



Contribution ID: 154

Type: Oral

Regional lung volume measures in small animal models from single projection X-ray images

Friday, 26 November 2021 11:45 (15 minutes)

Regional Lung volume is a key parameter in assessing lung function and health. Computed Tomography (CT) is considered the gold standard for measuring lung volume; however, it requires a relatively high radiation dose and typically has associated lower spatial and temporal resolution than X-ray projection imaging. In this work, we investigate whether regional lung volumes can be determined using 2D X-ray projections. The idea is that as the lung inflates with air, the attenuating tissue is displaced leading to a localised increase in X-ray intensity. We imaged 13 New Zealand white rabbit kittens using high-resolution X-ray imaging and CT at the IMBL at various airway pressures. From the 2D projections, we converted changes in regional X-ray intensity through the lungs to changes in lung air volume using the Beer-Lambert law, under the assumption that the lungs of the animal were comprised of a single material (water). We measured the true air volumes from CT data for comparison. We found that relative changes in regional lung air volume derived from the 2D x-ray projections showed a coefficient of determination (R^2) of 0.97 with CT data. This technique, therefore, provides a high speed, low dose method for measuring regional changes in lung volume that we are now using for studying lung aeration at birth in preclinical animal models.

Presenter Gender

Man

Do you wish to take part in the Student Poster Slam

No

Condition of submission

Yes

Students Only - Are you interested in AINSE student funding

Yes

Level of Expertise

Student

Pronouns

He/Him

Which facility did you use for your research

Australian Synchrotron

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Session Classification: Biomedicine, Life science & Food Science

Track Classification: Biomedicine, Life science & Food Science