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超声引导下腰骶丛神经阻滞联合全身麻醉对老年髋关节置换术患者认知功能、氧化应激和血流动力学的影响*

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摘要 目的：探讨超声引导下腰骶丛神经阻滞联合全身麻醉对老年髋关节置换术患者认知功能、氧化应激和血流动力学的影响。**方法：**选取 2018 年 1 月 ~2020 年 1 月期间我院收治的 80 例行髋关节置换术的老年患者，采用随机数字表法分为对照组（全身麻醉）和研究组（全身麻醉基础上联合超声引导下腰骶丛神经阻滞）各 40 例。比较两组患者认知功能、氧化应激、血流动力学、疼痛情况及不良反应。**结果：**两组麻醉前 ~ 术毕清醒时心率（HR）、平均动脉压（MAP）、脉搏血氧饱和度（SpO_2）均呈先下降后升高趋势（P<0.05）；研究组麻醉 10 min 后 SpO_2、MAP、HR 高于对照组（P<0.05）。两组术前 1 d~ 术后 3 d 超氧化物歧化酶（SOD）呈降低后升高趋势，丙二醛（MDA）呈升高后降低趋势（P<0.05）；研究组术后 1 d、术后 3 d 的 SOD 高于对照组，MDA 低于对照组（P<0.05）。两组术前 1 d~ 术后 3 d 简易智能状态量表（MMSE）评分呈先降低后升高趋势，但研究组术后 1 d、术后 3 d 评分高于对照组（P<0.05）。两组不良反应发生率对比无差异（P>0.05）。研究组术后 1 h、术后 12 h、术后 24 h 视觉疼痛模拟评分法（VAS）评分低于对照组（P<0.05）；两组术后 48 h VAS 评分比较无差异（P>0.05）。**结论：**老年髋关节置换术中应用超声引导下腰骶丛神经阻滞联合全身麻醉，可有效减轻机体血流波动、氧化应激以及对认知功能的损害，同时还可减轻患者术后早期疼痛，且安全性较好。

关键词：超声引导；腰骶丛神经阻滞；全身麻醉；老年；髋关节置换术；认知功能；氧化应激；血流动力学

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Effects of Lumbosacral Plexus Block Combined with General Anesthesia under Ultrasound Guidance on Cognitive Function, Oxidative Stress and Hemodynamics in Elderly Patients Undergoing Hip Replacement*

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ABSTRACT Objective: To investigate the effects of lumbosacral plexus block combined with general anesthesia on cognitive function, oxidative stress and hemodynamics in elderly patients undergoing hip replacement. **Methods:** From January 2018 to January 2020, 80 elderly patients who underwent hip replacement in our hospital were selected, they were randomly divided into control group (general anesthesia) and study group (lumbosacral plexus block under the guidance of ultrasound on the basis of general anesthesia), 40 cases in each group. The cognitive function, oxidative stress, hemodynamics, pain condition and adverse reactions were compared between the two groups. **Results:** The heart rate (HR), mean arterial pressure (MAP) and pulse oxygen saturation (SpO_2) of the two groups decreased and then increased at 10 minutes after anesthesia ~ awake after operation (P<0.05). SpO_2, MAP and HR of the study group were higher than those of the control group at 10 minutes after anesthesia(P<0.05). Superoxide dismutase (SOD) of the two groups decreased and then increased from 1 d before operation to 3 d after operation, malondialdehyde (MDA) increased and then decreased (P<0.05). SOD of the study group was higher than that of the control group at 1 d after operation and 3 d after operation, MDA was lower than those of the control group (P<0.05). The scores of mini-mental state examination (MMSE) of the two groups decreased first and then increased at 1 d before operation and 3 d after operation, but the scores of the study group 1d after operation and 3 d after operation were higher than those of the control group (P<0.05). There was no significant difference in the incidence of adverse reactions between the two groups (P>0.05). The visual analogue scale (VAS) score of the study group were lower than that of the control group at 1 h, 12 h and 24 h after operation (P<0.05). There was no significant difference between the two groups at 48 h after operation (P>0.05). **Conclusion:** Ultrasound-guided lumbosacral plexus block combined with general anesthesia can effectively reduce blood flow fluctuation, oxidative stress and cognitive impairment in elderly patients with hip arthroplasty, meanwhile, it can also reduce early postoperative pain, with good safety.

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前言

髋关节置换术是指针对患有严重关节疾病，髋关节部分结构已经无法达到它的功能要求的患者，采用模拟人体关节结构的材料置换病损的关节，以改善髋关节功能的一种治疗术式[1,2]。髋关节置换术现今已有几十年历史，是一种成熟的骨科手术，广泛应用于临床[3]。但随着社会老龄化的进程加快，高龄、多系统合并症的髋关节置换术患者不断增加，老年患者机体功能衰退，耐受性差，其围手术期麻醉风险明显高于年轻群体[4,5]。全身麻醉为实施髋关节置换术的常用麻醉方案，镇静、镇痛效果确切[6]。但此类麻醉方式会对机体呼吸系统、循环系统产生一定的负面影响，不利于患者术后早期康复。超声引导下腰骶丛神经阻滞在老年患者手术麻醉中具有一定优势，可对手术区域的伤害性刺激产生一定的阻滞作用，可减少循环抑制，有助于患者术后尽早进行康复训练[7,8]。本研究通过对我院收治的部分老年髋关节置换术患者麻醉方案给予超声引导下腰骶丛神经阻滞联合全身麻醉，取得了较好的疗效，现整理报道如下。

1 资料与方法

1.1 基线资料

选取 2018 年 1 月 ~2020 年 1 月期间我院收治的行髋关节置换术的老年患者 80 例，纳入标准：(1)均具备手术指征，择期行髋关节置换术的老年患者；(2) 均为首次行髋关节置换术治疗者；(3)美国麻醉医师协会(American Society of Anesthesiologists，ASA)[9]分级为 I~II 级者；(4)知情本研究且签署同意书。排除标准：(1)阻滞区域存在感染者；(2)合并感染、免疫缺陷者；(3)存在凝血功能障碍者；(4)患有精神疾病或认知功能障碍者；(5)对本次用药方案存在禁忌者；(6)存在长期服用阿片类药物史者。采用随机数字表法分为对照组(全身麻醉)和研究组(全身麻醉基础上联合超声引导下腰骶丛神经阻滞)，各 40 例。其中对照组男 22 例，女 18 例，年龄 60~83 岁，平均(71.65± 3.46)岁；ASA 分级：I 级 24 例，II 级 16 例；体质量指数 19.6~25.3 kg/m^2，平均(22.91± 0.75)kg/m^2。研究组男 23 例，女 17 例，年龄 61~80 岁，平均(71.09± 4.25)岁；ASA 分级：I 级 20 例，II 级 20 例；体质量指数 20.2~25.6 kg/m^2，平均(22.74± 0.65)kg/m^2。两组一般资料比较无差异(P>0.05)，组间具有可比性。此次研究已获得我院伦理委员会批准进行。

1.2 方法

两组患者术前常规禁饮禁食，入室后打开静脉通道，输注复方乳酸钠林格氏液，常规进行血氧饱和度、心电、心率、血压等监测。麻醉诱导：两组患者均给予全身麻醉，依次静脉推注依托咪酯(江苏恩华药业股份有限公司，国药准字 H32022992，规格：10 mL: 20 mg)0.3 mg/kg 舒芬太尼（宜昌人福药业有限责任公司，国药准字 H20064171，规格：按 $C_{22}H_{30}N_2O_2S$ 计 1 mL: 50 μg)0.4 μg/kg、顺式阿曲库铵[浙江仙琚制药股份有限公司，国药准字 H20090202，规格：5 mg (以顺阿曲库铵计)]0.15 mg/kg、，诱导成功后气管插管，连接麻醉机行机械控制通气，调整呼吸机参数。麻醉维持：采用微量泵泵注丙泊酚(四川国瑞药业有限责任公司，国药准字 H20030114，规格：50 mL:0.5 g)4~8 mg/kg·h、瑞芬太尼 [江苏恩华药业股份有限公司，国药准字 H20143315，规格：2 mg (以瑞芬太尼 $C_{20}H_{28}N_2O_5$ 计]0.1~0.2 μg/kg·min、顺式阿曲库铵 0.1~0.15 mg/kg·min，术中维持脑电双频谱指数 45~55，根据具体情况适当使用血管活性药维持生命征平稳。研究组则在全身麻醉前给予超声引导下腰骶丛神经阻滞，具体操作如下：采用德国 DWL 公司生产的 MDX TCD-7 型便携式超声仪，取患肢在上侧卧位，超声引导下将 0.5%的甲磺酸罗哌卡因注射液[宜昌人福药业有限责任公司，国药准字 H20103636，规格：10 mL:100 mg(按盐酸罗哌卡因计)]20 mL 注射于腰丛(L3-4)神经，同时在骶丛神经处注射 0.5%的甲磺酸罗哌卡因注射液 15 mL，完成腰骶丛神经阻滞。待患者阻滞区域痛觉消失后实施全身麻醉。

1.3 观察指标

(1)认知功能：于术前 1 d、术后 1 d、术后 3 d 采用简易智能状态量表(Mini-mental state examination，MMSE)[10]评价患者认知功能。MMSE 共 30 个评条，总分 30 分，分数越高，认知功能越好。(2)氧化应激：于术前 1 d、术后 1 d、术后 3 d 抽取患者 5 mL 肘静脉血，经 3600 r/min 离心 15 min，离心半径 13 cm，分离上清液待测。超氧化物歧化酶(Superoxide dismutase，SOD)水平检测采用黄嘌呤氧化酶法，丙二醛(malondialdehyde，MDA)水平检测采用硫代硫酸巴比妥法，试剂盒购自上海桑戈生物科技有限公司，严格遵守试剂盒说明书进行操作。(3)血流动力学：记录两组麻醉前、麻醉 10 min 后、术毕清醒时的心率(Heart rate，HR)、平均动脉压(Mean arterial pressure，MAP)、脉搏血氧饱和度(Saturation of pulse oxygen，SpO_2)情况。(4)安全性评价：记录两组围术期不良反应发生情况。(5)镇痛效果：记录两组患者术后 1 h、术后 12 h、术后 24 h、术后 48 h 的视觉疼痛模拟评分法(Visual analogue scale，VAS)[11]评分，其中 VAS 评分 0~10 分，分数越高，疼痛感越强。

1.4 统计学方法

采用 SPSS24.0 处理数据，计量资料以($\bar{x}\pm s$)表示，实施 t 检验，计数资料以率(%)表示，实施 x^2 检验，将α=0.05 作为检验标准。

2 结果

2.1 两组血流动力学指标比较

两组麻醉前 SpO_2、MAP、HR 比较未见统计学差异(P>0.05)；两组麻醉前～术毕清醒时 SpO_2、MAP、HR 均呈现下降后升高趋势(P<0.05)；研究组麻醉 10 min 后 SpO_2、MAP、HR 高于对照组(P<0.05)；两组术毕清醒时 SpO_2、MAP、HR 组间比较差异未见统计学意义(P>0.05)；详见表 1。

表 1 两组血流动力学指标比较($\bar{x}\pm s$)

Table 1 Comparison of hemodynamic indexes between the two groups($\bar{x}\pm s$)

Groups	Time	SpO_2(%)	MAP(mmHg)	HR(beats/min)
Control group(n=40)	Before anesthesia	98.29± 7.32	87.22± 6.27	85.59± 6.56
	10 minutes after anesthesia	87.15± 6.23*	77.12± 6.25*	75.64± 5.47*
	Awake after operation	98.93± 0.39$^{\&}$	86.16± 7.29$^{\&}$	84.09± 5.27$^{\&}$
Study group(n=40)	Before anesthesia	98.16± 6.21	87.41± 6.21	86.02± 7.24
	10 minutes after anesthesia	93.20± 5.95*$^{\#}$	82.73± 5. 71*$^{\#}$	81.20± 6.35*$^{\#}$
	Awake after operation	97.06± 6.88$^{\&\#}$	86.35± 7.64$^{\&\#}$	85.68± 5.29$^{\&\#}$

Notes: compared with before anesthesia, *P<0.05; compared with 10 minutes after anesthesia, $^{\&}P$<0.05; compared with the control group, $^{\#}P$<0.05.

2.2 两组氧化应激指标比较

两组术前 1 d SOD、MDA 比较未见统计学差异(P>0.05)；两组术前 1 d~ 术后 3 d SOD 呈降低后升高趋势，MDA 呈升高后降低趋势(P<0.05)；研究组术后 1 d、术后 3 d SOD 高于对照组，MDA 低于对照组(P<0.05)；详见表 2。

表 2 两组氧化应激指标比较($\bar{x}\pm s$)

Table 2 Comparison of oxidative stress indexes between the two groups($\bar{x}\pm s$)

Groups	Time	SOD(U/mL)	MDA(nmoL/mL)
Control group(n=40)	1 d before operation	68.33± 6.27	6.31± 1.28
	1 d after operation	53.75± 5.34*	21.84± 1.73*
	3 d after operation	60.19± 7.36*$^{\&}$	15.41± 1.49*$^{\&}$
Study group(n=40)	1 d before operation	68.59± 6.25	6.25± 1.55
	1 d after operation	63.62± 5.91*$^{\#}$	14.93± 1.16*$^{\#}$
	3 d after operation	68.21± 6.87$^{\&\#}$	7.01± 1.82*$^{\&\#}$

Notes: compared with 1 d before operation, *P<0.05; compared with 1 d after operation, $^{\&}P$<0.05; compared with the control group, $^{\#}P$<0.05.

2.3 两组认知功能比较

两组术前 1 d MMSE 评分比较差异未见统计学意义(P>0.05)；两组术前 1 d~ 术后 3 d MMSE 评分呈先降低后升高趋势，但研究组高于对照组(P<0.05)；详见表 3。

表 3 两组认知功能比较($\bar{x}\pm s$，分)

Table 3 Comparison of cognitive function between the two groups($\bar{x}\pm s$, scores)

Groups	1 d before operation	1 d after operation	3 d after operation
Control group(n=40)	27.34± 1.39	22.27± 1.25*	25.86± 1.65*$^{\&}$
Study group(n=40)	27.21± 1.26	24.83± 1.04*	26.97± 1.29$^{\&}$
t	0.438	9.957	3.352
P	0.662	0.000	0.001

Notes: compared with 1 d before operation, *P<0.05; compared with 1 d after operation, $^{\&}P$<0.05.

2.4 两组疼痛状况比较

研究组术后 1 h、术后 12 h、术后 24 h VAS 评分低于对照组（P<0.05)；两组术后 48 hVAS 评分比较未见统计学差异(P>0.05)；详见表 4。

表 4 两组疼痛状况比较($\bar{x}\pm s$，分)

Table 4 Comparison of pain condition between the two groups($\bar{x}\pm s$, scores)

Groups	1 h after operation	12 h after operation	24 h after operation	48 h after operation
Control group(n=40)	4.41± 0.92	3.63± 0.83^{a}	2.62± 0.73^{ab}	1.46± 0.52^{abc}
Study group(n=40)	3.53± 0.88	2.49± 0.61^{a}	1.75± 0.64^{ab}	1.37± 0.47^{abc}
t	4.372	7.001	5.668	0.812
P	0.000	0.000	0.000	0.419

Notes: compared with 1 h after operation, ^{a}P<0.05; compared with 12 h after operation, ^{b}P<0.05; compared with 24 h after operation, ^{c}P<0.05.

2.5 两组不良反应发生率比较

研究组围术期出现呼吸抑制 1 例、低血压 1 例、心动过速 1 例，不良反应发生率为 7.50%(3/40)；对照组围术期出现恶心呕吐 1 例、呼吸抑制 2 例、低血压 2 例、心动过速 1 例，不良反应发生率为 15.00%(6/40)；两组不良反应发生率对比未见统计学意义(x^2=1.127，P=0.288)。

3 讨论

髋关节置换术多见于老年群体，此类群体患者身体各项机能减退，且常合并多种慢性全身性的基础疾病，因而手术和麻醉的风险较高[12,13]。手术操作、麻醉药物的刺激除了可引起机体不程度的应激反应，造成血流波动，还可对患者认知功能产生一定影响[14]。全身麻醉是髋关节置换术的常用麻醉方式，近年来越来越多的研究发现，全身麻醉气管插管下行手术，具有镇痛不足、血流波动大、呼吸抑制、苏醒延迟等诸多不良反应[15,16]。骶丛神经主要支配大腿臀部和后方的感觉，而腰丛神经主要支配着大腿前方、外侧和内侧的感觉，故腰骶丛神经阻滞基本可以满足髋部手术的要求[17,18]。由于腰骶丛神经位置较深，采用传统的解剖标志定位并不精准，同时，由于韧带钙化、脊柱变形等原因，麻醉穿刺存在一定困难，难以达到良好的阻滞效果[19,20]。而超声引导下腰骶丛神经阻滞是在超声仪引导下直接阻滞神经周围，有助于局部麻醉药安全快速地达到相应神经干丛周围[21,22]。

本次研究结果显示，两组患者手术期间均存在不同程度的血流波动及氧化应激反应，但应用超声引导下腰骶丛神经阻滞联合全身麻醉者的波动明显更轻，氧化应激反应更小。全身麻醉仅可产生中枢神经系统的暂时抑制，而超声引导下腰骶丛神经阻滞可强化全身麻醉效果，弥补手术区域的刺激神经未被阻断的缺憾，有效阻断外周损伤冲动向中枢传导，获取超前镇痛效果，减少术中儿茶酚胺的分泌，从而维持血流动力学的稳定性，减轻氧化应激反应[23-25]。同时，超声引导下腰骶丛神经阻滞还可减少全麻药物的使用剂量，减少因大剂量麻醉药物出现的循环功能异常情况[26]。国内不少研究证实[27,28]，局部麻醉方式可能会影响患者的认知功能。因此，术后患者认知功能的影响也是决定麻醉方案效果的关键之一。本研究中研究组患者认知功能受到的影响较对照组轻。原因可能是因为联合麻醉方案可更有效的降低机体氧化应激反应，维持机体正常循环功能，继而避免患者神经功能进一步受损[29]。同时本次研究结果还显示，超声引导下腰骶丛神经阻滞联合全身麻醉可减轻患者术后早期疼痛，这主要是因为腰骶丛神经阻滞可有效阻滞支配髋部的神经，使得大部分的疼痛刺激得到有效控制[30]。另两组不良反应发生率对比未见统计学差异，可见该联合麻醉方案安全性可靠。

综上所述，老年髋关节置换术中应用超声引导下腰骶丛神经阻滞联合全身麻醉，可有效减轻机体血流波动、氧化应激以及对认知功能的损害，同时还可减轻患者术后早期疼痛，且安全性较好。

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