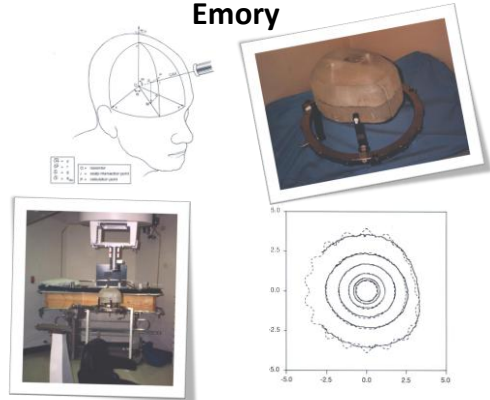




## Spine Radiosurgery Symposium

Ian Crocker MD FACR FRCP(C)  
 Professor and Vice Chair  
 Department of Radiation Oncology  
 Winship Cancer Institute of Emory University

## Cranial Radiosurgery Development at Emory



## Initiation of Clinical Radiosurgery Program

- In 1989, Emory was one of five centers in the U.S. to offer radiosurgery.
- Patton McGinley, Ph.D., and Elizabeth Butker M.Sc. Are seen setting up first SRS patient



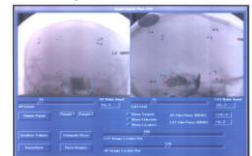
Phys. Med. Biol., 1990, Vol. 35, No 5, 649-657. Printed in the UK  
**A patient rotator for stereotactic radiosurgery**

P.H. McGinley, E.K. Butker, I.R. Crocker and J.C. Landry  
 The Emory Clinic, Division of Radiation Therapy, 1365 Clifton Road, Atlanta, GA 30322, USA

## Milestones in Radiosurgery Development at Emory

- Early 90's Dr. Tim Fox writes a treatment planning program for Patient Rotator
- Late 90's Dr. C. Alleyne documents efficacy of approach in publication in Radiation Oncology Investigations

Emory X-Knife



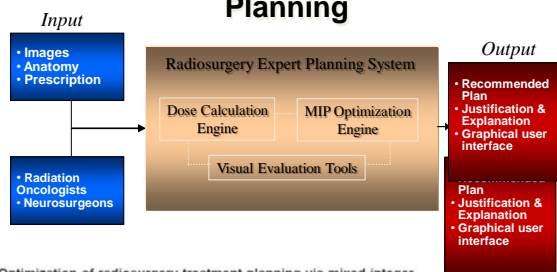
Radiation Oncology Investigations 5:20-39 (1995)

### Stereotactic Radiosurgery of Malignant and Benign Intracranial Lesions Utilizing a Patient Rotator

Cargill H. Alleyne, Jr., M.D.,<sup>1</sup> Tim H. Fox, M.D.,<sup>2</sup> Jeffrey J. Olson, M.D.,<sup>2</sup> George A. Cosmes, M.D.,<sup>2</sup> Ian Crocker, M.D.,<sup>2</sup> and Roy A.E. Butker, M.D.<sup>1</sup>



## Optimization of Radiosurgery Treatment Planning

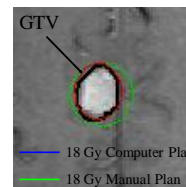


Optimization of radiosurgery treatment planning via mixed integer programming

Eva K. Lee  
School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332-0285  
Tim Fox  
Department of Radiation Oncology, Emory University School of Medicine, Atlanta, Georgia 30322  
Ian Crocker  
Department of Radiation Oncology, Emory University School of Medicine, Atlanta, Georgia 30322

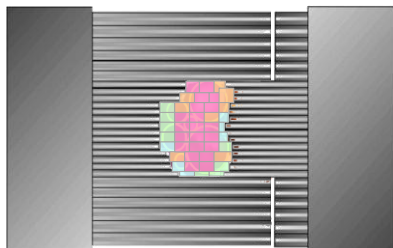
### Sample Case

- Clinical model: Minimize dose to normal tissue.
- Metastatic lesion comparing multiple isocenter plans.
- Dose conformity was desired.



Plan Description	Coverage Index	Homogeneity Index	Toxicity Index	Conformity Index
Manual Plan	0.93	1.5	0.3	2.1
Optimal Plan	0.94	1.9	0.3	1.2

## Circular Cones vs. MLC Field Shaping



Standard SRS  
Multiple isocenters necessary  
to cover irregular lesions

- Circular cones
- Dose conformal to the target GTV
- Dose conformal to the target GTV

## Varian's FramelessArray™ Optical Guidance System.



### Emory's First Frameless SRS Case-Testing Repositioning



### Emory's First Frameless Radiosurgery Case-Positioned for Tx



### Confirming Treatment Positioning using Cone Beam CT



### Today's Radiosurgery Technology



Gamma Knife

- Co-60
- Circular cones
- Brain only
- 45 min tx times



Cyberknife

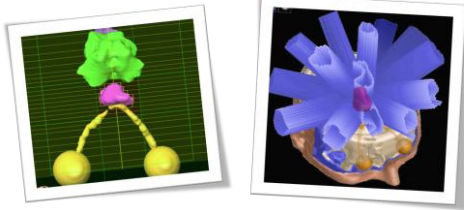
- Linac-based
- Cones only
- Brain & Body
- IGRT
- 60 min tx times



Trilogy/Novalis Tx

- Linac-based
- Cones & IMRT
- Brain & Body
- IGRT
- 15 min tx times

## Cranial Radiosurgery Today at Emory



- Implemented shaped-beam radiosurgery in 2000
- Treated more than 1,500 patients with MLC-based delivery system