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· 经验交流 ·

# 连续收肌管阻滞镇痛在双膝关节一期置换术后疼痛控制研究

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**【摘要】** 目的:探讨连续收肌管阻滞在双膝关节一期置换术后疼痛控制效果。方法:回顾性分析 2018 年 1 月至 2019 年 1 月收治的 24 例行双膝关节一期置换术,且术后行连续收肌管阻滞镇痛患者资料。男 6 例,女 18 例;年龄 60~72(65.05±5.82)岁。患者术后双膝均行连续收肌管阻滞,配合自控镇痛系统。术后 4、6、12、24、36、48 h 行静息状态及被动运动状态视觉模拟评分(visual analogue scale, VAS);随访患者术后 1 周及 1、3、6 个月膝关节活动度;对患者术后 6 个月膝关节功能进行评分,采用美国特种外科医院(Hospital for Special Surgery, HSS)膝关节评分标准;记录不良反应及并发症。结果:行连续收肌管阻滞患者术后各时点静息状态、被动运动状态 VAS 均分<3 分。患者术后膝关节活动度较好,术后 6 个月 HSS 评分优 20 例,良 2 例,可 1 例,差 1 例。术后仅 4 例出现恶心呕吐,无一例发生心动过缓、深静脉血栓等严重不良反应及并发症。结论:连续收肌管阻滞在双膝关节一期置换术后疼痛控制方面效果显著,且不良反应较少。

**【关键词】** 关节成形术, 置换, 膝; 疼痛; 手术后并发症

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**Study on pain control of continuous adductor block analgesia after primary knee replacement** WANG Shan-zheng, WANG Chen, GUO Yu-dong, YAO Juan, QIU Li-li, HUANG Lu-xin, and XIE Jue\*. \*Department of Anesthesiology, Zhongda Hospital Affiliated to Southeast University, Nanjing 210009, Jiangsu, China

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**ABSTRACT Objective:** To investigate the effect of continuous adductor block on pain control after bilateral knee joint I-stage replacement. **Methods:** A retrospective analysis was made of the data of 24 patients with bilateral knee joint I-stage replacement who were treated in our hospital from January 2018 to January 2019, and who underwent continuous adductor block analgesia. There were 6 males and 18 females, aged 60 to 72 ( $65.05 \pm 5.82$ ) years old. The patients underwent continuous block of adductor canal with patient-controlled analgesia system. At 4, 6, 12, 24, 36 and 48 hours after operation, visual analogue score (VAS) of resting state and passive motion state was performed; the knee joint activity was followed up for 1 week, 1, 3 and 6 months after operation; the knee joint function was scored at 6 months after operation, using the knee joint scoring standard of American Special Surgery Hospital (HSS); adverse reactions and complications were recorded. **Results:** The VAS scores under resting state and passive motion state at each time point were less than 3 points in patients with continuous adductor block. The patients had better postoperative exercise of knee joint activity. The score of HSS was excellent in 20 cases, good in 2 cases, fair in 1 case and poor in 1 case. There were only 4 cases of nausea and vomiting, none of them had serious adverse reactions and complications such as bradycardia and deep vein thrombosis. **Conclusion:** Continuous adductor block has a significant effect on pain control and less adverse reactions after bilateral knee joint I-stage replacement.

**KEYWORDS** Arthroplasty, replacement, knee; Pain; Postoperative complications

随着人口的老齡化, 膝关节骨关节炎 (knee osteoarthritis, KOA) 患者逐年增多<sup>[1]</sup>。当 KOA 保守治疗不能取得良好效果时, 合理采用手术重建膝关节功能, 能极为有效缓解患者临床症状<sup>[2]</sup>。全膝关节置换术 (total knee arthroplasty, TKA) 是当前开展较为广泛的手术操作方式, 美国每年大约完成 70 万例 TKA 手术, 至 2030 年, 这一数字预计增加至 350 万例<sup>[3]</sup>。当前, 多数 KOA 患者为单侧, 但仍有相当数量患者为双侧表现。在过去 20 年, 我国的医疗条件和手术技术取得了巨大的飞跃, 双膝关节 I 期置换手术患者逐年增加<sup>[4-5]</sup>。双膝关节 I 期置换手术时间长, 术中出血量相对单侧增加, 尤其是术后隐性失血量较多, 术后双侧膝关节疼痛会阻碍患者功能锻炼, 严重影响手术长期疗效<sup>[6]</sup>。因此, 双膝关节 I 期置换对于医生的手术技术, 麻醉的围手术期管理以及术后功能锻炼都提出了极高的要求<sup>[7]</sup>。近年来, 收肌管阻滞技术用于 TKA 术后镇痛受到了越来越多的关注。其主要目的在于通过神经阻滞麻醉技术, 减少患者术后疼痛及全身用药不良反应, 让患者在无痛状态下尽早开始功能锻炼, 达到快速康复的效果<sup>[8]</sup>。当前, 连续收肌管阻滞镇痛在双膝关节 I 期置换术后疼痛控制方面的研究报道较少。因此, 本研究回顾性分析 2018 年 1 月至 2019 年 1 月所行 24 例双膝关节 I 期置换术, 且术后行连续收肌管阻滞镇痛患者临床资料, 报告如下。

## 1 临床资料

### 1.1 一般资料

本组 24 例, 男 6 例, 女 18 例; 年龄 60~72 ( $65.05 \pm 5.82$ ) 岁, 身体质量指数 (Body Mass Index, BMI) ( $28.3 \pm 1.5$ ) kg/m<sup>2</sup>, ASA 分级<sup>[9]</sup>均为 I-II 级。术前 X 线片示双侧膝关节退行性变, K-L 分级<sup>[10]</sup> III-IV 级。

### 1.2 病例选择

纳入标准: (1) 年龄为 50~75 岁者。(2) 根据

2013 美国医师协会年会膝关节骨关节炎的治疗指南诊断为重度骨关节炎, 且保守治疗无效。(3) 均采取双膝关节 I 期置换术, 术中采用 PS 假体。排除标准: (1) 年龄 > 75 岁。(2) 合并严重心肺功能不全患者。(3) 合并糖尿病, 且近期经胰岛素干预, 血糖仍控制不佳者。(4) 合并低蛋白血症患者。(5) 长期卧床, 或心脏放有支架, 长期口服抗凝药患者。(6) 合并精神类疾病患者。

## 2 治疗方法

### 2.1 麻醉方法

患者均予腰硬联合麻醉, 阻滞平面控制在 T<sub>10</sub> 以下, 麻醉成功后行 I 期双侧 TKA 术。手术结束后, 由我院麻醉科急性疼痛管理 (acute pain service, APS) 小组完成持续收肌管置管, 并连接患者自控神经阻滞镇痛 (patient-controlled nerve analgesia, PCNA) 装置。具体如下: 患者取仰卧位, 暴露患侧大腿, 取髌前上棘和髌骨上缘连线的中点为起点。使用高频线阵探头, 沿股三角水平向远端滑动, 当看到缝匠肌内侧缘和长收肌内侧缘相交时定位股三角顶点水平; 继续向远端滑动探头, 当看到股血管远离缝匠肌潜入深面时, 定位收肌腱裂孔, 其近端 2~3 cm 处即为远端收肌管阻滞的穿刺点水平。穿刺路径采用短轴平面内由外侧向内侧进针, 当穿刺针接近隐神经时, 注入生理盐水进行水分离, 并确定针尖位置。置入导管, 连接 PCNA 装置 (0.195% 罗哌卡因: 背景剂量 5 ml/h, 单次剂量 5 ml/h, 锁定时间 45 min, 上限 10 ml/h)。典型病例见图 1。

### 2.2 置泵术后处理

术后加强手术创面及收肌管阻滞泵针道的护理, 定时换药, 保持创面干燥, 如伤口或针道有渗出, 需及时换药处理。我院麻醉科 APS 小组每日查房置泵患者, 对患者进行疼痛随访, 指导患者使用自控镇痛。我院骨科医生指导患者行膝关节功能锻炼, 通过

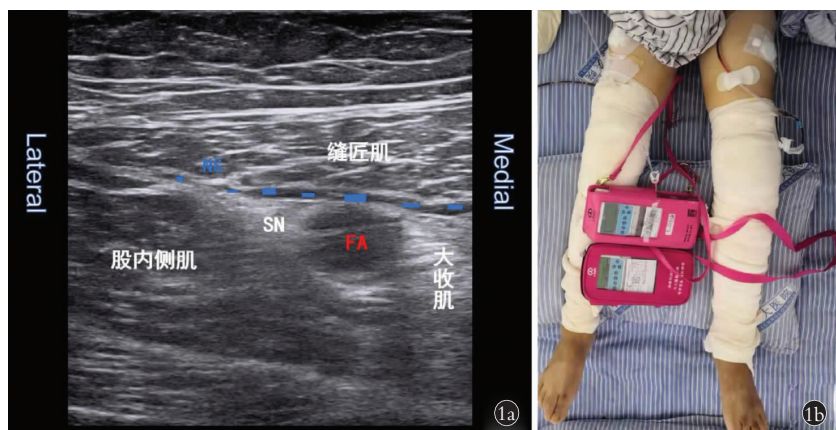


图 1 患者,女,65 岁,超声引导下收肌管置管 1a. 超声引导下,穿刺针接近隐神经时,注入生理盐水进行水分离(蓝色方块),沿水分离通道置入导管,连接 PCNA 装置 1b. 患者双膝关节一期置换术后,患者术后无明显不良疼痛感受。FA=femoral artery 股动脉,SN=saphenous nerve 隐神经,NS=normal saline 生理盐水

Fig.1 Patient, female, 65 years old, ultrasound-guided catheter placement 1a. Under the guidance of ultrasound, when the puncture needle was close to the saphenous nerve, normal saline was injected for water separation (Blue Square), and a catheter was inserted along the water separation channel to connect the PCNA device 1b. After one-stage knee replacement, there was no obvious adverse pain. FA=femoral artery, SN=saphenous nerve, NS=normal saline

增加关节活动度和股四头肌肌力的强化训练提高手术效果。患者出院前拔除持续收肌管阻滞泵,针道予以敷料包扎,嘱患者定期来医院门诊换药。

### 3 结果

#### 3.1 疗效评价标准

记录患者术后 4、6、12、24、36、48 h 静息状态以及被动运动状态的疼痛情况。采用视觉模拟评分(visual analogue scale, VAS)评分<sup>[11]</sup>对患者疼痛程度进行评定。使用 1 条长约 10 cm 的游动标尺,一面标有 10 个刻度,两端分别为“0”分端和“10”分端,0 分表示无痛,10 分代表难以忍受的最剧烈的疼痛。随访患者术后 1 周、1、3、6 个月膝关节活动度,由单独一组医师对患者术后 6 个月膝关节功能进行评分,采用美国特种外科医院(Hospital for Special Surgery, HSS)膝关节评分标准<sup>[12]</sup>,满分 100 分,其中疼痛 30 分,功能 22 分,活动范围 18 分,肌力 10 分,屈曲畸形 10 分,关节稳定性 10 分。评分 85 分以上为优,70~84 分为良,60~69 分为可,<59 分为差。记录患者术后心动过缓、尿潴留、恶心呕吐、皮肤瘙痒、低血压、深静脉血栓等不良反应,以及并发症的发生情况。

#### 3.2 治疗结果

24 例(48 膝)均获得随访,术后 4、6、12、24、36、48 h 静息状态 VAS 评分分别为 (0.375±0.576) 分、(0.667±0.565)分、(0.917±0.408)分、(0.875±0.701)分、(0.667±0.565)分、(0.412±0.503)分,术后 4、6、12、24、36、48 h 被动运动状态 VAS 评分分别为(0.625 ±

0.770)分、(1.790±0.509)分、(1.833 ±0.381)分、(1.792±0.628)分、(1.412 ±0.654)分。

术后 1 周及 1、3、6 个月测量膝关节活动度,结果分别为 (101.4 ±11.4)°、(105.2 ±12.2)°、(110.2±12.6)°、(112.2±10.5)°。

术后 6 个月膝关节 HSS 评分:优 20 例,良 2 例,可 1 例,差 1 例。术后 4 例出现恶心呕吐,无一例发生深静脉血栓等不良反应。术后连续收肌管阻滞镇痛典型病例见图 2。

### 4 讨论

TKA 对患者而言,是创伤较大的关节外科手术,不充分的镇痛不仅影响患者术后康复、远期关节功能,而且会增加医疗费用和不良事件风险<sup>[13]</sup>。这些不良事件包括:心肌梗死,肺功能不全,麻痹性肠

梗阻,尿潴留,下肢深静脉血栓以及肺栓塞等<sup>[14]</sup>。因此,让患者在无痛状态下尽早行膝关节功能锻炼成为骨科和麻醉科医生共同的诉求。传统的腹股沟区股神经阻滞镇痛技术操作较为简单,但有合并运动阻滞的弊端,往往会影响患者术后早期的功能锻炼<sup>[15]</sup>。此外,该区域无法阻滞闭孔神经及坐骨神经相关分支。作为股神经阻滞的优化,采用收肌管阻滞镇痛能够有效阻滞隐神经,减轻患者疼痛,同时避免了对收肌管外侧股内侧肌肌支影响,减少了对患者肌力的干扰<sup>[16]</sup>。

本研究所选择行双膝关节 I 期置换术病例,术前均常规与我院麻醉科 APS 小组共同综合评估患者一般状况、基础疾病、心肺功能等因素,对于评估不能耐受 I 期手术患者,则行分期手术治疗。双膝关节 I 期置换术对髓腔干扰较大,发生脂肪栓塞概率增高,且术后发生深静脉血栓(deep vein thrombosis, DVT)及肺栓塞等风险事件可能性也相应升高<sup>[17]</sup>。年龄不是决定患者行手术的绝对因素,但是因手术诱发高龄患者基础疾病情形较多(心衰、血糖紊乱较为常见),且高龄患者术后功能锻炼配合度不足,严重影响手术效果。此外,对于合并糖尿病、低蛋白血症患者,术后双下肢放置神经阻滞置管会增加感染、出血风险,不推荐常规使用。

本研究中,笔者采用了单纯的收肌管阻滞,而非联合股神经或坐骨神经阻滞,极大地减少了对患者肌力的影响。为进一步减少患者术后不良疼痛体验,





图 2 患者,女,65 岁,术后连续收肌管阻滞镇痛 2a. 术后返回病房当日即在无痛状态下完成膝关节伸屈活动(双膝关节一起置换手术时间较单侧延长,常规放置尿管) 2b. 术后保持双侧膝关节被动屈曲状态,避免膝关节僵直,患者疼痛耐受度较好 2c,2d. 术后 3 d 内完成双下肢直腿抬高功能锻炼,促进股四头肌恢复 2e. 术前双膝 X 线片 2f. 术后双膝 X 线片

**Fig.2** Patient, female, 65 years old, continuous adductor block analgesia after operation 2a. On the day when the patient returned to the ward after operation, the extension and flexion of the knee joint was completed in a painless state (the operation time of bilateral knee joint replacement was longer than that of unilateral replacement, and the catheter was placed routinely) 2b. After operation, keep the passive flexion state of bilateral knee joint, avoid knee joint rigidity, and the patient's pain tolerance was good 2c,2d. Complete straight leg raising exercise of both lower limbs within 3 days after operation to promote the recovery of quadriceps muscle strength 2e. Preoperative X-ray of bilateral knee joint 2f. Postoperative X-ray of the bilateral knee joint

在此间隙内置入导管,连接 PCNA 装置,进行连续术后镇痛。泵中药液沿着股动静脉,通过收肌腱裂孔扩散,从而阻滞闭孔神经后支和胫神经关节支。如在腹股沟处阻滞闭孔神经,则导致大腿内收乏力。因此,收肌管远端阻滞极大地减少了患者术后疼痛,且较少干扰患者肌力,促进患者进行早期康复和功能锻炼。本研究中,所有患者术后未因疼痛影响功能锻炼,VAS 评分均在 3 分以内,随访期内关节功能评分均较为满意。

对于关节外科医生而言,术后指导患者进行早期功能锻炼的重要性甚至超过了手术的本身<sup>[18]</sup>。因

此,无痛的手术体验能够提高患者对医生的依从性和术后康复锻炼质量<sup>[19]</sup>。本研究所报道 24 例患者,术后均未因疼痛而进行静脉或肌注镇痛药物,患者返回病房即刻进行膝关节的伸直和屈曲功能锻炼,部分患者可当日下床活动。在此前临床实践中,笔者观察到使用静脉镇痛泵患者,尤其是女性患者易发生头晕、呕吐、尿潴留等不良反应,且镇痛效果不佳,患者夜间常因膝关节疼痛而影响睡眠(VAS>3 分)。因此,采用局部神经阻滞极大地降低了系统用药所带来的不良反应。对于行单次神经阻滞患者而言,术后当天虽有着良好的疼痛体验,然而止痛作用不能持久,必须予以口服或静脉药物镇痛,极大地增加了心血管及胃肠不良事件风险。本研究中,笔者通过收肌管置管,对痛觉敏感神经进行持续阻滞,有效控制患者术后静息及运动状态疼痛。同时,笔者将置管连接 PCNA 装置,让患者可以根据自身疼痛体验,自行追加药量。

对于行双膝关节 I 期置换患者而言,手术创伤较大,疼痛体验无疑是增加的。过度的疼痛容易导致患者关节功能锻炼迟滞,对患者远期的膝关节手术效果造成不利影响<sup>[20]</sup>。既往较多文献提示对单侧 TKA 手术患者而言,可以进行神经阻滞(单次或持续),均取得了不错的临床效果<sup>[21-24]</sup>。本研究在既往研究基础上更进一步探讨了

双侧神经阻滞及患者自控持续阻滞的可行性和疗效,并证实其较好的临床效果。然而,本研究尚存在以下不足:由于样本量有限,不能完整地观察到其可能的并发症,如感染、血肿形成等;未同期设置对照组,缺乏横向对照研究,尤其是高质量的随机双盲研究,不能明确连续收肌管阻滞镇痛同其它镇痛方案之间的关系。

综上所述,连续收肌管阻滞镇痛可以有效地控制双膝关节 I 期置换术后疼痛,且术后患者可根据疼痛程度自控镇痛,医生可根据疼痛评分随时调整参数。该技术可以促进患者早期进行功能锻炼,并发

症较少, 可以作为双膝关节 I 期置换术后镇痛的一种较好选择。

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