Challenges of Retreatment

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1946 to 4/11/2002
Coil being installed
Taken on Dec 10 1947
IGRT – circa 1965
Clinical Challenges of Re-irradiation

• Usually at maximum tolerance for adjacent critical structures (chiasm, spinal cord)
• “Recall” phenomena – eg, skin, mucosa
• Concomitant chemotherapy often given for systemic control
• Debilitated patient – setup challenge
Goals of Proton Therapy in “Retreatment”

- Elimination of dose to adjacent critical structures previously tx
- Trajectory selection accounting for previous techniques
- Homogeneity optimal
- Hyperfractionation – but is it reproducible?
Nuances of Recurrence

• XRT – induced second tumor??
• Marginal failure about an adequate dose, but inadequate volume – aiming issue
• Insufficient dose, but adequate volume – difficult situation to re-irradiate
• Sufficient dose with adequate volume but with central failure – expect complications
Effects of Normal Tissues

- Wide range of complications possible depending on adjacent normal tissues
- Sarcomas/soft tissues vs nerve/cord vs skin/mucosa
- Do we really believe the linear quadratic model to hold for spinal cord with an alpha/beta of 2 for cervical and a differing value for lumbar cord of 4?
- Steep, steep portion of sigmoid curve we operate on for most re-irradiation of CNS tumors – should we have faith on a “safe” composite BED of <135Gy(2) for spinal cord?
Timing of Recurrence/Re-irradiation

- Personality of tumor - How long was local control established originally? >1yr or <1yr?
  - Reflects natural history/aggressiveness of tumor – Heidelberg/Dutch glioma retreatment series
  - If <1 year, was local control ever established?!

- Separation duration of 2 irradiation courses: Spinal cord data suggest risk increases with <6 months between courses.
Open Your Eyes
(and those of the Patient and your Colleagues)

• They remember you for your complications, not your successes…… Dr. Suit, et al.
• Consent your patient carefully – they really do not believe the complications are possible, only success is likely. Have a family member present – do not rush consent.
• “Consent” your colleagues ahead of time – ie, the neurosurgeon that must re-resect the radionecrosis of your attempts.
Improve Your Odds of Success

- Hemoglobin, nutrition, hydration, diabetes – minimize the PLD and maximize repair of the normal cells
- Hyperfractionate? Ok, but do not compromise effective total dose in process.
- Concomitant chemo?? - Reduce variables – and normal tissue insults – avoid the temptation.
- Prolonged delivery?? – Pulsed reduced rate RT – UW
- Hyperbaric Oxygen – facilitator of microvascular repair in H&N – maybe CNS? - at 4-6 months post RT.
Literature Review

- 2 Particle re-irradiation papers: MGH ocular melanoma/proposed advantage paper for metastases
- 50+ publications 1998-2008
  - CNS: 17 (31%)
  - ENT: 19 (35%)
  - Breast: 6 (11%)
  - Rectal: 3 (6%)
  - Sarcoma: 3 (6%)
  - Metastases: 3 (6%)
  - Other (Skin, Lung): 3 (5%)
Proton Reirradiation for Ocular Melanomas
MGH

- 70/5 Gy retx after 70 Gy/5
- ~4 year interval
- 63% local control/stability
- 55% eye retention rate
- 19% visual preservation rate
- Metastatic rate??
MPRI Patient Treatments – 5/08

- >425 patients treated
- 5% Retreatment cases
MPRI Recurrent Case Statistics

- 24 cases treated 4/04 to 5/08 (5%)
- Median OS = 1.7 yrs
- Local failure/progression rate = 28%
- Complications: 3/24 = 13%
- Case mix:
  - 30% base of skull
  - 20% head and neck/scalp
  - 10% vertebral column metastases retx
  - 25% brain/spinal cord parenchyma
  - 15% rectal/GI
Recurrent Caudal Ependymoma

- Previously treated 1971 @ age 12, L2-L3, 3900 cGy Co CNS axis PA SSD + 1050 cGy caudal boost
- Incomplete resection – age 12
- Recurrent 1985
- 3 resections all STR, now progressive disease, paraplegia
- Retreatment: 5400cGy/180cGy p+
Recurrent Caudal Ependymoma
Recurrent Clival Chordoma

- 33 y/o dx 1996 with sellar/clival chordoma
- 1996-2005: 6 transphenoidal, endoscopic resections + 4 GammaKnife tx
- Multiple progressions at inferior margin
- Recurrence bilateral petroclival junctions and progression to top-C1
- Retreatment: 7800 cGY/180cGy p+
Recurrent Clival Chordoma
Recurrent Adenoidcystic Carcinoma
Sphenoid Sinus

• 62 y/o Dx 2000 with ACC of Sphenoid STR
• 11/01: 5400/180 – traditional 3-field
• Progression into ethmoids and sella →
  bitemporal field loss, decreased color
  perception
• 2 additional STR (transnasal approach)
• Retreatment: 7200cGy/100cGy BID p+
Recurrent Adenoidcystic Carcinoma
Sphenoid Sinus
Clinical Case – D.O.

• 32 YO African female IU student with recurrent rectal carcinoma, s/p full photon radiation and chemotherapy – requiring 100mg MS/hour for pain – still teaching and studying for PhD

• Referred by BMG Radiation Oncology
  – Received 55Gy of proton re-irradiation
  – No dose delivered to bowel or spinal cord
  – At 7 months, tumor 90% regression, complete pain relief
  – Survived 2.3 years after re-irradiation, finished PhD.
Conclusion
(Retreatment Appraisal Tips)

• Choose your neighborhood carefully:
  – In-field, marginal, suboptimal dose, XRT induced?
• Who are your neighbors? – location, location: are you at the peak (glioma-chiasm/cord), or a little lower (sarcoma-soft tissue)
• Realistic goals: Cure vs durable palliation
• Check market history: <1yr since previous treatment – what is the tumor behavior??
• Resale strategy: Nutrition, hyperbaric, surgical consults
• The paperwork: Full consent, open dialogue, reflection
• Protocol only?