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CT and MRI matching for radiotherapy planning in head and neck cancer.

Aim of the study: To evaluate the impact of matched CT and MRI information on target delineation in radiotherapy planning for head and neck tumors.

Material and methods: MRI images of eight patients with head and neck cancer in supine position, **not** necessarily obtained in radiotherapy treatment position were matched to the CT scans made in radiotherapy position using automatic three-dimensional chamfer-matching of bony structures .
Four independent observers delineated the Gross Tumor Volume (GTV) in CT scans and axial and sagittal MR scans. The GTV's were compared, overlapping volumes and non-overlapping volumes between the different datasets and observers were determined.

Results: In all patients a good match of CT and MRI information was accomplished in the head region. The combined information provided a better visualisation of the GTV, oedema and normal tissues compared with CT or MRI alone. Determination of overlapping and non-overlapping volumes proved to be a valuable tool to measure uncertainties in the determinination of the GTV.

Conclusions: CT-MRI matching in patients with head and neck tumors is feasible and makes a more accurate irradiation with higher tumor doses and less normal tissue complications possible.
Remaining uncertainties in the determination of the GTV can be quantified using the combined information of MRI and CT.

Validation of new 3D post processing algorithm for improved maximum intensity projections of MR angiography acquisitions in the brain

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Purpose: to validate a new post processing algorithm for improved maximum intensity projections (mip) of intracranial MR angiography acquisitions

Material and methods: The core of the post processing procedure is a new brain segmentation algorithm. Two seed areas, background and brain, are automatically detected. A 3D region grower then grows both regions towards each other and this preferentially towards white regions. In this way, the skin gets included into the final 'background region' whereas cortical blood vessels and all brain tissues are included in the 'brain region'. The latter region is then used for mip. The algorithm runs less than 30min on a full dataset on a Unix workstation.
Images from different acquisition strategies including multiple overlapping thin slab acquisition, magnetization transfer (MT) MRA, Gd-DTPA enhanced MRA, normal and high resolution acquisitions and acquisitions from mid field and high field systems were filtered. A series of contrast enhanced MRA acquisitions obtained with identical parameters was filtered to study the robustness of the filter parameters.

Results: In all cases, only a minimal manual interaction was necessary to segment the brain. The quality of the mip was significantly improved, especially in post Gd-DTPA acquisitions or using MT, due to the absence of high intensity signals of skin, sinuses and eyes that otherwise superimpose on the angiograms.

Conclusion: The filter is a robust technique to improve the quality of MR angiograms.