



Pediatric Brain Tumors Pre, Intra & Post Op Evaluation and Management

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A member of the  Seton Family of Hospitals

PEDIATRIC BRAIN TUMORS

BACKGROUND:

- Incidence: Third most common pediatric tumor type
 - (leukemia, neuroblastoma, brain cancers, lymphomas, Wilms, germ cell tumors, retinoblastoma, other types)
- Midline location (third or fourth ventricle)
- Typical presenting S&S: headache, seizures, neurological deficits, endocrinopathy

PEDIATRIC BRAIN TUMORS

- Most frequently, they come from "young" cells. ("immature" or "primitive" cells) that have not reached full maturity.
- They are developing at the same time as the child is developing.
- Brain tumor types mirror the way a normal cell matures from its very beginning as a "primitive" brain cell (a precursor) towards becoming an adult cell type.
- "Cancer Stem Cell"

PEDIATRIC BRAIN TUMORS

Brain tumors behave differently than other tumors in the body

Types:

Intraparenchymal (benign or malignant)

Extra-axial (generally benign)

Brain Tumor Types

- **Astrocytoma / Glioma** Astrocytomas are tumors that arise from brain cells called astrocytes. Gliomas originate from glial cells, most often astrocytes.
- **Atypical Teratoid / Rhabdoid Tumor (ATRT)** This rare, high-grade tumor occurs most commonly in children younger than 2...
- **Brain Stem Glioma** The brain stem consists of the midbrain, pons and medulla located deep in the posterior part of the brain. Usually malignant, sometimes benign.
- **Choroid Plexus Tumor** The choroid plexus papilloma is a rare, benign tumor most common in children under the age of 2.
- **Craniopharyngioma** Craniopharyngiomas result from the growth of cells that have failed to migrate to their usual area just below the back of the skull early in fetal development.
- **Ependymoma** Ependymomas arise from cells lining the passageways in the brain that produce and store the cerebrospinal fluid or CSF.

Brain Tumor Types

- **Ganglioglioma** These rare, benign tumors arise from ganglia-type cells, which are groups of nerve cells.
- **Germ Cell Tumors (Brain)** The brain stem consists of the midbrain, pons and medulla located deep in the posterior part of the brain.
- **Gliomatosis Cerebri** This condition is similar to glioblastoma multiforme (GBM), but the cells of gliomatosis cerebri are more scattered and widespread...
- **Infant Brain Tumors** Medulloblastoma and ependymal tumors account for about 50 percent of tumors. Desmoplastic Neuroepithelial Tumor.
- **Medulloblastoma / PNET** Medulloblastomas are tumors that arise in the posterior fossa region of the brain. The exact cell of origin is not known.
- **Oligodendroglioma** These tumors arise from oligodendrocytes, a type of supportive brain tissue...
- **Optic Pathway Tumor** A childhood optic pathway tumor occurs along the nerve that sends messages from the eye to the brain (the optic nerve).

Brain Tumor Types

- **Esthesioneuroblastoma: Rare tumor of the olfactory pathways**

PEDIATRIC BRAIN TUMORS

- Signs & Symptoms
 - Timeline of Symptoms
 - General vs. Neurological symptoms
 - Increased Intracranial Pressure
 - Neurological Deficits
 - Generalized signs
- Diagnostic Studies
 - Lab test (electrolytes, hormone levels, tumor markers)
 - CT
 - MRI
 - fMRI
 - PET
 - MR Spectroscopy
 - Angiography

PEDIATRIC BRAIN TUMORS

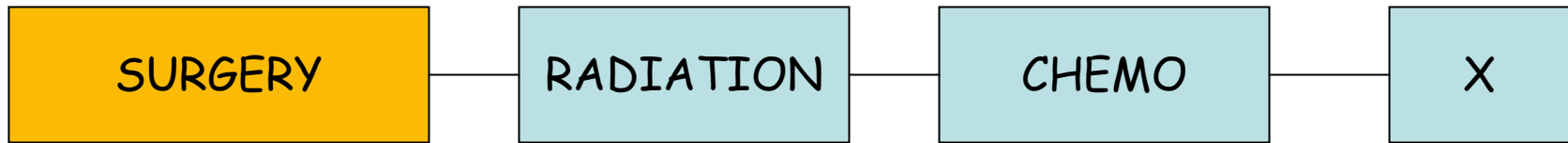
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PEDIATRIC BRAIN TUMORS

- Differential Diagnosis
 - Flu/Viral Syndrome
 - Migraines
 - Intracranial Tumors vs Parenchymal Tumors
 - Pseudotumor Cerebri (Benign Intracranial Hypertension)
 - Vascular Malformations
 - Congenital malformations (Lhermitte-Dulcos, Chiari, etc)
 - Cyst (arachnoid cyst, enterogenous, ependymal, Rathke's Cleft, etc)
 - Abscess
 - Stroke
 - Multiple Sclerosis

PEDIATRIC BRAIN TUMORS

TREATMENT ALGORITHM:



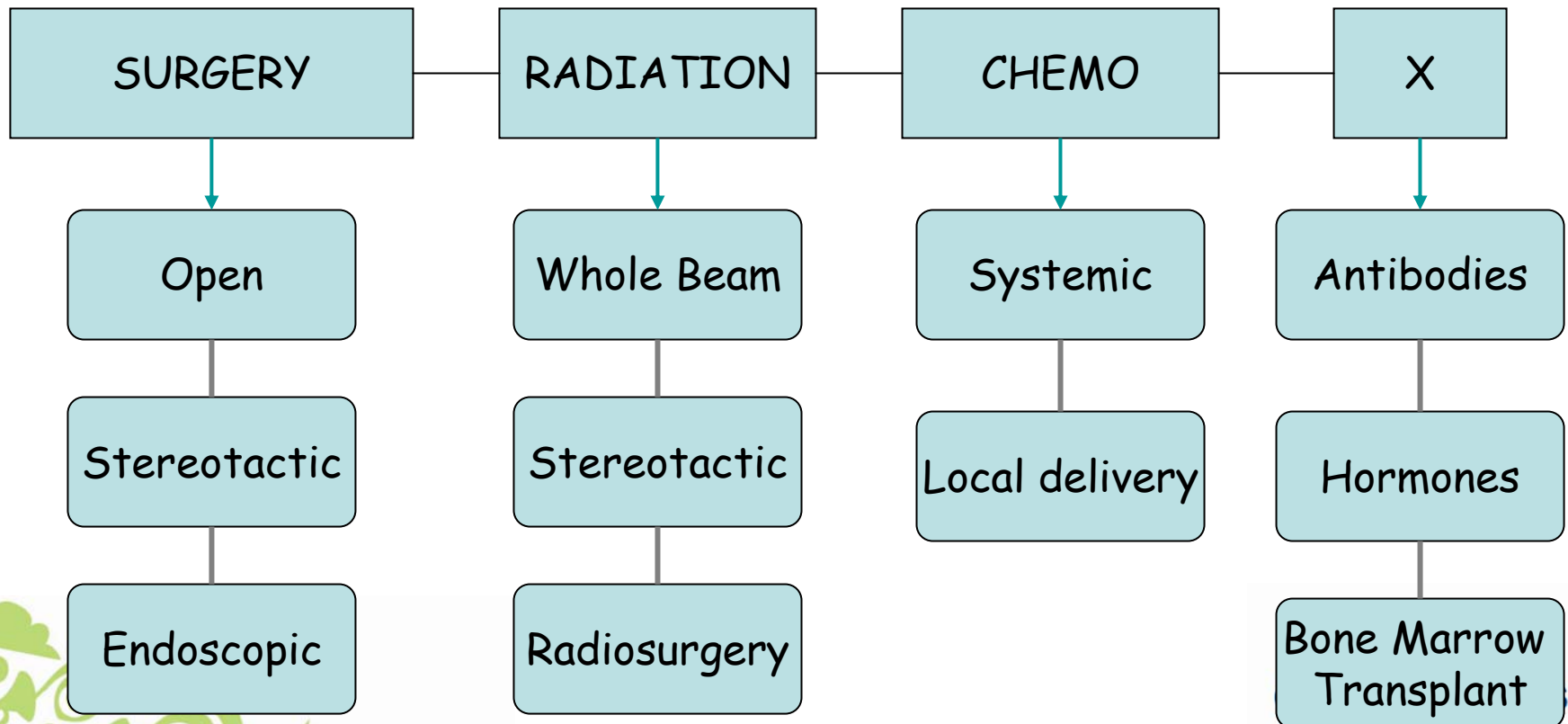
Strategy: To have the most direct treatment modality

The most targeted treatment is surgery

However, it is not always the best treatment!

PEDIATRIC BRAIN TUMORS

TREATMENT ALGORITHM:



PEDIATRIC BRAIN TUMOR

- GOALS of Surgery
 - Relieve Presenting Symptoms
 - Increased ICP
 - Seizures
 - Preserve Neurological Function
 - Obtain Diagnostic Tissue (Biopsy)
 - Treat Tumor

PEDIATRIC BRAIN TUMOR



Pre Op Management

- Goals-
 - Diminish Pre Op symptoms
 - Make Intra Op management easier
 - Prevent Post Op complications



PEDIATRIC BRAIN TUMOR

Pre Op Management

- Correct electrolyte abnormalities (Na)
- Correct Coagulopathy
- Normalize Hematocrit
- Treat existing infections (UTI, URI, etc)

PEDIATRIC BRAIN TUMOR

Pre Op Management

- Steroids
 - Decadron (long acting, high potency, glucocorticoid)
 - 0.1 to 0.3 mg/kg q6h
 - Solumedrol (moderate acting, high potency, mineralocorticoid)
- Antiepileptics
 - Dilantin (Phenytoin, Phosphenytoin (15-18mg/kg), Phenobarbital)
 - Intravenous administration
 - Good for most postoperative seizure types
 - Tegretol, Lamictal, Keppra, etc
- Analgesics
 - GOOD- Tylenol, Codeine, etc
 - OK - Ibuprophen
 - AVOID- ASA

PEDIATRIC BRAIN TUMOR

Intra Op Management

- GOALS:
 - Resect lesion
 - Prevent Neurological Deficits
 - Prevent Postoperative complications
 - Reduce operative time

PEDIATRIC BRAIN TUMOR

Intra Op Management

- Antibiotics
 - Nafcillin, Ancef
 - 25mg/kg
- Steroids
 - Decadron (long acting, high potency, glucocorticoid)
 - 0.1 to 0.3 mg/kg q6h
- Antiepileptics
 - Dilantin (Phosphenytoin, Phenobarbital)
- Diuretics
 - Mannitol
 - 0.25 to 1.0 g/kg
 - Lasix
- IV Fluids
- Hyperventilation
- Lumbar or Ventricular Drainage

PEDIATRIC BRAIN TUMOR

Intra Op Management

- Brain Mapping
 - Asleep (EEG, SSEP, BAER, MEP, EMG, Cortical Stimulation)
 - Awake (Language mapping)
- Image Guidance
 - MRI or CT stereotaxis (Framed or frameless)
- Intraop imaging
 - Ultrasound
 - Plain radiographs
 - *MRI*
- Multimodality Image Mapping

PEDIATRIC BRAIN TUMOR SURGERY

- GOALS
 - Relieve Presenting Symptoms
 - Increased ICP
 - Hydrocephalus
 - Seizures
 - Preserve Neurological Function
 - Obtain Diagnostic Tissue (Biopsy)
 - Treat Tumor

PEDIATRIC BRAIN TUMOR

Intra Op Management

- GOALS:
 - Resect lesion
 - Prevent Neurological Deficits
 - Prevent Postoperative complications
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PEDIATRIC BRAIN TUMOR

Intra Op Management

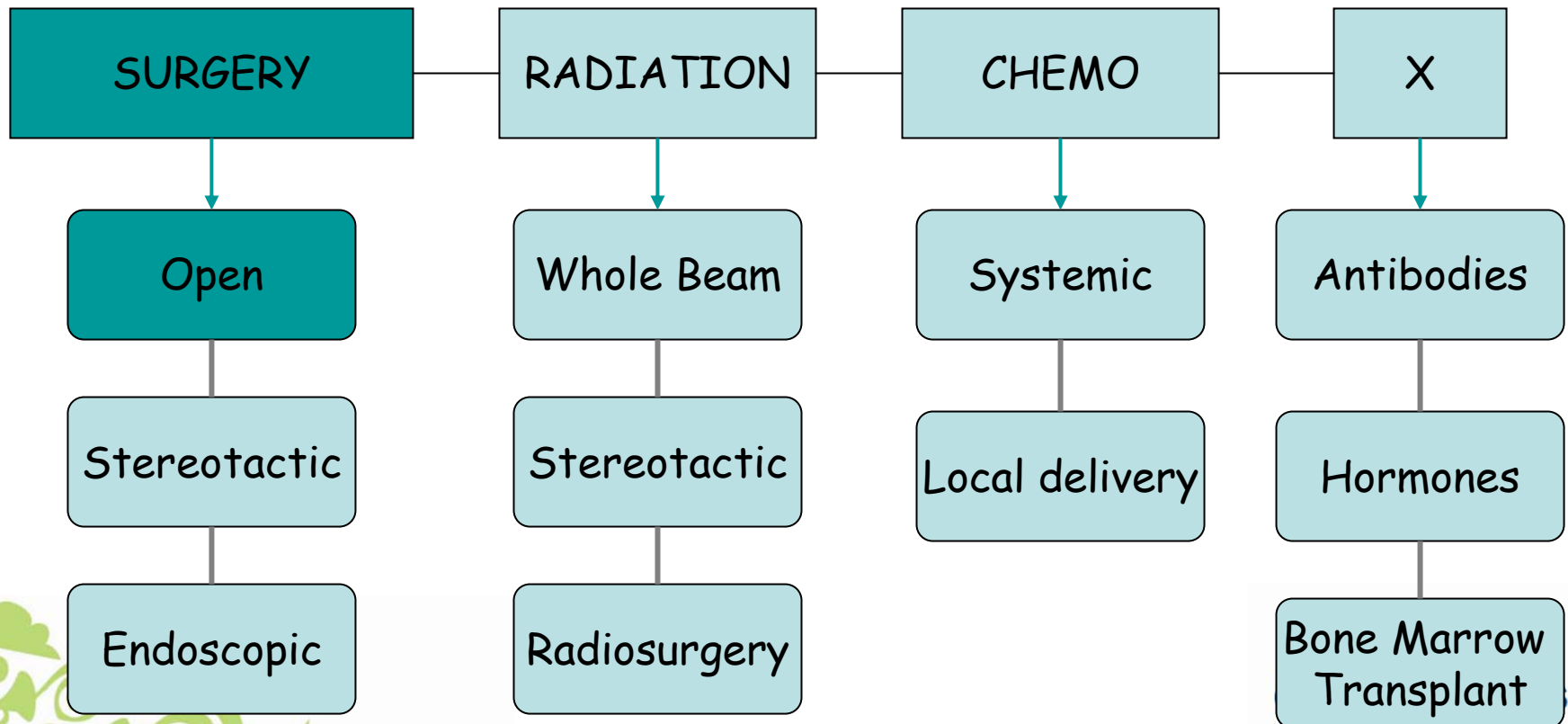
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Case 1

- 8 yo female with 3 mos of headache and seizures. Found to have adenoma sebaceum & ash leaf spots.

PEDIATRIC BRAIN TUMORS

TREATMENT ALGORITHM:

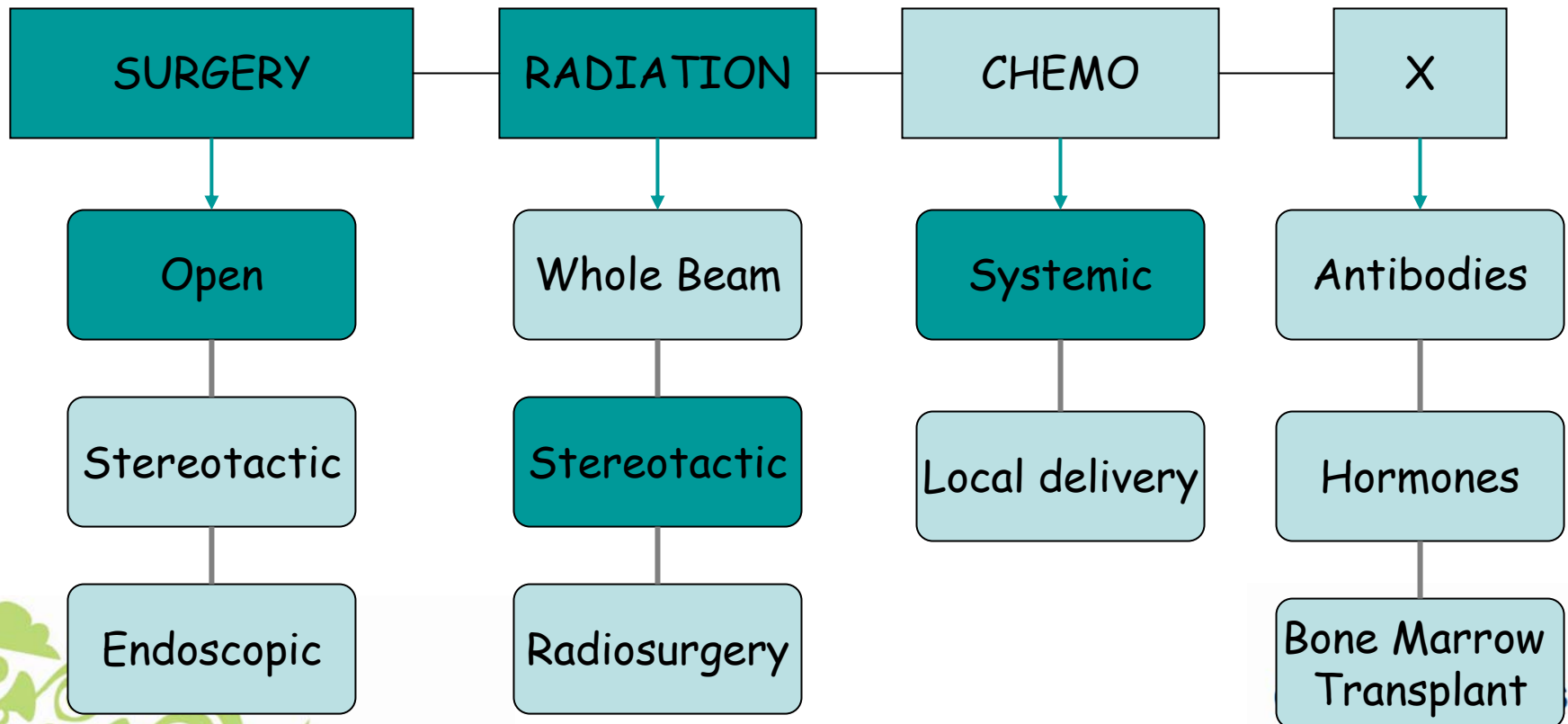


Case 2

- 6 yo male with 3 days of headache, then became progressively more obtunded.

PEDIATRIC BRAIN TUMORS

TREATMENT ALGORITHM:

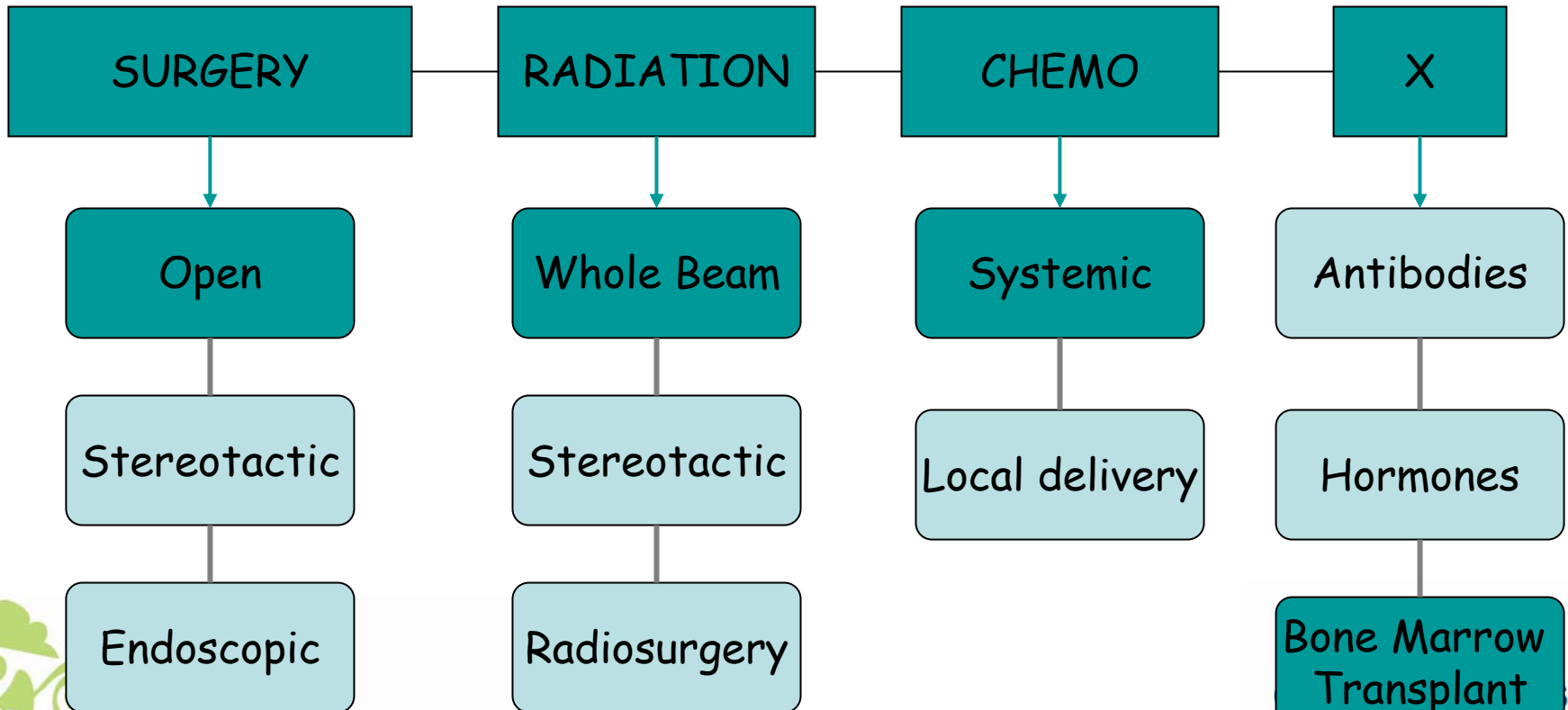


Case 3

- 4 yo male with 2 week history of nausea, vomiting and incoordination

PEDIATRIC BRAIN TUMORS

TREATMENT ALGORITHM: Medulloblastoma

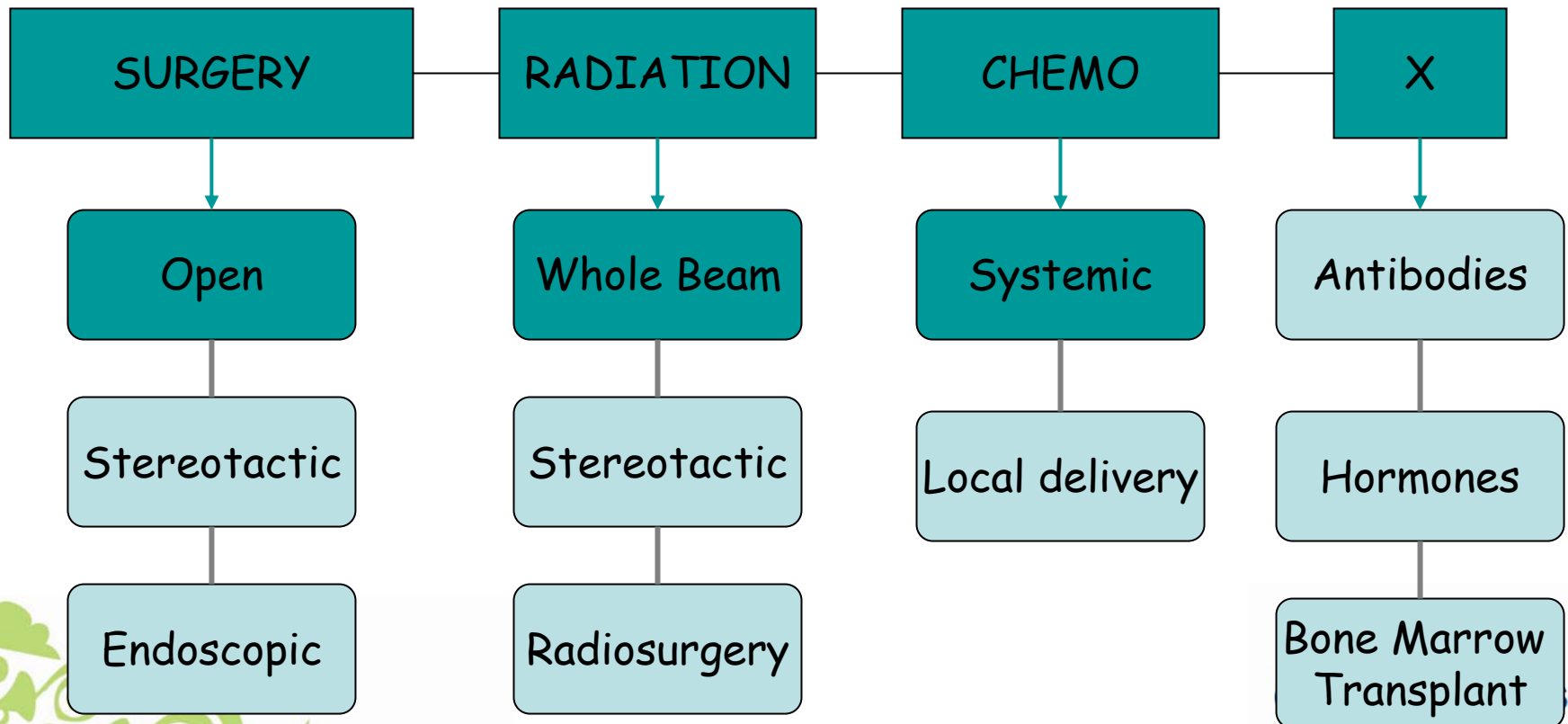


Case 4

- 17 yo with 1 month of progressive headaches, 3 days of progressive right hemiparesis and word finding difficulty

PEDIATRIC BRAIN TUMORS

TREATMENT ALGORITHM: GBM

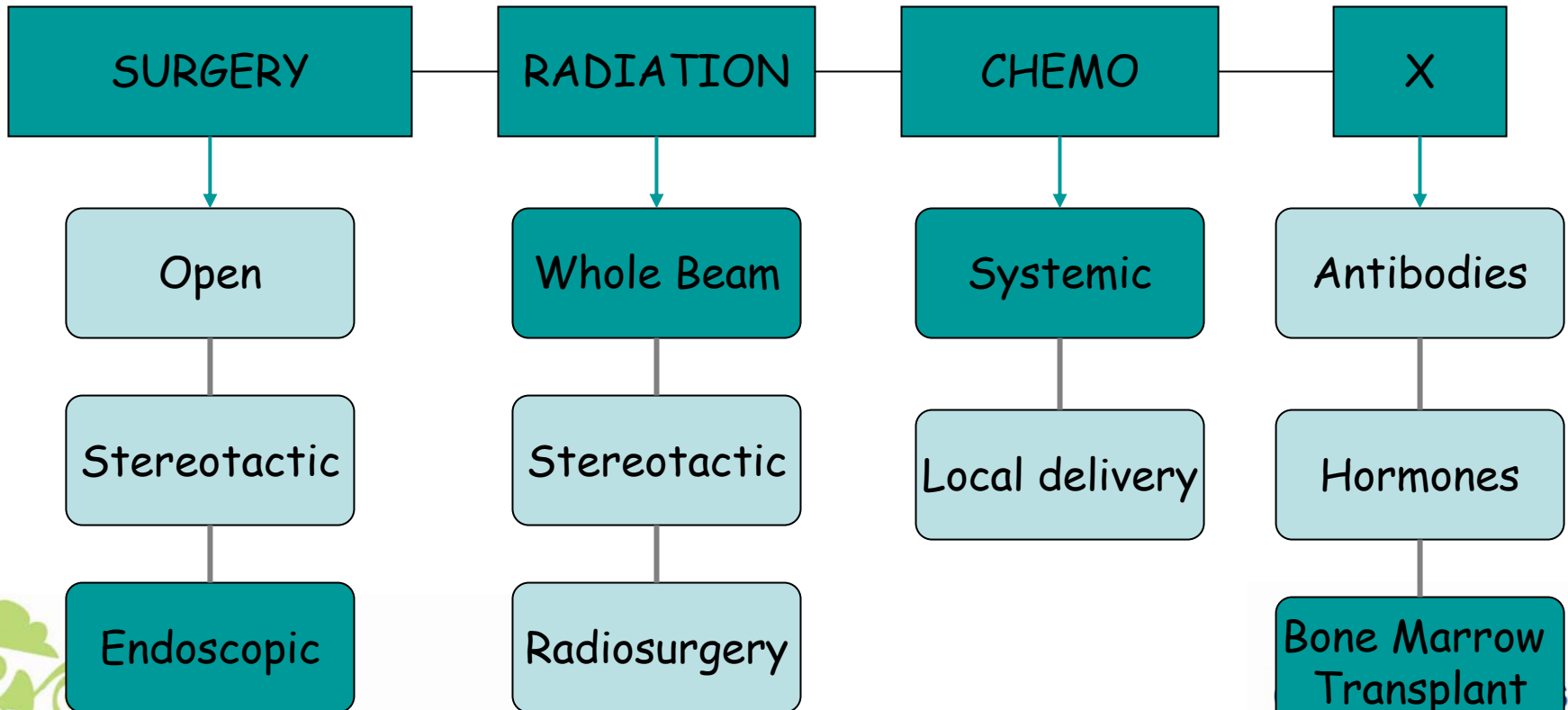


Case 5

- 13 yo girl with declining school performance and headaches, brought to the ER unresponsive

PEDIATRIC BRAIN TUMORS

TREATMENT ALGORITHM: NGGCT



Case 5

- 15 year old female presents with 2-3 months of headache and vision changes.
- Ophthalmologist found papilledema and constricted visual fields

PEDIATRIC BRAIN TUMOR SURGERY

- OVERALL OUTCOME
 - Better than adults
 - Goals survival and quality of life



PEDIATRIC BRAIN TUMOR SURGERY



- OVERALL OUTCOME
 - Determined by Operative Outcome!



Future Management



- Problem with current therapy:
NOT SPECIFIC

Make current therapy more specific
Treat Tumors in novel ways

