

doi: 10.13241/j.cnki.pmb.2022.02.021

小剂量罗哌卡因复合舒芬太尼硬膜外麻醉对高龄产妇分娩镇痛效果评估*

李江玉 戴庆[△] 艾克拜尔·努尔买买提 李玉倩 何金盼

(新疆医科大学第一附属医院麻醉科 新疆 乌鲁木齐 830000)

摘要 目的:评估小剂量罗哌卡因复合舒芬太尼硬膜外麻醉对高龄产妇分娩镇痛效果。**方法:**选取我院 2019 年 1 月-2020 年 12 月共收治的 80 例高龄无痛分娩产妇作为研究对象,对照组产妇应用罗哌卡因进行硬膜外麻醉;观察组产妇应用小剂量罗哌卡因复合舒芬太尼硬膜外麻醉,对比两组镇痛效果、VAS 评分、Bromage 评分、自控镇痛追加次数、产程时间、24 h 的新生儿窒息情况与 24 h 泌乳量评分情况。**结果:**观察组镇痛效果明显优于对照组($P<0.05$);观察组产妇的 VAS 评分在三个产程时间内评分较对照组低($P<0.05$);观察组产妇第一产程和第二产程的 Bromage 评分略低于对照组,但对比差异不显著($P>0.05$),第三产程观察组的 Bromage 评分明显较对照组低;观察组产妇的自控镇痛追加次数较对照组低($P<0.05$);观察组的第一产程和第二产程时间明显低于对照组($P<0.05$);观察组产妇产后 24 h 泌乳量评分优于对照组($P<0.05$);观察组新生儿窒息比例略低于对照组,但是并无显著差异($P>0.05$)。**结论:**对高龄产妇分娩应用小剂量罗哌卡因复合舒芬太尼硬膜外麻醉镇痛效果显著,镇痛追加药剂量少,产程时间短,安全有效,有利于产妇产后分泌母乳,值得临床应用推广。

关键词:小剂量罗哌卡因;舒芬太尼;硬膜外麻醉;高龄产妇

中图分类号:R714;R614 文献标识码:A 文章编号:1673-6273(2022)02-310-05

Effect of Low Dose Ropivacaine Combined with Sufentanil Epidural Anesthesia on Labor Analgesia in Elderly Women*

LI Jiang-yu, DAI Qing[△], AIKEBAIER Nuermaimaiti, LI Yu-qian, HE Jin-pan

(Anesthesiology department, First Affiliated Hospital of Xinjiang Medical University, Urumqi, Xinjiang, 830000, China)

ABSTRACT Objective: To evaluate the effect of low-dose ropivacaine combined with sufentanil epidural anesthesia on labor analgesia in elderly women. **Methods:** 80 elderly painless parturients admitted to our hospital from January 2019 to December 2020 were selected as the study objects. The control group was given ropivacaine for epidural anesthesia; the observation group was given low-dose ropivacaine combined with sufentanil for epidural anesthesia. The analgesic effect, VAS score, Bromage score, additional times of PCEA, duration of labor, the asphyxia and 24-hour lactation score of the newborn at 4 hours were compared between the two groups. **Results:** The analgesic effect of the observation group was significantly better than that of the control group, the difference was not significant ($P>0.05$), the Bromage score of the third labor process was different in the two groups ($P>0.05$); the Bromage scores of the first and second stages of labor in the observation group were slightly lower than those in the control group, but the difference was not significant ($P>0.05$). the additional times of PCEA in the observation group was significantly lower than that of the control group ($P<0.05$); the time of the first labor process and the second labor process was different in the two groups ($P<0.05$). The score of 24 h postpartum lactation in the observation group was compared with the control group ($P<0.05$). The proportion was slightly lower than that of the control group, but there was no significant difference ($P>0.05$). **Conclusion:** Low dose ropivacaine combined with sufentanil is effective in epidural analgesia for the elderly parturient. It is safe and effective for the parturient to secrete breast milk after childbirth. It is worthy of clinical application.

Key words: Low dose ropivacaine; Sufentanil; Epidural anesthesia; Elderly parturient

Chinese Library Classification(CLC): R714; R614 **Document code:** A

Article ID: 1673-6273(2022)02-310-05

前言

无痛分娩是一种通过麻醉、电击等方式减轻产妇分娩时疼痛程度的方法,又称为分娩镇痛。因受子宫收缩、产道牵拉或损

伤、负面情绪等多种因素影响,产妇自然分娩时会出现剧烈疼痛,大大增加了分娩痛苦^[1-3]。随着二胎政策的全面开放,高龄产妇的数量逐渐增加,与适龄产妇相比较来说,高龄产妇由于宫颈较为坚韧,一方面容易出现高危妊娠和难产的风险,另一方

* 基金项目:新疆维吾尔自治区自然科学基金项目(2021D01C309)

作者简介:李江玉(1990-),女,本科,住院医师,研究方向:产科麻醉,电话:18309915603, E-mail:li183099@163.com

△ 通讯作者:戴庆(1983-),男,硕士,主治医师,研究方向:产科麻醉,电话:13999419191, E-mail:37652118@qq.com

(收稿日期:2021-06-05 接受日期:2021-06-29)

面在分娩过程中也易出现更大痛苦^[4-6]。因此围生期中有效的麻醉方法,能促进产妇平稳度过围生期,并减少分娩带来的痛苦^[7,8]。临床上常用于无痛分娩的药物主要为麻醉药物和镇痛药物^[9,10]。罗哌卡因是新型长效酰胺类麻醉药,研究表明,该药物能够阻滞运动神经,同时对于人体心脏及中枢损伤较小;而舒芬太尼经血脑屏障与血浆蛋白的有效结合,其镇痛作用较强,并且能够持续较长的时间,但舒芬太尼硬膜外麻醉镇痛的镇痛效果不明显^[11-15]。相关研究表明,应用小剂量罗哌卡因复合舒芬太尼硬膜外麻醉能够显著提高高龄产妇的分娩镇痛效果,但目前在国内,该麻醉治疗高龄产妇相关研究甚少^[16]。因此,本文选取我院 2019 年 1 月-2020 年 12 月共收治的 80 例高龄无痛分娩产妇作为研究对象,研究该麻醉方法对于高龄产妇分娩的镇痛效果,以期减缓此类患者的痛感提供参考。

1 资料与方法

1.1 一般资料

选取我院 2019 年 1 月-2020 年 12 月共收治的 80 例高龄无痛分娩产妇,随机分为观察组与对照组,每组产妇 40 例。

纳入标准:所有入选产妇(1)均知情并签署知情同意书;(2)足月妊娠、无肢体语言障碍;(3)无麻醉禁忌症;(4)无多胎情况、胎儿无发育异常情况;(5)经产科医生评估可以进行阴道分娩的产妇。

排除标准:(1)患有麻醉禁忌症;(2)有精神疾病史。

1.2 方法

两组产妇均进行硬膜外麻醉,产妇在手术床上采取侧卧位,常规消毒、铺巾和局麻后于 L₂₋₃ 或者 L₁₋₂ 处行硬膜外穿刺,待穿刺针到达黄韧带后,当阻力突然消失、出现负压及无脑脊液流出等现象,确定针尖已进入硬膜外间隙,之后将针蒂小缺口转向头侧,再经针蒂插入硬膜外导管。最后调整好导管在硬膜外长度,在导管尾端接上注射器,回抽无血液或脑脊液后,注入少许生理盐水,无阻力,表示导管通畅,位置正确,即可固定导管。从硬膜外导管推注 2%,3 mL 的盐酸利多卡因(河北天成药业股份有限公司,规格:5 mg:100 mg,批准文号:国药准字 H13022313)试验量,注入试验剂量后观察 5-10 分钟,确定产妇无全脊麻的征象之后,观察组产妇,连接 0.08%盐酸罗哌卡因(AstraZeneca AB 生产,规格:10 mL:100 mg,批准文号:注册证号 H20140764)100 mg+ 枸橼酸舒芬太尼注射液 50 μ g(湖北宜昌人福药业有限责任公司生产,规格:1 mL:50 μ g,批准文号:国药准字 H20054171)的硬膜外 125 mL 的脉冲电子镇痛泵,输注混合麻醉药。将泵注剂量设置为:首剂量为 0.1 mL/kg,维持剂量为 0.1 mL/kg/h,自控量为 8 mL/h,锁定时间为 1 小时。对

照组产妇,连接 0.1%罗哌卡因 100 mg 的硬膜外 100 mL 的脉冲电子镇痛泵,输麻醉药。将泵注剂量设置为:首剂量为 10 mL,维持剂量为 10 mL/h,自控量为 8 mL/h,锁定时间为 1 小时。待痛觉阻滞达到 T8~T10 椎间隙的水平、孕妇分娩结束后,停止为其注药。

1.3 观察指标与评定标准

1.3.1 疼痛程度 观察两组产妇不同产程的 VAS 评分,采用视觉模拟量表(Visual analogue scale, VAS)评价疼痛程度^[3]:使用 0 至 10 共 11 个数字表示产妇的疼痛程度,其中 0 代表无痛,10 代表最痛,指导产妇从中选取 1 个数字,以表示自身的疼痛程度。

1.3.2 Bromage 评分 运动神经阻滞评分(Bromage 评分)^[14]:0 级,无运动神经阻滞;1 级,不能抬腿;2 级,不能弯曲膝部;3 级,不能弯曲踝关节;整个分娩过程 VAS 评分超过 3 分,患者可根据需要自行自控镇痛,并记录自控镇痛次数。不同的产程包括第一、第二、第三产程。

1.3.3 24 h 的新生儿窒息情况与 24 h 泌乳量评分 手法挤奶没有乳汁流出为 0 分;手法挤奶有乳汁流出,但不能满足新生儿需求,需要添加一些配方奶粉为 1 分;手法挤奶有乳汁流出,哺乳之后新生儿持续入睡时间大于 3 小时,排尿次数大于 6 次为 2 分;经过手法挤奶乳汁呈现喷射状态,并再哺乳之后,乳汁没有排空为 3 分^[9]。

1.3.4 评定标准 无痛:产妇伴有轻微疼痛感,但可忍受,睡眠和生活不受到影响;中度疼痛:产妇有明显疼痛感,且无法忍受,需要服用止痛药进行镇痛,会对睡眠和生活产生影响;重度疼痛:产妇疼痛感严重,无法忍受,需要大剂量的止痛药物在进行镇痛,无法正常睡眠和生活,会伴随被动体位和植物神经紊乱^[6]。总有效率 = 中度疼痛率 + 无痛率。

1.4 统计学方法

采用 SPSS20.0 软件分析数据,以($\bar{x} \pm s$)表示 VAS 评分、Bromage 评分、自控镇痛追加次数和产程时间,采取 t 检验;以[n(%)]表示镇痛效果,采取 χ^2 检验。以 $P < 0.05$ 差异具有统计学意义。

2 结果

2.1 一般临床资料比较

本次研究合计纳入 80 例病例,将两组患者的一般临床资料诸如平均年龄、孕周、平均体重、产次等纳入研究并实施组间差异性比较,结果显示两组上述资料对比无差异($P > 0.05$),有可比性,如表 1 所示。

表 1 患者一般资料对比
Table 1 Comparison of general clinical data

Groups	n	Average age (years)	Gestational week (week)	Average weight (kg)	Delivery times(n)	
					Primiparity	Multiparity
Observation group	40	38.4 $\pm$ 2.5	38.2 $\pm$ 2.5	62.2 $\pm$ 7.5	12	28
Control group	40	37.1 $\pm$ 2.4	38.5 $\pm$ 2.6	64.8 $\pm$ 7.6	11	29

2.2 产妇镇痛效果对比

观察组患者镇痛的总有效率为 87.5%,对照组镇痛总有效

率为 67.5%,观察组镇痛效果明显优于对照组($P < 0.05$)。如表 2。

表 2 产妇的镇痛效果对比分析表[n(%)]
Table 2 Comparison analysis of analgesic effect [n (%)]

Groups	n	Severe pain	Moderate pain	Mainless	Total effective rate
Observation group	40	5(12.5%)	17(42.5%)	18(45.0%)	35(87.5%)*
Control group	40	13(32.5%)	18(45.0%)	9(22.5%)	27(67.5%)

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

2.3 产妇不同产程的 VAS 评分、Bromage 评分与自控镇痛追加次数对比分析

观察组产妇的 VAS 评分在三个产程时间内评分较对照组低($P<0.05$);观察组产妇第一产程和第二产程的 Bromage 评

分略低于对照组,但对比差异不显著($P>0.05$),第三产程观察组的 Bromage 评分较对照组低($P<0.05$);观察组产妇的自控镇痛追加次数较对照组低($P<0.05$),如表 3 所示。

表 3 产妇不同产程的 VAS 评分、Bromage 评分与自控镇痛追加次数对比分析($\bar{x}\pm s$)
Table 3 Comparison of VAS score, Bromage score and additional times of controlled analgesia at different stages of labor ($\bar{x}\pm s$)

Groups	n	VAS score (points)			Bromage score (points)			Additional times of controlled analgesia (times)
		The first labor	The second labor	The third labor	The first labor	The second labor	The third labor	
Observation group	40	1.21± 0.11*	2.83± 1.53*	0.92± 0.31*	0.67± 0.21	0.52± 0.24	0.34± 0.16*	1.36± 0.35*
Control group	40	2.35± 1.24	3.92± 1.41	1.62± 0.23	0.73± 0.24	0.69± 0.21	0.42± 0.18	3.49± 1.26

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

2.4 产妇产程时间对比分析

观察组的第一产程和第二产程时间较对照组低($P<0.05$)。

如表 4。

表 4 产妇产程时间对比分析($\bar{x}\pm s$)
Table 4 Comparison of the duration of labor between ($\bar{x}\pm s$)

Groups	n	The first labor	The second labor	The third labor
Observation group	40	287.35± 43.27*	58.75± 22.51*	8.67± 2.86
Control group	40	312.59± 46.04	72.47± 22.95	9.23± 2.97

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

2.5 产妇产后 24 h 的新生儿窒息情况与 24 h 泌乳量评分对比分析

观察组产妇产后 24 h 泌乳量评分优于对照组($P<0.05$);观察组新生儿窒息比例略低于对照组,但并无显著差异($P>0.05$)。

表 5 产妇产后 24 h 的新生儿窒息情况与 24 h 泌乳量评分对比分析
Table 5 Comparison and analysis of neonatal asphyxia and 24 h milk yield score of women after delivery

Groups	n	Neonatal asphyxia [n (%)]	Postpartum milk yield score at 24 h ($\bar{x}\pm s$)
Observation group	40	2(5.0%)	1.75± 0.51*
Control group	40	6(15.0%)	1.27± 0.25

3 讨论

随着经济和科技的不断发展,人们生活观念的转变以及辅助生育技术的成熟,我国的婚育年龄结构发生了巨大的改变,出现了明显的结婚年龄以及生育年龄的推迟现象。同时,近些年我国实施“全面二孩政策”,累计生育需求集中释放,高龄产妇的数量以及其所占的比例急剧增加^[17]。随着高龄产妇的逐渐增多,其相应的将会面临极大的妊娠风险,分娩并发症和合并症的发病率正在升高。因此,高龄产妇的自然分娩镇痛成为了当前临床医学中研究的重要方面。常规分娩不仅时间较长,分

娩过程中产妇产道受到挤压,分娩结束后会出现持续疼痛现象。而疼痛不仅会影响产妇的心理状态,也会导致机体大量释放儿茶酚胺,进而抑制宫缩,顺产时极易出现宫缩乏力现象,导致产程的延长,增加难产发生率。故近年来临床剖宫产率逐渐升高,无痛分娩在临床通过麻醉镇痛,减轻分娩疼痛程度,从而促进宫口打开,缩短产程^[18-20]。

无痛分娩是一种有效减轻分娩痛苦的分娩方式,在产妇分娩中采取一定的镇痛处理措施,对母婴产生积极的影响。其起源于国外,现如今在我国迅速普及,并且越来越多的产妇信赖并选择该技术进行分娩。无痛分娩主要通过药物麻醉达到镇痛

作用,减轻产妇的痛苦和疲惫,提高阴道分娩的安全性,明显减少产妇产后并发症发生的风险,在一定程度上促进了产妇的恢复,使产妇尽快康复出院。对于其麻醉药物的选择具有严格的要求,需同时具备较优的镇痛效果以及避免阻滞运动神经,从而提高母婴的安全性。若麻醉药物选择不当,将严重威胁产妇的生命^[21-23]。舒芬太尼在临床中使用普遍,作为一种人工合成的阿片类药物,其具有麻醉起效快、镇痛效果好等特点,适用于各种手术中^[24-26]。罗哌卡因属于一种新型的长效酰胺类局麻药,麻醉效果显著,能够有效抑制机体神经细胞的钠离子通道,阻断神经的兴奋传导,在合理的浓度控制下起到较好的感觉神经阻滞作用,且不会对机体运动造成不利的影响。低浓度(小剂量)的罗哌卡因即可在分娩过程中起到镇痛的作用,使感觉神经同运动神经分离,有效避免分娩后行走困难等情况^[27-29]。

本文研究结果表明,观察组镇痛效果明显优于对照组,这一结果与 Cheng Q 等人的研究相一致^[30],即小剂量罗哌卡因复合舒芬太尼硬膜外麻醉较单独使用罗哌卡因麻醉具有较好的镇痛效果。其原因为:在分娩过程中应用小剂量罗哌卡因复合舒芬太尼,药物作用时间持续较长,对中枢神经系统及心血管等正常组织器官影响较小,低浓度便可达到较高度度的阻滞、分离感觉与运动神经,从而达到镇痛的作用;观察组产妇的 VAS 评分在三个产程时间内评分较对照组低;观察组产妇第一产程和第二产程的 Bromage 评分略低于对照组,但对比差异不显著;观察组产妇第三产程的 Bromage 评分明显较对照组低;观察组产妇的自控镇痛追加次数较对照组低。查阅已有研究发现, Lu YY 等人的研究结果^[31]显示:罗哌卡因复合舒芬太尼的 VAS 评分, Bromage 评分较对照组低,该麻醉方式可提供快速有效的镇痛,且止痛剂较少,且不会增加对母婴的不良反应。分析其原因为,麻醉药物在发挥镇痛作用时,降低对肌张力的影响并达到最小,进而对产妇的行走活动无影响,能有效地降低新生儿胎心异常和产妇尿潴留的发生率,提高产妇分娩的安全性;观察组的第一产程和第二产程时间较对照组低;观察组产妇产后 24 h 泌乳量评分优于对照组,观察组新生儿窒息比例略低于对照组,但是并无显著差异,由此说明将小剂量罗哌卡因复合舒芬太尼硬膜外麻醉应用于要求无痛分娩产妇中,利于产妇乳汁分泌,可有效降低新生儿窒息发生率。Zhang L 等人的研究结果发现^[32]:硬膜外麻醉组患者视觉模拟量表评分、平均动脉压、心率均显著降低,患者满意度较高,与本文结果相似。以上结果提示:小剂量罗哌卡因复合舒芬太尼硬膜外麻醉方式的应用,能显著作用于高龄产妇的分娩镇痛,降低对产妇和新生儿的不利影响,对于分娩具有积极的作用。

总而言之,小剂量罗哌卡因复合舒芬太尼硬膜外麻醉对于高龄产妇分娩镇痛效果良好,而且产程过程中 VAS 评分较低,减少了自控镇痛追加次数,并减少产程时间,不会对产妇的乳汁分泌量产生负面影响,同时新生儿窒息情况发生率低,安全有效。

参考文献(References)

- [1] Broughton K, Clark AG, Ray AP. Nitrous Oxide for Labor Analgesia: What We Know to Date[J]. Ochsner J, 2020, 20(4): 419-421
- [2] Li CJ, Xia F, Xu SQ, et al. Concerned topics of epidural labor analgesia: labor elongation and maternal pyrexia: a systematic review[J]. Chin Med J (Engl), 2020, 133(5): 597-605
- [3] Kumagai A, Makino S, Takeda J, et al. Characteristics of labor-onset hypertension persist after neuraxial labor analgesia [J]. J Obstet Gynaecol Res, 2020, 46(1): 104-109
- [4] Wei CN, Deng JL, Dong JH, et al. The Median Effective Dose of Oxytocin Needed to Prevent Uterine Atony During Cesarean Delivery in Elderly Parturients[J]. Drug Des Devel Ther, 2020, 14(3): 5451-5458
- [5] Brilhante APCR, Jorge MSB. Institutional violence in high-risk pregnancy in the light of pregnant women and nurses[J]. Rev Bras Enferm, 2020, 73(5): e20180816
- [6] Gu SF, Li MQ, Li Y, et al. Acupuncture at Ciliao (BL 32) for prevention of postpartum urinary retention in elderly parturient women: a randomized controlled trial [J]. Zhongguo Zhen Jiu, 2020, 40 (6): 611-614
- [7] Ikeda T, Kato A, Bougaki M, et al. A retrospective review of 10-year trends in general anesthesia for cesarean delivery at a university hospital: the impact of a newly launched team on obstetric anesthesia practice[J]. BMC Health Serv Res, 2020, 20(1): 421
- [8] Qiu C, Lin JC, Shi JM, et al. Association Between Epidural Analgesia During Labor and Risk of Autism Spectrum Disorders in Offspring[J]. JAMA Pediatr, 2020, 174(12): 1168-1175
- [9] Liu ZH, Wang DX. Potential impact of epidural labor analgesia on the outcomes of neonates and children[J]. Chin Med J (Engl), 2020, 133 (19): 2353-2358
- [10] Silva YAP, Araújo FG, Amorim T, et al. Obstetric analgesia in labor and its association with neonatal outcomes [J]. Rev Bras Enferm, 2020, 73(5): e20180757
- [11] Olapour A, Akhondzadeh R, Rashidi M, et al. Comparing the Effect of Bupivacaine and Ropivacaine in Cesarean Delivery with Spinal Anesthesia[J]. Anesth Pain Med, 2020, 10(1): e94155
- [12] Zhao N, Xu J, Li XG, et al. Hemodynamic characteristics in preeclampsia women during cesarean delivery after spinal anesthesia with ropivacaine[J]. World J Clin Cases, 2020, 8(8): 1444-1453
- [13] Wang Y, Xu M. Comparison of ropivacaine combined with sufentanil for epidural anesthesia and spinal-epidural anesthesia in labor analgesia[J]. BMC Anesthesio, 2020, 20(1): 1
- [14] Funcke S, Pinnschmidt HO, Wessler S, et al. Guiding Opioid Administration by 3 Different Analgesia Nociception Monitoring Indices During General Anesthesia Alters Intraoperative Sufentanil Consumption and Stress Hormone Release: A Randomized Controlled Pilot Study[J]. Anesth Analg, 2020, 130(5): 1264-1273
- [15] Wang ZC, Chen Q, Yu LS, et al. A Sufentanil-Based Rapid Cardiac Anesthesia Regimen in Children Undergoing Percutaneous Minimally-Invasive Intraoperative Device Closure of Ventricular Septal Defect[J]. Braz J Cardiovasc Surg, 2020, 35(3): 323-328
- [16] Chen G, Gong M, Liu Y. Comparison of ropivacaine plus sufentanil and ropivacaine plus dexmedetomidine for labor epidural analgesia: A randomized controlled trial protocol [J]. Medicine (Baltimore), 2020, 99(36): e22113
- [17] Ibarra-Nava I, Choudhry V, Agardh A. Desire to delay the first childbirth among young, married women in India: a cross-sectional study based on national survey data [J]. BMC Public Health, 2020, 20(1): 350

- [18] Lim G, Levine MD, Mascha EJ, et al. Labor Pain, Analgesia, and Postpartum Depression: Are We Asking the Right Questions? [J]. *Anesth Analg*, 2020, 130(3): 610-614
- [19] Lu YY, Cai JJ, Jin SW, et al. Application of dural puncture epidural technique for labor analgesia[J]. *Zhonghua Yi Xue Za Zhi*, 2020, 100(5): 363-366
- [20] Jenabi E, Khazaei S, Bashirian S, et al. Reasons for elective cesarean section on maternal request: a systematic review [J]. *J Matern Fetal Neonatal Med*, 2020, 33(22): 3867-3872
- [21] Lee A, Landau R, Lavin T, et al. Comparative efficacy of epidural clonidine versus epidural fentanyl for treating breakthrough pain during labor: a randomized double-blind clinical trial [J]. *Int J Obstet Anesth*, 2020, 42(4): 26-33
- [22] Lam KK, Leung MKM, Irwin MG. Labour analgesia: update and literature review[J]. *Hong Kong Med J*, 2020, 26(5): 413-420
- [23] Hussain N, Lagnese CM, Hayes B, et al. Comparative analgesic efficacy and safety of intermittent local anaesthetic epidural bolus for labour: a systematic review and meta-analysis[J]. *Br J Anaesth*, 2020, 125(4): 560-579
- [24] Xu N, Chen Q, Huang ST, et al. Sufentanil Reduces Emergence Delirium in Children Undergoing Transthoracic Device Closure of VSD After Sevoflurane-Based Cardiac Anesthesia [J]. *Braz J Cardiovasc Surg*, 2020, 35(5): 660-665
- [25] Li J, Li Y, Huang Z. Effect of dexmedetomidine on analgesia and sedation of sufentanil during anesthesia induction period of gynecological surgery[J]. *Pak J Pharm Sci*, 2020, 33(1(Special)): 429-432
- [26] Li G, Xiao Y, Qi X, et al. Combination of sufentanil, dexmedetomidine and ropivacaine to improve epidural labor analgesia effect: A randomized controlled trial[J]. *Exp Ther Med*, 2020, 20(1): 454-460
- [27] Zhao N, Xu J, Li XG, et al. Hemodynamic characteristics in preeclampsia women during cesarean delivery after spinal anesthesia with ropivacaine[J]. *World J Clin Cases*, 2020, 8(8): 1444-1453
- [28] Jaichandran VV, Srinivasan S, Raman S, et al. A prospective comparison of the efficacy of 0.5% bupivacaine vs 0.75% ropivacaine in peribulbar anesthesia for vitreoretinal surgery [J]. *Indian J Ophthalmol*, 2020, 68(1): 153-156
- [29] Viderman D, Ben-David B, Sarria-Santamera A. Analysis of bupivacaine and ropivacaine-related cardiac arrests in regional anesthesia: a systematic review of case reports[J]. *Rev Esp Anestesiología Reanim (Engl Ed)*, 2021, S0034-9356(20): 30289-9
- [30] Cheng Q, Bi X, Zhang W, et al. Dexmedetomidine versus sufentanil with high -or low-concentration ropivacaine for labor epidural analgesia: A randomized trial [J]. *J Obstet Gynaecol Res*, 2019, 45(11): 2193-2201
- [31] Lu YY, Cai JJ, Jin SW, et al. Application of dural puncture epidural technique for labor analgesia[J]. *Zhonghua Yi Xue Za Zhi*, 2020, 100(5): 363-366
- [32] Zhang L, Chang T, Xu Y, et al. Epidural Anesthesia With Low Concentration Ropivacaine and Sufentanil for Percutaneous Transforaminal Endoscopic Discectomy: A Randomized Controlled Trial[J]. *Front Med (Lausanne)*, 2020, 7(1): 362

(上接第 336 页)

- [22] Shrestha GS, Srinivasan S. Role of Point-of-Care Ultrasonography for the Management of Sepsis and Septic Shock[J]. *Rev Recent Clin Trials*, 2018, 13(4): 243-251
- [23] Levitov A, Frankel HL, Blaivas M, et al. Guidelines for the Appropriate Use of Bedside General and Cardiac Ultrasonography in the Evaluation of Critically Ill Patients-Part II: Cardiac Ultrasonography[J]. *Crit Care Med*, 2016, 44(6): 1206-1227
- [24] Caltabeloti F, Monsel A, Arbelot C, et al. Early fluid loading in acute respiratory distress syndrome with septic shock deteriorates lung aeration without impairing arterial oxygenation: a lung ultrasound observational study[J]. *Crit Care*, 2014, 18(3): R91-R92
- [25] Riordan KC, Wingerchuk DM, Wellik KE, et al. Anticonvulsant drug therapy after aneurysmal subarachnoid hemorrhage: A critically appraised topic[J]. *Neurologist*, 2010, 16(6): 397-399
- [26] 张立群, 干朝晖, 李舟跃, 等. 床旁超声检测对感染性休克患者容量反应性预测的价值研究[J]. *浙江医学*, 2017, 39(23): 2118-2120
- [27] 陈耀武, 陈一峰, 毛和明, 等. 床旁超声监测颈总动脉峰流速随正压通气的周期性变异率评估外科 ICU 病人容量状态的可行性[J]. *蚌埠医学院学报*, 2021, 46(1): 68-70
- [28] Skulec R, Cermak O, Skalicka H, et al. Variability of aortic blood flow predicts fluid responsiveness in spontaneously breathing healthy volunteers[J]. *Kardiol Pol*, 2009, 67(3): 265-271
- [29] Hadera MG, Eloqayli H, Jaradat S, et al. Astrocyte-neuronal interactions in epileptogenesis[J]. *Neurosci Res*, 2015, 93(7): 1157-1164
- [30] 乔志飞, 刘春艳, 王磊, 等. 床旁心脏超声联合被动抬腿试验在感染性休克患者容量反应性评估中的应用价值探讨[J]. *中国急救医学*, 2018, 38(5): 395-398
- [31] 王会娟, 贾彤, 李树铁, 等. 超声测量下腔静脉呼吸变异指数评估机械通气脓毒症休克患者容量反应性 [J]. *山西医科大学学报*, 2016, 47(6): 551-555
- [32] 刘铮, 刘志, 张海英, 等. 组织血氧饱和度与血乳酸对早期急诊感染性休克患者预后的评估价值 [J]. *中国急救医学*, 2020, 40(4): 319-323