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B超引导下臂丛神经阻滞麻醉对老年桡骨远端粉碎性骨折患者的麻醉效果分析*

汪浩¹ 雷鹏飞¹ 程翔¹ 张金毅² 李卫春¹

(1 暨南大学第二临床医学院深圳市人民医院麻醉科 广东 深圳 518020; 2 中山大学附属第八医院妇科 广东 深圳 518033)

摘要 目的:研究B超引导下臂丛神经阻滞麻醉对老年桡骨远端粉碎性骨折患者的麻醉效果。**方法:**选择2018年12月~2020年6月我院的80例老年桡骨远端粉碎性骨折患者,采用随机数字表法,将患者均分为两组。两组均实施臂丛神经阻滞麻醉,其中对照组使用传统的解剖定位法,观察组使用B超引导法。比较两组的麻醉效果、麻醉用药剂量、阻滞起效时间、麻醉完成时间、镇痛维持时间;不同时间的平均动脉压、心率;且记录两组的脊髓麻醉、气胸、呼吸困难、局麻药物中毒发生率。**结果:**观察组老年桡骨远端粉碎性骨折病人的麻醉效果优良率(95.00%)明显高于对照组(77.50%, $P<0.05$);观察组的麻醉用药剂量、阻滞起效时间、麻醉完成时间均显著低于对照组,镇痛维持时间长于对照组($P<0.05$);两组T2和T3时间点的平均动脉压和心率明显高于T1($P<0.05$),且观察组的平均动脉压和心率明显更低($P<0.05$);观察组的脊髓麻醉、气胸、呼吸困难、局麻药物中毒发生率明显更低($P<0.05$)。**结论:**B超引导臂丛神经阻滞麻醉能提高老年桡骨远端粉碎性骨折患者的麻醉效果。

关键词:B超;臂丛神经阻滞麻醉;桡骨远端粉碎性骨折

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Analysis of the Anesthetic Effect of Brachial Plexus Block Anesthesia Guided by B-ultrasound in Elderly Patients with Comminuted Distal Radius Fractures*

WANG Hao¹, LEI Peng-fei¹, CHENG Xiang¹, ZHANG Jin-yi², LI Wei-chun¹

(1 Department of Anesthesiology, Shenzhen People's Hospital, the Second Clinical School of Jinan University,

Shenzhen, Guangdong, 518020, China;

2 Department of Gynecology, The Eighth Affiliated Hospital of Sun Yat-sen University, Shenzhen Guangdong, 518033, China)

ABSTRACT Objective: Objective to study the anesthesia effect of brachial plexus block under the guidance of B-ultrasound in elderly patients with comminuted distal radius fracture. **Methods:** 80 cases of elderly patients with comminuted distal radius fractures in our hospital from December 2018 to June 2020, undergoing intracranial tumor resection, were divided into two groups. Two groups were given brachial plexus block anesthesia, the control group used the traditional anatomical positioning method, and the observation group used B-ultrasound guidance method. The anesthetic effect, anesthetic dosage, block onset time, anesthesia completion time, analgesia maintenance time, mean arterial pressure and heart rate at different times were compared between the two groups, and the incidence of spinal cord paralysis, pneumothorax, dyspnea and local anesthetic poisoning were recorded. **Results:** The excellent and good rate of anesthesia effect in the observation group (95.00%) was significantly higher than that in the control group (77.50%, $P<0.05$). The anesthetic dosage, block onset time and anesthesia completion time of the observation group were significantly lower than those of the control group ($P<0.05$), and the analgesic maintenance time of the observation group was significantly longer than that of the control group ($P<0.05$). The mean arterial pressure and heart rate of the two groups at T2 and T3 were significantly higher than those at T1 ($P<0.05$), and the mean arterial pressure and heart rate of the observation group were significantly lower ($P<0.05$). The incidence of spinal cord paralysis, pneumothorax, dyspnea and local anesthetic drug poisoning in the observation group was significantly lower ($P<0.05$). **Conclusion:** Ultrasound guided brachial plexus block anesthesia can improve the anesthetic effect of elderly patients with comminuted distal radius fractures.

Key words: B ultrasound; Brachial Plexus Block Anesthesia; Comminuted Fracture of distal radius

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作者简介:汪浩(1982-),男,硕士研究生,主治医师,研究方向:创伤与危险性消化道出血围术期管理,功能神经外科的麻醉与复苏,

电话:13826562677, E-mail: wang.hao@szhospital.com

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前言

桡骨远端粉碎性骨折是临床上常见的骨折,女性群体的患病率明显高于男性^[1-3]。大部分的桡骨远端粉碎性骨折发生于患者机体桡骨远端大约 2~3 cm 部位,而且常常会伴有桡腕关节损坏和下尺桡关节损坏,非常不利于其日常的工作及生活^[4-6]。目前主要采取手术复位内固定疗法,由于粉碎性骨折的手术时间较久、治疗难度较大,术中对麻醉效果有比较高的要求^[7]。老年桡骨远端粉碎性骨折患者的机体功能处在不断退化的状态,且常合并有多种的基础疾病,对麻醉及手术质量的要求比较高,因此,需要尽量选择对患者安全性高、生理功能干扰小以及麻醉效果显著的麻醉方式,以改善麻醉质量。臂丛神经阻滞麻醉是非常常用的一种麻醉方式,被广泛应用于上肢骨折手术中,通过在患者臂丛神经干周围注入局部麻醉药物,可以产生神经传导阻滞效果^[8,9]。臂丛神经阻滞能利用超声显像对患者神经以及周边的组织进行直观的辨别,能保证穿刺的准确性^[10]。

1 资料与方法

1.1 一般资料

选择 2018 年 12 月~2020 年 6 月我院的 80 例老年桡骨远端粉碎性骨折患者,纳入标准:凝血功能正常;患肢无运动及感觉异常;均知情同意。排除标准:(1)患肢感觉异常、组织部位感染、周围神经病变者;(2)恶性肿瘤、严重脑血管病变、血管外科手术史、高血压者;(3)认知功能障碍者;(4)意识模糊者。用抽签法随机分为两组。观察组 40 例,男 19 例,女 21 例;年龄 60~82 岁,平均(67.34±2.75)岁;体重 47~85 kg,平均(59.43±5.27) kg。对照组 40 例,男 18 例,女 22 例;年龄 60~82 岁,平均(67.29±3.16)岁;体重 47~85 kg,平均(59.38±6.24) kg。两组的基线资料具有可比性。

1.2 研究方法

观察组:采取迈瑞 M9 便携式超声仪,探头频率 6~13 MHz,无菌保护套套在探头上,在探头外侧大约 2 cm 处,采用 9 号长针斜行进针,使探头与针保持平行,保证探头与针处在

相同的声像图平面内;在超声的引导下,把针尖下插到斜角肌间隙部位,观察超声下中斜肌、胸锁乳突肌、前斜角肌与周围血管横断面的成像情况,明确肌间沟臂丛神经根的位置,表现为前中斜角肌间出现多个圆形或椭圆形低回声区,周边有高回声晕环绕;对穿刺针进行推动,使临近上述的臂丛神经根部位,按照 0.4 mg/kg 的剂量注入局部麻醉药物(等容量的 0.75 % 罗哌卡因以及 2 % 利多卡因的混合液);对针尖的方向进行调整,使用同样的方法对患者其他神经根进行阻滞操作,且在超声显像的监视下,观察局部麻醉药物的扩散情况和分布情况。对照组:首先明确肩前斜角肌、胛舌骨肌以及中斜角肌所构成的三角的确切部位,穿刺点选择临近患者肩胛舌骨肌的位置,垂直方向插入穿刺针大约 3~4 cm,稍微往脚端方向推进,直到出现异感或者触及横突后,即可停止推进,当回抽未见血液以及脑脊液时,注入局麻药物(剂量和种类同观察组)。

1.3 观察指标

观察两组的麻醉效果^[3]:(1)优:患者的肌松良好,无痛感,平静,没有采用辅助药物;(2)良:患者没有不适感,有轻微的疼痛,需要采取镇痛药物;(3)差:患者的疼痛明显,肌松效果比较差,躁动。

记录两组的麻醉用药剂量、阻滞起效时间、麻醉完成时间、镇痛维持时间。

观察两组进入手术室后(T1)、臂丛神经阻滞时(T2)以及臂丛神经阻滞 5 min (T3)的平均动脉压、心率。

比较两组的脊髓麻醉、气胸、呼吸困难、局麻药物中毒发生率。

1.4 统计学分析

采用 SPSS 21.0 分析软件,符合正态分布的计量资料用($\bar{x} \pm s$)示,组间对比用独立样本 t 检验,组内比较用配对 t 检验;计数资料用(n,%)示,用 χ^2 检验, $P < 0.05$ 有统计学意义。

2 结果

2.1 两组麻醉效果优良率对比

观察组的麻醉效果优良率(95.00 %)明显高于对照组(77.50 %, $P < 0.05$),见表 1。

表 1 两组麻醉效果优良率对比[例(%)]

Table 1 Comparison of excellent and good rate of anesthesia effect between the two groups[n (%)]

Groups	n	Excellent	Good	Bad	Excellent And Good Rate
Control group	40	19(47.50)	12(30.00)	9(22.50)	31(77.50)
Observation group	40	24(60.00)	14(35.00)	2(5.00)	38(95.00)*

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

2.2 两组臂丛神经阻滞相关观察指标对比

观察组的麻醉用药剂量、阻滞起效时间、麻醉完成时间明

显更短($P < 0.05$),镇痛维持时间明显更长($P < 0.05$),见表 2。

表 2 两组臂丛神经阻滞相关观察指标对比($\bar{x} \pm s$)

Table 2 Comparison of relevant observation indexes of brachial plexus block between the two groups($\bar{x} \pm s$)

Groups	n	Anesthetic dosage (mL)	Onset time of block (min)	Anesthesia completion time(min)	Duration of analgesia (min)
Control group	40	38.24±2.75	6.29±1.92	9.17±2.53	436.25±19.31
Observation group	40	27.13±2.49*	4.75±1.24*	6.13±1.45*	537.24±25.48*

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

2.3 两组平均动脉压和心率对比

($P<0.05$),且观察组的平均动脉压和心率明显更低($P<0.05$),见

两组 T2 和 T3 时间点的平均动脉压和心率明显高于 T1 表 3。

表 3 两组平均动脉压和心率对比($\bar{x}\pm s$)

Table 3 Comparison of mean arterial pressure and heart rate between the two groups($\bar{x}\pm s$)

Groups	n		Mean arterial pressure(kPa)	Heart rate (n/min)
Control group	40	T1	12.43 $\pm$ 1.27	71.23 $\pm$ 11.45
		T2	15.43 $\pm$ 1.82 [#]	86.34 $\pm$ 12.26 [#]
		T3	15.93 $\pm$ 2.14 [#]	102.39 $\pm$ 13.47 [#]
Observation group	40	T1	12.45 $\pm$ 1.39	71.24 $\pm$ 12.36
		T2	12.72 $\pm$ 1.48 ^{**}	72.39 $\pm$ 13.85 ^{**}
		T3	12.79 $\pm$ 2.24 ^{**}	74.58 $\pm$ 13.27 ^{**}

Note: Compared with the control group, ^{*} $P<0.05$; compared with T1, [#] $P<0.05$.

2.4 两组并发症对比

明显更低($P<0.05$),见表 4。

观察组的脊髓麻痹、气胸、呼吸困难、局麻药物中毒发生率

表 4 两组脊髓麻痹、气胸、呼吸困难、局麻药物中毒发生率对比[例(%)]

Table 4 Comparison of the incidence of spinal cord paralysis, pneumothorax, dyspnea and local anesthetic drug poisoning between the two groups[n (%)]

Groups	n	Spinal Cord Paralysis	Pneumothorax	Dyspnea	Local Anesthetic	Drug Poisoning Incidence
Control group	40	1(2.50)	2(5.00)	2(5.00)	1(2.50)	6(15.00)
Observation group	40	0(0.00)	1(2.50)	1(2.50)	0(0.00)	2(5.00)*

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

3 讨论

桡骨远端粉碎性骨折大多发生在机体桡骨远端大约 2~3 cm 部位,且常常伴有桡腕关节损坏和下尺桡关节损坏,严重影响了患者的日常生活^[11-14]。对采取手术治疗的桡骨远端粉碎性骨折患者采取合适的麻醉方法就显得极为关键,不但需要满足手术的要求,还必须尽可能减少对患者生理机能的损伤,避免围手术期发生并发症。由于老年患者大多伴有不同程度的糖尿病和心血管疾病,对循环波动的耐受能力比较差。因此,选择一种有效且安全的麻醉方法非常重要。传统的解剖定位法即操作者无法在直视的情况下寻找穿刺的具体部位,其与麻醉医师的操作水平和临床经验具有紧密的相关性,解剖定位法常常会引起反复性穿刺,使患者需要忍受更多的躯体疼痛,也会使并发症的发生危险增加^[15,16]。

随着医疗水平的提高和医疗观念的转变,患者普遍对麻醉效果提出了更高要求,不但要求获得优质的麻醉效果,还需要确保围术期安全,减少不良反应和并发症。臂丛神经阻滞麻醉确保局麻药物在臂丛神经周围有效的扩散有助于提高麻醉效果,而传统的盲探式操作容易受到麻醉医师的临床经验差异、患者的解剖变异及个体差异等多种因素的影响,容易出现阻滞不全或者阻滞无效,必须追加辅助麻醉药物或者改变麻醉方法^[17-20]。而且,机体的臂丛神经具有非常复杂的解剖结构,如果再增加一次性的局麻药物使用剂量,则可能会导致局部麻醉药物中毒^[21-24]。

本研究发现,观察组的麻醉用药剂量、阻滞起效时间、麻醉

完成时间明显低于对照组,镇痛维持时间明显长于对照组,与张联^[25]等学者的研究类似,该学者探讨 B 超引导下臂丛神经阻滞麻醉对老年桡骨远端粉碎性骨折患者术中麻醉效果,对照组采用传统解剖定位法实施臂丛神经阻滞麻醉,研究组采用 B 超引导下臂丛神经阻滞麻醉,结果显示研究组完成麻醉用时,感觉阻滞起效用时明显少于对照组,表明 B 超引导下进行臂丛神经阻滞麻醉能明显提高麻醉效果,减少麻醉用药剂量,缩短阻滞起效时间、麻醉完成时间,延长镇痛维持时间,维持术中平均动脉压和心率等血流动力学指标的稳定性,减少脊髓麻痹、气胸、呼吸困难、局麻药物中毒的发生,有助于确保手术的顺利进行。其原因为,经 B 超引导能清晰地观察患者肌间沟臂丛神经,一次进针就能达到目标神经,能有效缩短麻醉用时^[26,27];且经 B 超的引导进行麻醉,能有效避开患者的血管、胸膜和神经等,可以直观观察麻醉药物的扩散状况,不但能获得较好的麻醉效果,还可以降低盲目穿刺所致气胸、神经损伤以及局麻药物中毒等并发症^[28,29]。Arbona 等^[30]研究表明,因为单点注射麻醉药物不能使麻醉药物扩散到整个的臂丛神经,因而,一般并不完全将局麻药物注射在某一个点,而是对穿刺针的位置进行调节,使其可以在较远部位再次注射药物或者达到第一次注射麻醉药物没有扩散到的区域,直到患者的臂丛神经已经全部被局麻药物所包裹,能有效保证神经阻滞麻醉的临床效果。Gautier 等^[31]通过研究发现,在超声的引导下开展臂丛神经阻滞麻醉,能对针尖的位置进行调节,而促进局部麻醉药物尽量可以浸润在神经束的周边,痛觉消失速度比较快,神经阻滞比较完全,作用时间比较长。另外,本研究发现,观察组的脊髓麻痹、气胸、呼吸

困难、局麻药物中毒发生率明显更低,与周勤^[2]的研究类似,探讨超声引导下腰丛复合坐骨神经阻滞麻醉对股骨粗隆间骨折老年患者术后免疫功能的影响,对照组采取蛛网膜下腔阻滞麻醉复合硬膜外麻醉,观察组采取超声引导下腰丛复合坐骨神经阻滞麻醉,结果显示观察组不良反应发生率(8%)低于对照组(24%)。表明在B超的引导下进行臂丛神经阻滞麻醉不但能明显提高麻醉效果,还可以减少脊髓麻醉、气胸、呼吸困难、局麻药物中毒等术后并发症,有助于机体功能的尽快康复。其原因可能为,在B超的引导下进行麻醉,不但能有效避开老年桡骨远端粉碎性骨折患者的血管、胸膜以及神经等,还可以非常直观的观察麻醉药物的具体扩散情况,因而,不但能获得比较满意的麻醉效果,还可以减少盲目穿刺所造成的气胸、神经损伤、局麻药物中毒的发生,而且可以在一定程度上降低静脉镇痛药物的使用剂量。

综上所述,B超引导下进行臂丛神经阻滞麻醉能提高老年桡骨远端粉碎性骨折患者的麻醉效果。

参考文献(References)

- [1] Mehmet İkrü ahin, Gkku K, Sargin MB. Ulnar Nerve and Ulnar Artery Injury Caused by Comminuted Distal Radius Fracture [J]. J Surgical Case Reports, 2020, 10(4): 25-30
- [2] Meaike JJ, Kakar S. Management of Comminuted Distal Radius Fractures: A Critical Analysis Review[J]. JBJS Reviews, 2020, 8(8): e20.00010-e20.00010
- [3] Tiwari V, Karkhur Y, Das A. Concomitant Posterolateral Elbow Dislocation with Ipsilateral Comminuted Intra-articular Distal Radius Fracture: A Rare Orthopaedic Scenario[J]. Other, 2018, 10(3): 314-316
- [4] Mundada G, Khan SM, Singhania SK, et al. Type-I monteggia with ipsilateral fracture of distal radius epiphyseal injury: A rare case report [J]. Annals African Medicine, 2017, 16(1): e30
- [5] Lee JK, Lee S, Cho WM, et al. Primary Open Reduction and Plate Fixation in Open Comminuted Intra-Articular Distal Radius Fracture[J]. J Korean Fracture Society, 2021, 34(1): e16
- [6] Shah KA, Shah SA, Soomro ZI, et al. Comminuted intra articular fracture of distal radius: Outcome of Management with closed reduction and percutaneous pinning [J]. The Professional Medical J, 2019, 26(10): 1697-1701
- [7] Kar B, Kowshik S, Yadav SK, et al. Outcome of Comminuted Distal-End Radius Fracture Managed with UlnoCarpal and Distal Radius Stabilization Using Percutaneous KWires [J]. J Orthopaedic Diseases Traumatology, 2020, 3(2): 53-57
- [8] Ozturk NK, Kavakli AS. Comparison of the coracoid and retroclavicular approaches for ultrasound-guided infraclavicular brachial plexus block[J]. J Anesthesia, 2017, 31(4): 1-7
- [9] Andrés, Felipe, Gil, et al. Retroclavicular vs Infraclavicular block for brachial plexus anesthesia: a multi-centric randomized trial [J]. BMC anesthesiology, 2019, 19(1): 193-193
- [10] Hussain N, Grzywacz VP, Ferreri CA, et al. Investigating the Efficacy of Dexmedetomidine as an Adjuvant to Local Anesthesia in Brachial Plexus Block: A Systematic Review and Meta-Analysis of 18 Randomized Controlled Trials [J]. Regional Anesthesia Pain Medicine, 2017, 42(2): e184
- [11] Baek JR, Yoon YC, Baek SH. Use of Miniplate for Severe Comminuted Metadiaphyseal Fractures of the Distal Radius[J]. J Korean Fracture Society, 2019, 32(4): e204
- [12] Dubrov VE, Grechukhin DA, Maksimov BI, et al. Treatment of Comminuted Intraarticular Fracture of Distal Radius with Arthroscopic Reposition of Fragments under External Fixation [J]. N N Priorov J Traumatology Orthopedics, 2017, 24(1): 12-19
- [13] Toshihiro, Kanda, Naoto, et al. Low Bone Mineral Density of the Forearm and Femur among Postmenopausal Women with Metaphyseal Comminuted Fracture of the Distal Radius [J]. The Tohoku J Experimental Med, 2019, 249(3): 147-154
- [14] I. Schöter, Wappenschmidt J. Combined Volar and Dorsal Approach for Fixation of Comminuted Intra-Articular Distal Radial Fractures[J]. J Wrist Surgery, 2017, 7(3): 219-226
- [15] Lazar A, Szederjesi, János, Iftenie E, et al. Ultrasound Guidance Versus Peripheral Neurostimulation for Brachial Plexus Block Anesthesia with Axillary Approach and Multiple Injection Technique [J]. Acta Medica Marisiensis, 2017, 63(3): 75-78
- [16] Kim E, Choi CH, Kim JH. Effects of C8 nerve root block during interscalene brachial plexus block on anesthesia of the posterior shoulder in patients undergoing arthroscopic shoulder surgery: study protocol for a prospective randomized parallel-group controlled trial[J]. Current Controlled Trials in Cardiovascular Medicine, 2019, 20(11): 113-115
- [17] Imbellon LE, Gouveia M, Filho GBDM. Comparison of the effects of four subdoses of dextroketamine to reduce pain during posterior brachial plexus block: A randomized double blind study [J]. Anesthesia Essays & Researches, 2017, 11(2): 345-349
- [18] Rastabi HI, Kashani SS, Masoumi P, et al. Brachial plexus block as a part of balanced anesthesia in a jungle cat (Felis chaus) undergoing forelimb orthopedic surgery [J]. Comparative Clinical Pathology, 2019, 28(6): 1-3
- [19] Kilicaslan A, Hacibeyoglu, Gülcin, Goger E, et al. Combined erector spinae plane and interscalene brachial plexus block for surgical anesthesia of scapula fracture [J]. J Clinical Anesthesia, 2018, 54(17): 166-167
- [20] Kim H, Jang HY, Heo HJ, et al. Ipsilateral vocal cord paralysis after interscalene brachial plexus block for clavicle surgery: anatomical considerations and technical recommendations - a case report [J]. International J Clinical Experimental Medicine, 2019, 12 (8): 10132-10138
- [21] Emine Aysu Şalvız, Emre Sertaç Bingül, Karadeniz MS, et al. Use of ultrasound-guided supraclavicular brachial plexus block as an anesthesia technique in a patient with neurofibromatosis type 1: A case report[J]. Agri, 2018, 30(2): 93-96
- [22] Bharathi B, Praveena B, Krishnaveni K. Supraclavicular Brachial Plexus Block: Comparison of Varying Doses of Butorphanol Combined with Levobupivacaine - A Double-Blind Prospective Randomized Trial[J]. Anesthesia Essays and Researches, 2019, 13(1): e174
- [23] Kumar A, Sinha C, Kumar A, et al. The Effect of Intravenous Dexmedetomidine Compared to Propofol on Patients Hemodynamics as a Sedative in Brachial Plexus Block: A Comparative Study[J]. Anesthesia Essays & Researches, 2017, 11(1): 201-205

- 2017, 12(6): e0179509
- [17] Gorbunova ML, Vilkova AV. Assessment of Efficacy and Safety of Metabolic Therapy With Trimetazidine MB in Patients With Ischemic Heart Disease and Chronic Heart Failure [J]. *Kardiologiia*, 2016, 56(3): 67-72
- [18] Volterrani M, Perrone V, Sangiorgi D, et al. Effects of hyperkalaemia and non-adherence to renin-angiotensin-aldosterone system inhibitor therapy in patients with heart failure in Italy: a propensity-matched study[J]. *Eur J Heart Fail*, 2020, 22(11): 2049-2055
- [19] Kruik-Kollöffel WJ, van der Palen J, Doggen CJM, et al. Heart failure medication after a first hospital admission and risk of heart failure readmission, focus on beta-blockers and renin-angiotensin-aldosterone system medication: A retrospective cohort study in linked databases[J]. *PLoS One*, 2020, 15(12): e0244231
- [20] Sandercock GR, Brodie DA. The role of heart rate variability in prognosis for different modes of death in chronic heart failure [J]. *Pacing Clin Electrophysiol*, 2006, 29(8): 892-904
- [21] Koshy A, Okwose NC, Nunan D, et al. Association between heart rate variability and haemodynamic response to exercise in chronic heart failure[J]. *Scand Cardiovasc J*, 2019, 53(2): 77-82
- [22] Bavishi C, Bangalore S, Messerli FH. Renin Angiotensin Aldosterone System Inhibitors in Hypertension: Is There Evidence for Benefit Independent of Blood Pressure Reduction? [J]. *Prog Cardiovasc Dis*, 2016, 59(3): 253-261
- [23] Nunes RB, Alves JP, Kessler LP, et al. Aerobic exercise improves the inflammatory profile correlated with cardiac remodeling and function in chronic heart failure rats [J]. *Clinics (Sao Paulo)*, 2013, 68(6): 876-882
- [24] 陈瑜, 秦艳. 目标剂量螺内酯联合阿托伐他汀对老年慢性心力衰竭患者心室重构及心功能的影响 [J]. *广西医学*, 2018, 40(21): 2548-2551
- [25] Besnier F, Labrunée M, Richard L, et al. Short-term effects of a 3-week interval training program on heart rate variability in chronic heart failure. A randomised controlled trial [J]. *Ann Phys Rehabil Med*, 2019, 62(5): 321-328
- [26] 黄晓莉, 郝君锋. 慢性心力衰竭患者心功能及血浆 copeptin 和 NT-proBNP 检测及临床意义 [J]. *海南医学*, 2020, 31(10): 1241-1244
- [27] 胡黎文, 杜怡雯, 王皓霖, 等. 真武汤合桂枝茯苓丸对慢性心力衰竭患者 hs-CRP、TNF- α 、IL-6 的影响 [J]. *中国中医急症*, 2018, 27(5): 830-833
- [28] Slomka T, Lennon ES, Akbar H, et al. Effects of Renin-Angiotensin-Aldosterone System Blockade in Patients with End-Stage Renal Disease[J]. *Am J Med Sci*, 2016, 351(3): 309-316
- [29] Flevari P, Kalogeropoulou S, Drakou A, et al. Spironolactone improves endothelial and cardiac autonomic function in non heart failure hemodialysis patients[J]. *J Hypertens*, 2013, 31(6): 1239-1244
- [30] 魏梅, 刘永升, 马利祥, 等. 螺内酯联合贝那普利对急性前壁心肌梗死患者左心室重构及心率变异性的影响[J]. *山东医药*, 2015, 55(36): 51-52

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- [24] Zhang L, Pang R, Zhang L. Effect of different volumes of 0.375% ropivacaine on diaphragmatic paralysis by supraclavicular brachial plexus block under ultrasound guidance [J]. *Annals Palliative Medicine*, 2020, 9(6): 3993-4001
- [25] 张联, 张华. 老年桡骨远端粉碎性骨折患者术中 B 超引导下臂丛神经阻滞麻醉的效果观察 [J]. *广西医科大学学报*, 2018, 35(5): 122-125
- [26] Kitayama M, Hirota K, Satoh Y. Advances in Ultrasound-guided Nerve Block: Brachial Plexus Block[J]. *The Journal of Japan Society for Clinical Anesthesia*, 2018, 38(2): 265-269
- [27] Tankı Kılıç, Ebru, Akdemir, Mehmet Salim. Comparison of Supraclavicular, Infraclavicular, and Axillary Approaches for Ultrasound-Guided Brachial Plexus Block for Upper Limb Surgeries: A Retrospective Analysis of 182 Blocks [J]. *Dubai Medical Journal*, 2018, 1(1-4): 33-37
- [28] Honnannavar KA, Mudakanagoudar MS. Comparison between Conventional and Ultrasound-Guided Supraclavicular Brachial Plexus Block in Upper Limb Surgeries[J]. *Anesthesia: Essays and Researches*, 2017, 11(2): 467-469
- [29] Murata H, Hida K, Ogami-Takamura K, et al. Importance of careful identification of the axillary vessels during ultrasound-guided costoclavicular brachial plexus block [J]. *Regional Anesthesia and Pain Medicine*, 2019, 44(1): 138-140
- [30] Arbona FL, Khabiri B, Norton JA, et al. Ultrasound-Guided Regional Anesthesia: Supraclavicular brachial plexus block [J]. *Annales Françaises d'anesthésie et de Réanimation*, 2011, 32(9): 119-120
- [31] Gwutier P, Vandepitte C, Ramquet C, et al. The minimum effective anesthetic volume of 0.75% ropivacaine in ultrasound-guided interscalene brachial plexus block [J]. *Anesthesia & Analgesia*, 2011, 113(4): 951-955
- [32] 周勤, 谢敏, 黄建新. 超声引导下腰丛复合坐骨神经阻滞麻醉对股骨粗隆间骨折老年患者术后免疫功能的影响[J]. *甘肃医药*, 2018, 37(7): 589-592