Purpose or Objective: High dose lung-sparing pleural radiotherapy for malignant pleural mesothelioma (MPM) is difficult. Accurate target delineation is critical. The optimal imaging modality to define radiotherapy target volumes has not been studied in depth. This is the aim of the present study.

Material and Methods: Twelve consecutive patients with a histopathological diagnosis of stage I-IV MPM (6 left-sided and 6 right-sided) were included. CT scans with IV contrast, 18F-FDG PET/CT scans and MRI scans (post-contrast T1-weighted, T2 and diffusion-weighted images [DWI]) were obtained and downloaded from the institutional database onto a standalone image fusion workstation (MIM Software Inc., Cleveland, OH, USA) for image registration and contouring. CT scans were rigidly co-registered with 18FDG-CT-PET, with MRI scans and with DWI scans. Four sets of pleural GTVs were defined: 1) a CT-based GTV (GTVCT); 2) a PET/CT-based GTV (GTVCT+PET/CT); 3) a T1/T2-weighted MRI-based GTV (GTVCT+MRI); 4) a DWI-based GTV (GTVCT+DWI). Only the pleural tumor was contoured; mediastinal nodes were excluded. “Quantitative” and “qualitative” (visual) evaluation of the volumes was performed.

Results: Compared to CT-based GTV definition, PET/CT identified additional tumour sites in 12/16 patients. Compared to either CT or PET/CT, MRI and DWI identified additional tumour sites in 15/16 patients. Mean GTVCT, GTVCT+PET/CT, GTVCT+MRI and GTVCT+DWI (+ standard deviation [SD]) were respectively 630.1 mL (+302.81), 640.23 (+302.83), 660.8 (+290.8) and 655.2 mL (+290.7). Mean Jaccard index was lower in MRI-based contours versus all the others.

Conclusion: To the best of our knowledge, this is the first study showing that the integration of MRI into the target volume definition in hemithoracic radiotherapy in MPM may allow to improve the accuracy of target delineation and reduce the likelihood of geographical misses.

EP-1872
Benchmarking texture analysis for PET in oesophageal cancer
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Purpose or Objective: Texture and shape metrics are increasingly used for oncological applications such as the prediction of response to therapy. Commercial and freely available software tools have been used to publish significant results. However, it is unclear if these tools provide matched or even similar values, which is crucial when comparing such studies and drawing conclusions affecting patient management. In this work, we benchmark texture analysis software for PET in oesophageal cancer.

Material and Methods: PET-STAT, a texture analysis tool written in the Matlab-based open source software CERR, was benchmarked against the open source software CGITA and the Radiomics or CGITA were matched by their mathematical description. The metrics calculated were Maximum, Mean intensity, SUVpeak, Volume, Total Lesion Glycolysis; histogram-based Standard Deviation, Skewness, Kurtosis, Entropy (HeP) and Energy; grey level cooccurrence matrix (GLCM)-based Entropy, Homogeneity and Dissimilarity; Coarseness (C); grey level size-zone-based Intensity Variability, Large Area Emphasis and Zone Percentage, and shape metrics Maximum Diameter, Compactness, Sphericity, Spherical disproportion. No C was found in Radiomics, no shape metrics nor HeP were found in CGITA.

Results: Differences up to 7% in volume were observed between PET-STAT and CGITA, which disappeared when using data loaded from CERR, were due to different interpretation of the DICOM images and outline data. Errors of 7% in volume in one case could be tolerated, but would not be tolerated for clinical use or even similar values, which is crucial when comparing such differences of up to 44% were observed in the calculation of shape metrics between PET-STAT and CGITA. This was due to differences in the triangulation technique used to calculate the contour surface area. Furthermore, differences of up to 30% across the cases considered, were found to be due to different equations used for resampling the image to discrete intensities, as well as different methods for computing the GLCM and GLSZM.

Table 1. Feature values obtained for PET-STAT (PS) for each case with associated difference (%).

Conclusion: Our benchmarking work on oesophageal cancer PET imaging reported a number of non trivial differences in texture and shape metric values when using different software packages. This highlights the importance of commissioning and validating texture analysis tools and recommends that detailed descriptions of the metric and software implementation are available.

EP-1873
Multimodality functional imaging for characterizing tumour volume
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Purpose or Objective: Biologically guided radiotherapy needs an understanding of how different functional imaging techniques link together. We analyse three functional imaging techniques that can be useful to characterize tumour behaviour: DWMRI, DCMRI and PET/CT with FDG.

Conclusion: Our benchmarking work on oesophageal cancer PET imaging reported a number of non trivial differences in texture and shape metric values when using different software packages. This highlights the importance of commissioning and validating texture analysis tools and recommends that detailed descriptions of the metric and software implementation are available.