

# Microvascular decompression for trigeminal neuralgia technique

1. position: [park bench](#)
2. equipment: [microscope](#)
3. implants: [Ivalon](#) sponge or shredded [Teflon](#)
4. intra-op monitoring: (optional) BAER, facial EMG (monitors VII and portio minor (motor) of VII), VIII (CNAP (compound nerve action potential) using Cueva electrode placed directly on VIII nerve referenced to ipsilateral ear lobe).
5. consent (in lay terms for the patient—not all-inclusive):
  - a) procedure: surgery behind the ear to move a blood vessel from the sensory nerve of the face, if no offending vessel can be identified then possible partial sectioning of the appropriate part of the trigeminal nerve with associated numbness)
  - b) alternatives: needle procedures through the cheek (percutaneous rhizotomy), radiation (stereotactic radiosurgery)
  - c) complications: (in addition to usual craniotomy complications), CSF leak, hearing loss ( $\approx 10\%$ ), facial numbness, pain near incision (occipital neuralgia or lesser occipital neuralgia), rarely: diplopia, facial paralysis, failure of the procedure

## Technique

Also see Paramedian suboccipital craniectomy for important pointers, including the use of armored endotracheal tube.

## Preoperative preparation

An MRI is recommended (with FIESTA sequence or equivalent, if available) to rule out mass lesions or vascular abnormality. Baseline BAER is performed by some.

## O.R. setup

Setup for lateral oblique suboccipital (posterior-fossa) craniotomy. Microscope: observer's eyepiece is placed on the side opposite to that of the patient.

## Positioning

1. **lateral oblique position**, symptomatic side up, axillary roll
2. thorax elevated 10–15° to reduce venous pressure
3. 3-pin skull fixation. Head position:
  - a) head rotation: head rotated 10–15° away from the affected side. Do not exceed 30° rotation
  - b) lateral head tilt
    - for trigeminal neuralgia or VIII nerve approach: the head is parallel to the floor (if it is lower, nerves VII & VIII will obscure view of V)
    - for VII nerve or lower, the vertex is tilted 15° down from the horizontal
  - c) flex neck: leave 2 fingerbreadths room between the chin and the sternum
4. upper shoulder retracted caudally with adhesive tape
5. option: lumbar spinal drain. Drain 20–30 cc during craniotomy, then drain off small amounts from time-to-time during the case to keep the field mostly dry, but occasionally letting CSF build-up to bathe cranial nerves

## Intraoperative monitoring

Option: intraoperative monitoring of facial EMG and BAER (assesses acoustic nerve).

## Approach

1. skin incision: vertical incision 3–5 cm in length, 5 mm medial to mastoid notch, a small “5–6- 4” incision; in thick or short-necked patients, a slightly longer incision that angles inferomedially is used. 75% of the incision is inferior to the transverse sinus, 25% superior
2. burr hole:
  - a) 1 cm inferior and 1 cm medial to the asterion
  - b) if the asterion is not easily identified or if there are concerns about the reliability of the asterion as a landmark for the junction of the transverse and sigmoid sinuses, place the burr hole directly over the mastoid emissary vein which drains superolaterally into the sigmoid sinus
3. craniotomy: top of bone opening as close as possible to the transverse sinus. The position of the transverse sinus can be approximated by a line drawn from the posterior base of the zygomatic process to the inion, or roughly  $\approx$  2 finger-breadths above the upper end of the mastoid notch. Lateral limit of bone opening is sigmoid sinus. A triangular bony opening with a leg along each sinus works well. Craniectomy diameter needs to be only  $\approx$  3 cm. Apply bone wax liberally (blocks off any possible opening into the mastoid air cells)
4. dural opening: either a curvilinear with each end at sinus and the convexity away from the junction

(Jannetta) or an inverted "T" (with one incision towards each sinus and the third towards the junction of sinuses, lets you get as close as possible to the sinuses)

5. minimal or no retraction of the cerebellum is usually required
6. allow CSF to drain before proceeding: this may require gentle advancement of a cottonoid in the CPA. A lumbar drain should be placed if CSF cannot be drained
7. follow the junction of tentorium with temporal bone-deep. Place a retractor that both medially displaces the cerebellum and slightly "lifts" the cerebellum towards the surgeon (medial displacement alone is not as effective)
8. superior petrosal vein (SPV): drains to the superior petrosal sinus within the tentorial dura and often blocks access to Cr. N V (sometimes there is a venous complex of 2-3 veins). Coagulating and dividing the SPV is controversial, with risks including cerebellar infarction, midbrain and pontine infarction (0-5%) and thus should be avoided if possible.

If the vein is torn, the dural side is tamponaded (sometimes up to 30 minutes is needed) while the free end is coagulated

9. V is deeper than the VII/VIII complex, which should not even be seen with this approach. If VII/ VIII are seen, move the retractor superiorly as even gentle traction may cause hearing loss

In some cases, the suprameatal tubercle (a small hillock of bone just posterior to Meckel's cave) may be large enough to obscure the site where the fifth nerve enters the cave and may need to be reduced with a diamond burr

## **Decompression of nerve**

1. arachnoid overlying the fifth nerve is sharply divided (caution re Cr. N. IV, which follows the tentorial opening in the arachnoid rostral to the fifth nerve). Intra-op changes in BAER are often attributed to retraction of arachnoid that is tethered to the VII/VIII complex
2. the fifth nerve may be markedly atrophic if previous PTRs have been done
3. identify the smaller motor root (portio minor) of the fifth nerve
4. arteries and/or veins compressing V should be dissected off the nerve. NB: vessels located proximally are the most likely offenders; however, the dorsal root entry zone (which is the sensitive part of the nerve) may be variable in location and peripheral vessels may be culpable. The nerve should be inspected and freed of vessels from its origin at the brainstem all the way to its entrance into Meckel's cave.

Veins may be coagulated and then should be divided (to prevent recanalization)

5. the most common cause of compression is the superior cerebellar artery (SCA)
6. check the nerve at the junction with brainstem for any residual compression prior to the next step
7. insulating material is interposed between nerve and vessel to prevent re-compression. Options include:

a) e.g. Ivalon® (polyvinyl formyl alcohol)sponge (Ivalon Surgical Products, 10400 CL Parkway, Eudora, KS, 66025, U.S.A. distributed by Fabco in the U.S.A. (860) 536-8499, toll free: (888) 813-8214, <http://fabco.net/catalog/ivalon-ophthalmic/>) cut in a saddle shape. Note: if an Ivalon block is used instead of pre-packaged sterile pads, it must be rinsed thoroughly to remove formalin, then autoclaved.

Ivalon should be hydrated in NS for 10 minutes prior to cutting it

b) shredded Teflon felt; see merits of Ivalon® vs. Teflon or muscle

8. Wilson recommends performing a partial sensory rhizotomy of the inferior one-half to two-thirds of the portio major for the following: cases where no vascular contact with the nerve or no deformity of the nerve is identified, in most cases of patients undergoing a repeat MVD, or for cases with duration of symptoms > 8-9 yrs, as this latter group tends to have a lower success rate with MVD alone

9. if the procedure is for a failed MVD and it is desired to partially divide the nerve, the nerve is organized somatotopically with V1 fibers superiorly, and V3 inferiorly. If the goal is the total elimination of pain pathways and there is concern about pain conduction through ancillary pathways, consider also dividing the motor root (portio minor)

## Closure

1. bone wax should be applied liberally to the exposed lateral bone edges (to paraphrase Dr. Jannetta and Mr. Miyagi, "Wax in, wax out.")
2. irrigate gently with warm saline (avoid "jet" irrigation which can damage the VIII nerve)
3. intra-op BAER decline may occur on dural closure and should prompt re-opening of the dura and checking for tension on the VIII nerve from a vessel or Telfa
4. perform several Valsalva maneuvers to ensure watertight closure of dura
5. the bone defect should be covered e.g. with burr hole cover to reduce chance of pain associated with uncovered craniectomy
6. after fascial closure, Valsalva maneuver is performed again to ensure a watertight closure
7. use 4-0 [running locked skin closure nylon](#) to approximate skin in watertight fashion (avoid excessive tension)

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