

# Spinal Tumor Surgery (techniques)

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## INTRAMEDULLARY TUMORS

**Surgical extirpation** is treatment of choice for *benign tumors*! (cures have been reported only after complete surgical resections)

Total removal with preservation of neurologic function!

### PREOPERATIVE

- **steroids** in perioperative period (start at least 24 h prior to surgery; begin tapering 3-5 days after surgery).
- baseline *urodynamic studies*!

### PROCEDURE

Monitor spinal cord function using intraoperative electrophysiology (real-time feedback regarding possible ischemia or retraction injury):

- 1) *somatosensory-evoked potentials*
  - 2) *motor-evoked potentials*
  - 3) *EMG* (extremity muscles, anal sphincter)
- spinal cord is sensitive to decreased perfusion - avoid hypotension!
  - alterations in evoked potentials → prompt cessation of dissection until potentials recover.
- patient under general anesthesia in prone position.
  - if tumor spans several spinal levels → wide **laminectomy (laminoplasty\*** in children);
    - \*removing all laminae as single unit en bloc with footplate → at the end place back and suture to the facet/pars with silk sutures (drill bone holes with C bit) - to protect spinal cord, to lessen risk of subsequent spinal deformity.
  - laminectomy should be of sufficient size to allow visualization of healthy cord above and below neoplasm.
- need dry field - wax bone edges, lay 3x1 in patties along dura.
  - microscope
  - prior to dural opening, tumor is localized with *intraoperative ultrasound* or *spinal stereotaxy*.
  - **perfect hemostasis** before opening dura; then lay 0.5x3 patties along gutters to absorb blood ooze.
  - open dura and place 4-0 silk tuck-ups to retain dura open
  - under microscope, linear\* **midline\*\* myelotomy** at thinnest area between tumor and spinal cord.
    - \*to spare vertically running white matter tracts.
    - \*\*eccentric lesions may be approached through dorsal root entry zone.
  - stimulate with bipolar fork where it is safe to cut - midline myelotomy with #11 blade.
  - **ultrasonography** may help to define tumor extent.
  - if tumor has *exophytic component*, this is initial area of approach (pia mater is opened directly over tumor), i.e. debulk any exophytic component prior to addressing tumor located within parenchyma
  - exposure is opened until full extent of lesion can be visualized.
  - dissect pia and place 5-0 Prolene stitches (to keep myelotomy open) suturing edge of pia to edge of dura (may place vascular clips instead of tying knots).
  - try to find cleavage plane to dissect tumor around.
  - upon entering lesion, send biopsy for histopathology.
  - tumors tend to be avascular and may have true capsule (or definable plane).
    - if ill-defined plane is present, risk-to-benefit ratio for aggressive removal is not clear (e.g. developmental tumors can be quite adherent to spinal cord).
    - for biopsy-proven high-grade\* lesions, only biopsy and dural patch graft (to enlarge space for spinal cord) may be alternate approach to attempted resection.
      - \*rapid progression even after aggressive resections
  - EPENDYMOMAS have plane – easy to dissect
  - ASTROCYTOMAS do not have plane – debulk.
  - if frozen section shows tumor to be malignant → surgery is aborted (→ radiotherapy).

N.B. extent of resection must be based on combination of presence of plane-of-dissection and intraoperative neurophysiological monitoring data; plus, surgeon's experience and patient's wishes!!!

- debulking instruments: **NICO Myriad side-cutting dissector**, **Cavitron ultrasonic surgical aspirator (CUSA)**, **CO<sub>2</sub> laser**, **KTP laser**.
- any **cysts/syringes** encountered should be drained, septations divided (spinal cord pulsations demonstrating adequate decompression are monitored).
- when operating on tumors of *conus medullaris*, filum terminale should probably also be removed.
- for hemostasis use irrigating bipolar cautery (e.g. MALIS).
- defect in *neural tissue* does not need to be closed; alternative - approximate myelotomy edges with Prolene (but leave gaps – to prevent intramedullary hematoma).
- watertight **dural closure** is necessary (may use dural grafting, tissue adhesives over suture line) to minimize formation of pseudomeningocele or CSF leak.
  - irrigate intradurally – leave no blood.
  - simple running 4-0 silk / 5-0 Prolene suture (ideally, Hemo-Seal (HS-7) needle)
  - Valsalva maneuver → layers of Surgicel + DuraSeal / Tisseel
- epidural drain may be left in place (but risk of infection or CSF tracking along drain); H: place drain above muscles (to avoid pulling CSF).

### POSTOPERATIVE

- see p. Onc50 >>
- flat for 3 days.