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Monitoring regional lung volumes during weighted restraint

EIT 2019: London, United Kingdom

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Restraint



CBC News · Posted: Nov 25, 2013

Introduction

Positional asphyxiation is occasionally listed as the cause of death in restrained subjects

Major contributing factors are thought to be the posture of the subject and weight on the abdomen

Previous work has shown that prone posture and weight up to 102 kg have not affected the health of subjects,

but

it is widely accepted that chest wall restriction has a significant impact on lung function...

Objective

to develop a monitoring technique and protocol using EIT to determine:

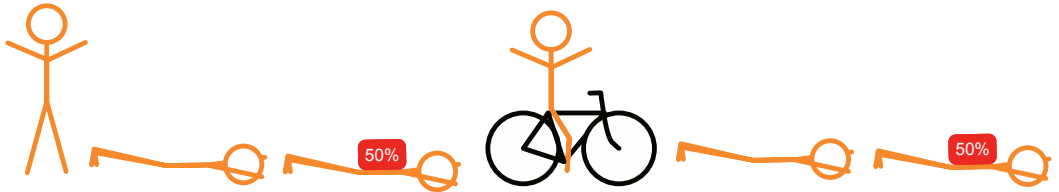
- to what degree different restraint postures and weight applied to the thorax affect chest compression
- to what extent cardiovascular stress impacts lung function during periods of chest compression

A good model of restraint will allow studies to determine better safety limits and techniques.

Protocol

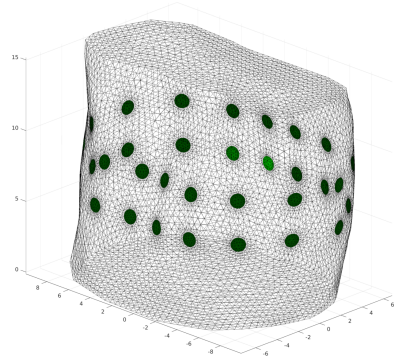
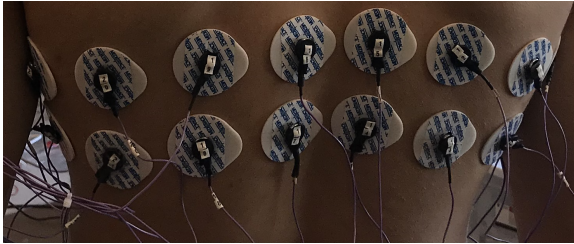
Develop an experimental protocol and analysis method to:

- Evaluate the effect of posture, cardiovascular stress, and weight on subjects breathing
- Enable EIT to be used as a monitoring tool



Subjects

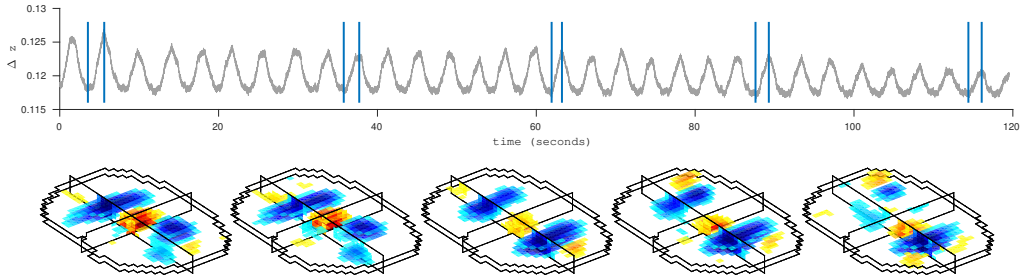
3 healthy male subjects aged 20-30 years were selected and fitted with silver/silver chloride electrodes in two rows of 16.



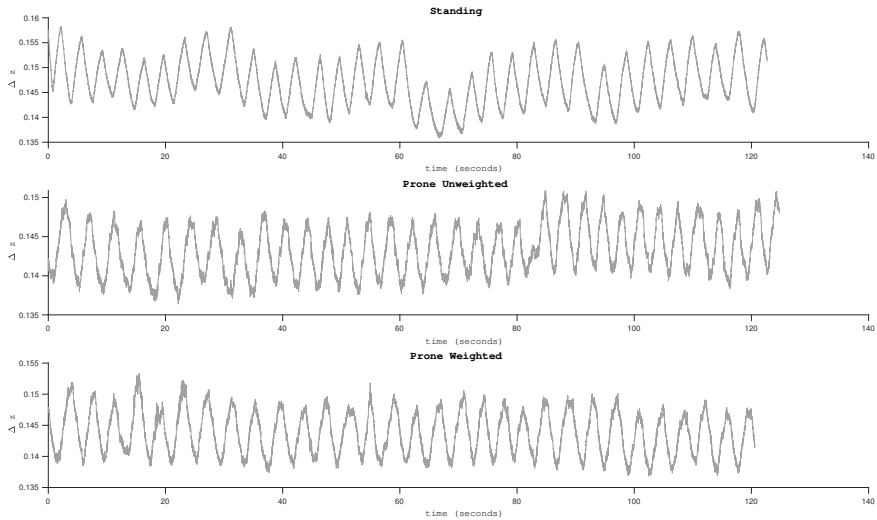
The 3D forward model model was created through segmentation of a CT image

Initial Results

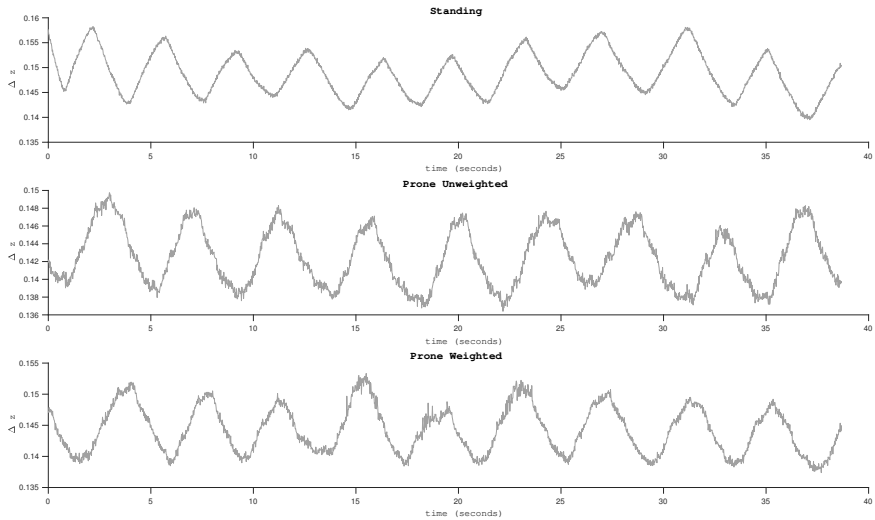
Before exercise there were drastic drops in tidal volume observed during periods of restraint.



Results



Results



Direction

- More subjects are being recruited and analyzed and future subjects will include an exercise protocol
- Propose as a model to evaluate restraint techniques can be tested and provide advice on duration and technique
- Difference between postures and weight without exercise demonstrate the ability of the protocol to induce changes in ventilation
- Under restraint conditions with arms above head a large decrease in lower lung volumes



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