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Quantitative Evaluation of Surface Electromyography on Upper Limb Dystonia after Stroke

Abstract:

Objective: To explore the feasibility of evaluating the rehabilitation effect of surface electromyography (SME) on limb dystonia in hemiplegic patients after stroke， and to establish a quantitative range of surface electromyography parameters and modified Ashworth scale (MAS).

Methods: Surface electromyography (sEMG) was used to evaluate the root mean square (RMS) and integral electromyography (iEMG) of biceps brachii with the affected upper limbs during passive movement in patients with post-stroke spasm(MAS≤ III grade) . The above indexes of biceps brachii with different MAS grades were analyzed by one-way ANOVA， and the correlation between RMS and MAS scores was analyzed.

Results: The degree of spasticity MAS in upper limbs after stroke was correlated with RMS (P ＜ 0. 01) and iEMG(P ＜ 0. 01) of biceps brachii. There was no statistical difference between grade 0 and grade 1 of MAS (P ＞ 0. 05)， but there was statistical difference among other levels (P ＜ 0.05) .

Conclusion: Surface electromyography can be used to quantitatively analyze the degree of upper limb spasm in some stroke patients.

Keywords: Spasm after stroke， Surface electromyography

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Table 1 Correlation between iEMG and RMS of biceps brachii with different MAS grades

MAS	Grade 0	Grade I	Grade I+	Grade II	Grade III	*P* value	*R value*
N	9	10	10	8	5		
MAS score	0	1	2	3	4		
iEMG	19.79±1.21	20.83 ±4.80	33.52±3.85	57.76±11.32	119.23 ±12.46	0.000	0.822
RMS	6.77±1.11	7.33±1.49	10.16±1.71	12.98±1.78	20.55±2.46	0.000	0.873

Table 2 Comparison of iEMG of biceps brachii with different MAS grades ($\bar{x}\pm S$)

MAS	Grade 0	Grade I	Grade I+	Grade II	Grade III
iEMG	19.79±1.21	20.83 ±4.80	33.52±3.85	57.76±11.32	119.23 ±12.46
Compared with Grade 0 (*P value*)	-	0.999	0.000	0.000	0.001
Compared with Grade I (*P value*)	-	-	0.000	0.000	0.000
Compared with Grade I+ (*P value*)	-	-	-	0.004	0.001
Compared with Grade II (*P value*)	-	-	-	-	0.000

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Table 3 Comparison of RMS of biceps brachii with different MAS grades ($\bar{x}\pm S$)

MAS	Grade 0	Grade I	Grade I +	Grade II	Grade III
RMS	6.77±1.11	7.33±1.49	10.16±1.71	12.98±1.78	20.55±2.46
Compared with Grade 0 (*P value*)		0.987	0.001	0.000	0.000
Compared with Grade I (*P value*)		-	0.010	0.000	0.001
Compared with Grade I + (*P value*)		-	-	0.039	0.001
Compared with Grade II (*P value*)		-	-	-	0.007

In patients with post-stroke spasticity, as muscle tone increases, resistance during passive movements rises, muscle discharge intensifies, and interval quantification can be performed between Grads other than Grade 0 and Grade I. During passive movements, the iEMG and RMS scores of the biceps brachii are correlated with its modified Ashworth grading.

Biography: Fan Jiang is a dedicated clinician and researcher in the Department of Neurology at Shapingba Hospital, affiliated with Chongqing University (Shapingba District People's Hospital of Chongqing), China. With strong expertise in neurological evaluation and patient care, Fan Jiang focuses on the diagnosis and management of a wide range of neurological disorders. Her clinical interests include stroke, neurodegenerative diseases, and neuromuscular conditions, supported by a commitment to evidence-based practice and continuous medical advancement. Through her work at one of Chongqing's leading medical institutions, she contributes to improving neurological outcomes and promoting high-quality, patient-centered care.

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