15. Velopharyngeal Insufficiency

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INTRODUCTION

- Velopharyngeal insufficiency (VPI) is the inability to completely close the velopharyngeal port during speech. The resultant leakage of air through the nasal cavity during speech can cause hypernasal vocal resonance and nasal emissions. Compensatory misarticulations often result, interfering with speech intelligibility and complicating efforts to correct the problem.
- The best treatment for velopharyngeal insufficiency (VPI) is prevention. A good primary repair with meticulous rearrangement of the levetor veli palatiniti (velopasty) is the best solution.
- The age of the patient, length of time that VPI has been present, and general intellect of the patient all can influence treatment and likelihood of success.
- Therapeutic approaches to VPI include speech therapy; prosthetic management (speech bulb); augmentation of the posterior pharyngeal wall; palatal lengthening procedures; pharyngeal flap; and sphincter pharyngoplasty.

ANATOMY AND PHYSIOLOGY OF VELOPHARYNX

- The velum or the soft palate extends from the hard palate to the uvula.
- The paired levetor veli palatine (LVP) muscles are primarily responsible for velopharyngeal competence. The paired LVP muscles act as a sling to create the upward and backward movement of the velum to close the VP port. Meticulous LVP muscle dissection and veloplasty forms the sling elevates the soft palate, and is the most important component of palate repair.
- Assisting musculature of the velopharynx include the superior

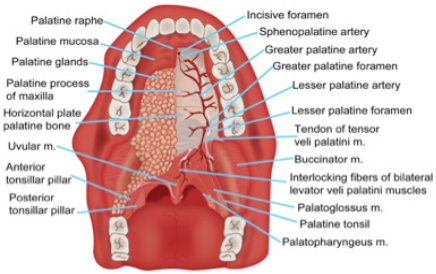

Figure 15-1. Anatomy of the Palate. © 2017 A Campbell, C Restrepo

pharyngeal constrictor, palatopharyngeus, palatoglossus, tensor veli palatine, and the musculus uvulae.

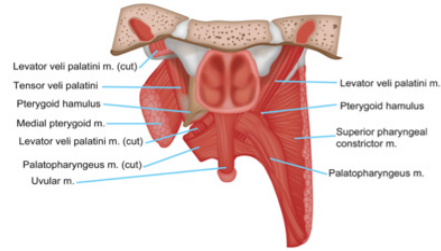

Figure 15-2. Anatomy of the Palate. © 2017 A Campbell, C Restrepo

Velopharyngeal Closure Patterns:

- At rest, the velum is suspended with tip of uvula resting on dorsum of tongue.
- Velopharyngeal port remains open during resting breathing to allow unencumbered air flow.
- During normal closure, contraction of the LVP sling elevates the velum to make complete contact with posterior pharyngeal wall to prevent escape of air through nose.
- Lateral pharyngeal wall movement toward midline and anterior movement of posterior wall assists VP closure.
- Velopharyngeal closure is necessary during the normal production of oralized versus nasalized sounds. In English language only /m,n,ng/ sounds are nasalized, meaning they are produced with open velopharyngeal port.
- Various patterns of velopharyngeal closures are coronal, sagittal, circular, and circular with Passavant's ridge.
- Passavant's ridge is a prominent bulging of posterior pharyngeal wall in patients with inadequate velar elevation and compensatory hypertrophy of superior pharyngeal constrictor
- Surgical management of VPI is influenced by closure pattern.

Terminology

- *Velopharyngeal Inadequacy:* General term used for all types of VP dysfunction
- *Velopharyngeal Insufficiency:* *Anatomical* or structural defect that precludes adequate velopharyngeal closure
- *Velopharyngeal Incompetence:* *A neuromotor physiological disorder* that results in poor movement of structures

Some Characteristics of Cleft Palate Speech	
Nasalance	An acoustic correlate of nasal resonance, calculated as ratio of nasal to nasal plus oral acoustic energy
Nasal emission	Different from nasal acoustic energy, nasal air escape associated with hypernasality. Nasal emission and turbulence are disturbances or airflow mostly on production of pressure consonants
Nasal rustle, or turbulence	Nasal rustle or turbulence is distracting, accompanies consonant production. Generally, small constriction in the nasopharynx produces a distinctive fricative sound. On the voiced pressure consonants b, d, and g.
Hypernasality	Nasally escaping air reverberating in a confined postnasal space
Grimace	Aberrant facial muscle movement, subconscious attempr to inhibit the abnormal nasal airflow by constricting the nares.
Hyponasality	Blocked up tone; may occur with nasal obstruction; enlarged adenoids, deviated septum, inadequate nasal airway, or chronic catarrh.

Table 15-1. Characteristics of cleft palate speech. Adapted from "Velopharyngeal Dysfunction," by P. Witt in Losee JE, Kirschner RE (Eds.), Comprehensive Cleft Care 2nd Ed. New York: McGraw-Hill Medical, 2009.

Anatomic Causes of VPI and Hypernasality in Cleft Palate

- LVP not oriented transversely to form sling
- Instead LVP inserts anteriorly on HP
- Oronasal fistula
- Abnormal LVP cannot elevate velum
- Submucous cleft palate
- Adenoidal involution (puberty)
- Orthognathic surgery (controversial)

Variables That May Impact Communication in Individuals with Cleft Lip and/or Palate Thus Contributing to the Heterogeneity of the Population
• Cleft type/severity
• Associated syndromes or other associated conditions
• Age at the time of palate repair
• Efficacy of the palate repair
• Unrepaired residual cleft
• Prensence of a palatal fistula
• Status of velopharyngeal function
• Hearing status over time
• Timing, amount and efficacy of communication interventions
• Socioeconomic/linguistic status of the family

Table 15-2. Variables that may impact communication in individuals with cleft palate. Adapted from "Communication Disorders Associated with Cleft Palate," by L. D'Antonio and N. Scherer in Losee JE, Kirschner RE (Eds.), Comprehensive Cleft Care 2nd Ed. New York: McGraw-Hill Medical, 2009.

DIAGNOSIS OF VPI

- The best aid to diagnose VPI is "the ear of a trained speech pathologist."
- Screening of VP Function:
  - Assess VP closure with oral sounds (pressure consonants) – P ,B, S ,D

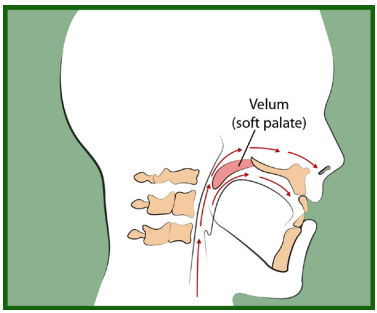

Figure 15-3. Air escape through the nose with VPI.

- Assess VP opening with nasal sounds (open VP port) - M, M, Ng
- Sentence repetition, "Pet the puppy;" "Coca Cola;" "Buy Bobby a book;" "Go get a bigger egg;" "Katie cut the cake;" "Daddy eats doughnuts;" "Take it to Ted;" "I like lollipops;" "My name is not Mickey Mouse;" "Mommy made lemonade."

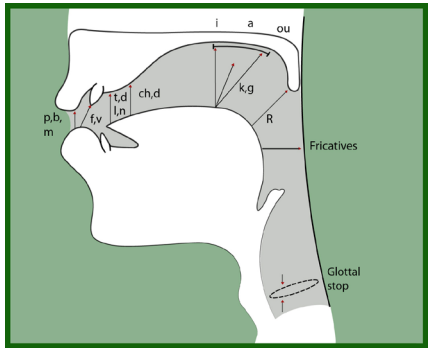

Figure 15-4. Production of various sounds. © 2017 A Campbell, C Restrepo

- Instrumental techniques can be divided as Direct and Indirect methods.
  1. Direct Method: allows the observer to visualize structures used during velopharyngeal closure.
  2. Indirect Method: provides information concerning the results of velopharyngeal function during speech such as aerodynamic or acoustic events.
- Both methods have their advantages and limitations. So the choice of method has to be judiciously chosen and overzealous attempt to use complex diagnostic tools should be avoided.
- Most commonly used direct methods include, lateral cephalogram, video fluoroscopy and nasoendoscopy.

Resonance, Articulation, and Phonation Disordes Frequently Associated wit Cleft Palate and/or Velopharyngeal Dysfuntion

- **Hypernasality**
  The perception of inordinate nasal resonance during the production of vowels. This results from inappropriate coupling of the oral and nasal cavities. (The term *inordinate* is used because low vowels and vowels in nasal consonant contexts are normally somewhat nasalized).
- **Nasal emission**
  Nasal air escape associated with production of *consonants* requiring high oral pressure. It occurs when air is forced through an incompletely closed velopharyngeal port or a patent-oral nasal fistula. Nasal emission may be audible or not.
  Note: Hypernasality and nasal emission are not synonymous, although they often occur together and are both symptoms of velopharyngeal dysfunction.

- **Hyponasality**
  A reduction i n normal nasal resonance usually resulting from blockage or partial blockage of the nasal airway by any number of causes, including upper respiratory tract infection, hypertrophied turbinates, and a wide, obstructing pharyngeal flap.
- **Hyper-hyponasality (mixed resonance)**
  The simultaneous occurrence of hypernasality and hyponasality in the same speaker usually as the result of incomplete velopharyngeal closure in the presence of high nasal cavity resistance that is not sufficient to block nasal resonance completely.
- **Cul-de-sac resonance**
  A variation of hyponasality usually associated with tight anterior nasal constriction often resulting in a muffled quality.
- **Nasal substitution**
  The articulators are placed appropriately for an intended oral consonant. However, incomplete velopharyngeal closure causes the sound to be produced as a nasal consonant. For example, b becomes m and d becomes n. Such substitutions frequently are called homorganic nasals.
- **Compensatory articulation**
  The articulators are placed inappropriately so as to enable creation of the plosive or fricative characteristics of the sounds they replace. For example, if a patient cannot build up oral pressure for the fricatives (eg., s) or plosives (eg., p) because of velopharyngeal dysfunction, they may create those pressures below the level of the velopharyngeal port. Such substitutions included glottal stops, pharyngeal stops, and pharyngeal fricatives among others.
- **Sibilant distortion**
  Inappropriate tongue placement for the sounds /s/ and /z/.
- **Laryngeal/ voice symptoms**
  A variety of phonation disorders may accompany velopharyngeal dysfunction, including hoarseness, low speaking volume strained or strangled voice quality, and unusual pitch altenations. One theory for the co-ocurrence of velopharyngeal and laryngeal symptoms is that speakers with velopharyngeal dysfunction may attempt to compensate for the inability to achieve complete clousure and maintain adequate speech pressures by compensatory activity at the level of the larynx.

Modified from D'Antonio L. Scherer NJ. THe evaluation of speech disorders associated with clefting In Shprintzen RJ, Bardach J 9eds). Cleft Palate Speech Management, St. Louis: Mosby Elsevier, 1995, 1995, pp. 176-220/

Table 15-3. Resonance, Articulation, and Phonation Disorders Frequently Associated with Cleft Palate and/or VPI. Modified from D'Antonio L. Scherer NJ. The evaluation of speech disorders associated with clefting. In Shprintzen RJ, Bardach J, et al. Cleft palate Speech Management, St Louis: Mosby Elsevier, 1995, pp 176-220.

Sample Questions for Use in a Diagnostic Interview

Current concern

- What concerns you about your child's speech?
- When did you first become concerned?
- Who referred your child for the evaluation and what was that person's concern?

Articulation

- What types of sounds does your child use during vocal play-vowel only or some consonantes?
- If consonants, what are some of the consonants that you hear?
- Are they produced individually or over and over?
- Does the child jabber or use jargon?
- Does your child leave out sounds in words?
- Do you understand your child's speech all of the time, most of the time, some of the time, or hardly at all?
- How well do strangers understand your child's speech?
- Are there any particular sound that are difficult for your child to produce?

Resonance

- Does your child sound "nasal" to you? If yes, does it sound like your child is talking through the nose, or does
- it sound like your child has a cold?
- When did you first notice the problem with nasality?
- If the onset was sudden, what event preceded it?
- Does it vary with the weather, allergies, fatigue, or any other factor?
- Do you ever hear air coming, through the nose during speech?

Language

- Does your child communicate with gestures, single words, short phrases, incomplete sentences, or complete sentences?
- How many words does your child usually put together in an utterance?
- Does your child leave out the little words (such as "of," "to," "the," "is") in the sentence?
- Is your child communicating as well as other children of his or her age?
- Have you ever had a concern about how well your child understands the speech of others or follows directions?

Medical History

- Was your child born with any congenital problems? If so, what were they? How and when were they treated?
- Does your child have any medical problems, medical diagnoses, or conditions?
- What surgeries has your child undergone?
- Does your child take any medications on a regular basis? If so, wat is it for?
- Does your child hear normally? When was the last hearing test?
- Has your child had many ear infections? If so, hoy were they treated?
- Does your child have any problems with vision?
- Were is your child on the growth chart?

Developmental history

- Was you child quiet, about average, or very vocal as an infant?
- Did you have any concerns about initial speech development?
- Did your child begin to use words before or after his/her first birthday?
- When your child was learning to sit up, stand and walk, did it seem normal or behind other children?
- Did your child walk before or after his/her first birthday?
- Does your child have any difficulty learning in preschool or school?

Feeding and oral-motor skills

- Does your child have any difficulty chewing, sucking, or swallowing?
- Is there a history or feeding problems?
- Does your child drool or keep the mouth open during the day?

Table 15-4. Sample questions in diagnostic interview. Adapted from Kummer AW. Cleft Palate and Craniofacial Anomalies: Effect on Speech and Resonance, 2nd Edition. Clifton Park, NY" Delmar, Cengage Learning, 2008.

Nasometry:

- This is the most commonly used indirect technique.
- Currently many different types of nasometry instruments are available, in general all of these calculate the nasalance, ratio of acoustic energy output from the nasal and oral cavities during connected speech.
- To obtain this measure, directional microphones located on either side of a sound separator transduce acoustic energy that is then converted to a nasalance score reported as a percentage.
- Specifically, nasal energy/nasal energy + oral energy × 100 = nasa-

lance. Higher percentages of nasalance are associated with increased amounts of hypernasality32 and normative data are available for many languages.
- Different research methodologies have led to widely varying correlations of nasalance scores with perception of hypernasality, ranging from 0.02 to 0.82.
- Variations in nasalance data may occur for reasons other than a change in velopharyngeal function, including the phonetic characteristics of the speech stimulus used during assessment inconsistencies in positioning the sound separator differing microphone sensitivities and the patient's degree of nasal congestion.

Lateral cephalogram:
- Provides still radiographic images at constant magnification with velopharynx at rest and with patient saying /ee/ or /s/. These images can be compared with that of rest position and maximum velopharyngeal excursion and contact against posterior pharyngeal wall noted.
- Use of barium injected through nose can increase the clarity of images.
- Its disadvantage is that since it is a 2D representation, the complex dynamic relationship of velopharyngeal structures cannot be recorded. Also, the movement of lateral pharyngeal walls cannot be recorded.
- The advantage is that it gives relatively fair knowledge of the space between the maximum velar function and posterior pharyngeal wall and is inexpensive and easily available.

Multiview Video Fluroscopy:
- Allows the examiner to view velopharyngeal function during a variety of speech tasks, with less radiation exposure (approximately one tenth)
- than lateral still cephalometrics.
- Videofluoroscopy can provide accurate and reliable data if the patient's head remains in a stable position; a consistent speech sample is used that includes the full range of phonemic possibilities in a language.

- Multi view is important to get complete knowledge of the velopharynx as singe view may not provide with reliable information.
- The radiation has to be limited by using narrow radiographic field and the procedure has to be finished in 2 minutes.

Nasoendoscopy:

- Involves insertion of a flexible endoscope through the nose and is positioned above the velum to visualize the nasal surface of the velum, lateral pharyngeal walls, and the posterior pharyngeal wall.
- Proponents of nasoendoscopy report that this technique provides substantial information about patterns of velopharyngeal closure. The relative contributions of velum and pharyngeal walls and the symmetry of palatal and pharyngeal wall movement during velopharyngeal closure,
- It can be also used to diagnose occult submucous cleft palate.
- It allows for the identification of small velopharyngeal gaps and the exact location of the gap.
- It does not require a radiologist to perform the test, any well trained member of the tea, especially surgeon or speech therapist can perform this test.
- The only limitation is that it may be difficult to perform in young children due to limited compliance.

Treatment Indications for VPI Based Upon Findings at Nasendoscopy

➡ Superior Pharyngeal Flap
- good lateral wall movement
- moderate to large defect

➡ Sphincter Pharyngoplasty
- poor lateral wall movement

➡ Furlow (double opposing Z-plasty) Palatoplasty
- small defect
- occult or small submucous cleft palate

Pushback Palatoplasty

- moderate to large defect if combined with superior flap
- small defect if isolated procedure

Nonsurgical (palatal lift device)

- surgical contraindication
- patient request
- training device for borderline/ marginal VPI

Table 15-5. Treatment Indications for VPI based on findings at nasendoscopy. Adapted from "Posterior Pharyngeal Flaps," by C. Forrest, P. Klaiman, and A. in Losee JE, Kirschner RE (Eds.), Comprehensive Cleft Care. New York: McGraw-Hill Medical, 2009.

Non-Surgical Management

- A speech bulb/obturator is an acrylic prosthesis used for closing residual velo-pharyngeal gaps to achieve closure when there is inadequate tissue.

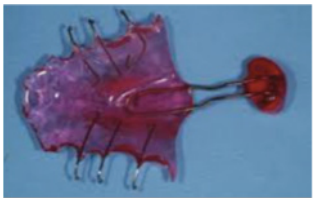

Figure 15-5. Obturator with speech bulb.

SURGICAL MANAGEMENT

- Lengthen the palate: Double opposing Z plasty, Pushback with buccal flap, Intravelar veloplasty.
- Reduction of static VP port opening: Pharyngeal flaps, pharyngo-plasty.

Double opposing Z plasty

- Technique discussed details in Chapter 11, but the general guide-lines for using double opposing Z plasty for VPI are as follows:
  1. The surgeon is comfortable in performing this surgery as pri-mary operation.
  2. On videofluroscopy, the residual VP gap is less than 8-10 mm
  3. The patient is a high risk for OSA
  4. On nasoendoscopy, the velar closing ratio is 80-99%.

Figure 15-6. Operative sequence of double opposing z-plasty. Oral incisions (solid) and nasal incisions (dashed) (A). Elevation of left side posteriorly based oral myomucosal flap and right side anteriorly based oral mucosa flap (B). Nasal mucosa cut to create left side anteriorly based nasal mucosa flap and right side posteriorly based nasal myomucosal flap (C). © 2017 A Campbell, C Restrepo

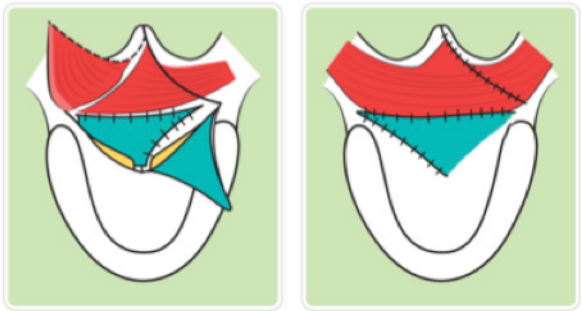

Figure 15-7. Rotation and inset of flaps for closure of nasal mucosa (A) and oral mucosa (B). © 2017 A Campbell, C Restrepo

Intravelar veloplasty

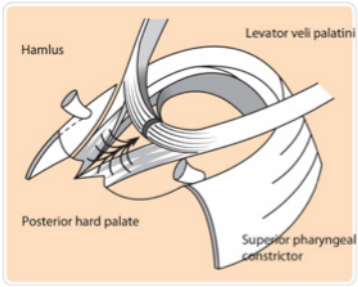

Figure 15-8. Retropositioned levator veli palatine after dissection, mobilization and repair during intravelr veloplasty. © 2017 A Campbell, C Restrepo

- Dissection, retroposition, and repair of levator veli palatine muscles under gentle tension. At the completion of the veloplasty an anatomic sling should be visualized definitelvely incorporating both levator veli palatine muscles.
- Utilized when suspected or known history of previous surgery where veloplasty was not attempted, and by surgeon experienced in performing this surgery as primary operation. Residual VP gap should not be more than 5-8 mm.

Palatal pushback with bilateral buccal myomucosal flap(s):

- Palatal pushback with interposition of buccal flaps to fill the defect that is created and provide nasal and orl lining.

- This technique should be used in case with good velar movement but visibly short length. This technique can be used to treat VPI in patients with residual VP gap of upto 10-12 mm.
- A through-and -through transverse incision is placed at the junction of hard and soft palate from one side Hamulus to other side to create a diamond shaped defect. The velum "falls back" after this incision.
- The buccal flaps are designed to be at least 15-20 mm wide and extending up to the oral commissure. The flaps are myomucosal flaps incuding buccinator muscle for blood supply.
- Flaps must be designed at the occlusal plane, inferior to the opening of Stenson's duct to avoid injury. Care must be taken not to dissect too deep as this may result in facial nerve injury.
- One flap is sutured to the nasal layer, and contralateral flap inset into the oral layer for two layer clossure and mucosal coverage sides.
- The cheek wounds are closed primarily. The flap for oral lining will be twisted and sutures are not placed too close to the base of the flap so as to maintain a good blood supply.

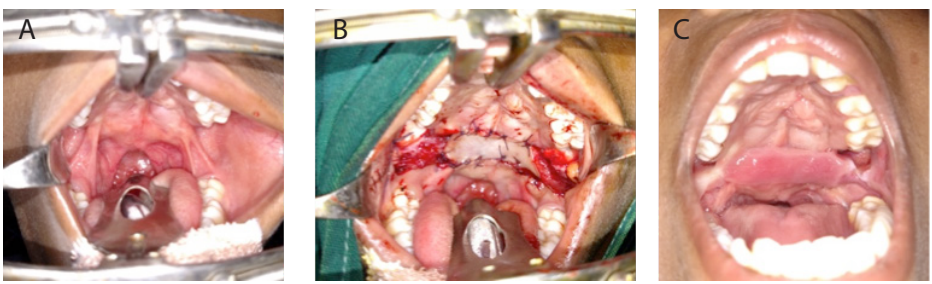

Figure 15-9. Short palate (A) treated with palatal pushback and bilateral buccal flaps for nasal and oral layers (B) with final result demonstrating elongated palate and well healed flaps (C). Photos by G Deshpande.

- Advantages:
  - Simple technique
  - Does not cause obstructive sleep apnea
  - Donor site closed primarily without morbidity.
  - Good technique on humanitarian missions where adequate intensive care facilities are not available for monitoring pharyngeal flaps.

- In the case of poor velar movement an intravelar veloplasty should be performed.

Pharyngeal Flaps:

- The aim of the pharyngeal flap procedure is to create a central subtotal velopharyngeal obstruction with 2 small lateral ports remaining for nasal airflow. This is a static way to limit the air escape through nose.
- Gustav Passavant in 1865 performed the first VPI surgery when he sutured the soft palate to the posterior pharyngeal wall. Karl Schoenborn in 1875 was the first to perform the inferiorly based pharyngeal flap in a 17-year-old female with unrepaired cleft palate. However, he shifted to superiorly based flaps as he found it technically difficult to suture due to fragile adenoid tissues.
- The Superior Constrictor is a curved quadrilateral sheet of muscle encompassing the nasopharynx and upper oropharynx, and the thinnest of the three constrictor muscles. It originates from the posterior pharyngeal raphe and runs laterally and anteriorly to insert into the medial pterygoid palate and hamulus superiorly, and the pterygomandibular raphe and mandible inferiorly. Contraction of the superior constrictor muscle results in the medial and anterior movement of the lateral pharyngeal walls.
- The palatopharyngeus muscle forms part of the palatopharyngeal arch and is composed of two fasciculi that lie in the same plane but are separated by the levator veli palatine. These two layers unite at the posterolateral border of the soft palate and run downwards and lateral to form an internal incomplete muscle layer in the pharyngeal wall.
- Passavant's ridge is a thickened band of muscle on the posterior pharyngeal wall, seen at the level of the soft palate when the soft palate is elevated. Controversy exists as to whether this represents a separate distinct muscle (Passavant's muscle), or whether it is a part of the superior constrictor and palatopharyngeus muscle. This is also the site of the change from columnar ciliated respiratory epithelium of the nasopharynx to the stratified squamous epithelium of the oropharynx.
- Lateral movement of pharyngeal walls is caused by contraction

of superior constrictor and palatopharyngeus, which form hemi sphincters. After elevating pharyngeal flaps, this movement may be reduced due to the disruption of transverse fibres of these muscles.

- The primary blood supply to these flaps come from ascending pharyngeal artery.
- Inferiorly based flaps have the advantage of better vascularity but are used less frequently due to limitations on length, low position of the base in the pharynx, and friable adenoid tissue. .
- Superiorly based flaps are designed to be relatively wide according to the pattern of velopharyngeal closure, are best if lined with nasal mucosal flaps, and sutured in place with a catheter throgh the lateral port on either side to control the size of lateral ports.

Key Tip: Patients with velocardiofacial syndrome often have anamalous and medial displaced carotid and vertebral arteries, which could easily be severed during surgery of the posterior pharynx. MRA should be performed in all velocardiofacial syndrome patients prior to pharyngeal flap surgery to identify high-risk cases.

Superior pharyngeal flap:

- The patient is intubated with an oral RAE tube and a bolster placed under the shoulder. Dingman retractor is placed.
- The anaesthetist may place the throat pack using laryngoscope, such that it does not interfere with the surgery.
- The posterior pharynx is palpated for aberrant vessels.
- The flap is marked out with its base located at the adenoid pad and correlating to the anterior tubercle of the first cervical vertebrae.
- The average flap width is 2-3 cm; wider flaps are used if the lateral pharyngeal wall movement is poor. The length depends on tension free insetting of the flap.
- The posterior pharyngeal wall and the soft palate are

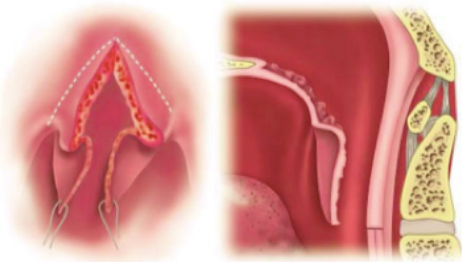

Figure 15-10. Soft palate split and nasal mucosa flaps raised.

infiltrated with xylocaine 1% with 1:100,000 epinephrine.

- The soft palate is split in the middle using No. 11 blade from the back of the hard palate till the tip of the uvula.
- The tip of uvula can be retracted using suture. This also aids in better exposure of the pharyngeal flap.
- Triangular or rectangular flaps of nasal mucosa based along the free posterior edge of the soft palate are marked out and raised at a submucosal level using a No.15 blade or fine dissecting scissors. The length of these flaps should be equal to the depth of the palate. Once elevated, they can be retracted away using suture ties.
- The pharyngeal flap is incised and dissection proceeds through the superior constrictor and palatopharyngeus muscle to the prevertebral fascia, which is characterized by its avascular appearance.
- The flap is stabilized with a tie and mobilised completely to the base for a tension free closure.
- A brisk bleeding may be encountered from the posterior pharyngeal veins, which can be easily controlled using cautery.
- The donor site is closed primarily to reduce discomfort and postoperative risk of infection and bleeding. During the closure, bites are taken through the prevertebral fascia to prevent webbing and narrowing of the pharynx, and to decrease deadspace and risk for hematoma.
- The flap is inset using a 5-point su-

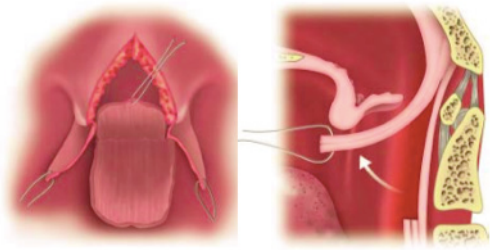

Figure 15-11. Superiorly based pharyngeal flap elevated from posterior pharyngeal wall. © 2017 A Campbell, C Restrepo

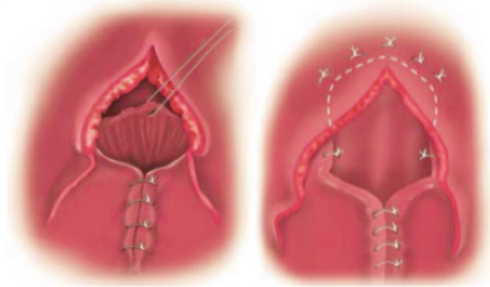

Figure 15-12. Donor site closed primarily and flap inset into nasal surface of soft palate. © 2017 A Campbell, C Restrepo

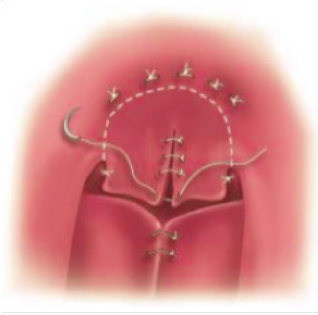

Figure 15-13. Closure of soft palate after inset of nasal flaps to line raw surface of pharyngeal flap. © 2017 A Campbell, C Restrepo

turing, where one stitch is placed to position the lateral extent of each side of the flap, one stitch in the midline, and bilateral sutures placed in between these points.

- Nasaopharyngeal airways (NPA) can be placed on each side to adequately sie the lateral ports.
- The two nasal flaps are sutured in the midline and the tips of these flaps are then sutured to the prevertebral fascia in the midline at the base of the pharyngeal flap. This lines the raw under surface of the pharyngeal flap.
- The surgery ends with hemostasis, careful removal of the mouth gag and throat pack. The NPA's are removed on second post-operative day. Antibiotics and analgesics are prescribed as per the

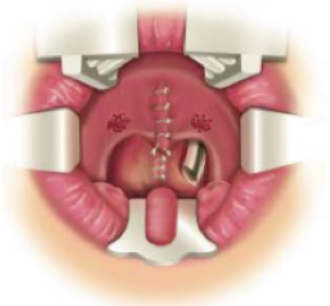

Figure 15-14. Final closure with nasopharyngeal airway in place. © 2017 A Campbell, C Restrepo

Complications:

Early Complications	Late complications
- Airway compromise	- Obstructive sleep apnea
- Haemorrhage	- Hyponasality
- Infection	- Residual VPI
- Flap dehiscence	
- Aspiration/ pneumonia	

- Following pharyngeal-flap surgery, the airway is relatively unprotected immediately following extubation, and aspiration of blood should be watched for. Judicious suctioning, head elevation, and careful observation are indicated in the first 24 hours following surgery.
- Care must be taken to keep the airway patent. Chances of complete stenosis of the airway are rare but possible. The NPA's secured in place will keep lateral ports open and prevent this complication.
- Partial or complete separation of the flap from the palate has been reported in up to 7% of cases.
- Residual postoperative VPI may result from a flap being too narrow or placed too low, either by faulty design, or as a result of posto-

perative shrinkage.

- Witt et al. (1998) found that 20% of patients following pharyngeal flap or sphincter pharyngoplasty required revisionary surgery for residual VPI occurring primarily as the result of flap dehiscence.
- Virtually all patients snore following the placement of a superior pharyngeal flap. Obstructive sleep apnea, however, is a recognized problem occurring in up to 38%of cases immediately following pharyngoplasty surgery. The preoperative identification of potential risk factors for sleep apnea mandates a preoperative sleep study. These potential risk factors include snoring, the history of Pierre Robin Sequence, and non-cleft (neuromuscular) causes of VPI. Postoperative OSA may be managed by nasal continuous positive airway pressure, but may require takedown or modification of the flap.

Sphincter Pharyngoplasty:

Indications:

- Large central gap
- Adynamic VP
- Coronal gap
- Bow-tie gap

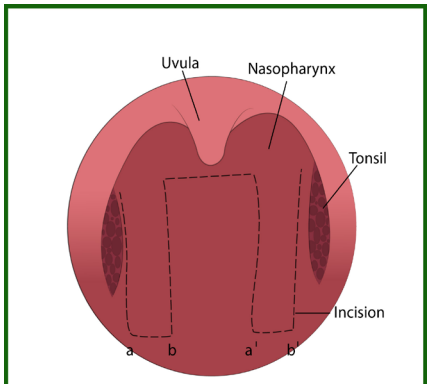

Figure 15-15. Design of sphincter pharyngoplasty. © 2017 A Campbell, C Restrepo

- In order to harvest the posterior tonsillar pillar, tonsillectomy is performed at least 3 months prior to the planned pharyngoplasty. Adenoidectomy is also performed to attain a stable bed for repositioning of the posterior tonsillar pillars.
- The patient is intubated with an RAE tube and Dingman retractor placed. A bolster is placed under the shoulder and patient is positioned in a mild Trendelenburg's position to improve visualization.
- The posterior pharyngeal wall is palpated for pulsations.
- The site for insertion is selected by a pre-operative video fluoroscopy. 1% Xylocaine with 1:100,000 epinephrine is injected into this site.
- A Foley catheter is inserted into one nostril and is passed until seen in the pharynx. It is then clamped and passed below the Dingman

retractors bar and secured. This maneuver aids in displacing the velum ventrally and provides with a clear view of the posterior pharynx.

- Traction sutures can be placed in the posterior pharyngeal wall and the site is injected with 1% Xylocaine with 1:100,000 epinephrine.
- The junctional mucosa between the ventral surface of posterior tonsillar pillar and tonsillar fossa is incised using No.12 blade. The beak of the blade makes it very convenient to place the incision.
- A curved scissor is inserted into the mucosal incision and spread separating the palatopharyngeus muscle from the tonsillar bed in continuity with the overlying mucosa of the posterior tonsillar pillar.
- A unipedicled, superiorly based, myomucosal flap is developed, whose length is equal to the transverse width of the insertion site.

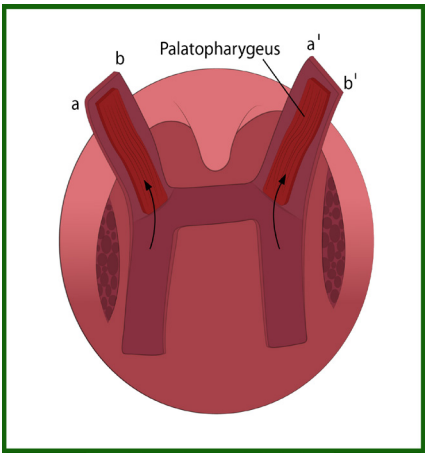

Figure 15-16. Elevation of palatopharyngeus myomucosal flaps.
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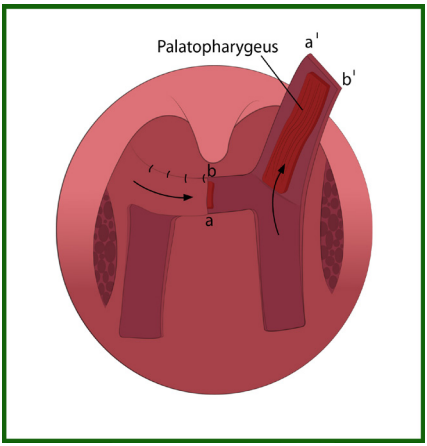

Figure 15-17. Inset of flaps into transverse posterior pharyngeal wall insertion site. © 2017 A Campbell, C Restrepo

- The superior aspect of the flap is preserved and the inferior aspect divided.
- A curved scissors is then used to transect the flap mucosa where the posterior aspect of the pillar joins the posterior pharyngeal wall.
- The flap is then elevated until the level of the transverse posterior pharyngeal wall insertion site is reached.
- The same procedure is then repeated for the opposite posterior tonsillar pillar. Haemostasis is achieved using cautery.

- The mucosa of the transverse posterior pharyngeal wall insertion site is cut, using a #12 blade. Care is taken to only cut the mucosa with a minimum of the underlying muscle.
- This transverse posterior pharyngeal wall insertion site incision is connected to the superior aspects of each lateral posterior pillar myomucosal flap donor site incisions, resulting in a final incision shape of a "U."
- The posterior pillar flaps are then rotated 90" and inset into the posterior pharyngeal wall mucosa defect and to each other in an overlapping Z pattern.
- The medial myomucosal edge of the left pillar flap is sutured to the superior myomucosal edge of the posterior pharyngeal wall incision; the lateral myomucosal edge of the left pillar flap is sutured to the medial myomucosal edge of the right pillar flap; and then the lateral myomucosal edge of the right pillar flap is sutured to the inferior myomucosal edge of the posterior wall incision.
- Donor sites closed primarily.
- After suturing, the tension on the catheter is released and the remaining defect in the posterior pharyngeal wall is sutured.
- The Dingman is now removed and the patient shifted to recovery for close monitoring of the airway.

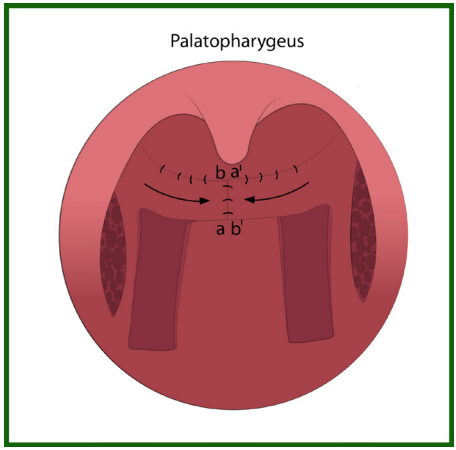

Figure 15-18. Final inset sphincter pharyngoplasty.

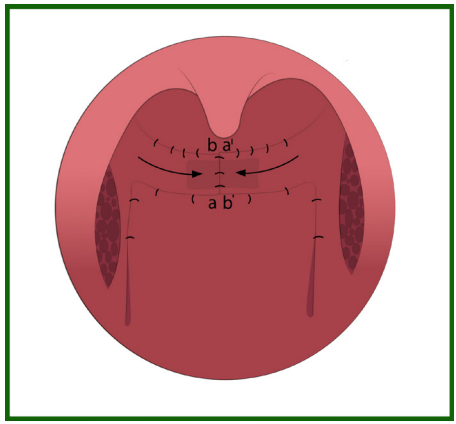

Figure 15-19. Donor sites closed primarily.

KEY READING

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