THE APPROACH AND MANAGEMENT OF LARYNGOTRACHEAL STENOSIS, FLOPPY EPIGLOTTIS, AND HYOID SUSPENSION

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LEARNING OBJECTIVES

- IDENTIFY THE APPROACH AND MANAGEMENT OF EACH DISEASE
- GAIN AN UNDERSTANDING OF EACH DISEASE AND THEIR ROLE WITH SLEEP APNEA

HGNS CASE

MD

- 54 year old female with PMH of anxiety and depression, GERD
- Presented to the sleep medicine clinic with ~10 year history of reported moderate OSA
- Previously did not tolerate PAP or oral appliance
- Sleep history:
  - 7-7.5 hours TIB each night
  - Complains of long sleep latency ~45 min
  - 1-3 short nighttime awakenings
  - ESS: 13
  - ISI: 22
- Family history: 2 sisters with OSA
- Surgical history: bariatric surgery, cholecystectomy

MD

- HST
  - REI 28.3 (supine 47.2, nonsupine 7.8)
  - O2 nadir 72%
  - T90 30 min
  - T88 9 min
- Not interested in trying CPAP again
- Referred to ENT

MD

- Physical exam:
  - BMI 30.4
  - High arched palate
  - FTP 3
  - Tonsils 1+
  - Unremarkable awake nasopharyngoscopy

MD

- Drug Induced Sleep Endoscopy with PAP
  - Complete AP collapse at velum
  - No collapse at oropharynx
  - T: complete tongue base collapse
  - E: incomplete epiglottic collapse secondary to tongue base
  - P_{open}: 6.5 cm H2O at velum and 5.5 cm at tongue base
  - Maneuvers:
    - Minimal improvement with chin lift
    - Mild improvement at velum and TB with jaw protrusion
    - Mild improvement at TB with head turn
- Recommendations:
  - Oral appliance +/- positional therapy
  - Hypoglossal nerve stimulator +/- positional therapy

MD

- HGNS
- Activation 4 weeks post op:
  - Good respiratory waveform and impedances
  - Functional threshold 0.8 mV
  - Left at default +-+ configuration, 30 min start and 15 min pause delay with range of 0.6 – 1.5 mV

MD

- 3 months post op/2 months post activation visit
  - 32 hours/week usage
  - Self-titrated up to 1.0 mV
    - Left at same settings
  - Complaints of insomnia – started doxepin 3 mg
  - HST ordered

MD

- Post op HST 3.5 months post op
  - REI 5.2 (supine 6.1, nonsupine 1.9)
  - O2 nadir 84%
  - T90%: 6.8 min
  - T88%: 0 min
- Post study visit with overall subjective improvement in daytime sleepiness and functioning
  - No usage data

CASE PRESENTATION

M.S.

- HPI

- 56 y/o WF presents to clinic on 6/20/22 with progressive shortness of breath, worse in the last year
- Lifetime history of asthma, albuterol not helping

- PMH

- OSA diagnosed 4 years ago. Not on CPAP because it was recalled
- Former smoker (quit age 25)
- Intubated for respiratory failure on 11/17/2021
- Her husband had contracted COVID and died of respiratory failure just before the patient got sick
- Tracheostomy placed after 10 days
- Cardiac Arrest in January 2022 while in rehab because of a mucus plug in trach tube

- PE

- BMI 48 (5' 1", 254 lb)
- Awake and alert with noisy breathing
- #6 Shiley extra long cuffed trach in place with cuff deflated.
- Patient is phonating with trach uncapped

- Bronchoscopy

- 50% narrowing of the trachea just above the tracheostomy stoma causing significant obstruction.
- Unable to tolerate capping of the tracheostomy tube

- NEXT STEP?

M.S

- 10/21/2022
- CO2 laser and balloon dilation of what had become an 80% tracheal stenosis

- 12/7/2022
- Surgery site healed to a 20% obstruction
- Trach downsized to a #4 and capping trials started

- 1/9/2023
- Patient able to tolerate caped trach during the day but unable to tolerate cap at night due to snoring and apnea episodes. Still waiting for a CPAP that had been ordered after the recall
- Referred for a sleep study with trach capped.

- 3/13/2023
- Sleep study in Ft Smith showed AHI of 2 with O2 nadir of 86% with less than 1 minute of O2 desaturation below 88%
- Snoring, did not qualify for CPAP

- 5/18/2023
- Patient is now tolerating the trach cap at night and wants her trach tube removed.
- #4 Trach tube removed.

- 7/11/2023
- She continues to have trouble sleeping and breathing at night.
- Her bronchoscopy now shows the stenosis has progressed to a 30%-40% obstruction. Revision surgery offered but she declined

- NEXT STEP?

M.S.

- 7/11/2023
- Patent sent over the BMC sleep clinic
- Sleep study by Dr Williams did show OSA and the patient was fitted with CPAP

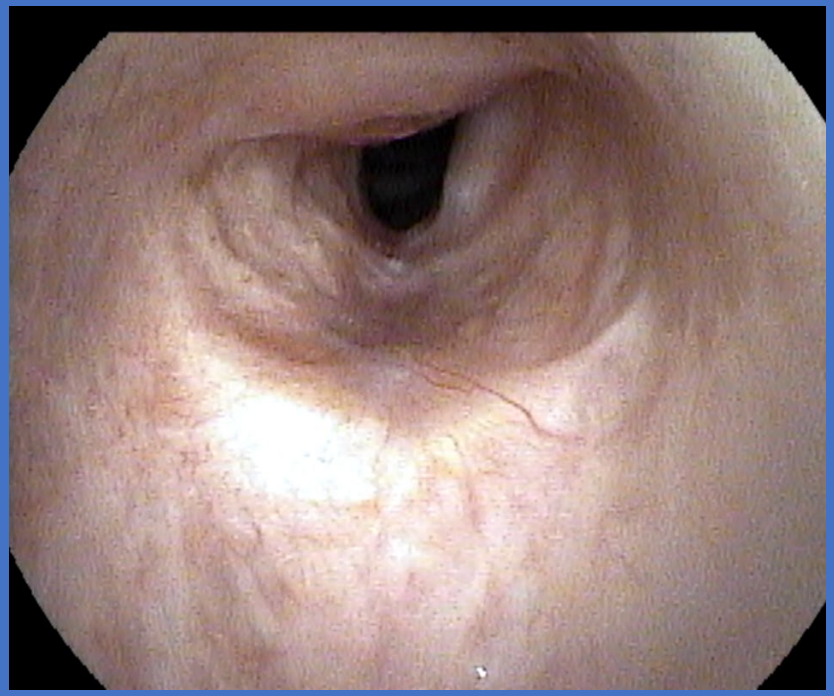
- 12/5/2023
- Patient now doing well at night
- Occasionally feels short of breath during the day and she wears her CPAP during the day when these episodes occur
- Patient does not have a pulmonologist
- Patient is no longer taking PPI meds and is not watching her diet.

- Bronchoscopy on 12/5/2023
- 1 cm A-frame subglottic narrowing located 4 cm below the glottis
- Mild collapse of the lateral trachea at the stenosis with some blunting narrowing the airway by about 40%
- Membranous posterior tracheal collapse blocking up to 60% of the airway on expiration.

- NEXT STEP?

M.S.

- PLAN
- Inspiratory and Expiratory Dynamic CT scan requested
- Refer to a pulmonologist for evaluation of lung functions
- Restart Omeprazole bid, Alginate after meals and at bedtime, Reflux diet reviewed, patient referred to GI for long term management of reflux



Kirsch panel discussion case – Patient P. R. "The Weight - OSA Severity - Multilevel Surgery Interplay"

- **3/2013 - Initial consult for OSA with failed CPAP tolerance**
  - AHI = 88.3 (per 6/2012 in-lab PSG) at BMI 39.3 (290 lb), with O2 <=90% for 23% TST
- **12/2013 - Multilevel Surgery**
  - Tonsillectomy, UPPP, Partial/Midline Glossectomy, Airlift multilevel tongue suspension, Septo, SMR Turbs
- **10/2014 and 11/2014 - Post-op in-lab PSG and Office visit**
  - AHI = 2.1 at BMI 33.5 (247 lb), with no desat of <90%, after approx 75 lb post-op weight loss
- **12/30/21 – Office visit for c/o worsened sleep quality**
  - AHI = 34.3 (per 8/2021 in-lab PSG) at BMI 40.7 (300lb), with O2 <= 88% for 4.8% TST - after approx 50 lb weight gain, and additional 3 months of failed CPAP therapy

Kirsch panel discussion case – Patient P. R. "The Weight - OSA Severity - Multilevel Surgery Interplay"

- **2/2022 – Additional Surgery**
  - **Airlift hyoid suspension with infrahyoid myotomy, accompanied by revision/tightening of previously placed tongue suspension sutures**
- **7/2022 Post-op in-lab PSG**
  - **AHI = 46.1 at BMI 39.3 (290 lb), with O2 <= 88% for 1.2% TST**
- **8/2022 Confirmatory WatchPAT HST**
  - **AHI = 23.4 at BMI 41.2 (304 lb), with O2 <= 88% for 5.1% TST**

Case 1

HPI

- 67 y/o WM presents to clinic 10/21 with OSA, hx of HGNS
- On CPAP for 20+ years with good result, then developed severe cough with use
- Due to the cough, had HGNS placed elsewhere - pre-op AHI 46, 21% central/mixed, O2 nadir 60%
- Still had the cough with HGNS, but not as severe; only mild improvement on post-op PSG
- Had suspected TIA and was recommended to temporarily stop using HGNS until seen by ENT
- History of previous nasal surgery, with residual congestion
- No prior treatment for the cough

Case 1

Exam
- BMI 29.4 (5’ 7”, 187 lb)
- Posterior septal deviation, enlarged nasal turbinates
- 1+ tonsils, Friedman tongue position 3, thick palate

Office Laryngoscopy
- Extensive nasal adhesions in rt nasal cavity and sinuses
- Normal tongue base
- Long epiglottis
- Normal larynx

Case 1

4/22
- Addressed the cough - dc'd lisinopril
- Resumed HGNS

5/22
- Sleeping better, cough still present
- Started amitriptyline for potential neurogenic cough

7/22
- Reported 50% improvement in cough
- Scheduled revision nasal surgery and DISE with HGNS

Case 1

7/22

- DISE
- Lysis of nasal adhesions
- HGNS adjusted for optimum tongue movement

Case 1

8/22

- Subjective improvement in sleep quality
- Improvement in nasal sxs
- Cough improved, now mild
- Plan?

- Home sleep study using HGNS – had AHI 11
- Gave option for lingual tonsillectomy with epiglottopexy if cough or sleep symptoms worsen
- Presently doing well without additional intervention

Case 1

Talking Points

- Cough with CPAP can indicate epiglottic collapse
- Don’t just ignore the cough
- The laryngeal surface of the epiglottis is extremely sensitive – treating hypersensitivity showed improvement in the cough
- DISE can be used to troubleshoot and titrate HGNS
- Although success is lower, HGNS can be effective for epiglottic prolapse
- No relation between TIAs and HGNS

Case 2

HPI

- 66 y/o WM seen 10/22 for long hx of OSA with CPAP intolerance
- Most recent sleep study - AHI 54, O2 nadir 56%

PE

- BMI 33.5 (5’ 8”, 220 lb)
- 2+ tonsils, FTP 3, thick uvula and palate
- No abnormalities noted on office laryngoscopy

Case 2

11/22

- DISE

Recommendations?

Case 2

3/23

- Underwent tonsillectomy, expansion pharyngoplasty, and hyoid suspension
- Reported improved sleep quality and snoring
- Optimal pharyngeal exam

7/23

- Post op sleep study – AHI 36, O2 nadir 64%

Case 2

11/22

- Repeat DISE
- HGNS

Changed from primary lateral oropharynx to primary tongue base obstruction

Case 2

1/24

- Subjectively doing well on HGNS at 1.4 V
- Sleep quality much improved
- Very mild snoring
- Upcoming HGNS titration study

Case 2

Talking Points

- Surgical treatment of OSA can be a step-wise process
- UPPP or expansion pharyngoplasty can convert patients from CCC to non-CCC
- Pcrit is a relevant topic – some patients have a higher Pcrit, so if one obstruction is addressed, another may show up. In this case, there was only mild tongue base obstruction at the start, but severe after fixing the oropharyngeal obstruction