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腹横筋膜平面阻滞与腹横肌平面阻滞对腹腔镜子宫切除术患者术后镇痛及早期康复的影响

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[摘要] 目的: 探讨腹横筋膜平面阻滞(transversalis fascia plane block, TFPB)与腹横肌平面阻滞(transverse abdominal plane block, TAPB)对腹腔镜子宫切除术患者术后镇痛及早期康复的影响。方法: 选取100例腹腔镜子宫切除术患者, 随机分为TFPB组($n=50$)与TAPB组($n=50$); 两组均于超声引导下行神经阻滞, 其中TFPB组行双侧TFPB, TAPB组行双侧TAPB, 每侧均予以0.375%罗哌卡因20 mL注射; 两组术后均实施静脉自控镇痛(patient-controlled intravenous analgesia, PCIA)。记录两组术后6、12、24、48 h的疼痛视觉模拟评分(Visual Analogue Scale, VAS)、术后48 h内镇痛情况和不良反应; 于术前1 d和术后1 d, 对患者行匹兹堡睡眠指数量表(Pittsburgh Sleep Quality Index, PSQI)评分以评价患者睡眠质量, 40项恢复质量(40 Quality of Recovery, QoR-40)评分以评价患者术后恢复质量, 并行血清白细胞介素-6(interleukin-6, IL-6)和IL-8的测定。结果: 术后6、12、24及48 h, TFPB组VAS评分均显著低于TAPB组(均 $P<0.05$)。TFPB组术后24和48 h舒芬太尼用量以及补救镇痛率均显著低于TAPB组(均 $P<0.05$), 镇痛满意度评分显著高于TAPB组($P<0.05$), 且术后恶心呕吐发生率显著低于TAPB组($P<0.05$)。术后1 d, TFPB组PSQI评分显著低于TAPB组($P<0.05$), QoR-40评分显著高于TAPB组($P<0.05$), TFPB组血清IL-6、IL-8水平均显著低于TAPB组(均 $P<0.05$)。结论: TFPB能够减少腹腔镜子宫切除术后阿片类药物用量, 减少术后恶心呕吐发生, 减轻术后应激, 提高术后恢复质量, 镇痛效果优于TAPB。

[关键词] 腹横筋膜平面阻滞; 腹横肌平面阻滞; 腹腔镜; 子宫切除术; 镇痛; 术后恢复

Effect of transversalis fascia plane block and transverse abdominal plane block on postoperative analgesia and early rehabilitation in patients undergoing laparoscopic hysterectomy

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Abstract **Objective:** To investigate the effects of transversalis fascia plane block (TFPB) and transverse abdominal

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plane block (TAPB) on postoperative analgesia and early rehabilitation of patients undergoing laparoscopic hysterectomy. **Methods:** A total of 100 patients undergoing laparoscopic hysterectomy were randomly divided into a TFPB group ($n=50$) and a TAPB group ($n=50$). Ultrasound-guided nerve block was performed in both groups. Bilateral TFPB was performed in the TFPB group and bilateral TAPB was performed in the TAPB group. Each side was injected with 0.375% ropivacaine 20 mL. In addition, patient-controlled intravenous analgesia (PCIA) was performed in both groups after the operation. The Visual Analogue Scale (VAS) at 6, 12, 24, and 48 h after the operation was recorded in the 2 groups. The postoperative analgesia and adverse reactions within 48 h after the operation were recorded in the 2 groups. The Pittsburgh Sleep Quality Index (PSQI) score was used to evaluate the sleep quality of patients 1 day before the operation and 1 day after the operation, and 40-item Quality of Recovery (QoR-40) scores was used to evaluate the postoperative recovery quality of patients. Serum interleukin-6 (IL-6) and IL-8 were measured. **Results:** At 6, 12, 24, 48 h after the operation, the VAS scores of the TFPB group were significantly lower than those of the TAPB group (all $P<0.05$). The sufentanil dosage and rescue analgesia rate at 24 and 48 h after operation in the TFPB group were significantly lower than those in the TAPB group (both $P<0.05$), and the analgesic satisfaction score was significantly higher than that in the TAPB group ($P<0.05$), and the incidence of postoperative nausea and vomiting was significantly lower than that in the TAPB group ($P<0.05$). At 1 day after operation, the PSQI score of the TFPB group was significantly lower than that of the TAPB group ($P<0.05$), the QoR-40 score was significantly higher than that of the TAPB group ($P<0.05$), and serum IL-6 and IL-8 levels in the TFPB group were significantly lower than those in the TAPB group (both $P<0.05$). **Conclusion:** TFPB can reduce opioids after laparoscopic hysterectomy, reduce postoperative nausea and vomiting, relieve postoperative stress, and improve the quality of postoperative recovery. The analgesic effect is better than TAPB.

Keywords transversalis fascia plane block; transverse abdominal plane block; laparoscopy; hysterectomy; analgesia; postoperative recovery

腹腔镜下子宫切除术具有创伤小、恢复快等诸多优势^[1],但术中高压气腹会刺激腹膜,诱发机体较大应激反应,致使术后疼痛明显。术后疼痛若未能得到有效管理,会使出院延迟,一些患者甚至可能发展为慢性疼痛,影响患者预后^[2]。目前,以阿片类药物为基础的自控静脉镇痛(patient-controlled intravenous analgesia, PCIA)是常用的术后镇痛手段,但阿片类镇痛药物不良反应明显,不利于术后早期恢复^[3]。为优化麻醉管理,减少阿片类药物不良反应,提高镇痛效果,联合区域阻滞技术的多模式镇痛模式近年逐渐涌现并受到关注,包括腹横肌平面阻滞(transverse abdominal plane block, TAPB)、腹横筋膜平面阻滞(transversalis fascia plane block, TFPB)等^[4-5],其中TAPB是腹腔镜术后常用的镇痛方法,操作简便且安全,而TFPB也被证实能够改善术后镇痛效果。但目前关于TAPB、TFPB应用于妇科腹腔镜手术中的镇痛效应对比尚缺乏文献报道。为此,本研究拟对比TAPB与TFPB对腹腔镜子宫切除术患者术后镇痛及早期康复的影响,为优化麻醉方案提供一定参考。

1 对象与方法

1.1 对象

本试验开始前基于统计学原理进行了试验所需样本量的估算,参照文献[4],并根据样本量计算公式: $n_1=n_2=2[(t_\alpha+t_{2\beta})s/\delta]^2$,当两组病例数目相等时,每组例数不应少于44例,本研究设计为每组50例,共纳入100例样本。选取2020年1月至2021年12月在海口市第四人民医院行腹腔镜子宫切除术的100例患者。纳入标准:1)择期行腹腔镜子宫切除术;2)年龄35~60岁;3)美国麻醉师协会(American Society of Anesthesiologists, ASA)分级为I、II;4)体重指数(body mass index, BMI)为18~24 kg/m²。排除标准:1)严重肝肾功能不全;2)合并严重心肺疾病;3)术前有阿片类药物用药史;4)严重精神障碍;5)有腹部手术史;6)穿刺部位感染;7)有局部麻醉药物过敏史;8)有慢性疼痛病史;9)术前有睡眠障碍。应用随机数字表将患者分为TFPB组($n=50$)与TAPB组($n=50$)。本研究符合海口市第四人民医院医学伦理委员会批准,并与患者签署知情同意书。

1.2 麻醉方法

入室后建立外周静脉通路, 行心电图、血压、心率、脉搏血氧饱和度(pulse oxygen saturation, SpO₂)和脑电双频指数(bispectral index, BIS)等监测。麻醉诱导依次予以舒芬太尼(宜昌人福药业有限责任公司)0.5~0.8 μg/kg, 咪达唑仑(宜昌人福药业有限责任公司)0.04~0.05 mg/kg、依托咪酯(江苏恒瑞医药股份有限公司)0.3 mg/kg、顺式阿曲库胺(江苏恒瑞医药股份有限公司)0.3 mg/kg缓慢静脉注射。然后行气管插管, 连接麻醉机进行机械通气, 潮气量为6~8 mL/kg, 呼吸频率为10~14次/min, 呼吸比=1:2, 氧流量为2 L/min, 吸入氧浓度为50%, 呼气末二氧化碳分压(end-tidal carbon dioxide partial pressure, P_{ET}CO₂)维持35~45 mmHg(1 mmHg=0.133 kPa)。麻醉维持予以瑞芬太尼(江苏恩华药业)0.1~0.3 μg/(kg·min), 丙泊酚(西安力邦制药)4~8 mg/(kg·min), 并予以顺式阿曲库胺0.05 mg/kg间断推注, 维持平均动脉压(mean arterial pressure, MAP)、心率波动程度小于基础值的20%, BIS值为40~60。

术后, 两组均于超声引导下神经阻滞, 所有操作均由同一高年资麻醉科医师完成。其中TFPB组行双侧TFPB, TAPB组行双侧TAPB, 每侧均予以0.375%罗哌卡因20 mL注射。TFPB操作方法: 让患者仰卧, 在常规消毒铺巾后, 将超声探头(2~5 MHz)放置于前腹壁处, 能够清晰呈现腹外斜肌、腹内斜肌和腹横肌三层肌肉结构。朝腋中线移动探头, 一直到显示胸腰筋膜, 采用平面进针技术进针, 超声直视下显示针尖到达腹横肌, 并将其移行到胸腰筋膜位置, 利用“水分离技术”确认针尖位于腹横筋膜与胸腰筋膜之间, 回抽无血, 注入局麻药物。TAPB组将穿刺针置入腹横肌与腹内斜肌之间, 回抽无血后, 注入局麻药物。

此外, 两组术后均连接PCIA泵, 镇痛配方: 舒芬太尼2.0 μg/kg, 格拉司琼2 mg, 用生理盐水稀释至100 mL。镇痛泵参数: 首次负荷剂量为5 mL,

背景剂量为2 mL/h, 患者自控镇痛(patient-controlled analgesia, PCA)剂量为0.5 mL, 锁定时间设置为15 min。持续镇痛至术后48 h, 必要时静脉予以地佐辛5 mg进行补救镇痛, 维持疼痛视觉模拟评分(Visual Analogue Scale, VAS)不超过3。

1.3 观察指标

1)术后镇痛情况: 记录两组术后24和48 h内舒芬太尼用量和补救镇痛率, 并记录患者对镇痛的满意程度, 按不满意(1分)、较满意(2分)、满意(3分)、很满意(4分)进行计分。2)睡眠质量和术后恢复质量: 于术前1 d和术后1 d对患者行匹兹堡睡眠指数量表(Pittsburgh Sleep Quality Index, PSQI)评分^[6]来评价患者睡眠质量, PSQI评分越高, 说明睡眠质量越差; 并行40项恢复质量(40-item Quality of Recovery, QoR-40)评分^[7]评价患者术后恢复质量, 总分40~200, 评分越高说明术后恢复质量越好。3)不良反应: 记录两组术后48 h内恶心呕吐、口干等发生情况。4)炎症应激指标: 于术前1 d和术后1 d, 抽取患者外周静脉血, 3 000 r/min离心10 min, 获得血清, 进行白细胞介素6(interleukin-6, IL-6)和IL-8的测定, 方法为酶联免疫吸附法。

1.4 统计学处理

采用SPSS 24.0统计学软件分析数据。计量资料(舒芬太尼用量、PSQI评分、QoR-40评分等均满足正态分布)以均数±标准差($\bar{x} \pm s$)描述, 比较行成组 t 检验(两组之间)或配对 t 检验(同组前后); 计数资料采用例(%)描述, 用 χ^2 检验或Fisher确切概率法进行分析。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 一般情况

两组一般资料及手术一般情况差异均无统计学意义(均 $P > 0.05$, 表1)。

表1 两组一般情况比较($n=50$)

Table 1 Comparison of general conditions between the 2 groups ($n=50$)

| 组别 | 年龄/岁 | BMI/(kg·m ⁻²) | ASA分级(I/II)/例 | 手术时间/min | 失血量/mL | 输液量/mL |
|------------|--------------|---------------------------|---------------|----------------|----------------|----------------|
| TFPB组 | 49.37 ± 6.34 | 22.87 ± 1.65 | 36/14 | 116.21 ± 20.17 | 231.47 ± 32.86 | 284.55 ± 50.79 |
| TAPB组 | 50.21 ± 5.49 | 23.11 ± 1.58 | 33/17 | 113.49 ± 19.74 | 226.71 ± 30.89 | 276.41 ± 48.73 |
| t/χ^2 | 0.708 | 0.743 | 0.421 | 0.686 | 0.746 | 0.818 |
| P | 0.481 | 0.459 | 0.517 | 0.494 | 0.457 | 0.416 |

2.2 术后不同时间点 VAS 评分

术后6、12、24及48 h, TFPB组VAS评分均显著低于TAPB组(均 $P < 0.05$, 表2)。

2.3 术后镇痛情况

TFPB组术后24和48 h舒芬太尼用量及补救镇痛率均显著低于TAPB组(均 $P < 0.05$), 镇痛满意度评分显著高于TAPB组($P < 0.05$, 表3)。

2.4 PSQI 评分和 QoR-40 评分

术前1 d, 两组PSQI评分和QoR-40评分差异均无统计学意义(均 $P > 0.05$); 术后1 d, TFPB组

PSQI评分显著低于TAPB组($P < 0.05$), QoR-40评分显著高于TAPB组($P < 0.05$, 表4)。

2.5 不良反应

TFPB组恶心呕吐发生率显著低于TAPB组($P < 0.05$, 表5)。

2.6 炎症因子

术前1 d, 两组IL-6、IL-8水平差异均无统计学意义(均 $P > 0.05$); 术后1 d, TFPB组IL-6、IL-8水平均低于TAPB组(均 $P < 0.05$, 表6)。

表2 两组术后不同时间点VAS评分比较($n=50$)

Table 2 Comparison of VAS scores at different time points after operation between the 2 groups ($n=50$)

| 组别 | VAS评分 | | | |
|----------|-------------|-------------|-------------|-------------|
| | 术后6 h | 术后12 h | 术后24 h | 术后48 h |
| TFPB组 | 1.63 ± 0.54 | 1.88 ± 0.59 | 1.65 ± 0.56 | 1.21 ± 0.38 |
| TAPB组 | 2.27 ± 0.58 | 2.47 ± 0.73 | 2.04 ± 0.63 | 1.46 ± 0.42 |
| <i>t</i> | 5.711 | 4.445 | 3.272 | 3.121 |
| <i>P</i> | <0.001 | <0.001 | 0.002 | 0.002 |

表3 两组术后镇痛情况比较($n=50$)

Table 3 Comparison of postoperative analgesia between the 2 groups ($n=50$)

| 组别 | 舒芬太尼用量/ μg | | 补救镇痛率/% | 镇痛满意度评分 |
|------------|-----------------------|--------------|---------|-------------|
| | 术后24 h内 | 术后48 h内 | | |
| TFPB组 | 50.27 ± 5.38 | 68.23 ± 7.56 | 6.00 | 3.58 ± 0.51 |
| TAPB组 | 53.47 ± 5.69 | 81.25 ± 8.47 | 22.00 | 2.91 ± 0.47 |
| t/χ^2 | 2.890 | 8.109 | 5.316 | 6.831 |
| <i>P</i> | 0.005 | <0.001 | 0.021 | <0.001 |

表4 两组PSQI评分和QoR-40评分比较($n=50$)

Table 4 Comparison of PSQI score and QoR-40 score between the 2 groups ($n=50$)

| 组别 | PSQI评分 | | QoR-40评分 | |
|----------|-------------|--------------|---------------|----------------|
| | 术前1 d | 术后1 d | 术前1 d | 术后1 d |
| TFPB组 | 3.26 ± 0.61 | 7.41 ± 1.89* | 184.21 ± 3.62 | 176.24 ± 4.23* |
| TAPB组 | 3.31 ± 0.64 | 8.29 ± 2.06* | 185.17 ± 3.49 | 169.41 ± 4.55* |
| <i>t</i> | 0.400 | 2.226 | 1.350 | 7.774 |
| <i>P</i> | 0.690 | 0.028 | 0.180 | <0.001 |

与同组术前1 d相比, * $P < 0.05$ 。

Compared with 1 d before the operation, * $P < 0.05$.

表5 两组不良反应比较($n=50$)Table 5 Comparison of adverse reactions between the 2 groups ($n=50$)

| 组别 | 恶心呕吐/[例(%)] | 嗜睡/[例(%)] | 皮肤瘙痒/[例(%)] | 口干/[例(%)] | 合计/[例(%)] |
|----------|-------------|-----------|-------------|-----------|------------|
| TFPB组 | 5 (10.00) | 2 (4.00) | 2 (4.00) | 1 (2.00) | 10 (20.00) |
| TAPB组 | 13 (26.00) | 1 (2.00) | 3 (6.00) | 2 (4.00) | 19 (38.00) |
| χ^2 | 4.336 | — | — | — | 3.934 |
| P | 0.037 | 1.000* | 1.000* | 1.000* | 0.047 |

*Fisher确切概率法。

*Fisher exact probability method.

表6 两组炎症因子比较($n=50$)Table 6 Comparison of inflammatory factors between the 2 groups ($n=50$)

| 组别 | IL-6/(pg·mL ⁻¹) | | IL-8/(pg·mL ⁻¹) | |
|-------|-----------------------------|---------------|-----------------------------|-----------------|
| | 术前1 d | 术后1 d | 术前1 d | 术后1 d |
| TFPB组 | 9.12 ± 1.86 | 25.79 ± 4.34* | 58.42 ± 10.21 | 136.58 ± 16.47* |
| TAPB组 | 9.24 ± 1.79 | 29.14 ± 4.67* | 56.58 ± 11.32 | 143.49 ± 14.89* |
| t | 0.329 | 3.716 | 0.853 | 2.201 |
| P | 0.743 | <0.001 | 0.396 | 0.030 |

与同组术前1 d相比, * $P<0.05$ 。Compared with 1 day before the operation, * $P<0.05$.

3 讨论

近年来, 区域神经阻滞已成为多模式镇痛的重要组成部分。在腹腔镜手术中, TAPB、TFPB均是常见区域神经阻滞技术, 但二者时常被混淆^[8-9]。TAPB通过向腹内斜肌、腹横肌之间注入局部麻醉药, 能够阻滞T₇~L₁脊神经前支, 产生良好镇痛效应。TFPB是于胸腰筋膜与腹横筋膜之间注入局部麻醉药, 能够对髂腹下、髂腹股沟神经产生阻滞作用, 也能够发挥良好的镇痛效应。

腹腔镜子宫切除术虽创伤较小, 但切口刺激、高压气腹等多因素所致的切口痛、内脏痛、炎性痛, 致使患者术后疼痛明显, 不利于术后恢复^[10]。本研究结果显示: 术后6~48 h各时间点, TFPB组VAS评分均显著低于TAPB组, 且TFPB组术后24和48 h舒芬太尼用量和补救镇痛率均显著低于TAPB组, 镇痛满意度评分显著高于TAPB组。这提示TFPB能够减少腹腔镜子宫切除术后阿片类药物用量, 降低补救镇痛率, 相比TAPB镇痛效果更优。腹部手术的皮区神经支配主要源于T₁₂~L₁

脊神经, TAPB是腹部手术的常用神经阻滞, 然而TAPB主要对T₁₀₋₁₂感觉神经产生阻滞作用, 同时对L₁神经发挥阻滞作用的概率仅为50%^[11]。故TAPB难以对T₁₂~L₁神经产生有效阻滞, 对腹腔镜术后镇痛效果并不十分确切。T₁₂~L₁脊神经穿行于胸腰筋膜与腹横筋膜之间, 故行TFPB阻滞可能获得更充分的阻滞效果, 本研究结果与研究^[12]报道一致。

PSQI广泛应用于精神障碍和睡眠障碍患者睡眠质量的评价, 对于一般人群也适用。PSQI测评不仅操作简便, 并且评价结果与客观睡眠质量较为接近^[6]。QoR-40量表在术后患者康复质量评估中应用广泛, 有良好的信度和效度, 且操作简便, 已被用于评价麻醉手术患者术后恢复质量^[7]。本研究结果显示: 术后1 d时TFPB组PSQI评分显著低于TAPB组, QoR-40评分显著高于TAPB组。这表明TFPB有助于改善患者睡眠质量, 并提高术后恢复质量。术后疼痛是影响术后恢复的关键因素, 并且疼痛和阿片类药物会使深睡眠受到抑制, 进而影响睡眠^[13]。TFPB能够提高镇痛效果, 减少阿片

类药物使用,这可能是其改善术后睡眠质量和术后恢复质量的重要原因。术后恶心呕吐也是影响术后早期恢复质量的重要因素,同时也是阿片类药物的不良反应,围手术期阿片类药物减少有助于降低术后恶心呕吐发生率^[14-15]。本研究结果表明TFPB能够降低患者术后恶心呕吐发生率,这也可能是其提高术后恢复质量的另一原因。

术后疼痛还诱发机体应激反应,产生大量炎症因子,影响术后早期快速恢复,炎症因子水平也能够间接反映机体恢复状况^[16-17]。IL-6是典型的促炎因子,在创伤及疼痛刺激下会出现增高,但过度增高可使机体抵抗力下降,进而不利于术后恢复。IL-8也是常见的炎症因子,能够反映机体炎症应激的严重程度^[18]。本研究结果显示术后1 d两组IL-6、IL-8水平增高,但TFPB组低于TAPB组,提示患者术后存在明显应激反应,而TFPB能够减轻机体应激,这有利于术后恢复。本研究的局限性主要是单中心研究,样本量较小,关于不同神经阻滞方法对腹腔镜子宫切除术患者的影响仍有待多中心、大样本量研究进一步验证。

综上,相比TAPB,TFPB应用于腹腔镜子宫切除术患者,能够提高术后镇痛效果,减少阿片类药物用量,减少不良反应,改善患者睡眠质量,并提高术后恢复质量。

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