Focus on treatment complications and optimal management: Radiation Oncology

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Disclosure

None to declare
Side-effects and incidence

- Esophageal damage
  - Acute: grade 3 or more:
    - Concurrent chemo-radiation: 20 % - 30 %
    - Sequential chemo-radiation: < 5 %
  - Late: strictures grade 2 or more: < 5 %
- Lung damage: 5 % - 30 %
- Skin reactions: severe: < 10 %
- Rib fractures: 10 % - 30 %
Dose-limiting side-effects

• Esophageal damage
  – Acute: grade 3 or more
    • From ± week 3 during therapy to 2-6 weeks post-radiation
  – Late: grade 2 or more
    • 3 months to many years post-radiation

• Lung damage
  – Acute: grade 2 or more
    • 1-6 months post-treatment ("Radiopneumonitis")
  – Late: grade 2 or more
    • 6 months and more post-radiotherapy ("Fibrosis")
Parameters related to acute esophagitis

• Most important: concurrent administration of chemotherapy
• NTCP models
• DVH parameters (highly correlated with each other)
  – Mean dose
  – Max. Dose
  – $V_{55}$
  – Circumference > 80%
  – Overall treatment time ("BID" as a surrogate)
  – Length not consistent
  – ...

De Ruysscher et al. J Clin Oncol 2010
Correlation between acute esophagitis and neutropenia.

n=328

Dysphagia Odds Ratio +/- S.E.

Maximal neutropenia (grade)

p<0.001
p=0.024
p=0.362

Restrictions for acute esophagitis

- No consensus: Mean dose and $V_{55}$, $V_{35}$ most often used
- EORTC: e.g. Mean Esophageal Dose < 34 Gy
  (De Ruysscher et al. J Clin Oncol 2010)
- RTOG: Mean Esophageal Dose < 34 Gy.
  “This is not an absolute requirement, but is strongly recommended unless other, more critical constraints force the situation.”
Treatment of radiation-induced acute esophagitis

- Empirical, no hard data
- Crucial: maintain intake of food and fluid!
- Symptomatic
Treatment of radiation-induced acute esophagitis

• RTOG suggestions
  – Ketoconazole 200 mg PO q day OR Fluconazole 100 mg PO q day until the completion of radiation
  – Mixture of: 2% viscous lidocaine: 60 ml
  – Mylanta: 30 ml
  – Sucralfate (1 gm/ml): 10 ml (take 15-30 ml PO q3-4 hrs prn. 
    Contraindications: Dilantin, Cipro, Digoxin)
  – Ranitidine 150 mg PO BID (or other H2 blocker or a proton pump inhibitor such as omeprazole) until the completion of radiation
  – Grade 4 esophagitis: hold RT + chemotherapy until grade 2 or less
Late esophagitis

• Most consistent: maximal dose
• Constraint: Maximal dose < 75 Gy (< 5 % grade 2 strictures)
• Treatment:
  – Grade 1: diet
  – Grade 2-3: dilatation
Radiation-Induced Lung Toxicity (RILT)

- Problems:
  - No consistent definition: RTOG? CTC? Steroids required?
  - Mostly only the peak reaction is reported: Reversible?
  - At least 25% of patients have “pneumonitis” due to COPD exacerbation

“Radiopneumonitis” is a diagnosis of exclusion!
Radiation Pneumonitis
Radiation Pneumonitis
Parameters related to RILT

- **NOT**: concurrent administration of cisplatin, vinorelbine, etoposide; careful with docetaxel
- NTCP models
- DVH parameters (highly correlated with each other)
  - Mean dose
  - \( V_{20} \)
  - \( V_5 \)
  - Smoking: less RILT

*De Ruysscher et al. J Clin Oncol 2010*
*Palma DA et al. Int J Radiat Oncol Biol Phys 2013*
Restrictions for RILT

Maximal

MLD = 20 Gy

\( V_{20} = 35 \% \)

Below MLD = 20 Gy and \( V_{20} = 35 \% \) no clear dose-response relation

Dyspnea evolution after radiotherapy: No baseline dyspnea

De Ruysscher et al. Radiother Oncol 2009
Dyspnea evolution after radiotherapy:
Baseline dyspnea grade 1: 20% no dyspnea after radiotherapy

De Ruysscher et al. Radiother Oncol 2009
Dyspnea evolution after individualised radiotherapy: 10% less patients with dyspnea

van Baardwijk et al. J Clin Oncol 2010
SBRT: No change of FeV1 or DLCO over time

Guckenberger et al. J Thor Oncol 2012
SBRT: No decline in FeV1 or DLCO in patients with poor pulmonary function

Guckenberger et al. J Thor Oncol 2012
Treatment of acute RILT

- Empirical
- Symptomatic
- ! Other causes; e.g. Infections: chest physician
- Not severely ill patient:
  - Inhalation bronchodilators + steroids
  - Codein
  - When not effective: oral steroids: e.g. Prednison 30 mg/day, 10 days
- Severely ill patient:
  - Chest physician
  - High-dose corticosteroids
Late RILT

- Risk factors: same as acute RILT
- Treatment (?): Symptomatic