

Blinded assessment of radiological changes after stereotactic ablative radiotherapy (SABR) for early-stage lung cancer: Local recurrences versus fibrosis.

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Background: Stereotactic ablative radiotherapy (SABR) is a guideline-recommended treatment for unfit patients with early-stage lung cancer. The 5-year local recurrence rates are approximately 10% but fibrotic changes are common during follow-up, leading to difficulty with timely detection and salvage therapies. Previously reported high-risk features (HRFs) on computed tomography (CT) are 1) enlarging opacity at the primary site; 2) sequential enlarging opacity; 3) enlarging opacity after 12 months; 4) bulging margin; 5) loss of linear margin and 6) loss of air bronchograms. We performed a blinded assessment of CT imaging of patients with and without local recurrences. **Methods:** Patients treated with SABR for early stage lung cancer between 2003 and 2012, who developed pathology-proven local recurrence (n=12), were matched 1:2 to patients without recurrences (n=24), based on baseline factors. The median age at diagnosis was 68 years and median post-SABR imaging follow-up was 24 months (range 6 to 67 months). Patients were well-matched in the recurrence and non-recurrence groups. Serial CT images were assessed by 3 radiation oncologists blinded to outcomes, viewing anonymized images projected onto a large screen. **Results:** All established HRFs were significantly associated with local recurrence ($p < 0.01$), and one additional HRF was identified: cranio-caudal growth ($p < 0.001$). The best individual predictor of local recurrence was opacity enlargement after 12 months (100% sensitivity, 83% specificity, $p < 0.001$). The odds of recurrence increased 4-fold for each additional HRF detected in an individual patient. The presence of ≥ 3 HRFs in an individual patient was highly sensitive and specific for recurrence (both $> 90\%$). The HRFs enlarging opacity and cranio-caudal growth were each detected ≥ 3 months prior to the actual diagnosis of local recurrence in 42% of patients. **Conclusions:** Local recurrences following SABR can be accurately predicted by the presence of HRF's on post-treatment CT scans. This approach may reduce unnecessary diagnostic procedures, and ensure earlier use of salvage therapies.

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