Volume Perfusion CT Using Texture Analysis in NSCLC Treated with Human Recombinant Endostatin

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The conclusion first
Recombinant human endostatin significantly improved blood perfusion, alleviating tumor hypoxia. Texture analysis based on volume perfusion CT imaging can help to predict the response of patients with stage IIIA/B NSCLC treated with recombinant human endostatin.

Introduction
Recombinant human endostatin (rhES), an endogenous inhibitor of angiogenesis, has been proved to be able to normalize tumour vasculature, improve blood supply and increase sensitivity of radiation, therefore improving the response rate and survival in advanced NSCLC patients. CT texture analysis (CTTA) is an image processing technique that can be applied to routinely acquired images to provide quantitative information about tumour heterogeneity as reflected by the characteristics, variation, distribution of pixel values within the tumour which allows a more detailed and quantitative assessment of the tumour features than visual analysis. To our knowledge, this is the first study to explore texture analysis using whole-tumour perfusion CT in the prediction of the response of locally advanced unresectable NSCLC treated with antiangiogenic therapy.

The goal of the poster
To observe the dynamic changes of blood perfusion with CT perfusion imaging using texture analysis in patients with unresectable stage IIIA/B non-small-cell lung cancer (NSCLC) who were treated with rhES.

Methods and materials
11 patients diagnosed with stage IIIA/B NSCLC were enrolled. All patients were recruited to a multicenter phase II clinical trial (ClinicalTrials.gov, registration number: NCT01733589). All patients underwent contrast-enhanced perfusion CT at baseline and a second CT scan 1 week after anti-angiogenic therapy (Endostar). The data of CT perfusion imaging was imported into Omnikinetics software (GE Healthcare, United State). Blood flow (BF), blood volume (BV), permeability (PMB) were quantitatively assessed by CT perfusion imaging using texture analysis. The texture parameters of NSCLC in baseline and after anti-angiogenic therapy were analyzed statistically using paired samples t-test or wilcoxon signed ranks test.

Results
The values of skewness for BF demonstrated significant differences in baseline and after treatment (0.597 ± 2.696 vs. 1.034 ± 2.572, p=0.009, Figure 1), while skewness of BV, PMB did not significantly vary (p=0.283, p=0.213, respectively). The values of kurtosis for BF, BV, PMB had no significant differences in baseline and after treatment (all p >0.05). In adenocarcinoma, the values of skewness for BF were significant higher after treatment than in baseline (-0.188 ± 3.261 vs. 0.586 ± 3.153, p=0.013). Furthermore, the pixelvalues of BF in one patient were significant higher after treatment than in baseline (66.306±34.221 vs. 78.785±50.505, p=0.001, Figure 2).

A large sample size is needed to verify our preliminary resultts. Moreover, biological markers referring to tumour vasculature and hypoxia status within the NSCLC tumours treated with rhES should also be included in the future study in order to explore the underlying mechanism.