

# Introduction to Radiosurgery of Multiple Targets: A SRS Brief History

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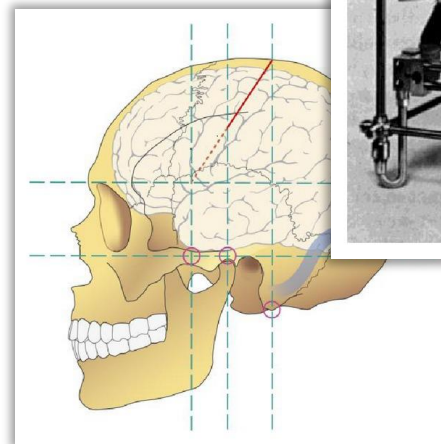
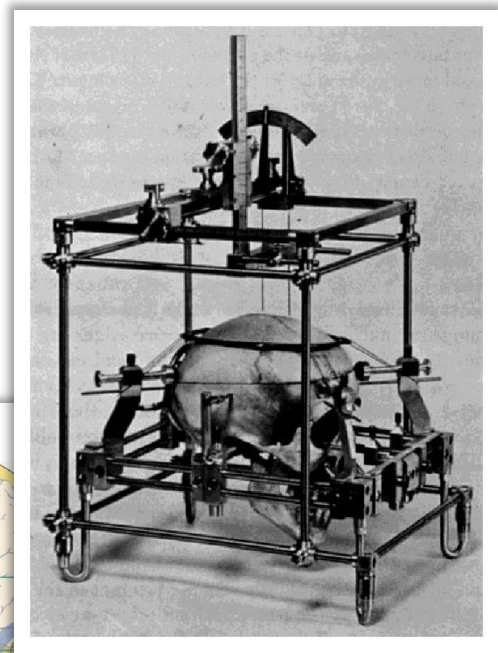
University Health Network, Toronto, Canada



# Stereotactic Surgery

1947: Spiegle and Wycis Developed First Stereotactic Apparatus for Humans

- Localization of Internal Brain Anatomy
- Required Radiograph and Atlas
- Treatment of Motion Disorders



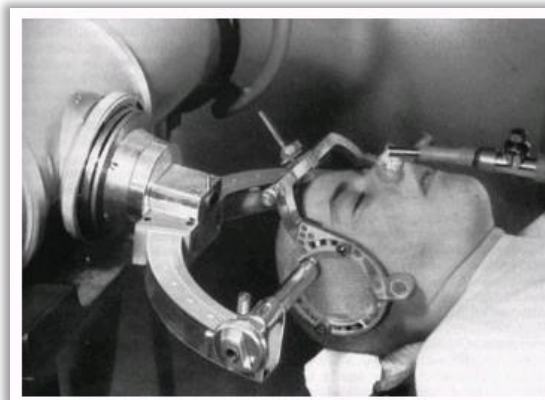
Peter Grunert, Minimally Invasive Surgery. 2013.



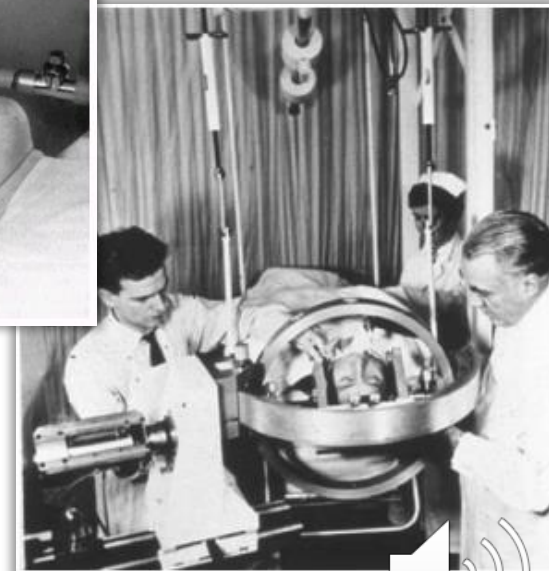
# Stereotactic Radiosurgery

Lars Leksell: - Stereotactic Frame + Cross Fired-Radiation  
- Single High Dose Fraction

- 1951: SRS Orthovoltage
- 1960: First SRS proton
- 1968: First Gamma Knife



Meyerson and Linderoth,  
Textbook of Stereotactic  
and Functional  
Neurosurgery (2009)



Chin and Regine, Principles and  
Practice of Stereotactic Radiosurgery  
(2008)

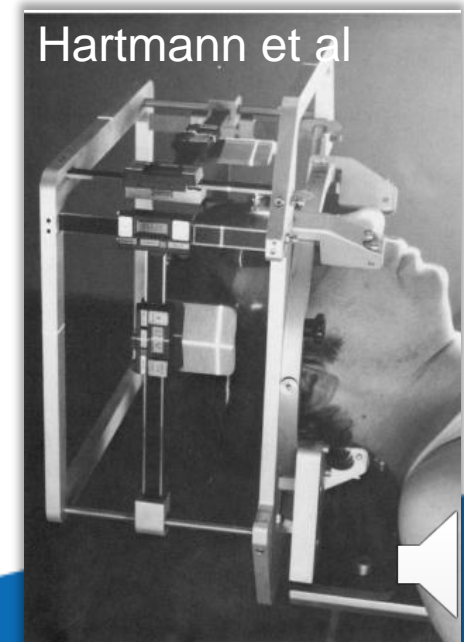
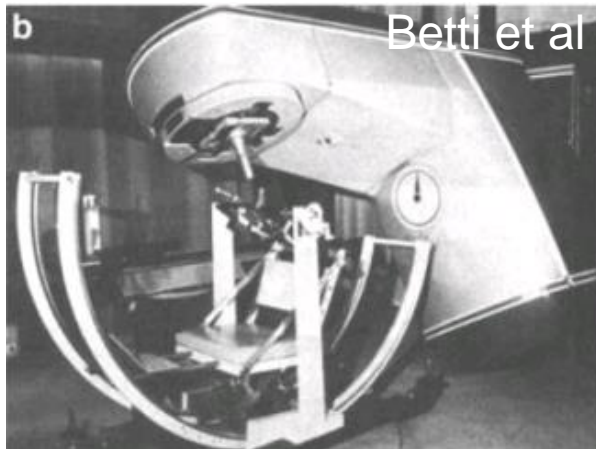
# SRS Early Days

- Indications
  - Parkinson's disease, Trigeminal neuralgia, Acoustic Neuroma and Arteriovenous Malformation
- 70's: CT imaging enables SRS for cancer
- 80's: Wider use of Gamma Knife



# Linac-Based SRS

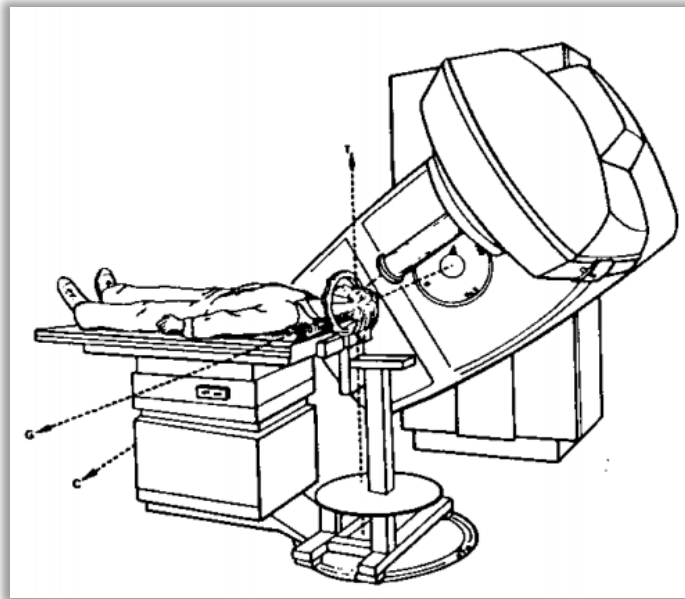
- First Clinical Reports
  - Betti and Derenchinsky (1984), Argentina
  - Colombo et al (1985), Italy
  - Hartmann et al (1985), Germany
- SRS Frame, Multiple arcs, TPS, SRS Localization and Cones



# Linac-Based SRS

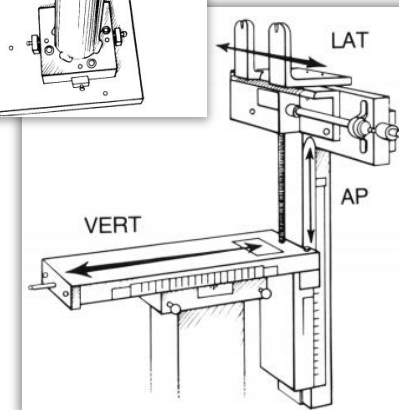
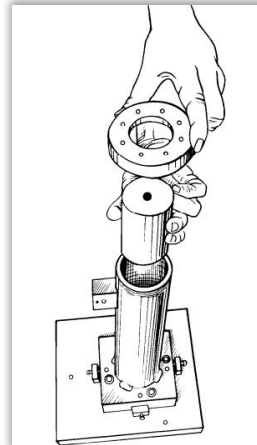
## Joint Center for Radiation Therapy System

### System Overview



Lutz et al, IJROBP (1988)

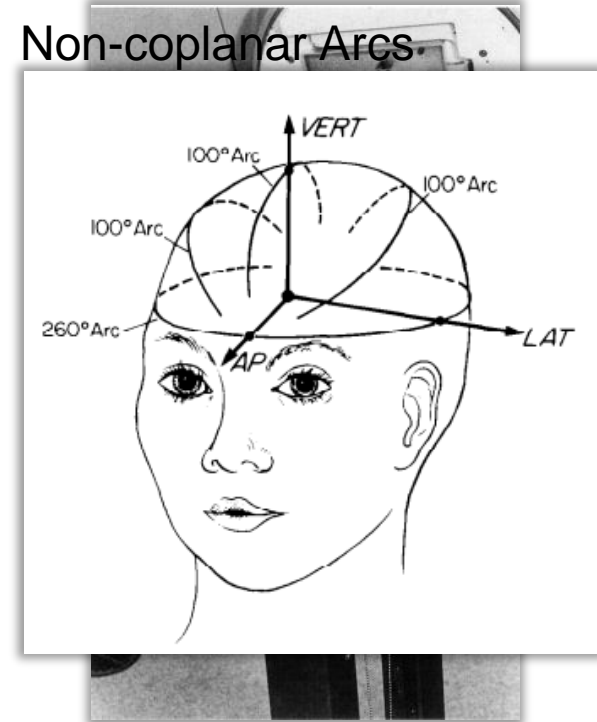
### Collimator



BRW Floor Stand

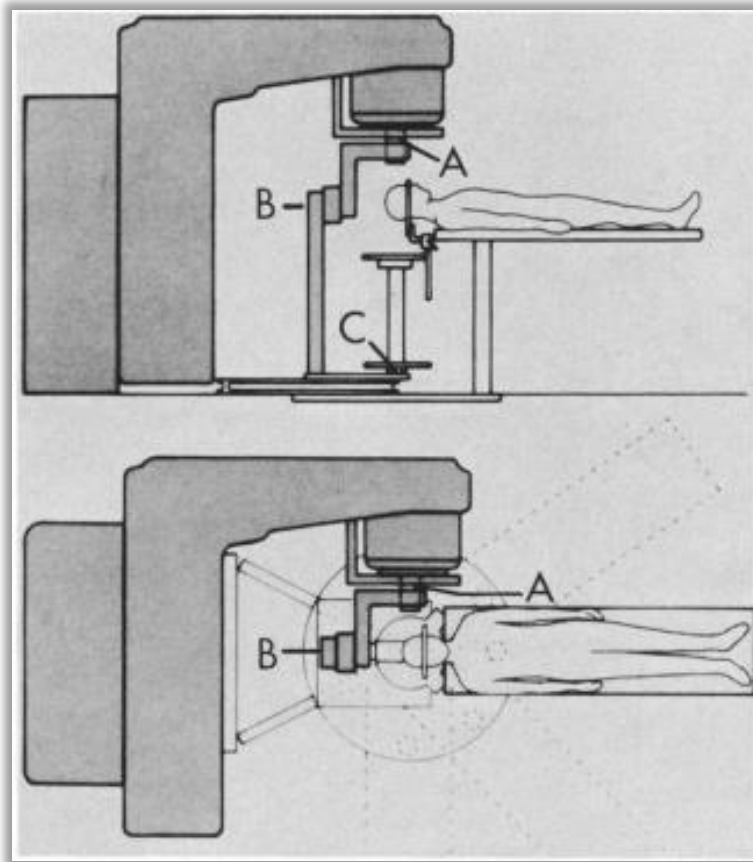
### Verification Alignment

### Non-coplanar Arcs



# Linac-Based SRS

## University of Florida System



- Modern Planning System
- Improved Geometric Accuracy
- 0.5 mm Maximum Alignment Error

Friedman and Bova, Surg Neurol (1989)

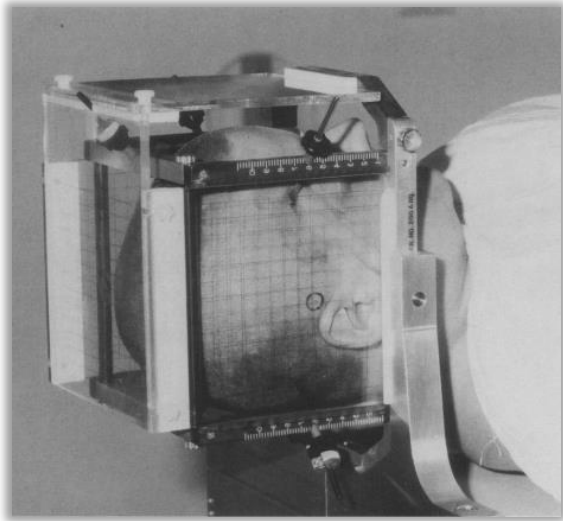


# Linac-Based SRS

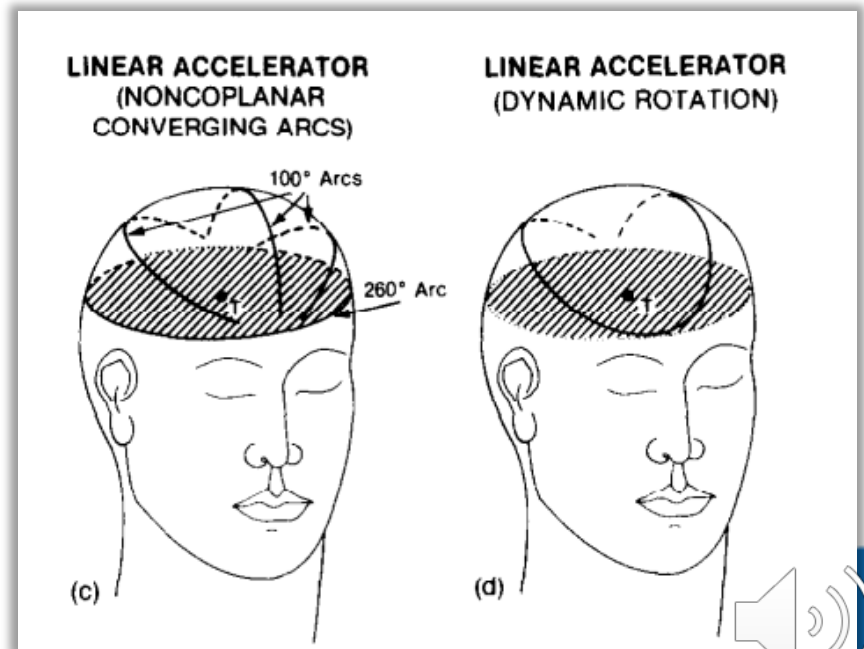
## McGill University System: Dynamic SRS

- Simultaneous Gantry and Couch Motion while Beam On

Couch Mounted Frame



Beam Trajectory Comparison





# AAPM TG-42 (1997)

## Future Directions:

- MRI Distortion Corrections
- Multiple Fractionation
  - Frameless SRS while Maintaining Setup Accuracy
- Portal Imaging for Setup Correction
- Conformal SRS
  - Micro-MLC

