Stereotactic ablative radiotherapy (SABR) for central lung tumors: plan quality and long-term clinical outcomes

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Purpose/Objectives
As SABR for central lung tumors is less established due to toxicity concerns, we studied plan quality and outcomes at our center.

Materials/Methods
- Primary NSCLC treated between 2008-2013
- PTV ≤2 cm from the proximal bronchial tree (PBT, RTOG 0813)
- 8x7.5Gy SABR using RapidArc (Varian Medical Systems)
- No constraints used for PBT or heart if PTV was adjacent
- Endpoints:
  - Compliance of plan quality with institutional guidelines, RTOG 0813 and LungTech protocols
  - Organs-at-risk (OARs) doses and clinical outcomes (including toxicity CTCAE v4.03)

Conclusion
- In this study of central SABR, most tumors were moderately central. Although many patients received ≥60Gy in OARs, 3-year overall survival was similar to patients with peripheral tumors.
- OAR tolerance doses continue to be refined. Patients should be informed of the potential risks and benefits of central SABR.
- In the meantime, it appears reasonable to limit Dmax in OARs (including inside PTV) and lung doses (e.g. V5), using IMRT/VMAT.
- These findings cannot be extrapolated to ‘ultra-central’ lung tumors, where the toxicity risks may be higher.

Results
- 80 consecutive patients (median age: 73 years) were studied:
  - WHO score ≥2 in 29%, PTV ≥80cm³ in 46%, PTV-main bronchus overlap in 6.3% (majority were ‘moderately central’)
  - PTV underdosage occurred in only 4% of patients
  - Doses delivered to OARs (Figure 2):
    - Dmax ≥80Gy for PBT in 40% of patients, in 55% for heart, and in 26.3% for aorta
    - Mean total lung and contralateral lung V5Gy: 21% and 6%
    - RTOG0813 and LungTech Dmax constraints were exceeded for ≥1 OAR in 88% and 60% of patients, respectively
  - Clinical outcomes after a median follow-up of 47 months:
    - 3-year survival was 53%, compared with 57% for 252 peripheral tumors treated with 3- or 5-fractions SABR in the same period (p=0.369) (Figure 3)
    - 6.4% had G3 toxicity; no G4 toxicity was observed
    - A panel of clinicians scored deaths as being ‘possible’ (n=3) or ‘likely’ (n=3) treatment-related (G5 toxicity) in 6 patients (7.5%)

Figure 2: Doses delivered to the PBT, heart, aorta, and esophagus. Numbers within each dose bin refer to total number of likely or possible treatment-related deaths within the corresponding dose bin.

Figure 3: Survival Analysis