Respiratory movements cause significant misregistration and altered SUVs in thoracic PET-CT studies with $^{18}$F-DG

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INTRODUCTION

- Combined systems
- PET CT
  Morphologic and Metabolic
- Metabolic-Morphological Fusion
Aim

...”to investigate the influence of forced Inspiration (I), forced Expiration (E) and Shallow breathing (S) by means of anatomic registration and SUV calculation”...
METHODS

Patients
- 30 Patients
- 25 male and 5 female
- Pulmonary and/or hepatic lesion(s)
- 40 to 78 years

CT
- GE Discovery LS/4 PET-CT Scanner
- 120 kV, 60 mA and 1.5 pitch
- Inspiration (I), Expiration (E) and Shallow Breathing (S)

PET
- > 2 hours p.i. of $^{18}$F DG (5 MBq/Kg)
- 2D mode, 1/2 AFOV, 6 minutes (Shallow Breathing)
ANALYSIS

- 3 attenuation correction maps generated (I), (E) and (S).
- Emission images datasets reconstructed with OSEM and MAC
- Lung anatomy divided in superior, medium and inferior
- Liver images classified in superior and deep
Analysis

- SUV Calculation
- Lesion Anatomic Registration
ANALYSIS - MISREGISTRATION

Superior
- 50% on Inspiration
- 42% on Expiration
- 9% on Shallow Breathing

Medium
- 40% on Inspiration
- 30% on Expiration
- 27% on Shallow Breathing

Inferior
- 20% on Inspiration
- 20% on Expiration
- 0% on Shallow Breathing
ANALYSIS - MISREGISTRATION
ANALYSIS - MISREGISTRATION
ANALYSIS – ANALYSIS OF METHOD COMPARISON STUDIES

Superior

ANALYSIS – ANALYSIS OF METHOD COMPARISON STUDIES

ANALYSIS – ANALYSIS OF METHOD COMPARISON STUDIES

CONCLUSIONS

- respiratory movements impact significantly in image registration and SUV calculation of lung and hepatic lesions
- Failure to correct adequately for respiratory movements in follow-up longitudinal studies may cause significant evaluation errors
- A well defined and "rigid" protocol must be used for longitudinal studies.
See also Poster Exhibition Area

Respiratory motion artefacts in PET imaging with CT attenuation correction

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Thank You!