Francis H. Burr Proton Therapy Center

Medical Director: Thomas F. DeLaney, M.D.
Associate Director: Hanne Kooy, Ph.D.
Technical Director: Jay Flanz, Ph.D.
Physics Research: Thomas Bortfeld, Ph.D.
Chief, Physics: George Y. Chen, Ph.D.
Chief, Radiation Oncology: Jay Loeffler, M.D.
Francis H. Burr Proton Therapy Center

• Equipment
  – Cyclotron 230 MeV (IBA)
  – 3 Treatment rooms
    • Two 360° rotational gantries (Double scattered)
    • Fixed horizontal beams room
      – Eye station- Degraded 70 MeV beam
      – STAR (single scattered)
  – Experimental room
    • Horizontal beam
Francis H. Burr Proton Therapy Center

- First patient treatment: November 8, 2001

TREATMENT STATISTICS

- First year 11/01-10/02: 208 patients
- Second year 11/02-10/03: 366 patients
- Third year 11/03-10/04: 404 patients
- Fourth year 11/04-10/05: 509 patients
- Fifth year 11/05-10/06: 602 patients
- Sixth year 11/06-10/07: 621 patients
- Seventh year 11/07-4/08: 326 patients (project 652)
- TOTAL: 3036 patients
Francis H. Burr Proton Therapy Center

- **Patients Treated**
  - Through 9/06: 2003 patients
    - ADULT: 1478 (74%)
    - PEDIATRIC: 257 (13%)
    - STEREOTACTIC: 268 (13%)
# F. H. Burr Proton Center
1478 Adult Patients Treated 11/01-9/06

**Adults**

<table>
<thead>
<tr>
<th>Tumor Type</th>
<th>Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye</td>
<td>690</td>
<td>47%</td>
</tr>
<tr>
<td>Bone/Soft Tissue</td>
<td>228</td>
<td>15%</td>
</tr>
<tr>
<td>Skull Base</td>
<td>150</td>
<td>10%</td>
</tr>
<tr>
<td>CNS</td>
<td>111</td>
<td>7.5%</td>
</tr>
<tr>
<td>Head/Neck</td>
<td>111</td>
<td>7.5%</td>
</tr>
<tr>
<td>Prostate</td>
<td>105</td>
<td>7.1%</td>
</tr>
<tr>
<td>Lung</td>
<td>16</td>
<td>1.1%</td>
</tr>
<tr>
<td>Lacrimal</td>
<td>16</td>
<td>1.1%</td>
</tr>
<tr>
<td>Liver</td>
<td>5</td>
<td>0.5%</td>
</tr>
<tr>
<td>Other</td>
<td>44</td>
<td>3.0%</td>
</tr>
</tbody>
</table>
F. H. Burr Proton Center
257 Pediatric Patients Treated 11/01-9/06

<table>
<thead>
<tr>
<th>Location</th>
<th>Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS</td>
<td>130</td>
<td>51%</td>
</tr>
<tr>
<td>Bone/Soft Tissue</td>
<td>41</td>
<td>16%</td>
</tr>
<tr>
<td>Skull Base</td>
<td>38</td>
<td>15%</td>
</tr>
<tr>
<td>Eye</td>
<td>31</td>
<td>12%</td>
</tr>
<tr>
<td>Head/Neck</td>
<td>13</td>
<td>5%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>1.6%</td>
</tr>
</tbody>
</table>
F. H. Burr Proton Center
271 Stereotactic Patients Treated 11/01-9/06

NPTC / FHBPTC 2001-2006
271 Proton Radiosurgery Cases

- AVM: 43%
- Acoustic: 15%
- Pituitary: 18%
- GBM: 11%
- Meningioma: 2%
- Mets: 1%
- Other: 7%
- Extracranial: 3%
FHBPTC Patient Population 2006

- **Adult**: 84%
- **Pediatric**: 16%

- **Patients**: 602
  - Gantry: 59%
  - Eye: 27%
  - STAR: 14%

- **Treatments**: 6651
  - Gantry: 93%
  - Eye: 6%
  - STAR: 1%

- **Gantries**
  - Adult: 72%
  - Pediatric: 28%
Francis H. Burr Proton Therapy Center-Operations

- Treat 252 days (52 weeks) per year
- Operational availability
  - 98% availability
- Passive scanning
- Pencil beam scanning (Fall, 2008)
- Maintenance
  - Weekends
  - Long weekends
Francis H. Burr Proton Therapy Center-Operations

• **Gantry 1,2**
  – Current status
    • 55 patients on treatment during 10 hour treatment day
    • Ongoing efficiency improvements
    • Physical renovations have increased pediatric anesthesia capacity from 6 to 8 patients per day

• **Room 3**
  – Eye treatments: 4-5 patients per day
  – STAR (Stereotactic Assisted Radiosurgery/XRT)
    • 3 Radiosurgery/week  5 Sterotactic Radiotherapy
STAR: Stereotactic Assisted Radiosurgery/Therapy

- STAR
  - 150 SRS / year
  - 30 SRT / year
- Unique facility optimized for cranial fields treatments
- Research into IMPT and multi-leaf collimator application in protons
Clinical Research Objectives

• Improve local control with dose escalation
  – Expanded range of tumor sites/types
  – Evaluate normal tissue dose response

• Reduce treatment-related morbidity

• Improve compliance and treatment intensity of combined modality therapy

• Assess Quality-of-Life
Proton Clinical Research

- **Prostate:** W. Shipley MD, A. Zietman MD, J. Coen MD
- **Pediatrics:** N. Tarbell MD, T.Yock MD, S. Macdonald MD
- **Brain/CNS:** J. Loeffler MD, A. Chakravarti MD, H. Shih MD
- **Head/Neck/Sinus:** P. Busse MD/ N. Liebsch MD/A. Chan MD
- **Gastrointestinal:** Ted Hong, MD
- **Sarcoma:** T. DeLaney MD/ Y-L Chen MD, PhD
- **Thoracic:** N. Choi, MD, H. Willers
- **Eye:** Y-L Chen MD, H Shih MD
- **Breast:** A. Taghian, MD
- **Statistics:** D. Finkelstein PhD, B. Yeap PhD
Proton Clinical Research

• Proton NCI program project grant
  • Funded through 3/31/07
  • 1st competitive renewal application not funded
  • 2nd competitive renewal application in conjunction with M.D. Anderson Cancer Center pending
Clinical Studies: Open and Enrolling

• **PEDIATRIC**

• 99-271 Medulloblastoma

• 04-188 Rhabdomyosarcoma

• 05-326 Non-RMS Bone and Soft Tissue Sarcomas

• 2005P001629 QOL in Pediatric Patients Treated With Radiation Therapy for Brain Tumors and Non-CNS Malignancies
Clinical Studies: Open and Enrolling

- **ADULT**
- 02-330 Chordoma Family Study
- 03-084 Phase I Liver
- 05-089 Nasopharynx
- 06-195 Low-grade Glioma
- 06-248 Phase I/II Pancreas
- 07-007 Novel Dural Plaque
Clinical Studies: Closed to Accrual, Active Follow-Up

- **ADULT**
- 97-502 Spine Sarcomas (Thoracic/Lumbosacral)
- 97-553 Chordoma/Chondrosarcomas
  - Skull Base or Cervical Spine
- 00-285 RT Tolerance of the Cauda Equina
- 02-064 Prostate
Retrospective Studies

• Proton Center Research Data Repository
• Second Malignancies from Proton RT
• Protons vs. Carbon Ions for Sarcomas
• Planning Studies of Protons vs. Photons
  – Retroperitoneal sarcomas,
  – Skull Base and Spine Sarcomas
• Sarcoma Outcomes studies (5)
• Pediatric Outcomes studies (6)
• Pediatric Brain Tumor database
Pending Studies

• 07-162 Hypoxia imaging in Chordoma
• 07-166 QOL & Long Term Results of Retinoblastoma Patients Treated w/ Protons
Proposed Studies
MGH/MD Anderson Proton Therapy Program Project

- Pencil Beam Dosimetry
- Dose Verification by PET
- IMPT Base of Skull/Spine Planning study
- Non Small Cell Lung Cancer (5)
  - Early Stage (3)  Locally advanced (2)
- Phase II Liver (2)
  - Protons  Protons + Sorafenib
Proposed Studies
MGH/MD Anderson Proton Therapy Program Project

- Phase II IMPT for Base of Skull and Spine
- Paranasal Sinus
  - IMRT/Protons->IMPT
- Medulloblastoma
- Rhabdomyosarcoma
- Pediatric QOL