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肌电控制康复机器人协助的脑卒中患者肘关节康复训练的多参数评价

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摘要：

摘要目的：探索在肌电控制机器人协助的脑卒中偏瘫患者肘关节康复训练中，有关肘关节电生理、动力学、运动学等多项参数的变化情况，并为脑卒中评估提供更加全面的定量评估方法。方法：本研究募集了8例偏瘫患者，对其分别进行了20次肌电控制机器人辅助的肘关节康复训练，在实验过程中记录了肱二头肌与肱三头肌的肌电信号，肘关节力矩信号和角度信号。结果：训练后Fugl-Meyer上肢功能评测值显著大于训练前（P<0.05），Ashworth量表值显著小于训练前（P<0.05）；在最大自主等长收缩（MVC）实验中，肘关节屈曲与伸展的MVC力矩显著大于训练前（P<0.01）；三头肌的力矩-肌电比显著大于训练前（P<0.05）；在无辅助跟踪运动中肘关节运动角度和目标角度均方根误差（RMSE）显著小于训练前（P<0.05）。结论：肌电控制康复机器人肘关节康复训练从关节力矩、肌肉效率、运动精度等多个方面改善偏瘫患者的运动功能。以上参数从多角度定量反映了偏瘫患者运动功能状态，具有应用于临床运动功能评估的潜在价值。

关键词：肌电　康复机器人　偏瘫　脑卒中　肘关节

Quantitative evaluation of motor function recovery process in chronic stroke patients during myoelectric controlling robot-assisted elbow training　Download Fulltext

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Fund Project:

Abstract:

Abstract Objective: To investigate the changes in electrophysiological, kinetic and kinematical parameters during myoelectric controlling robot-assisted elbow training in stroke patients, and to provide a more comprehensive and quantitative evaluation method. Method: Eight subjects with chronic upper extremity paresis after stroke attended a 20-session elbow training using a myoelectric controlling robot. EMG of biceps and triceps, elbow torques and angle signals were recorded synchronously during the experiment. Result: After the 20-session training, there were statistically significant improvements in Ashworth scale and Fugl-Meyer scale for elbow（P<0.05）. After training in maximal voluntary isometric contraction(MVC) experiment, elbow flexion, and extension MVC torques increased significantly (P<0.01). The moment torque-EMG ratio of triceps increased significantly(P<0.05). Root mean square error(RMSE) between target angle and motion angle also decreased significantly (P<0.05). Conclusion: The myoelectric controlling robot-assisted elbow training could improve joint moment torques, muscle efficiency, and motion accuracy for stroke patients. These parameters could quantitatively reflect motor function of stroke patients from different aspects, and possesed the potential value in applied in clinical evaluation of motor function.

Keywords:electromyogram　rehabilitation robot　hemiplegia　stroke　elbow

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