4-26-2017

OSA and Primary Snoring: Palatal Surgery and Office-Based Procedures

Adam Vasconcellos, MD
Department of Otolaryngology- Head and Neck Surgery, Thomas Jefferson University Hospital

OSA and Primary Snoring: Palatal Surgery and Office-Based Procedures

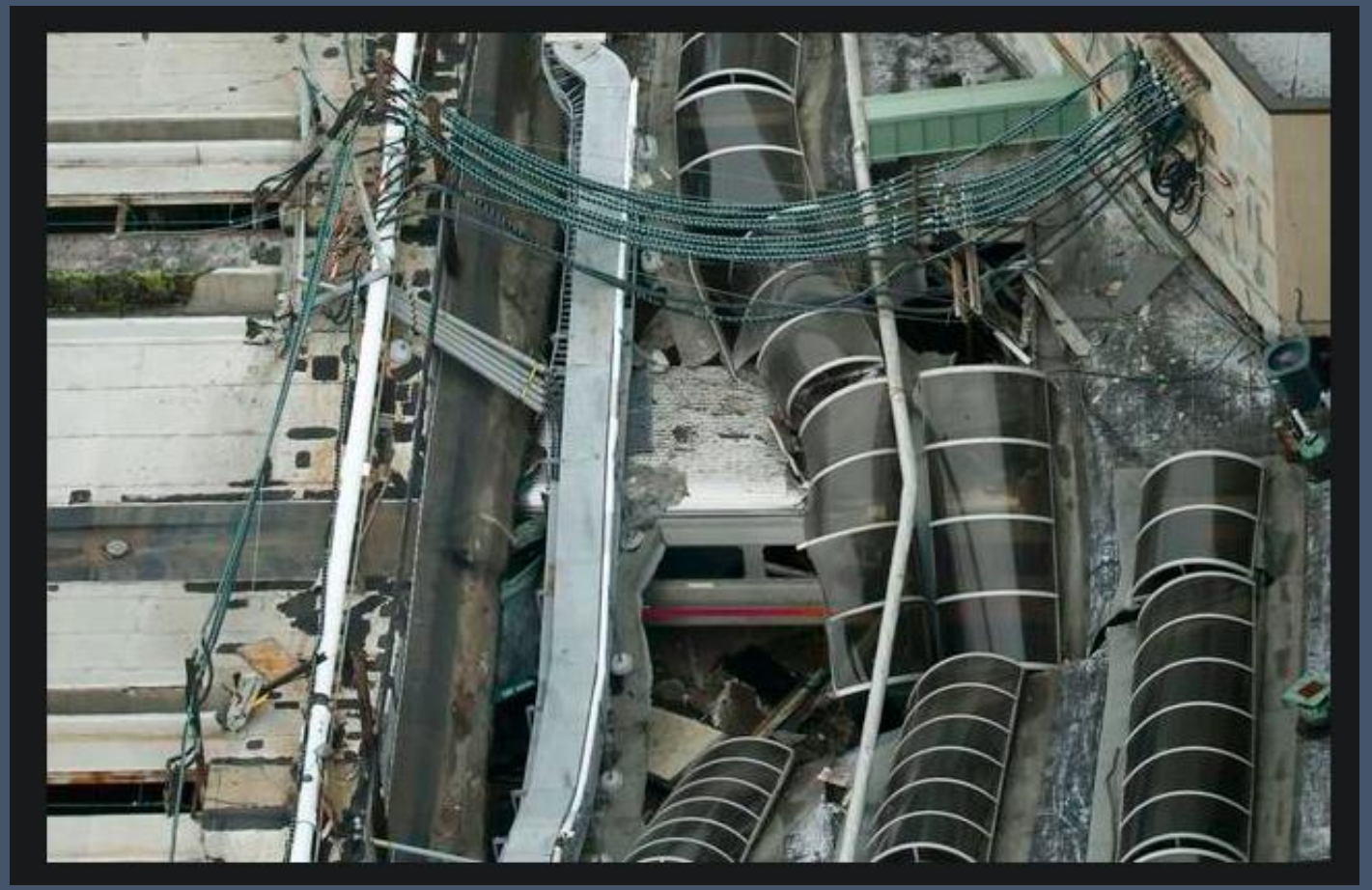
Adam Vasconcellos, MD
Department of Otolaryngology, Head & Neck Surgery
Thomas Jefferson University Hospital

April 26, 2017

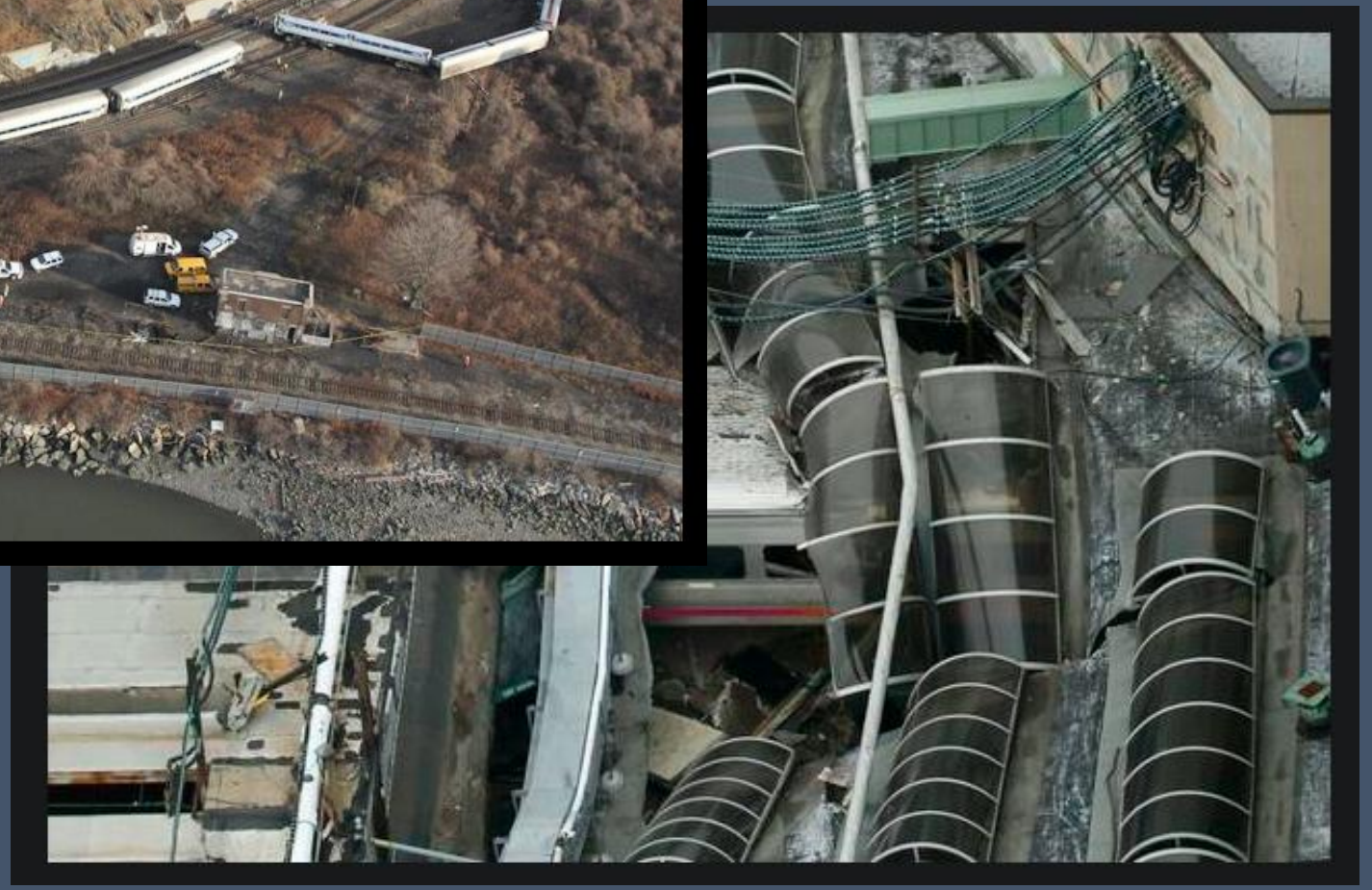
Jefferson
HEALTH IS ALL WE DO

Disclosures

- None



Jefferson
HEALTH IS ALL WE DO



Jefferson
HEALTH IS ALL WE DO

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

The Association between Sleep Apnea and the Risk of Traffic Accidents

J. Terán-Santos, M.D., A. Jimenez-Gomez, M.D., J. Cordero-Guevara, M.D., and *the Cooperative Group Burgos–Santander

N Engl J Med 1999; 340:847-851 | March 18, 1999 | DOI: 10.1056/NEJM199903183401104

- Case population N = 102 drivers receiving emergency care after accidents
- Control pop n = 152 from primary care centers, matched age/sex
- Mean age 44, men 77%
- AHI 10+ = OR 6.3 of traffic accident

Teran-Santos 1999

Jefferson
HEALTH IS ALL WE DO

The Science of Sleep

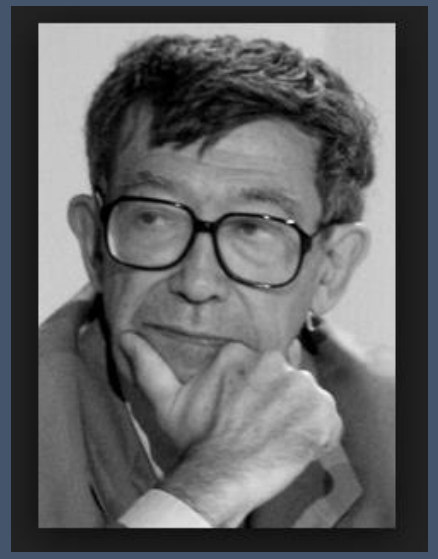
- 1836: Charles Dickens “The Pickwick Papers”

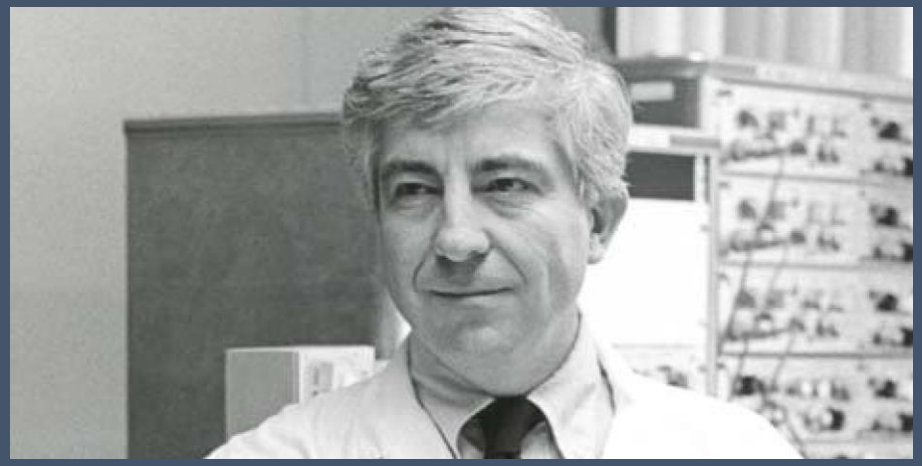
- Late 1800s: Doctors began to lump sleep apnea syndromes together using the term “Pickwickian Syndrome”

- 1960s: multiple reports to suggest that obesity is not essential for sleep related breathing problems

The Science of Sleep

Christian Guilleminault





William Dement

- 1970 – first sleep clinic established at Stanford
- Observed correlation of prolonged pauses (apneas) in sleep with blood pressure rises
- Guilleminault documented reversal of cardiac arrythmias, HTN with tracheostomy
- Defined OSAS and later, AHI

Jefferson
HEALTH IS ALL WE DO

The Science of Sleep

- 1978: Remmers et al: obstruction in apnea commonly at level of soft palate / oropharynx, not the larynx

- 1980: Colin Sullivan applied positive pressure air via nasal passages to a patient with severe OSAS

Jefferson
HEALTH IS ALL WE DO

The Promise of Sleep

- General well-being
- Insulin metabolism
- Cardiovascular health
- Cognitive functioning

Jefferson
HEALTH IS ALL WE DO

The Plan

What I'll cover:

- OSA and Primary Snoring
- Anatomical Sites of Obstruction
- DISE Interpretation
- Minimally Invasive Techniques for Primary Snoring
- Palatal Surgery for OSA

The Plan

What I'll cover:

- OSA and Primary Snoring
- Anatomical Sites of Obstruction
- DISE Interpretation
- Minimally Invasive Techniques for Primary Snoring
- Palatal Surgery for OSA

Not for today

- Upper Airway Stimulation
- Extra-Palatal Sites of Intervention
- Kids
- CPAP

Jefferson
HEALTH IS ALL WE DO

The Stats on OSA

- Dx Criteria (ICSD-2):
  - ≥ 5 / hour resp events
    - Apnea, Hypopnea, or RERA
  - Respiratory effort
  - Symptoms

  - ≥ 15 / hour resp events
  - Respiratory effort
  - No symptoms

- Estimated 5-10% of US population
- Higher prevalence:
  - Male gender
  - BMI >30
  - Age 40+
  - Neck circumference >17in male, >14.5in female
- Comorbid Conditions:
  - HTN, smoking, ETOH, anatomic characteristics (i.e. retrognathia, tonsillar hypertrophy), family history

Typical Patient Presentation

- Daytime fatigue
- Waking up at night
- Ultimatum from a bed partner
  - Reports of apnea
  - Snoring
- Can’t deal with this:

Jefferson
HEALTH IS ALL WE DO

Typical Patient Presentation

- Daytime fatigue
- Waking up at night
- Ultimatum from a bed partner
  - Reports of apnea
  - Snoring
- Can’t deal with this:

- CPAP Compliance: 4 hours/night 5 nights/week
  - Est 50-70% noncompliance
  - Nasal congestion
  - Facial discomfort
  - Air leaks
  - Abdominal bloating
  - Claustrophobia
  - Social
- Many are never referred to us…

Jefferson
HEALTH IS ALL WE DO

Patient Workup

- In-office exam of anatomical sites of obstruction
- Polysomnography (if not already performed)
  - CPAP Trial
- Drug Induced Sleep Endoscopy (DISE)

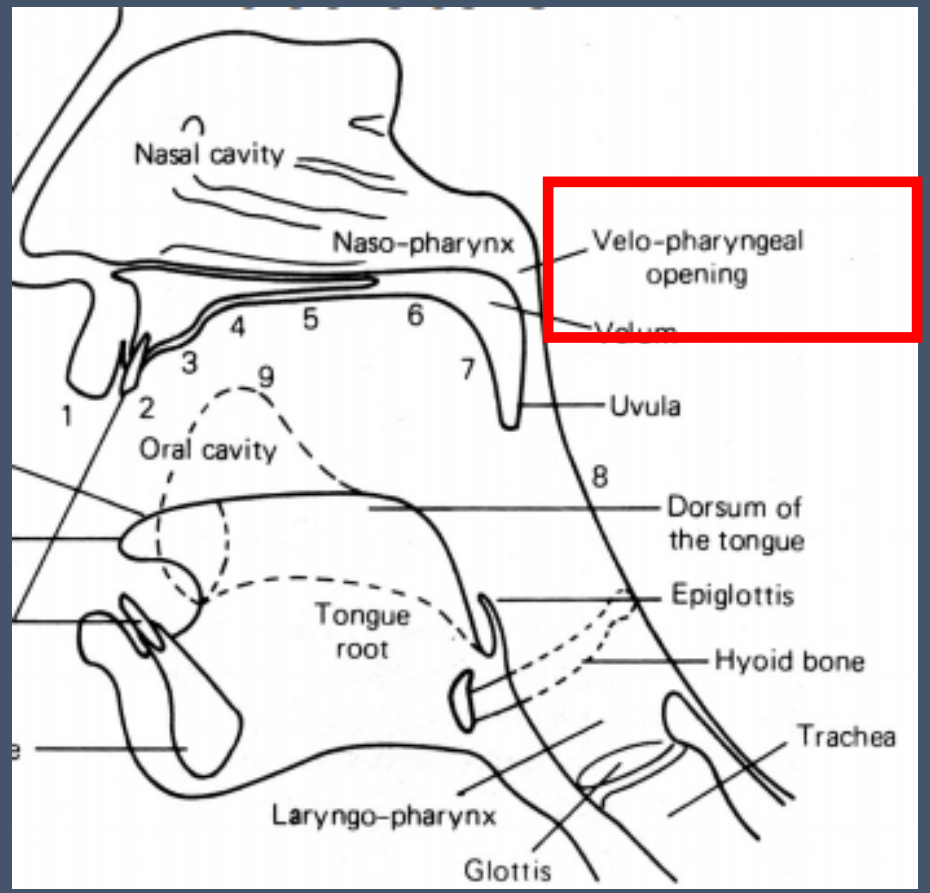
Anatomical Sites of Obstruction

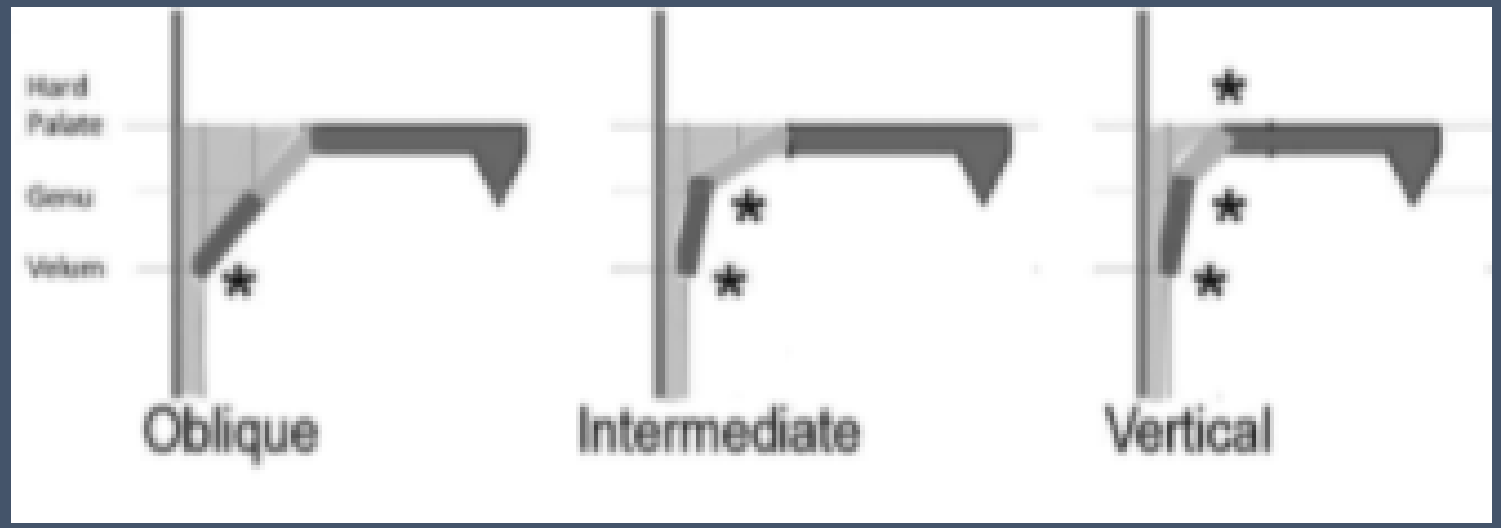
- Nasal
- Velum
- Oropharynx
- Tonsils
- Tongue Base
- Epiglottis

Anatomical Sites of Obstruction

- Nasal
- Velum
- Oropharynx
- Tonsils
- Tongue Base
- Epiglottis

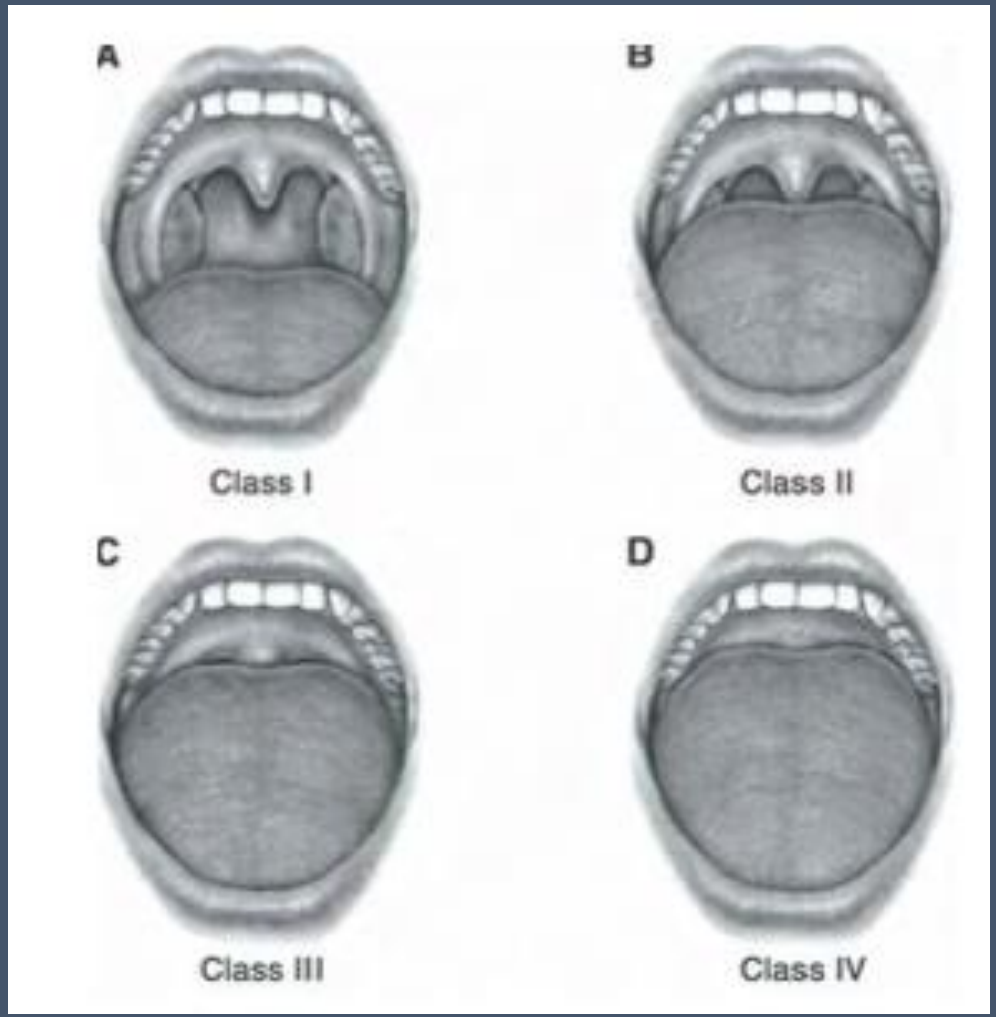
Anatomical Sites of Obstruction: Velum





Anatomical Sites of Obstruction: Oropharynx

Friedman classification: tongue in neutral position

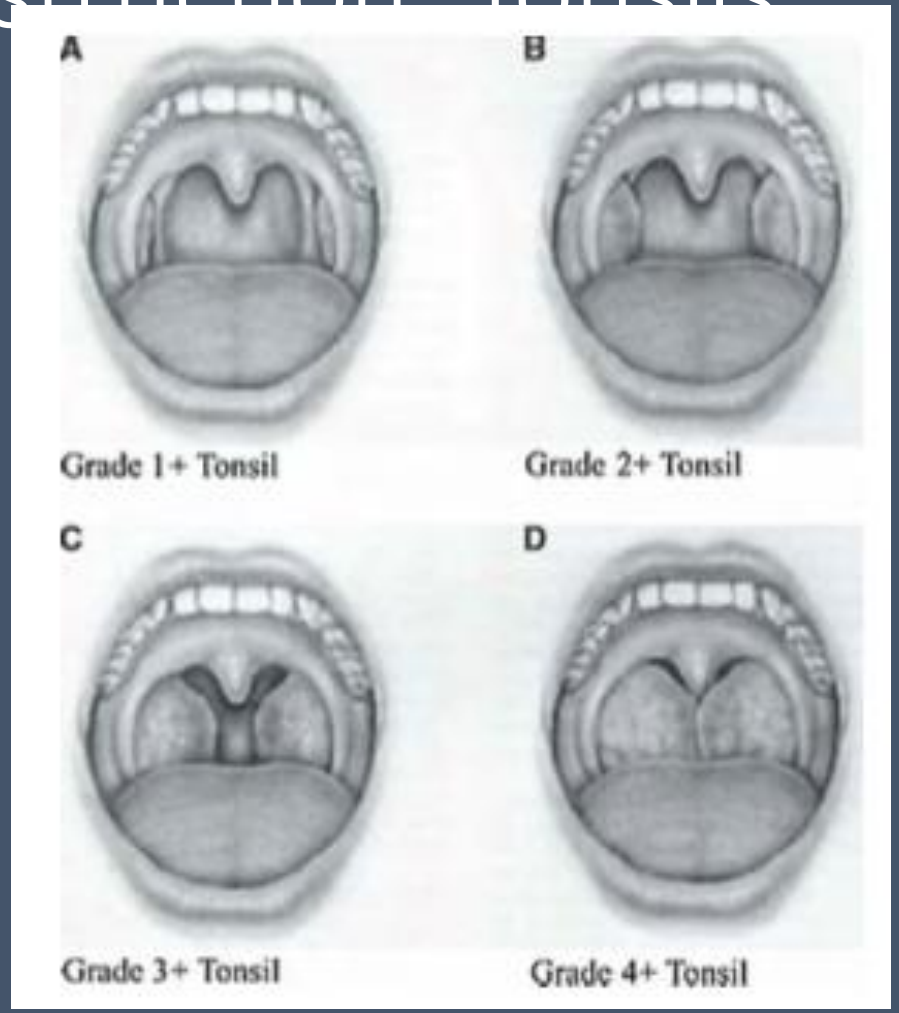


Friedman 2004

Jefferson
HEALTH IS ALL WE DO

Anatomical Sites of Obstruction: Tonsils

- Classification of Tonsil Size



Friedman 2004

Jefferson
HEALTH IS ALL WE DO

Modified Friedman staging system

	Friedman Palate Position	Tonsil Size	BMI
Stage I	1	3, 4	<40
	2	3, 4	<40
Stage II	1, 2	1, 2	<40
	3, 4	3, 4	<40
Stage III	3	0, 1, 2	<40
	4	0, 1, 2	<40
Stage IV	1, 2, 3, 4	0, 1, 2, 3, 4	>40
All patients with significant craniofacial or other anatomic deformities.			

BMI = Body Mass Index.

Friedman 2004

Drug Induced Sleep Endoscopy (DISE)

- Assist surgeon to develop anatomically focused plan of care
- Anatomical location, severity, pattern of collapse
- Mimics sleep state with real time pulse oximetry
- Not perfect, but it's the best we have

Kohn 2015

Drug Induced Sleep Endoscopy (DISE)

- Assist surgeon to develop anatomically focused plan of care
- Anatomical location, severity, pattern of collapse
- Mimics sleep state with real time pulse oximetry
- Not perfect, but it's the best we have

- Identification of airway sites in need of surgery
- Outpatient selection for snoring treatments
- Adjunct during nasal surgery

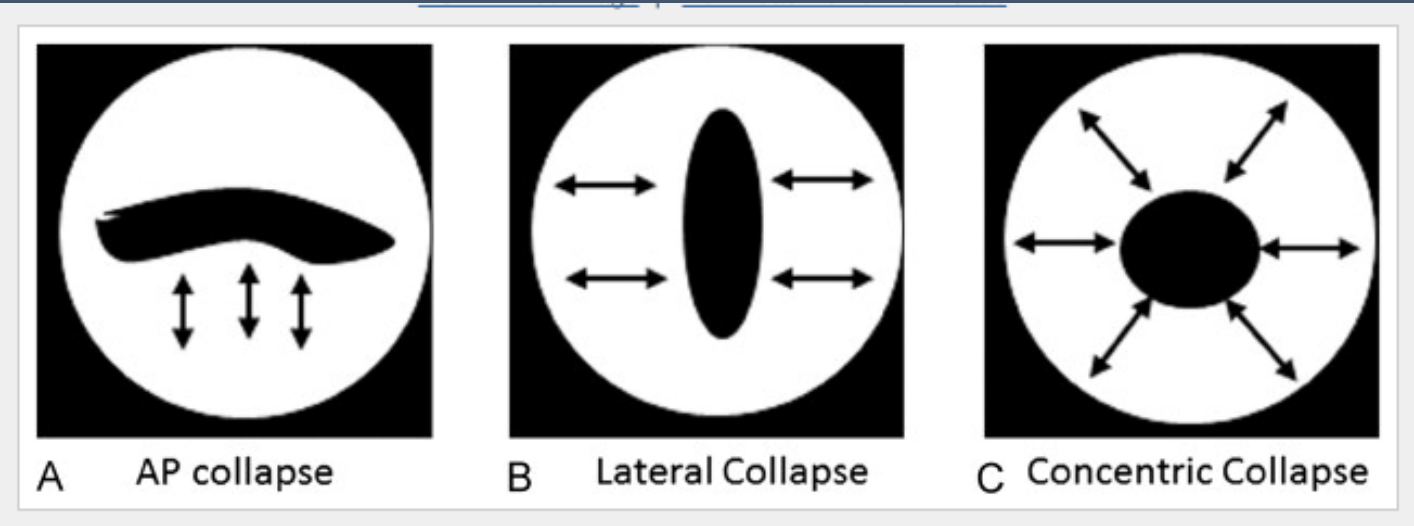
Kohn 2015

Jefferson
HEALTH IS ALL WE DO

Sedation Goals with DISE (Propofol)

- Patient asleep with steady breathing
- Nonarousable to verbal stimuli
- Arousable to sternal rub
- Snoring and apneas with mild desaturations (pulse O2 > 85%)

Patterns of Collapse



- VOTE scoring: no collapse – complete collapse (0-2)
- Indicate predominate type of collapse
- Subsites: velopharynx, oropharynx, tongue base, epiglottis

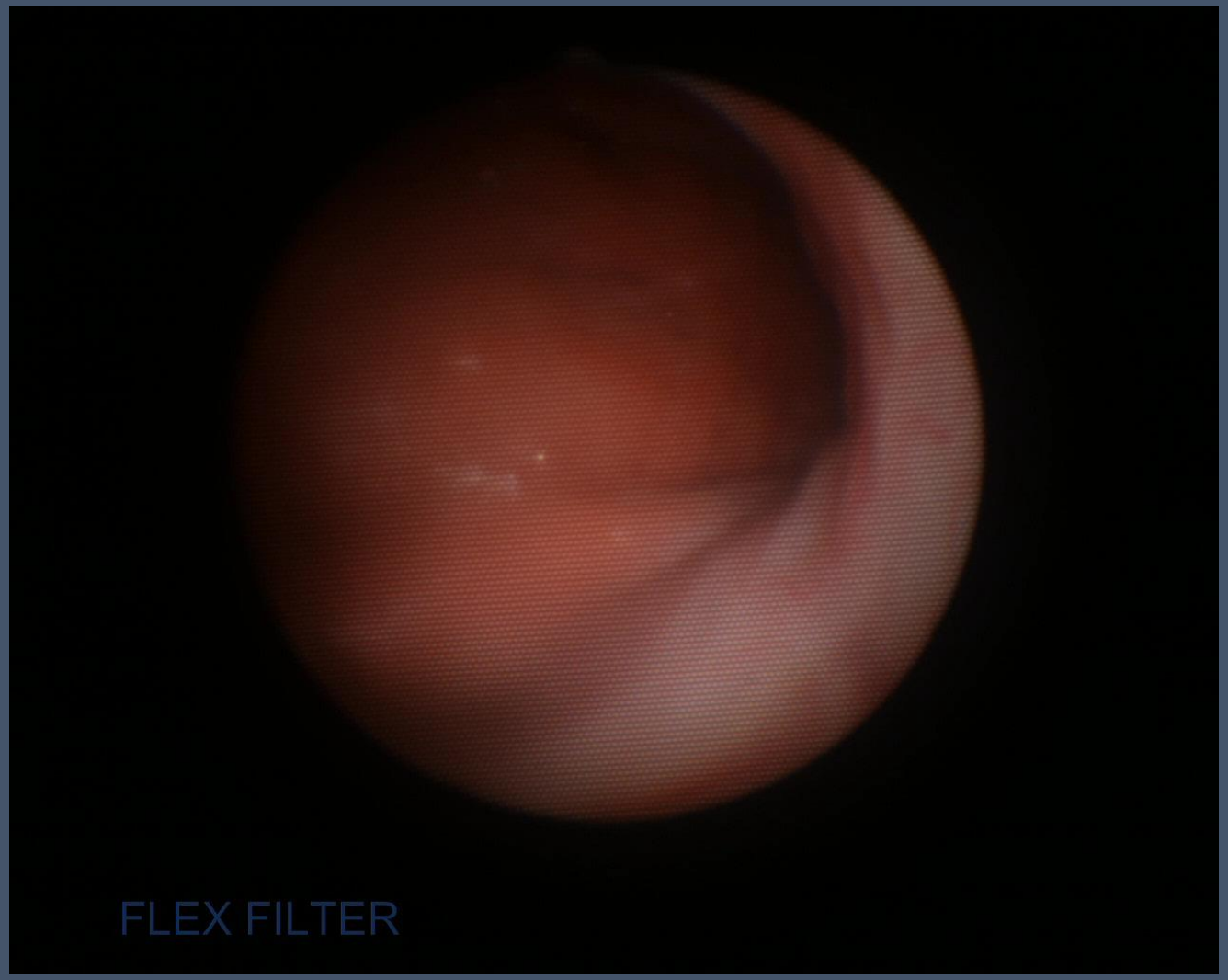
Kohn 2015

Jefferson
HEALTH IS ALL WE DO

AP Collapse of Velopharynx

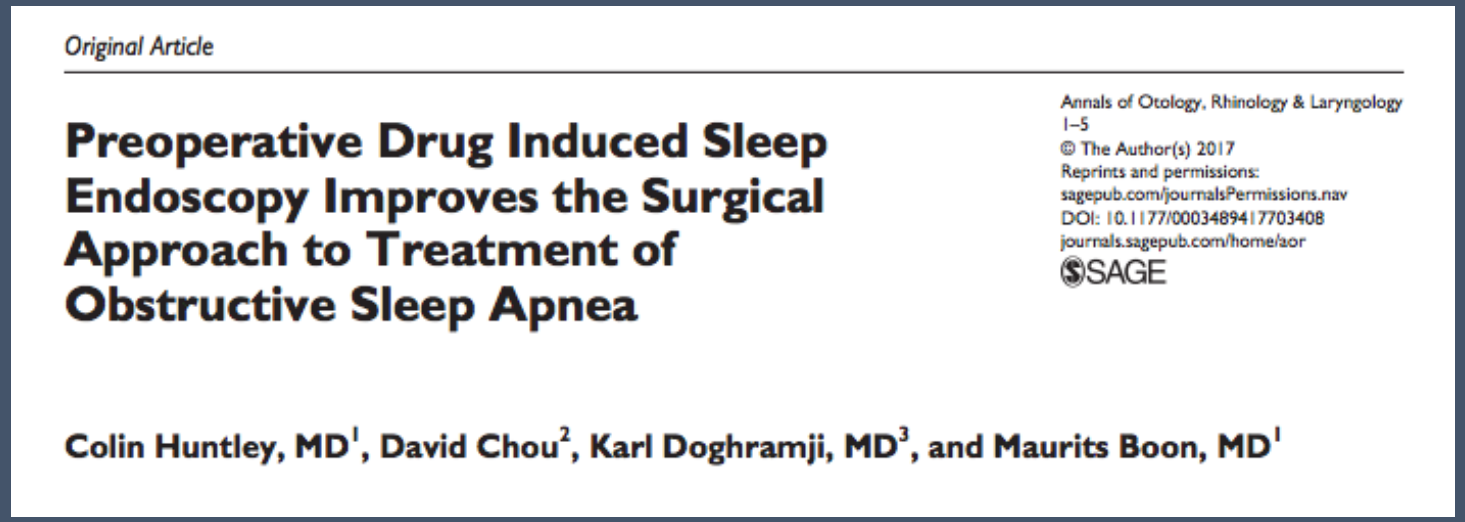
Jefferson
HEALTH IS ALL WE DO

Concentric Collapse of Velopharyx
Lateral Collapse of Oropharynx



Jefferson
HEALTH IS ALL WE DO

DISE Finding	OSA Severity	Possible CPAP Alternatives
Palatal Flutter or Vibration	UARS, mild, moderate, severe	Palatal stiffening
Uvula prolapse	UARS, mild, moderate, severe	Partial uvulectomy
AP partial or total palatal collapse	Moderate-severe	Standard UPPP Inspire
Circumferential partial/total palatal collapse	Moderate-severe	Expansion pharyngoplasty
Tonsil Collapse Lateral oropharyngeal wall collapse	UARS, mild, moderate-severe	Tonsillectomy Expansion pharyngoplasty Oral appliance



Original Article

Preoperative Drug Induced Sleep Endoscopy Improves the Surgical Approach to Treatment of Obstructive Sleep Apnea

Annals of Otology, Rhinology & Laryngology
1–5

DOI: 10.1177/0003489417703408
journals.sagepub.com/home/aor
SAGE

Colin Huntley, MD[1], David Chou[2], Karl Doghramji, MD[3], and Maurits Boon, MD[1]

- N = 87 patients with postoperative polysomnogram results
- Preoperative DISE (n=50): 8% multilevel surgery; 86% success* rate
- No preop DISE (n=37): 59.5% multilevel surgery; 51.4% success rate
- Success = 50% reduction from preop AHI; postop AHI < 20

- ESP: concentric collapse velum
- MMA: maxillary constriction
- Inspire: AP velum collapse
- TORS BOT: lingual tons hypertrophy or epiglottic collapse

Huntley 2017

Jefferson
HEALTH IS ALL WE DO

Office-Based Procedures to Address Snoring

Jefferson
HEALTH IS ALL WE DO

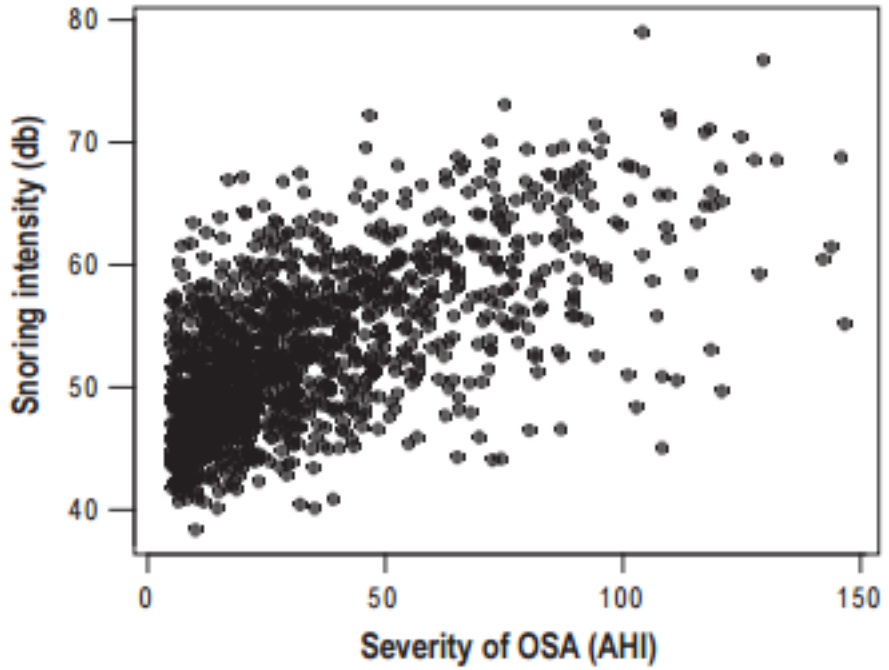
Does Snoring Intensity Correlate with the Severity of Obstructive Sleep Apnea?

Nimrod Maimon, M.D.[1]; Patrick J. Hanly, M.D.[2]

[1]*Department of Medicine, Respirology Unit, Soroka University Medical Center, Ben-Gurion University, Beer-sheva, Israel;*
[2]*Department of Medicine, University of Calgary, Alberta, Canada*

- N = 1643, habitual snorers referred for polysomnography
  - 65% male, mean age 48, mean BMI 30.9
- Snoring intensity (db) increased progressively as AHI increased (r – 0.66, p <0.01)

Figure 1—Correlation between severity of OSA and snoring intensity



Maimon 2010

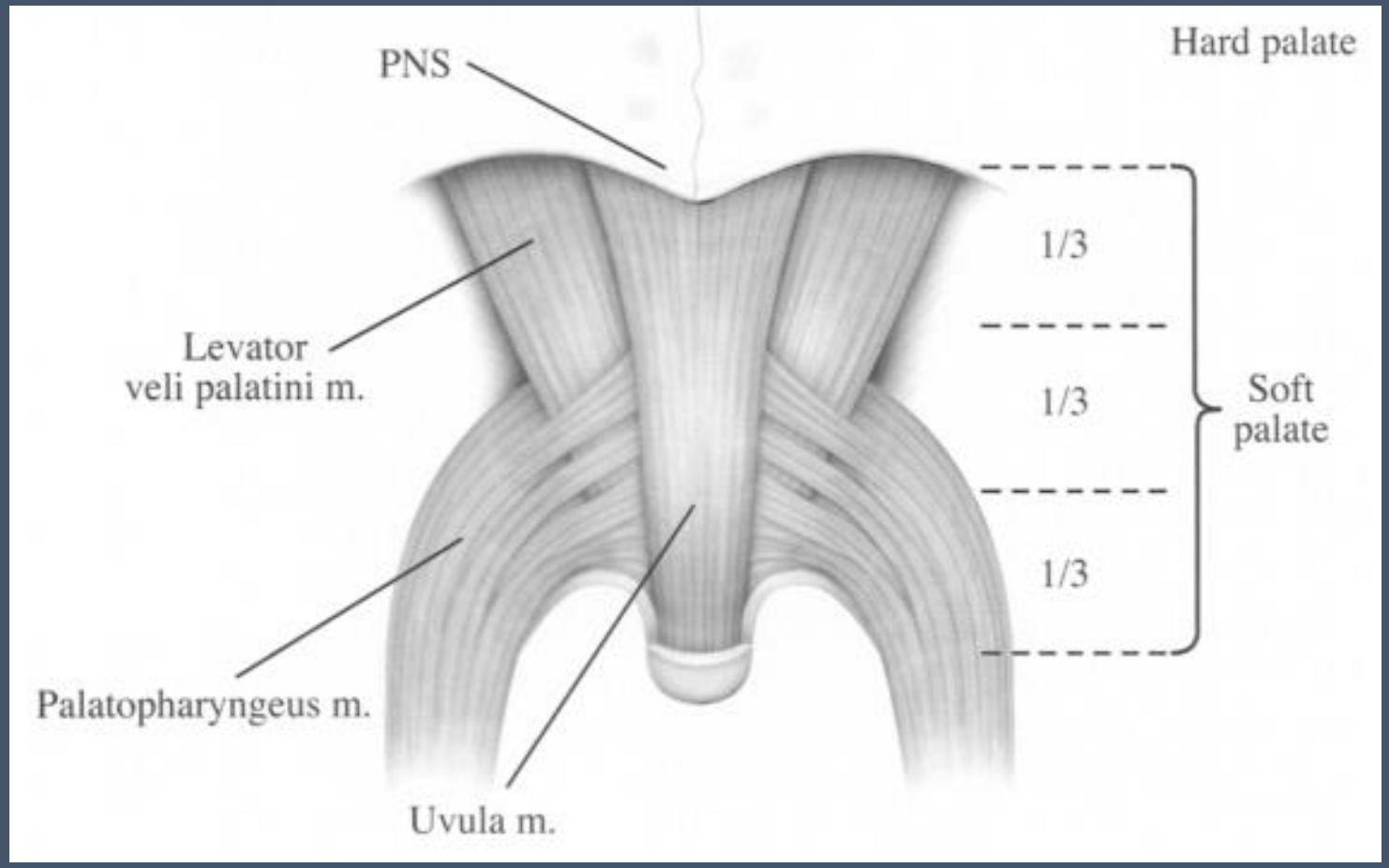
Jefferson
HEALTH IS ALL WE DO

Primary Snoring

- Absence of apneas / hypopneas
- Palatal: 80-85%
- Vibration of soft tissues
- Theme of intervention: stiffen the palate

Jefferson
HEALTH IS ALL WE DO

Muscular Anatomy of the Soft Palate

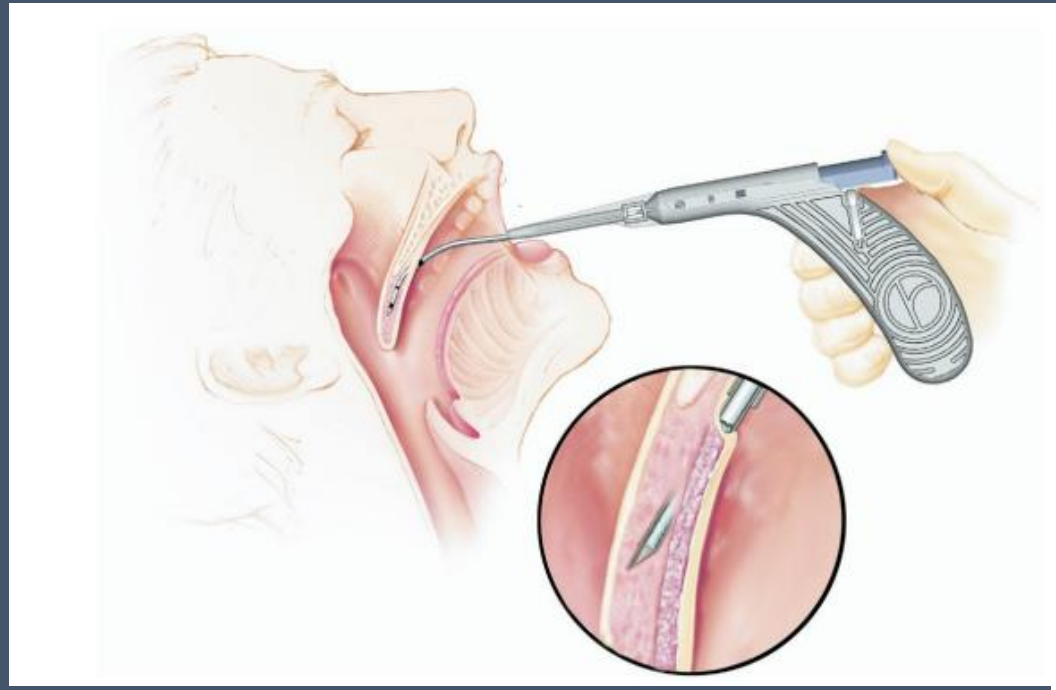


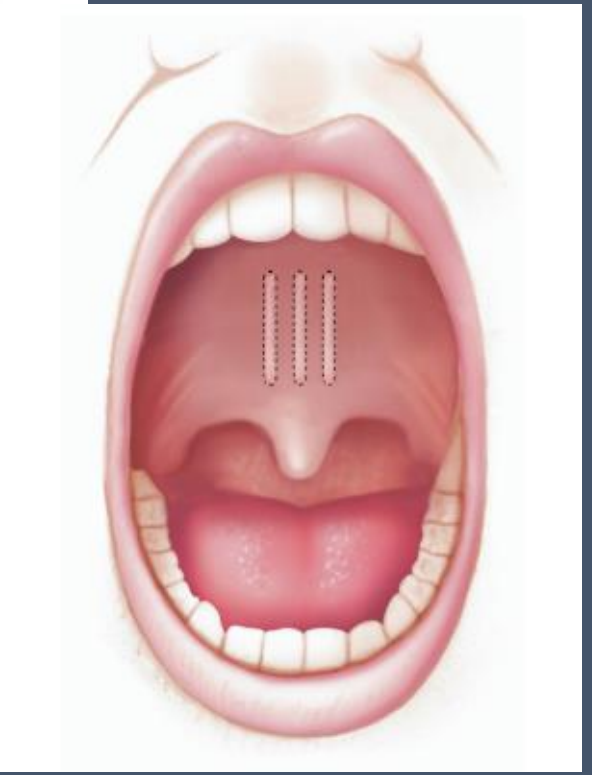
Troell 2000

Jefferson
HEALTH IS ALL WE DO

Pillar Soft Palate Implant

- Primary snoring, mild OSA
- Braided polymer implants
- 18mm x 1.5mm
- Positioned near hard/soft palate junction
- One central, two paramedian





Walker 2006

Jefferson
HEALTH IS ALL WE DO

Radiofrequency Tissue Ablation and Coblation

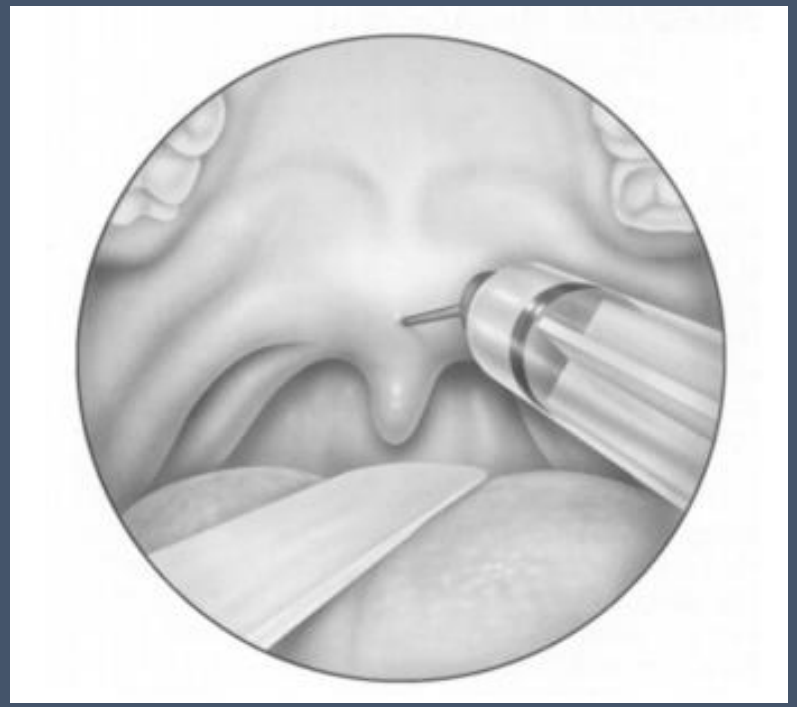
- Primary snoring
- RF energy delivered to palate with 22-gauge needle electrode
- Needle inserted into muscle of soft palate, entry point near junction of hard palate
- Coblation
- One central, two paramedian

Troell 2000

Jefferson
HEALTH IS ALL WE DO

Injection Snoreplasty

- Primary snoring
- Soft palate sclerotherapy
- 3% sodium tetradecyl sulfate, now ethanol used as well
- Single midline submucosal plane 27g needle, middle soft palate
- Expected mucosal sloughing, scarring to develop over 4-6 weeks
- Reinjection: paramedian



Brietzke 2002

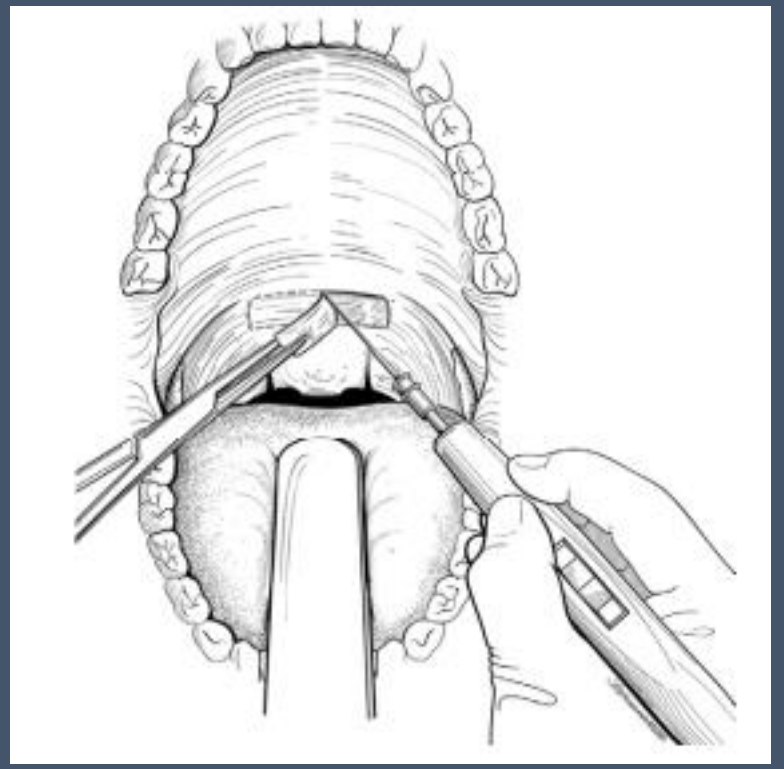
Office-Based Procedures

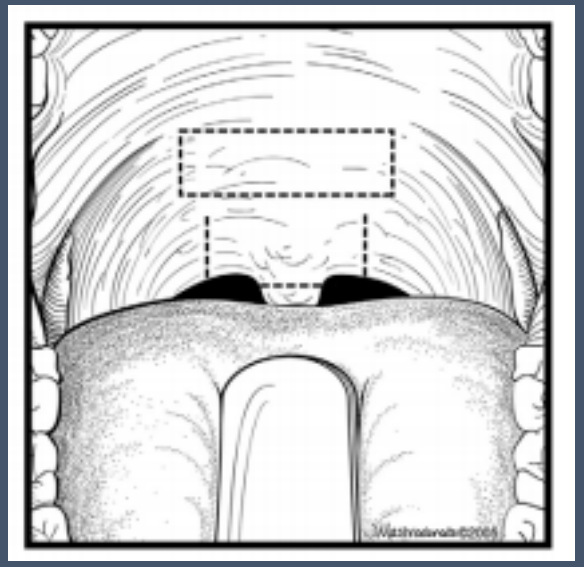
- Local anesthesia
- Less pain
- Reported efficacy of approximately 80%
- Good candidates: obliquely oriented palate; long transverse distance between posterior pillars
- Standalone, or adjuncts

- Cost – Primary Snoring
  - $300 Injection Snoreplastly
  - $1500-$2200 for Pillar implant
- RF: mucosal ulceration
- Injections: mult treatments possible
- Pillar: risk extrusion (3-30%)
- Minimal if any effect on AHI
- Minimal if any aid with CPAP tolerance

Anterior Palatoplasty (Modified Cautery-Assisted Palatal Stiffening)

- AP collapse, Snoring or Mild OSA
- Local anesthesia in the office, or under GA
- Mucosa only, expose underlying muscle
- Widen airway, direct scar formation





Pang 2007

Jefferson
HEALTH IS ALL WE DO

Otolaryngology–Head and Neck Surgery (2009) 141, 253-256

ORIGINAL RESEARCH–SLEEP MEDICINE

Anterior palatoplasty for the treatment of OSA: Three-year results

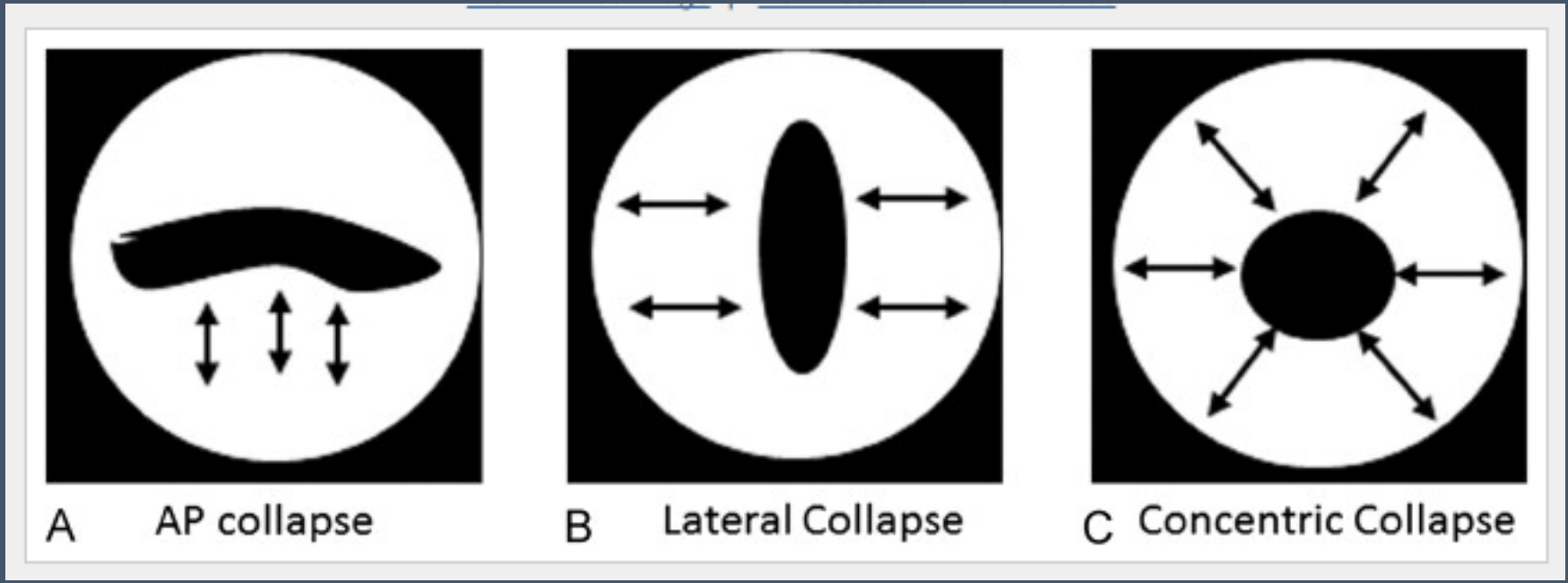
Kenny P. Pang, FRCSEd, FRCSI(OTO), MBBS,
Raymond Tan, FRCS(Glas), MBBS, Puravi Puraviappan, MS(ORL), and
David J. Terris, MD, Paragon, Singapore; Kuala Lumpur, Malaysia; and Augusta, GA

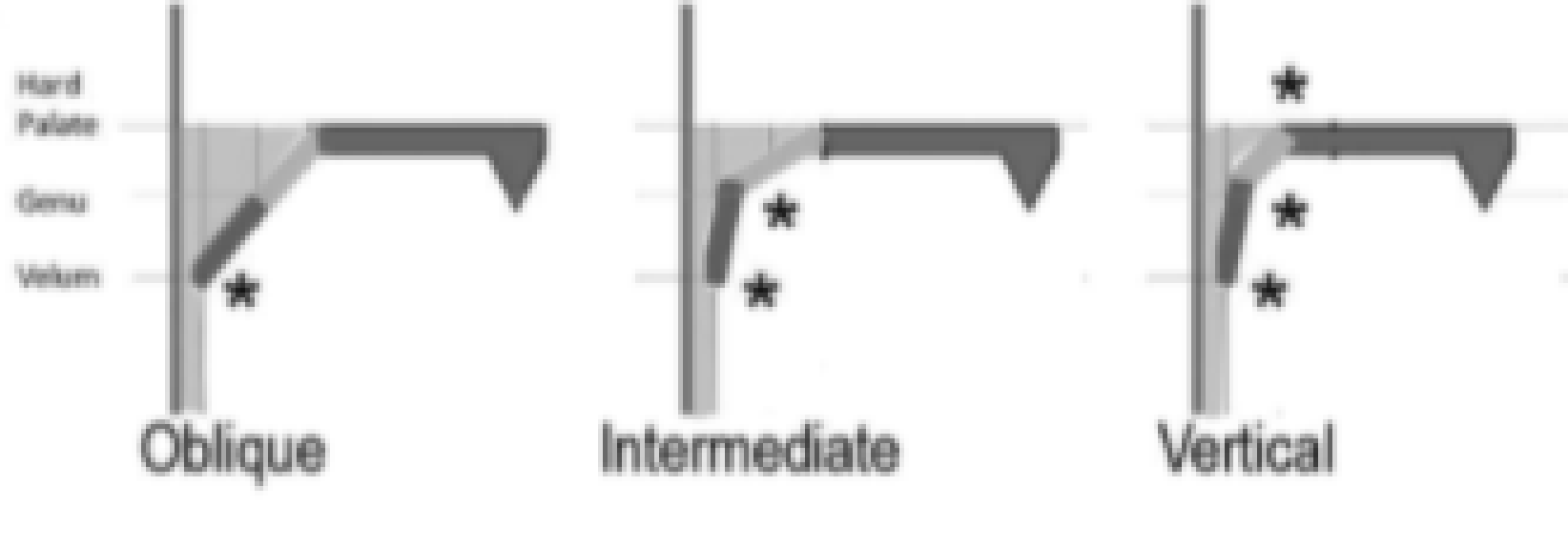
- N = 77; BMI < 33, Friedman II, AHI 1-30, tonsil grade 1-2
  - 38 snorers, 39 OSA
  - +/- tonsillectomy
  - <25% BOT collapse via Muller maneuver
- Mean f/u: 33.5 mo
- AHI mean 25 -> 9.9
- Snore Visual Analog Scale 8.4→ 2.5

Pang 2009

Jefferson
HEALTH IS ALL WE DO

Palatal Surgery for OSA

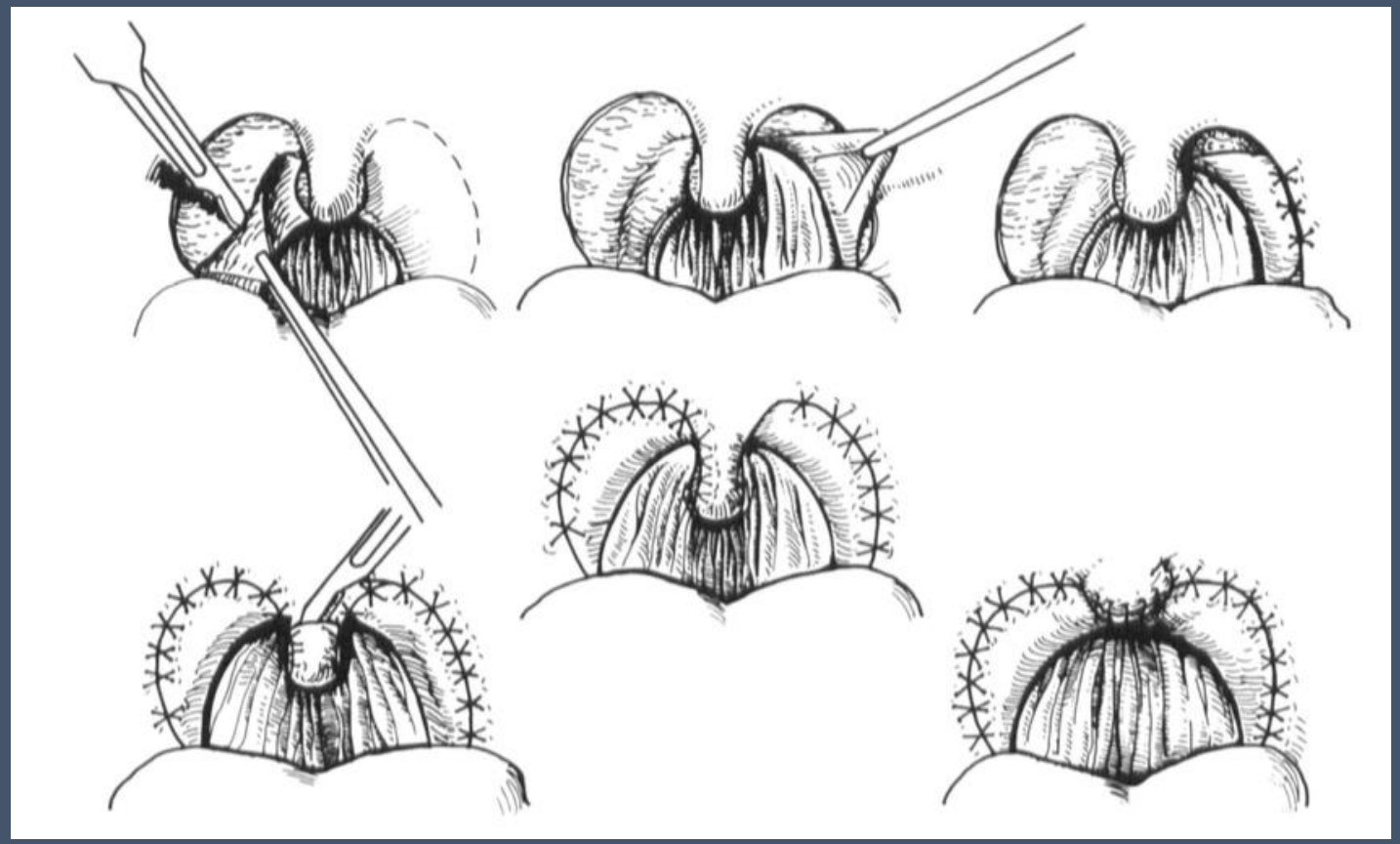




Kohn 2015

Jefferson
HEALTH IS ALL WE DO

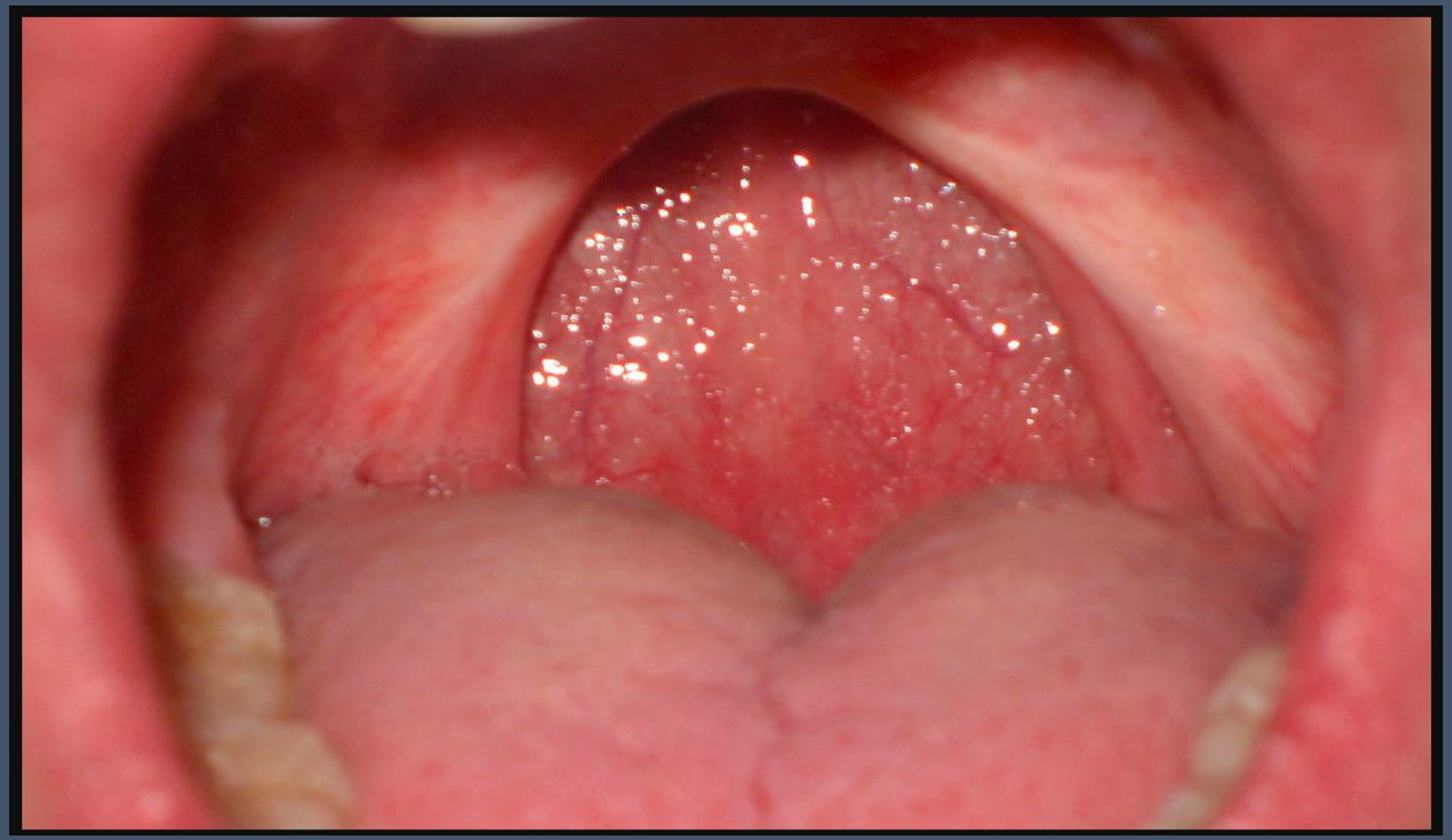
Uvulopalatopharyngoplasty (UPPP)



- Obliquely oriented palate with primary AP collapse
- Rims of anterior and posterior pillar mucosa trimmed, approximated
- Redundant posterior pharyngeal wall mucosa resected

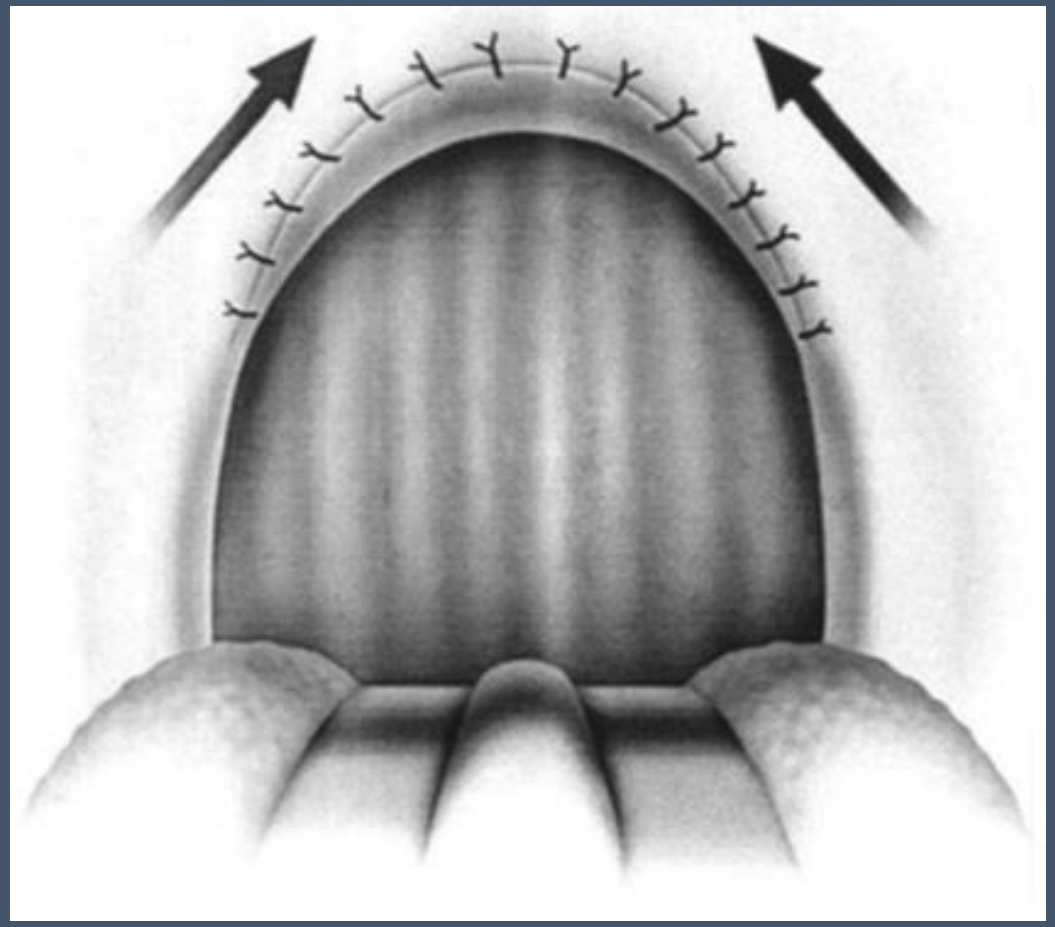
Fujita 1981

Uvulopalatopharyngoplasty (UPPP)



Jefferson
HEALTH IS ALL WE DO

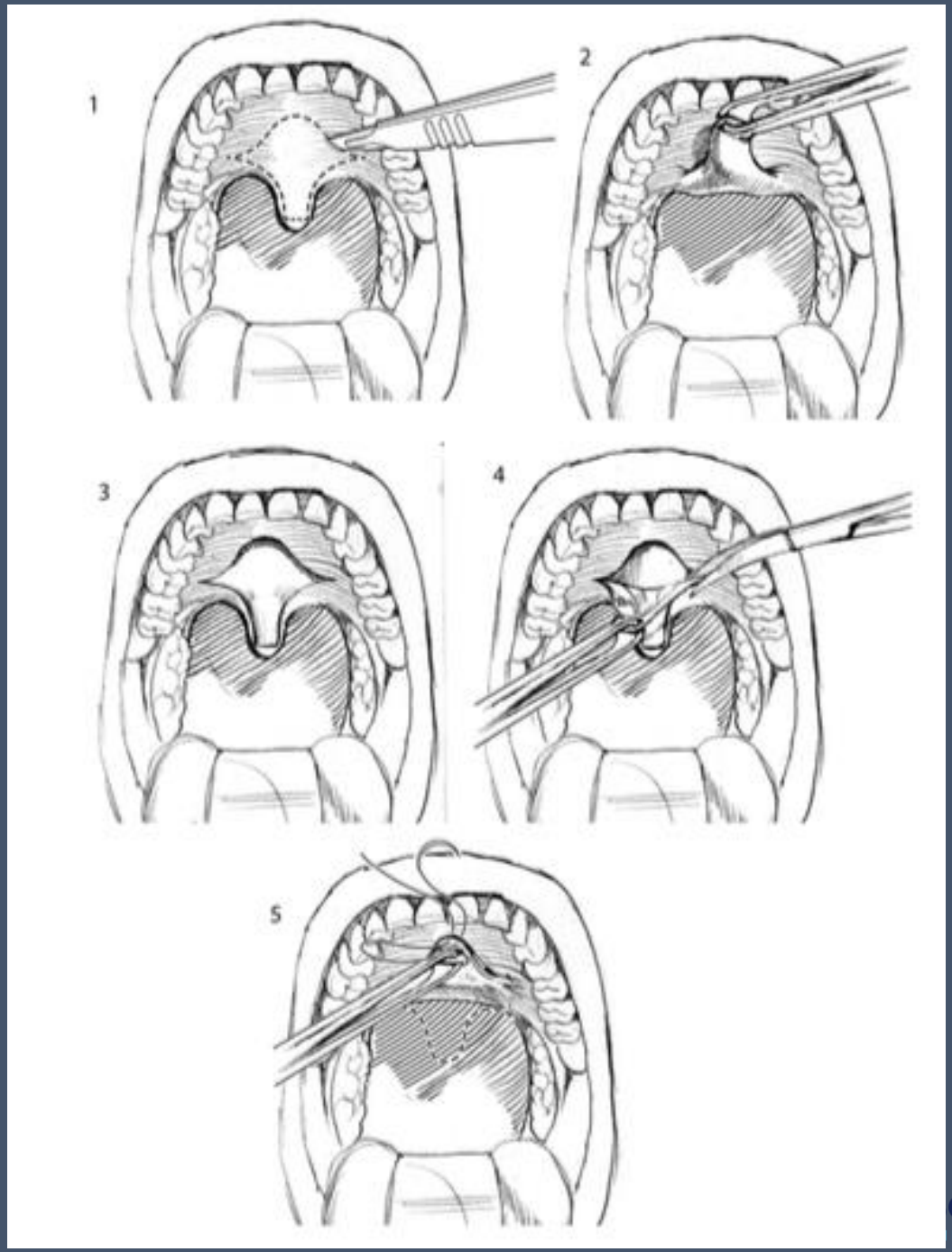
Uvulopalatopharyngoplasty (UPPP)



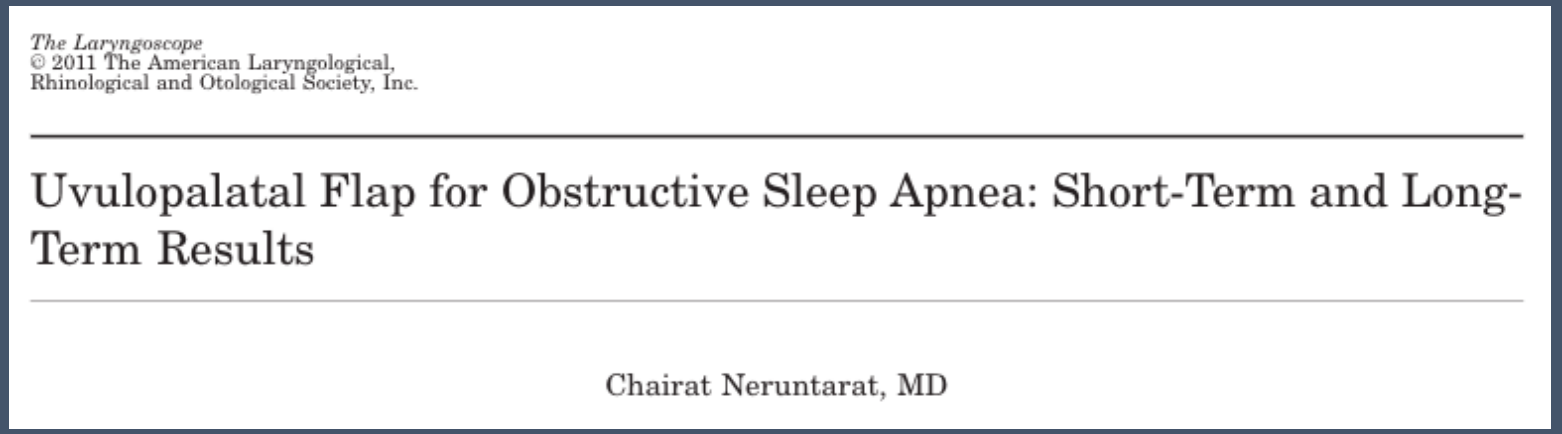
Jefferson
HEALTH IS ALL WE DO

Uvulopalatal Flap

- Obliquely oriented palate with primary AP collapse
- Diamond-shaped incision through mucosal layer only.
- Mucosa/glandular tissue removed
- Tip of uvula approximated to hard/soft palate junction



Powell 1996



The Laryngoscope

Uvulopalatal Flap for Obstructive Sleep Apnea: Short-Term and Long-Term Results

Chairat Neruntarat, MD

- Prospective study, n = 83 pts evaluated 6mo and 48+ mo postoperatively
- 6 mo: 69.9% success
- 48+ months: 51.8% success
- BMI > 30, AHI > 45 independently associated with failure

- *Success: >50% AHI reduction, final AHI <20

Neruntarat 2011

Jefferson
HEALTH IS ALL WE DO

Systematic Review/Meta-analysis

AMERICAN ACADEMY OF OTOLARYNGOLOGY–HEAD AND NECK SURGERY FOUNDATION

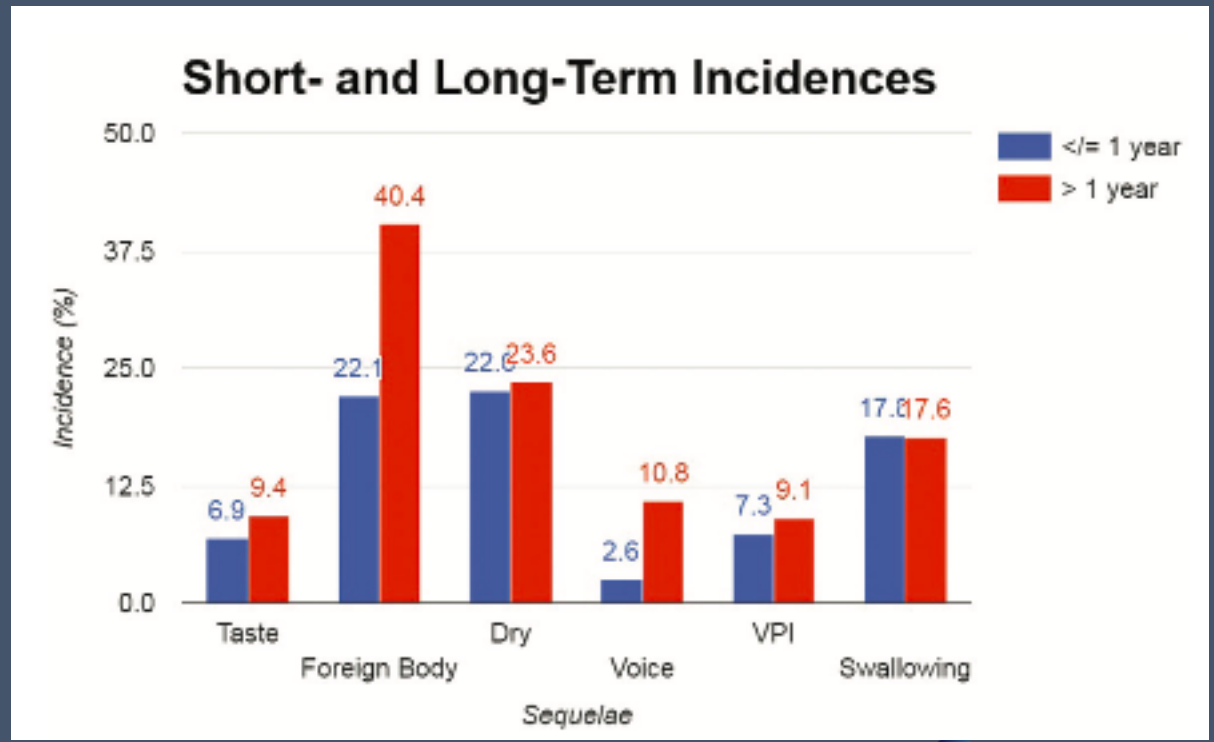
Long-Term Incidence of Velopharyngeal Insufficiency and Other Sequelae following Uvulopalatopharyngoplasty

Jessica A. Tang, MD[1], Anna M. Salapatas, MS[1], Lauren B. Bonzelaar, MD[1], and Michael Friedman, MD[1,2]

Otolaryngology–Head and Neck Surgery
2017, Vol. 156(4) 606–610

DOI: 10.1177/0194599816688646
http://otojournal.org
SAGE

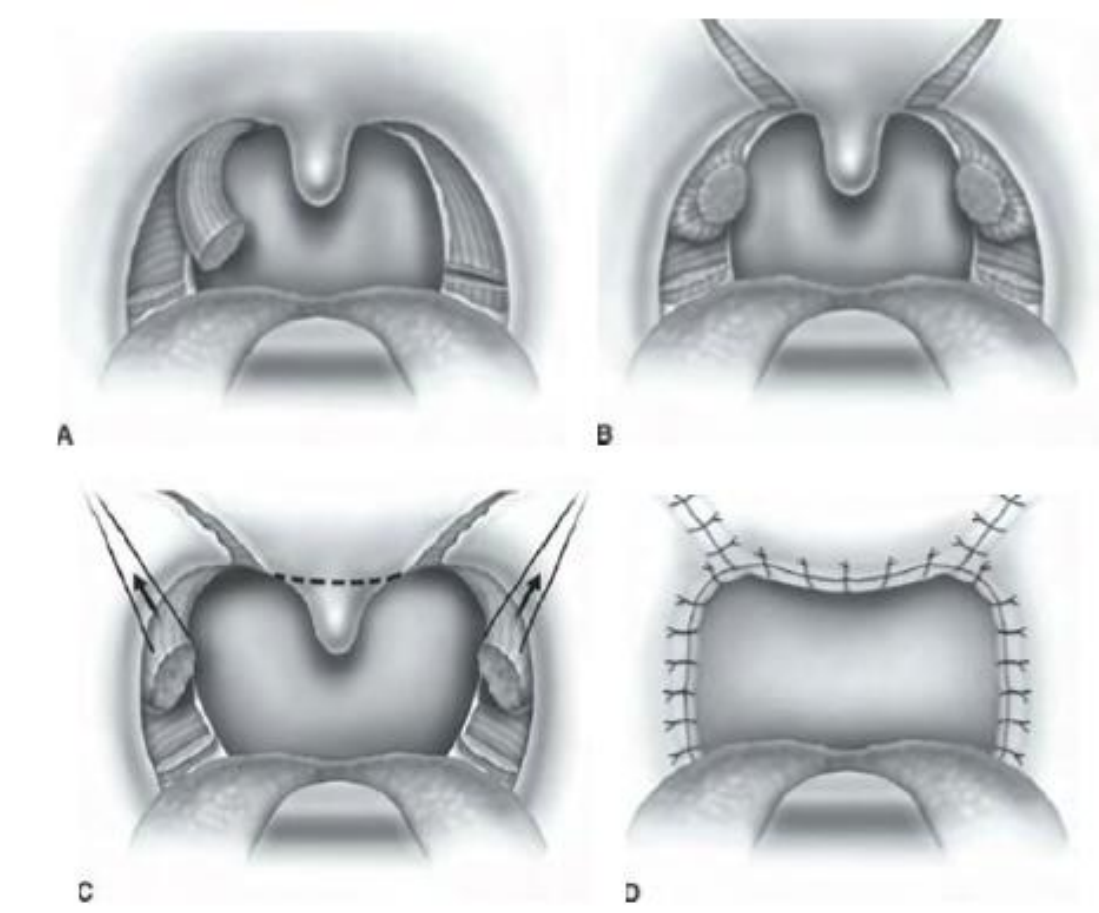
- Meta-analysis of 24 studies of patients having underwent UPPP or mUPPP
- Observed complications;
  - VPI (24 studies, n = 191)
  - Dysphagia (7 studies, n = 83)
  - Taste dist (4 studies, n = 10)
  - Voice changes (7 studies, n = 46)
  - Foreign body (9 studies, n = 427)
  - Dry pharynx (7 studies, n = 150)



Tang 2017

Jefferson HEALTH IS ALL WE DO

Expansion Sphincter Pharyngoplasty



- Concentric, Lateral collapse
- Palatopharyngeus muscle transected at inferior end
- Fascia attachment preserved to underlying horizontal constrictors
- Tunnel palatopharyngeus m. antero-supero-laterally
- Incision anterior surface of soft palate (last upper molar)

Pang 2007

Jefferson
HEALTH IS ALL WE DO

Eur Arch Otorhinolaryngol (2016) 273:2329–2333
DOI 10.1007/s00405-015-3831-2

REVIEW ARTICLE

Expansion sphincter pharyngoplasty for the treatment of OSA: a systemic review and meta-analysis

Kenny P. Pang[1] · Edward B. Pang[2] · Ma Thin Mar Win[3] · Kathleen A. Pang[2] · B. Tucker Woodson[4]

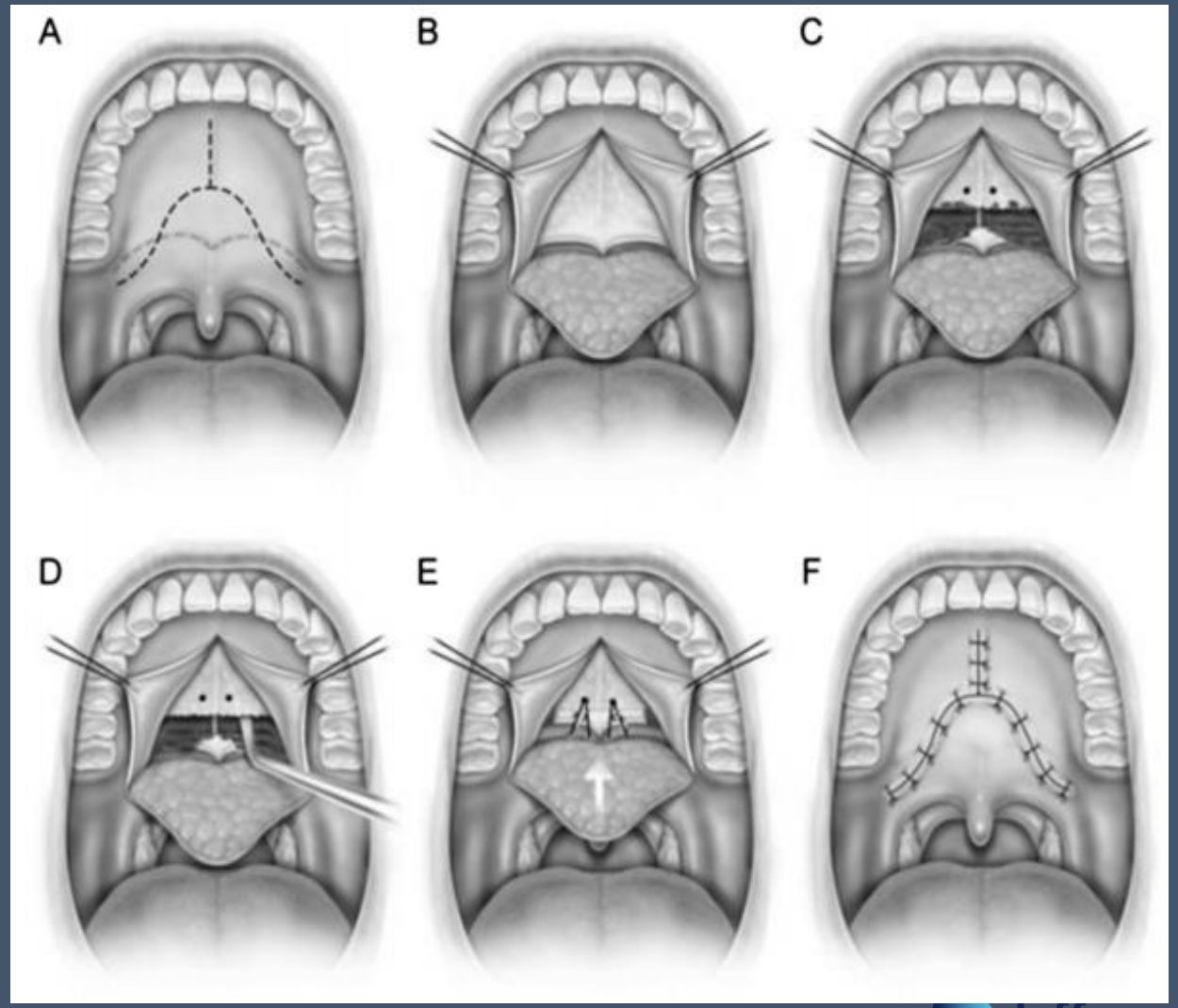
	N	Age	BMI	Intervention	Pre-op AHI	Post-op AHI	Success rate	f/u
Pang 2007	45	42.1	28.7	EP vs UPPP	44.2 ± 10.2	12 ± 6.6	82.6	6
Sorrenti 2012	85	42.7	–	EP	33.3	11.7	89.2	36
Vicini 2014	24	54.2	27.2	TORS/EP vs TORS/UPPP	38.5 ± 14.3	9.9 ± 8.6	–	9
Ulualp 2014	50	8	32	EP vs TA	60.5 ± 38.5	2.4 ± 3.9	80	6
Carrasco 2015	53	43.9	27.5	EP vs UPPP	27.7 ± 7.5	6.5 ± 5.2	90	6.9

Success rates (in all articles) defined as 50 % reduction of pre-operative AHI and an AHI <20, except Ulualp (2014), success rate defined as post-operative AHI <5

Pang 2016

Transpalatal Advancement Pharyngoplasty

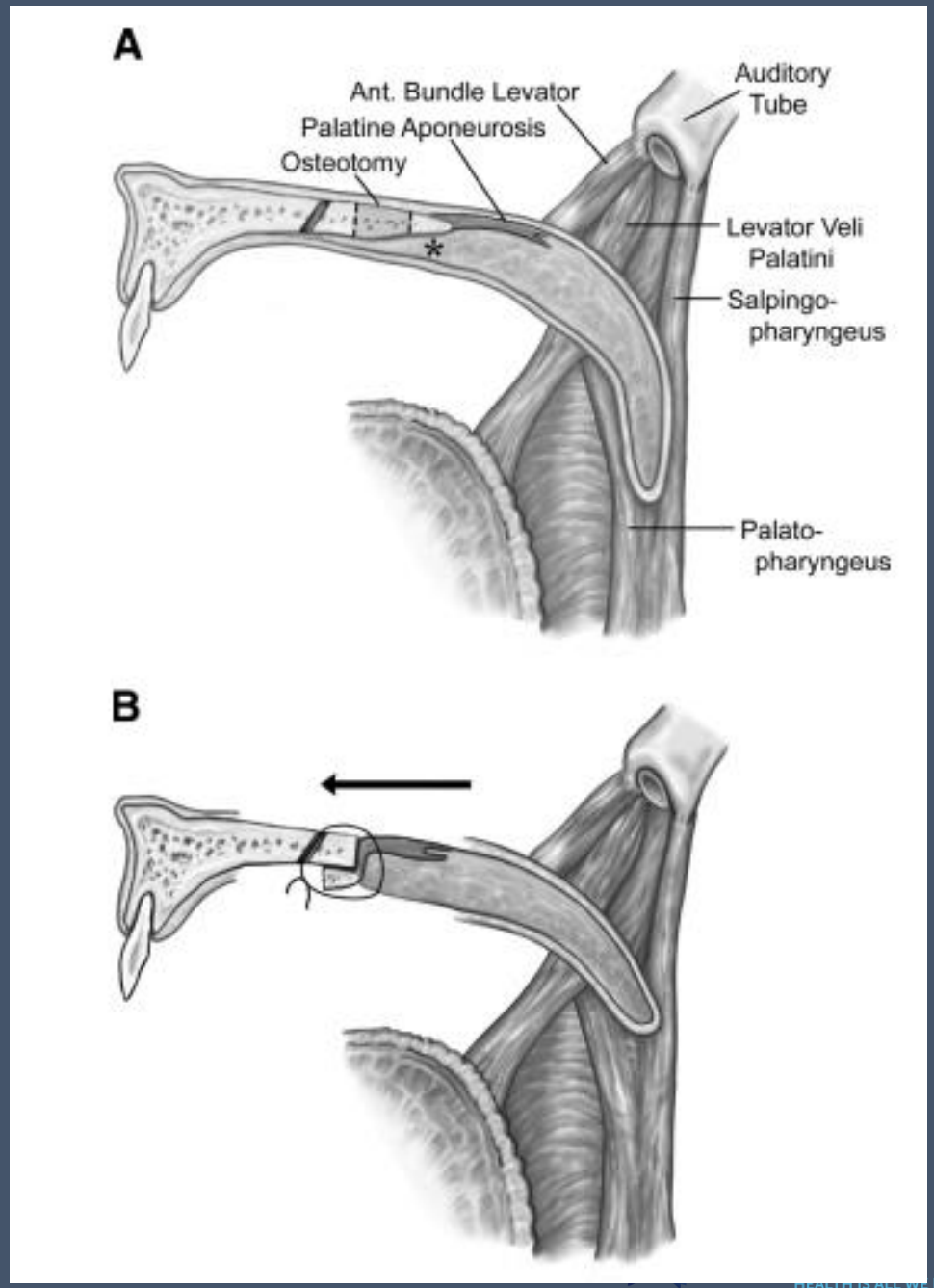
- posteriorly-based hard-soft palate junction
- Turns “vertically-oriented”palate into obliquely oriented palate
- Lateral flaps medial to greater palatine foramen, over hamulus
- Posterior osteotomy, with 1-2 mm rim of bone



Woodson 2007

Transpalatal Advancement Pharyngoplasty

- Sutures though palate drill holes into tensor aponeurosis laterally
- Strong rim of bone supports the sutures



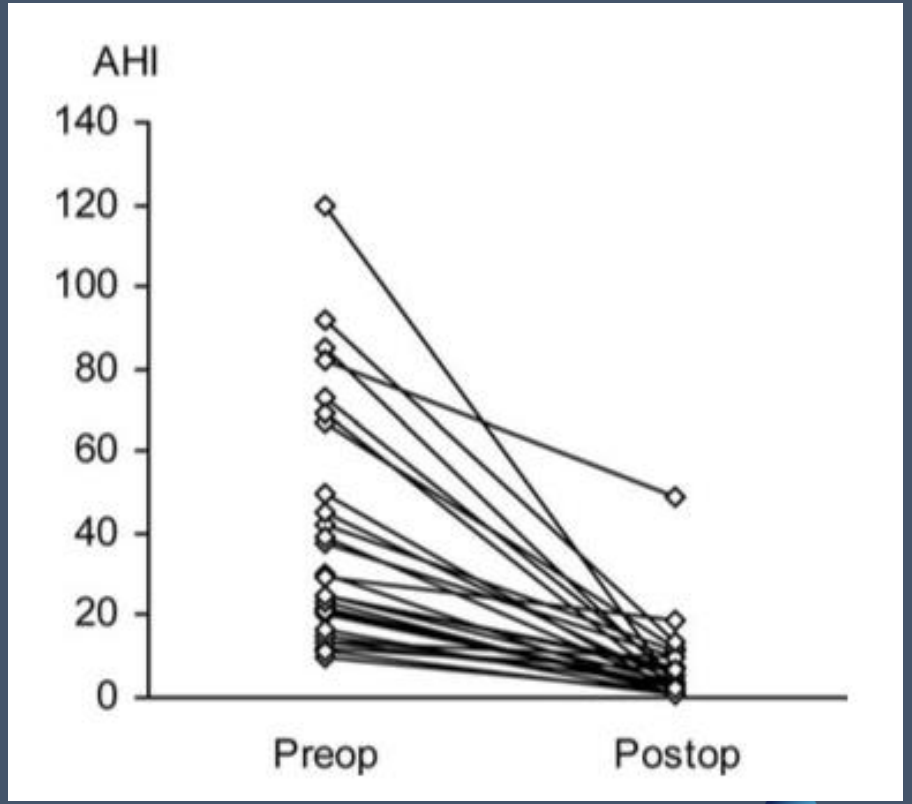
Woodson 2007

The Laryngoscope

Tonsillectomy in Adults With Obstructive Sleep Apnea

Thorbjörn Holmlund, MD; Karl A. Franklin, MD, PhD; Eva Levring Jäghagen, DDS, PhD; Marie Lindkvist, PhD; Torbjörn Larsson, MD; Carin Sahlin, PhD; Diana Berggren, MD, PhD

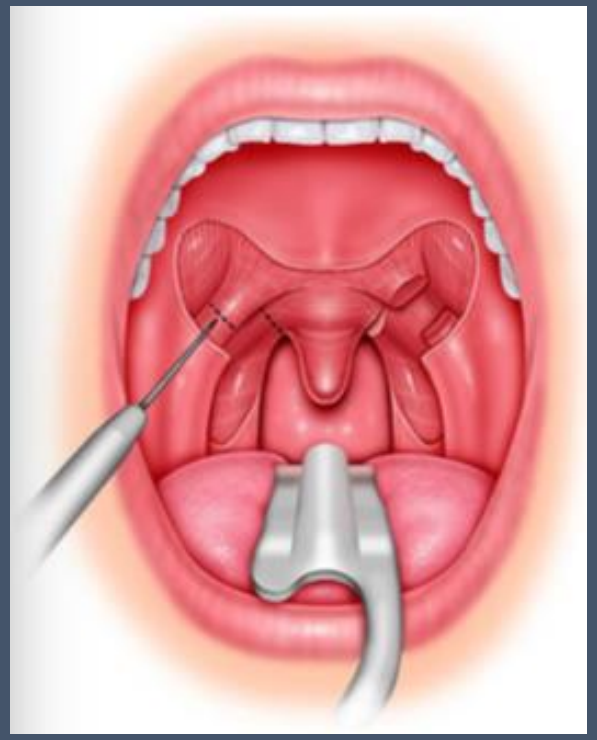
- N = 28; AHI > 10, Tonsil size 3-4
- Mean age 33; BMI 32
- f/u 6mo
- AHI mean 40 -> 7
- ESS mean 11 -> 6



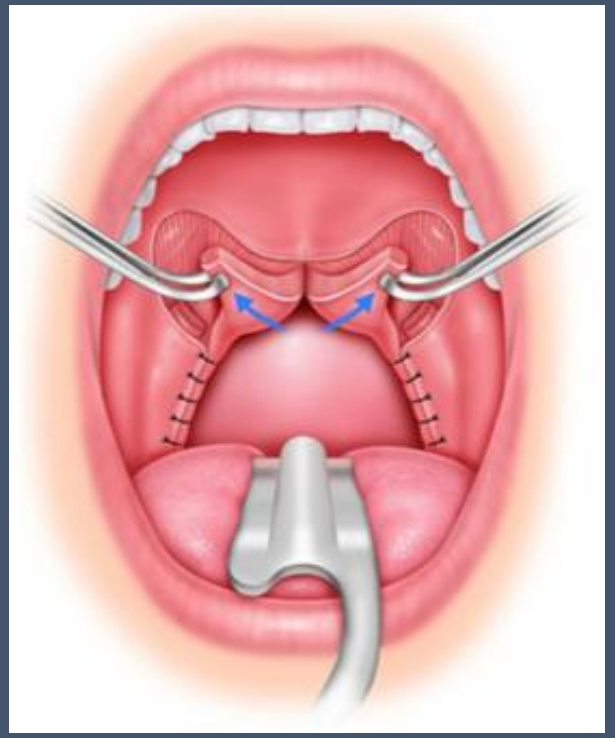
Holmlund 2016

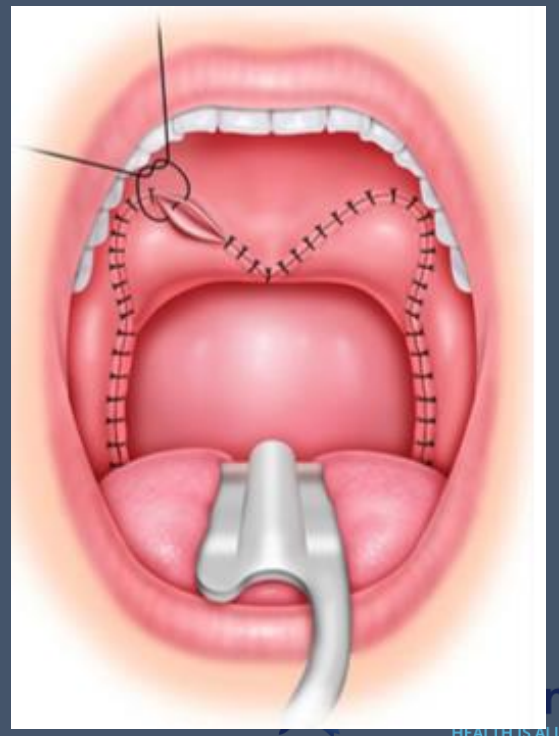
Z-Palatopharyngoplasty

- AP collapse
- Transect palatoglossus and palatopharyngeus muscles



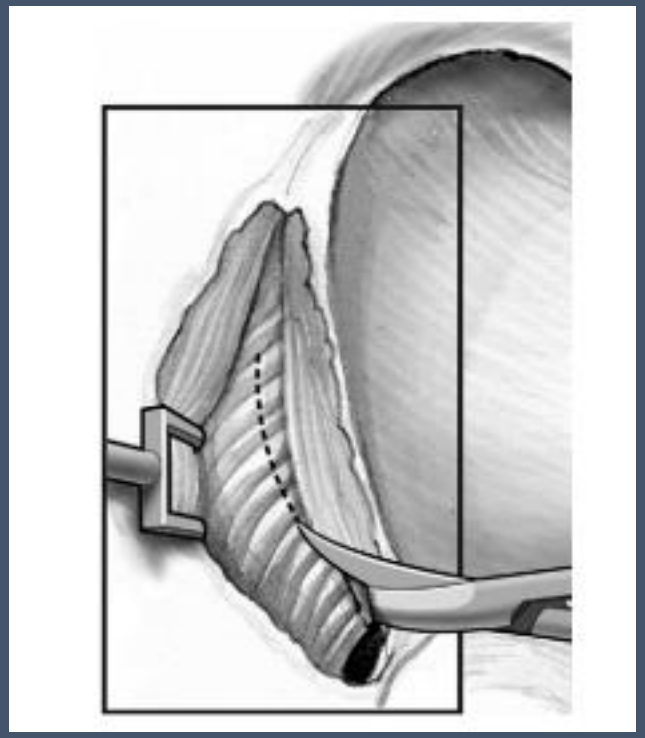
- Uvula and palate split in midline

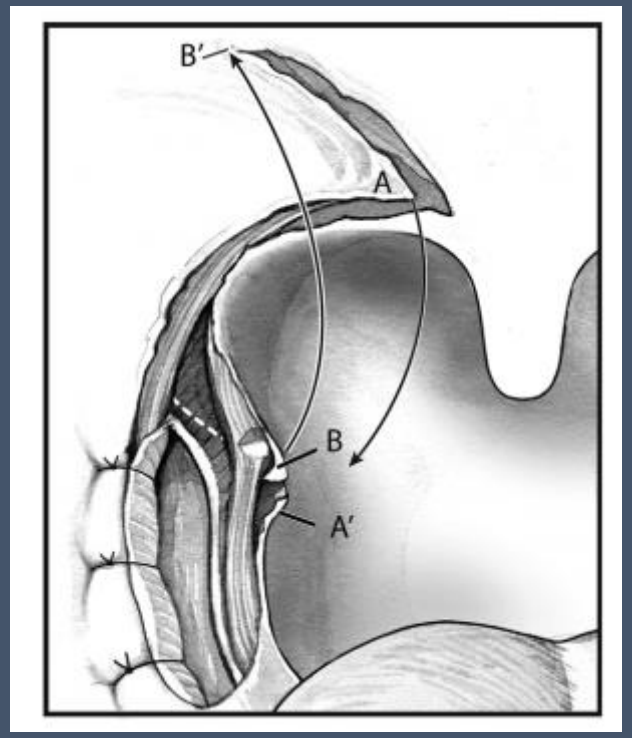


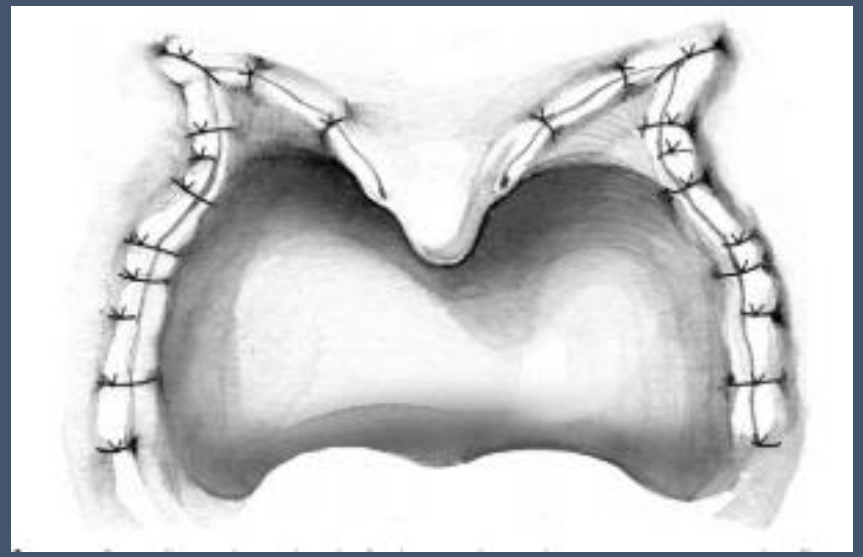


Friedman 2015

Lateral Pharyngoplasty







- Lateral pharyngeal collapse
- Divide superior constrictor

- Transverse subtotal resection of palatopharyngeus
- Closure in Z-plasty fashion

Pang 2006

Jefferson
HEALTH IS ALL WE DO

Conclusions and Future Directions

- Healthy sleep is essential
- Many go untreated or undertreated by CPAP, and surgical options exist
- Everyone's anatomy is different: Tailored approach to patient and anatomy

Special Thanks!

Dr. Boon

Jefferson
HEALTH IS ALL WE DO

Special Thanks!

Dr. Boon

Colin

Jefferson
HEALTH IS ALL WE DO

Special Thanks!

Dr. Boon

Colin

The Talented and Incredibly Good-Looking PGY-3 Class

Jefferson
HEALTH IS ALL WE DO

References

1. Friedman M, Hwang MS. Z-palatopharyngoplasty. *Oper Tech Otolaryngol Neck Surg*. 2015;26(2):90-94. doi:10.1016/j.otot.2015.03.008.

2. Friedman M, Ibrahim H, Joseph NJ. Staging of obstructive sleep apnea/hypopnea syndrome: a guide to appropriate treatment. *Laryngoscope*. 2004;114(3):454-459. doi:10.1097/00005537-200403000-00013.

3. Fujita S, Conway W, Zorick F, Roth T. Surgical correction of anatomic azbnormalities in obstructive sleep apnea syndrome: uvulopalatopharyngoplasty. *Otolaryngol - Head Neck Surg*. 1981;89(6):923-934. doi:10.1177/019459988108900609.

4. Holmlund T, Franklin KA, Levring J??ghagen E, et al. Tonsillectomy in adults with obstructive sleep apnea. *Laryngoscope*. 2016;126(12):2859-2862. doi:10.1002/lary.26038.

5. Huntley C, Chou D, Doghramji K, Boon M. Preoperative Drug Induced Sleep Endoscopy Improves the Surgical Approach to Treatment of Obstructive Sleep Apnea. *Ann Otol Rhinol Laryngol*. 2017:3489417703408. doi:10.1177/0003489417703408.

6. Kohn JL, Boyd Gillespie M. Drug-induced sleep endoscopy. *Oper Tech Otolaryngol Neck Surg*. 2015;26(2):66-73. doi:10.1016/j.otot.2015.03.004.

7. Maimon N, Hanly PJ. Does snoring intensity correlate with the severity of obstructive sleep apnea? *J Clin Sleep Med*. 2010;6(5):475-478.

8. Neruntarat C. Uvulopalatal flap for obstructive sleep apnea: Short-term and long-term results. *Laryngoscope*. 2011;121(3):683-687. doi:10.1002/lary.21157.

9. Pang KP. Lateral pharyngoplasty in the treatment of obstructive sleep apnea. *Oper Tech Otolaryngol - Head Neck Surg*. 2006;17(4):226-229. doi:10.1016/j.otot.2006.10.008.

10. Pang KP, Pang EB, Win MTM, Pang KA, Woodson BT. Expansion sphincter pharyngoplasty for the treatment of OSA: a systemic review and meta-analysis. *Eur Arch Oto-Rhino-Laryngology*. 2016;273(9):2329-2333. doi:10.1007/s00405-015-3831-2.

11. Pang KP, Tan R, Puraviappan P, Terris DJ. Anterior palatoplasty for the treatment of OSA: Three-year results. *Otolaryngol - Head Neck Surg*. 2009;141(2):253-256. doi:10.1016/j.otohns.2009.04.020.

12. Pang KP, Terris DJ. Injection snoreplasty. *Rhinol Sleep Apnea Surg Tech*. 2007;13(3):319-321. doi:10.1007/978-3-540-34020-1_34.

13. Pang KP, Terris DJ. Modified cautery-assisted palatal stiffening operation: New method for treating snoring and mild obstructive sleep apnea. *Otolaryngol - Head Neck Surg*. 2007;136(5):823-826. doi:10.1016/j.otohns.2006.11.014.

14. Pang KP, Woodson BT. Expansion sphincter pharyngoplasty in the treatment of obstructive sleep apnea. *Oper Tech Otolaryngol - Head Neck Surg*. 2006;17(4):223-225. doi:10.1016/j.otot.2006.10.008.

15. Tang JA, Salapatas AM, Bonzelaar LB, Friedman M. Long-Term Incidence of Velopharyngeal Insufficiency and Other Sequelae following Uvulopalatopharyngoplasty. *Otolaryngol Neck Surg*. 2017:19459981668864. doi:10.1177/0194599816688646.

16. Teran Santos, Jimenez-Gomez A C-GJ. The association between sleep apnea and the risk of traffic accidents. *N Engl J Med*. 1999;340:847-851.

17. Troell RJ, Li KK, Powell NB, Riley RW. Radiofrequency of the soft palate in snoring and sleep-disordered breathing. *Oper Tech Otolaryngol - Head Neck Surg*. 2000;11(1):21-23. doi:10.1016/S1043-1810(00)80006-8.

18. Tucker Woodson B. A method to describe the pharyngeal airway. *Laryngoscope*. 2015;125(5):1233-1238. doi:10.1002/lary.24972.

19. Walker RP. Palatal implants for snoring and sleep apnea. *Oper Tech Otolaryngol - Head Neck Surg*. 2006;17(4):238-241. doi:10.1016/j.otot.2006.10.001.

20. Woodson BT. Transpalatal advancement pharyngoplasty. *Rhinol Sleep Apnea Surg Tech*. 2007:339-346. doi:10.1007/978-3-540-34020-1_37.

Jefferson
HEALTH IS ALL WE DO

Jefferson
HEALTH IS ALL WE DO