

Snoring – Effects and Treatments

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Disclosures

- None

Outline

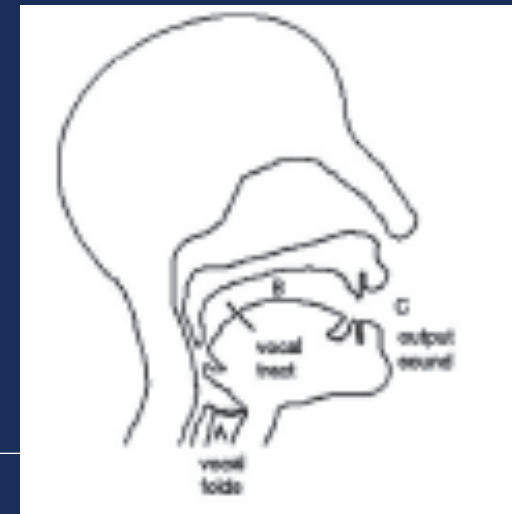
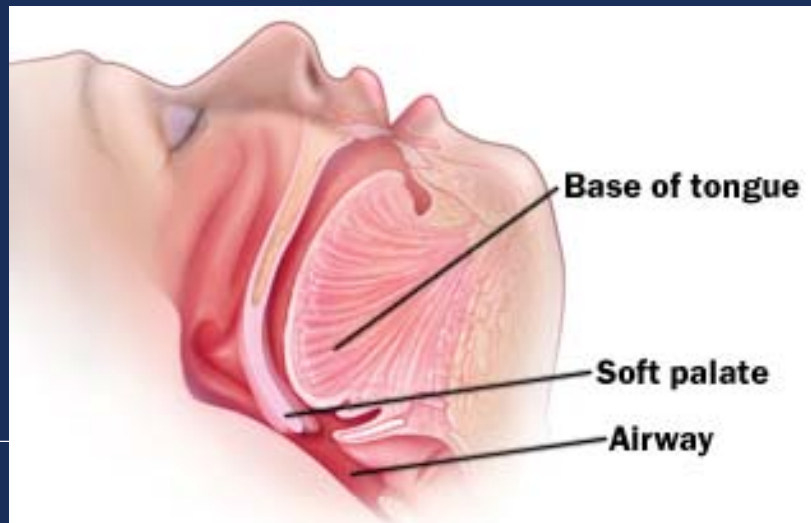
- Snoring definition
- Snoring Impact
- Evaluation
- Treatment
- Outcomes

Snoring and Sleep

- Chronic habitual snoring
 - 20% women; 40% men
 - Most common symptom of OSA (occurring in 70-95%)
- OSA
 - AHI >5 + excessive daytime sleepiness
- Primary snoring
 - AHI <5; no daytime symptoms
- Snoring risk factors
 - Age, sex, obesity, ETOH or sedative use, smoking, nasal obstruction, asthma, COPD.

Snoring - Acoustics

- Snoring = noise generated when air flows through a narrowed upper airway
- Sound source: oscillation of soft palate >> pharyngeal walls, epiglottis, tongue
- Atonia of upper airway -> narrowing/increased resistance-> turbulent airflow-> vibration of pharyngeal tissues



Measuring Snoring

- Most studies depend on self-report
- Snoring evaluation measures
 - No agreed standard
 - Subjective: bed partner report, self-report (VAS)
 - Objective:
 - microphone, airflow, vibrations
 - amplitude, frequency, duration, timing
- Studying clinical effects:
 - Snoring intensity? Sound frequency? Time spent snoring?

Effects of primary snoring



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Social Impact

- Bed partner
 - Impaired sleep quality
 - Relationship disharmony
- Second-hand snoring
 - Once treated, partner QOL increased, sleepiness scores improved (Parish & Lyng. Chest 2003)



Snoring and Sleepiness

- Sleep Heart Health Cohort Study
- 6000 self-reported snoring and ESS
- ESS increases with snoring frequency and loudness

TABLE 3
RELATION OF SLEEPINESS TO SNORING FREQUENCY AND RESPIRATORY DISTURBANCE INDEX (RDI)*

Epworth Score by RDI and Snoring Frequency[†]

RDI	Snoring Frequency (nights/wk)					All
	0	< 1	1–2	3–5	6–7	
< 1.5	6.1 (275)	6.9 (249)	7.3 (241)	8.5 (162)	8.8 (162)	7.3 (1,089)
1.5– < 5	6.1 (184)	6.9 (183)	7.5 (243)	8.2 (206)	9.2 (246)	7.7 (1,062)
5– < 15	6.7 (135)	7.2 (137)	7.6 (276)	8.5 (254)	8.9 (406)	8.1 (1,208)
≥ 15	7.5 (58)	7.5 (60)	8.2 (125)	8.9 (175)	10.2 (370)	9.2 (788)
All	6.4 (652)	7.0 (629)	7.6 (885)	8.5 (797)	9.3 (1,184)	8.0 (4,147)

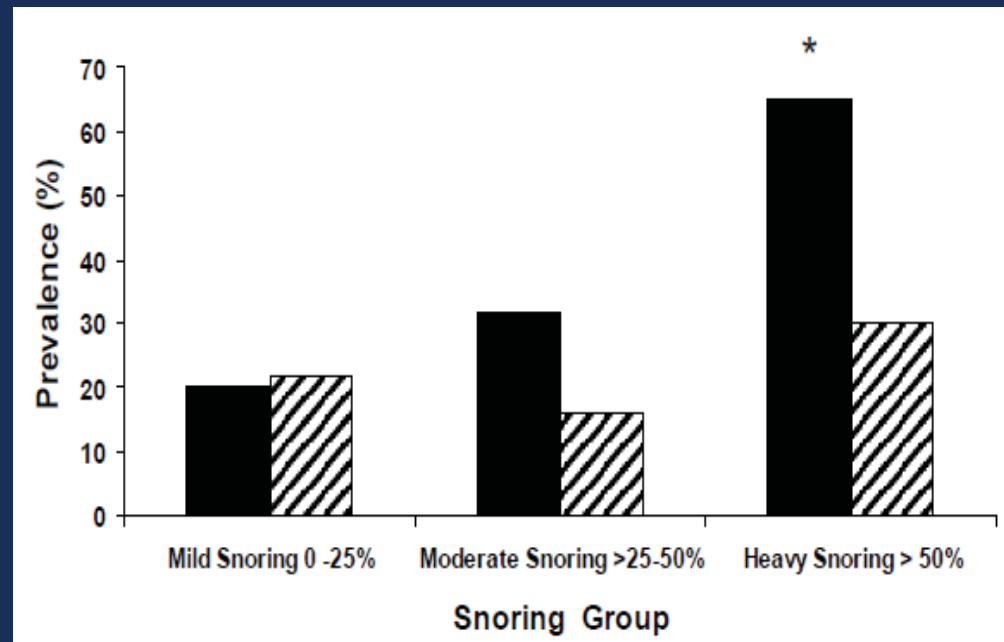
Gottlieb et al. Am J Respir Crit Care Med. 2000.

Heavy Snoring as a Cause of Carotid Artery Atherosclerosis

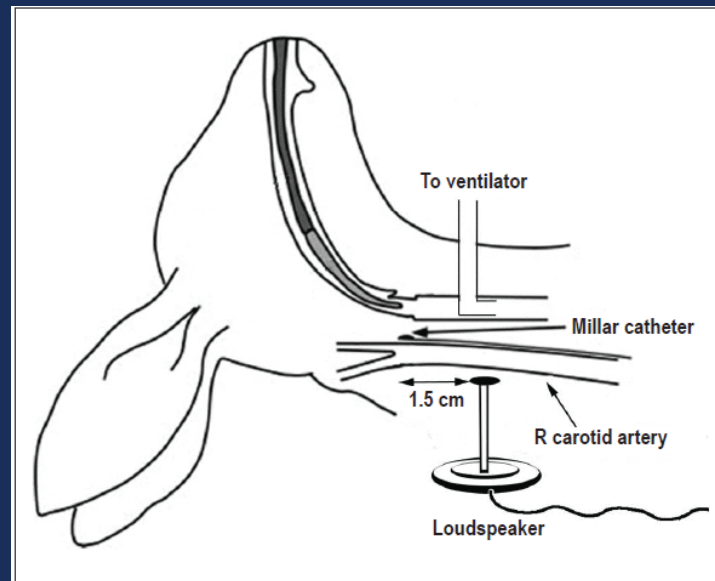
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- SLEEP 2008.
- 110 Subjects; Cross-sectional study
 - PSG, snoring, carotid + femoral artery doppler U/S
 - Severe snoring (>50% sleep time) is associated with carotid – but not femoral-atherosclerosis
 - AHI was not associated with CA after adjusting for snoring severity.
 - Adjusted for AHI - Did not examine primary snorers



Mechanism of atherosclerosis

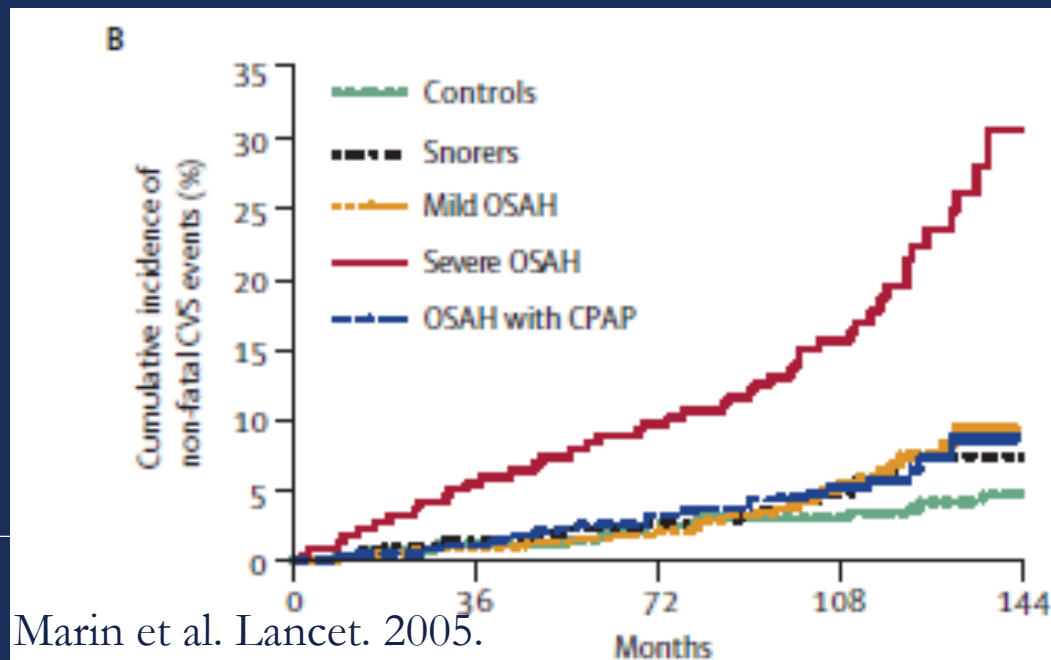


Rabbit model

- Right common carotid exposed to 6 hours of vibration
- Endothelial dysfunction: Reduced vasorelaxation
- Vibration induced vascular injury

Snoring and CV events

- Prospective cohort study with 10 year followup
- 377 snorers; 264 non-snorers; AHI<5
- Self-reported snoring confirmed by close relative, no excessive daytime sleepiness
- *No increased risk of fatal or nonfatal CV events in primary snorers without OSA.*

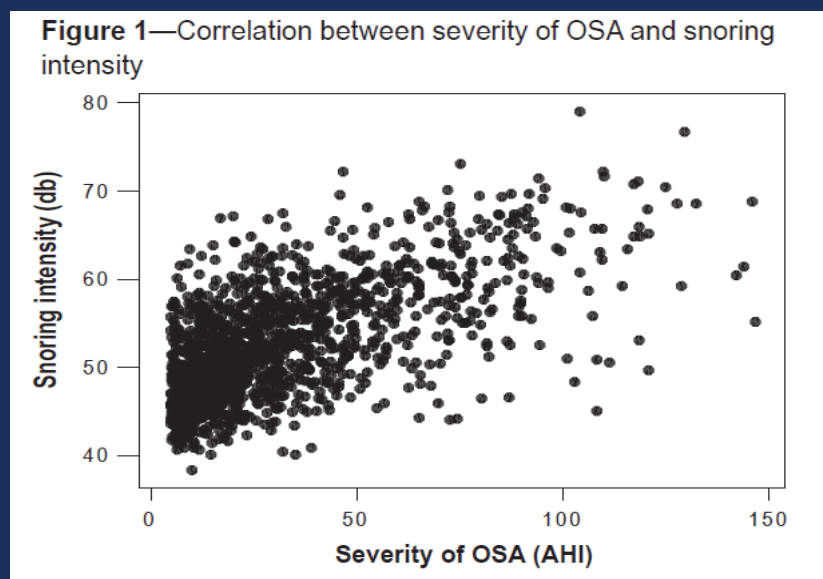


Evaluation of Snoring

- Screen for OSA
- Sleepiness, daytime symptoms
- Bed partner – Separate rooms
- Patient expectations
- Exam
 - BMI
 - Nose
 - Palate/Oropharynx
 - Mandible
 - Neck

Snoring Intensity and OSA

- **1600 Habitual snorers**
 - PSG and objective measures
- **Significant correlation between loudness of snoring and AHI**
 - AHI < 5 46dB
 - AHI > 50 60dB



Snoring Treatment

- Amazon.com ~800+ products
- Treatment Goals
- Treatment Types:
 - Behavior Modification
 - Devices
 - Surgery

Snoring Solution

The snorer is woken up immediately by their own microphoned snoring noise



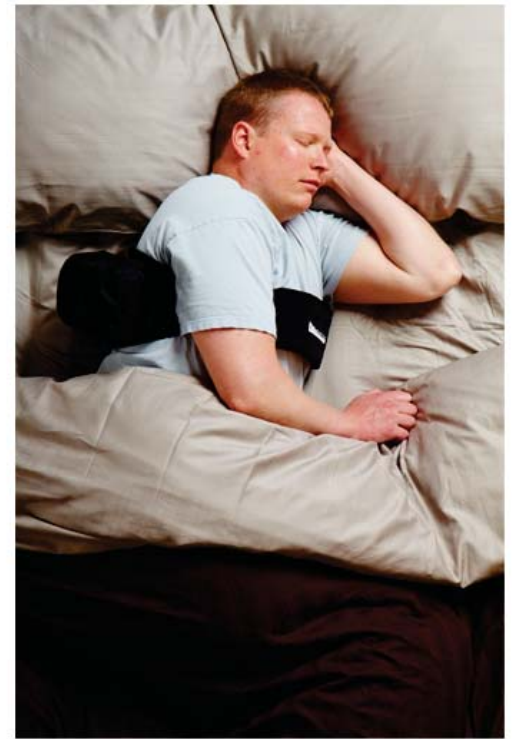
Snore Aids

- Michaelson and Mair. OtoHNS 2004.
- Prospective randomized trial
 - Oral lubricant spray
 - Breathe right strips
 - Snore-no-more pillow
- No objective or subjective difference



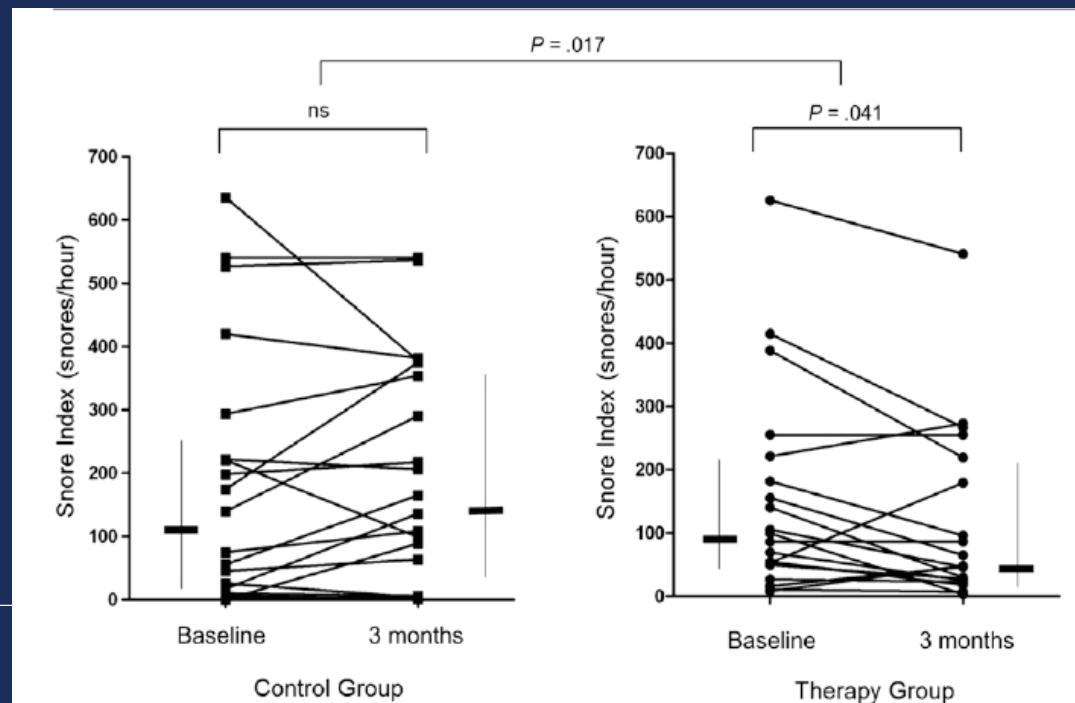
Behavioral Modification

- Position
- Weight Loss
- Avoid alcohol, sedatives
- Singing/Exercises



Exercises for Snoring

- Ieto et al. Chest 2015.
- 39 patients randomized: Nasal strips plus
 1. Respiratory exercises (control)
 2. Oropharyngeal exercises (8 minutes TID)
- Decreased snoring frequency by 36%;
Snore index 99.5 to 48.2



Devices – MAD and Theravent



Fig. 1. Theravent nasal EPAP device

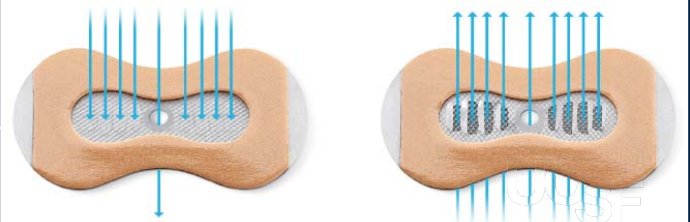


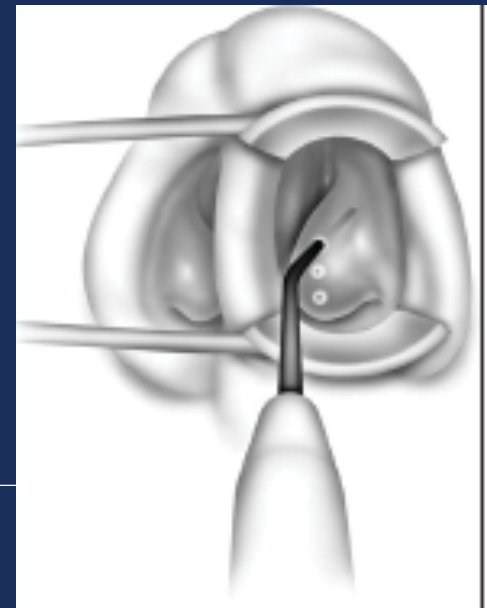
Fig. 2. Theravent microvalves during expiration and inspiration respectively

Surgical Approaches

- Nasal
- Tonsils
- Palate
- Tongue

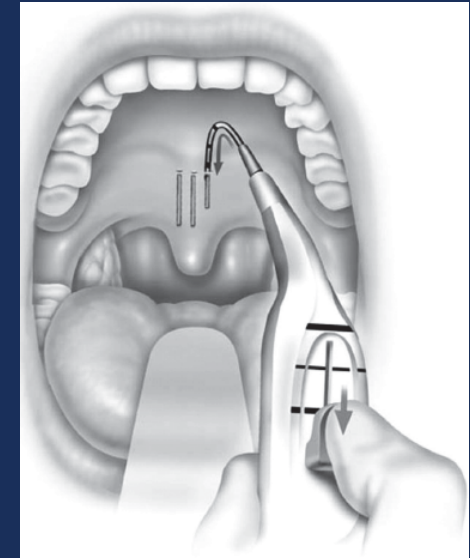
Treating Nasal Obstruction

- Trial with nasal steroid spray x 3 weeks
- Breathe-right strips
- Allergy and sinus management
- Surgery – Septoplasty, turbinate reduction, NSR
- Medical or surgical treatment
 - Improves quality of life
 - Reduces mouth breathing
 - Variable results on snoring



Palate Stiffening

- Injection Snoreplasty
 - 99% denatured alcohol
 - 3% sodium tetradecyl sulfate
- Palate Radiofrequency
 - 1-3 treatments
- CAPSO – Cautery Assisted Palatal Stiffening
 - Pang OtoHNS 2007: remove mucosa
Subjective improvement at 3 months
- Pillar Implants
 - 3-5 in muscular layer of soft palate
 - Extrusion in up to 11%



Pillar vs. RF (one treatment)

- RCT single session implant vs RF treatment (14 per group)
- 3-month VAS improved in both: implant group better
- Objective snore maximal loudness reduced in implant group
- Snoring index reduced in RF group

Subgroups, % (n)	Palatal implant group (n=14)	Radiofrequency group (n=14)	Ratio (95% CI)	Difference (95% CI)	P value
Δ VAS ≥ 1	93 (13)	64 (9)	1.44 (0.95–2.19)	29% (–3% to 55%)	0.165
Δ SOS ≥ 10	93 (13)	57 (8)	1.63 (1.01–2.62)	36% (3% to 61%)	0.077
Postoperative VAS ≤ 3	29 (4)	7 (1)	4.00 (0.51–31.46)	21% (–8% to 48%)	0.326
Postoperative VAS ≤ 5 plus SOS ≥ 60	71 (10)	29 (4)	2.50 (1.02–6.10)	43% (6% to 67%)	0.057
Response (Either Δ VAS ≥ 1 or Δ SOS ≥ 10)	93 (13)	71 (10)	1.30 (0.91–1.87)	21% (–8% to 48%)	0.326
Good response (Either postoperative VAS ≤ 3 or postoperative VAS ≤ 5 plus SOS ≥ 60)	79 (11)	29 (4)	2.75 (1.15–6.58)	50% (13% to 72%)	0.021

Pillar Implants – Long Term

- Rotenberg and Luu. Laryngoscope 2012.
- Prospective cohort: 23 snorers, AHI < 15
- At 1 year: 95% would recommend;
- At 4 years: only 22% would recommend

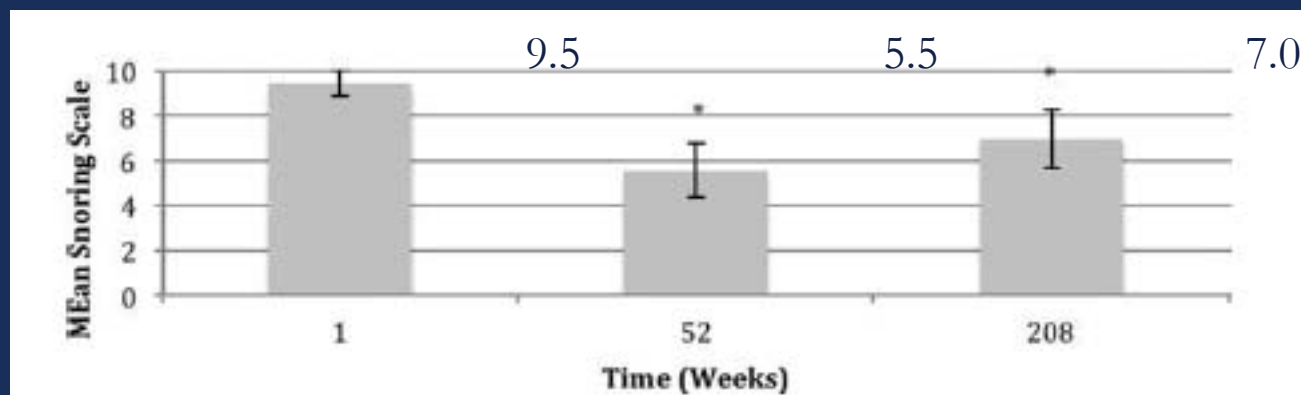


Fig. 1. Comparison of mean snoring scale at baseline, week 52 and week 208. * = significant difference from baseline.

Palate Reduction

- UPPP, UPF
- LAUP – Laser Assisted Uvulopalatoplasty
 - 1-3 treatments to reshape the soft palate
 - Can reduce tonsil size
 - Laser: CO2, KTP, Argon, (electrocautery)
- Comparison of UPPP vs. LAUP 1-4 years. (Prasad 2003) – 60 patients, bed-partner queried

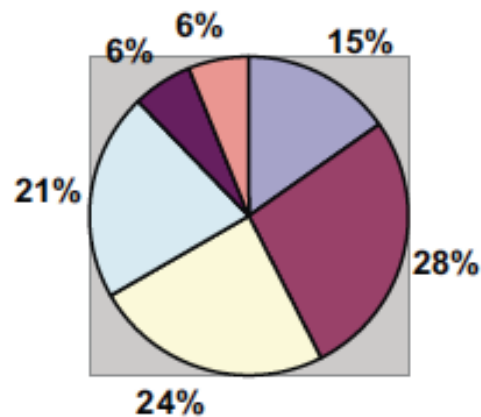


Figure 1. Rating of snoring after LAUP.

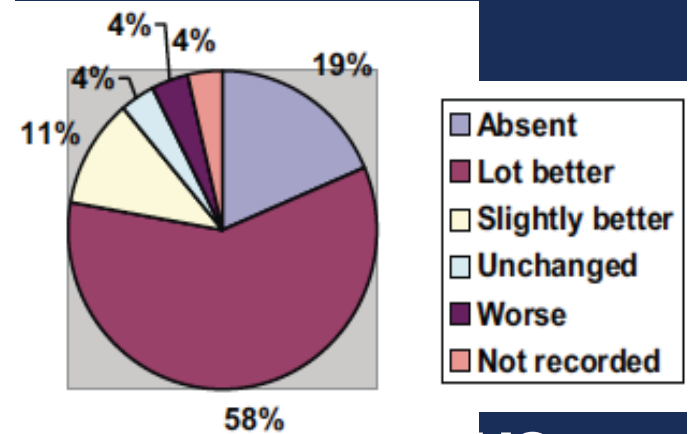
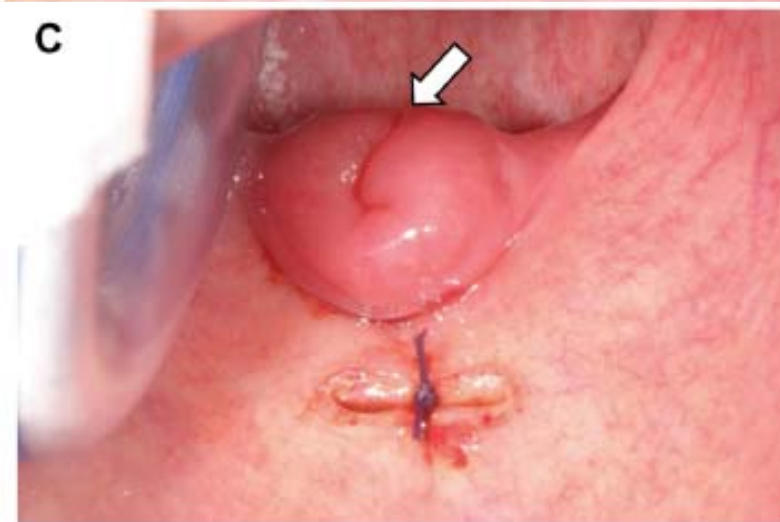
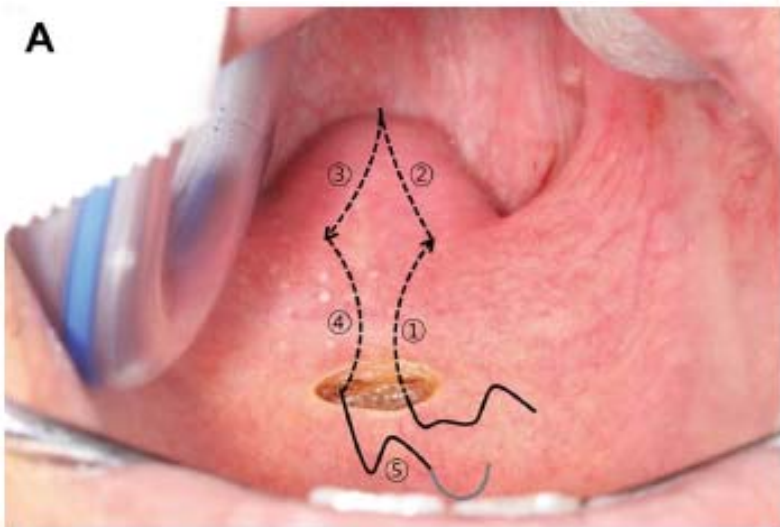


Figure 3. Rating of snoring after UVPP.

Palate Suture Techniques

Suture Technique



TranQuill Sling



Comparisons

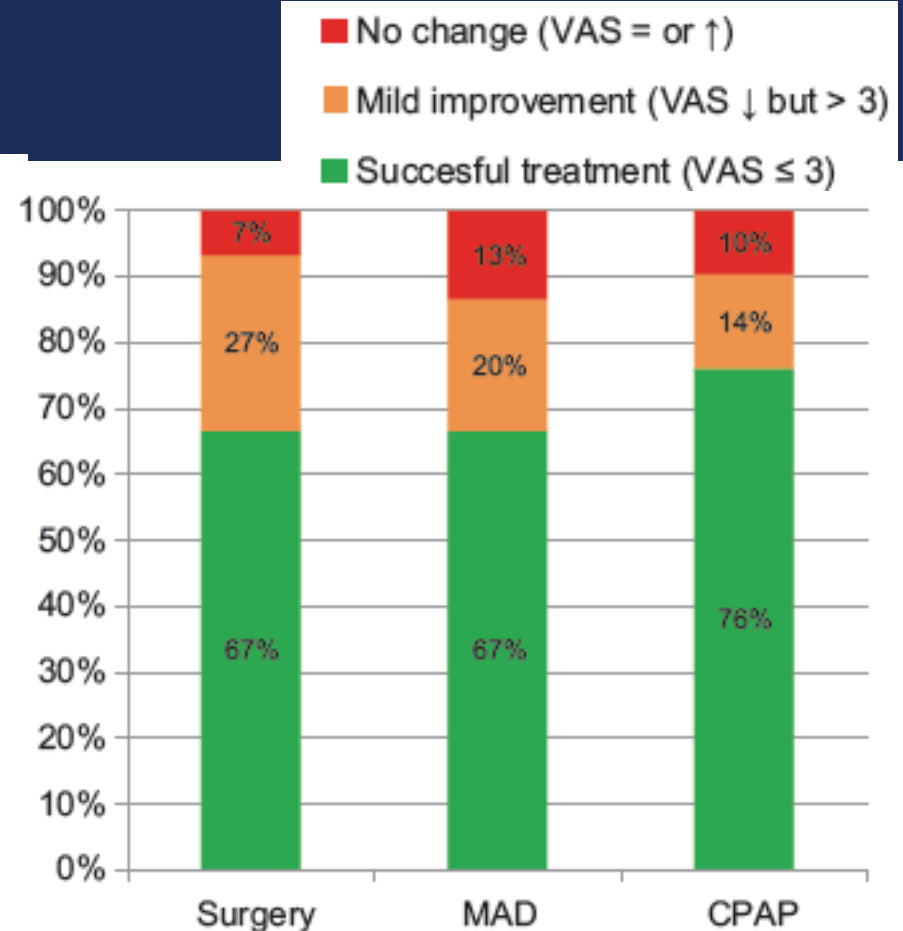
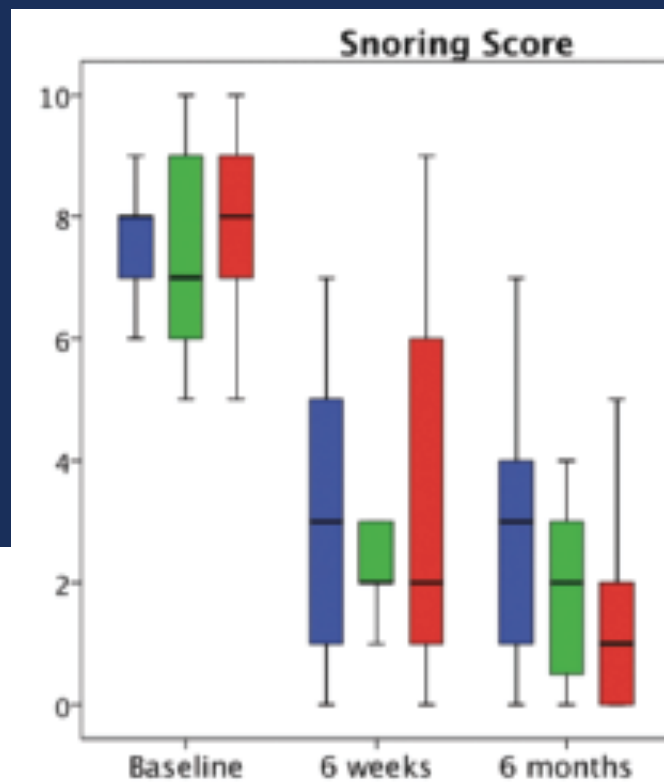
- Measures of snoring: subjective vs. objective
 - Often results don't match
- Most treatments have demonstrated improvement in subjective scores at 6-12 months post-procedure (short term)
- Long-term relapse rate is high

Treatment Comparisons

- Terryn et al. Oto HNS 2015.
- 200 pts treated with CPAP, MAD, or surgery (various).
- AHI < 20

Treatment

- Surgery
- MAD
- CPAP



Conclusions

- Snoring is prevalent and has significant impact on the patient and the bed partner
- Evaluation should rule out OSA
- Snoring interventions can improve snoring with varying success. Defining goals of treatment is essential
- More work is needed to define health effects of snoring and changes with treatment