

IN THE NAME OF GOD

Iran as a Great Center for Medical Tourism in Neurosurgery





Introduction

- Medical tourism (MT) is patient movement from highly developed nations to other areas of the world for medical care, usually to find treatment at a lower cost.
- Medical tourism is different from the traditional model of international medical travel where patients generally journey from less developed nations to major medical centers in highly developed countries for medical treatment that is unavailable in their own communities.
- Over 50 countries have identified medical tourism as a national industry.



History

- The first recorded instance of medical tourism dates back thousands of years to when Greek pilgrims traveled from all over the Mediterranean to the small territory in the Saronic Gulf called Epidauria.
- In eighteenth century England, for example, patients visited spas because they were places with supposedly health-giving mineral waters, treating diseases from gout to liver disorders and bronchitis.



Essential Factors

- Factors that have led to the increasing popularity of medical travel include the high cost of health care, long wait times for certain procedures, the ease and affordability of international travel, and improvements in both technology and standards of care in many countries.
- Medical tourists come from a variety of locations including Europe, the Middle East, Japan, the United States, and Canada.
- Factors that drive demand for medical services abroad in First World countries include: large populations, comparatively high wealth, the high expense of health care or lack of health care options locally, and increasingly high expectations of their populations with respect to health care.



Medical Tourism in the Western Countries

- In First World countries like the United States medical tourism has large growth prospects and potentially destabilizing implications.
- An estimated 750,000 Americans went abroad for health care in 2007, and the report estimated that 1.5 million would seek health care outside the US in 2008.
- The growth in medical tourism has the potential to cost US health care providers billions of dollars in lost revenue.
- The avoidance of waiting times is the leading factor for medical tourism from the UK, whereas in the US, the main reason is cheaper prices abroad.

Malaysia

- Ranked in the top five destinations for health tourism.
- The majority of the foreign patients seeking medical treatments in Malaysia are from Indonesia, Singapore, Japan, and West Asia.
- Malaysia received 671,727 patients from around the globe.



Japan

- To promote medical tourism, the Japanese government issues six-month entry visas to travelers entering Japan to receive medical care, double the duration of regular tourist visas.
- An estimated 2% of foreign visitors to Japan came for medical care. Japan's medical system is reportedly strong in the area of cancer treatment.



IRAN

- Iran is also among the 12 countries with biological medicines technology and can serve as a health tourism center.
- 30,000 people come to Iran each year to receive medical treatment (2012)

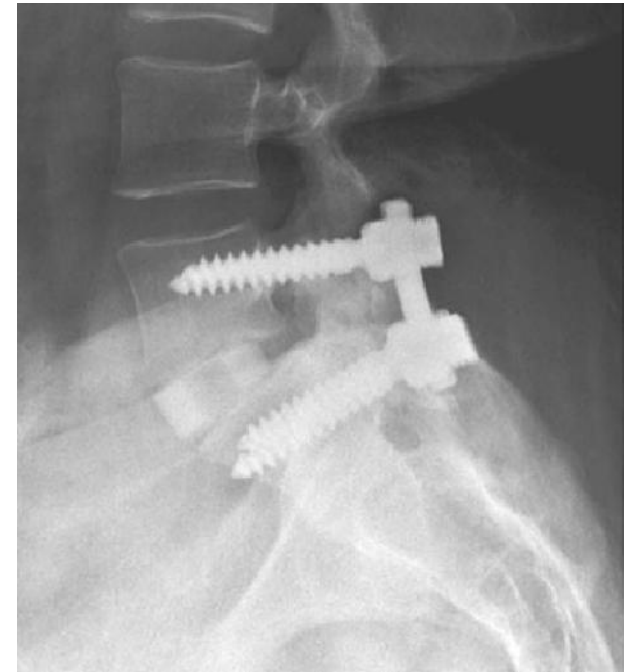


Neurosurgical Procedures



Spinal Fusions

- ALIF
- TLIF
- PLIF

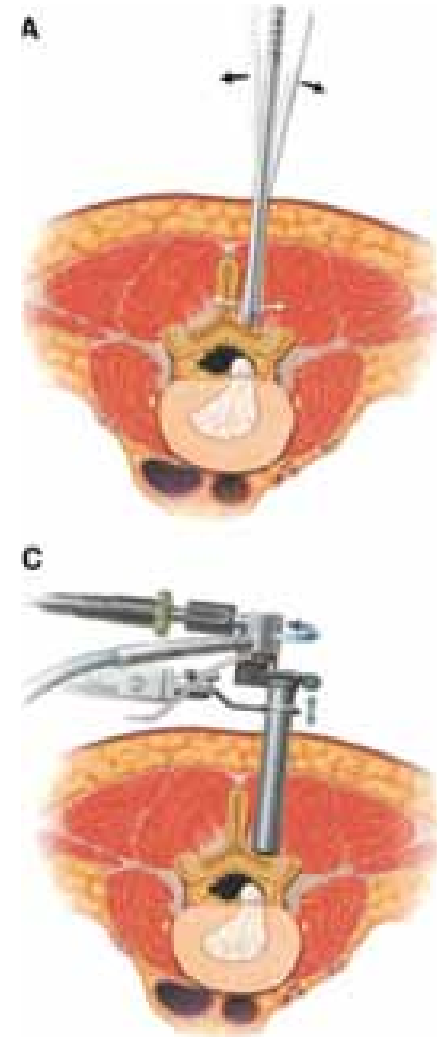
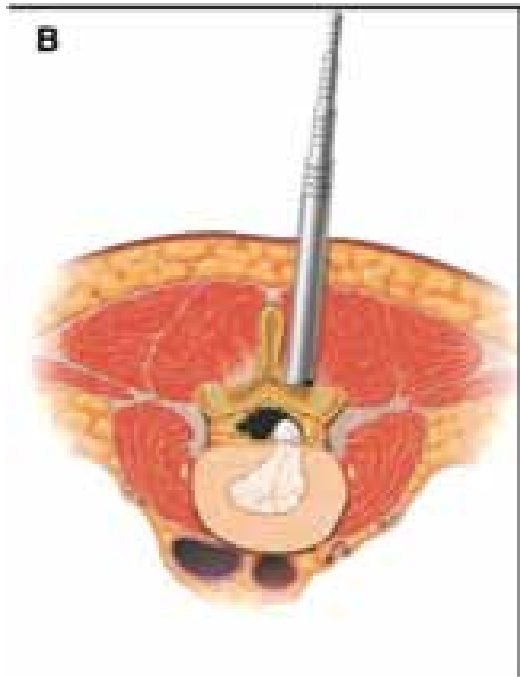


Vertebroplasty & Kyphoplasty



Minimally Invasive Spine Surgery

ENDOSCOPIC DISCECTOMY

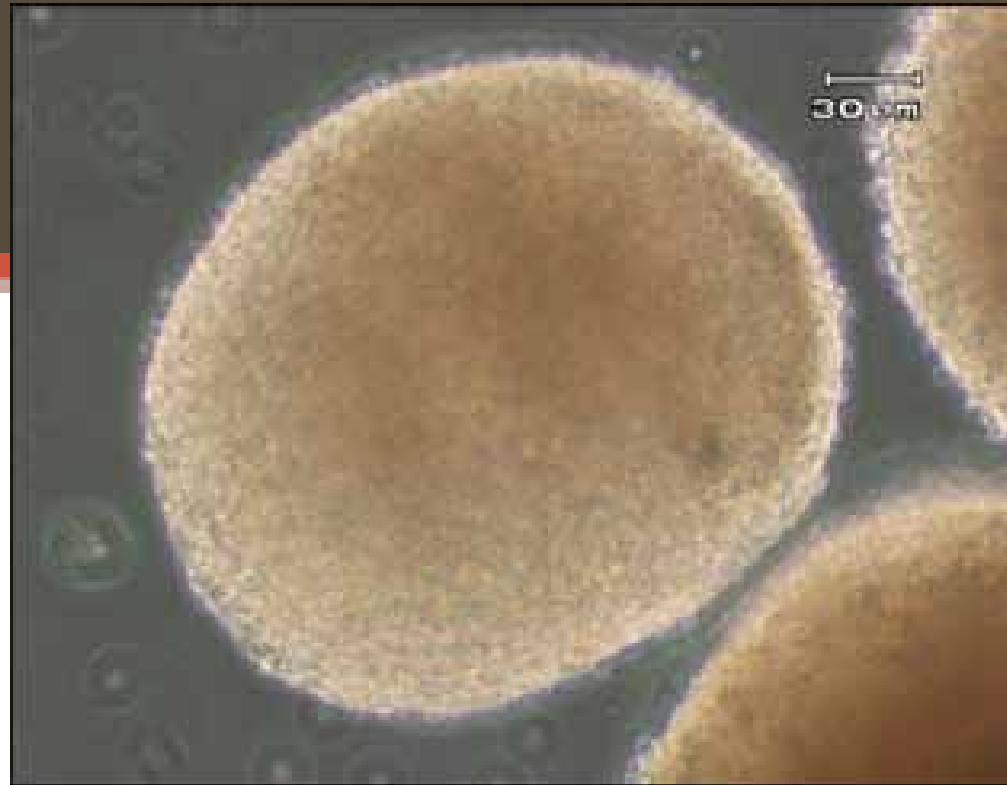


Peripheral Nerve Surgery

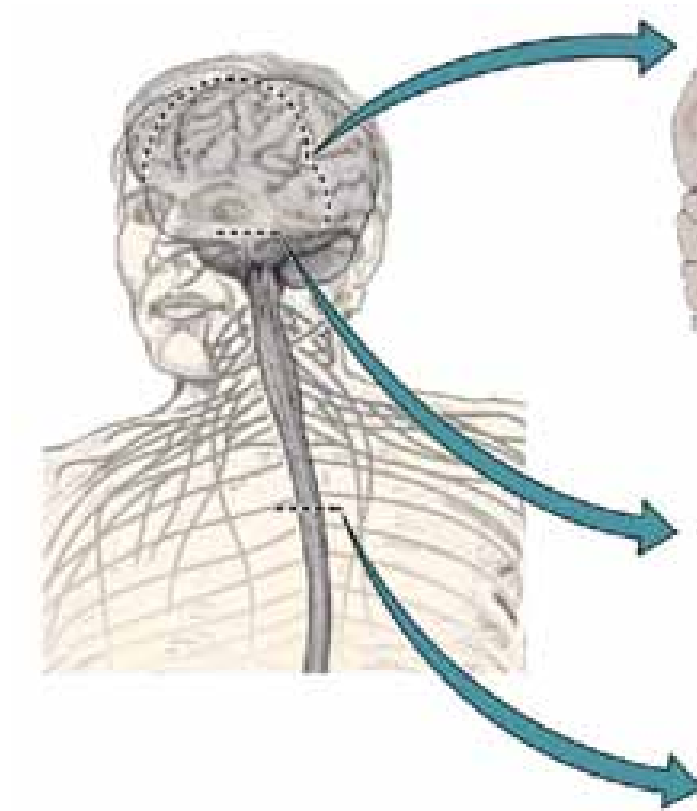
- Surgery of brachial plexus and other peripheral nerves.
- All type of traumatic, neoplastic, entrapment disorders of nerves.



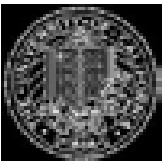
Cell Therapy



Stem cell therapies for neurological disorders



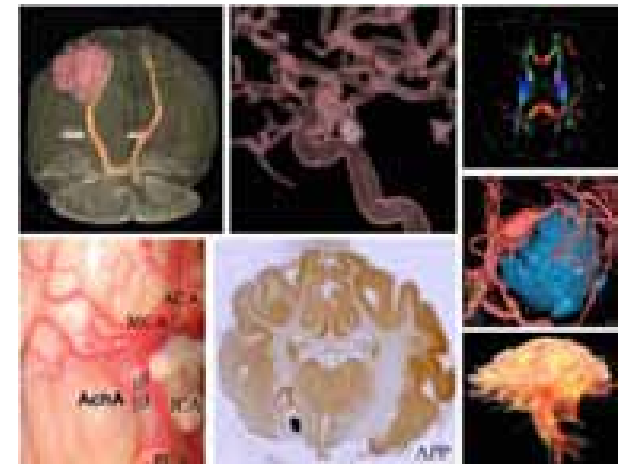
- Brain and spinal cord injury.
- Stroke.
- Neurodegenerative diseases
 - Parkinson's Disease
 - Huntington's Disease
 - Alzheimer's Disease
 - Multiple Sclerosis
 - Lou Gerhig's Disease (ALS)



Gamma-Knife Radio surgery

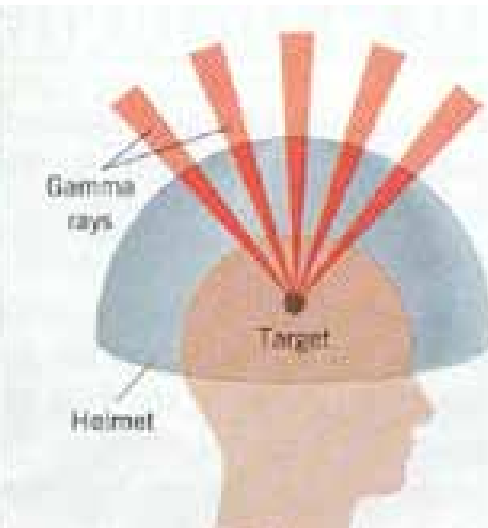
The following conditions are treated with Gamma-knife:

- Parkinson's
- Trigeminal neuralgia
- Arteriovenous malformation
Neurosurgeon India
- Essential tremors
- Benign tumors
- Malignant tumors
- Epilepsy



Gamma Knife

- The device aims gamma radiation through a target point in the patient's brain. The patient wears a specialized helmet that is surgically fixed to their skull so that the brain tumor remains stationary at target point of the gamma rays.
- A killing dose of radiation is sent through the tumor in one treatment session while all surrounding brain tissues receive less than a killing dose



Endovascular Neurosurgery



Before Coil



After Coil



Endovascular Neurosurgery

- Endovascular Neurosurgery is treatment from the **inside** of the blood vessels.
- Traditionally a neurosurgeon has had to open up the skull or neck to see the outside of the blood vessels - a modern alternative has been to approach the vessels with tubes (or "catheters") often gaining entry to the blood vessels from the top of the leg.
- The treatment is guided by the appearance of X-ray dye injected directly into the blood vessels - to produce an **Angiogram**.

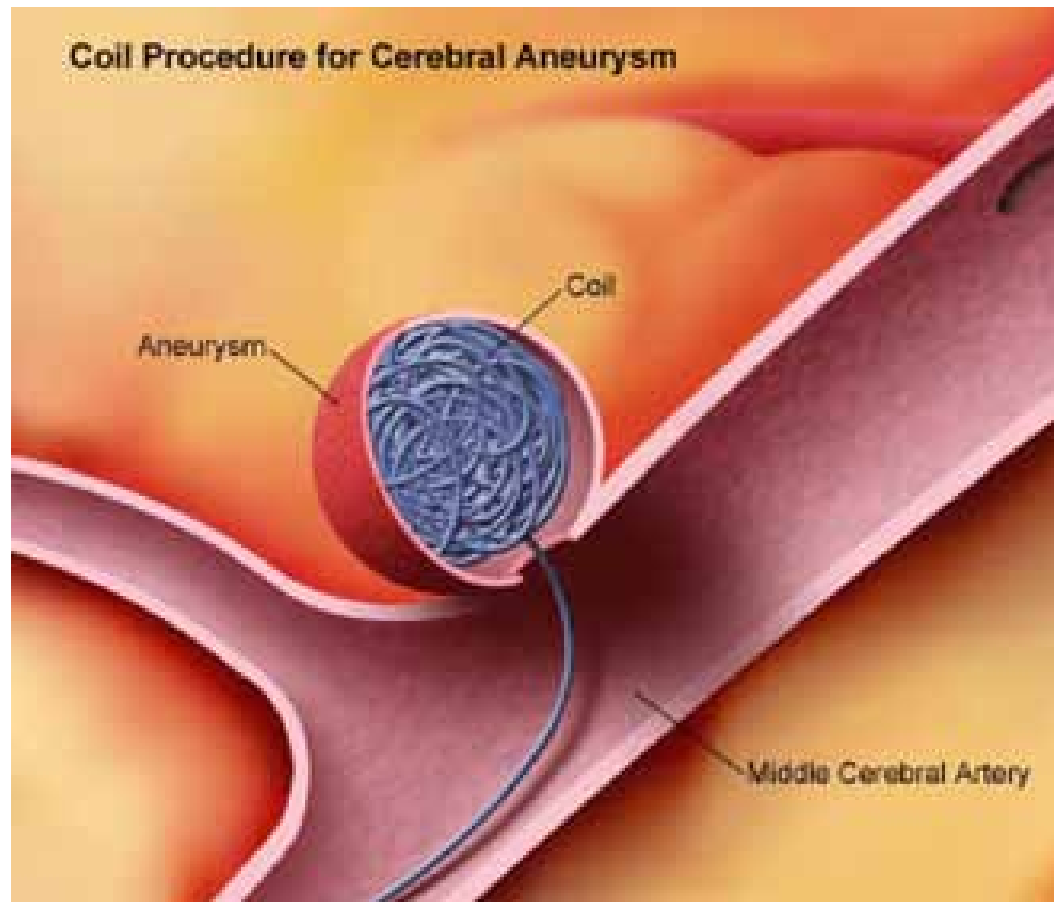
Ventral Paraclinoid Aneurysm



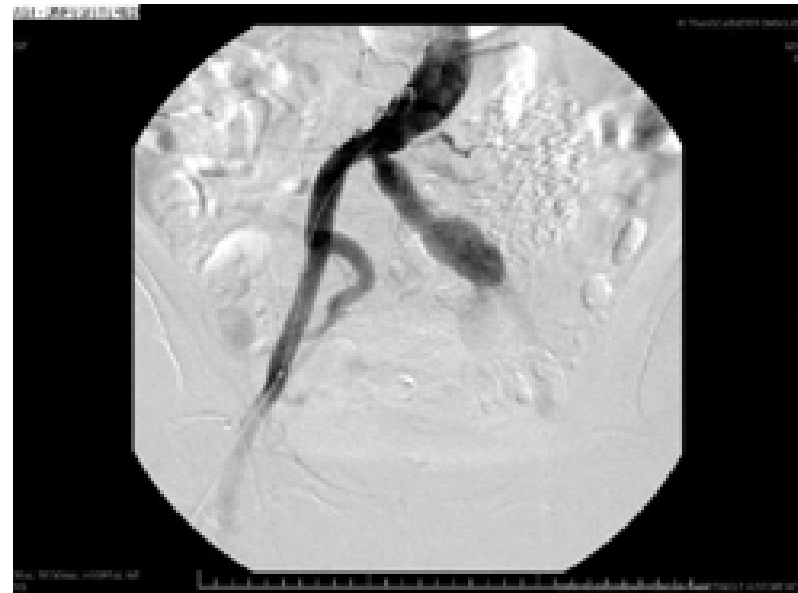
Clip Intradural Portion,
Coil Extradural Portion



Cerebral Aneurysms



Coiling

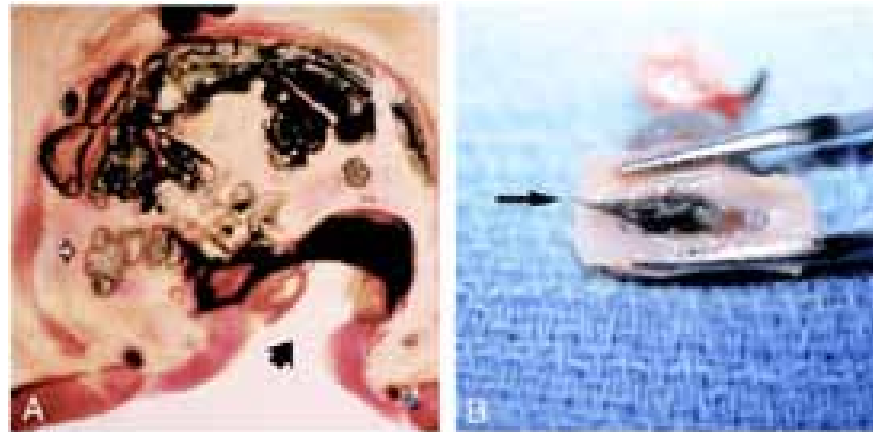


Onyx Embolization

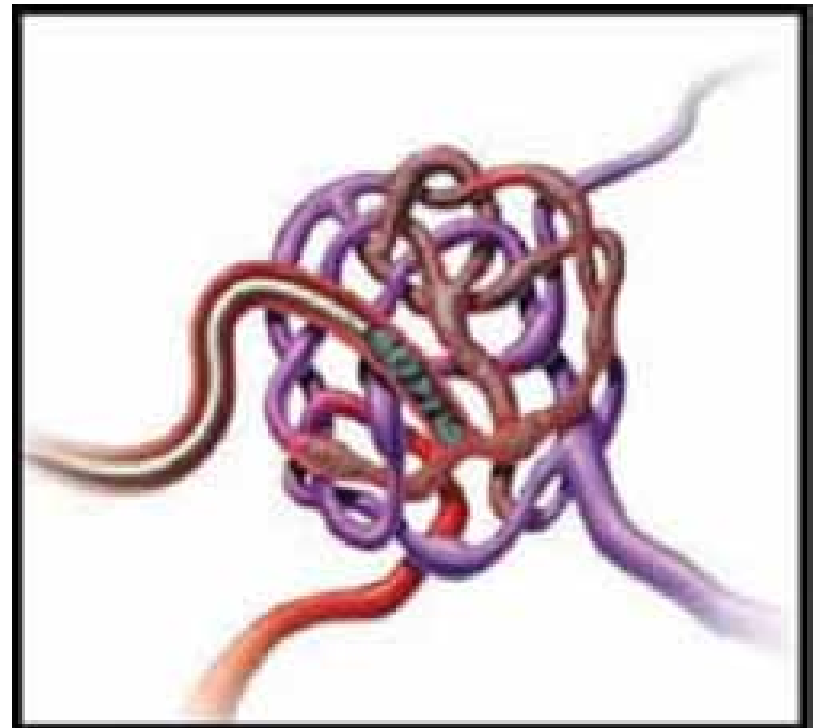
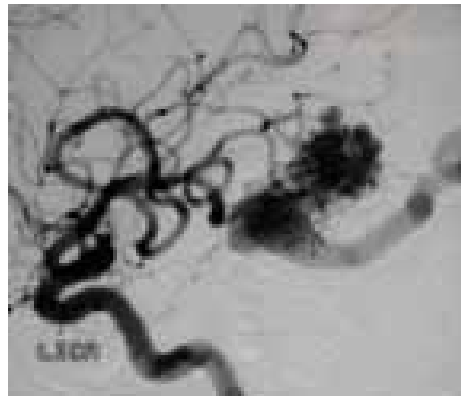
- Onyx is a liquid embolic material that is delivered by neurovascular specialists through MTT's proprietary micro catheters directly into a vascular defect, such as a brain aneurysm or AVM, in a very controlled manner.
- After delivery of the embolic material, the liquid quickly transforms into a solid polymer cast, thereby sealing off the vessels in the AVM from blood flow and reducing the risk of rupture.



Onyx Embolization of Aneurysm



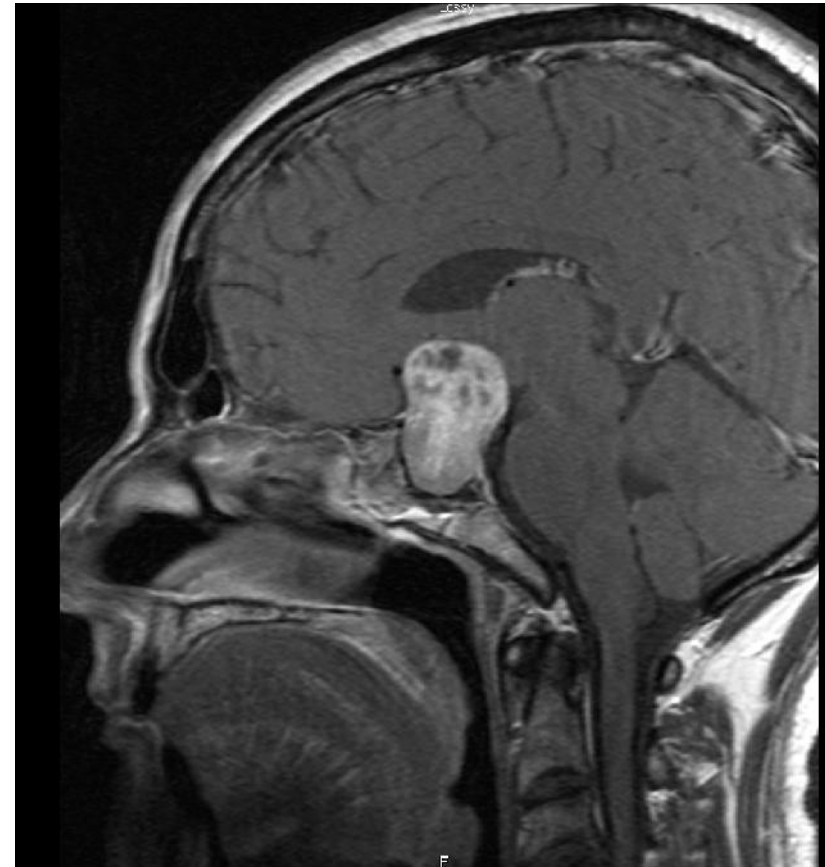
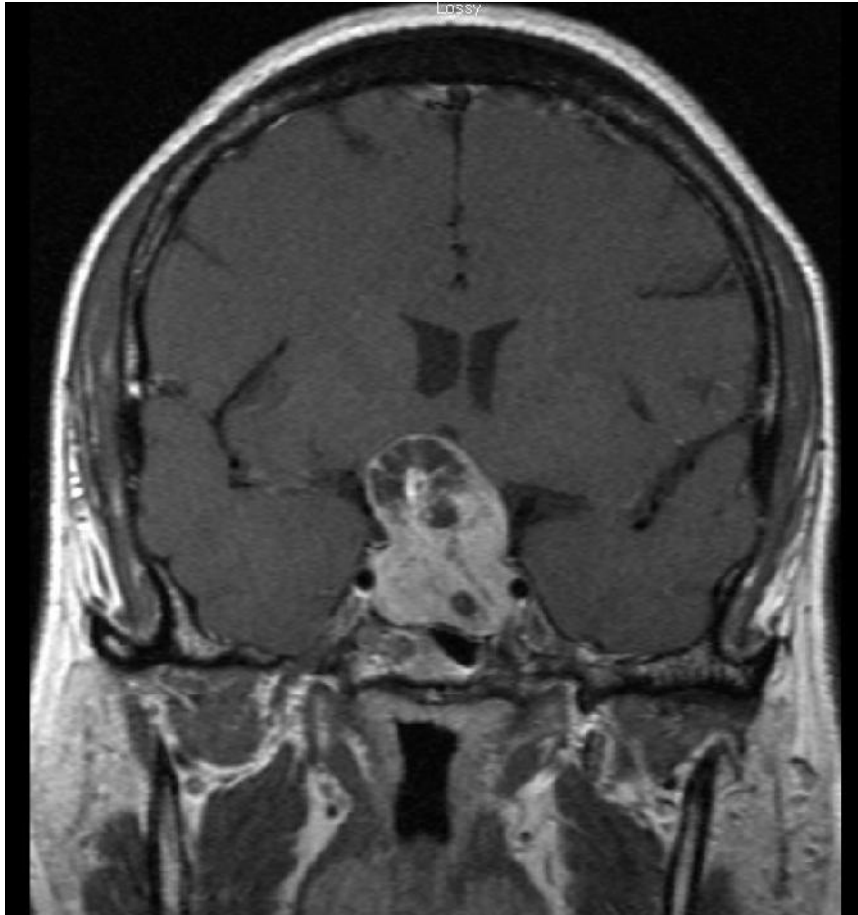
Onyx Embolization for AVM



Endoscopic Pituitary Surgery

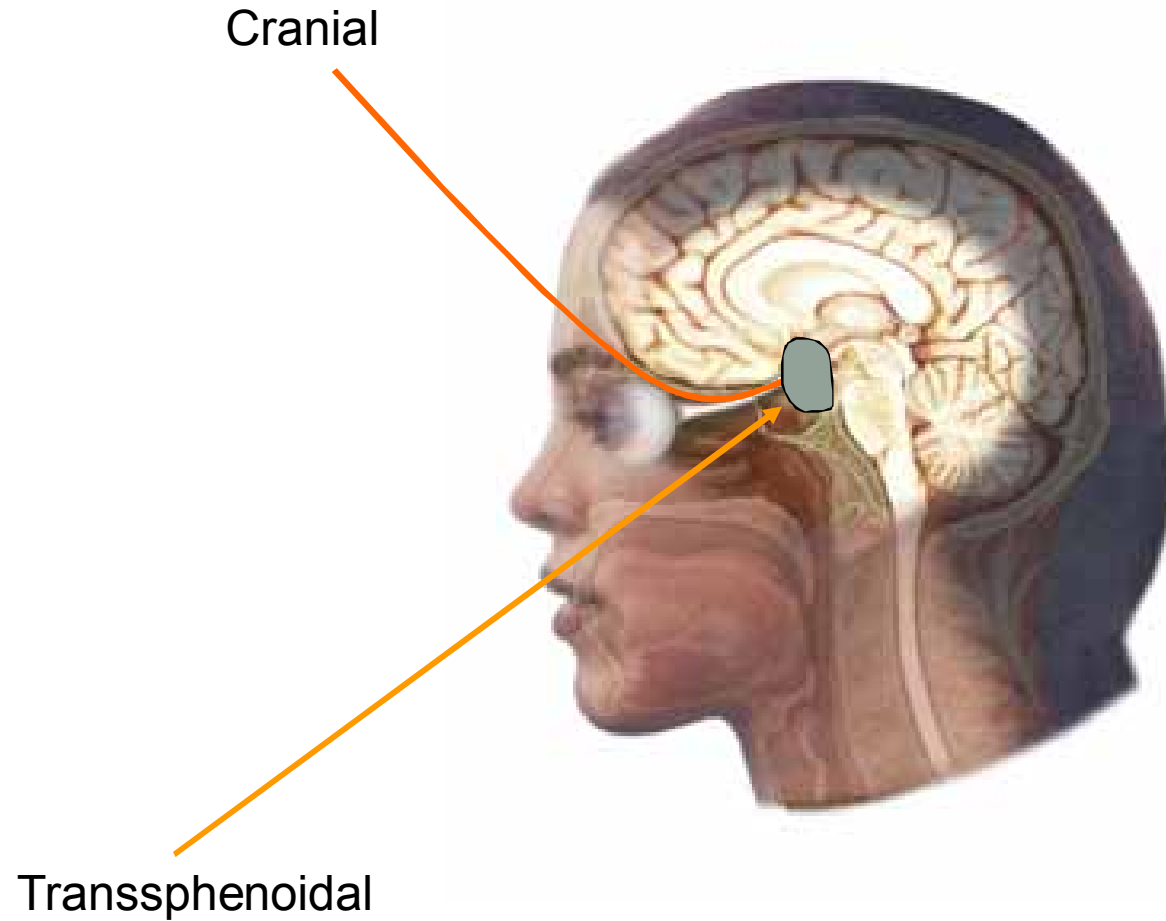


Macroadenoma

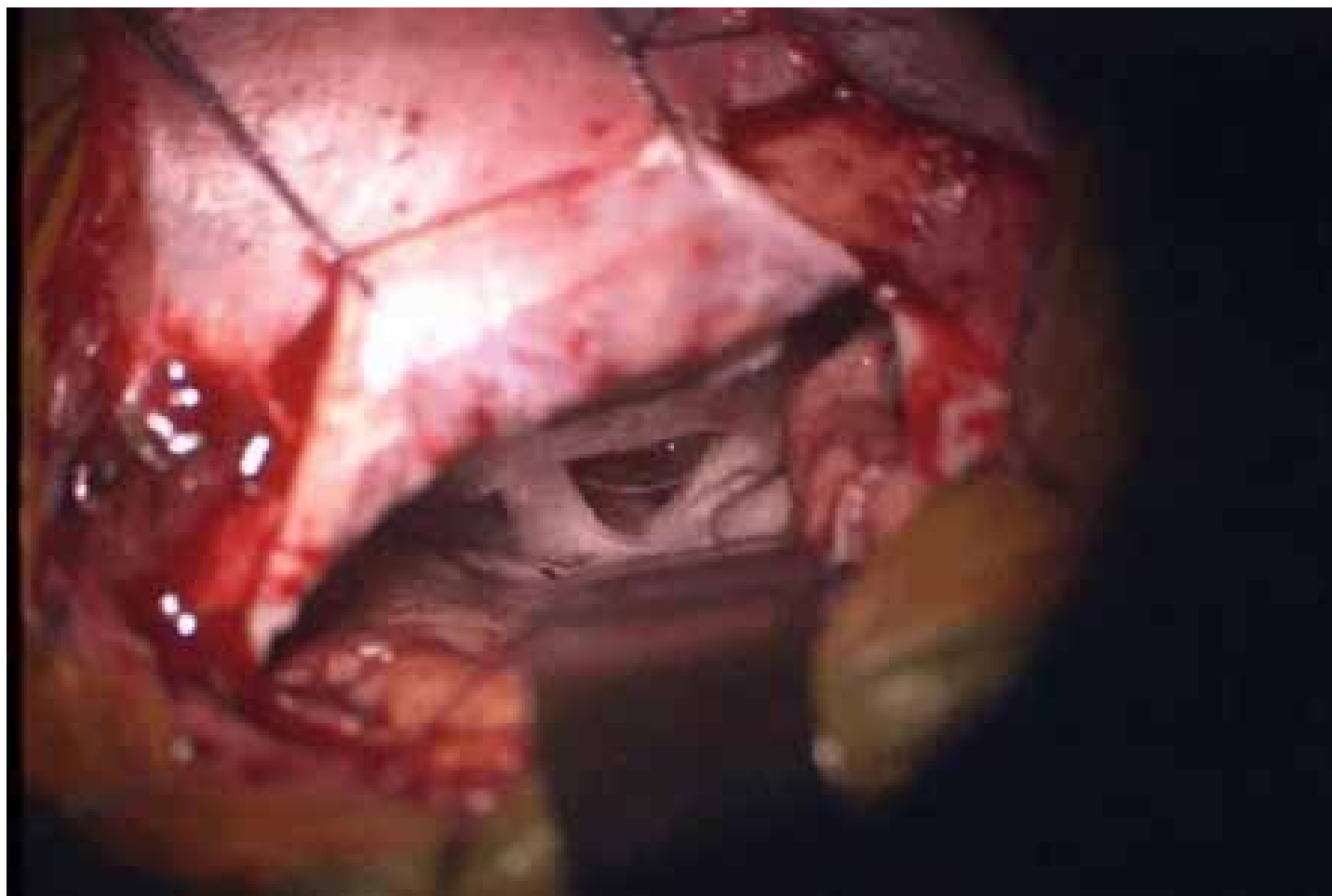


Surgical Options

- Transcranial
- Transsphenoidal
- Combined
- Extended Skull Base



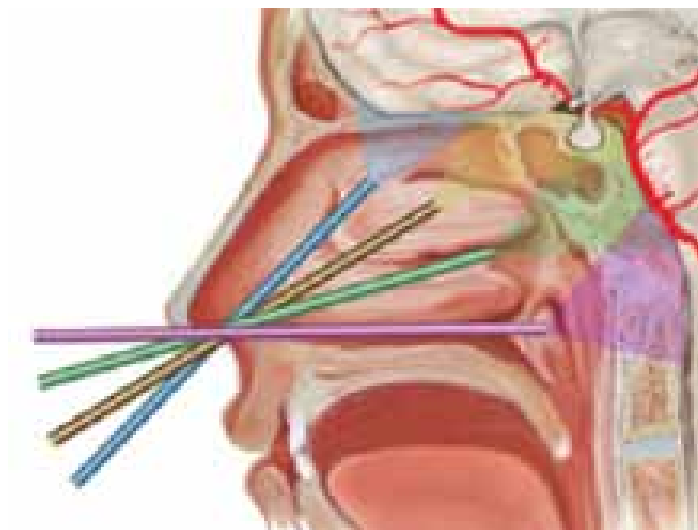
Transcranial approach



Endonasal Transsphenoidal Approach



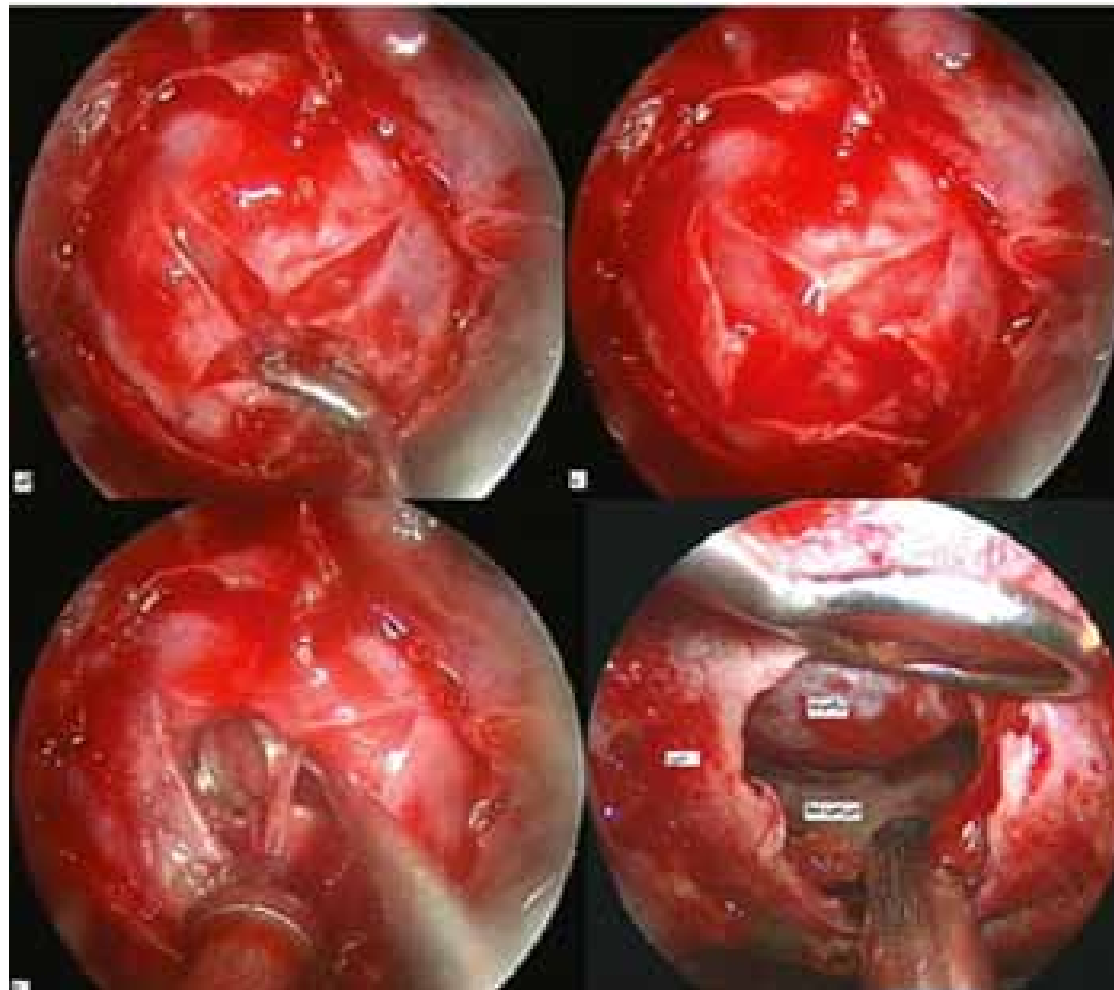
Endonasal Route



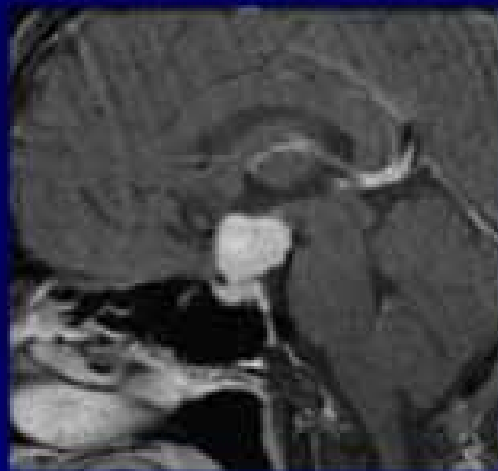
Endoscope



Endoscopic Removal of Pituitary Adenoma



Pre-Op



Post-Op



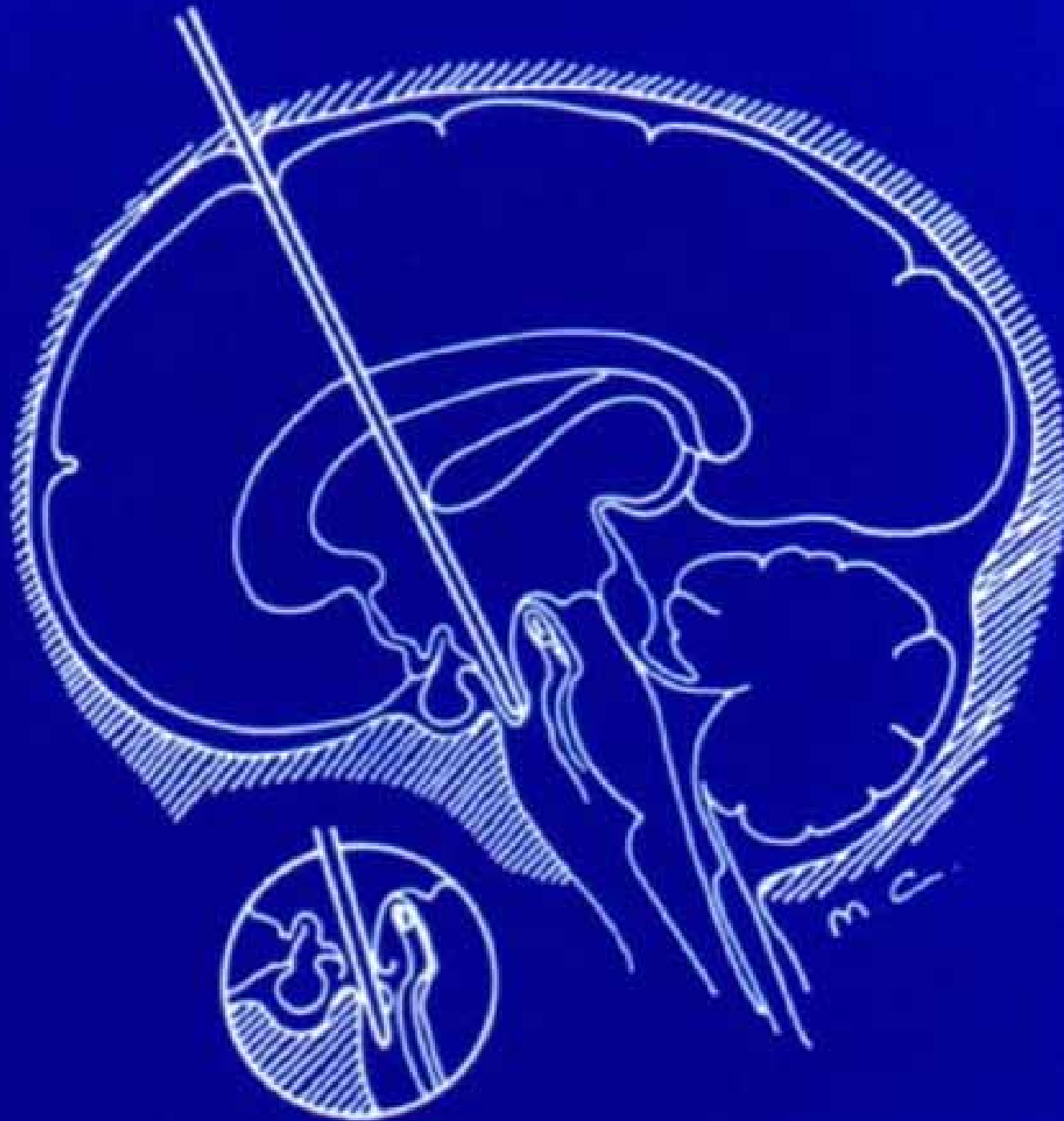
Endoscopic CSF Shunt Surgery



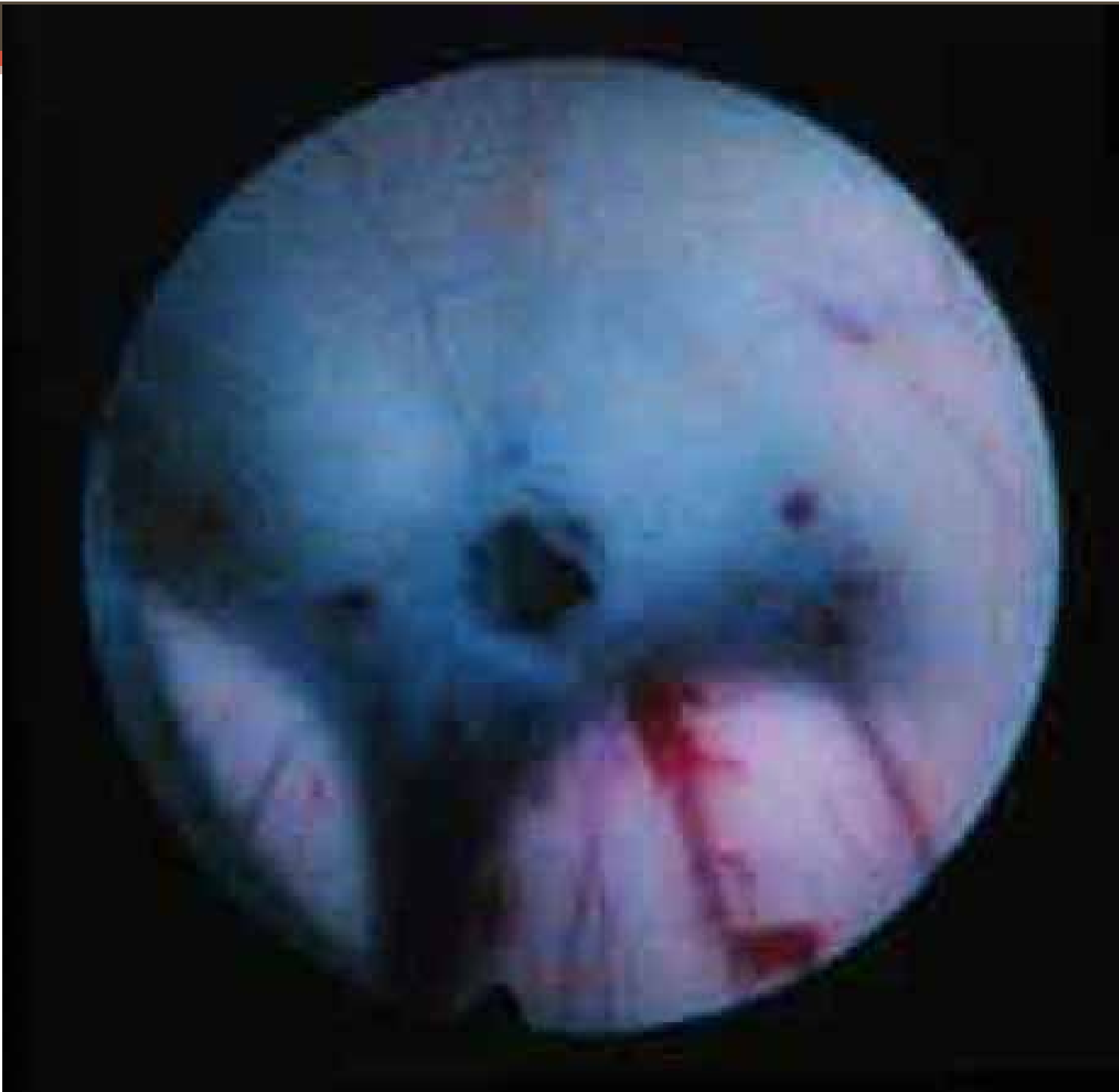
Endoscopic Third Ventriculostomy















Evolution of NeuroSurgery



- Medical Imaging has evolved greatly in the past 35 years-
-Neurosurgery has been the greatest beneficiary
- Prior to 1975, Brain tumours were mapped out by
Pneumoencephalograms and Arteriograms
- CT Scan was the first modality that allowed surgeons to
non-invasively visualize structures within the skull
- MRI further impacted Neurosurgery by allowing
surgeons to see the spinal cord and the brain in
multi-planar images with excellent subject contrast

Framed Stereotactic Systems



- Prior to image guidance, were the primary method for guided needle biopsy
- Recent systems are still the most accurate in localization
- This process, while cumbersome in an adult environment was even more difficult for pediatrics
 - CT scan had to be performed under General Anaesthesia, and then the patient was transported to the Operating Room
- If for some reason, the approach to the lesion must be altered, co-ordinates have to be recalculated on computer

B.R.W. STEREOTACTIC FRAME



Frameless Stereotactic Biopsy

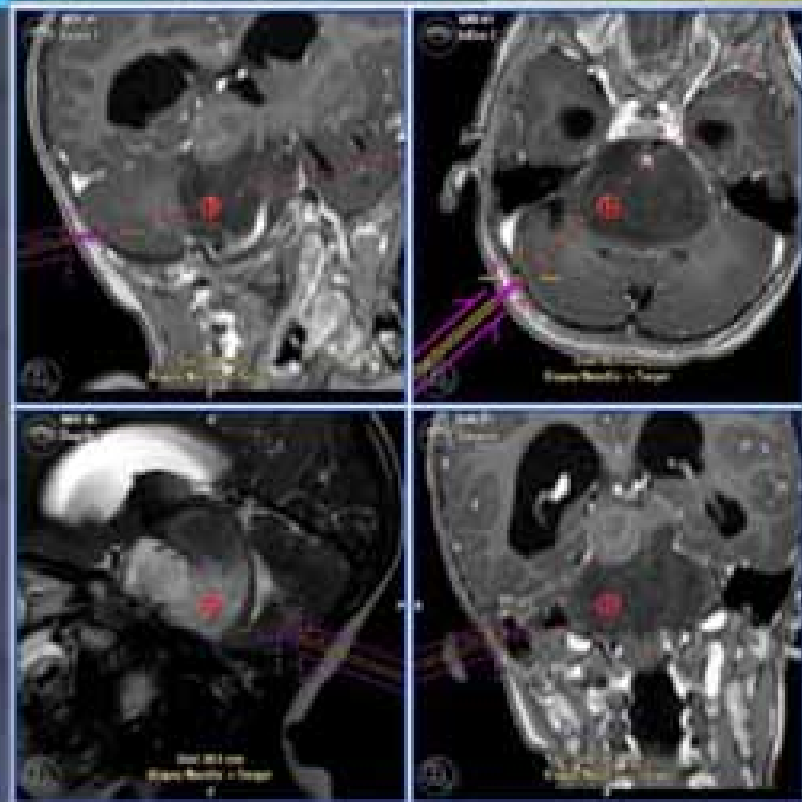
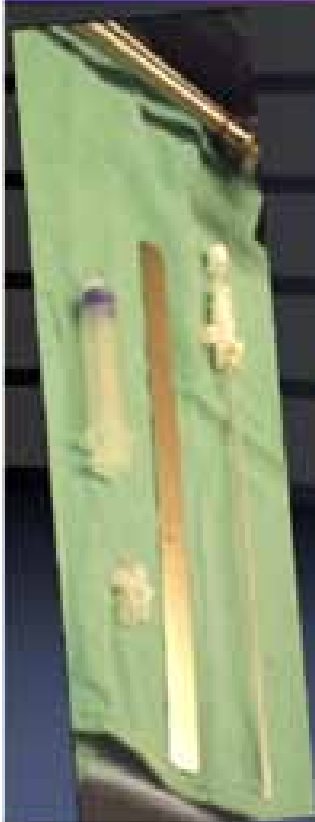


Image Guided NeuroSurgery



- Image guidance with computers allows several ways to utilize imaging in NeuroSurgery
 - Pre-operative planning
 - Intra-Operative Localization
 - Biopsies
 - Epilepsy Surgeries
 - depth and grid electrode placement
 - corpus callosotomies

Evolution of Surgical Guidance

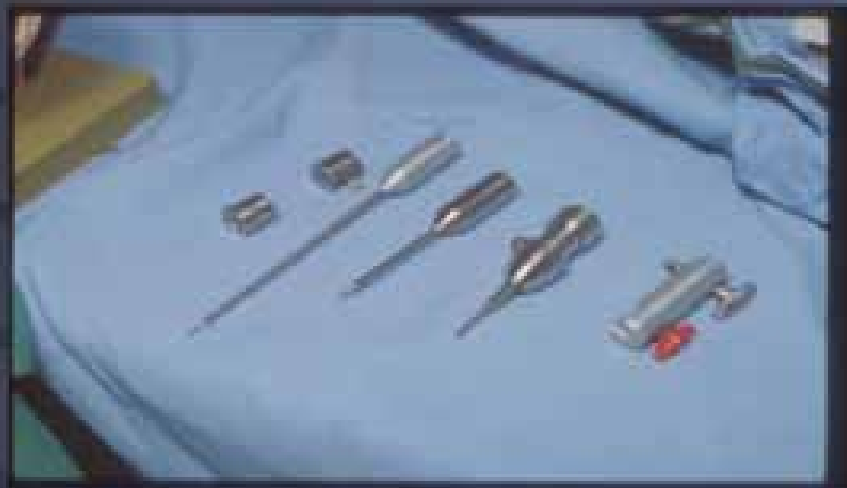
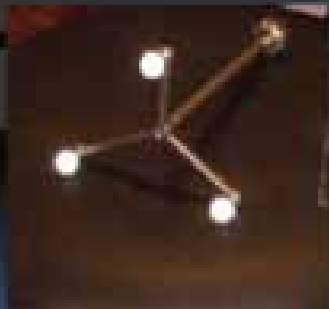


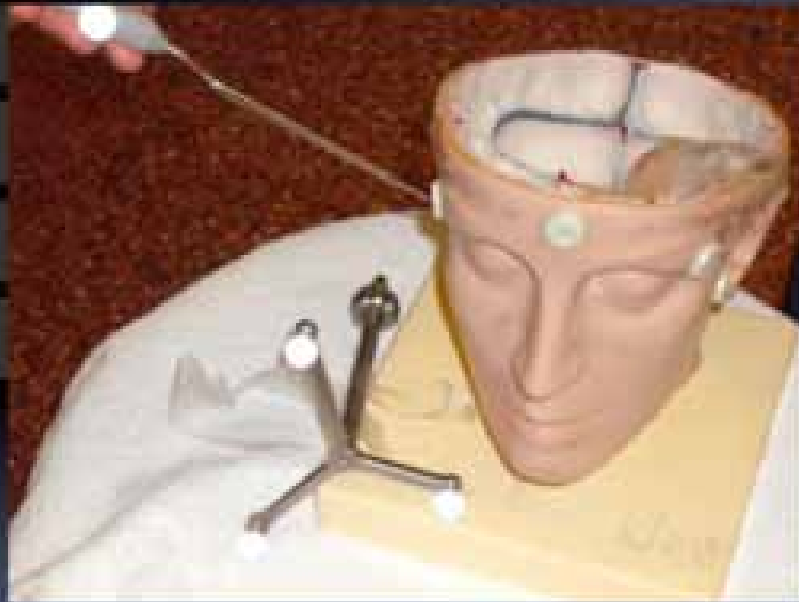
Image Fusion in Surgery



Reference Arrays



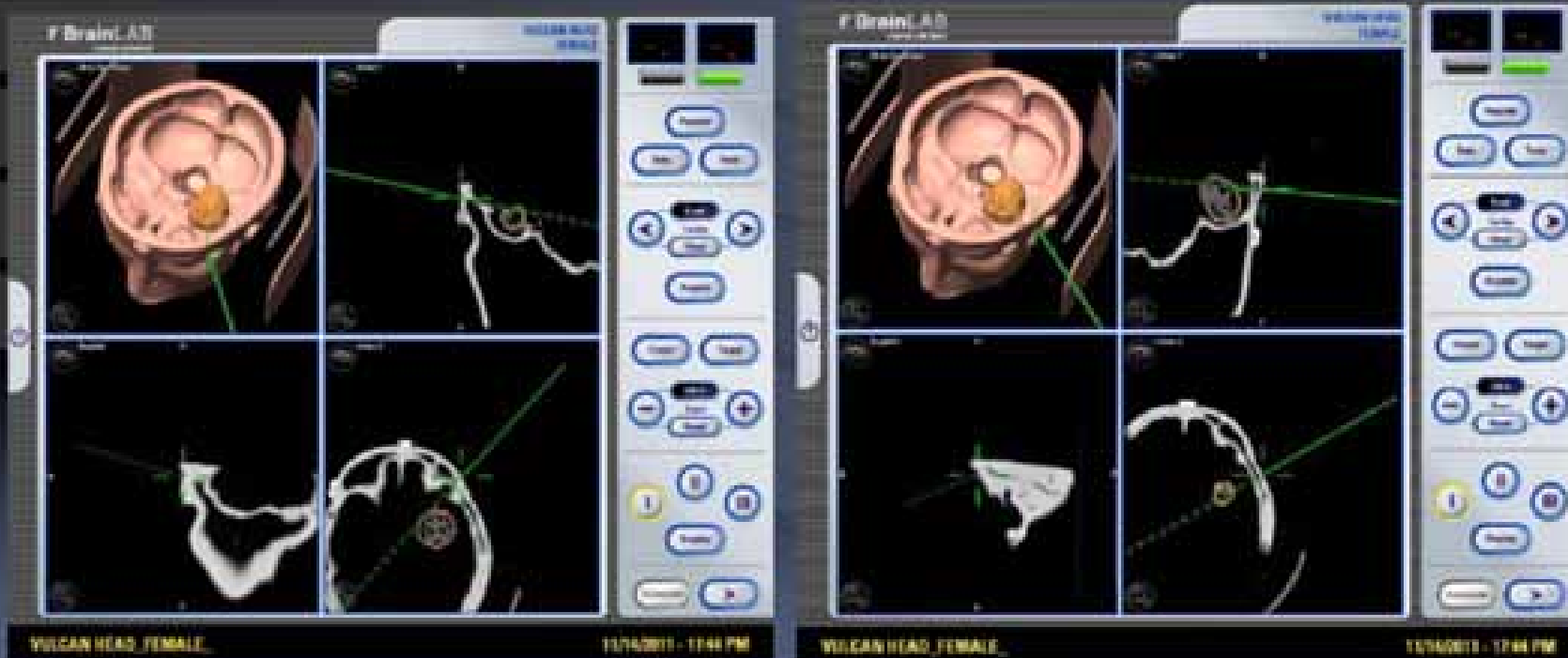
Registering with Fiducials



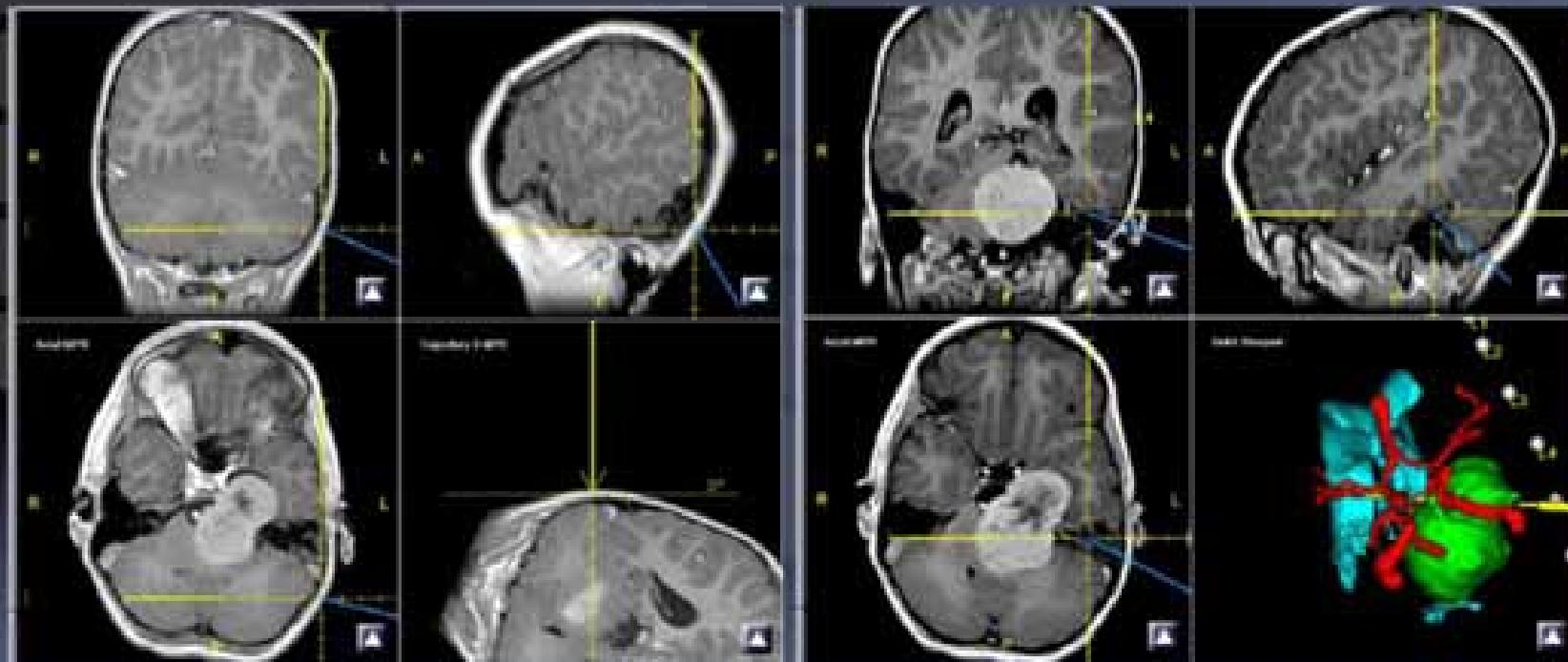
Other Chosen Registration Points



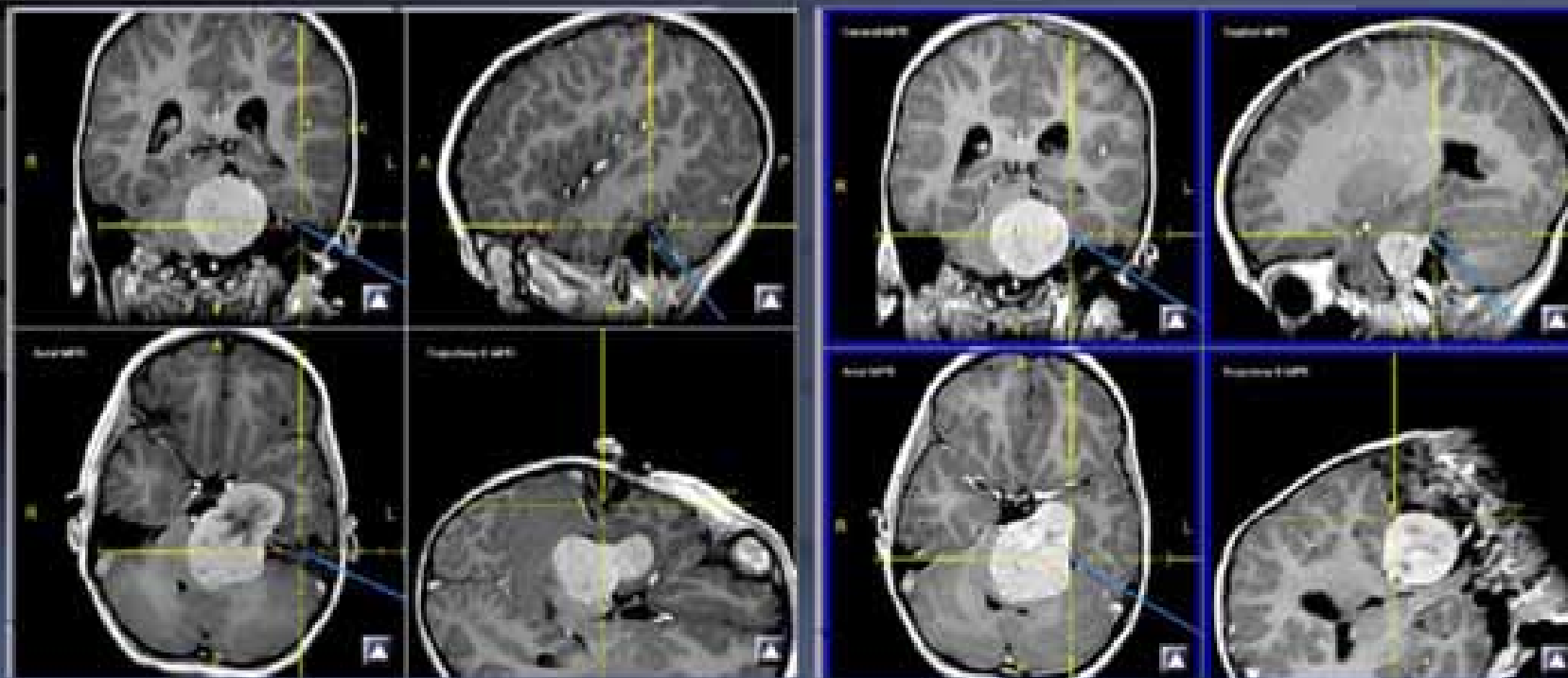
Surgeon can Navigate



Planning Entry and proceeding



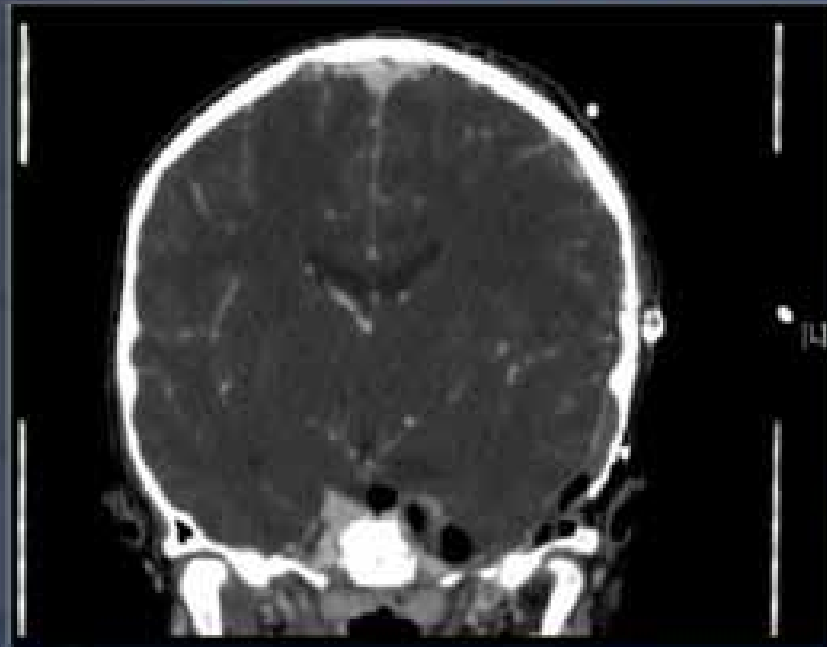
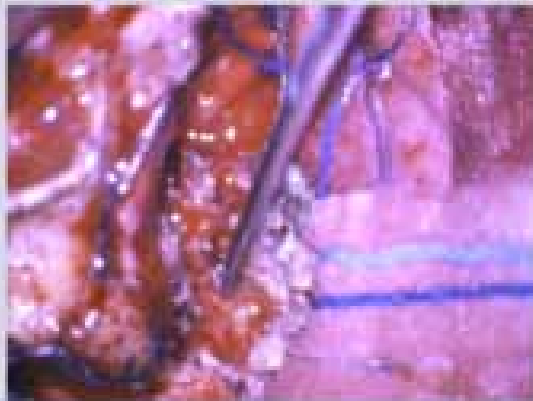
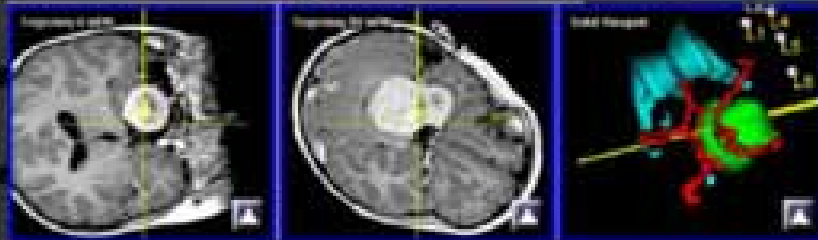
Tracking Location



Microscope Connection to Navigation System for Focal Spot Tracking

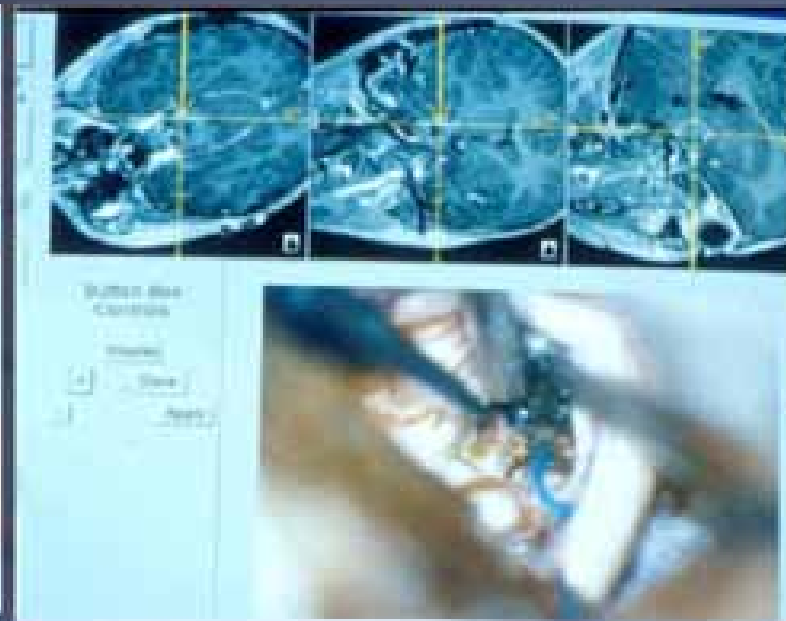
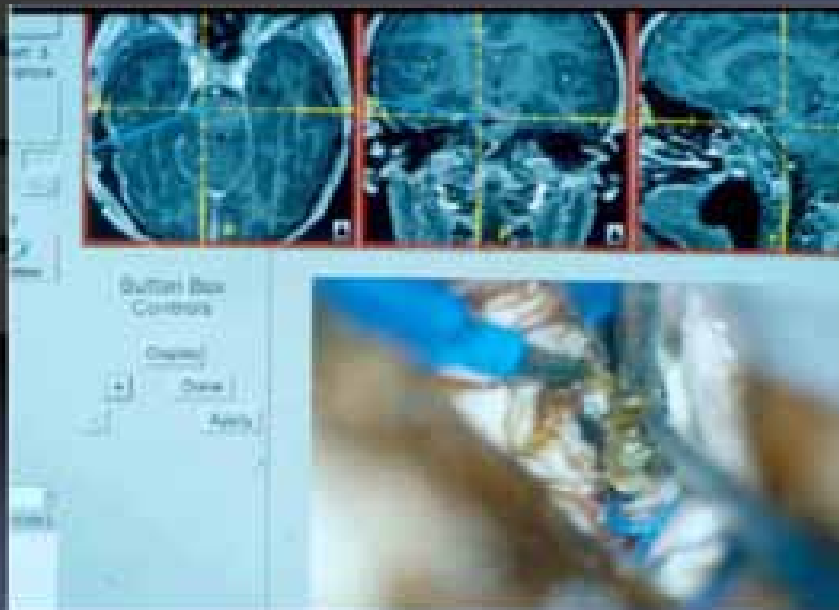


Tracking from another Perspective

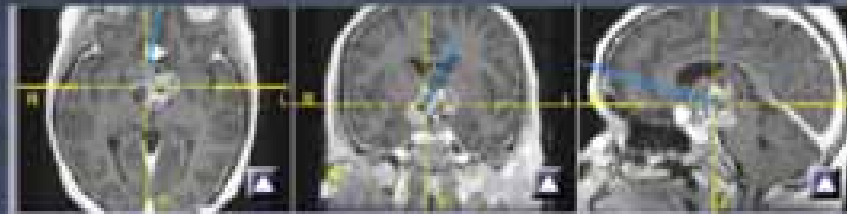
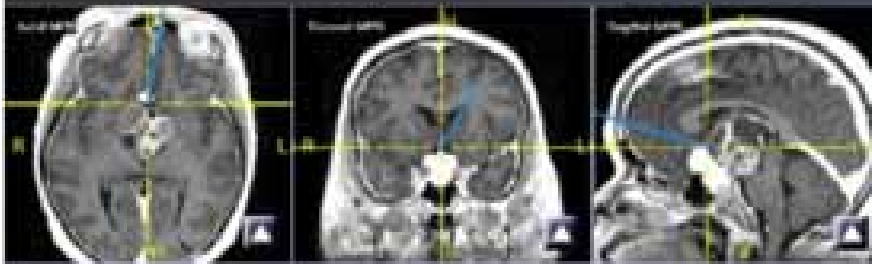


SCHWANNOMA

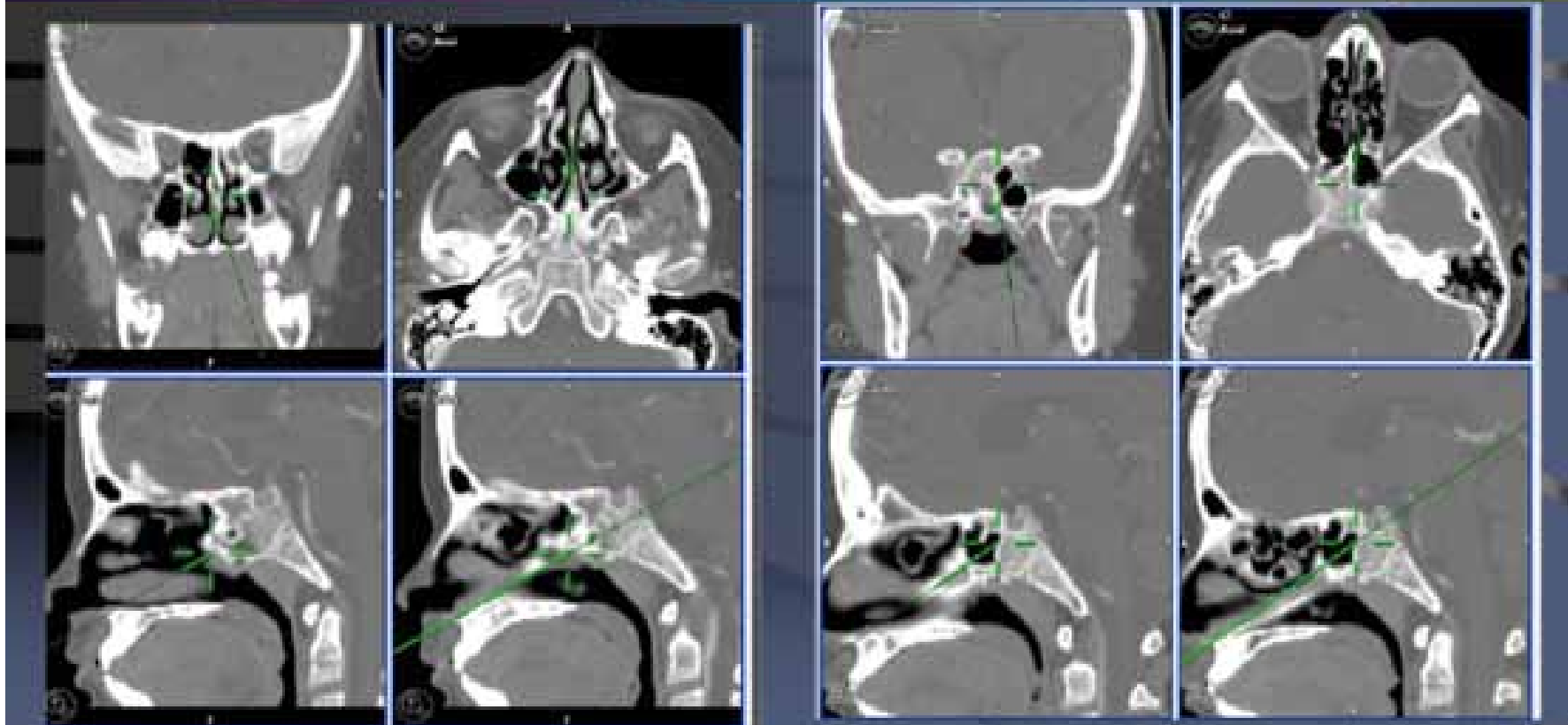
Brain Stem Cavemous Angioma Removal



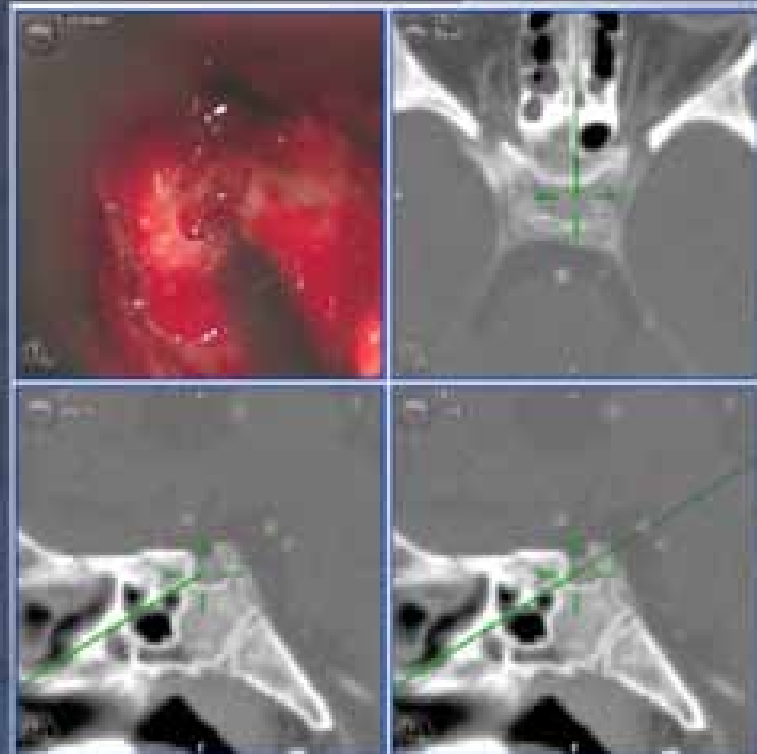
Subfrontal Approach



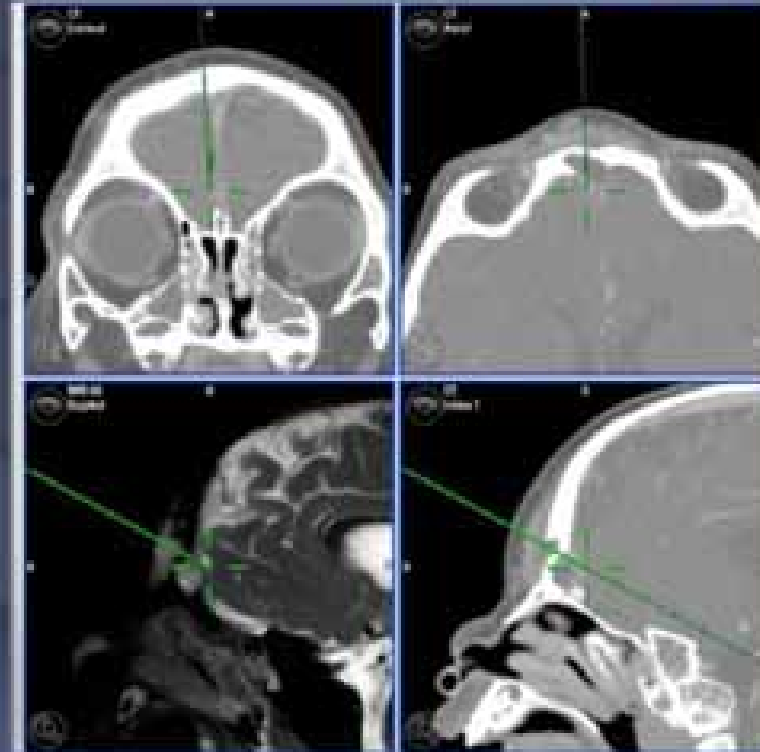
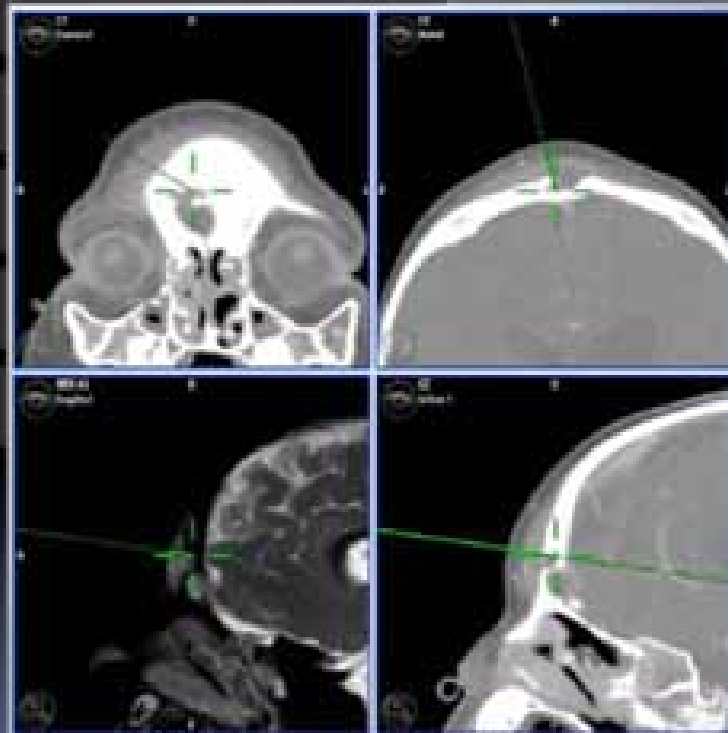
Transphenoidal Approach



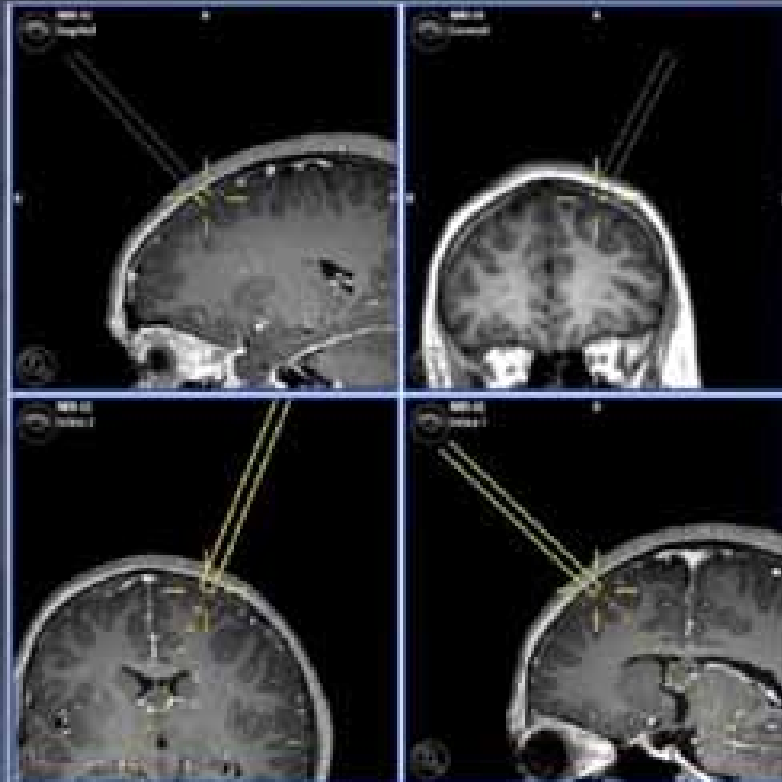
Into the Pituitary Fossa



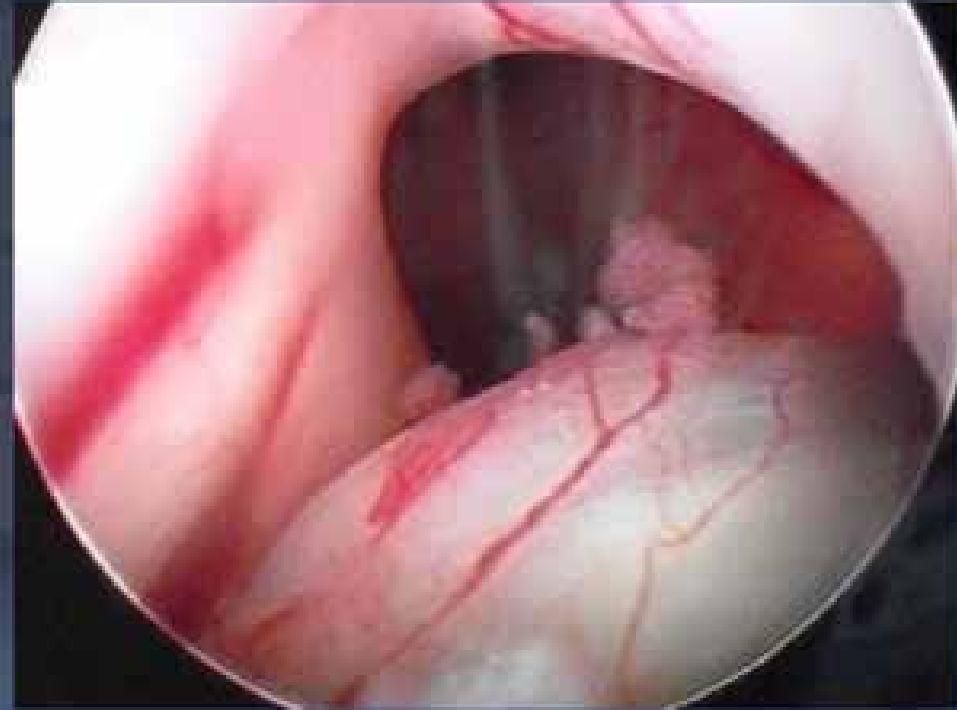
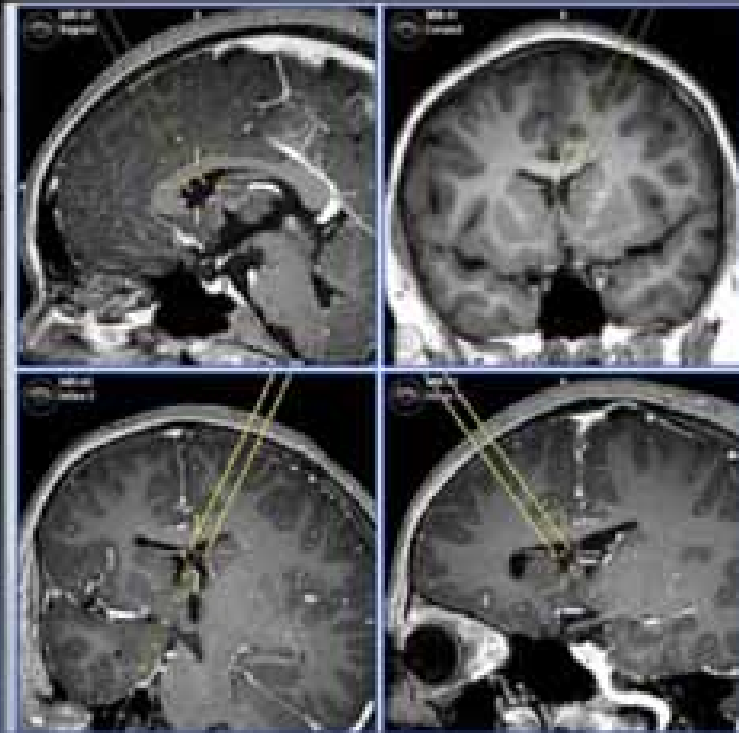
Complex Dermoid



Tracking a Ventriculoscope



Arriving at Target



AVM Near Motor Strip and DTI



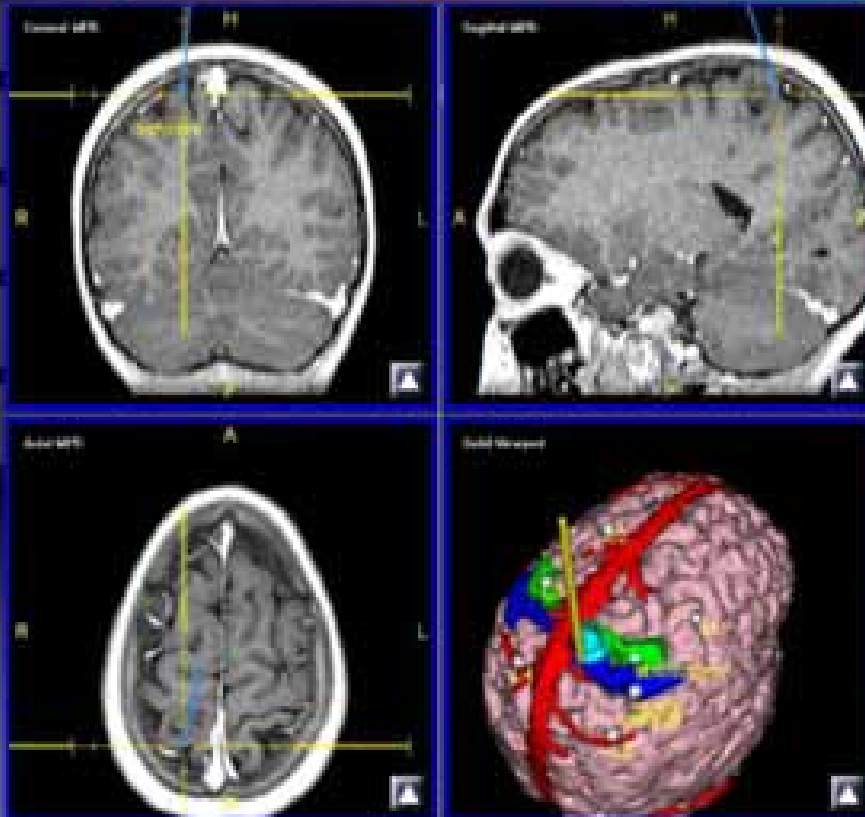
•DTI Analysis is the work of Dr. Elysa Widjaja, NeuroRadiologist

Epilepsy Surgery, MEG and Navigation



- MEG imaging was set up so that it could be used on the surgical navigation system
 - MRI sequence for MEG is a registration scan for navigation
 - Must have a 256 reconstruction matrix
 - on PACS MEG series is label lists the corresponding mappings visible on the images
 - Ie: MEG_EEG_SEF-BILAT_AEF-BILAT_LANGUAGE
- MEG image data is stored on PACS and can be easily retrieved for surgical planning and navigation

Early Function Mapping from MEG



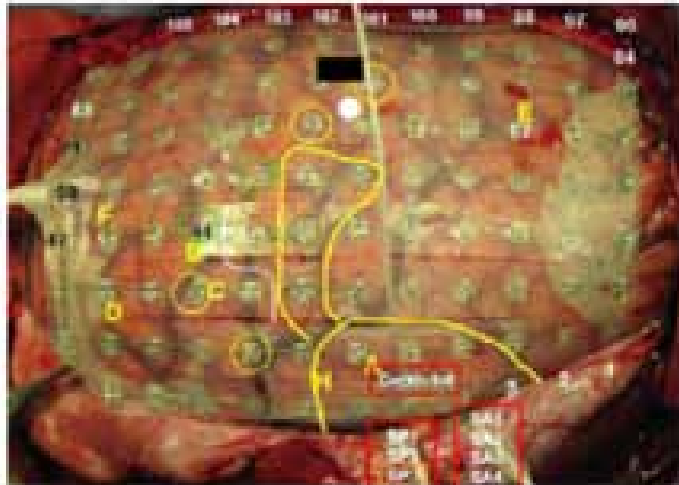
Navigating the Spine



Grid assessment and Resection site



2010-V86, Left hemisphere (JB)



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5. 2010-V86
6. Assessment
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Navigating Around the Vertebral Artery

