Effect of Data-Driven Respiratory Gating on Lesion Characteristics in Tc99m-MAA SIRT Planning Scans

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Aims:

Respiratory motion imposes blurring and quantitative bias on lesions. Gating alleviates this effect by subdividing data into subsets within which motion is small.
This study aimed to investigate the effect of respiratory gating on characteristics of liver lesions in Tc99m-MAA scans.

Methods:

11 datasets from 10 patients injected intraarterially with 106.7 ± 67.5 MBq Tc99m-MAA were acquired with a Symbia T2 SPECT/CT (Siemens Healthcare) for 60 15sec views. All patients granted informed consent. In addition to ungated projections, fully-automated data-driven respiratory gating was applied to acquired list-mode data to subdivide it into 5 gates. These 6 datasets were reconstructed using prototype xSPECT Quant software (20iterations/1subset, attenuation and scatter correction).

25 focal lesions were located in coregistered MR images, and Volumes of Interest (VOI) were demarcated on SPECT images using 50% isocontours centered on each focus. For each VOI, the following parameters were computed: translation of centroid along anterior/posterior, left/right, and head/foot axes during respiration (T_{AP}, T_{LR}, and T_{HF}), ratio of mean gated to ungated full widths at half maximum (W_{AP}, W_{LR}, and W_{HF}), and ratio of mean gated to ungated maximum uptake (M).

Results:

T_{AP}, T_{LR}, and T_{HF} were 4.4 ± 3.1, 1.0 ± 1.8, and 6.3 ± 2.4mm, respectively. W_{AP}, W_{LR}, and W_{HF} were 0.91 ± 0.11, 0.96 ± 0.15, and 0.92 ± 0.10, respectively. On average, VOI maxima were 14.3% higher in gated images. All quantities are significant ($p<0.001$) except T_{LR}. T_{HF} was correlated with M ($\rho=-0.42$, $p=0.04$).

Conclusion:

Significant motion of focal liver lesions was observed during respiration. In gated images, narrower lesion widths and higher maxima were found than in ungated images, indicating that respiratory gating could improve image quality in SPECT liver imaging. Ultimately, patients with more diverse pathology must be imaged to truly assess clinical benefits.