Microvascular Decompression Surgery for Trigeminal Neuralgia

*Pearls and Pitfalls*

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Disclosures

• Aaron A. Cohen-Gadol
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Operated on Cushing's Case (Brody -)

Attempted evulsion of right parasagittal root
Broken root posterior to fasciculus.
“TN/MVD – Desirable Practice”

- TN is relatively easy to diagnose
- MVD is one of the most satisfying operations in neurosurgery
  - Prescient/pleasing anatomy
  - Relatively short procedure
  - Microsurgical environment
- Patients do well and are thankful
  - TN is “one of the worst pains humans have been afflicted with”
- Minimal side-effects
TN Pain

- Isolated to the 3 divisions of the nerve
- Convulsive, not crossing midline
- Has oral and skin triggers
- Normal neurologic exam
- Responds to Tegretol & antiepileptic drugs
- The character of the pain may change with the use of neuropathic pain medications and have more of a constant character
  - Detailed history is important
- Patients with predominantly constant or burning pain or facial numbness are not good candidates
## Classification of TN

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
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<tbody>
<tr>
<td>TN, type 1</td>
<td>Pain of spontaneous onset with &gt; 50% limited to duration of an episode of pain</td>
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<tr>
<td>TN, type 2</td>
<td>Pain of spontaneous onset with &gt; 50% as constant</td>
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<tr>
<td>TNP, neuropathic</td>
<td>Unintentional injury to trigeminal system from trauma, oral surgery, ENT surgery, root injury from posterior fossa or skull base surgery, stroke, etc.</td>
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<tr>
<td>TDP, deafferentation</td>
<td>Pain in a region of trigeminal numbness resulting from intentional injury to trigeminal system from neurectomy, gangliolysis, rhizotomy, nucleotomy, tractotomy, or other denervating procedures</td>
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<tr>
<td>STN, symptomatic</td>
<td>Pain resulting from multiple sclerosis</td>
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<tr>
<td>PHN, postherpetic</td>
<td>Pain resulting from trigeminal Herpes zoster outbreak</td>
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<td>ATN, atypical</td>
<td>Pain predominantly having a psychological rather than a physiological origin</td>
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</tbody>
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Burchiel, Neurosurg Focus 18:1-3, 2005
• Medication

• Surgical
  • Physiologic
    • Microvascular decompression (MVD)
  • Ablative
    • Radiosurgery
    • Percutaneous stereotactic rhizotomy (PSR)
    • Glycerol injection
    • Balloon compression
Pathogenesis and Treatment

- No matter what the responsible etiology
- MVD - Effective and durable palliative option
- Percutaneous procedures - Less invasive
- Posterior fossa exploration offers *the only chance* for a non-destructive procedure and a more durable result
Imaging for MVD

- Brain MRI or CT scan
  - Exclude a structural pathology such as a meningioma, acoustic neuroma or an epidermoid tumor
- High resolution MRI: Negative
  - Posterior fossa exploration is reasonable
  - We have routinely offered MVD to the patients who did not harbor an “MRI evident” vascular loop and have found compressive arterial loops during their posterior fossa exploratory surgery
MRI findings
Indications for MVD

• Failure of medical or percutaneous therapy
• Patient preference
• Location of pain in V1 or multiple divisions
• Physiologic young and can tolerate procedure

• No perfect procedure, no cure
• Be caring, listen and stay optimistic
• Cure a few, comfort all!
• Dysesthesia is not responsive to more procedures
Positioning
Microvascular Decompression Surgery
Operating room set-up
Patient positioning
Head clamp positioning
Positioning Video
Linear incision
Surgical corridors
Burr hole placement
Mastoid bone drilling
Bone removal over the dural sinuses
Waxing the mastoid air cells and dural opening.
Exposure
Petrous-tentorial junction
Opening arachnoid membranes
“Watching” for vessels
Variations of nerve-vessels
Implant insertion
Nuance of technique
Complete decompression
Venous “conflict”
Ectatic basilar artery
Surgical Videos
PEARLS and PITFALLS
Pearls

- Control bleeding from the sinus with “bone wax” and avoid aggressive packing
- Control bleeding from SPV with gelfoam powder
- Neurovascular conflict at the root entry zone of the nerve
  - Detailed and careful inspection of the space around the root entry zone (360)
  - Gentle handling of the nerve for a thorough inspection
- The manipulation (“gentle” rhizotomy) of the nerve is responsible for some of the pain control afforded by MVD operations
Pearls

• Arterial compression by the superior cerebellar artery along the **medial axilla of the root entry zone** is one of most common overlooked sites of compression
  • Covered by motor rootlets or a vein
  • Small space and surrounding vessels
  • Inexperience in mobilizing plays a role

• Discovery of discoloration along the root entry zone and the nerve
Hiding artery
Pearls

• A possibility of multiple offending vessels (arterial and/or venous loops) should be excluded with careful inspection
  • **DO NOT** GIVE UP TOO EARLY
  • **DO NOT** PERSEVERE TOO LATE
  • Perforators deserve respect
• For a large artery embedded in the axilla
  • Work superior and inferior to the nerve to partially mobilize the artery
  • Small pieces of *shredded* Teflon may be inserted from the inferior aspect of the nerve and pushed superiorly in a semi-blinded fashion
  • Identification of the Teflon patch superior to the nerve confirms adequate mobilization of the nerve
  • Endoscopic techniques?
Pitfalls

• Avoid cerebellar retraction – Drain CSF
• Watch for the veins
  • Sacrificing any vein: Superior petrosal vein?
• Arteries hide within arachnoid membranes
  • Open arachnoid membranes widely
  • Watch for the tip of your scissors
• “Does not look right?” Please stop!
• Inadequate exposure leads to inadequate decompression
  • Place your retractor WISELY
  • “I do not want to retract the brainstem”
Pitfalls

- No compression or venous compression – controversial?
  - Rhizotomy
    - Forceps “squeeze”
    - Gentle bipolar coagulation of the root entry zone
    - We have avoided partial root transaction due to the potential risk of disabling anesthesia De La Rosa
Pitfalls

• Aggressive manipulation of the nerve should be avoided
• Overzealous use of Teflon should be avoided
  • Teflon granuloma has been reported as a cause of pain recurrence
• Decompression of the wrong nerve (VII/VII complex) has been reported
• Irrigate to assure no implant displacement
• Wax in! Wax out!
“Teflon granuloma conflict”
Final thoughts

• Intraop monitoring for uncomplicated cases?
• Perioperative steroids
• Tapering preoperative meds
• CSF leak (wound versus nose)
• Pain recurrence
• Redo operation
• Atypical cases?