Dyspnea: Measurement and Mechanism

Dyspnea is basically a subjective sensation and generally no specific objective changes accompany it, therefore difficult to properly treat this type of suffering. On the other hand, dyspnea is the most common and urgent complaint of patients consulting with medical doctors. Accordingly, from the viewing point of clinical medicine, this is an important factor to determine the quality of life (QOL) of the patient.

The two current advances have made in the research of dyspnea. One: in the past in Japan, rating of breathlessness was primarily evaluated by the severity of the physical response to varying exercise stimulations, and classified into several degrees by using an assessment such as the Hugh-Jones criterion (1). However, the stimulus-response relationship in this method does not provide a qualitatively meaningful measure for dyspnea, because the magnitude of dyspnea is merely indirectly assessed. To cope with this difficulty, more direct measurements for dyspneic sensation have currently been advocated (2). These methods are principally based on the psychophysical stimulus-response characteristics termed Steven’s law; in practice, two methods, visual analog scale (VAS) (3) and the modified Borg scale (4) are most frequently used. Another progress in this area is the new hypothesis to explain the genesis of dyspnea. It is generally agreed that a single mechanism commonly responsible for every dyspneic sensation does not likely to exist. The afferent information from the receptors such as in the upper and lower airways, the chest wall, the respiratory muscles or the peripheral and central chemoreceptors may eventually converge somewhere in the central nervous system (CNS), then the ventilatory command is sent from the motor cortex to the respiratory muscles. Simultaneously, corollary discharge are transmitted to the sensory cortex, thereby eliciting dyspneic sensation. This concept, first proposed by Killian et al (5) is termed the multi-factorial motor command theory.

One of the important issues at present is the clarification of the individual mechanisms involved in this motor command system. In this issue of Internal Medicine, Nakayama et al (6) reported that dyspnea elicited by arm elevation in COPD patients was mitigated by in-phase chest wall vibration (IPV).

They proposed that increased muscle-spindle afferent discharges induced by tonic vibration reflex with IPV may effectively counteract the motor command signal, and thus the dyspneic sensation is lessened. Involvement of the respiratory muscle activity to alleviate dyspneic sensation has long been known since the pioneering breath holding experiment by Fowler (7). Kobayashi and Sasaki (8) further demonstrated that rebreathing a volume as small as 0.1 liter is still effective to mitigate dyspnea during breath holding. The paper by Nakayama et al (6) seems to provide a good insight into the involvement of the respiratory muscle activities in the mechanism of dyspnea.

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References