

doi: 10.13241/j.cnki.pmb.2023.14.029

低频电刺激联合康复训练治疗脑卒中偏瘫患者效果及运动功能、自我效能的影响*

孙晓燕^{1,2} 陈艳丽³ 颜亚博² 李润东² 陆学超^{4△}

(1 青岛大学医学部 山东 青岛 266071; 2 青岛大学附属青岛市海慈医院针推康复中心 山东 青岛 266000;

3 青岛大学附属青岛市海慈医院重症医学科 山东 青岛 266000;

4 青岛大学附属青岛市海慈医院呼吸与危重症(肺病)中心 山东 青岛 266000)

摘要 目的:分析低频电刺激联合康复训练治疗脑卒中偏瘫患者效果及运动功能、自我效能的影响。**方法:**选择我院自 2019 年 5 月至 2022 年 1 月收治的 156 例脑卒中偏瘫患者作为研究对象,随机分为对照组和观察组,每组各 78 例。对照组予以常规对症支持治疗,加用康复训练;观察组在对照组的基础上,加用低频电刺激治疗,持续治疗 8 周后评估疗效。根据患者的下肢 Brunnstrom 分级改善幅度,评价治疗效果;比较两组治疗前后的下肢 Fugl-Meyer 运动功能量表(FMA)、Berg 平衡量表(BBS)、改良 Barthel 指数(MBI)和一般自我效能感量表(GSES)评分。**结果:**观察组治疗总有效率为 96.15%,高于对照组的 84.62% ($P<0.05$);对比对照组,观察组治疗后下肢 FMA 评分、BBS 评分均更高 ($P<0.05$);对比对照组,观察组治疗后 MBI 评分、GSES 评分均更高 ($P<0.05$)。**结论:**低频电刺激联合康复训练治疗脑卒中偏瘫患者的效果明显,能够有效改善运动功能和生活质量,提高自我效能,值得进一步研究应用。

关键词:脑卒中;偏瘫;低频电刺激;康复训练;运动功能;自我效能

中图分类号:R743 **文献标识码:**A **文章编号:**1673-6273(2023)14-2750-04

Effect of Low Frequency Electrical Stimulation combined with Rehabilitation Training on Stroke Patients with Hemiplegia, Motor Function and Self-efficacy*

SUN Xiao-yan^{1,2}, CHEN Yan-li³, YAN Ya-bo², LI Run-dong², LU Xue-chao^{4△}

(1 Department of Medicine, Qingdao University, Qingdao, Shandong, 266071, China;

2 Acupuncture rehabilitation center, Qingdao Haici Hospital Affiliated to Qingdao University, Qingdao, Shandong, 266000, China;

3 Department of Critical Care Medicine, Qingdao Haici Hospital Affiliated to Qingdao University, Qingdao, Shandong, 266000, China;

4 Respiratory and Critical Illness (lung disease) Center, Qingdao Haici Hospital Affiliated to Qingdao University, Qingdao, Shandong, 266000, China)

ABSTRACT Objective: To analyze the effects of low frequency electrical stimulation combined with rehabilitation training on stroke patients with hemiplegia, motor function and self-efficacy. **Methods:** A total of 156 stroke patients with hemiplegia admitted to our hospital from May 2019 to January 2022 were selected as research objects and randomly divided into control group and observation group, with 78 cases in each group. The control group was given routine symptomatic support treatment, plus rehabilitation training. The observation group was additionally treated with low-frequency electrical stimulation on the basis of the control group, and the efficacy was evaluated after continuous treatment for 8 weeks. The therapeutic effect was evaluated according to the Brunnstrom grade improvement of lower limbs. lower limb Fugl-Meyer Motor Function Scale (FMA), Berg Balance Scale (BBS), modified Barthel Index (MBI) and general Self-efficacy Scale(GSES) scores were compared between the two groups before and after treatment. **Results:** The total effective rate of the observation group was 96.15%, which was significantly higher than that of the control group (84.62%) ($P<0.05$). Compared with control group, lower limb FMA score and BBS score in observation group were higher after treatment ($P<0.05$). Compared with the control group, the MBI score and GSES score of the observation group were higher after treatment ($P<0.05$). **Conclusion:** Low frequency electrical stimulation combined with rehabilitation training in the treatment of stroke patients with hemiplegia has obvious effects, can effectively improve motor function and quality of life, improve self-efficacy, worthy of further research and application.

Key words: Stroke; Hemiplegia; Low-frequency electrical stimulation; Rehabilitation training; Motor function; Self-efficacy

Chinese Library Classification(CLC): R743 **Document code:** A

Article ID: 1673-6273(2023)14-2750-04

* 基金项目:山东省医药卫生科技发展计划项目(2016WS0306)

作者简介:孙晓燕(1989-),女,本科,主管技师,研究方向:康复治疗,E-mail: sxiaoyan202212@163.com

△ 通讯作者:陆学超(1974-),男,博士,主任医师,研究方向:呼吸与危重症,E-mail: sxiaoyan202212@163.com

(收稿日期:2023-01-07 接受日期:2023-01-29)

前言

脑卒中是一种突然起病且进展迅速、病情凶险的脑缺血性或出血性疾病,在成功救治的患者中发生偏瘫的可能较大,极大地影响患者的预后^[1]。偏瘫是脑卒中成功救治患者最常见的后遗症之一,与脑卒中引起脑组织死亡、损伤神经功能有关^[2]。一直以来,积极有效的康复训练是治疗脑卒中偏瘫的主要方法,原因在于部分神经功能可通过康复训练得到恢复,然而康复训练对脑卒中偏瘫的效果影响因素较多,作用机制尚未明确,整体效果存在明显的个体差异性。近年来,国内外研究表明,脑卒中偏瘫的发生、发展与肌张力增大、肌痉挛密切相关^[3,4]。由于常规康复训练对减小脑卒中偏瘫肌张力、解除肌痉挛的效果不明显,近年来,越来越多临床学者青睐于使用低频电刺激治疗脑卒中偏瘫,期望减小肌张力、解除肌痉挛,从而改善运动功能,提高自我效能,扩大临床疗效,增加患者的临床获益^[5,6]。与此同时,低频电刺激具有安全无创、操作简便、花费廉价等优点,尤其适用于治疗脑卒中偏瘫^[7]。然而低频电刺激联合康复训练治疗脑卒中偏瘫患者的效果如何,尚未明确,相关研究鲜有报道。对此,本研究目的在于分析低频电刺激联合康复训练治疗脑卒中偏瘫患者效果及运动功能、自我效能的影响。

1 资料和方法

1.1 一般资料

选择我院自2019年5月至2022年1月收治的156例脑卒中偏瘫患者作为研究对象。随机分为对照组和观察组,每组各78例。其中对照组男、女各47例、31例;年龄最小45岁,最大79岁,平均 (65.17 ± 4.72) 岁;病程最短1个月,最长4个月,平均 (1.69 ± 0.71) 个月;下肢Brunnstrom分级:II级28例、III级38例、IV级12例;观察组男、女各48例、30例;年龄最小42岁,最大78岁,平均 (64.98 ± 4.63) 岁;病程最短1个月,最长4个月,平均 (1.65 ± 0.78) 个月;下肢Brunnstrom分级:II级26例、III级39例、IV级13例。两组基线资料比较,差异均不显著($P > 0.05$)。

纳入标准:年龄18~80岁;首次发生脑卒中,存在偏瘫;病情处于恢复期,生命体征稳定,意识清晰;患者签署知情同意书,自愿入组,参与研究,配合治疗。

排除标准:有颅内手术史或患有其他颅内疾病者;合并恶性肿瘤、严重且病情不稳定的内科疾病者;存在其他原因引起的肢体运动障碍者;具有低频电刺激或康复训练禁忌证者。

1.2 治疗方法

对照组予以常规对症支持治疗,严格遵循《中国脑卒中早期康复治疗指南》^[8]对患者开展各项治疗,如积极控制高血压、糖尿病、高脂血症等危险因素,酌情进行营养神经、预防感染、营养支持、抑制血小板聚集等治疗,并加用康复训练,循序渐进地开展坐位练习、自主形成坐位、床上运动(患肢关节主动活动、患肢关节被动活动、桥式运动等)、下床活动(稳定站姿、扶栏杆缓行)、平衡运动(单脚站立、双足站立),根据患者的恢复进度,院后居家继续进行各项康复训练,以患者独立完成或由家属辅助完成且可耐受为原则。观察组在对照组的基础上,加用低频电刺激治疗,具体如下:使用耀洋康达KD-2A型经皮神经电刺激仪(TENS Therapy Apparatus),协助患者取俯卧位,将电极贴在臀上神经、股后神经、腓总神经、胫神经等,分别以脉冲50us、频率5Hz各刺激3次,电流大小以病号耐受为准,每次5min;持续治疗8周后评估疗效。

1.3 观察指标

根据患者的下肢Brunnstrom分级改善幅度,评价治疗效果;临床疗效分为显效、好转和无效3个等级,其中治疗后下肢Brunnstrom分级较治疗前提高2级及以上,判定为显效;治疗后下肢Brunnstrom分级较治疗前提高1级,判定为好转;治疗后下肢Brunnstrom分级较治疗前无提高或下降,判定为无效。比较两组治疗前后的下肢Fugl-Meyer运动功能量表(Fugl-Meyer assessment, FMA)、Berg平衡量表(Berg Balance Scale, BBS)、改良Barthel指数(Modified Barthel index, MBI)和一般自我效能感量表(General self-efficacy scale, GSES)评分,其中FMA评分范围0-34分,评分越高,说明运动功能越好;BBS评分范围0-56分,评分越高,说明平衡能力越好;MBI评分范围0-100分,评分越高,说明生活质量越好;GSES评分范围0-40分,评分越高,说明自我效能越强^[9,10]。

1.4 数据处理

采用软件SPSS22.0处理数据,两组计量资料比较使用t检验;两组计数资料比较使用 χ^2 检验;以 $P < 0.05$ 说明差异有统计学意义。

2 结果

2.1 对照组与观察组治疗总有效率比较

观察组治疗总有效率为96.15%,高于对照组的84.62%($P < 0.05$);数据见表1。

表1 对照组与观察组治疗总有效率比较[n(%)]

Table 1 Comparison of total response rates between the control and observation groups [n (%)]

Groups	n	Excellence	Improve	Invalid	Clinical total effectiveness
Matched group	78	25(32.05)	41(52.56)	12(15.38)	66(84.62)
Observation group	78	38(48.72)	37(47.44)	3(3.85)	75(96.15)
χ^2					12.452
P					<0.001

2.2 对照组与观察组下肢FMA评分、BBS评分比较

对比对照组,观察组治疗后下肢FMA评分、BBS评分均

更高($P < 0.05$);数据见表2。

表 2 对照组与观察组下肢 FMA 评分、BBS 评分比较(分)

Table 2 Comparison of FMA scores and BBS scores between control and observation groups (scores)

Groups	n	Lower extremity FMA score		BBS Score	
		Pretherapy	Post-treatment	Pretherapy	Post-treatment
Matched group	78	15.73± 2.61	22.52± 4.44*	24.56± 3.28	35.82± 5.61*
Observation group	78	16.27± 2.68	28.46± 6.93*	25.33± 3.49	46.89± 7.31*
t		1.275	6.374	1.420	10.610
P		0.204	<0.001	0.158	<0.001

2.3 对照组与观察组 MBI 评分、GSES 评分比较 ($P<0.05$);数据见表 3。

对比对照组, 观察组治疗后 MBI 评分、GSES 评分均更高

表 3 对照组与观察组 MBI 评分、GSES 评分比较(分)

Table 3 Comparison of MBI scores and GSES scores between control and observation groups (scores)

Groups	n	MBI grade		GSES grade	
		Pretherapy	Post-treatment	Pretherapy	Post-treatment
Matched group	78	27.85± 4.53	55.64± 6.82*	15.42± 2.63	26.71± 4.05*
Observation group	78	27.92± 4.49	70.06± 10.34*	15.37± 2.59	35.08± 4.57*
t		0.097	10.282	0.120	12.106
P		0.923	<0.001	0.905	<0.001

3 讨论

脑卒中偏瘫的发生与中枢神经系统损伤有关,约 55%-75% 的脑卒中患者存在不同程度的偏瘫,极大地影响患者的生活质量和预后^[11]。尽管脑卒中偏瘫患者的中枢神经系统已损伤,但大量研究表明,在脑卒中偏瘫发生初期,患者的神经可塑性较好,积极有效的康复训练,对于缓解肢体痉挛,改善肢体功能均具有重要作用^[12-14]。Zhu^[15]等研究认为,对脑卒中偏瘫患者进行各项康复训练,能够逐渐增强肌肉力量,缓解痉挛状态,改善运动功能。也有研究认为,康复训练是脑卒中偏瘫患者最有效、最基础且安全性、可重复性均较好的疗法,尤其在恢复患者肢体肌力上具有显著优势^[16]。笔者认同上述观点,并在临床实践中认为,脑卒中偏瘫患者单纯接受康复训练,并不足以使患者最佳的康复效果,存在治疗周期长、短期效果不明显的优点,有必要联合其他疗法,以增加患者的临床获益。近年来,低频电刺激疗法逐渐用于治疗脑卒中偏瘫,通过电流刺激以恢复神经功能、增强肌力、促进血液循环,进而改善肢体运动功能^[17]。也有研究认为,低频电刺激肢体神经、肌肉,使脑卒中偏瘫患者的大脑中枢得以兴奋,有助于促进大脑功能重建^[18]。从本研究表 1 结果可知, 观察组治疗总有效率为 96.15%, 高于对照组的 84.62%; 提示低频电刺激联合康复训练治疗脑卒中偏瘫患者的效果显著。

国内外研究表明,康复训练对脑卒中偏瘫患者的作用不可替代,原因在于患者存在运动神经元损伤和肢体肌力减小,及时予以规范的康复训练,目的是促进大脑皮质重建神经反射,恢复运动神经的兴奋性,加快大脑可塑化进程,进而改善肢体功能^[19-21]。也有研究认为,将康复训练贯穿脑卒中偏瘫患者的治

疗全过程,可修复损伤的神经,使受损的神经运动功能重构,纠正异常运动模式^[22]。在本研究中,观察组患者在康复训练的基础上,采取低频电刺激治疗,目的是对肢体分布的神经、肌肉进行低频电刺激,模拟神经冲动,使肢体肌肉出现被动收缩和舒张,避免肌肉萎缩,从而发挥治疗作用。从本研究结果可知,下肢 Brunnstrom 分级改善幅度及 FMA 评分、BBS 评分,与 Chen^[23]等的研究结果相符,提示低频电刺激联合康复训练治疗可以有效地改善患者的运动功能。分析原因,可能在于持续进行的康复训练结合低频电刺激患肢的神经、肌肉,可显著提高肢体肌力,改善神经运动功能。Maeda^[24]等研究表明,低频电刺激联合康复训练可协同恢复脑卒中偏瘫患者的肌肉活性,减小患侧肌张力,有助于恢复运动功能,亦佐证了本研究观点。与此同时,本研究结果显示, 观察组治疗后下肢 FMA 评分、BBS 评分均明显高于对照组,进一步说明了低频电刺激联合康复训练治疗在改善脑卒中偏瘫患者运动功能上具有显著优势。

对于脑卒中偏瘫患者,运动功能障碍导致生活质量和自我效能降低均是影响其治疗依从性和康复效果的重要因素,在康复过程中有必要重视改善患者的生活质量,提高自我效能^[25,26]。也有研究认为,生活质量和自我效能评价均是评估脑卒中偏瘫患者康复效果的重要指标^[27]。鉴于本研究结果显示,低频电刺激联合康复训练治疗脑卒中偏瘫患者,能够有效减小患者的肌张力,改善运动功能,能否进一步提高患者的生活质量和自我效能,有待明确。从本研究表 3 结果可知,两组患者治疗后 MBI 评分均较治疗前明显升高,然而观察组治疗后 MBI 评分明显高于对照组,提示低频电刺激联合康复训练治疗脑卒中偏瘫患者,可协同提高患者的生活质量,与税丽娟^[28]等的研究结果相符。Long^[29]等研究表明,脑卒中偏瘫患者的自我效能与治疗效

果、运动功能的恢复程度密切相关。由此不难看出,低频电刺激联合康复训练在提高脑卒中偏瘫患者运动功能、生活质量上均较单纯采取康复训练具有优势,很可能因此明显提高患者的自我效能。本研究比较了对照组与观察组的 GSES 评分,结果显示:对比对照组,观察组治疗后 GSES 评分均更高($P<0.05$);与 Bilek^[30]等研究表明低频电刺激联合康复训练治疗可有效改善脑卒中偏瘫患者自我效能的这一观点相契合。另外,脑卒中偏瘫患者自我效能的提高,有助于康复治疗方案的顺利开展,亦在一定程度上促进患者运动功能的恢复,增加患者的临床获益。

综上所述,低频电刺激联合康复训练治疗脑卒中偏瘫患者的效果明显,能够有效改善运动功能和生活质量,提高自我效能,值得进一步研究应用。本研究创新之处在于揭示了低频电刺激联合康复训练在脑卒中偏瘫康复领域中的临床应用价值,为优化此类患者的康复治疗方案提供了新方向。而不足之处在于样本量相对较少,未分析上述治疗方案对患者远期运动功能及生活质量的影响,需要后续研究深入分析低频电刺激和康复训练对脑卒中偏瘫的具体作用机制,为改善脑卒中偏瘫患者的康复治疗方案提供依据。

参考文献(References)

- [1] 邵慧兴, 马力, 刘湘敏, 等. 肌内效贴镇痛联合康复训练对脑卒中偏瘫患者下肢运动功能、步行参数和生活质量的影响[J]. 现代生物医学进展, 2019, 19(2): 342-345
- [2] Byrd EM, Jablonski RJ, Vance DE. Understanding Anosognosia for Hemiplegia After Stroke[J]. Rehabil Nurs, 2020, 45(1): 3-15
- [3] Rutkowski S, Kiper P, Cacciante L, et al. Use of virtual reality-based training in different fields of rehabilitation: A systematic review and meta-analysis[J]. J Rehabil Med, 2020, 52(11): 1-16
- [4] Hu Y, Tian J, Wen X, et al. Clinical Effects of MOTomed Intelligent Exercise Training Combined with Intensive Walking Training on the Rehabilitation of Walking, Nerve and Lower Limb Functions among Patients with Hemiplegia after Stroke[J]. Pak J Med Sci, 2022, 38(5): 1222-1227
- [5] Wouters E F M, Posthuma R, Koopman M, et al. An update on pulmonary rehabilitation techniques for patients with chronic obstructive pulmonary disease [J]. Expert Rev Respir Med, 2020, 14(2): 149-161
- [6] Kang JH, Kim MW, Park KH, et al. The effects of additional electrical stimulation combined with repetitive transcranial magnetic stimulation and motor imagery on upper extremity motor recovery in the subacute period after stroke: A preliminary study [J]. Medicine (Baltimore), 2021, 100(35): e27170
- [7] 余乐华, 毕美仙, 邵娟, 等. 低频脉冲电刺激联合肢体康复锻炼对脑卒中偏瘫患者 PSQI 总分、凝血功能和肢体运动功能的影响[J]. 临床和实验医学杂志, 2021, 20(18): 1951-1955
- [8] 中华医学会神经病学分会, 中华医学会神经病学分会神经康复学组, 中华医学会神经病学分会脑血管病学组. 中国脑卒中早期康复治疗指南[J]. 中华神经科杂志, 2017, 50(6): 405-412
- [9] 郑苏, 彭力. 神经干刺激联合任务导向训练对脑卒中偏瘫患者下肢运动功能及三维步态的影响 [J]. 中国医药导报, 2020, 17(14): 73-77
- [10] Kwong P W H, Ng S S M. Cutoff score of the lower-extremity motor subscale of fugl-meyer assessment in chronic stroke survivors; a cross-sectional study [J]. Arch Phys Med Rehabil, 2019, 100(9): 1782-1787
- [11] Lin LC, Liao CD, Wu CW, et al. Effect of arm sling application on gait and balance in patients with post-stroke hemiplegia: a systematic review and meta-analysis[J]. Sci Rep, 2021, 11(1): 11161
- [12] Takebayashi T, Takahashi K, Amano S, et al. Robot-Assisted Training as Self-Training for Upper-Limb Hemiplegia in Chronic Stroke: A Randomized Controlled Trial [J]. Stroke, 2022, 53(7): 2182-2191
- [13] Song GF, Wu CJ, Dong SX, et al. Rehabilitation training combined acupuncture for limb hemiplegia caused by cerebral hemorrhage: A protocol for a systematic review of randomized controlled trial [J]. Medicine (Baltimore), 2019, 98(9): e14726
- [14] Tomida K, Sonoda S, Hirano S, et al. Randomized Controlled Trial of Gait Training Using Gait Exercise Assist Robot (GEAR) in Stroke Patients with Hemiplegia [J]. J Stroke Cerebrovasc Dis, 2019, 28(9): 2421-2428
- [15] Zhu J M, Zhuang R, He J, et al. Yin-yang balance penetrating acupuncture combined with rehabilitation training on upper limb spasticity in stroke hemiplegia [J]. Chin Acupunc Moxibust, 2020, 40(7): 697-701
- [16] Hu L, Liu G. Effects of early rehabilitation nursing on neurological functions and quality of life of patients with ischemic stroke hemiplegia[J]. Am J Transl Res, 2021, 13(4): 3811
- [17] 王颖, 席佳韵, 宗丽春, 等. 低频神经肌肉电刺激联合巴氯芬治疗脑卒中偏瘫伴肌痉挛患者的疗效观察[J]. 实用心脑血管病杂志, 2018, 26(12): 80-83
- [18] 东妍, 韩亚杰. 低频脉冲电刺激联合肢体康复锻炼对脑卒中后偏瘫患者的治疗效果[J]. 检验医学与临床, 2022, 19(19): 2707-2710
- [19] Han Y, Zhao X, Xu Q. Analysis of the Influence of Early Rehabilitation Nursing on the Rehabilitation of Stroke Patients with Hemiplegia[J]. Invest Clin, 2020, 61(3): 1464-1473
- [20] Wang J, Ran C, Pan P, et al. Rehabilitation training combined acupuncture for limb hemiplegia caused by cerebral infarction: A protocol for a systematic review of randomized controlled trial [J]. Medicine (Baltimore), 2021, 100(1): e23474
- [21] Hashimoto Y, Kakui T, Ushiba J, et al. Portable rehabilitation system with brain-computer interface for inpatients with acute and subacute stroke: A feasibility study[J]. Assist Technol, 2022, 34(4): 402-410
- [22] Huo C, Li X, Jing J, Ma Y, et al. Median Nerve Electrical Stimulation-Induced Changes in Effective Connectivity in Patients With Stroke as Assessed With Functional Near-Infrared Spectroscopy [J]. Neurorehabil Neural Repair, 2019, 33(12): 1008-1017
- [23] Chen L, Gu B, Wang Z, et al. EEG-controlled functional electrical stimulation rehabilitation for chronic stroke: system design and clinical application[J]. Front Med, 2021, 15(5): 740-749
- [24] Maeda M, Mutai H, Toya Y, et al. Effects of peripheral nerve stimulation on paralysed upper limb functional recovery in chronic stroke patients undergoing low-frequency repetitive transcranial magnetic stimulation and occupational therapy: A pilot study [J]. Hong Kong J Occup Ther, 2020, 33(1): 3-11
- [25] Chen X, Gan Z, Tian W, et al. Effects of rehabilitation training of core muscle stability on stroke patients with hemiplegia[J]. Pak J Med Sci, 2020, 36(3): 461-466

- [19] 钟雨晴, 刘洋, 胡艳, 等. 子宫腺肌症四种亚型的 MRI 特征及其 HIFU 治疗相关参数的差异性研究 [J]. 磁共振成像, 2022, 13(9): 95-99
- [20] 薛颖, 杨艳景, 闫娟, 等. 补肾活血散瘀汤联合高强度聚焦超声对子宫腺肌病的疗效及病人免疫功能的影响 [J]. 安徽医药, 2023, 27(1): 131-134
- [21] Zhang W, Liu X, Zhu Y, et al. Transcriptional and posttranslational regulation of Th17/Treg balance in health and disease [J]. Eur J Immunol, 2021, 51(9): 2137-2150
- [22] 李晓彤, 霍丽娟. Th17 细胞在炎症性肠病发病中作用的研究进展 [J]. 国际免疫学杂志, 2023, 46(1): 103-107
- [23] 戴鸿宇, 季东, 谈程, 等. 致病性 Th17 细胞在神经炎症中的作用及调控机制的研究进展 [J]. 遗传, 2022, 44(4): 289-299
- [24] Eggenhuizen PJ, Ng BH, Ooi JD. Treg Enhancing Therapies to Treat Autoimmune Diseases [J]. Int J Mol Sci, 2020, 21(19): 7015
- [25] Ohkura N, Sakaguchi S. Transcriptional and epigenetic basis of Treg cell development and function: its genetic anomalies or variations in autoimmune diseases [J]. Cell Res, 2020, 30(6): 465-474
- [26] 郭赞, 包东明. Embosphere 微球子宫动脉栓塞对重症子宫腺肌病患者月经恢复及血清性激素的影响 [J]. 中国妇产科临床杂志, 2021, 22(5): 480-482
- [27] 许昌翠, 徐燕红, 殷广莉, 等. 经阴道与经腹部彩色多普勒超声对子宫肌瘤及子宫腺肌病的鉴别诊断 [J]. 中国实验诊断学, 2022, 26(1): 50-54
- [28] Li X, Zhu X, He S, et al. High-intensity focused ultrasound in the management of adenomyosis: long-term results from a single center [J]. Int J Hyperthermia, 2021, 38(1): 241-247
- [29] 叶明珠, 薛敏. 高强度聚焦超声在子宫腺肌病治疗中的应用 [J]. 中国实用妇科与产科杂志, 2019, 35(5): 522-527
- [30] 崔运能, 姚亮凤, 冯敏清, 等. 磁共振成像 DWI 序列可代替增强扫描评估高强度聚焦超声治疗子宫腺肌症的即时消融效果 [J]. 南方医科大学学报, 2021, 41(10): 1583-1587

(上接第 2753 页)

- [26] Liu G, Cai H, Leelayuwat N. Intervention Effect of Rehabilitation Robotic Bed Under Machine Learning Combined With Intensive Motor Training on Stroke Patients With Hemiplegia [J]. Front Neurobot, 2022, 16(5): 865403
- [27] Li M, Gai H, Nie Y, et al. Application of transitional Care in Hemiplegia Patients during Recovery of ischemic stroke via cloud follow-up system [J]. Int J Sci, 2020, 7(1): 136-141
- [28] 税丽娟. 康复运动联合低频电刺激对缺血性脑卒中后下肢功能障碍患者下肢肌力及神经运动功能的影响 [J]. 心血管康复医学杂志, 2019, 28(4): 389-393
- [29] Long Y, Ouyang R, Zhang J. Effects of virtual reality training on occupational performance and self-efficacy of patients with stroke: a randomized controlled trial [J]. J Neuroeng Rehabil, 2020, 17(1): 1-9
- [30] Bilek F, Deniz G, Ercan Z, et al. The effect of additional neuromuscular electrical stimulation applied to erector spinae muscles on functional capacity, balance and mobility in post-stroke patients [J]. NeuroRehabilitation, 2020, 47(2): 181-189