

ADVANCED TOOLS FOR QUANTITATIVE ANALYSIS OF PULMONARY CT SCANS

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Purpose

Due to the rapid development of scanner technology, thoracic CT offers completely new possibilities for quantitative analysis of thoracic CT scans.

The aim was to develop and evaluate two new tools for local functional analysis of the lungs as well as therapy monitoring of lung carcinomas and metastases.

Methods

(1) By identifying the anatomical compartments of the lungs, the presented application for functional analysis is able to assess established functional CT parameters for each single lobe and segment. This allows for a more localized diagnosis of lung diseases such as emphysema and a more accurate estimation of regional lung function from CT data. (2) The application for therapy response evaluation provides follow-up support for oncological therapy monitoring by volumetric quantification of tumors and temporal registration. In close cooperation between computer scientists and radiologists, both applications were tested on clinical data and their workflow was optimized to achieve a high degree of usability.

Results

A reproducibility study of the segmented lobe volumes showed a standard deviation of below 1% per lobe. A second study compared the quantitative analysis results with established analysis software for 30 clinical multidetector CT datasets. Measured correlations for volume, mean lung density and pixel index were 0.997, 0.975 and 0.999, respectively.

A reproducibility study of the volumetric tumor quantification of 96 lung nodules showed a low inter-observer variability (median: 0.1%).

Conclusion

The presented applications for quantitative analysis of pulmonary CT scans have the ability to improve diagnosis, therapy planning and monitoring with respect to accuracy and time effort.