ISSS 2025

ANNUAL MEETING

CADAVER LAB

SYLLABUS

OCTOBER 11, 2025

Indianapolis, Indiana

How I Do It: Hyoid Suspension

Faculty: Boyd Gillespie MD and Paul Hoff MD

Surgical Steps
**using the Encore System to perform the Airlift hyoid suspension

- Patient Prep and Positioning
  - Not necessary to turn the bed
  - Neck extended over a shoulder roll
  - Prep and towel neck; cover the field with iodoform film
- Incision planning
  - 2 cm incision marked at the submental crease
  - 3 cm incision marked over the hyoid bone
- Incision created over the hyoid bone
  - Dissection carried down to the hyoid bone using Bovie cautery
  - Create a 2 cm clearing on the anterior surface of the hyoid bone
  - Extend the dissection to the inferior border of the hyoid bone
  - Do not release the supra and infrahyoid musculature
  - Grasp the hyoid bone with a straight Allis or Cricoid hook
  - Use the Revolution passer (included with the Encore system) to pass the suture around the hyoid bone such that the loop is on the superior aspect of the hyoid.
  - Secure the 2 anchor sutures around the hyoid with a half hitch
  - Keep sutures organized – place a hemostat on the end of each suture
- Incision created submentally
  - Dissection carried down to posterior mandible with Bovie
  - Be sure to expose 2 cm of bone between heads of digastric muscle.
  - Drill 2 holes (hyoid only) or 3 holes (hyoid and tongue base suture)
  - Holes should be perpendicular to the surface of the mandible to avoid visible/palapable screws)
  - Use anchor screws provided in Airlift system to place screws into mandible
  - Important to orient lock-nut holes correctly - anterior posterior plane
- Optional passage of tongue base suture (Encore system)
- Pass all sutures in a subplatysmal plane from the hyoid to the submental incision
  - Take care not to cross the two sutures
  - Loosen the lock nuts
  - Pass the anchor screws through the lock-nut from posterior to anterior
  - Tie a knot with the sutures against the suspension screw. This is useful as a marker of the length of suture advancement.
  - Have an assistant flex the neck
  - Pull on anchor screws with neck flexed (expect 2 cm advancement of anchor sutures from knot to suspension screw)
  - Tighten lock-nuts and tie off the anchor sutures

- Wound closure
  - Irrigate (antibiotic-infused irrigation may be of benefit)
  - **Optional-**Place a Penrose drain or equivalent to prevent seroma formation if a thick fatty neck or associated fat debridement
  - Close in layers
  - Cover the incision with Telfa and tegaderm dressing

Instrument Considerations

- Marking pen
- 15 blade
- Senn retractors
- Army-Navy retractors
- Debakey pickups
- Straight Allis Clamp
- Cricoid hook
- Tonsil dissector
- Needle driver
- Suture
  - 3-0 vicryl – platysma and deep dermis
  - 4-0 monocryl – running subcuticular
  - 2-0 nylon - drain
- Bovie electrocautery
- Airlift system (included in Encore System)
- Revolution Passer (included in Encore System)
- Drill with drill bit (bit included in Encore system)
- Suture scissors

Postoperative Considerations

- Consider antibiotics pre- op and 3 days post op (Ancef/Keflex); medrol dosepack
- Cold pack compress for first 12-24 hours may reduce submental edema

Pearls from the Experts

- If performing combined hyoid suspension and pharyngoplasty, perform hyoid procedure first (start with a clean procedure)
- Tongue suspension is rarely performed
- Tongue suspension equipment is included in the Encore system and can be discarded

References

- Hyoid Suspension With UPPP for the Treatment of Obstructive Sleep Apnea. Van Tassel J, Chio E, Silverman D, Nord RS, Platter D, Abidin MR.Ear Nose Throat J. 2023 May;102(5):NP212-NP219. doi: 10.1177/01455613211001132. Epub 2021 Mar 18.
- Hyoid myotomy and suspension without simultaneous palate or tongue base surgery for obstructive sleep apnea. Ong AA, Buttram J, Nguyen SA, Platter D, Abidin MR, Gillespie MB.World J Otorhinolaryngol Head Neck Surg. 2017 Jun 13;3(2):110-114.

How I Do It: Australian Modified Pharyngoplasty

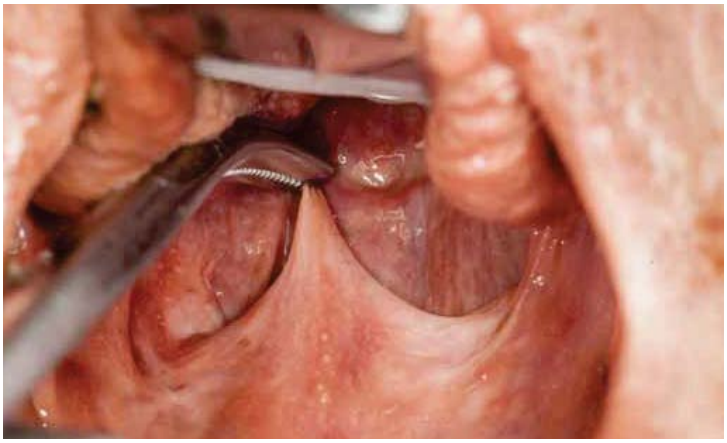
Faculty: Julia Crawford

Patient Prep and Positioning

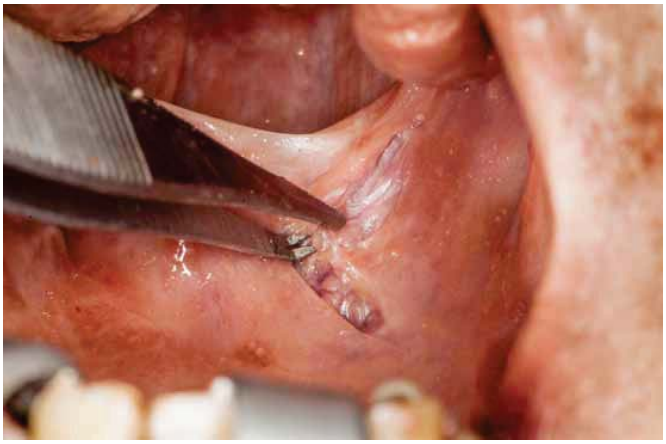
- Neck extended over a shoulder roll
- Boyle davis gag in suspension

Surgical Steps

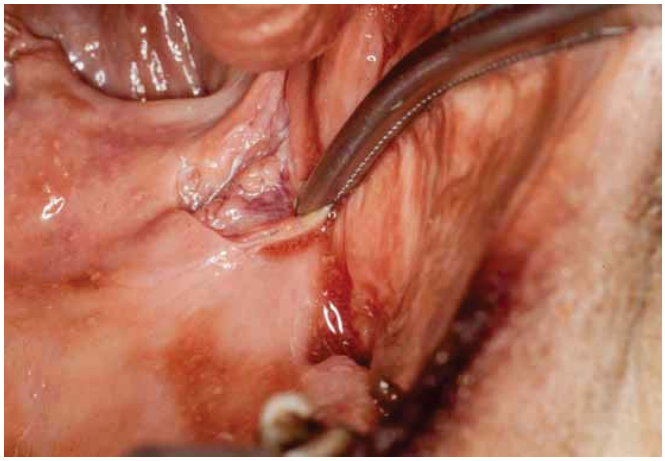
1. Mucosal sparing tonsillectomy
2. Caudal traction on the uvula towards the contralateral (left) foot

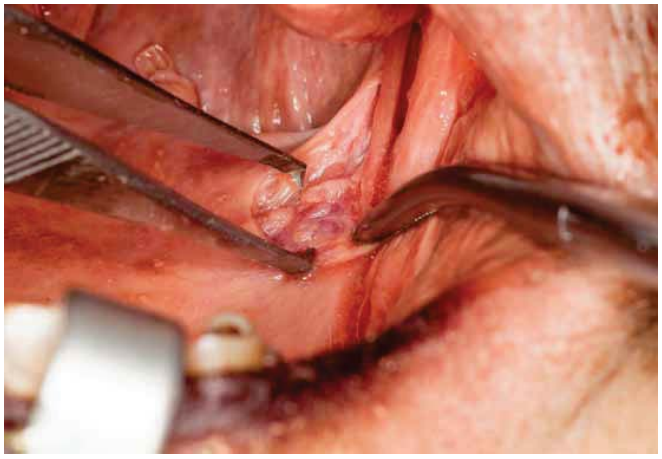


3. Whilst maintaining the caudal traction, a triangular flap is elevated
4. The upper limb of the triangle angles towards the maxillary tuberosity
5. The lower limb follows the line of the anterior pillar

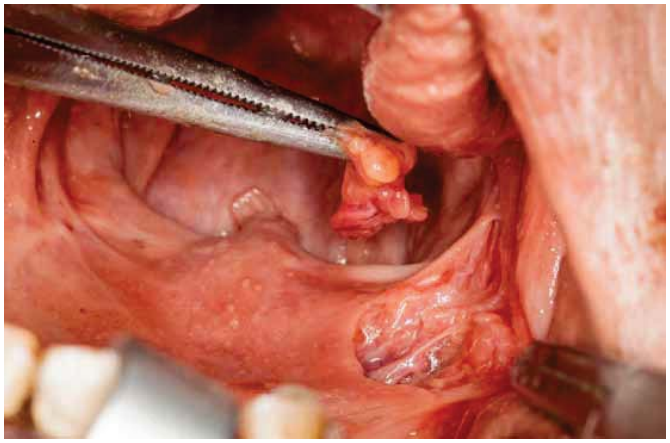


4. The triangular lap of mucosa is elevated to display the supratonsillar fat

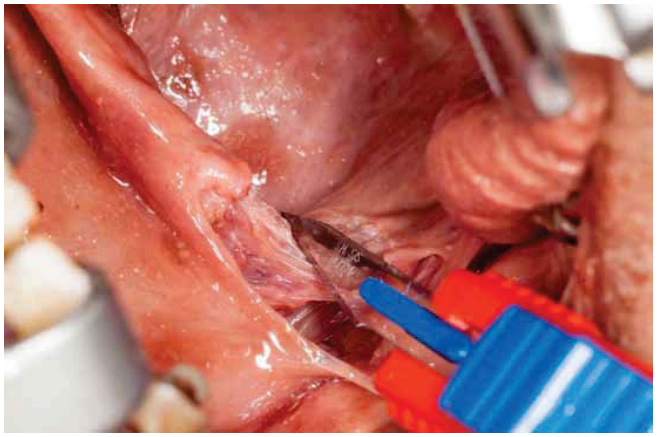




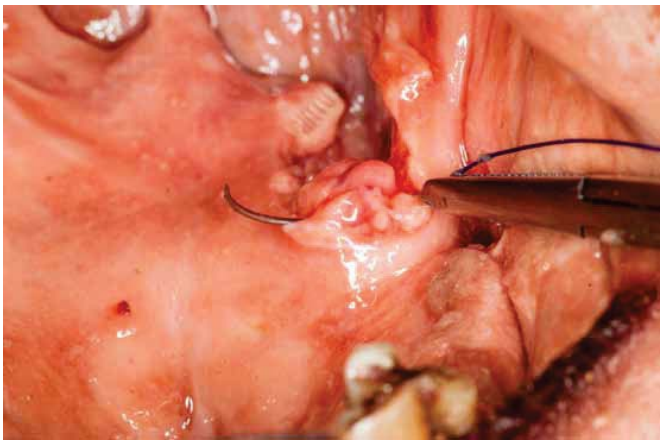
5. The supratonsillar fat is grasped with a toothed forceps and the fat is removed from the underlying arching muscular fibers



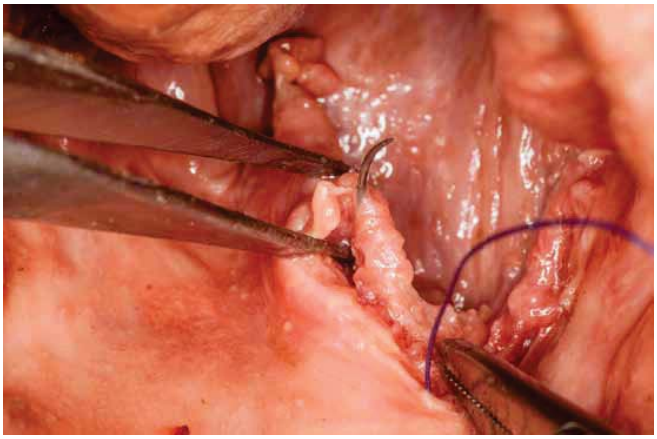
6. The posterior pillar mucosa is divided at the junction of the upper third and lower two-thirds



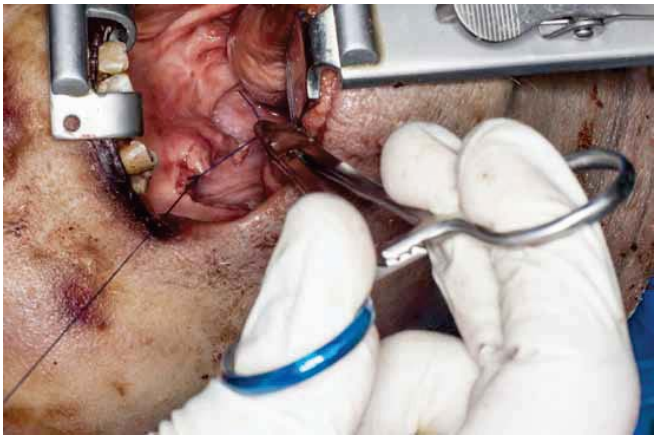
7. A 2-0 vicryl on an SH needle (tapered) is passed with a large bite through the upper arching muscle fibers



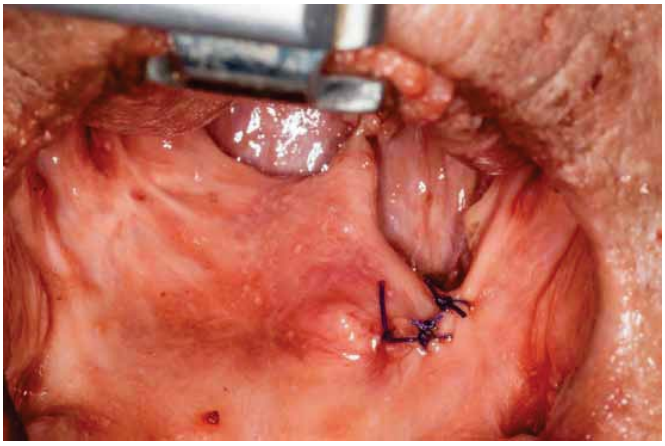
8. The suture is then passed through the muscle of the upper third of the divided posterior pillar tissue



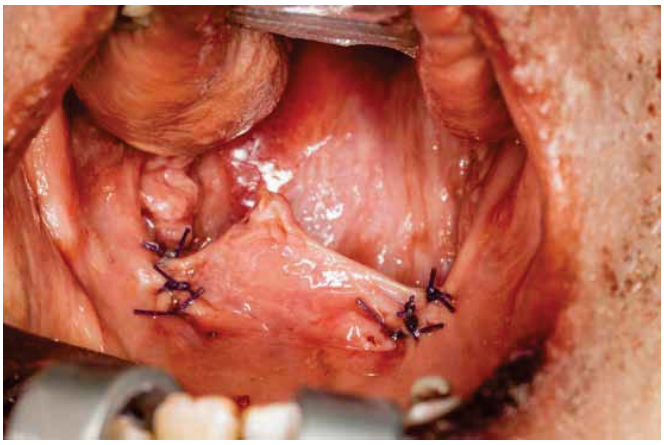
9. The needle holder is grasped in the orientation shown in order to secure the knot of the suture



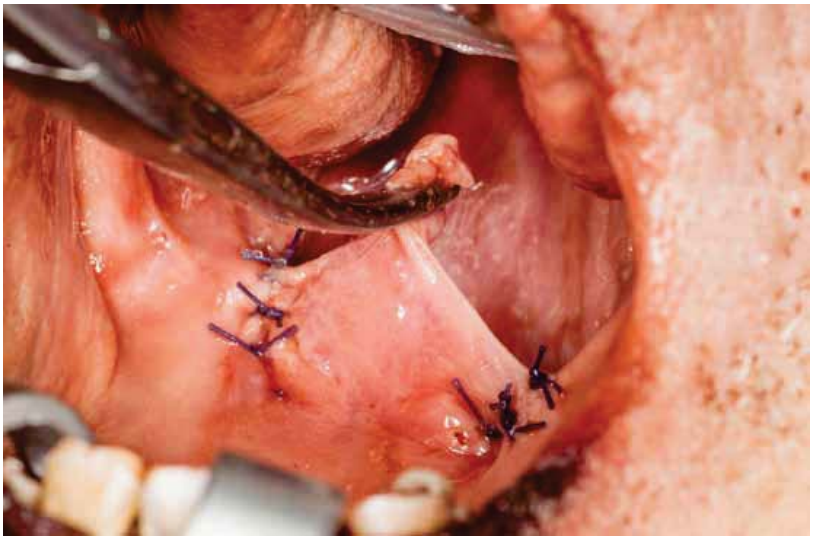
10. After muscle apposition is achieved, the mucosal flaps are closed to reduce post-operative pain



11. The same steps are repeated on the left opening the velopharyngeal ports and increasing the anterior-posterior dimension



12. A small neo-uvula is fashioned in a beveled plane leaving a slightly greater amount of the posterior uvula mucosa



Instrument Considerations
- Boyle-Davis Tonsil Gag
- Long toothed and non-toothed forceps
- Monopolar diathermy
- Bipolar diathermy
- Needle holder
- 2-0 vicryl suture on an SH needle (tapered)

Postoperative Considerations
- Regular analgesia
- Return to a normal diet avoiding spicy, acid or vinegary foods
- Post-operative steroids from Day 3-10

References (Okay if blank, but please include any particularly good resource, such as a published paper)

- MacKay SG, Carney AS, Woods C, Antic N, McEvoy RD, Chia M, Sands T, Jones A, Hobson J, Robinson S. Modified uvulopalatopharyngoplasty and coblation channeling of the tongue for obstructive sleep apnea: a multi-centre Australian trial. J Clin Sleep Med. 2013 Feb 1;9(2):117-24. doi: 10.5664/jcsm.2402. PMID: 23372463; PMCID: PMC3544378.
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- Alison J Pinczel, Charmaine M Woods, Peter G Catcheside, Richard J Woodman, Andrew Simon Carney, Ching Li Chai-Coetzer, Michael Chia, Peter A Cistulli, John-Charles Hodge, Andrew Jones, Matthew E Lam, Richard Lewis, Nigel McArdle, Eng H Ooi, Siobhan Clare Rea, Guy Rees, Bhajan Singh, Nicholas Stow, Aeneas Yeo, Nick Antic, Ronald Doug McEvoy, Edward M Weaver, Stuart G MacKay, Sleep apnea multi-level surgery trial: long-term observational outcomes, *Sleep*, Volume 47, Issue 1, January 2024, zsad218, https://doi.org/10.1093/sleep/zsad218

How I Do It: Lateral Pharyngoplasty

Faculty: Michel Cahali

Patient Prep and Positioning

Anesthesia – oral intubation – reinforced ETT
Habitual positioning for tonsillectomy

Surgical Steps

- Exposure using a mouth gag.
- Remove tonsils or overlying mucosa, depending on the cadaver. Note that the procedure is currently not indicated for patients without tonsils because it decreases the success rate significantly.
- Remove the palatoglossal arch to expose the superolateral aspect of the tonsil fossa, if needed (according to the tonsil shape, you may have already done it during the tonsillectomy).
- Using the Hartmann nasal forceps, perform a small dissection of the superior pharyngeal constrictor muscle next to the palatopharyngeal muscle, exposing less than 1cm of the buccopharyngeal fascia.
- Divide the remainder of the lower aspect of the superior pharyngeal constrictor from the palatopharyngeal muscle.
- Suture the flap (which is the palatopharyngeal muscle with its covering mucosa) to the lateral wall with four interrupted vertical mattress sutures (Vicryl 3.0). Tag all sutures and leave them untied. Start at the most superior aspect of the lateral wall. Ideally, no suture or only one suture should lie below the mandibular line.
- Cut the flap (muscle and mucosa) caudally to the sutures
- Tie all sutures.
- Make a through-and-through relaxing incision between the flap and the posterior pharyngeal wall (as close as possible to the sutures).

Instrument Considerations

- Bovie Cautery Needle Tip
- Bipolar
- Clamp for grabbing the tonsil
- Metz scissor
- Long Hartmann nasal forceps
- 3-0 Vicryl suture, semicircular round needle, ideally 26mm
- 4 Halsted Mosquito Forceps (or anything like that to tag the sutures)

Postoperative Considerations

- Antibiotics por 7 days
- Steroids until day 4, followed by ketorolac from day 5 to 9
- Painkillers, Tramadol if needed
- Discharge on next day
- Oropharyngeal exercises for 2 months, starting at the day of the surgery

Pearls from the Experts (please provide 3-5 surgical pearls - positioning, instruments, techniques, critical steps, or other hints to improve efficiency and/or outcomes)

- Place the blade of the mouth gag over the reinforced endotracheal tube.
- Mount your needle driver like a hook.
- At the lateral wall, the needle runs from posterior to anterior, and not from medial to lateral.
- Cauterize the territory of the external palatine vein at the lateral pharyngeal wall, even if it is not visible.
- Aim your relaxing incision laterally, not posteriorly.

References

CAHALI MB. Lateral pharyngoplasty. In FRIEDMAN M, JACOBOWITZ O, ed. Sleep apnea and snoring: surgical and non-surgical therapy. 2.ed. Philadelphia, EUA: Elsevier; 2020: 229-34. (New edition coming soon).

How I Do It: Expansion Pharyngoplasty

Faculty: Guillermo Plaza

Patient Prep and Positioning

- As in regular tonsillectomy

Surgical Steps

1) Use open mouth retractors to fully expose palatopharyngeal and palatoglossal plicae.
2) Identify the limits of the tonsil, and remove it, trying not to damage the palatopharyngeal muscle and the palatoglosal muscle.
3) Observe the vertical muscle fibers of palatopharyngeal muscle, as opposed to the horizontal ones of the constrictor muscle.
4) Isolate palatopharyngeal muscle from constrictor muscle, cutting insertions totally after sawing it.
5) Free the inferior attachment of the palatopharyngeal muscle to base of the tongue.
6) Identify hamulus pterigoides by palpation.
7) Insert a needle 3/0 cilindric in the hamulus.
8) Advance the needle through soft palate until the inferior portion of the free palatopharyngeal muscle.
9) Tight and suture passing the needle again to the hamulus pterigoides, introducing the inferior part of the palatopharyngeal muscle in the palate muscle raphe. Give at least two tight knots.

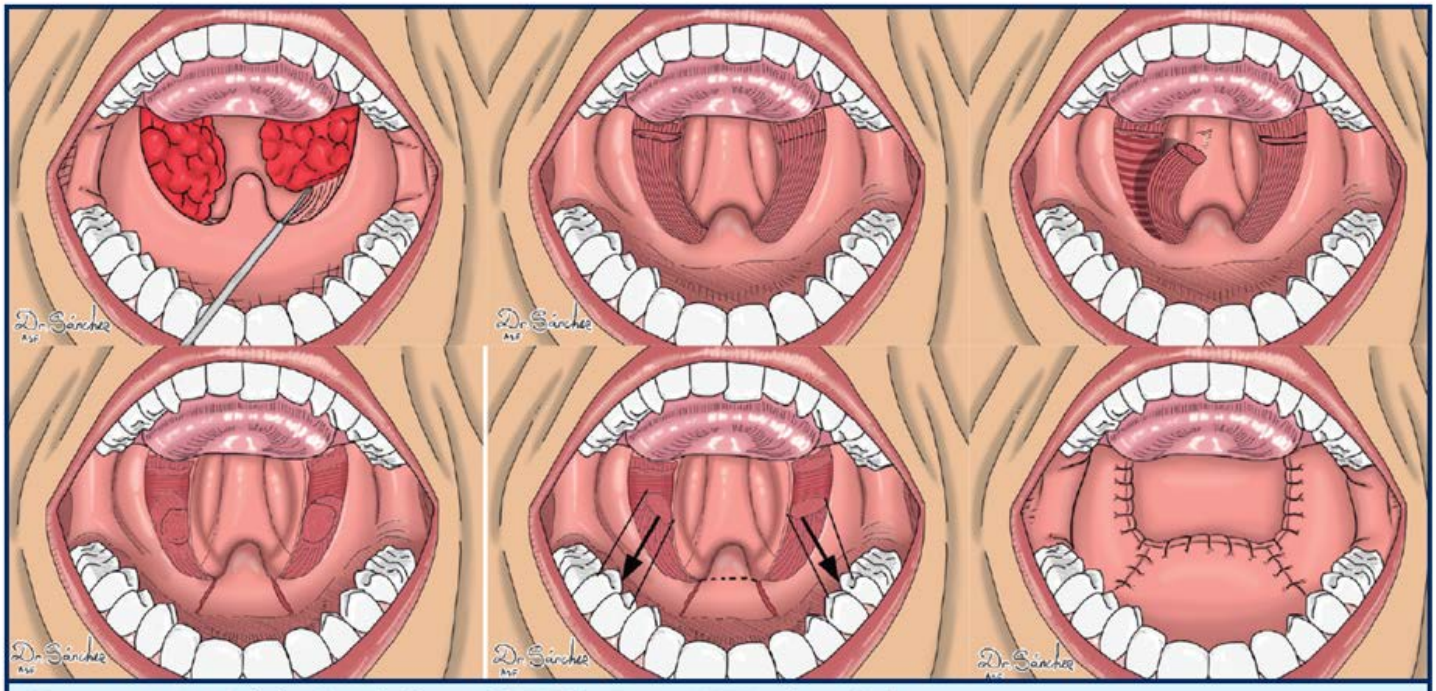


Figure 14.21. Original technique of ESP by Pang & Woodson (15).

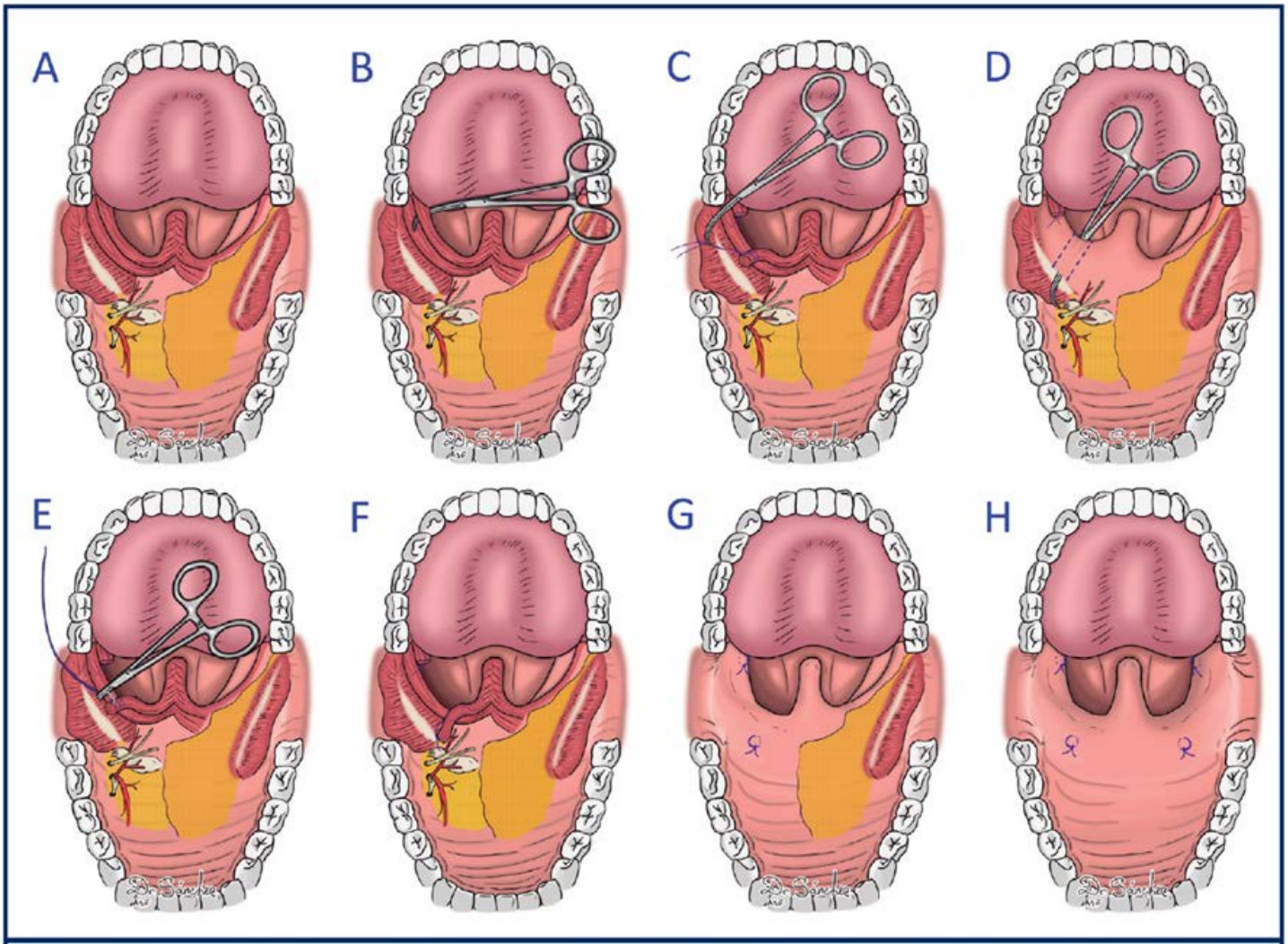
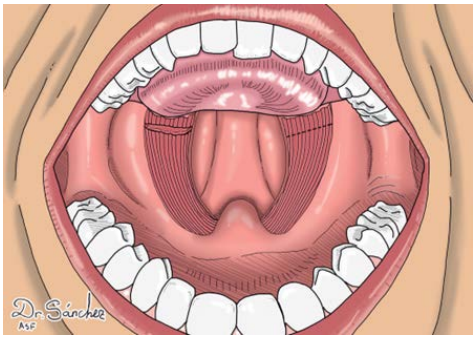
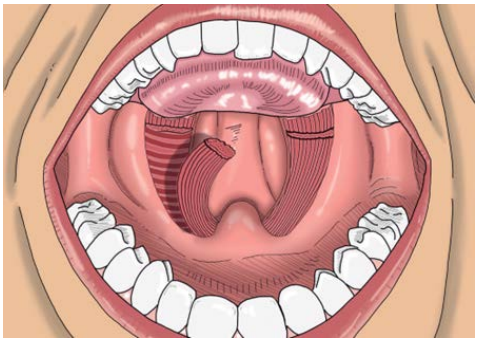
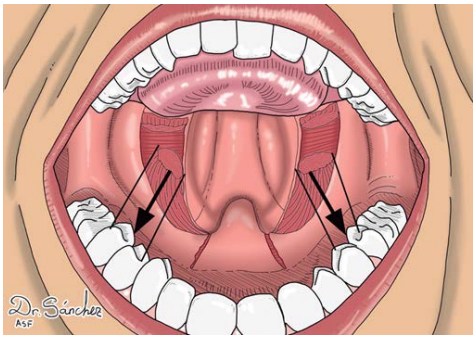


Figure 14.22. Functional expansion pharyngoplasty (FEP). A: Tonsillectomy. B: Identification and careful







Instrument Considerations
- As in regular tonsillectomy
- Consider adding Hartmann forceps

Postoperative Considerations
- Overnight stay.
- Standard hospital care (routine postoperative monitoring)
- Soft diet start 4-5 hours postop.
- Elevated head of bed and cooling tissue are recommended.
- Tramadol 100mg/8h IV with Paracetamol 1 g/8h IV always.
- Patient controlled analgesia (PCA) morphine as needed.
- Steroids 1mg/Kg IV and Metoclopramide 10mg/8h IV (first 24 h).

Pearls from the Experts
- Check DISE to confirm lateral collapse.
- Careful dissection of palatopharyngeal muscle.
- Strong tightening of sutures.

References

- Olszewska E, Woodson BT. Palatal anatomy for sleep apnea surgery. Laryngoscope Investig Otolaryngol. 2019 Jan 10;4(1):181-187. doi: 10.1002/lio2.238.
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- Sorrenti G, Piccin O. Functional expansion pharyngoplasty in the treatment of obstructive sleep apnea. Laryngoscope. 2013; 123: 2905-2908. doi: 10.1002/lary.23911.
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Full dissection Video:

How I Do It: Barbed Pharyngoplasty

Faculty: Ryan Nord

Patient Prep and Positioning

- Oral RAE tube (helpful to size up ½ size) ensure that the bend is at the lip not in the mouth to avoid kinking with suspension. Rotate 90 degrees, place shoulder roll, suspend with mouth gag and tuck right arm (allows Mayo stand to come in for suspension).
- Communicate early with anesthesia to start reducing FiO2 to avoid start delay. Paralytic is helpful in achieving maximal mouth opening.

Surgical Steps

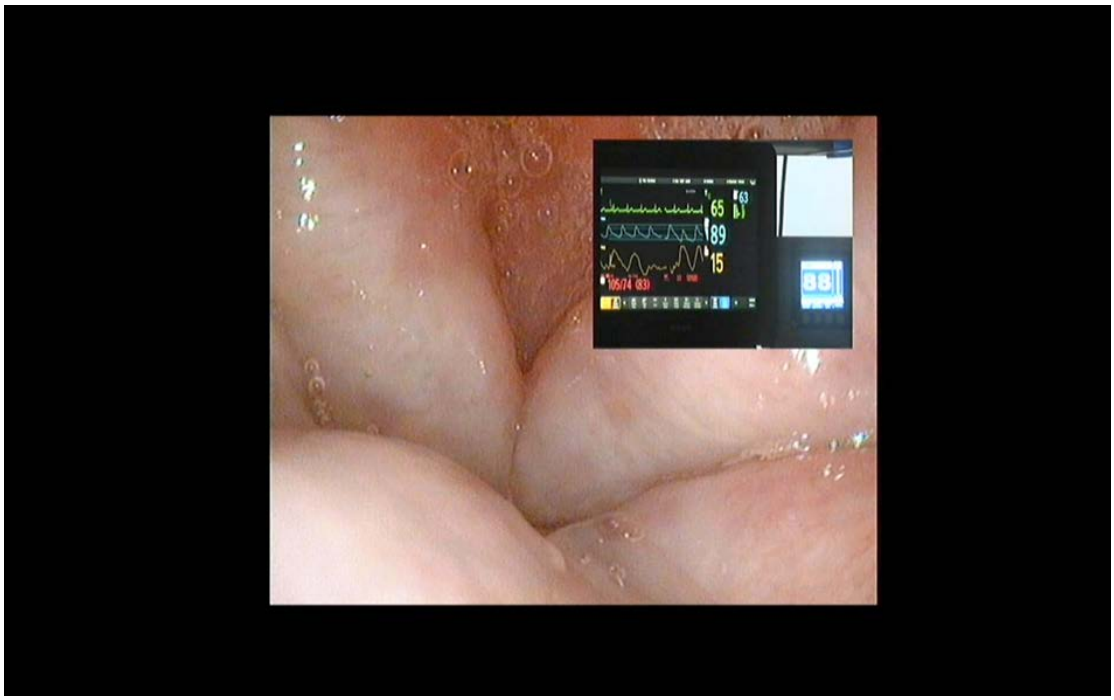
- Partial uvulectomy: if indicated a partial uvulectomy is performed at the start of the case by removing the redundant mucosal portion of the uvula. No sutures are needed. Doing this at the start is helpful as the uvula may become swollen throughout the case especially with suction trauma.
- Tonsillectomy: bilateral tonsillectomy is performed or removal of the overlying mucosa in the tonsillar fossa in the case of a previous tonsillectomy.
- Mobilization of palatopharyngeus (PP) muscles: whether by needle-tip bovie or Bizact, the PP muscle may be transected horizontally at the lower ⅓ of the tonsillar fossa. Then the PP is separated from the constrictor muscle by undermining from the lateral aspect. Toothed forceps can be used to grasp the PP and feel its resistance to be mobilized and continued release is performed until the PP is readily mobile.

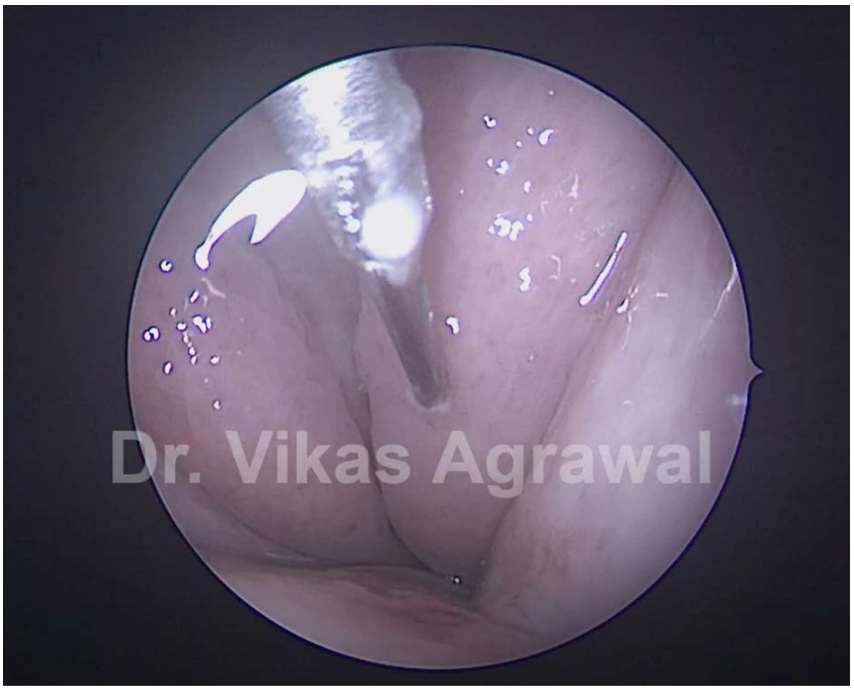
How I Do It: Salpingopharyngoplasty

Faculty: Vikas Agarwal

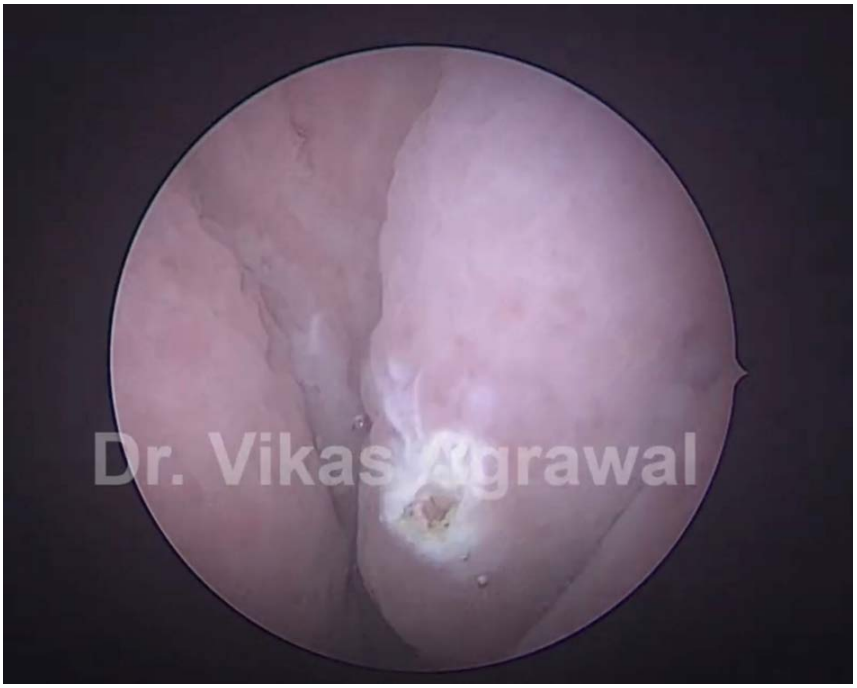
Surgical Steps

1. Nasal cavity to be decongested with adrenaline soaked patties.
2. Zero degree 4 mm nasal endoscope to be introduced in the nasal cavity along the floor of nose to visualize the salpingopharyngeal fold of one side.
3. Ultra SP wand from smith and nephew to be introduced under endoscopic guidance to reach the lower part of salpingopharyngeal fold of that side (below level of hard palate).
4. Pressing the ablation pedal at a setting of 4 , the wand tip is to be gently inserted in the lower part of salpingopharyngeal fold .
5. The salpingopharyngeal fold is to be pulled medially and ablation pedal is to be pressed for 8-10 second.
6. Then coagulation pedal is pressed at setting of 2 and the wand is gradually withdrawn over 2-4 seconds keeping coagulation pedal pressed. This avoids bleeding from inside the fold.
7. Same procedure is to be repeated for the other side.





Salpingopharyngeal fold hypertrophy Grade 2 by Agrawal's classification.



Insertion of Ultra SP wand by smith and nephew into the lower part of salpingopharyngeal fold
Channel created at the end of the procedure without.

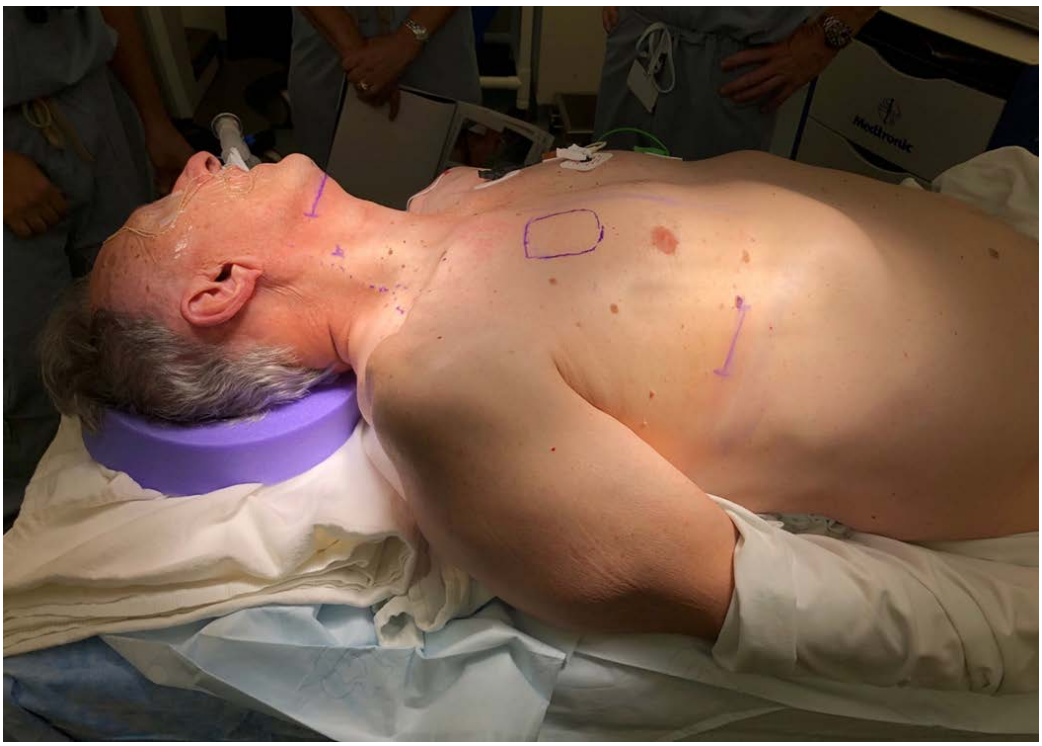
How I Do It: Inspire

Faculty: Ryan Soose, Phil Losavio

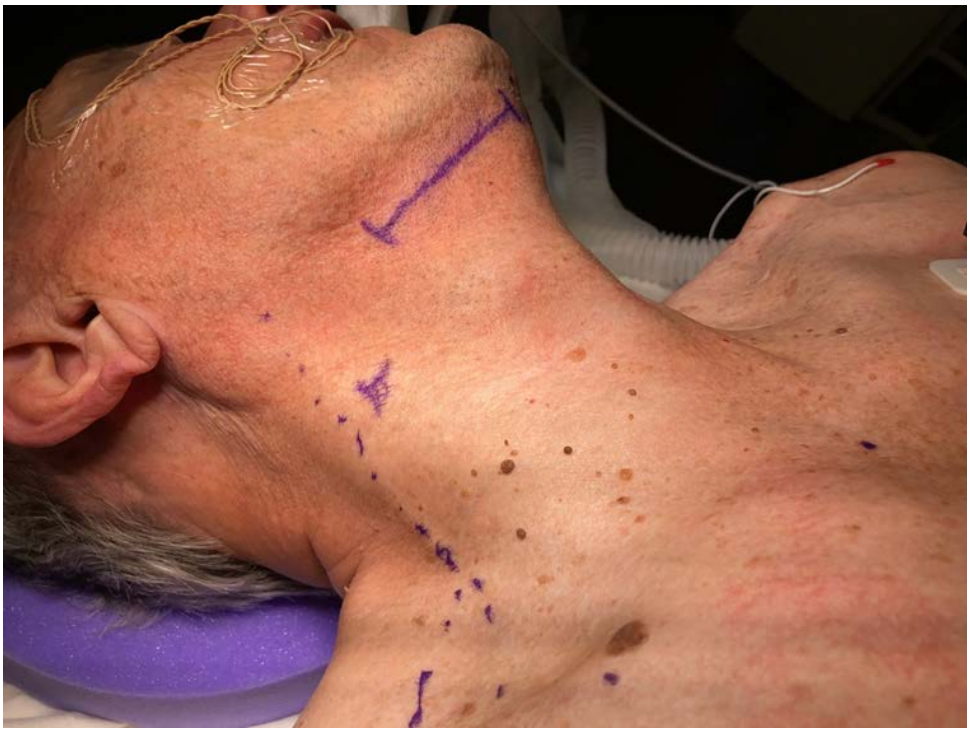
Patient Prep and Positioning

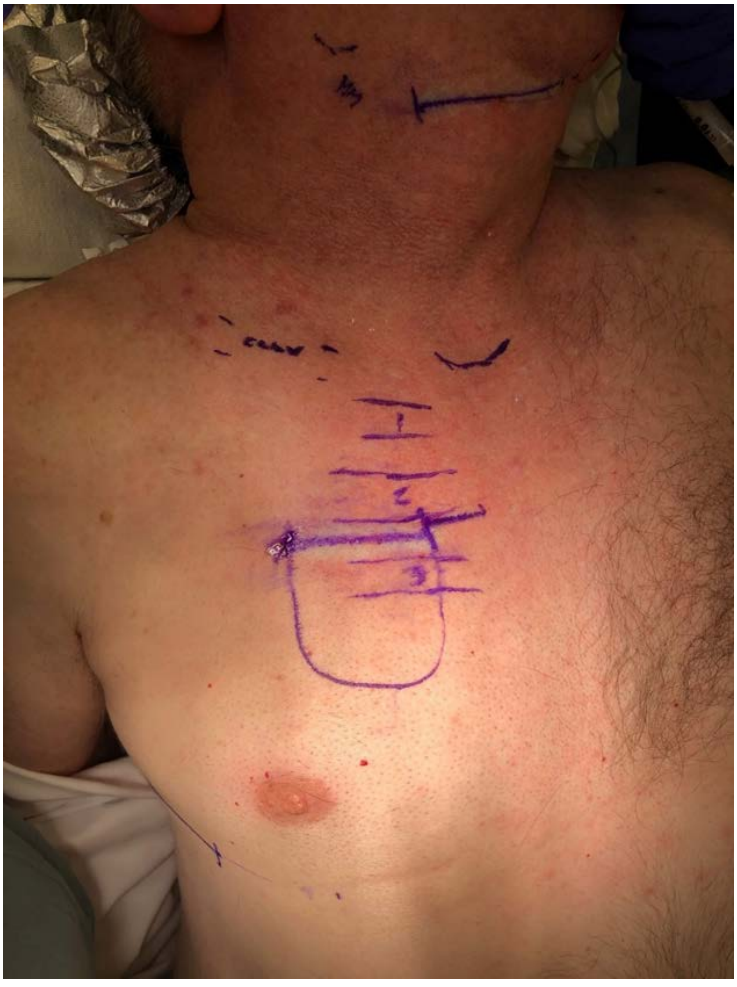
1. NPO 8 hours before procedure (GA)
2. Holding area – right arm free of IV/equipment, No cuff, pulseox, IV line on right arm
3. Anesthesia – oral intubation – **anode reinforced ETT**, short acting muscle relaxant, no EKG leads on right chest.
4. Pre-op Abx – 2gm Ancef within 60 min incision
5. No Foley catheter, bovie pad on left thigh
6. Shave sites on chest and/or neck – keep sites clean and remove all hair with tape.
7. Shoulder roll using blanket, no axillary roll, secure arms by tucking well on each side, left sided arm board only if necessary with larger patient.
8. Mark out incisions (use a new ruler, not the one used in the mouth)
   a. Mark – Hyoid, Thyroid notch, cricoid, sternal notch, clavicle, EJ
   b. Stimulation Lead – 5-6 cm (1 cm inferior and lateral from midline), 1 finger below jaw – Use width of ruler against jaw line to mark.
   c. IPG – Mark midline, feel for 2nd ribspace (below the 2nd rib) – measure 4.5 cm from the midline of the chest to this space. Then measure a 5.5 cm incision from that point going out lateral. Measure a 5.5cm inferior line to create square for the pocket. Should generally find yourself about 3 finger widths below clavicle.
   d. Sensor lead (3rd incision only if needed in special circumstances) – 5th intercostal space, 5 cm back from midnipple line for medial aspect of incision, 5 cm long
   e. Inject incisions with 1:100,000 Epinephrine in Saline
9. EMG setup Use gauze to retract tongue – no clamp (Standard 18mm leads, can use 25mm Medtronic leads if patient larger/obese with difficulty placing genioglossus).
   a. Place **Red Lead** (Hyo-Styloglossus) – 5cm from tip of tongue, submucosal ventrolateral tongue, should be able to see shallow parallel impression of leads along edge of tongue, place in mucosa just below papillae
      i. You - Stand on left side facing mouth – use left hand with gauze to hold tongue, use right hand to measure 5cm and then place lead
      ii. Assistant stands on opposite side, uses right hand to push chin inferior and left hand to hold back right cheek with tongue blade
   b. Place **Blue Lead** (Genioglossus) – Antero - Lateral to Wharton's duct, directly inferior into muscle just in front of mandible.
      i. You - use right hand with **curved** hemostat clamp holding lead (but not clamped) to place, use left hand to push tongue posterior/left with tongue blade. After you place, keep holding the lead until you reposition the tongue over the blue lead to prevent it from rebounding back up.
      ii. Assistant - pushes down chin with hand
   c. Place **Green Lead** on left shoulder. No white lead used.
   d. Secure leads with loop to face with tegaderm wrapping around right side of face, over forehead and then off to left side – usually 3 tegaderms – cheek, temple, forehead.
   e. Connect to monitor and setup stimulation level at 0.5 mA, Rate 10Hz, Pulse Width 100 microsec
   f. Reset Head position off to left side.

10. Re-Check final position - Supine, shoulder roll, head extended to left side with foam donut, arm at right side tucked, left arm tucked with arm board only if needed.
11. Mark out incisions (use a new ruler, not the one used in the mouth)
    a. Mark – Hyoid, Thyroid notch, cricoid, sternal notch, clavicle, EJ
    b. Stimulation Lead – 5-6 cm (1 cm inferior and lateral from midline), 1 finger below jaw – Use width of ruler against jaw line to mark.
    c. **IPG – (Inspire V)** - 3 finger breadths below the clavicle in the midline or where it seems appropriate anatomically.
    d. **IPG - (Inspire IV – 3028)** - Mark midline, feel for 2nd ribspace (below the 2nd rib) – measure 4.5 cm from the midline of the chest to this space. Then measure a 5.5 cm incision from that point going out lateral. Measure a 5.5cm inferior line to create square for the pocket. Should generally find yourself about 3 finger widths below clavicle.
    e. **3rd Incision Sensor lead (Historical)** – 5th intercostal space, 5 cm back from midnipple line for medial aspect of incision, 5 cm long
    f. Inject incisions with 1:100,000 Epinephrine in Saline
12. Prep field - From upper lip down to umbilicus, include: face, neck, chest, upper abdomen, right arm. Arm to Arm Prep – Be complete!
13. Place towels -> clear 1010 or 1012 drape -> Ioban up to mandible (start Ioban on mandible at edge of 1010 drape then go inferior, overlap slightly – 3 people to do this – RN, Resident, Attending)
14. Large split sheet drape over field, ¾ sheet folded in half at top of head
15. Hook up cautery, bipolar, Ligasure, NIM stimulator probe (NO monopolar after device brought in field)
16. Timeout (check all items)



Picture showing patient with all 3 incisions from original Setup. Now only the top 2.





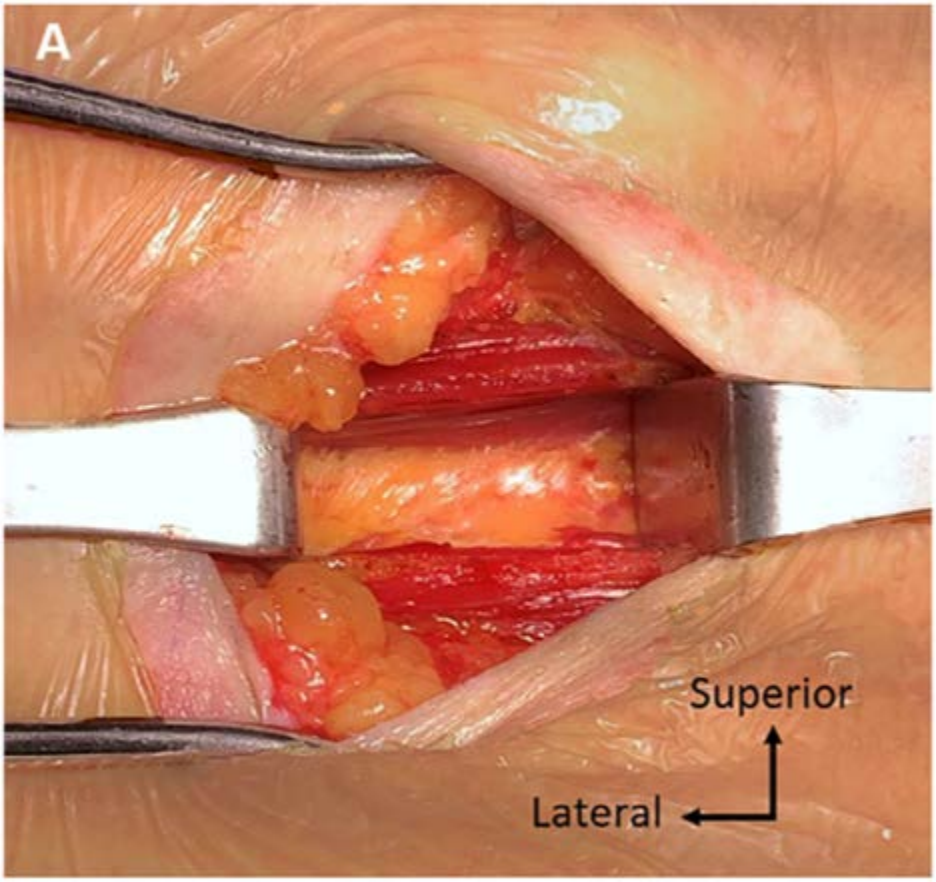
Surgical Steps

SURGICAL STEP 1 - Create IPG pocket (Only step needed for Inspire V)

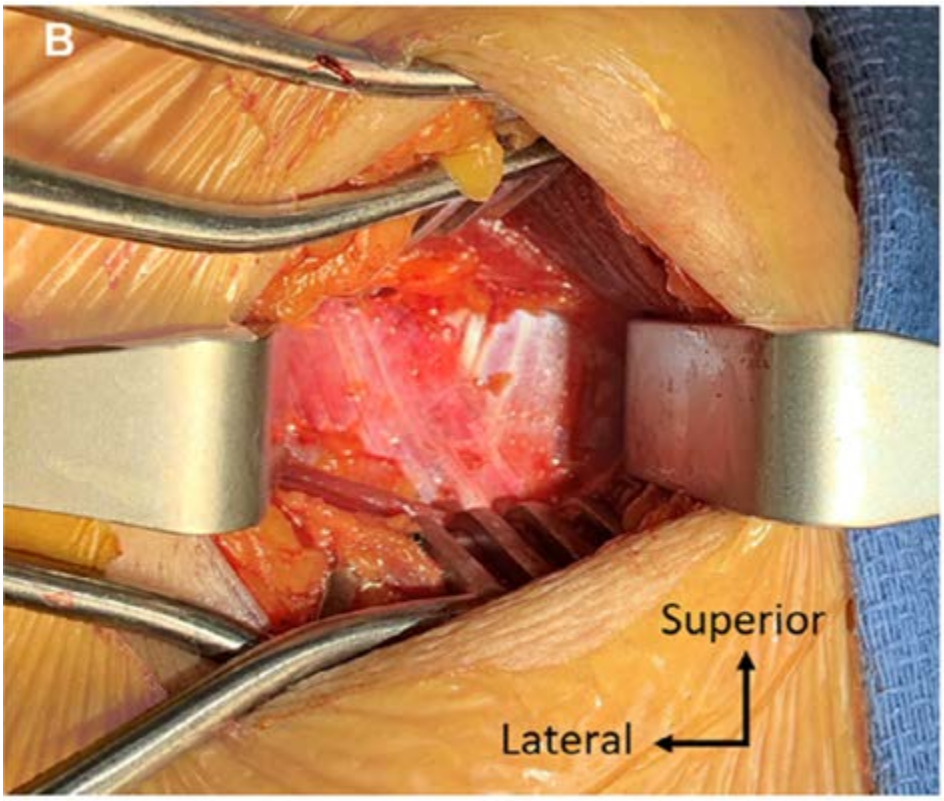
1. Incision as planned 5.5 cm long (5.5 x 5.5cm)
2. Dissect through fat down to pec major muscle and create a plane.
3. Blunt dissection of pocket if helpful, use bovie to divide any adhesions that will obstruct.
4. Start superior tunnel with Curved 6 clamp + Ligasure
5. Trial the sterile model device for sizing if available.

SURGICAL STEP 1a – Sensory Lead anterior (Inspire IV 2-incision approach – most common)

1. Divide the Pec muscle in your field using a tonsil dissector. Assistant helps with bipolar.
2. Keep using Army Navy retractors or Toe-In long retractors to keep pulling back the muscle until you see a large fatty plane



3. Next pick up the fat and tent it with your assistant – give a gentle spread until you see muscle fibers then use 2 peanut dissectors to spread away the fat. Now you should see intercostals – you may need to adjust retractors a few times and feel for ribs to be sure you are in the space. Don't get fooled by the pec minor which is much thicker and sometimes covers the external intercostal.

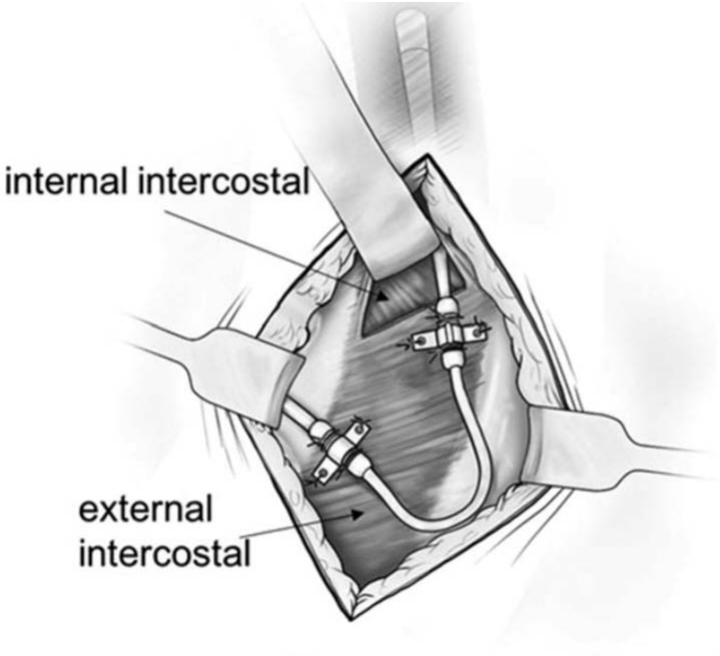


4. In center of interspace, pick up external intercostal, carefully, and use small hemostat or small scissors to make small 2mm hole, spread to see internal fibers and spread slightly under externals. Use angled debakey to pick up sensory lead and place into interspace. Secure proximal anchor with 3-0 silk sutures (x3) on the intercostals. Secure distal anchor with 3-0 silk suture (x2) on top of pec muscle.

SURGICAL STEP 1b – HISTORICAL – Sensory Lead and Tunneling (NOTE: Alternative 3rd incision approach – not currently used – for reference if needed for revision surgery with old leads)

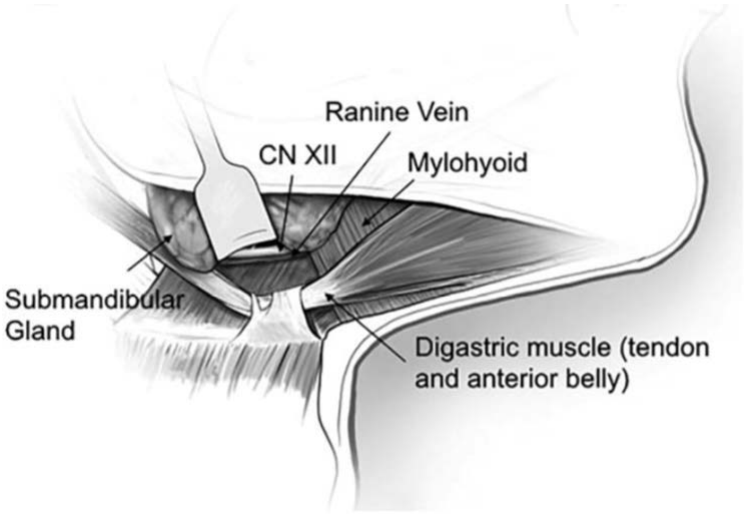
1. Dissect through fat down to Serratus –stay between and medial. Serratus attaches to lateral portion of ribs, intercostals attach in between ribs.
2. Consider retracting with Richardson superior and inferior
3. Identify fascia on intercostals – incise
4. Identify external intercostal and bluntly dissect between
5. Use ¼ inch ribbon retractor – bend out at 5cm and dissect at medial edge of incision to allow room for anchors. Move side to side gently to dissect.
6. Before placing sensing lead, create a pocket for the wire. Consider throwing down sutures ahead of time if necessary
7. Orient probe anchors at proper distance (about 5 cm)
8. Place probe between external and internal intercostal. Stay between rib and orient down. Stay away from inferior edge of rib. Do not touch metal on probe. Grasp honey comb hub of sensor lead with Kelly hemostat. Do not grap membrane, tip or wire. Advance by holding anchor.

9. Secure fixed anchor (4 sutures – 2 holes, 2 loops, 3-0 silk RB-1)
10. Tunnel Sensor (sensor lead to pocket) – consider starting with long-thin Kelly
11. Secure movable anchor (4 sutures) – omega shape with excess between anchors for chest motion



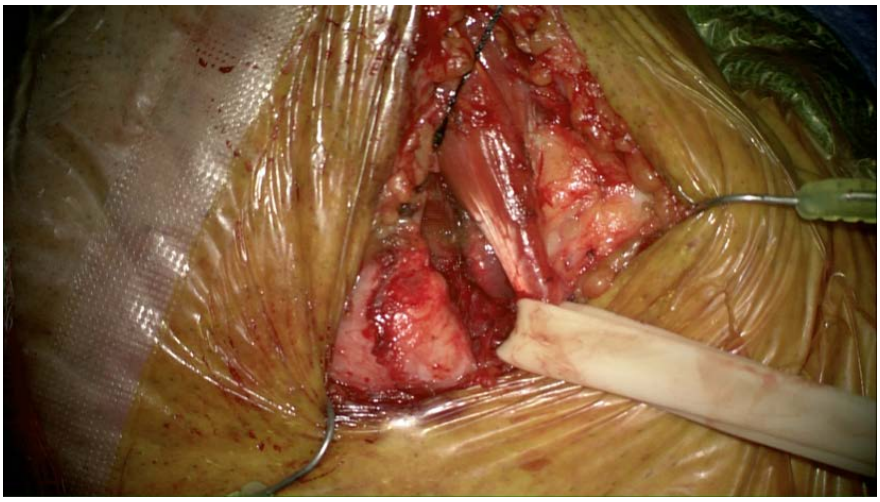
SURGICAL STEP 2 - Stimulator lead site prep:

1. Neck Incision as planned
2. Subplatysmal flaps with close attention to hemostasis

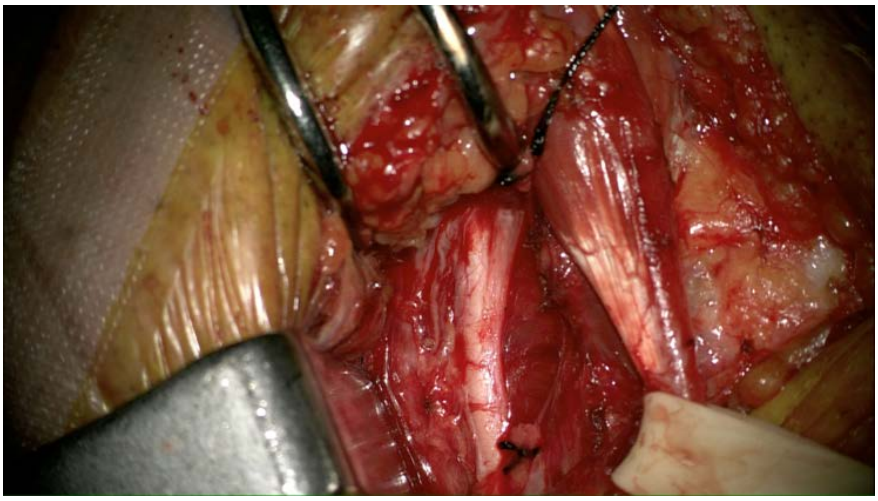


3. Identify anterior edge of submandibular gland -> retract superior-lateral
4. Identify digastric -> follow to central tendon and identify -> retract inferior
5. Make tunnel with right angle under digastric – use ¼" penrose to retract the digastric inferior. Attach a hemostat, then use another penrose looped through the hemostat handles and attach a second hemostat to the second penrose to secure to the drape (It won't reach otherwise).
6. Identify mylohoid -> switch to Jeweler's bipolar (18 cautery). Use right angle dissector to dissect then divide with Bipolar.

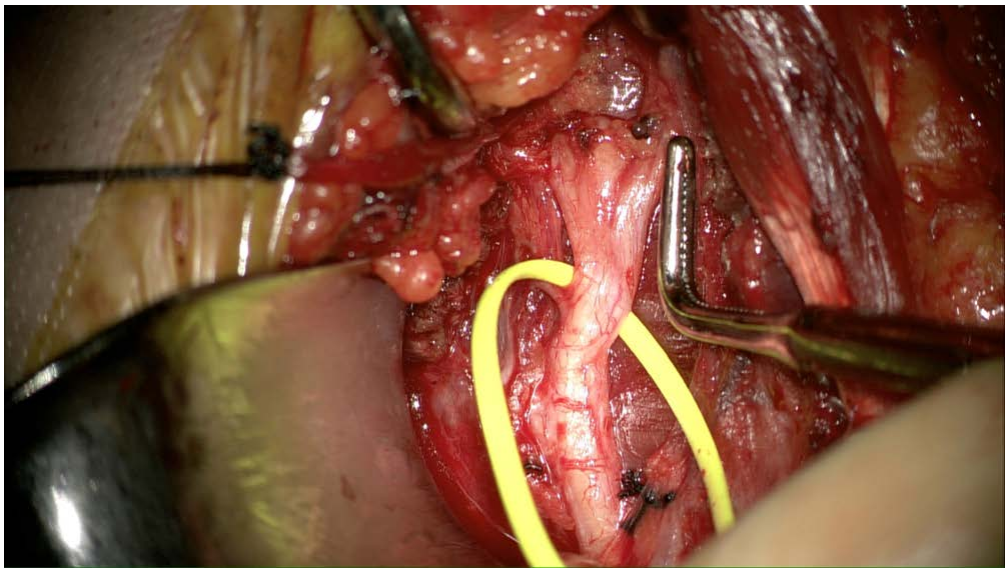
7. Identify CN XII within fascia on top of hyoglossus -> follow to medial edge of muscle



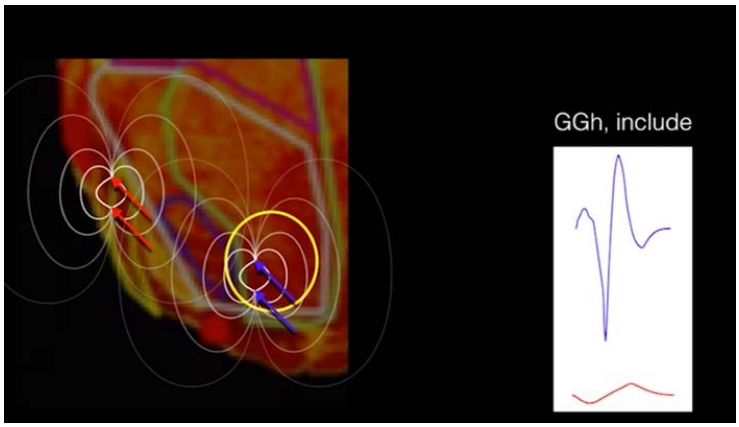
8. Do as much dissection as possible before bringing in the magnification especially tying off veins. Try and get a sense of where the major division of the nerve is located.
    a. Tip!! – look for a small vasa nervorum on the nerve that typically divides the lateral from medial branches

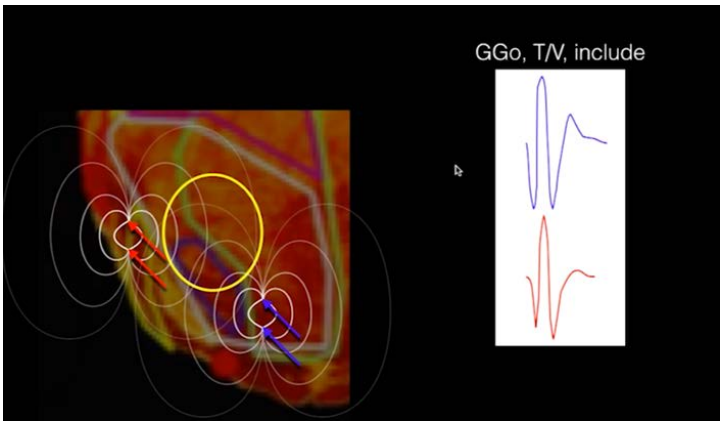


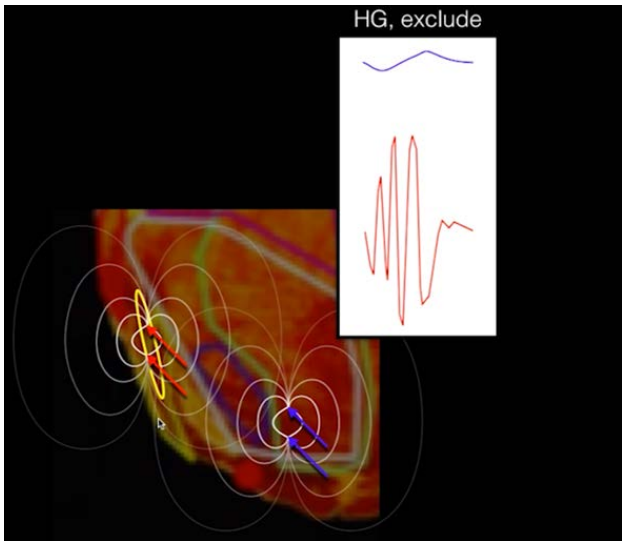
9. Bring in magnification
10. Identify nerve branches of m-XII, C1 if possible
    a. Anterior margin of hyoglossus
    b. GGh – early, inferior, small, GGo – late, plexus, large
    c. m-IL and T/V plunge deep/medial between GGo and GGh
    d. Follow counterclockwise along branches excluding last retractor. Use vessel loop to mark dividing line where cuff will go. Once the nerve is identified a final check is needed to look for late retracting branches under the medial division using a peanut to rotate the nerve. Use right angle dissector as guide to know if window is wide enough (same width as cuff).

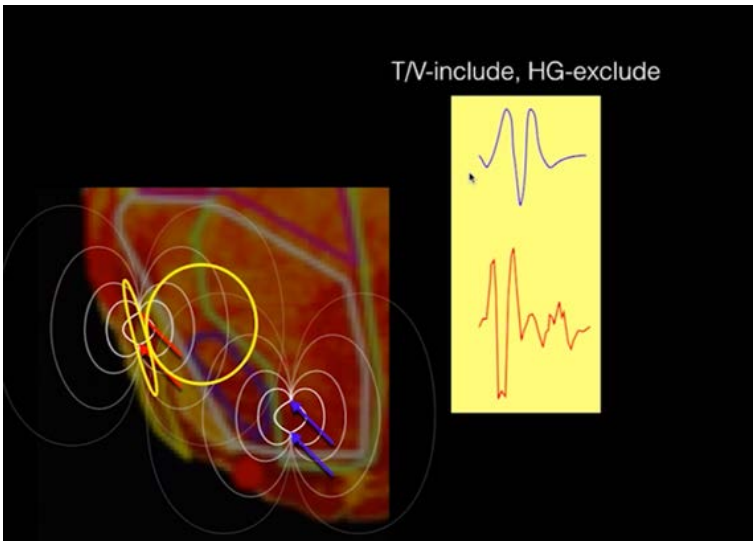


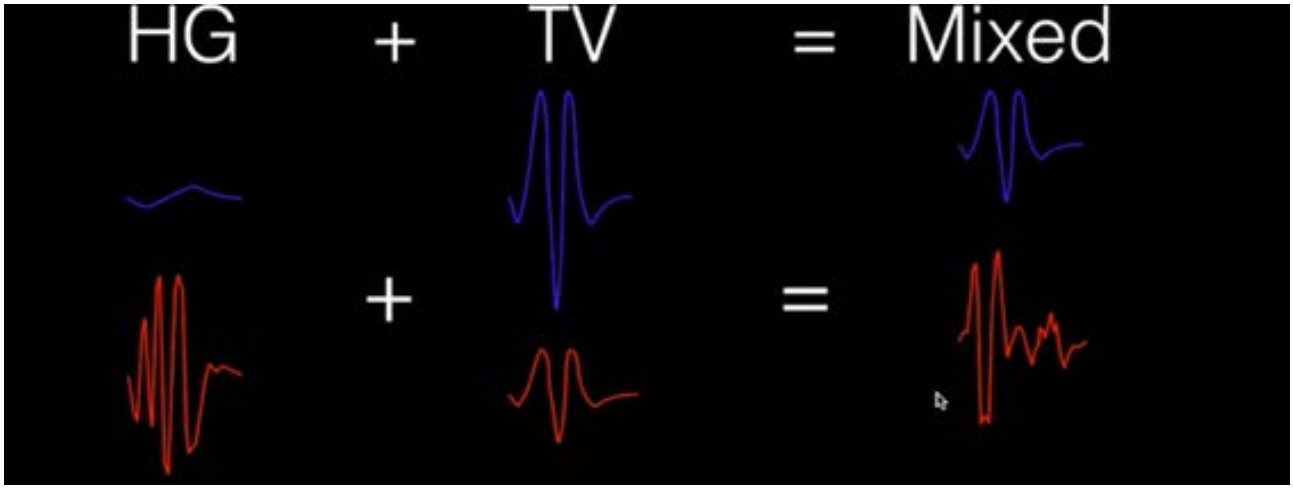
11. Test Counterclockwise w/ EMG – point black tip distally. Mixed signals show jagged runoff







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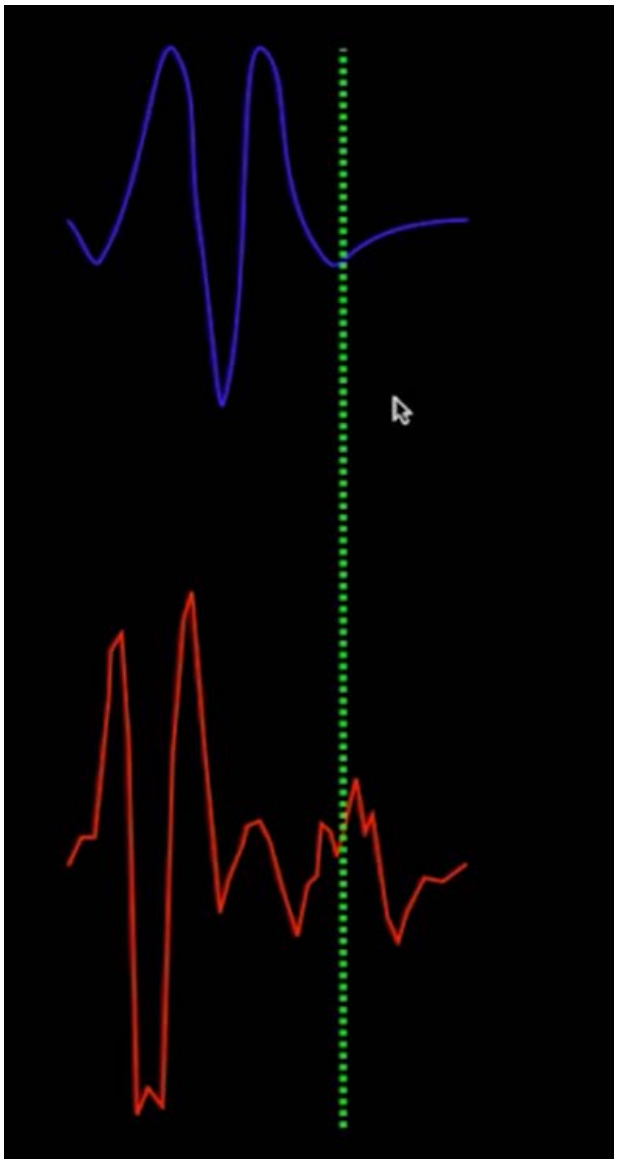
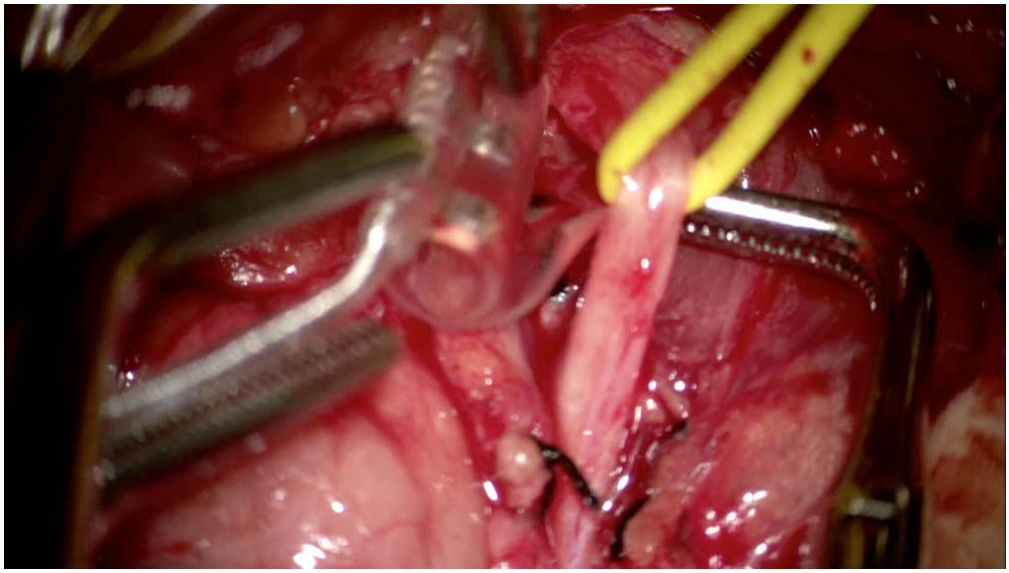
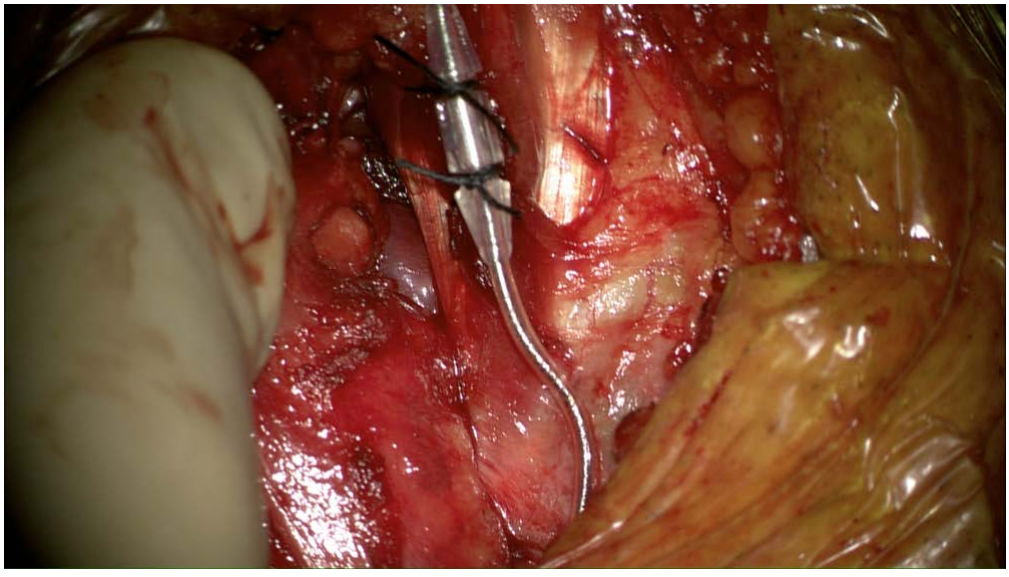


SURGICAL STEP 3 - Stimulator lead placement:

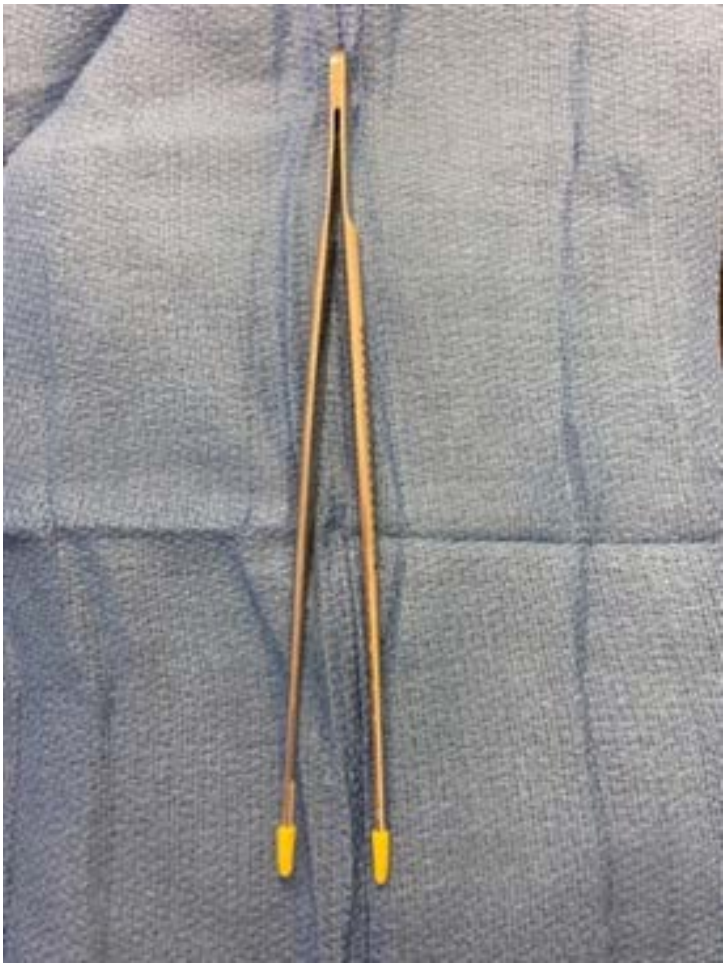
1. Hold long section of cuff lead in left hand with angled debakey at 45 degree angle. Right angle dissector gets passed under nerve from inferior edge using right hand.
2. Grab long section with right angle and pass under. Do not use microforceps to hold the cuff – they are too sharp. Assistant uses 2 Smooth Geralds.
3. Continue to hold long section with right hand taught while short section is unfurled around nerve. Long section then unfurled over short section.
4. Check for position, bring nerve to the cuff now using microforceps, not the cuff to the nerve. Grasp perineurium or soft tissue around nerve at edges to mobilize.



5. Irrigate cuff with saline. Cut penrose at the digastric and carefully remove, taking care to not pull-out lead.
6. At this point only use forceps with suture boots (see below) to handle the leads specifically touching designated anchor sites.
7. Throw down sutures (3-0 silk on RB-1) on digastric muscle and then tie to grooves on anchor – orient anterior. Note: Not 2-0 silk!



8. Place large double postage stamp size gelfoam with adrenalin sponge in field



SURGICAL STEP 5 - Tunnel Stim lead (pocket to stimulation lead)

a. Start Tunnel with tonsil clamp from above looking for vessels, go about 2-3 cm.
b. Use tunneling device to pass from neck to chest – stay above pec muscle –this will cause tethering and pain.
c. Try and hit your pre-dissected tunnel from below using 2 hands.
d. Place the wire in the tunneling device just covering the lead tip then pull thru leaving some extra slack up top.

SURGICAL STEP 6 - Connect Leads/Implant in pocket

1. Clean and dry the leads.
2. Connect Leads
    a. Pop and Place wrench on screw to allow air to escape
    b. Connect SENSE lead to lower port 1st
    c. Connect STIM to upper port (Only lead for Inspire V)
    d. Tighten screws 3 turns with torque wrench on each screw
    e. TUG test
3. Place device in pocket
    a. Engraving outside, wires come out at 3 o'clock to the right.
    b. Loosely wrap excess leads - counterclockwise
    c. Keep lead wrap just beneath or on outer margin
    d. AVOID –
        i. Lead on lead contact
        ii. Sharp kinks
        iii. Leads on top of IPG
        iv. Torque on lead body
4. Anchor device in pocket
    a. In V-shaped sling, secure down to fascia x 2
    b. Use 2-0 Silk-SH – make air knots on upper hole x 2 with instrument in loop

SURGICAL STEP 7 – Verify Device and Close

1. Re-irrigate cuff before testing
2. Verify tongue motion
    a. Telemetry head through sterile sleeve
    b. Program amplitude 0.5-1.0 V (33Hz, 90 microsec)
    c. Can check alternate configuration (0 – 0) as standard or if questions.
3. Verify sensing
    a. Program amplitude to 1.5 V
    b. Assess sensor waveform up to 30 sec
4. Turn off device
5. Hemostasis
6. 3-0 Vicryl, 4-0 Monocryl closure, ½ inch Steris (cut to thirds up at the neck). Close from one edge to the other to visualize device, do not bisect.
7. Telfa/Tegaderm on chest wound, just steris on neck.
8. Fluff and Medpore dressing on chest
9. Sling only for 3 incisions - historical (usually 2 incisions with no sling).

Preoperative care:

- Labs - CBC, PT, PTT, CMP, EKG, PA/Lat CXR
- PCP or Preop clinic clearance
- CT Sleep Protocol, Chest CT if prior chest surgery
- Preop visit with Sleep medicine team if not already done prior
- 23-hour observation reservation if needed
- SSI – CHG Wipe prep, CHG Mouth Rinses, Bactroban Nasal Prep
- Shave 48 hours prior to surgery facial and chest hair.

Postoperative in-hospital care – Outpatient or 23 hour:

1. Admit to 23 hour observation
2. AP and Lateral soft tissue neck in recovery
3. PA and lateral chest in recovery
4. Check x-ray result before being discharged
5. Norco for pain
6. 24 hours IV Abx postop, with 7 days po Abx
7. Advance diet tolerated
8. Shower 48 hours
9. Large Dressings and tegaderm taken down POD 1
10. No heavy lifting x 6 weeks
11. Home with:
    a. Script for Norco
    b. Script for Stool Softener
    c. Home instruction sheet
    d. Script of Augmentin x 7 days (alternative Clindamycin).

1. **Pain Control**
    a. Colace bid
    b. Norco 5/325 – 1 tablet q 4 hours prn pain, Dispense 15 tablets
    c. Ibuprofen every 6 hours prn – Norco should be used for breakthrough pain in place of Ibuprofen
2. **Diet:** Advance as tolerated to general diet.
3. **Activity:** No work or school for 1 week. May consider return to school or light work at week 2. No heavy lifting for 6 weeks postop (no weights, heavy work, gym class/recess/outdoor play). No travel for 2 weeks postop unless otherwise stated.
4. **Followup appointment** – Postop appt 1 week postop for wound check appointment.
5. **Postop calls** – take all calls seriously. Especially any concern for hematoma or wound infection. Anytime someone calls with significant concerns they should be offered an earlier follow-up appointment if they would like an earlier in-person evaluation that week for reassurance. Most patients will not need this.

How I Do It: Livanova

Faculty: Ofer Jacobowitz

Instruments/Equipment:

- 2 Kits (Auro6000 IPG, lead/cuff, torque wrench)
- Lead Tunneller (Livanova)
- NIM or hand-held stimulator
- Sterile sleeve for remote
- Neck Tray

Skin Marking

- Mark skin of Neck for a standard submandibular gland incision, 2-3cm below mandible, 5cm length
- Mark skin of Chest 1-2cm below clavicle, in skin tension line. Draw outline of IPG location on skin, label up
- Antiseptic skin preparation and sterile draping

Neck Approach:

- Palpate hyoid
- Incise and dissect subplatysmal
- Find Submandibular gland, intermediate digastric tendon and retract myelohyoid
- Identify Proximal HGN trunk in triangle between myelohyoid and intermediate digastric tendon (may use NIM)
- Clear of if required ligate venUe comitantes
- Clear ~ 2cm of HGN
- Place cuff- unfurl cuff by pulling on rubber loops. Use angled clamp on clear silicone zone to pass. Make sure 6 electrodes are in contact with the HGN. Remove loops

Chest Approach:

- Incise skin, fat but dissect no deeper than 1cm
- Pocket should be as small as possible (verify size with IPG)
- Bend Tunneling tool shaft as needed
- Prepare the passer tool's path by dissecting partially above and below
- Tunnel subcutaneously but exit subplatysmal in neck
- Remove tip and thread lead down to chest /IPG

Connect and test

- Clean tip
- Insert lead w/o bending and verify complete insertion
- Test each contact at 3hz and assess contraction in neck
- Tighten lead with torque wrench – 2 audible clicks

Secure and Close

- Secure lead in IPG with wrench
- Pass two Prolene retention sutures via IPG holes and suture in pocket
- Place IPG in pocket, label-up and tie sutures
- Place silicone sleeve around lead wire in neck and suture to subplatysmal tissue, creating a strain relief loop
- Close in layers, no drains
- Occlusive dressing

How I Do It: Genio

Faculty: Clemens Heiser, Colin Huntley

Patient Prep and Positioning

- Naso-tracheal vs Oro-tracheal intubation
  - Naso-tracheal intubation during DREAM, but the procedure can be done with oro-tracheal intubation.
- Standard ENT surgical set + extra retractors (hand-held, self-retaining, LoneStar).
- Nerve Integrity Monitor (NIM) – 4 channels with electrodes (preferred: 18mm).
  - Used to monitor bilateral genioglossus (floor of mouth) and stylo/hyoglossus (lateral tongue) muscles.
  - Sewn in place w 4-0 silk
- Shoulder roll for neck extension.
- Gauze roll for mouth opening (if needed).

Surgical Steps

Step 1. Operative Preparation

- Identify and mark:
  - Inferior border of mandible.
  - Thyroid cartilage notch & hyoid bone.
  - Midline from mandible to hyoid.
- Plan 5-6 cm incision:
  - horizontal or slightly curvilinear
  - 1cm above the hyoid
- Prepare the skin in a typical sterile fashion from the lower lip to the clavicles.
- Ioban dressing from the lower lip to the clavicles.
- A clear dressing is applied over Ioban and covers the mouth to allow visualization of the tongue.

Step 2. Skin Incision

- 5-6 cm transverse incision, 1 cm above the hyoid.
- Divide platysma.
- Develop subplatysmal flaps from the mandible to the hyoid.
- Place self-retaining retractors.

Step 3. Access Mylohyoid

- Identify the anterior bellies of the digastric.
- Identify **horizontal** fibers of mylohyoid.
- Divide mylohyoid in midline vertically (mandible → hyoid).
- Identify the **vertical** fibers of the geniohyoid beneath.

Step 4. Expose Geniohyoid

- Identify the midline fatty raphe.
- Split the geniohyoid muscles to expose genioglossus (GG).
  - Geniohyoid muscle can be thicker than you expect
  - The geniohyoid will clearly insert into the hyoid bone
  - The genioglossus will travel deep to the hyoid bone
  - The genioglossus muscle will be paler in appearance
- Dissect the lateral borders of GG.

Step 5. Expose Genioglossus

- **Do not dissect into GG**.
- Open the fat lateral to GG with blunt dissection.
- Identify distal hypoglossal nerve (HGN) branches.
  - The ranine vein will be seen paralleling the inferior aspect of the nerve
- Create pockets for Genio's legs.

Step 6. Identify Hypoglossal Nerve Branches

- Dissect the hypoglossal nerve from medial to lateral
  - It can be helpful to stand on the opposite side of the nerve
  - Retract the nerve medially with a peanut, gauze, or pledget
- Use NIM bipolar stimulator (0.1–0.3 mA, 100 µs).
- Identify:
  - Medial HGN branch → genioglossus (protrusor).
  - Lateral branch → hyoglossus (retrusor).
- After identification of the nerve and respective branches, leave a pledget in the surgical field and proceed to the contralateral side
- Repeat the process on the contralateral side

Step 7. Place Genio® IS

- Position IS on genioglossus "like a saddle."
- IS legs straddle GG, electrodes facing HGN branches.
- Secure the IS in place with suture to the genioglossus muscle

Step 8. Placement Check

- Use external stimulator (ES).
- Confirm bilateral contact and effective stimulation (via NIM).

Step 9. Measure Depth

- Max distance: **3.5 cm** skin → IS.
- If excessive depth: perform lipectomy.

Step 10. Interim Test

- Connect Genio® AC-DP system.
- Assess muscle contraction & airway opening (endoscopic view).
- If suboptimal at 30% amplitude → reposition IS.

Step 11. Skin Closure

- Layered closure of incision.

Step 13. Final Test

- Perform repeat Genio® AC-DP test.
- Confirm effective stimulation and airway opening.

Pearls from the Experts (please provide 3-5 surgical pearls - positioning, instruments, techniques, critical steps, or other hints to improve efficiency and/or outcomes)

✔ Handle implant with care, gentle manipulation only.
✔ Confirm nerve targeting with NIM at multiple steps.
✘ Do not grasp the implant with toothed forceps.
✘ Do not use metal tweezers on electrodes.
✘ Avoid excessive force or tool contact with the implant.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