THE EARLY DIAGNOSIS OF THE LUMBAR SPINE FUNCTIONAL DISORDERS IN ATHLETES WITH USE OF ELECTROMYOGRAPHIC METHODS

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INTRODUCTION

One of the promising and informative methods for quantitative analysis of the functional state of athletes neuromuscular system could be tests with use of stimulation electromyography in which the parameters of such electromyographic (EMG) phenomena as the H (Hoffmann) reflex are measured. Using EMG-study of *m. soleus* we can recognize the state of the level L_v-S_1 segmental apparatus of lumbar and sacral parts of spinal cord. This part of athletes spine experiences the greatest stress during exercises.

The aim of our work was to assess the functional state of the neuromuscular system of athletes performing in different sports, using the method of stimulation electromyography and to provide recommendations for improving the training process to compensate and prevent possible functional disorders.

METHODOLOGY / PROCEDURE

Seventy two qualified athletes (Masters of Sport and Master of Sports of International Class), specializing in rowing and canoeing, freestyle, swimming and diving, 18-25 years of age, took part in this EMG-study. To assess the functional state of athletes neuromuscular system the method of H-reflex of soleus muscle was used. Registration of EMG-signals and tibial nerve stimulation were performed using neurodiagnostic complex (Nicolet Viking Select, USA-Germany).

RESULTS

The following parameters of H-reflex were analyzed: THR (threshold of H-response), TMR (threshold of M-response (evoked muscle compound action potential)), THR/TMR (thresholds ratio of H-and M-responses), H_{max} (the amplitude of the maximal H-response), M_{max} (the amplitude of the maximal M-response) H_{max}/M_{max} (ratio of maximal amplitudes of H-and M-responses). Some abnormalities were found in athletes EMG-parameters, which can be referred to two degrees (Table 1).

Table 1. Number of athletes with EMG-data overrunning the standard (% from total number of the group)

Kind of sport	Men		Women	
	1st Degree	2nd Degree	1st Degree	2nd Degree
Freestyle	25	25	33	33
Diving	30	0	38	0
Swimming	25	0	25	0
Rowing and canoeing	15	0	25	0

The disorders of 1st degree (slight) are characterized by increase of thresholds of H-and M-responses (in about 2 times of normal), some decrease in the amplitude of the H-response and amplitude ratios of H-and M-responses (in about 2 times of normal). The disorders of 2nd degree are significant and more apparent, they are characterized by a considerable increase in the thresholds of H-and M-responses (in about 3-3.5 times of normal, often a threshold ratio of H- and M-responses is greater than 1), a significant reduction in the amplitude of H-and M-responses and their ratio (in about 3-4 times of normal), sometimes there is even a complete lack of H-response.

DISCUSSION/CONCLUSIONS

The deviations of EMG parameters from the established standard could serve as an earliest diagnostic sign of spinal nerve S_1 roots compression, when the clinical symptoms are not yet pronounced. The timely compensation of disorders can prevent further injuries of athletes.

It was found that the largest part of EMG-parameters deviations from the standard was observed in athletes, performing in sports associated with permanent exercise stress of the lumbar spine, such as during jumps (freestyle, diving) (Table 1). Smaller deviations were found for athletes doing rowing and swimming and experiencing less significant load.

In order to prevent further development of the detected disorders in the neuromuscular system of athletes the set of exercises was designed and developed aiming at strengthening and stretching the muscles of the back, straight and oblique abdominal muscles. The tools that help in unloading and rehabilitation of intervertebral disks, such as swimming, physiotherapy, massage were also recommended.