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肌电生物治疗联合运动康复在桡神经损伤治疗中的临床应用及疗效评价*

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摘要 目的：探究肌肉电刺激生物疗法联合运动疗法对于治疗桡神经损伤患者的临床疗效及运动恢复效果评价。**方法：**选择 2013 年 5 月至 2016 年 5 月我院收治的 100 例桡神经损伤患者。采用随机数字表法随机分为研究组和对照组各 50 例。对照组采用常规治疗（营养神经药物 + 针灸）和运动疗法，研究组在此基础上联合肌电生物治疗。治疗时间均为 12 周。治疗结束后应用统计学方法对两组患者的治疗有效率、腕伸肌和指总伸肌恢复情况、伸腕角度和伸肘角度以及神经传导速度和波幅等方面进行疗效对比。**结果：**治疗 12 周后，研究组治疗有效率 66.00%高于对照组的 50.00%，差异有统计学意义（P<0.05）。研究组肌力恢复至 4-5 级的比例和表面肌电信号(sEMG)增幅均高于对照组，差异均有统计学意义（P<0.05）。经治疗后，研究组伸腕角度和伸肘角度的优良率分别为 84.00%、80.00%，明显高于对照组的 66.00%、68.00%，差异均有统计学意义（P<0.05）。两组患者胫神经运动传导速度(MCV)及波幅的均有改善，但研究组的改善效果明显优于对照组，差异有统计学意义（P<0.05）。**结论：**常规治疗联合肌电生物反馈和运动疗法的治疗方案明显能使得患者受益更多，能更好地恢复患者的患肢运动功能，值得临床推广。

关键词：桡神经损伤；肌电生物反馈；运动疗法；电刺激

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Clinical Application and Efficacy Evaluation of Electromyographic Biological Therapy Combined with Motor Rehabilitation in the Treatment of Radial Nerve Injury*

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ABSTRACT Objective: To explore the clinical efficacy and the effect of electromyographic biological therapy combined with exercise therapy in the treatment of patients with radial nerve injury. **Methods:** Selected 100 cases of patients with radial nerve injury treated in our hospital from May 2013 to May 2016. They were randomly divided into the study group and the control group with 50 cases in each group by random number table method. The control group was treated with conventional therapy (Neurotrophic drugs +acupuncture)and exercise therapy, and the experimental group was treated with electromyographic therapy on the basis of the same routine treatment. The duration of treatment was 12 weeks. At the end of the treatment, the treatment efficiency, wrist extensor and total extensor recovery, wrist extension angle, elbow extension angle, nerve conduction velocity and amplitude were compared between the two groups by statistical method. **Results:** After 12 weeks of treatment, the effective rate of the treatment group was 66.00%, higher than 50.00% of the control group, the difference was statistically significant (P<0.05). The proportion of muscle strength returned to grade 4-5 and the amplitude of EMG (sEMG) increase in the study group was higher than that of the control group, the difference was statistically significant (P<0.05). After treatment, the excellent rate of wrist and elbow extension angle was 84.00%, 80.00%, significantly higher than 66.00% and 68.00% in the control group, the difference was statistically significant (P<0.05). The MCV and amplitude of the two groups were improved, but the improvement effect of the study group was better than that of the control group, the difference was statistically significant (P<0.05). **Conclusion:** Conventional treatment combined with electromyographic therapy and exercise therapy can significantly improve the patient's benefit, and it can better restore the patient's limb movement function. It is worthy of clinical promotion.

Key words: Radial nerve injury; Electromyographic biofeedback; Exercise therapy; Electrical stimulation

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前言

目前在临床上桡神经损伤的主要原因包括炎症、神经营养血管受压等，且常常由睡前饮酒史、睡眠时肢体摆放不当或者

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上肢受压而引起[1-3]。桡神经的解剖位置从臂丛神经的后束发出,故桡神经出现损伤后,常常表现为伸腕和伸指,前臂旋后等运动障碍,甚至由于腕伸肌瘫痪而导致腕下垂[4,5]。桡神经损伤恢复的时间较长,目前在临床上对其的治疗也是观点不一[6]。本研究通过在药物治疗和针灸治疗的常规治疗模式的基础上联合肌电生物反馈和运动康复治疗桡神经损伤,取得了一定的显著临床疗效,现报道如下。

1 资料与方法

1.1 一般资料

选择 2013 年 5 月至 2016 年 5 月在我院门诊或住院的桡神经损伤患者 100 例,均为高位损伤,诊断标准[7]:根据患者主诉及生命体征明确诊断。入选标准:① 年龄小于 60 周岁;② 仅有单纯桡神经损伤的生命体征。排除标准:① 伴有精神类疾病及沟通障碍者;② 合并严重或肌电生物疗法绝对禁止的疾病,如冠心病,糖尿病等。按照随机数字表将所有患者随机分为对照组和研究组各 50 例。其中对照组男性为 28 例,女性为 22 例;平均年龄为(46.32± 10.15)岁;病程 2～7 周,平均为(4.58± 1.74)周;研究组男性为 31 例,女性为 19 例;平均年龄为(45.99± 11.33)岁;病程 2～6 周,平均为(4.72± 1.75)周。对比两组患者在治疗前的性别、年龄、病程等一般临床资料发现差异并无统计学意义(P>0.05)。告知所有患者本次实验内容及方法,并签署知情同意书。

1.2 治疗方法

对照组:给予对照组患者营养神经的相关药物如单唾液酸神经节苷酯钠、维生素 B1、维生素 B12、丹红,并加以常规针灸辅助治疗,同时教会患者自己进行康复运动锻炼,患肢做肘腕关节的背伸、手指背伸、拇指外展及背伸等运动方式,循序渐进,由被动向主动运动过渡,每次总时长为 40 min,每周训练 6 次,共治疗 12 周。研究组治疗方法:在给予与对照组相同的治疗方案的基础上联合肌电生物治疗:指导患者坐在神经康复重建仪(厂家:广州三甲医疗产业有限公司,型号:WOND 2000F)的显示器前,保持放松状态,将电极的正极放置受损桡神经的近端,负极放置在受损部位的远端,第一次治疗时需在 " 刺激器设置 " 中,执行电流强度自动测量程序,以能引起合适的训练目标为准,确认后保存患者档案以便下次自动加载,指导患者学会根据肌电图(EMG)波形反馈信号通过自我控制调节 EMG 电压从而使治疗部位肌肉放松或紧张,总时长为 40min,每周训练 6 次,研究组行上述疗法共 12 周。

1.3 评价指标

① 治疗有效率:根据中华医学会手外科学会桡神经功能评定标准[8]对两组患者治疗效果进行评价。② 腕伸肌、指总伸肌恢复情况:利用手法肌力检查(MMT)[9]和 EMG 数据对患者的腕伸肌、指总伸肌恢复情况进行对比,其中 EMG 数据采用神经康复重建仪(厂家:广州三甲医疗产业有限公司,型号:WOND 2000F)记录,并按 Brucker 占正常肌电信号百分比的换算法进行换算。③ 伸腕角度和伸肘角度:优为角度大于 60°,良 45°-60°,差为角度小于 45°。④ 神经传导速度和波幅:将针电极刺入腕伸肌和指总伸肌的肌腹作为引导电极,在靠近腋窝的肱二头肌和肱三头肌内侧头之间以及 Erb 氏点作为刺激电位。

1.4 统计学分析

使用 SPSS 19.0 软件对研究数据进行统计学分析。用平均数± 标准差表示计量资料,并进行两组间 t 检验;采用率(%)表示计数资料,并进行 x^2 检验或 Fisher 精确检验;以 α=0.05 为检验水准,p<α 则代表差异具有统计学意义。

2 结果

2.1 两组治疗疗效对比

连续治疗 12 周后,对所有患者进行评估,结果显示,研究组治疗有效率高于对照组,且差异有统计学意义(P<0.05),见表 1。

表 1 两组治疗有效率对比

Table 1 Comparison of therapeutic effective rate between the two groups

Groups	Excellent	Good	Average	Weak	Effective rate(%)
Control group	11	14	10	15	50.00
Study group	13	20	8	9	66.00
x^2 value	-	-	-	-	9.18
P value	-	-	-	-	<0.05

2.2 两组腕伸肌、指总伸肌肌力恢复及表面肌电信号(sEMG)对比

经治疗后,研究组肌力恢复至 4-5 级的比例高于对照组,差异有统计学意义(P<0.05),见表 2。经治疗后,研究组的 sEMG 信号增幅同时也要高于对照组,差异有统计学意义(P<0.05),见表 3。

2.3 两组患者伸腕、伸肘角度疗效比较

经治疗后,研究组伸腕角度和伸肘角度的优良率明显高于对照组,差异有统计学意义(P<0.05),见表 4。

2.4 两组患者胫神经运动传导速度(MCV)及波幅对比

治疗前,两组患者的 MCV 及波幅差异并无统计学意义(P＞0.05);经治疗后,两组患者 MCV 及波幅的均有改善,但研究组的改善效果明显优于对照组,差异有统计学意义(P<0.05),见表 5。

3 讨论

桡神经起自于臂丛后束,在大圆肌表面分支分别支配肱三头肘肌和肘肌,然后继续向下延伸而进入桡神经沟,并在肘关节的上方部位分支分别支配肱桡肌以及桡侧腕长伸肌,随后在肱骨上髁平面分支后继续下行并支配前臂背侧肌群[10-13]。桡神经损伤是上肢周围神经损伤的常见类型之一,其主要原因是该

表 2 两组患者的腕伸肌、指总伸肌肌力恢复 MMT 分级对比

Table 2 Comparison of MMT grade of wrist extensor and extensor digitorum muscle recovery in two groups

Groups	Time	Wrist extensors		Extensor digitorum	
		0-3 level	4-5 level	0-3 level	4-5 level
Control group	Before treatment	50	0	50	0
	After treatment	38	12	41	9
Study group	Before treatment	50	0	50	0
	After treatment	24	26[a]	29	21[b]

Note: Compared with the control group after treatment, x^2=3.78, [a]P<0.05; x^2=15.54, [b]P<0.05.

表 3 两组患者治疗前后 sEMG 对比

Table 3 Comparison of sEMG between the two groups before and after treatment

Groups	Wrist extensors		Extensor digitorum	
	Before treatment	After treatment	Before treatment	After treatment
Control group	43.22± 13.78	98.46± 18.27	58.91± 19.89	179.34± 55.93
Study group	45.46± 10.14	127.05± 19.33	57.98± 20.13	231.51± 60.05
T value	1.09	16.81	0.92	20.67
P value	＞0.05	＜0.05	＞0.05	＜0.05

表 4 两组治疗后伸腕伸肘角度变化对比

Table 4 Changes of wrist and elbow extension angle in two groups after treatment

Groups	Wrist extension angle				Elbow extension angle			
	Excellent	Good	Weak	Excellent rate(%)	Excellent	Good	Weak	Excellent rate(%)
Control group	18	15	17	66.00	16	18	16	68.00
Study group	26	16	8	84.00	23	17	10	80.0
x^2 value	-	-	-	4.41	-	-	-	3.76
P value	-	-	-	<0.05	-	-	-	<0.05

表 5 两组患者 MCV 及波幅恢复的对比

Table 5 Comparison of MCV and amplitude recovery in two groups

Groups	MCV(m/s)		Amplitude(μV)	
	Before treatment	After treatment	Before treatment	After treatment
Control group	43.91± 14.54	51.15± 19.78	10.08± 4.13	11.61± 4.25
Study group	46.22± 12.47	68.98± 21.31*	11.32± 3.93	17.54± 3.93*
T value	0.76	4.98	0.87	6.71
P value	＞0.05	＜0.05	＞0.05	＜0.05

神经走形较为表浅，容易受到外界危险因素的刺激（如压迫、撞击、冷冻等）[14-16]。常见的病因包括肱骨干骨折，上臂长期压迫和睡前吹空调史等[17,18]。因桡神经在不同部位所支配的支配运动和感觉的区域不同，所以不同损伤部位的临床表现也往往具有较大的差异，具体可分为三类：① 腋部高位损伤：在发出支配肱三头肌的分支前发生损伤，表现为完全性的桡神经麻痹，整个患上肢出现瘫痪，各上肢关节均发生运动障碍；② 肱骨 1/3 处损伤：在发出支配肱三头肌的分支后发生损伤，表现为除肱三头肌能维持正常运动功能，其他体征改变同前；③ 肱骨 1/3 以下损伤：仅出现指关节的功能障碍，其余功能正常[20-23]。

目前在临床上对于桡神经损伤的患者主要以恢复其相关肌肉的运动功能为主，并要求患者尽早活动相关障碍关节和肌肉，防止肌腱粘连，关节僵硬[24-26]。传统的治疗方案包括服用营养神经的药物、中医针灸和温热治疗等，通过以上方案在一定程度上能改善患者的临床症状。本课题组通过在常规治疗方案的基础上加用肌电生物和运动疗法治疗桡神经损伤的患者，与传统的治疗模式对比，在运动功能、伸肘伸腕角度以及神经传导速度和波幅等方面进行评价，差异均有显著的统计学意义。主要利用肌电生物反馈系统能够收集并放大刺激患者的肌肉收缩电信号，从而引起肌肉更强烈的运动的原理进行治疗，从一个完整的电信号传导通路达到一个反复刺激的目的[27,28]。进一步配合运动康复治疗，从被动运动和主动运动两个方面促进患者损伤神经的恢复或者激活保留功能的神经通路，从而恢复肢体功能，另外肌电生物反馈系统可使患者能及时直观地看到自主运动的变化，从而提高自我感知能力，进而由意识控制内环境，并自我进行运动的控制及调整其正确性，从而增强患者

参与治疗的积极性,可增强运动训练的疗效,因此研究组治疗有效率明显高于对照组。肌电生物反馈系统反复肌电刺激可兴奋神经、肌肉的细胞去极和复极化,促进中枢神经系统内源性类吗啡样物质释放,增强肌肉张力[29,30],因此研究组肌力恢复至4-5级的比例要更加明显。在运动疗法基础上给予肌电生物反馈治疗,可有效增加神经血流,给神经再生提供了良好的营养环境,促进神经功能恢复,从而利于正常的关节活动功能恢复,因此研究组的伸腕角度和伸肘角度疗效要明显高于对照组。

综上所述,肌电生物治疗和运动疗法能更大程度地刺激患者患肢肌肉残留的运动功能,使患者主动和被动的参与到整个恢复的过程,更好地改善桡神经所支配地相关重要关节活动度和肌肉的运动功能。这一技术的临床疗效是肯定的,值得临床推广。

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