POSTURAL EFFECTS ON COMPARTMENTAL VOLUME CHANGES OF BREATHING BY OPTOELECTRONIC PLETHYSMOGRAPHY IN HEALTHY SUBJECTS

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INTRODUCTION: Breathing pattern was an important factor to affect the performance of sports for athletes. Optoelectronic plethysmography (OEP) was a new method to evaluate breathing pattern by measuring compartmental volume (upper thorax (UT), lower thorax (LT), and abdomen (AB)) freely without limitation. Previous study already investigated the swimmers had better breathing pattern measured by OEP (Karine et al., 2008) in sitting posture. Swimming, such as backstroke, is perfromed in supine posture, but previous study did not consider the postural effect on breathing pattern. This study explored the compartmental volume changes of healthy subjects in different postures.

METHOD: 7 healthy male subjects were recruited in this study (age: 41.4±12.9 yrs, height: 170.7±4.3 cm, body weight: 77.3±12.2 kg). To compare the volume changes in supine and sitting, subjects performed breathing in sitting posture with a back support. Passive markers were applied in front and lateral side of chest wall as figure 1. For posterior part of chest wall, the model used the reference plane of the back of chair and bed. 45 markers on the chest wall identified three compartments during breathing from functional residual capacity to maximal inspiration in 2 postures. A 2-way repeated ANOVA was performed. (α=0.05).
RESULTS: The results indicated that there was interaction between compartmental volume changes and postures (p<0.001). The post hoc comparison showed significant differences in UT and AB between different postures (p = 0.015 and 0.001 perspectively) in figure 2.

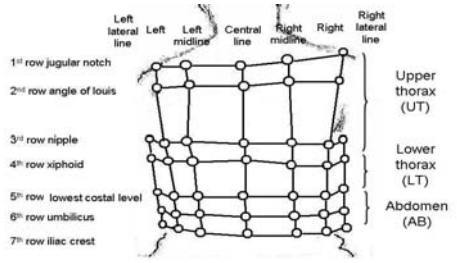

Figure1:Geometric diagram of chest wall with 3-compartment model.

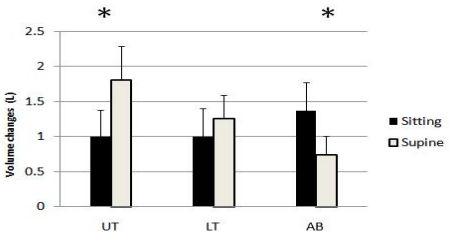

Figure2: The compartmental volume changes between 2 postures. (*: p<0.05)

DISCUSSION: The results show that posture can affect the breathing pattern to increase the volume of UT and decrease the AB volume. Gravity would help the diaphragm descend in sitting. For supine posture, this position did not benefit the diaphragm movement. The main volume change was contributed by upper thorax (Estenne et al., 1985). The further work will recruit backstroke swimmers to discuss the postural effect on breathing pattern. This study provided a feasible method to assess the breathing pattern in sitting and supine postures and useful information about breathing patterns of healthy male subjects in different postures.
CONCLUSION: The breathing pattern was influenced by posture in healthy subjects, especially in upper thorax and abdomen.

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