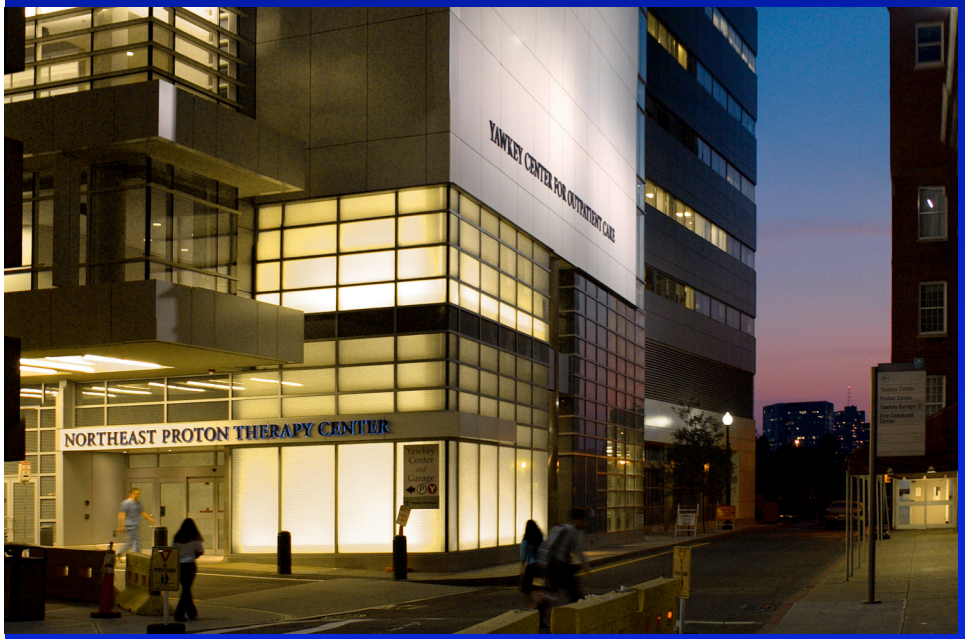
Francis H. Burr Proton Therapy Cente



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.

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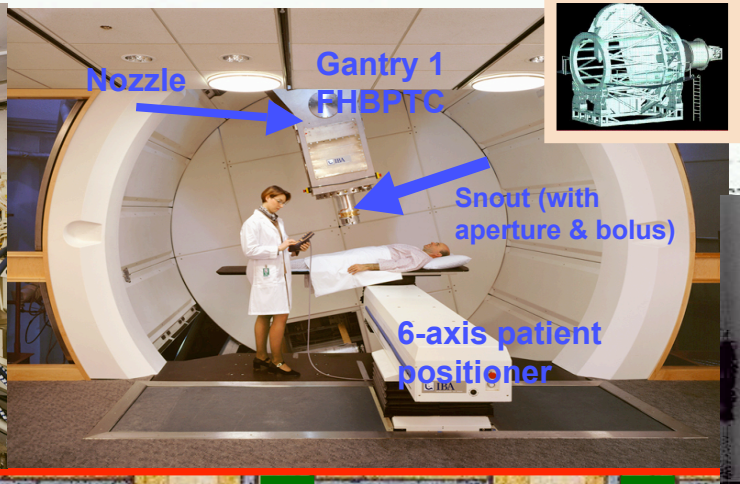
FHBPTC Equipment Areas



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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

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Francis H. Burr Proton Therapy Center

- Patients Treated
  - Through 9/06 2003 patients

  - ADULT 1478 (74%)
  - PEDIATRIC 257 (13%)
  - STEREOTACTIC 268 (13%)

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F. H. Burr Proton Center
1478 Adult Patients Treated 11/01-9/06

Adults

Eye	690	47%
Bone/Soft Tissue	228	15%
Skull Base	150	10%
CNS	111	7.5%
Head/Neck	111	7.5%
Prostate	105	7.1%
Lung	16	1.1%
Lacrimal	16	1.1%
Liver	5	0.5%
Other	44	3.0%

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257 Pediatric Patients Treated 11/01-9/06

Children

CNS	130	51%
Bone/Soft Tissue	41	16%
Skull Base	38	15%
Eye	31	12%
Head/Neck	13	5%
Other	4	1.6%

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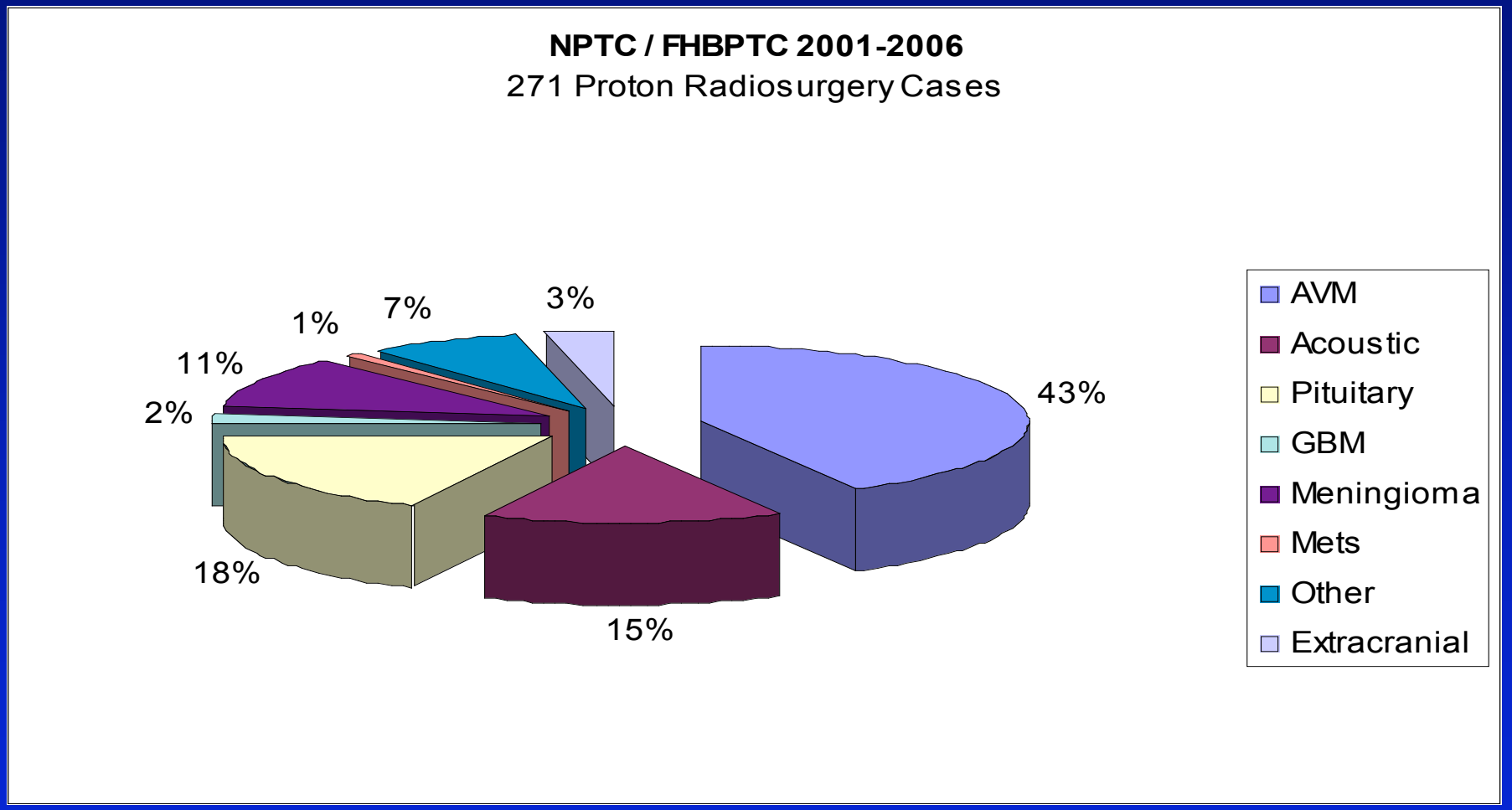
271 Stereotactic Patients Treated 11/01-9/06



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FHBPTC Patient Population 2006

- **Adult 84%** **Pediatric 16%**
- **Patients 602** **Treatments 6651**
  - Gantry 59% Gantry 93%
  - Eye 27% Eye 6%
  - STAR 14% STAR 1%
- Gantries
  - Adult 72%
  - Pediatric 28%

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Francis H. Burr Proton Therapy Center-Operations

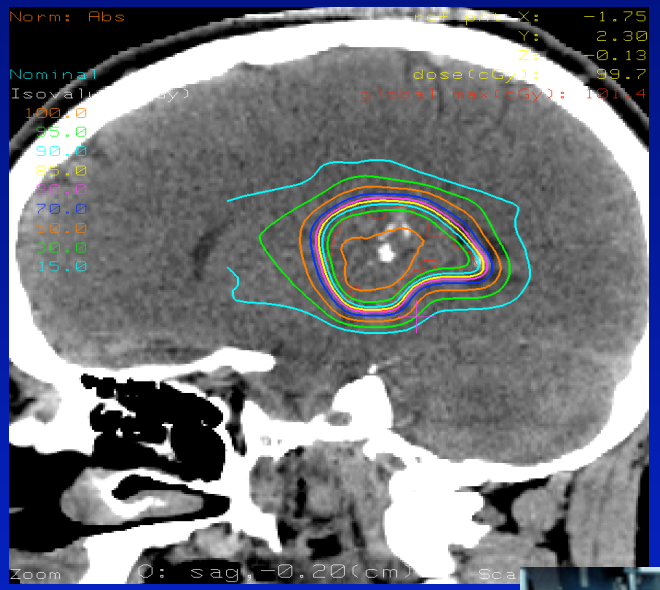
- Treat 252 days (52 weeks) per year
- Operational availability
  - 98% availability
- Passive scanning
- Pencil beam scanning (Fall, 2008)
- Maintenance
  - Weekends
  - Long weekends

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



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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

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Proton Clinical Research

- Proton NCI program project grant
  - Funded through 3/31/07
  - 1st competitive renewal application not funded
  - 2nd competitve 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

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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

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