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神经阻滞与全身麻醉在跟骨骨折内固定术后疼痛控制中的价值*

张海华 熊华平 李巧云 胡吉 刘金花

(中国人民解放军联勤保障部队第910医院麻醉科 福建泉州 362000)

摘要 目的:探讨神经阻滞与全身麻醉在跟骨骨折内固定术后疼痛控制中的价值。**方法:**2019年1月到2019年10月选择在本院诊治的开放性跟骨骨折患者480例,按照入院顺序,根据随机数字表法分为研究组与对照组,各240例。所有患者都给予跟骨骨折内固定治疗与全身麻醉,观察组术后给予连续坐骨神经自控镇痛,对照组术后给予静脉自控镇痛,记录疼痛控制效果。**结果:**两组的手术时间、引流时间、引流量等对比差异无统计学意义($P>0.05$),研究组的切口干燥时间与切口愈合时间显著短于对照组($P<0.05$)。观察组术后4 h、24 h与48 h的疼痛视觉模拟评分法(Visual analog scales,VAS)评分显著低于对照组($P<0.05$)。两组术后48 h的感觉阻滞情况0级、1级、2级对比差异无统计学意义($\chi^2=0.00, 0.083, 0.083, P=1.0, 0.773, 0.773$),组间对比均无统计学意义($P>0.05$)。研究组术后1个月的切口裂开、感染、皮下血肿与皮缘坏死等并发症发生率为4.2%,显著低于对照组的15.8%($\chi^2=18.148, P=0.000$),两组对比有显著的统计学意义($P<0.001$)。**结论:**神经阻滞与全身麻醉在跟骨骨折内固定术后的应用具有更好的镇痛效果,且不影响阻滞效果,能促进患者康复,减少术后并发症的发生。

关键词:神经阻滞;全身麻醉;跟骨骨折;内固定;并发症

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Values of Nerve Block and General Anesthesia in Pain Control after Internal Fixation of Calcaneal Fracture*

ZHANG Hai-hua, XIONG Hua-ping, LI Qiao-yun, HU Ji, LIU Jin-hua

(Department of Anesthesiology, the 910th Hospital of the Chinese People's Liberation Army Joint Service, Quanzhou, Fujian, 362000, China)

ABSTRACT Objective: To explore the values of nerve block and general anesthesia in pain control after internal fixation of calcaneal fractures. **Methods:** From January 2019 to October 2019, 480 cases of patients with open calcaneal fractures were selected for diagnosis and treatment in our hospital and were divided into study group and control group of 240 patients in each groups accorded to the order of admission and the random number table method. All patients were treated with calcaneal fractures internal fixation and general anesthesia. The observation group were given continuous self-controlled analgesia of the sciatic nerve after operation, and the control group were given intravenous self-controlled analgesia. **Results:** There were no statistically significant difference in surgical time, drainage time, and drainage volume compared between the two groups ($P>0.05$). The incision drying time and incision healing time in the study group were significantly shorter than those in the control group ($P<0.05$). The pain VAS scores of the observation group at 4 h, 24 h and 48 h after operation were significantly lower than those of the control group ($P<0.05$). There was no statistically significant difference in the level of sensory block between the two groups at 0, 1, and 2 ($\chi^2 = 0.00, 0.083, 0.083, P=1.0, 0.773, 0.773$). There was no statistical comparison between the two groups ($P>0.05$). The incidence of complications such as incision dehiscence, infection, subcutaneous hematoma, and marginal necrosis was 4.2 % in the study group at 1 month after operation, which was significantly lower than 15.8 % in the control group ($\chi^2=18.148, P=0.000$). There was statistical significance ($P<0.001$). **Conclusion:** The application of nerve block and general anesthesia after internal fixation of calcaneal fractures has better analgesic effect, it does not affect the block effect, can promote patient recovery, and reduce the incidence of postoperative complications.

Key words: Nerve block; General anesthesia; Calcaneal fracture; Internal fixation; Complications

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前言

作为人体最大的跗骨,跟骨与邻近的足舟骨、距骨、骰骨形成关节面,在下肢运动与负重功能中发挥重要作用^[1]。该病多由

高能量损伤所致,以高处坠落、交通伤为主,多为开放性跟骨骨折^[2]。该病常容易合并骨、肌腱等深部组织及内植物外露,有40%左右的患者容易发生创面感染,增加了治疗难度^[3,4]。手术为跟骨骨折的主要治疗方法,当前跟骨骨折内固定具有很高的

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作者简介:张海华(1983-),女,本科,主治医师,研究方向:临床麻醉,电话:13459543729, E-mail: zhanghaihua198304@163.com

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治疗成功率,具有固定牢固等优点,也能避免损伤血管和神经,同时具有保护血供的功能^[5,6]。但是手术为一个强烈的应激源,术后疼痛可严重制约患者的术后锻炼,也会增加深静脉血栓、心功能异常等并发症发生率^[7,8]。因而为患者提供高质量的术后镇痛可降低相关并发症发生率,促进持续改善患者的预后^[9]。目前跟骨骨折内固定术后的镇痛方法包括静脉自控镇痛、硬膜外自控镇痛等^[10,11]。随着医学技术的发展,特别是神经刺激器和便携式超声的开发应用,坐骨神经阻滞可以为跟骨手术患者提供更好的镇痛效果,并且具有穿刺时定位精准等特点,能降低神经损伤发生率^[12,13]。本文具体探讨了神经阻滞与全身麻醉在跟骨骨折内固定术后疼痛控制中的价值,希望为临床上合理选择麻醉方法提供参考。现总结报告如下。

1 资料与方法

1.1 研究对象

2019年1月到2019年10月选择在本院诊治的开放性跟骨骨折患者480例,纳入标准:符合开放性跟骨骨折的诊断标准,具有手术指征;患者受伤致手术时间<24h;单侧发病;患者签署了知情同意书;ASA分级I-II级;患者年龄20-60岁;本院伦理委员会批准了此次研究。排除标准:伴有糖尿病神经病变、腓骨肌萎缩等病症的患者;临床资料缺乏者;合并严重心肝肾功能异常患者,不具有手术指征;孕妇、哺乳期妇女;全身感染以及凝血功能障碍的患者。

按照入院顺序,根据随机数字表法分为研究组与对照组,各240例,两组的一般资料对比无统计学意义($P>0.05$)。见表1。

表1 两组一般资料对比

Table 1 Comparison of two groups of general information

Groups	n	Sex (male/female)	Age (years)	Injury to operation time (h)	BMI (kg/m ²)	Cause of injury (fall from height / traffic accident / other)	Location of onset (left / right)
Study group	240	129/111	43.19±2.48	13.28±2.47	22.77±1.43	180/40/20	123/117
Control group	240	130/110	44.08±3.19	13.11±3.11	22.18±2.74	182/38/20	129/111

1.2 麻醉与镇痛方法

所有患者都给予跟骨骨折内固定治疗与全身麻醉,观察组术后给予连续坐骨神经自控镇痛,对照组术后给予静脉自控镇痛。

两组全麻成功后俯卧位于手术床上,铺无菌巾单,取足跟外侧"L"型切口,依次切开皮肤、皮下组织,剥离顺跟骨骨膜下,显露跟骨,清理骨折端血凝块及软组织,于跟骨后上结节斜向前上方打入骨圆针固定骨折块,并进行骨折块撬拨复位,使跟骨维持基本外形。于跟骨外侧骨缺损处植骨并进行外侧皮质骨覆盖,应用跟骨钛钢板固定,止血、冲洗切口,缝合皮下组织并负压引流。

观察组:术毕检测患者生命体征,将超声探头置于腘窝褶皱处,准确辨认坐骨神经及其分支部位。采取平面内进针,使用1%利多卡因局部麻醉穿刺。超声参数:频率2Hz,初始电流1.0mA,电流时程0.1ms,腓肠肌收缩伴足跖屈或者内翻动作。超声下导管头端位于坐骨神经旁,于穿刺点旁行皮下隧道穿刺,导管固定后注入0.2%罗哌卡因20mL,连接神经阻滞镇痛泵,镇痛参数:锁定时间20min,单次剂量3mL/h,背景剂量3mL/h。镇痛配方:0.75%罗哌卡因注射液(齐鲁制药有限公司)40mL+0.9%氯化钠注射液(辰欣药业股份有限公司)稀释到150mL。

对照组:术毕连接静脉镇痛泵,镇痛参数:锁定时间20min,

单次剂量1.5mL/h,背景剂量2mL/h,负荷剂量2mL/h。镇痛配方:托烷司琼5mg+舒芬太尼4μg/kg+氟比洛芬酯注射液100mg+地塞米松10mg+0.9%氯化钠注射液稀释到100mL。

1.3 观察指标

(1)记录两组的手术时间、引流时间、引流量、切口干燥时间与切口愈合时间。(2)记录两组术后4h、24h与48h的疼痛状况,采用患者视觉模拟评分法(Visual analog scales,VAS),分数越高,疼痛越严重。(3)采用两组术后48h腓总神经的感觉阻滞情况,2级:对针刺无感觉(完全阻滞);0级:感觉正常(未被阻滞);1级:感觉迟钝(部分阻滞)。(4)记录两组术后1个月出现的切口裂开、感染、皮下血肿与皮缘坏死等并发症发生情况。

1.4 统计方法

应用SPSS 22.00,计量数据以($\bar{x} \pm s$)表示,对比为t检验;计数数据以百分比表示,予以卡方分析,检验水准均为双侧 $\alpha=0.05$, $P>0.05$ 有统计学意义。

2 结果

2.1 两组围手术指标对比

两组的手术时间、引流时间、引流量等对比差异无统计学意义($P>0.05$),研究组的切口干燥时间与切口愈合时间显著短于对照组,对比有统计学意义($P<0.05$)。见表2。

表2 两组围手术指标对比($\bar{x} \pm s$)

Table 2 Comparison of perioperative indicators between the two groups ($\bar{x} \pm s$)

Groups	n	Operation time (min)	Drainage time (h)	Drainage flow (mL)	Incision drying time (d)	Incision healing time (d)
Study group	240	73.44±6.21	27.29±1.44	78.66±6.94	2.08±0.87*	14.99±2.48*
Control group	240	73.41±5.89	27.56±4.11	76.39±22.10	3.61±0.72	17.02±2.11

Note: Compared with the control group, * $P<0.05$.

2.2 两组术后不同时间点的疼痛评分对比

观察组术后 4 h、24 h 与 48 h 的疼痛 VAS 评分为 (1.45±0.23、0.82±0.13、0.44±0.07) 分, 显著低于对照组的 4 h、24 h

与 48 h 的疼痛 VAS 评分(4.20±0.37、4.43±0.31、3.17±0.14), 对比有统计学意义($P<0.05$)。见表 3。

表 3 两组术后不同时间点的疼痛评分对比(分, $\bar{x}\pm s$)Table 3 Comparison of pain scores at different time points between the two groups (scores, $\bar{x}\pm s$)

Groups	n	4 h	24 h	48 h
Study group	240	1.45±0.23*	0.82±0.13*	0.44±0.07*
Control group	240	4.20±0.37	4.43±0.31	3.17±0.14

2.3 两组术后 48 h 的感觉阻滞情况对比

两组术后 48 h 的感觉阻滞情况 0 级、1 级、2 级对比差异

无统计学意义($\chi^2=0.00$ 、0.083、0.083, $P=1.0$ 、0.773、0.773), 组间对比均无统计学意义($P>0.05$)。见表 4。

表 4 两组术后 48 h 的感觉阻滞情况对比(例, %)

Table 4 Comparison of sensory block in the two groups after 48 hours (n, %)

Groups	n	Level 0	Level 1	Level 2
Study group	240	0 (0.0)	26 (10.8)	214 (89.2)
Control group	240	0 (0.0)	28 (11.7)	212 (88.3)

2.4 两组术后并发症情况对比

研究组术后 1 个月的切口裂开、感染、皮下血肿与皮缘坏死等并发症发生率为 4.2 %, 显著低于对照组的 15.8 %

($\chi^2=18.148$, $P=0.000$), 两组对比有显著的统计学意义($P<0.001$)。见表 5。

表 5 两组术后并发症发生情况对比(例, %)

Table 5 Comparison of postoperative complications between the two groups (n, %)

Groups	n	Disruption of wound	Infect	Ecchymoma	Skin margin necrosis	Total
Study group	240	2	3	2	3	10 (4.2)*
Control group	240	9	12	11	6	38 (15.8)

3 讨论

跟骨骨折在临床上比较常见, 多为高能量暴力所致^[14]。跟骨外形较复杂, 呈不规则立方形, 其完整的解剖形态对于维持正常的足弓支持形态、后足关节功能具有重要意义^[15]。跟骨关节面众多, 周围缺少肌肉组织覆盖, 跟骨周围血供丰富, 且有较多神经走行。手术治疗跟骨骨折的目的是恢复跟骨的高度和宽度及其解剖结构的完整性, 注意恢复跟骨结节关节角^[16]。如果诊治不当可产生较多的并发症, 甚至会造成足部残疾, 造成走路困难、功能障碍等后遗症, 严重影响患者的身心健康^[17, 18]。

内固定术为跟骨骨折的主要治疗方法, 手术入路采用足踝外侧 "L" 形切口, 切口区域属于坐骨神经支配, 也为神经阻滞提供了理论基础^[19]。该方法可以为跟骨手术提供良好的术后镇痛, 特别是超声的应用能确保阻滞效果, 可准确地把导管尖端放置在神经旁边, 从而提高镇痛效果^[20]。本研究显示两组的手术时间、引流时间、引流量等对比差异无统计学意义, 研究组的切口干燥时间与切口愈合时间显著短于对照组; 观察组术后 4 h、24 h 与 48 h 的疼痛 VAS 评分显著低于对照组, 表明神经阻滞的应用能提高镇痛效果, 促进术后康复。主要在于神经阻滞能很好为患者提供更长时间的有效镇痛^[21, 22]。

跟骨骨折多见于成年人, 发病部位以足跟部为主, 在临床

上主要表现为瘀斑、肿胀、疼痛等表现, 常见的病因包括高处坠落、交通事故等^[23, 24]。手术治疗跟骨骨折具有很好的效果, 但是术后容易出现剧烈疼痛^[25, 26]。目前有多种方法应用于临床镇痛, 包括持续性周围神经阻滞、患者自控镇痛泵等^[27, 28]。坐骨神经是人体最粗大的神经, 解剖变异较少, 穿刺成功率比较高, 且容易留置导管。本研究显示两组术后 48 h 的感觉阻滞情况对比差异无统计学意义; 研究组术后 1 个月的切口裂开、感染、皮下血肿与皮缘坏死等并发症发生率为 4.2 %, 显著低于对照组的 15.8 %, 说明神经阻滞的应用能减少术后并发症的发生, 且不影响阻滞效果。当前也有研究显示全身麻醉联合区域神经阻滞麻醉可减少阿片类药物用量, 促使患者快速清醒, 可使患者进行早期功能锻炼, 降低了相关并发症的发生率^[29, 30]。本研究也有一定的不足, 样本数量比较少, 且随访时间比较短, 没有进行具体的剂量分析, 将在后续研究中深入探讨。

总之, 神经阻滞与全身麻醉在跟骨骨折内固定术后的应用具有更好的镇痛效果, 且不影响阻滞效应, 能促进患者康复, 减少术后并发症的发生。

参 考 文 献 (References)

- [1] Ahamed ZA, Sreejit MS. Lumbar Plexus Block as an Effective Alternative to Subarachnoid Block for Intertrochanteric Hip Fracture Surgeries in the Elderly[J]. Anesth Essays Res, 2019, 13(2): 264-268

- [2] Park JH, Chun DI, Park KR, et al. Can sural nerve injury be avoided in the sinus tarsi approach for calcaneal fracture?: A cadaveric study[J]. *Medicine (Baltimore)*, 2019, 98(42): e17611
- [3] Taha T, Mahmoud K, Attia AK, et al. Delayed Soft Tissue Necrosis in an Atypical Closed Calcaneal Fracture: A Case Report [J]. *J Orthop Case Rep*, 2019, 9(2): 11-14
- [4] Zelle BA, Morton-Gonzaba NA, Adcock CF, et al. Healthcare disparities among orthopedic trauma patients in the USA: socio-demographic factors influence the management of calcaneus fractures [J]. *J Orthop Surg Res*, 2019, 14(1): e359
- [5] Zhao W, Zhang Y. Comparison and predictive factors analysis for efficacy and safety of Kirschner wire, anatomical plate fixation and cannulated screw in treating patients with open calcaneal fractures[J]. *Medicine (Baltimore)*, 2019, 98(43): e17498
- [6] Karaca O, Pinar HU. Efficacy of ultrasound-guided bilateral erector spinae plane block in pediatric laparoscopic cholecystectomy: Case series[J]. *Agri*, 2019, 31(4): 209-213
- [7] Lu F, Tian J, Dong J, et al. Tonic-clonic seizure during the ultrasound-guided stellate ganglion block because of an injection into an unrecognized variant vertebral artery: A case report [J]. *Medicine (Baltimore)*, 2019, 98(48): e18168
- [8] Mavarez AC, Ripat CI, Suarez MR. Pectoralis Plane Block for Pacemaker Insertion: A Successful Primary Anesthetic[J]. *Front Surg*, 2019, 6(8): e64
- [9] Plecko M, Bohacek I, Tripkovic B, et al. Applications and critical evaluation of fascia iliaca compartment block and quadratus lumborum block for orthopedic procedures[J]. *Acta Clin Croat*, 2019, 58(Suppl 1): 108-113
- [10] Rossel T, Uhlig C, Pietsch J, et al. Effects of regional anesthesia techniques on local anesthetic plasma levels and complications in carotid surgery: a randomized controlled pilot trial [J]. *BMC Anesthesiol*, 2019, 19(1): e218
- [11] Torres JP, Rodrigues A, Morais N, et al. Efficacy and safety of a combined anesthetic technique for transrectal prostate biopsy: a single center, prospective, randomized study [J]. *Cent European J Urol*, 2019, 72(3): 258-262
- [12] Urits I, Ostling PS, Novitch MB, et al. Truncal regional nerve blocks in clinical anesthesia practice [J]. *Best Pract Res Clin Anaesthesiol*, 2019, 33(4): 559-571
- [13] Van Zantvoort A, Setz M, Hoogeveen A, et al. Chronic lower leg pain: entrapment of common peroneal nerve or tibial nerve-German version[J]. *Unfallchirurg*, 2019, 122(11): 854-859
- [14] Zhang LK, Li Q, Zhu FB, et al. Comparison of adductor canal block with periarticular infiltration analgesia in total knee arthroplasty: A meta-analysis of randomized controlled trials [J]. *Medicine (Baltimore)*, 2019, 98(50): e18356
- [15] Zhou Y, Zhang WC, Chong H, et al. A Prospective Study to Compare Analgesia from Femoral Obturator Nerve Block with Fascia Iliaca Compartment Block for Acute Preoperative Pain in Elderly Patients with Hip Fracture[J]. *Med Sci Monit*, 2019, 25(9): 8562-8570
- [16] Bao X, Huang J, Feng H, et al. Effect of local anesthetic volume (20 mL vs 30 mL ropivacaine) on electromyography of the diaphragm and pulmonary function after ultrasound-guided supraclavicular brachial plexus block: a randomized controlled trial[J]. *Reg Anesth Pain Med*, 2019, 44(1): 69-75
- [17] Carlock KD, Hildebrandt KR, Konda SR, et al. The use of regional anaesthesia for surgical intervention has minimal effect on functional outcomes following fracture nonunion repair [J]. *Injury*, 2019, 50(3): 671-675
- [18] Cooke ME, Welch T, Gusakov O, et al. Are Continuous Femoral Nerve Catheters Beneficial for Pain Management After Operative Fixation of Tibial Plateau Fractures? A Randomized Controlled Trial [J]. *J Orthop Trauma*, 2019, 33(12): e447-e451
- [19] Guo P, Xu ZJ, Hu CE, et al. Rare empty sella syndrome found after postoperative hypotension and respiratory failure: A case report [J]. *World J Clin Cases*, 2019, 7(5): 663-667
- [20] Hakim TA, Shah AA, Teli Z, et al. The Safety and Effectiveness of Superficial Cervical Plexus Block in Oral and Maxillofacial Surgery as an Alternative to General Anesthesia in Selective Cases: A Clinical Study[J]. *J Maxillofac Oral Surg*, 2019, 18(1): 23-29
- [21] Li YS, Chen CY, Lin KC, et al. Open reduction and internal fixation of ankle fracture using wide-awake local anaesthesia no tourniquet technique[J]. *Injury*, 2019, 50(4): 990-994
- [22] McLeod G, Mckendrick M, Taylor A, et al. Validity and reliability of metrics for translation of regional anaesthesia performance from cadavers to patients[J]. *Br J Anaesth*, 2019, 123(3): 368-377
- [23] Sort R, Brorson S, Gogenur I, et al. Rebound pain following peripheral nerve block anaesthesia in acute ankle fracture surgery: An exploratory pilot study [J]. *Acta Anaesthesiol Scand*, 2019, 63(3): 396-402
- [24] Ahn J, Kim TY, Kim TW, et al. Learning Curve for Open Reduction and Internal Fixation of Displaced Intra-articular Calcaneal Fracture by Extensile Lateral Approach Using the Cumulative Summation Control Chart[J]. *Foot Ankle Int*, 2019, 40(9): 1052-1059
- [25] Aslan A, Sargin S, Gulcu A, et al. Clinical, radiological and patient-reported outcomes in intra-articular calcaneal fractures: Comparison of conservative and surgical treatment [J]. *Ekleml Hastalik Cerrahisi*, 2019, 30(2): 143-148
- [26] Baca E, Koluman A. Modified percutaneous fixation for displaced intra-articular calcaneal fractures [J]. *Ekleml Hastalik Cerrahisi*, 2019, 30(2): 168-174
- [27] Blasius FM, Link BC, Beeres FJP, et al. Impact of surgical procedures on soft tissue microcirculation in calcaneal fractures: A prospective longitudinal cohort study[J]. *Injury*, 2019, 50(12): 2332-2338
- [28] Tang Z, Zhang C, Xu Z, et al. Observation of single spinal anesthesia by 25G needle puncture through a lateral crypt for hip surgery in elderly patients[J]. *Medicine (Baltimore)*, 2019, 98(27): e16334
- [29] Cui ST, Liu ZZ, Tang B, et al. Closed reduction and internal fixation versus transtarsal sinus small incision internal fixation for Sanders type II calcaneal fractures[J]. *Zhongguo Gu Shang*, 2019, 32(5): 448-453
- [30] Fourgeaux A, Estens J, Fabre T, et al. Three-dimensional computed tomography analysis and functional results of calcaneal fractures treated by an intramedullary nail[J]. *Int Orthop*, 2019, 43(12): 2839-2847