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CLASSIFICATION OF THE MAIN DRUGS THAT AFFECT MUSCLE TONE

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ABOUT ARTICLE

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Abstract: This article describes the physiological characteristics of muscle tone and the impact of muscle tone disorders on human health.

INTRODUCTION

The simple definition of tone as passive stretching resistance is physiologically a complex interconnected network that includes neural circuits in the brain, spinal cord, and muscle spindle. Muscle tone disorders can be caused by dysfunction of these pathways and manifest as hypertension or hypotonia.

Loss of Supraspinal control mechanisms causes hypertension, resulting in spasticity or stiffness. On the other hand, dystonia and paratonia also manifest as abnormalities of muscle tone, but are more likely caused by network dysfunction between basal ganglia and thalamo-cerebello-cortical joints. In this review, we discussed the normal homeostatic mechanisms of tone maintenance and the pathophysiology of spasticity and stiffness with its anatomical correlations, after which we also highlighted the phenomenon of network dysfunction, cortical dysinhibition and neuroplastic changes. Muscle tone is a complex and dynamic condition caused by hierarchical and mutual anatomical connection. It is regulated by input and output systems and has important interactions with power and task performance requirements. Tone is essentially a construction of motor control, on the basis of which power is self-balanced.

This hierarchy of motor control includes the cortex (broad processing ability with the highest degrees of freedom), basal ganglia (learning and training context-dependent tasks with lower degrees of freedom), cerebellum (fine tuning), brainstem reticular system (general path of ascent). and descending paths), spinal cord (the main path of ascending and descending paths) and muscle spindle (the last common path with the least degree of freedom). This review discusses the definition of muscle tone and its classification, followed by arguments related to the mechanisms and pathways responsible for maintaining tone. Spasticity and rigidity have been developed in the context of two types of hypertensions, dysfunction of the supraspinal pathways and interaction of the spinal cord and muscle spindle.

The other two disorders of altered tone, namely dystonia and paratonia, are not fully associated with physiological dysfunction of the tone pathways. In an engine control system, spasticity and stiffness are primarily an output system problem, while dystonia is a system-level processing problem.

Dystonia and paratonia altered secondary tone in the basal ganglia, thalamocortical periods, and their connections as a result of network disruption. These mechanisms were later discussed because they are important both clinically and pathophysiologically in terms of movement disorders that cause dystonia and paratonia.

Muscle tone is traditionally defined as" tension of the relaxed muscle "or" resistance felt by The Examiner during passive stretching of the joint while the muscles rest". This definition of tone has some ambiguity, for example, it is not clear what "passive stretch resistance" means, and "perceived by The Examiner" opens the way for subjective changes and variability of assessment during clinical examination.

Studies with electromyographic (EMG) evaluation often equate muscle tone to basic EMG levels in a relaxed state. However, in addition to the active or contractile component, which is caused by the activation of the motor block and is detected by EMG, the muscle tone also has a passive or viscoelastic component that does not depend on nerve activity, which is not detected by EMG.

The viscoelastic component, in turn, is dependent on many factors such as sarcomeric actin-myosin cross bridges, adhesion, elasticity and elongation of contractile filaments, filamentous coupling of non-sarcomeric contractile proteins (e.g. desmin, titin), osmotic pressure. in cells, as well as in the surrounding connective tissue.

Mathematically, muscle tone can be interpreted as a change in resistance or a change in the length of the force to a unit change (d force / D shift of the tissues). In the relaxed state, resistance to external movement (RTOT) depends on inertia (RIN), apparent stiffness (resistance to stretching / RST) and damping (resistance to speed / RDA): RTOT = RIN + RDA + RST. However, in all these definitions there is a general misconception that a person is in a fully relaxed state, which cannot be achieved if a muscle relaxant is not used.

Muscle tone is regulated by spinal and supraspinal mechanisms. Although spinal control depends on the interaction between the muscle spindle and the spinal cord, along with interneurons, supraspinal control is regulated by the facilitating and inhibitory long pathways and the cerebellum.

Interaction between the muscle shaft and the spinal cord

To regulate muscle tone, an emotional connection between the muscle and the spinal cord in terms of its length and tension is necessary. Intrafusal fibers send information about muscle length or rate of change in length, while Golgi tendon organs send information about tendon tension or rate of change in tension. Type Ia afferents determine the rate of change in muscle length during stretching (dynamic response). At the same time, the tonic activity of Type Ia and Type II afferents determines the length of the muscle in a steady state (static response).

Type Ib afferents send information from the Golgi tendon organs.

The muscle spindle forms a tone by activating the stretching reflex. When a motor command is sent to the alpha motor fibers (the supplier of extrafusal fibers), the gamma fibers (the supplier of intrafusal fibers) are also excited (activation in conjunction with Alpha-gamma), thanks to which both extrafusal and intrafusal fibers contract. The Stretch reflex can be of two types: (a) dynamic and (b) static. Sudden rapid stretching of the muscle stimulates the core sac fibers (responding to the rate or speed of stretching) and IA afferents (annulospiral ends) transfer the dynamic signal to the spinal cord.

This is the basis of the clinical picture of deep tendon reflexes. On the other hand, continuous muscle stretching stimulates the core chain fibers, and Type II afferents (flower-spray tips) transfer the signal to the wire. From the cord, the efferent signal passes through Alpha-efferents to extrafusal fibers. However, this time, asynchronous contraction of extrafusal muscle fibers (combined discharge of motor units) occurs, which, when stretched, leads to a slight stable contraction of these fibers. This static stretching reflex response is the physiological basis for maintaining muscle tone.

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