),明显高于低搏组的0.00%(0/72),差异有统计学意义(χ^2=4.391,P=0.045)。

表4 2组患者CKMB、cTnT、NT-proBNP比较

Table 4 Comparison of CKMB, TnT, NT-proBNP between two groups ($\bar{x} \pm s$)

Group	n	CKMB (U/L)		TnT (ng/L)		NT-proBNP (ng/L)	
		Preoperation	1 d after operation	Preoperation	1 d after operation	Preoperation	1 d after operation
High pacing	128	36.74±4.36	46.87±5.43*#	68.76±7.52	86.45±9.05*#	223.45±28.56	275.12±30.24*#
Low pacing	72	37.11±4.41	38.32±4.16	67.98±7.43	68.02±7.36	225.16±28.97	228.31±29.57

CKMB: creatine kinase isoenzyme MB; TnT: troponin T; NT-proBNP: amino-terminal pro-brain natriuretic peptide. Compared with preoperation, *$P<0.05$; compared with low pacing group, #$P<0.05$

3 讨 论

TPM是一种辅助改善心功能的仪器,具有电极安置简便、尖端易固定等优点,通过在非心脏手术中临时安置,可有效规避心室频率变为程控低限频率,改善患者血流动力学,从而避免患者术中心率、心排血量显著降低,有利于减少麻醉、手术对心功能的不良影响,对预防和治疗围手术期心律失常具有良好的作用。但近年相关研究指出,植入起搏器的非生理性起搏会对患者的心脏造成一定的不良影响,随着右心室起搏比例的增高,会导致心室电活动与激动顺序不同步,心力衰竭、心房颤动发生风险增加,可能会削弱起搏器带来的益处[6,7]。

CKMB、TnT、NT-proBNP是可有效反映心肌损伤的血清学指标,其中CKMB、TnT临床常用,具有调节心肌肌肉收缩的作用,心肌细胞因缺血缺氧等受损时可被大量释放至血浆中。NT-proBNP是一种由心肌细胞合成的天然激素,在心室容量或压力负荷过大时,可被大量分泌至血浆中且浓度稳定[8]。HR、CI和LVEF是心功能指标,心功能下降使得每搏输出量和心输出量减少时,其水平也会随之下降[9]。

本研究结果显示,2组患者均一次成功植入TPM且均无围手术期不良心脏事件发生,高搏组和低搏组并发症发生率分别为4.69%和6.94%,2组基本相同,表明植入TPM安全有效,此结论与Jin等[10]研究基本一致,且不同起搏比例对手术效果无明显影响。这可能是由于不同起搏比例在植入TPM后均能有效发挥TPM的作用,能够为患者提供频率适应而改善心功能,从而缓解心脏及其他重要脏器供血情况,有效规避围手术期心律失常的发生,且不会增加TPM植入相关并发症的发生。同时,本研究结果表明高搏组患者CKMB、TnT和NT-proBNP术后1 d明显高于术前,且明显高于低搏组患者。高搏组患者HR、CI和LVEF术后1 d明显低于术前,且低于低搏组患者,低搏组患者术前术后基本相同。表明相比>50%起搏比例,非心脏手术中植入TPM后≤50%起搏比例能有效保持患者心功能稳定,且不会对患者心功能产生不良影响,此结论与Boriani等[11]研究基本一致,这可能是由于患者植入TPM产生的电极脉冲激动顺序始于右室心尖间隔部,使除极通过传导速度缓慢的心肌细胞传播至心底部。而右心室起搏比例高(>50%)可能使电极脉冲造成心肌某一节段收缩时另一节段相对舒张,致使心肌收缩既无顺序也不同步,造成左房激动延迟,引起左室后乳头肌功能不全、二尖瓣后叶脱垂、二尖瓣返流及左房扩张,从而导致CKMB、TnT和NT-proBNP等被大量释放入血,心底部收缩时心尖收缩完毕而形成瘤样矛盾运动,左、右心室的失同步可引起心脏每搏输出量减少而使心输出量减少,表现为HR、CI和LVEF等心功能指标水平下降,最终造成心功能下降。

此外,本研究随访6个月期间,高搏组患者新发房颤发生率为7.81%,明显高于低搏组患者的0.00%,此结果与彭晖等[12]研究基本一致,表明与>50%起搏比例比较,非心脏手术中植入TPM后≤50%起搏比例能有效避免术后新发房颤的发生。这可能是由于非心脏手术中植入TPM后>50%起搏比例可对心功能产生不利影响,尤其造成左房激动延迟而导致左房扩大,从而引起心电活动的室房逆传及干扰心房正常的生物电活动,最终导致不恰当的心房刺激而增加术后新发房颤的发生。

本研究也存在一定的不足,如植入TPM起搏比例对非心脏手术患者心功能的影响机制复杂,且纳入的病例少,不足以代表所有情况,但与>50%起搏比例比较,非心脏手术中植入TPM后≤50%起搏比例可有利于保持患者心功能稳定,避免术后新发房颤发生,因此在植入TPM后应加强右心室起搏管理,尽量优化房室间期,减少不必要的右心室起搏可能给患者会带来更多的收益。

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