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超声引导下外周神经阻滞对老年下肢动脉硬化闭塞症截肢患者 循环系统和疼痛的影响*

倪达力 秦 蕾 卢 敏 池 卉 袁 芬

(华中科技大学同济医学院附属梨园医院麻醉科 湖北 武汉 430000)

摘要 目的:研究超声引导下外周神经阻滞对老年下肢动脉硬化闭塞症截肢患者循环系统和疼痛的影响。**方法:**选择我院 2016 年 2 月~2019 年 11 月收治的 82 例老年下肢动脉硬化闭塞症患者为研究对象,所有患者均接受下肢截肢治疗,对照组采用硬膜外麻醉,研究组采用超声引导下外周神经阻滞。对比两组感觉神经、运动神经阻滞情况、阻滞效果,循环功能,疼痛指标和不良反应。**结果:**研究组感觉神经及运动神经阻滞起效时间较对照组短,感觉神经及运动神经阻滞维持时间较对照组长,差异比较有统计学意义($P<0.05$)。两组优良率差异比较无统计学意义($P>0.05$)。手术开始 30 min 时,对照组心率、平均动脉压均下降,研究组无明显改变,差异比较有统计学意义($P<0.05$)。术后 24h 时,两组疼痛指标浓度均较入室时增加,研究组低于对照组,差异比较有统计学意义($P<0.05$)。研究组不良反应总发生率低于对照组($P<0.05$)。**结论:**老年下肢动脉硬化闭塞症截肢患者予以超声引导下外周神经阻滞的起效时间更快,能够减轻围术期疼痛,保持术中循环功能的稳定。

关键词:老年下肢动脉硬化闭塞症截肢术;超声引导下外周神经阻滞;循环功能;疼痛

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Effect of Ultrasound-guided Peripheral Nerve Block on Perioperative Stress Response of Elderly Patients Undergoing Amputation for Lower Limb Arteriosclerosis Obliterans*

NI Da-li, QIN Lei, LU Min, CHI Hui, YUAN Fen

(Department of Anesthesiology, Liyuan hospital, Tongji Medical College, Huazhong University of science and technology, Wuhan, Hubei, 430000, China)

ABSTRACT Objective: To study the effect of ultrasound-guided peripheral nerve block on perioperative stress response in elderly patients with lower extremity arteriosclerosis obliterans undergoing amputation. **Methods:** 82 elderly patients with lower limb arteriosclerosis obliterans admitted to our hospital from February 2016 to November 2019 were selected as the research object. All patients were treated by lower limb amputation, the control group was treated with epidural anesthesia, and the research group was treated with ultrasound-guided peripheral nerve block. The sensory nerve and motor nerve block, block effect, circulation function, pain index and adverse reactions were compared between the two groups. **Results:** The onset time of sensory nerve and motor nerve block in the research group was shorter than that in the control group, and the maintenance time of sensory nerve and motor nerve block was longer than that of the control group leader, the difference was statistically significant ($P<0.05$). There was no significant difference in the excellent and good rates between the two groups ($P>0.05$). At the beginning of the operation for 30 min, heart rate and mean arterial pressure in the control group decreased, but there was no significant change in the research group, and the difference was statistically significant ($P<0.05$). At 24h after surgery, the pain index concentration in both groups increased compared with that at the time of entry, and the difference between the research group and the control group was statistically significant ($P<0.05$). The total incidence of adverse reactions in the research group was lower than that in the control group ($P<0.05$). **Conclusion:** The onset time of ultrasound-guided peripheral nerve block in elderly patients with lower extremity arteriosclerosis obliterans amputation is faster, which can reduce perioperative pain and maintain the stability of circulatory function during operation.

Key words: Amputation of arteriosclerosis obliterans of lower limbs in the elderly; Ultrasound guided peripheral nerve block; Circulation function; Pain

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作者简介:倪达力(1987-),男,初级,本科,研究方向:麻醉方向、超声引导神经阻滞,

电话:18171087202, E-mail: caohaijun050@163.com

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前言

下肢动脉硬化闭塞症为退行性病变,是因下肢动脉粥样硬化斑块形成导致下肢动脉狭窄、闭塞,引起肢体慢性缺血,近年来随着人口老龄化,其发生率呈上升趋势^[1]。下肢动脉硬化闭塞症病情严重者需行截肢治疗,截肢术作为一种破坏性手术,创伤较大,能够引起明显的应激反应及疼痛^[2-3]。老年患者多伴程度不一的心脑血管系统、呼吸系统的合并疾病,加上衰老引起机体脏器生理功能和代偿能力降低,对手术及麻醉的耐受力较差,增加老年患者麻醉、手术中的危险程度^[4-5]。为提高老年患者麻醉的舒适度及安全性,促进患者尽早康复,应尽可能的选择便于管理,麻醉效果确切,及对生理机能影响小的麻醉干预方案。外周神经阻滞术能够提前阻断手术刺激所致的外周及中枢敏感,对患者呼吸及循环系统的影响较小,从而避免血流动力学的大幅度波动^[6]。但既往外周神经阻滞术主要依靠解剖标志进行穿刺定位,对于肥胖或解剖变异患者,可能因定位不准导致穿刺失败^[7]。近年来超声引导下的神经阻滞操作能够明显增加定位准确性,可在实时引导下,于神经靶点置入穿刺针,提高阻滞成功率^[8]。本研究主要分析超声引导下外周神经阻滞对老年下肢动脉硬化闭塞症截肢术患者循环系统和疼痛的影响。

1 资料与方法

1.1 一般资料

82例老年下肢动脉硬化闭塞症患者纳入标准^[9]:临床确诊为下肢动脉硬化闭塞症,有下肢截肢术指征;美国麻醉医师协会(American association of anesthesiologists, ASA)分级:Ⅱ~Ⅲ级;年龄 ≥ 60 岁;无硬膜外麻醉或外周神经阻滞禁忌症。排除标准:局部麻醉药过敏;肝肾功能、凝血功能、肾上腺皮质功能异常;慢性疼痛病史。82例患者随机分为对照组($n=41$)和研究组($n=41$),对照组男26例,女15例;年龄(67.04 ± 5.83)岁;平均体重(66.29 ± 6.02)kg;合并症:冠心病12例,糖尿病7例,轻中度高血压18例。研究组男22例,女19例;年龄(65.93 ± 6.24)岁;平均体重(68.09 ± 5.77)kg;合并症:冠心病10例,糖尿病9例,轻中度高血压16例。两组基线资料比较无统计学意义($P>0.05$)。

1.2 方法

两组患者术前均完善凝血功能、肝肾功能、血常规、心脏彩超、心电图等常规检查,术前禁水4h,禁食8h。入室后常规监测脉搏血氧饱和度、心率、心电图和无创血压。予以鼻导管吸氧,氧气流量控制在2 L/min。创建上肢静脉通道,输入6~8 mL/kg乳酸钠林格氏液,缓慢静注1~3 mg咪达唑仑及0.5~1 μ g/kg芬太尼,依据需要追加芬太尼、丙泊酚等静脉麻醉药。

对照组采用硬膜外麻醉,指导患者为侧卧位,保持腰背部后弓成弧形,背部与床面垂直,和手术台边沿平齐。于L3~4间隙进行硬膜外穿刺,取2%利多卡因3 mL在穿刺点逐层浸润,向头侧放置硬膜外导管,并留置3~5 cm,固定导管。患者取平卧位,预先推注2%利多卡因3 mL,5 min后生命体征无异常则继续用药。硬膜外间隙局麻药共推注0.375%罗哌卡因15~17 mL。用针刺法测定麻醉阻滞平面,控制平面在T10以下。

研究组采用超声引导下外周神经阻滞,患者取仰卧位,超声探头与腹股沟韧带平行,于股动脉外侧查找股神经截面,用短轴平面内技术于股神经深面注射0.375%罗哌卡因10 mL阻滞股神经。于髂前上棘下缘,将探头横行放置,在缝匠肌外缘和阔筋膜张肌之间寻找股外侧皮神经,于外侧进针注射0.375%罗哌卡因3 mL。于闭孔神经前支及后支注射分别注射0.375%罗哌卡因4 mL。患者更改为侧卧位,屈髋、屈膝,于坐骨神经周围注射0.375%罗哌卡因20 mL,于股后皮神经周围注射0.375%罗哌卡因5 mL。

1.3 观察指标

阻滞效果评价^[10]:患者术中安静无痛,未表现出明显不适为优;患者术中轻微疼痛,术中辅助少量镇痛、镇静药为良;术中麻醉平面或神经阻滞平面难以满足患者手术需要,明显疼痛,需予以大量镇痛、镇静药物或复合静脉麻醉,或更改为全身麻醉为差。

观察两组感觉神经、运动神经阻滞情况;记录患者入室时、手术开始30 min时患者心率、平均动脉压;于入室时及术毕24h时采集患者外周静脉血,用放射免疫法测定血清中前列腺素E₂(PGE₂)、P物质(SP)、5-羟色胺(5-HT)浓度。

1.4 统计学分析

数据处理选用SPSS18.0软件包,计量资料用($\bar{x}\pm s$)表示,选用t检验,计数资料用[例(%)]表示,用 χ^2 检验比较, $P<0.05$ 表示差异有统计学意义。

2 结果

2.1 两组感觉神经、运动神经阻滞情况分析

研究组感觉神经及运动神经阻滞起效时间较对照组短,感觉神经及运动神经阻滞维持时间较对照组长,差异比较有统计学意义($P<0.05$),见表1。

2.2 两组阻滞效果分析

两组优良率差异比较无统计学意义($P>0.05$),见表2。

2.3 两组循环功能分析

入室时,两组心率、平均动脉压差异比较无统计学意义($P>0.05$);手术开始30 min时,对照组心率、平均动脉压均下降,研究组无明显改变,差异比较有统计学意义($P<0.05$),见表3。

表1 两组感觉神经、运动神经阻滞情况分析($\bar{x}\pm s$, min)

Table 1 Analysis of sensory nerve and motor nerve block in two groups($\bar{x}\pm s$, min)

Groups	n	Sensory nerve block		Motor nerve block	
		Working time	Maintain time	Working time	Maintain time
Control group	41	10.84 $\pm$ 1.29	348.01 $\pm$ 40.33	16.03 $\pm$ 2.15	261.23 $\pm$ 35.77
Research group	41	6.31 $\pm$ 0.81 [#]	473.29 $\pm$ 65.72 [#]	9.19 $\pm$ 1.21 [#]	342.14 $\pm$ 39.04 [#]

vs control group, [#] $P<0.05$.

表 2 两组阻滞效果分析[例(%)]
Table 2 Analysis of blocking effect of two groups[n(%)]

Groups	n	Optimal	Good	Poor	Optimal And Good Rate
Control group	41	38(92.68)	3(7.32)	0(0.00)	41(100.00)
Research group	41	40(97.56)	1(2.44)	0(0.00)	41(100.00)

表 3 两组循环功能分析($\bar{x} \pm s$)
Table 3 Analysis of circular function in two groups($\bar{x} \pm s$)

Groups	n	Time	Heart rate (times/min)	Mean arterial pressure(mmHg)
Control group	41	When entering the house	89.10±10.58	87.21±12.95
		30 min after operation	78.02±8.74*	78.34±8.33*
Research group	41	When entering the house	87.18±11.27	89.03±11.46
		30 min after operation	84.97±12.06 [#]	85.44±13.48 [#]

vs control group, [#] $P < 0.05$; vs when entering the house, * $P < 0.05$.

2.4 两组疼痛指标分析

入室时, 两组疼痛指标差异比较无统计学意义($P > 0.05$);

术后, 两组疼痛指标均较入室时增加, 研究组低于对照组, 差异比较有统计学意义($P < 0.05$), 见表 4。

表 4 两组疼痛指标分析($\bar{x} \pm s$)
Table 4 Analysis of pain index in two groups($\bar{x} \pm s$)

Groups	n	Time	PGE2(ng/mL)	SP(pg/mL)	5-HT(μ mol/L)	NPY(pg/mL)
Control group	41	When entering the house	19.04±2.07	53.85±7.21	0.36±0.04	45.29±6.74
		After surgery	36.48±4.26*	105.74±13.21*	0.62±0.07*	81.26±11.26*
Research group	41	When entering the house	18.26±2.39	56.95±6.04	0.35±0.06	46.14±6.27
		After surgery	29.73±3.02* [#]	85.87±10.25* [#]	0.53±0.06* [#]	70.37±7.65* [#]

vs control group, [#] $P < 0.05$; vs when entering the house, * $P < 0.05$.

3 讨论

下肢动脉硬化闭塞症为血管外科常见疾病, 多发于老年人, 早期以肢体疼痛、间歇性跛行等为主要症状, 随着疾病进展能够发生溃疡或坏疽, 严重者需截肢治疗以延缓疾病恶化^[11]。但下肢截肢术的创伤较大, 加上老年患者因衰老出现全身退行性改变, 降低机体代谢率, 影响重要脏器的储备功能, 对麻醉及手术的耐受能力显著下降, 因此手术提高了麻醉要求和增加了麻醉难度^[12]。

临床研究报道^[13], 老年患者多存在气管插管困难或全麻禁忌症, 椎管内麻醉有明显优势。既往下肢截肢术多选择硬膜外麻醉, 尽管其镇痛完善, 但阻断了交感神经的传出纤维, 副交感神经较兴奋, 导致容量血管及阻力血管扩张, 减少回心血量, 使心率减缓, 血压降低, 影响患者全身状态^[14]。老年患者自主神经系统的调控能力较弱, 可能合并循环和呼吸系统等慢性疾病, 无法完全代偿血流动力学的大范围波动, 甚至可能引起脑血管意外, 增加麻醉风险^[15, 16]。

近年来随着临床区域阻滞技术的进步, 外周神经阻滞已成为外科常见麻醉方式。外周神经阻滞术可在外周神经周围给药, 直接阻滞手术部位对疼痛信号的传导^[17]。据有关文献报道^[18, 19], 外周神经阻滞的阻滞范围相对较局限, 对机体全身的影响较小, 能够避免椎管内麻醉和全身麻醉对老年患者心肺功能的影

响, 安全性高。但传统的外周神经阻滞对操作的要求较高, 且主观性较强, 盲探式操作可能发生神经内穿刺, 且定位准确度欠佳, 对于肥胖患者, 体表定位难度加大, 可能并发局部损伤^[20, 21]。目前超声技术不断改良, 超声引导下神经阻滞在临床广泛开展。超声引导下外周神经阻滞的声像图可清晰显示神经的位置, 直接查看目标区域内的解剖结构, 沿着神经分布区域进行系统地纵向、横向反复扫描, 实时查看进针行径, 避免神经阻滞的盲目性, 掌握给药进程^[22]。穿刺针在超声声像图上呈线性高回声, 其位置和动态走行在超声下较清晰, 能够进一步提高麻醉效果及安全性^[23]。临床研究证实^[24, 25], 超声引导下神经阻滞具有操作时间短、起效快和阻滞成功率高等特点。Grasso A 等^[26]研究发现, 超声引导下外周神经阻滞能够避免个体解剖超声所致的阻滞困难, 且可减少局部麻醉药的用量。本研究结果显示, 超声引导下外周神经阻滞组感觉神经和运动神经阻滞起效时间相对较短, 维持时间则显著长于硬膜外麻醉组, 说明超声引导下外周神经阻滞的起效时间更快, 与 Galluccio F 等^[27]研究报道结果相似。进一步分析显示, 两组阻滞效果优良率相似, 提示超声引导下外周神经阻滞及硬膜外麻醉均可起到良好的阻滞效果。又有研究指出^[28], 围术期麻醉、手术和疼痛等刺激能够影响循环系统, 导致血流动力学变化。本研究发现, 手术开始 30 min 时超声引导下外周神经阻滞组心率和平均动脉压与入室时无显著差异, 但硬膜外麻醉组相对较低, 提示超声引导下外周神

经阻滞更能保持术中血流动力学稳定,对机体的影响较小。

截肢术作为一种创伤性刺激事件,其导致的组织创伤能够激活外周伤害性感受器,引起疼痛介质的产生及释放,产生神经冲动传递至大脑,诱导疼痛感觉^[29]。PGE2 是介导疼痛的重要物质,其含量增加能够降低神经根痛阈,从而导致疼痛^[30]。PGE2 又能够刺激 SP 的释放,SP 是评估疼痛程度的客观依据^[31]。一方面 SP 可刺激 5-HT 的释放,产生强烈持久的疼痛反应及组织损伤。NPY 为神经肽类物质,动物试验证实其浓度降低可明显增加实验小鼠的疼痛感觉^[32]。本研究结果显示,术后患者 PGE2、SP、5-HT 和 NPY 均较术前上升,说明术后创伤可诱导相关疼痛介质的表达,但疼痛管理组变化趋势相对较小,提示疼痛管理能够调节疼痛介质表达,减轻中枢及外周敏感化,从而减轻患者术后疼痛。Navratilova E 等研究表明^[33],PGE2、SP、5-HT 和 NPY 水平上升能够增加机体疼痛感。动物模型报道^[34],神经痛小鼠 PGE2、SP、5-HT 和 NPY 浓度明显增加。本研究结果显示,入室时两组 PGE2、SP、5-HT 和 NPY 浓度相似,术毕时两组以上指标均上升,但超声引导下外周神经阻滞组增加幅度较小,提示超声引导下外周神经阻滞更能控制患者围术期疼痛,减轻疼痛对患者产生的不良影响。

相关研究报道^[35],连续硬膜外麻醉可导致支配膀胱括约肌的神经受到阻滞,术后容易合并尿潴留,多需留置尿管,增加感染风险,不利于患者恢复。外周神经阻滞术未阻滞盆腔及腹腔神经,不影响患者排尿及胃肠道功能,因此恶心、呕吐,尿潴留等发生率相对较低。本研究结果也证实以上结论,发现外周神经阻滞组无患者发生尿潴留,仅有 1 例患者发生恶心、呕吐,提示超声引导下外周神经阻滞的安全性更高。

综上所述,老年下肢动脉硬化闭塞症截肢术患者予以超声引导下外周神经阻滞的起效时间更快,能够减轻围术期疼痛,保持术中循环功能的稳定。

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