MR-Predictive Assay in Preoperative Lung Cancer Therapy
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Purpose/ Objectives
To develop, refine, and test Dynamic Contrast Enhancement (DCE) Magnetic Resonance Imaging protocols and analysis methodologies for predicting response to preoperative neoadjuvant chemo-radiation therapy (PNT) and resectability in non-small cell lung cancer.

Materials/Methods
Patients with stage IIIA (T1-3 N2 or T3N1) nonsmall cell lung carcinoma were prospectively studied and received 45 Gy in 25 daily fractions of conformal external beam radiotherapy with 2 courses of concurrent cisplatin (50 mg/m² IV days 1 & 8; 29 & 36) and etoposide (50 mg/m² IV days 1-5 & 29-33). Three MRI studies (pre-contrast and 3 Tesla DCE MRI) before, during (2 weeks into treatment) and after PNT (study 1, 2, and 3 respectively) were performed for each patient.

Results
Five patients have been completed therapy. One patient progressed and developed pericardial, pulmonary artery branch, and pulmonary vein invasion and did not undergo resection. One patient was found to be unresectable at the time of surgery due to invasion of the descending aorta. Both of the unresectable patients have expired. Three patients were resectable: 2 of 3 had complete pathological response with no evidence of residual tumor at primary site or nodes; one had residual tumor at both the nodes and primary.

Among the pharmacokinetic parameters (Amp, kep, and k10), kep of the second MRI appeared to differentiate unresectable (n= 2; kep = 4.3 min⁻¹) from resectable tumors (n= 3; kep = 2.3 min⁻¹); and the case with residual tumor (n=1; kep = 2.6 min⁻¹) from those without residual tumor (n = 2; kep = 2.1 min⁻¹). Kep represents the exchange rate constant between blood plasma and extravascular extracellular space, which reflects the wash-in slope of the time-signal intensity curve.

Conclusion
The early data shows the feasibility of performing prospective functional tumor imaging timed with the ongoing radiation course, and suggests that therapy responsiveness and resectability may be associated with lower kep. The ability to predict unresectability with the DCE-MRI’s would not only spare patients the morbidity of unsuccessful surgery, but also would eliminate the detrimental treatment gap in the patients’ therapy, which results when patients are found to be unresectable after preoperative therapy and require completion of the radiation therapy course.

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