any pair were found to be significantly different. The smallest differences were found for ΔADC_7b (median [iqr] = 0.011 [0.009] and median [iqr] = 0.006 [0.001] 10^−3 mm^2/s) and the highest for ΔADC_200b (median [iqr] = 0.274 [0.034] and median [iqr] = 0.231 [0.034] 10^−3 mm^2/s), whereas ΔADC_3b and ΔADC_2b showed intermediate results.

Conclusions. From this preliminary evaluation, online ADC seems to make use of all available DW images, thus better relating to ADC_7b. Attention must be paid when comparing discriminative threshold values based on online ADC maps and studies aiming at defining the optimal b-values combination for different target tissues should be encouraged.

Reference


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[OA045] Robustness of textural features in ADC magnetic resonance imaging maps among different contouring for prostate cancer patients

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Purpose. Among Radiomics studies MR ones are the most challenging. This is due to variability in acquisition and reconstructions methods. In this study we proof robustness of features in prostate cancer patients which predict gleason score from ADC maps employing 5 different contouring methods.

Methods. In our study 25 patients diagnosed with prostate cancer from biopsy and staged by gleason score were enrolled for MR scan and subsequent radiotherapy. A DW echo planar imaging sequence with b-values of 0–1000 s/mm², and TR/TE = 3000/120 ms provided data for Apparent Diffusion Coefficient (ADC) maps. 41 lesions were contoured and labeled according to respective patient gleason score. Radiomics features extracted from 2 manual contours and 3 thresholds contouring algorithm (range 120–140% of the minimum value) were correlated with gleason score. A predictive model was developed by selecting features able to discriminate gleason 6 vs higher grade lesions among all the 5 contouring styles.

Results. Correlation with gleason 6 versus higher grade was found for one feature for the manual contouring. Four more feature agreed with the main endpoint employing the automatic contouring in the threshold range. A model based on the feature selected by manual contouring scored an AUC of 0.79 whereas the model based on threshold algorithm an AUC of 0.85.

Conclusions. Our study underlined the critical importance in the choice of contouring style. Agreement of 4 feature correlation with gleason score was confirmed for semi automatic algorithm in a wide threshold range scoring a high predictive power. Validation with 8 external patient is ongoing.

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[OA046] Visualizing sites of increased cellularity and high permeability in soft tissue sarcomas

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Purpose. Radiological evaluation of tumor aggressiveness is very frequently based on diffusion and/or perfusion imaging findings and conclusions are used to guide biopsy. The present work describes a post processing process that highlights areas of increased cellularity (low ADC) and also increased vascular transendothelial permeability (high Ktrans), two of the most significant markers of malignancy, at the early stage of imaging. Preliminary results tested on 5 patients with soft tissue sarcomas are presented.

Methods. Quantitative ADC maps were generated from MR data by pixelwise mono-exponential fitting of multi-b (8b, 0–1500) DW images with custom-built tools written in Python. Similarly, Ktrans map was calculated based on the Extended Tofts Model from T1-w GRE data (temporal resolution 7 s, 45 time points). All pixel values assigned as tumor volume (3D ROI) were used as input for the initial whole tumor ADC and Ktrans histograms. As a next step, only pixels with values lower than the mean of ADC histogram and Ktrans values greater than the mean Ktrans were located and visualized in order to examine if a voxel cluster with adequate size is discriminated after thresholding. Patient population (5 male, mean age 60) comprised 3 dedifferentiated liposarcomas and 2 pleomorphic liposarcomas.

Results. Whole tumor pixel percentages with ADC value below the mean ADC value of the same ROI (used as histogram threshold) for the five high grade liposarcomas were: 58.7, 82.5, 52.1, 65.7, and 78.8%. Ktrans pixel percentages above the mean Ktrans (threshold) were: 11.8, 23.4, 4.3, 62.9, 39.9% respectively. The percentage of pixels meeting both criteria for low ADC and high Ktrans were: 4.2, 14.2, 0.6, 20.1, 15.3% respectively.

Conclusion. For 4 out of 5 patients visualization of a pixel cluster with adequate size that can be proposed as suitable site for preoperative needle biopsy was possible. Further appropriate ADC/Ktrans thresholding can be used to increase disease conspicuity under certain criteria, depending on the special characteristics of each tumor subtype.

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