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收肌管阻滞不同输注方式对全膝关节置换术后镇痛的效果

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[摘要] 目的: 观察收肌管阻滞不同输注方式用于全膝关节置换术后的镇痛效果。方法: 拟行全膝关节置换术患者60例, 美国麻醉医师学会(American Society of Anesthesiologists, ASA)II或III级, 年龄65~77岁, 随机分为2组($n=30$): 程序间歇式输注组(P组)和恒速输注组(C组)。术毕给予负荷剂量0.2%罗哌卡因10 mL, 并连接患者自控神经阻滞镇痛泵。P组程序间歇输注, 单次自动给药剂量为10 mL, 间歇时间为2 h。C组持续输注, 背景剂量为5 mL/h。两组患者单次按压剂量为5 mL, 锁定时间为30 min。当视觉模拟评分(Visual Analogue Scale, VAS) >4 时, 按压镇痛泵。若30 min后无缓解, 皮下注射盐酸羟考酮5 mg, 进行镇痛补救。分别于术后4、8、24、48和72 h时评估患者疼痛程度及患肢股四头肌肌力, 并记录术后1~3 d患者步行距离。记录术后72 h内镇痛补救情况、患者满意度评分及不良反应发生情况。结果: 与C组比较, P组患者8~48 h动态VAS评分降低($P<0.05$), P组术后1~3 d患者步行距离增加($P<0.05$)。两组股四头肌肌力、镇痛补救率、患者满意度及不良反应发生率差异无统计学意义($P>0.05$)。结论: 程序间歇式输注收肌管阻滞可有效用于全膝关节置换术后镇痛, 抑制动态痛效果优于恒速输注方式。

[关键词] 程序间歇式输注; 恒速输注; 收肌管阻滞; 全膝关节置换术

Analgesic effect of adductor canal block with different infusion methods for patients undergoing total knee arthroplasty

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Abstract **Objective:** To compare the analgesic effect of adductor canal block with different infusion methods for patients undergoing total knee arthroplasty. **Methods:** A total of 60 elderly patients undergoing total knee arthroplasty, aged 65–77 years, with American Society of Anesthesiologists (ASA) II or III, were randomly divided into two groups ($n=30$): a programmed intermittent bolus infusion group (Group P) and a constant infusion group (Group C). After the operation, a loading dose of 10 mL of 0.2% ropivacaine was given, and patient-controlled nerve block

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analgesia pump was connected. Programmed intermittent bolus infusion with a single automatic dose of 10 mL and intermittent time of 2 hours was used in Group P. Constant infusion with a background dose of 5 mL/h was used in Group C. The single patient pressing dose was 5 mL with a 30-minute locking time in both groups. When Visual Analog Scale (VAS) score was over 4 points, the analgesia pump was pressed. If pain was not relieved 30 minutes after pressing by patients, oxycodone hydrochloride of 5 mg was subcutaneously injected as analgesic remedy. VAS and quadriceps strength were recorded 4, 8, 24, 48 and 72 hours after surgery. The walking distance was recorded on day 1–3 after total knee arthroplasty (TKA). The analgesic remedy, patient satisfaction and adverse reactions were recorded within 72 hours after surgery. **Results:** Compared with Group C, the the dynamic VAS score between 8 hours and 48 hours after surgery was lower in Group P ($P<0.05$). Compared with Group C, the walking distance on day 1–3 was increased in Group P ($P<0.05$). But the quadriceps strength, analgesic remedy, patient satisfaction and the incidence of adverse reactions were not significantly different between Group P and Group C ($P>0.05$). **Conclusion:** Adductor canal block with programmed intermittent bolus infusion is effective for postoperative analgesia for patients undergoing total knee arthroplasty, and its effect of inhibiting dynamic pain is better than that of constant infusion.

Keywords programmed intermittent bolus infusion; constant infusion; adductor canal block; total knee arthroplasty

全膝关节置换术是目前治疗终末期膝关节病变的主要方法。然而,术后的剧烈疼痛影响患者早期功能锻炼。收肌管阻滞可为全膝关节置换术患者提供良好的术后镇痛效果^[1-2]。目前恒速输注为连续收肌管阻滞用于全膝关节置换术后镇痛的主要给药方式^[3-5]。与恒速输注比较,程序间歇式输注方式用于持续周围神经阻滞镇痛可为患者提供更加完善的镇痛效果^[6-7]。故本研究拟比较程序间歇式输注与恒速输注方式在连续收肌管阻滞用于全膝关节置换术的镇痛效果,为优化镇痛策略提供参考。

1 对象与方法

1.1 对象

本研究获保定市第一中心医院医学伦理委员会批准,并与患者签署知情同意书。择期行全膝关节置换术患者60例,美国麻醉医师学会(American Society of Anesthesiologists, ASA)分级II或III级,性别不限,年龄65~77岁。排除标准:穿刺部位感染,凝血功能障碍,对罗哌卡因过敏,糖尿病神经病变及沟通障碍不能配合者。采用随机数字表法,将患者分为2组($n=30$):程序间歇式输注组(P组)与恒速输注组(C组)。

1.2 方法

所有患者入院后进行疼痛知识宣教,教会患者正确使用视觉模拟评分(Visual Analogue Scale, VAS)描述疼痛程度。

所有患者禁食禁饮,未予术前用药。入室后开放静脉通路,输注复方林格氏液5 mL/(kg·h)。鼻导管吸氧1~2 L/min,监测心电图(electrocardiogram, ECG)、脉搏血氧饱和度(pulse oxygen saturation, SpO₂)和无创血压(blood pressure, BP)。局部麻醉下行桡动脉穿刺置管,持续监测有创动脉血压。腰-硬联合麻醉:患者侧卧位,选择L3~4间隙作为穿刺点,蛛网膜下腔注射0.5%等比重罗哌卡因2.5 mL,将麻醉平面控制于T₁₀水平。向硬膜外腔置入硬膜外留置导管,导管留置3~5 cm并妥善固定。超声引导下连续收肌管阻滞:患者仰卧位,将超声探头置于股骨大转子与髌骨上缘连线中点水平,辨认收肌管结构。采用平面内技术进针,针尖穿过缝匠肌到达股动脉外侧三角形高回声区域后,采用水分离技术确认针尖位置正确。固定穿刺针,向收肌管内置入神经阻滞留置导管,留置3~5 cm并妥善固定。

术毕通过神经阻滞留置导管给予负荷剂量0.2%罗哌卡因10 mL,并连接患者自控神经阻滞镇痛泵,药物配方为0.2%罗哌卡因200 mL。P组程序间歇式输注给药,单次自动给药剂量为10 mL,间歇时间为2 h。C组恒速输注给药,背景剂量为5 mL/h。两组患者单次按压剂量为5 mL,锁定时间为30 min,镇痛至术后72 h。当VAS>4时,按压镇痛泵。若30 min后无缓解,皮下注射盐酸羟考酮5 mg进行镇痛补救。分别于术后4、8、24、48和72 h时评估患者静态、动态(被动屈膝60°)疼痛评分及患肢股四头肌肌力,并记录术后1~3 d患者步行距离。记录

术后72 h内镇痛补救情况、患者满意度评分及不良反应(瘙痒、头晕、尿潴留、恶心呕吐)发生情况。

1.3 统计学处理

采用SPSS 17.0软件进行分析, 正态分布的计量资料以均数±标准差($\bar{x}\pm s$)表示, 组间比较采用独立样本 t 检验; 非正态分布的计量资料以中位数(四分位数间距)[$M(IQR)$]表示, 组间比较采用Mann-Whitney U 检验。计数资料比较采用 χ^2 检验。 $P<0.05$ 为差异有统计学意义。

2 结果

两组年龄、性别构成比、ASA分级构成比、身高、体重及手术时间差异无统计学意义($P>0.05$, 表1)。与C组比较, P组患者8~48 h动态VAS评分降低($P<0.05$, 表2)。两组患者股四头肌肌力差异无统计学意义($P>0.05$, 表3)。两组镇痛补救率、患者满意度及不良反应发生率差异无统计学意义($P>0.05$, 表4)。与C组比较, P组术后1~3 d患者步行距离增加($P<0.05$, 表5)。

表1 两组患者一般资料比较($n=30$)

Table 1 Comparison of general data between the two groups ($n=30$)

组别	年龄/岁	性别(男/女)/例	ASA分级(II/III)/例	身高/cm	体重/kg	手术时间/min
P组	71.03 ± 3.20	16/14	22/8	168.07 ± 4.92	68.50 ± 4.02	85.80 ± 3.80
C组	72.33 ± 3.02	17/13	24/6	168.47 ± 4.75	67.07 ± 3.37	86.97 ± 3.03

表2 两组患者VAS评分比较($n=30$)

Table 2 Comparison of VAS score between the two groups ($n=30$)

组别	VAS/分				
	4 h	8 h	24 h	48 h	72 h
静态					
P组	1 (0~1)	2 (1~2)	2 (2~3)	2 (1~2)	1 (1~1)
C组	1 (0~1)	2 (1~2)	2.5 (3~3)	2 (2~3)	1 (1~1)
动态					
P组	1 (1~2)	2 (2~2)*	3 (2~3)*	2 (2~3)*	2 (1~2)
C组	1 (1~2)	3 (3~4)	4 (4~4)	3 (3~4)	2 (2~2)

与C组相比, $*P<0.05$ 。

Compared with Group C, $*P<0.05$.

表3 两组患者股四头肌肌力比较($n=30$)

Table 3 Comparison of quadriceps strength between the two groups ($n=30$)

组别	股四头肌肌力/分				
	4 h	8 h	24 h	48 h	72 h
P组	2 (2~3)	5 (4~5)	5 (4~5)	6 (5~6)	6 (5~6)
C组	2 (2~3)	5 (4~5)	5 (4~5)	6 (5~6)	6 (5~6)

表 4 两组镇痛补救率、患者满意度及不良反应发生率比较 (n=30)

Table 4 Comparison of the incidence of analgesic remedy, satisfaction of patients and incidence of adverse reactions between two groups (n=30)

组别	镇痛补救率 / [例 (%)]	患者满意度 / 分	不良反应发生率 / [例 (%)]
P 组	2 (6.67)	8 (8~9)	1 (3.33)
C 组	5 (16.67)	8 (7~9)	3 (10.00)

表 5 两组患者步行距离比较 (n=30)

Table 5 Comparison of walking distance between the two groups (n=30)

组别	步行距离 / m		
	术后 1 d	术后 2 d	术后 3 d
IA 组	38.50 ± 6.39*	56.47 ± 5.33*	78.87 ± 7.04*
LA 组	35.33 ± 5.04	45.20 ± 4.46	65.43 ± 7.70

与 C 组相比, *P<0.05。

Compared with Group C, *P<0.05.

3 讨论

全膝关节置换术后中、重度疼痛发生率可高达90%^[8]。此外, 功能锻炼时引起的股四头肌痉挛可导致运动痛限制了患肢功能锻炼的实施^[9]。股神经阻滞可有效缓解全膝关节置换术后静息痛及运动痛^[10]。然而, 股神经阻滞阻断痛觉转导的同时可显著削弱股四头肌肌力。与股神经阻滞相比, 收肌管阻滞可为全膝关节置换术患者提供良好的术后镇痛效果, 且不影响患肢肌力^[11]。李灿峰等^[12]研究发现持续收肌管阻滞对全膝关节置换术后静息及活动状态下的镇痛效果均优于单次收肌管阻滞。故本研究选择持续收肌管阻滞用于全膝关节置换术后镇痛。研究^[13]表明: 0.5%与0.2%罗哌卡因用于收肌管阻滞时对术后镇痛效果及股四头肌肌力影响均无差异。本研究为降低局部麻醉药用量, 避免老年患者发生局部麻醉药中毒, 故采用0.2%罗哌卡因用于持续收肌管阻滞。为加速患者康复, 术后2 h患者即开始被动功能锻炼; 椎管内麻醉作用消退, 下肢肌力逐渐恢复时, 患者即在病床上开始主动功能锻炼; 术者评估肌力适宜下床活动后即开始下床活动(本研究中所有患者均可于术后第1天清晨即可下床活动)。此外, 为更准确地比较两种输注方式的镇痛效果, 本研究仅在术后VAS>4分, 按压镇痛泵无缓解时, 皮下注射盐酸羟考酮5 mg, 进行镇痛补救。此外, 未通

过应用其他镇痛类药物。

恒速输注为连续收肌管阻滞用于全膝关节置换术后镇痛的主要给药方式^[4-5]。与恒速输注比较, 程序间歇式输注方式用于持续周围神经阻滞镇痛可为患者提供更加完善的镇痛效果^[6-7]。本研究发现: 与C组比较, P组患者8~48 h动态VAS评分降低, 提示连续收肌管阻滞用于全膝关节置换患者术后镇痛时, 程序间歇式输注方式较恒速输注方式可更有效抑全膝关节置换术后运动时疼痛, 更利于患者早期功能锻炼的实施。Thapa等^[14]将连续收肌管阻滞用于膝关节镜下前交叉韧带修复术后镇痛发现, 程序间歇式输注方式较恒速输注方式可明显降低术后疼痛程度, 减少围手术期阿片类用量, 与本研究结果相吻合。Chen等^[7]研究发现: 持续胸椎旁阻滞用于电视胸腔镜辅助肺叶切除术后镇痛, 程序间歇输注较恒速输注患者疼痛程度更低, 阿片类药物用量更少, 患者满意度更高。Taketa等^[15]研究发现持续胸椎旁阻滞用于电视胸腔镜辅助胸科手术镇痛, 程序间歇输注较恒速输注可产生更为广泛的感觉阻滞平面。Bojaxhi等^[16]研究发现: 对于持续腹横筋膜平面阻滞, 程序间歇输注较恒速输注局部麻醉药扩散方为更加广泛。以上研究结果均与本研究结果相似。分析原因可能是, 程序间歇输注时单次高容量可产生较高的注射压力, 有利于增加药液向目标区域的扩散范围, 从而产生更加完善的镇痛效

果。膝关节感觉支配由多支神经共同完成, 包括股内侧皮神经、股外侧皮神经、隐神经、股神经股内侧肌支、腓总神经分支、胫神经分支及闭孔神经后支^[17]。隐神经与股神经股内侧肌支、股内侧皮神经及闭孔神经后支共同走行于收肌管内。收肌管阻滞时, 程序间歇输注的高容量高注射压力有利于局麻药在收肌管内扩散, 从而同时阻滞走行于收肌管内的隐神经、股神经股内侧肌支及闭孔神经后支, 从而达到完善的镇痛效果。然而, Monahan等^[18]开展的一项志愿者研究发现, 程序间歇式输注与恒速输注用于持续收肌管阻滞时, 两组患者对疼痛刺激的耐受阈值差异无统计学意义, 这与本研究结果相左。分析原因可能是由于志愿者与全膝关节置换患者的病理生理差异造成的。

理想的全膝关节置换术后镇痛策略要求保证完善镇痛的同时, 不影响患肢肌力, 从而满足早期功能锻炼的需求, 促进患者术后恢复。本研究发现: 两组患者股四头肌肌力差异无统计学意义。与C组比较, P组术后1~3 d步行距离增加, 提示程序间歇式输注较恒速输注对患肢运动功能影响更小, 更利于早期康复锻炼。

综上所述, 程序间歇式输注收肌管阻滞可有效用于全膝关节置换术后镇痛, 抑制动态痛效果优于持续输注方式, 更利于患者术后康复。

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