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超声引导下硬膜外阻滞在老年髋关节置换手术中的应用*

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摘要 目的:探讨超声引导下硬膜外阻滞在老年髋关节置换手术中的应用方法与效果。**方法:**2017年6月至2020年5月选择在本医院进行髋关节置换手术的老年患者112例,根据随机数字表法把患者分为研究组与对照组,各56例。研究组给予超声引导下硬膜外阻滞,对照组给予传统的静脉持续镇痛。两组都给予全麻诱导与维持,记录镇痛效果与患者术后康复情况。**结果:**两组的性别、年龄、麻醉时间、手术时间与术中出血量等对比差异无统计学意义($P>0.05$),研究组的术后住院时间显著短于对照组($P<0.05$)。两组术后1 d、3 d、7 d的疼痛视觉模拟评分法(Visual Analogue Scale/Score, VAS)评分都低于术前1 d,观察组也都显著低于对照组,对比差异都有统计学意义($P<0.05$)。研究组术后1 d、3 d、7 d的髋关节活动度都显著高于对照组($P<0.05$)。研究组术后1 d、3 d、7 d的血清P物质(Substance P, SP)、前列腺素E2(Prostaglandin E2, PGE2)含量都高于术前1 d,观察组低于对照组,对比差异都有统计学意义($P<0.05$)。**结论:**超声引导下硬膜外阻滞在老年髋关节置换手术中的应用能抑制血清SP、PGE2的释放,能缓解患者术后疼痛,促进髋关节功能的恢复,缩短患者的康复时间。

关键词:超声;硬膜外阻滞;老年人;髋关节置换;P物质;前列腺素E

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Ultrasound-guided Epidural Blockade in Elderly Hip Replacement Surgery*

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ABSTRACT Objective: To explore the application method and effect of ultrasound-guided epidural block in elderly hip replacement surgery. **Methods:** From June 2017 to May 2020, 112 cases of elderly patients who underwent hip replacement surgery in our hospital were selected as the research object, and the patients were divided into study group and control group of 56 cases in each groups accorded to the random number table method. The study group was given ultrasound-guided epidural block, and the control group was given traditional intravenous continuous analgesia. The two groups were given general anesthesia induction and maintenance, and the analgesic effects and patient's postoperative recovery were recorded. **Results:** There were no significant difference in gender, age, anesthesia time, operation time and intraoperative bleeding compared between the two groups ($P>0.05$). The postoperative hospital stay in the study group were significantly shorter than that in the control group ($P<0.05$). The visual analogue scale/score (VAS) scores of pain in the two groups at 1 d, 3 d and 7 d after surgery were significantly lower than those at 1 d before operation, and the study groups were lower than the control group ($P<0.05$). The hip joint mobility of the study group at 1 d, 3 d and 7 d after surgery were significantly higher than that of the control group ($P<0.05$). The contents of Substance P (SP) and Prostaglandin E2 (Prostaglandin E2, PGE2) in the two groups at 1 d, 3 d and 7 d after surgery were significantly higher than those at 1 d before operation, and the study groups were lower than the control group ($P<0.05$). **Conclusion:** The application of ultrasound-guided epidural block in elderly hip replacement surgery can inhibit the release of serum SP and PGE2, can relieve postoperative pain, promote the recovery of hip function, and shorten the recovery time of patients.

Key words: Ultrasound; Epidural block; Elderly; Hip replacement; Substance P; Prostaglandin E

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前言

髋关节置换术是一种成熟、有效的治疗晚期髋关节疾病的手术,可以恢复患者的髋关节功能,提高生活质量。但是髋关节置换术中涉及的组织多,并且需要截骨、磨臼等操作,术后患

者疼痛反应强烈^[1]。急性疼痛可直接影响到患者的手术效果和髋关节功能恢复^[2,3]。硬膜外阻滞、静脉持续镇痛、外周神经阻滞是目前进行关节置换术后的主要镇痛方法,静脉持续镇痛操作比较简单,但是对机体心血管循环的影响比较大,容易造成不良反应^[4,5]。外周神经阻滞具有全身不良反应较少等优势,但是

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可引起下肢动静脉血流排空率增加与血液粘滞度降低^[6]。临床上普遍采用,但此法有低血压及尿潴留等不良反应,有增加硬膜外血肿的可能性,限制了硬膜外镇痛的临床使用^[7,8]。硬膜外阻滞可减轻疼痛应激反应对凝血功能的影响,临床效果明确^[9,10]。超声引导下硬膜外阻滞可以在直视条件下进行阻滞,可动态观察局麻药的扩散情况,有利于提高阻滞成功率和减少不良反应的发生^[11,12]。本文具体探讨了超声引导下硬膜外阻滞在老年髋关节置换手术中的应用方法与效果,为临床上选择最佳的镇痛方法提供参考。

1 资料与方法

1.1 研究对象

2017年6月至2020年5月选择在本院进行髋关节置换手术的老年患者112例,纳入标准:年龄60~75岁;具有髋关节置换手术的指征;医院伦理委员会批准了此次研究;患者所有患者均被实情告知并签字同意;正确理解并同意参与本临床研究;美国麻醉师协会(American Society of Anesthesiologists, ASA)分级I-II级。排除标准:长期服用镇痛药物史的患者;不能正确理解疼痛评分标准者;合并严重内科疾病者;有神经系统疾病者;有酰胺类局麻药和阿片类药物过敏史的患者。根据随机数字表法把患者分为研究组与对照组各56例。

1.2 麻醉与镇痛方法

研究组:给予超声引导下硬膜外阻滞,患者取上侧卧位,外展身体。使用便携式彩色二维超声仪(美国Sonosite公司, M-Turbo型)探头频率为6~13 MHz,调整探头位置以获得最佳超声图像。给予L3-4硬膜外穿刺,在硬膜外腔隙保留硬膜外导管,注入3 mL 2%利多卡因,确定硬膜外位置后,注入0.2%罗哌卡因10 mL+肾上腺素1:200 000。硬膜外阻滞完后连接术后镇痛泵,持续给药输注速度5 mL/h。

对照组:给予传统的静脉持续镇痛。

两组都给予全麻诱导,麻醉药物包括罗库溴铵0.6 mg/kg、丙泊酚2 mg/kg、芬太尼3 μ g/kg。麻醉维持药物为丙泊酚6 mL/kg和瑞芬太尼0.1~0.2 μ g/(kg·min)。

两组患者均采用陶瓷生物假体行全髋关节置换,全髋关节购自美国捷迈公司,表面构成为钛丝涂层,人体材质为钴铬钼合金。

1.3 观察指标

(1)记录两组的性别、年龄、麻醉时间、手术时间、术后下地活动时间、术后住院时间、术中出血量。(2)在术前1 d、术后1 d、3 d与7 d进行视觉模拟疼痛评分(visual analogue scale, VAS),横线的起点为0,终点为10,分别表示无痛及剧痛,分数越高,疼痛越严重。(3)在术后1 d、3 d与7 d测量患者的髋关节活动度,患者取仰卧位,移动臂与股骨纵轴平行,以髌前上棘为轴心,固定臂与身体纵轴平行,股骨向外运动,固定臂与移动臂之间夹角为髋关节活动度。(4)在术前1 d、术后1 d、3 d与7 d采集两组患者的肘静脉血2~3 mL,离心分离血清,采用酶联免疫吸附试剂盒测定血清SP、PGE2等疼痛因子含量。

1.4 统计方法

应用SPSS 19.00,将计量资料以($\bar{x} \pm s$)表示,计数数据以%表示,根据数据的性质不同,用t检验、卡方 χ^2 检验等分析,检验水准为 $\alpha=0.05$ 。

2 结果

2.1 一般资料与手术情况对比

两组的性别、年龄、麻醉时间、手术时间与术中出血量等对比差异无统计学意义($P>0.05$),研究组的术后住院时间显著短于对照组($P<0.05$),见表1。

表1 两组一般资料与手术情况对比

Table 1 Comparison of general information and operation between the two groups

Groups	n	Gender (male/female)	Age (years)	BMI(kg/m ²)	Anaesthesia time (min)	Operation time (min)	Intraoperative bleeding volume(mL)	Postoperative hospital stay (d)
Study group	56	30/26	67.33 $\pm$ 2.91	22.48 $\pm$ 1.48	135.09 $\pm$ 22.19	72.98 $\pm$ 4.14	265.09 $\pm$ 45.02	7.88 $\pm$ 0.13
Control group	56	28/28	67.87 $\pm$ 1.11	22.10 $\pm$ 1.04	136.87 $\pm$ 18.77	73.99 $\pm$ 3.18	263.76 $\pm$ 54.88	11.00 $\pm$ 0.42

2.2 疼痛评分对比

两组术后1 d、3 d、7 d的VAS评分都低于术前1 d,观察

组也都显著低于对照组,对比差异都有统计学意义($P<0.05$),见表2。

表2 两组围手术期的疼痛评分对比(分, $\bar{x} \pm s$)

Table 2 Comparison of pain scores between the two groups at perioperative period(scores, $\bar{x} \pm s$)

Groups	n	1 d preoperatively	1 d postoperatively	3 d postoperatively	7 d postoperatively
Study group	56	4.11 $\pm$ 0.08	2.09 $\pm$ 0.02 [*] #	1.32 $\pm$ 0.12 [*] #	1.00 $\pm$ 0.13 [*] #
Control group	56	4.13 $\pm$ 0.10	4.09 $\pm$ 0.21 [#]	3.09 $\pm$ 0.13 [#]	1.98 $\pm$ 0.09 [#]

Note: Compared with the control group, ^{*} $P<0.05$; compared with 1 d preoperatively, [#] $P<0.05$.

2.3 髋关节活动度对比

研究组术后1 d、3 d与7 d的髋关节活动度都显著高于对照组($P<0.05$),见表3。

研究组术后1 d、3 d、7 d的血清SP、PGE2含量都高于术前1 d,观察组低于对照组,对比差异都有统计学意义($P<0.05$),见表4。

2.4 疼痛相关因子含量对比

表 3 两组术后不同时间点的髋关节活动度对比($^{\circ}$, $\bar{x} \pm s$)Table 3 Comparison of hip joint mobility between two groups at different time points ($^{\circ}$, $\bar{x} \pm s$)

Groups	n	1 d postoperatively	3 d postoperatively	7 d postoperatively
Study group	56	65.87 $\pm$ 2.14*	83.98 $\pm$ 2.11*	93.09 $\pm$ 3.58*
Control group	56	62.09 $\pm$ 1.48	78.98 $\pm$ 2.55	87.87 $\pm$ 2.81

表 4 两组围手术期的血清疼痛相关因子含量对比(pg/mL, $\bar{x} \pm s$)Table 4 Comparison of serum pain-related factors between the two groups at perioperative period (pg/mL, $\bar{x} \pm s$)

Groups	n	SP				PGE2			
		1 d	1 d	3 d	7 d	1 d	1 d	3 d	7 d
		preoperative-ly	postopera-tively	postopera-tively	postopera-tively	preoperative-ly	postopera-tively	postopera-tively	postopera-tively
Study group	56	22.84 $\pm$ 2.18	125.03 $\pm$ 24.02**	76.98 $\pm$ 12.74**	45.09 $\pm$ 5.69**	8.17 $\pm$ 0.44	50.87 $\pm$ 3.14**	30.01 $\pm$ 2.58**	14.98 $\pm$ 2.75**
Control group	56	23.09 $\pm$ 1.74	168.77 $\pm$ 31.47#	94.76 $\pm$ 13.00#	67.01 $\pm$ 7.11#	8.22 $\pm$ 0.38	64.89 $\pm$ 2.81#	45.87 $\pm$ 3.11#	31.87 $\pm$ 4.84#

Note: Compared with the control group, * $P < 0.05$; compared with 1 d preoperatively, # $P < 0.05$.

3 讨论

全髋关节置换手术是临床上比较常见的一种手术方式,多应用于股骨颈骨折、类风湿性关节炎、关节强直等疾病,具有很好的疗效。疼痛是一种伤害性刺激,通过炎症反应、机械性刺激、化学应激反应等共同导致的结果^[13]。特别是手术切口处局部组织发生炎症反应,可激活外周神经传导,经脊髓后由下丘脑传递冲动到大脑皮质中央感觉区,然后在中枢神经系统形成疼痛感^[14]。术后疼痛可直接影响患者术后康复进程,使机体的消化、内分泌、循环、免疫、凝血等系统发生改变,且剧烈的疼痛可以造成精神创伤,直接关系到患者的预后恢复情况^[15,16]。本研究显示两组的性别、年龄、麻醉时间、手术时间与术中出血量等对比差异无统计学意义,研究组的术后住院时间显著短于对照组,与高翔^[17]等人的研究类似,该学者比较三种常见麻醉方式对全髋关节置换术的老年患者术后转归的影响,结果显示与全身麻醉组比较,腰麻-连续硬膜外麻醉组和腰丛-坐骨神经阻滞组麻醉操作时间明显延长,术中出血量明显减少,手术时间明显缩短,术后 24 h 静脉自控镇痛用药量明显减少,下床活动时间和术后住院时间均明显缩短,而腰麻-连续硬膜外麻醉组和腰丛-坐骨神经阻滞组各指标差异均无统计学意义。两组术后 1 d、3 d、7 d 的 VAS 评分都低于术前 1 d, 观察组也都显著低于对照组,与魏凤香^[18]等学者的研究类似,该学者探讨与比较静脉与硬膜外自控镇痛对老年髋关节置换术患者术后镇静、舒适度及不良反应影响,结果显示硬膜外自控镇痛患者术后 4 h、8 h、12 h、24 h 与 48 h 的静息状态 VAS 评分均显著性低于静脉自控镇痛, 术后 12 h、24 h 与 48 h 的活动状态 VAS 评分均显著低于静脉自控镇痛,表明超声引导下硬膜外阻滞在老年髋关节置换手术中的应用能提高患者的镇痛效果,从而促进患者康复,且不影响手术进程。从机制上分析,静脉持续镇痛为常见的麻醉方法,具有对肌力影响小、操作简便等优点,但是具有比较多的不良反应,镇痛效果和不良反应常难以平衡^[19]。硬膜外阻滞对患者的血流动力学影响比较小,能促进患者术后恢复,也

能够有效降低并发症的发生率。而超声引导可以直视神经结构、局麻药扩散情况、穿刺针及导管的位置,可提高阻滞效果^[20]。当前也有研究表明超声引导下硬膜外阻滞可减少手术切口炎症因子,使患者的疼痛阈值稳定在较高水平,从而达到满意的镇痛效果^[21,22]。

本研究显示研究组术后 1 d、3 d 与 7 d 的髋关节活动度都显著高于对照组,与陆卫萍^[23]等人的研究类似,对比腰硬联合麻醉与硬膜外麻醉用于老年髋关节置换术的麻醉效果,结果显示联合组 Bromage 评分 3 分者所占比例显著高于对照组,1 分者所占比例显著低于对照组,但与本研究不同但是没有应用超声引导。本研究表明超声引导下硬膜外阻滞在老年髋关节置换手术中的应用能促进患者髋关节功能的恢复。从机制上分析,全髋关节置换术后患者的疼痛发生机制情况复杂,传统镇痛方法很难控制患者的疼痛,反而有导致患者心理上、精神上受到创伤,不利于患者髋关节功能的恢复^[24]。特别是机体的免疫系统与神经内分泌系统可以进行互相影响,麻醉药物的使用可促进机体加速合成与释放肾上腺皮质激素,形成应激反应。过度的应激反应可导致机体在围手术期出现情绪紧张与牵拉反应,影响手术效果^[25]。并且术后剧烈疼痛往往导致患者无法主动配合早期康复训练,导致关节挛缩、骨质疏松、肌肉萎缩等,从而影响髋关节功能的恢复^[26]。当前也有研究显示超声引导下硬膜外阻滞可使镇痛效果持续时间延长,可同时阻断痛觉在脊髓水平的上行传导通路,可改善患者围手术期的主观体验,提高康复的依从性^[27]。特别是超声的应用可获得准确定位,进针点远离神经血管鞘,保护了神经,可获得良好的阻滞效果^[28]。本研究显示研究组术后 1 d、3 d、7 d 的血清 SP、PGE2 含量都高于术前 1 d, 观察组低于对照组,焦相等^[29]学者的研究与本研究也类似,探究超声引导下肢神经阻滞用于老年髋关节置换术的镇痛、抗炎、抗氧化效果,结果显示超声引导下肢神经阻滞麻醉血清中疼痛介质 PGF2、SP、神经肽 Y 的含量低于全身麻醉组。表明超声引导下硬膜外阻滞在老年髋关节置换手术中的应用能抑制血清 SP、PGE2 的释放。从机制上分析,髋关节置换术后疼痛

的本质是手术损伤引起的急性伤害感受性疼痛,一方面组织损伤后,伤害性刺激经 C 纤维传入,致使脊髓背角神经元兴奋性升高,并释放神经递质或神经调质,这些神经递质或神经调质作用于相应的受体,形成中枢敏感化^[30]。另一方面损伤细胞释放炎症介质,使伤害性感觉器初级感觉神经元的传导敏感性增加,激活外周伤害性感受器。两者共同促使了痛觉过敏状态的形成,增加了机体对伤害性刺激的反应^[31]。静脉镇痛虽然操作简单,但是对术后的疼痛控制效果不佳,且易导致呼吸抑制、恶心呕吐等不良反应^[32]。SP 和 PGE2 是与疼痛产生密切相关神经递质,后者是由环氧合酶催化花生四烯酸后生成的促炎介质,前者是一类速激肽并且能够降低周围组织的疼痛阈值^[33]。两者都是与疼痛产生密切相关的细胞因子,也具有痛觉致敏作用^[34]。超声引导下硬膜外阻滞可减少外周和中枢疼痛敏感化,防止血管性前列腺素、前列腺素和血栓素 A2 的合成,提高痛阈、抑制中枢痛觉超敏^[35]。也可以抑制创伤组织化学物质及酶的释放,减少机体的应激反应,能避免使用镇痛药物产生的不良反应,从而有利于降低血清 SP、PGE2 的释放^[36]。本研究也存在一定的不足,没有进行长时间的随访调查,研究病例数较少,没有对超声直视下的药物的具体扩散范围进行测定,可能存在研究偏倚,将在后续研究中深入探讨。

总之,超声引导下硬膜外阻滞在老年髋关节置换手术中的应用能抑制血清 SP、PGE2 的释放,能缓解患者术后疼痛,促进髋关节功能的恢复,缩短患者的康复时间。

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