Brachytherapy Against Deadly Threat: Dyspnea

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Disclosures

- Consulting Fees: ICAD, Inc.
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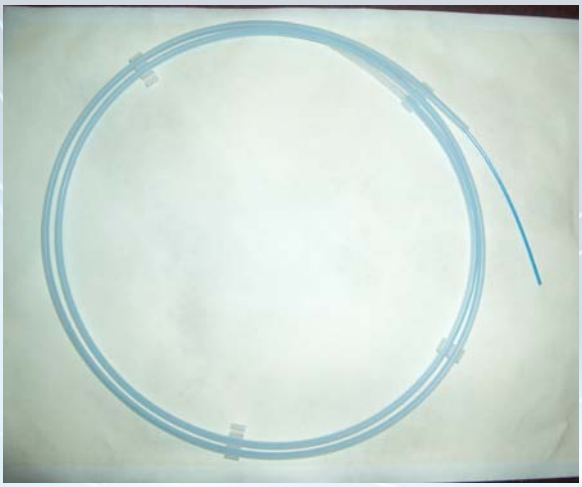
Endobronchial Therapy

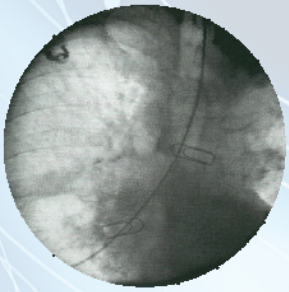
- Curative
  - No proven benefit
- Palliation
  - Dyspnea
  - Hemoptysis
  - Obstruction
  - Cough

Procedure

- Anesthesia
  - General versus sedation
- Bronchoscope
  - Enter through nose
  - Visualize lesion
- Catheter placement
  - At least 2 cm beyond tumor

Endobronchial Catheter





HDR Monotherapy

- Small bronchial carcinoma
- 34 patients
  - 5 Gy x 6
  - 2-year follow-up
  - Local control: 85%
  - Overall survival: 78%
  - No > grade 2 toxicity

Marsiglia, *IJROBP*, 2001

HDR Boost

- Phase II*
  - Stage III lung cancer
  - 30 patients
  - 60 Gy plus 5 Gy times 3 HDR
  - No improvement in local control or overall survival
- Phase III**
  - 60 Gy EBRT +/- 4.8 Gy times 2
  - Not statistically significant

*Anacak, *Lung Cancer*, 2001
**Huber, *IJROBP*, 2001

Curative – Randomized Data

- Inoperable endobronchial tumor*
  - Brachytherapy had better palliation of dyspnea (P = 0.02), especially in obstructing lesions
  - Median survival 8.5 months, no difference
- Cancer in trachea or bronchi**
  - Improved local control with brachytherapy (P = 0.05)
  - Trend toward increased median survival with brachytherapy (P = 0.08)
  - No difference in complication rates

*Langendjick, *Rad&Onc*, 2001
**Huber, *IJROBP*, 1997

Palliation

- HDR versus LDR
  - No difference*
- Prescription point
  - Typically 1 cm
- Dose regimen – ABS recommendations (2001)
  - 10 Gy x 2, 7.5 Gy x 3, 6 Gy x 4 in weekly fractionation
    - Optimized planning may lower risk of subsequent hemoptysis**

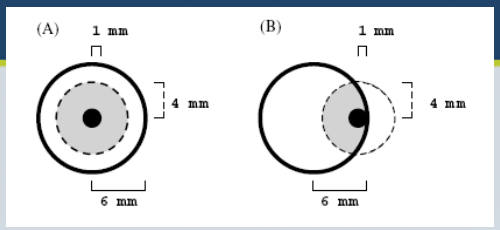
*Lo, *Rad&Onc*, 1995
**Gay, *Phys Med Biol*, 2007

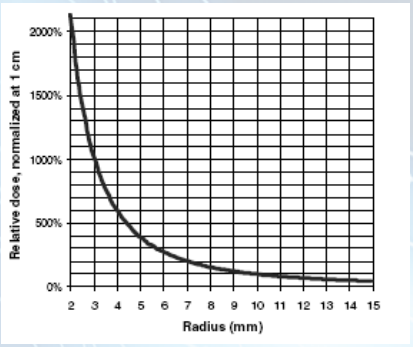
Palliation

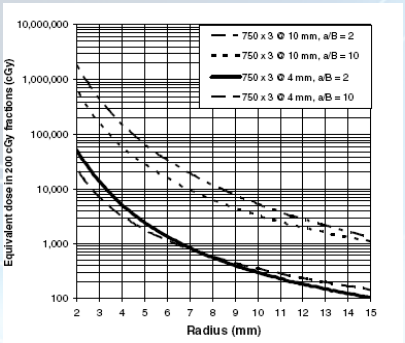
- ABS recommendations changes (in press)
- CT guidance for planning
- 3D dose planning over point prescription
- Ability to optimize dose makes HDR or PDR preferable over LDR

ABS Dose Recommendations

PDR	30 Gy in one insertion (using pulses that offer biological equivalence to LDR)
HDR	10 Gy in 1 fraction 15 Gy in 1 fraction 14.2-20 Gy in 2 fractions 22.5 Gy in 3 fractions 24 Gy in 4 fractions 30 Gy in 6 fractions (high dose palliation)







Speiser Scoring

Hemoptysis
0 None
1 Less than 2×/week
2 Less than daily but greater than 2×/week
3 Daily, bright red blood or clots
4 Decrease of Hb/Htc >10% greater than 150 cm³, requiring hospitalization or leading to respiratory distress

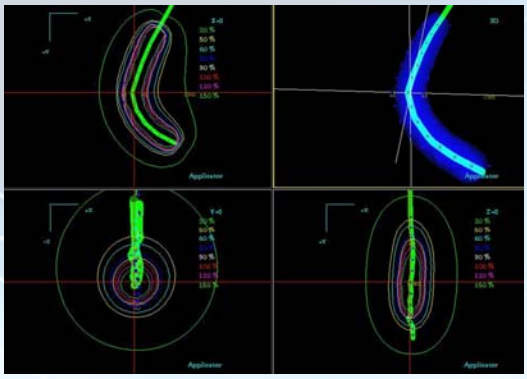
Dyspnea
0 None
1 Dyspnea on moderate exertion
2 Dyspnea with normal activity, walking on level ground
3 Dyspnea at rest
4 Requires supplemental oxygen

Cough
0 None
1 Intermittent, no medication necessary
2 Intermittent, non-narcotic medication
3 Constant or requiring narcotic medication
4 Constant, requiring narcotic medication but without relief

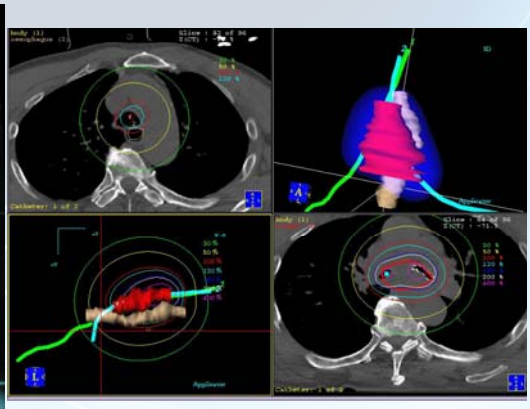
Pneumonia/elevated temperature
0 Normal temperature, no infiltrates, WBC <10 000
1 Temperature >38.5 and infiltrate, WBC <10 000
2 Temperature >38.5 and infiltrate and/or WBC >10 000
3 Lobar consolidation on radiograph
4 Pneumonia or elevated temperature requiring hospitalization

Trachea	>50% = 10, but	<50% = 6, and	<10% = 2
Main bronchus	>50% = 6, but	<50% = 3, and	<10% = 1
Lobar bronchus	>50% = 2, but	<50% = 1	
Atelectasis	2 per lobe		
Pneumonia	2 per lobe		

Trachea/Bronchus



Sub-carinal Mass



Palliation Results

- 54-85% improvement or resolution of symptoms
- MD Anderson
  - 66% subjective improvement*
  - 78% objective improvement*
- Ankara University
  - 100% improvement**

*Kelly, *IJROBP*, 2000
**Celebioglu, *Jpn J Clin Oncol,* 2002

Complications

- Transient dysphagia: 5-20%
- Hemoptysis: 2-10%
- Radiation pneumonitis: 5-10%
- Radiation bronchitis and/or bronchial stenosis: 10%
  - Less toxicity with more fractions*
  - 15 Gy at 1 cm had 50% death from hemoptysis, no increased deaths with 10 Gy or 7.5 Gy**

*Muto, *Oncologist*, 2000
**Langendjik, *Rad&Onc,* 2004

Combination Therapy

- EBRT + HDR*
  - 72% subjective and 54% objective resolution of symptoms
- Safety (and improvement) has been shown with stent, Nd-YAG, and PDT
- MVA shows multimodality better than single
  - Statistically significant increase in OS**

*Gejerman, *Brachy*, 2002
**Santos, *Surg Endo*, 2004

Immediate vs Delayed

- Multi-institutional European trial
  - Asymptomatic HDR versus treatment after symptoms occur
  - 8.5 Gy x 2 or 10 Gy x 1
  - No improvement in survival
  - No improvement in activity level
    - About 50% of delayed patients require RT

Falk, *BMJ*, 2002

EBRT vs HDR

- Phase III
  - EBRT vs HDR, laser or cryotherapy
  - 400 patients estimated
    - 75 accrued
  - Trial closed in 1996

Moghissi, *Clinical Oncology*, 1999

EBRT vs HDR

- Phase III
  - 99 patients
  - 30 Gy EBRT vs 15 Gy x 1 HDR
  - Trend towards increased palliation and duration in EBRT arm
    - Slight increase in median survival in EBRT arm
  - Toxicity similar

Stout, *Rad&Onc*, 2000

Cochrane Database

- 14 randomized controlled trials
  - 3 small trials show EBRT better than EBB alone
- No conclusive evidence to recommend EBRT with EBB
  - One trial suggests 7.5 Gy x 2 is better than 3.8 Gy x 4 for improved LC and decreased hemoptysis
  - No evidence of increased fatal hemoptysis
- EBB should be considered for symptomatic patients who have received EBRT
- High-quality research into role of EBB is needed

ASTRO Guidelines

- There is no randomized trial to recommend routine use of EBB alone or with another modality for palliation
- EBB is a reasonable option for palliation of hemoptysis for patients who have received previous thoracic radiation

Rodrigues, *PRO*, 2011

Questions?