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Title: The difference in upper airway morphology between supine and upright posture

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Body: Introduction The effect of upper airway (UA) morphology and especially the effect of the minimal cross sectional area (CSA) on lung deposition of inhaled medication (IM) is significant. However since IM is used when a patient is upright, conventional computed tomography (CT) data may not provide accurate information on the influence of the UA on lung deposition. The objective of this study is to evaluate variability in UA morphology for supine posture using CT vs. upright posture using cone beam CT (CBCT). Materials and Methods A total of 20 normal subjects were included. 15 valid CBCT scans could be included as the rotating gantry of the CBCT touched the shoulders of the broad-shouldered subjects, causing motion artifacts. The UA CT scans were performed using the GE VCT LightSpeed scanner and the CBCT scans were performed using the ISI i-CAT scanner. Results It is found that the CT scans were characterized by lower CSAs as compared to CBCT (Minimal CSA, $p = 0.036$, Average CSA, $p = 0.006$). The minimal CSA in the CT scan could accurately predict the difference in minimal CSA between CT and CBCT as indicated in the figure.

Conclusions It can be concluded that the UA morphology is different between upright and supine position. From the supine CT image, it can be predicted how large the minimal CSA will be when the subject is in an upright position. This function can be used to generate a correction factor for assessing lung deposition of IM.