Surgical Advances for Brain Tumors

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Tumors cause mass effect
Tumors cause brain swelling
Surgical goals

- Make diagnosis
- Relieve pressure
- Remove as much tumor as possible
- Preserve brain function
Risks vs benefits

- Acceptable risks?
  - Mortality <3%
  - Morbidity <10%

- Data are not clear
Location location

$250,000 - small, Midwestern town

$1.5 million - San Francisco
The functional brain

- Planning
- Problem solving
- Short-term memory
- Behavior
- Skilled movement
- Voluntary movement
- Sensations
  - Sensory data analyzed
  - Visual data analyzed
- Speech formation
- Smell
- Memory
- Learning
- Auditory data analyzed
- Language interpretation
- Balance
- Coordination
Why can’t tumors be removed?

- Tumor cells invade the brain
- Located in important areas
- Attachment
- Difficult location
Why can’t tumors be removed?

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35 yo man with headache
Favorable: Polar resection

preop

postop
Stereotactic biopsy

Bilateral-corpus callosum

Basal ganglia
Advantages of aggressive resection

- Reduce mass effect
- Reduce risk of bleeding
- Improved outcome?
- Better response to adjuvant therapy
An extent of resection threshold for newly diagnosed glioblastomas

Clinical article

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EOR ≥ 90%
EOR ≥ 95%
EOR ≥ 98%
EOR = 100%
p<0.0001

Survival (months)
Surgical Advances

A. image-guided surgery

B. Instrumentation (cavitron, laser)

C. functional brain mapping
Stereotactic guidance

- Method for distinguishing tumor from normal brain
- Reduces size of operation
- Particularly helpful for tumors located deep in brain
Stereotactic guidance
Stereotactic guidance
Stereotactic localization
Brain mapping

- Uses electrical stimulation to map important brain areas
- Useful for motor and speech areas
- Patient remains awake for testing
- Provides safety
Brain mapping
Awake brain mapping
Blood-oxygen-level-dependent (BOLD) fMRI

- a functional neuroimaging technique that maps the brain by detecting perfusion-related changes that are coupled to cognitive tasks (therefore, to neuronal activity)

Pouratian N et al. (2007)
Neurosurgical instrumentation in the fight against brain tumors

- Endoscopes
- Cavitron
- Lasers
Endoscopes
Cavitron

- Ultrasonic aspirator
- Breaks up tumor tissue without disrupting surrounding brain
- Reduces brain manipulation
Future Surgical Advances
Fluorescein sodium with Yellow569 filter
Improving Chemotherapy Treatment for Brain Tumors

• Many chemotherapy drugs work well in the laboratory but not in patients

• Blood brain barrier prevents drugs from getting into the brain

• Drugs are toxic to the rest of the body
CONVECTION-ENHANCED DELIVERY

- Can control drug concentrations
- Fewer side effects
Clinical Trial: Topotecan via CED
64 yo man -
GBM
Future Advances

• Safer methods to remove tumors
• Identification of important brain areas
• Optimization of microsurgical techniques
• Better training of neurosurgeons
Advice: Understanding the disease

- Seek reputable specialist
- Notebook - write down questions
- Make sure instructions are understood
- Be skeptical of anecdotes (no matter how well meaning)
- Don’t be afraid of second opinions
Questions to be answered

• Is the tumor operable?
• What are risks?
• What are other treatments?
• Can treatment wait?
• What happens with no treatment?
• Surgery for brain tumors comes with good expectations
• Invasive tumors are not completely removable
• Seek out experienced surgeons for best results
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