



The ART of the “CPAP START”

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-Managing Expectations

Never expected that snoring would ever be considered a medical problem.

Thought I was tired from other issues, such as busy schedule, family, work, stress, or not enough sleep.

I can't imagine how a CPAP device would do anything.

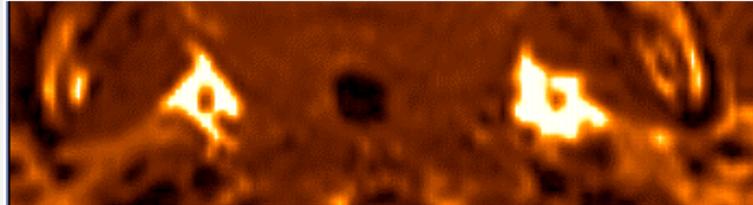
I think I know what I need to do to fix this, but can't right now.

Eyeglass analogy to achieve "20/20 breathing...."

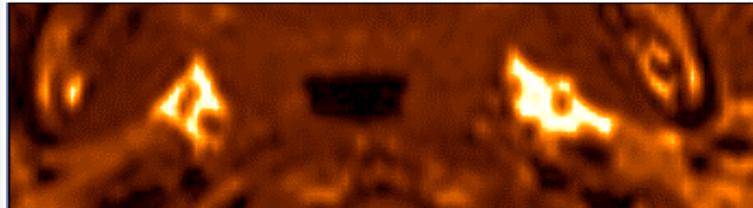
A Leap of Faith is in order.....Congratulations you have OSA!

CPAP Acts as an Airway Stent- laterally

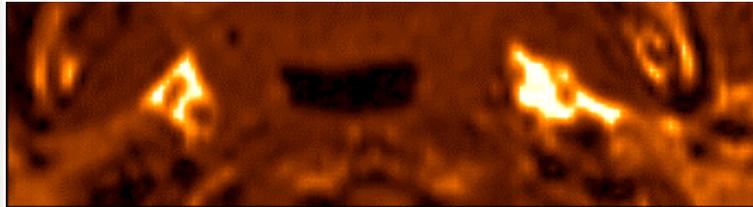
0 cm H₂O



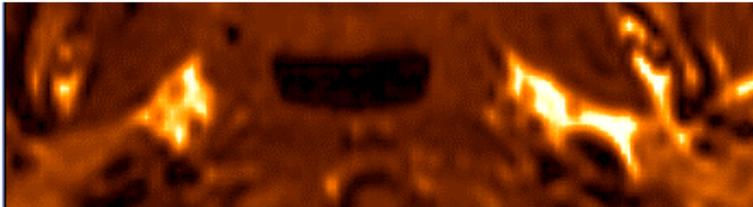
5 cm H₂O



10 cm H₂O



15 cm H₂O



Analog Manometry



-Sample of CPAP Patients thoughts about CPAP

It's a breathing machine that will force air into me....

I have to be on this for the rest of my life.....

If this prevents another stroke.....

I will try anything to help get my memory back.

I'll never meet anybody wearing this.....

I know someone who wore this and they died.....

My cardiologist said if I don't use it, I'll need a pacemaker.

I won't wear any mask.....I can't have anything on my face.

I'd rather have surgery and be done with it.

Finding the Common Ground and Creating Expectations

What annoying symptom do all persons with untreated sleep apnea experience?

Oxygen desaturations are never normal.

Your snoring is now an unhealthy indicator of a medical problem and no longer just noise pollution.

Finding the symptom complex (comorbidities) in a given patient that can be used to incentivize their attempt at CPAP therapy

At a minimum “try treatment”, if you don’t like it or can’t use it, we can explore other options, but for now keep an open mind.

Goal: to become an ex-snorer

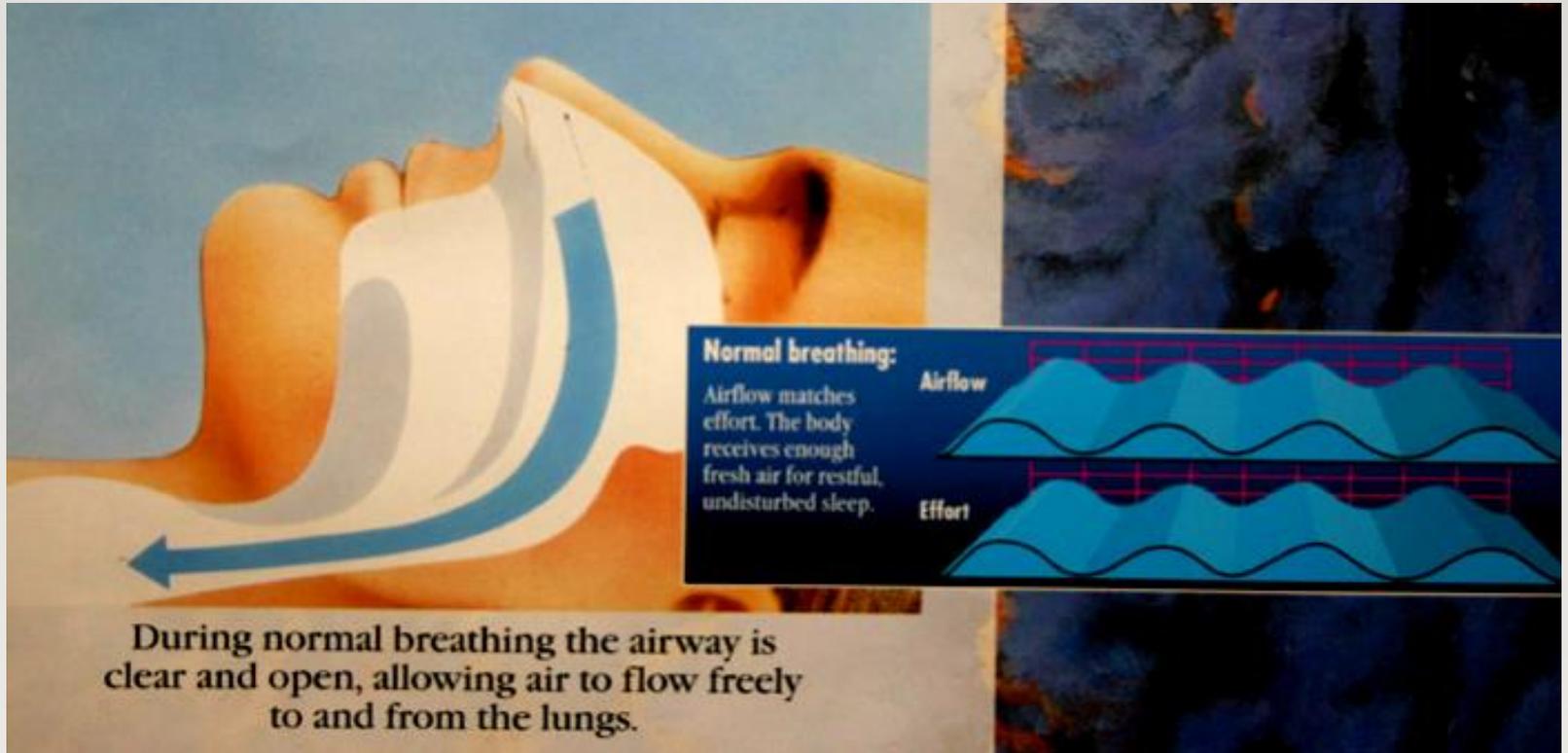
-Counter the anxiety of CPAP use with Grounding Concepts

- The amount of air you breathe while asleep is 40% less than when you are awake.
- If you can breathe through you nose while relaxed in a the chair, then you should be able to breathe through your nose while sleeping on a correct CPAP pressure.
- Make the case from the get go that they will NEVER experience nasal congestion again while using CPAP therapy...that cab be a game changer!
- How do you predict an adequate initial CPAP pressure in a given patient?
- 88,88,88 and 99,99,99 as well as yes,yes,yes and no,no,no.....

-Selling the collateral Effects of CPAP therapy

- CPAP therapy can actually help lessen the clinical symptoms of patients with symptomatic allergic rhinitis, URI-induced nasal congestion, PND, asthma, in addition to treating their underlying OSA.
- Reduce nocturia frequency.
- Lessen nocturnal GERD symptoms
- End AM headaches/ migraines
- Improve AM FBS in diabetics.
- Reduce Blood pressure
- Increase energy and time for physical activity
- Reduce cardiovascular risks in those with a genetic predisposition.

Normal Breathing During Sleep



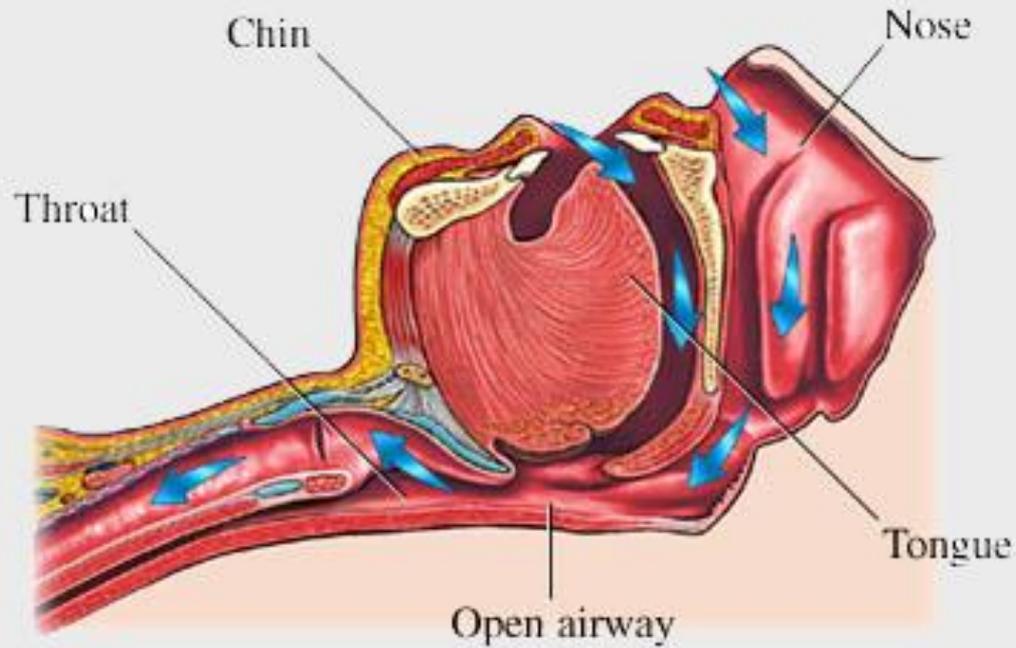
-Nasal Breathing is Nature's Way

- The very act of easy and unobstructed nasal breathing is commonly employed in a wide range of relaxing activities, including meditation, yoga and during CBT training in patients with insomnia.
- Oral breathing, to augment someone's minute ventilation, is normal in response to an increased work load, and quite natural during periods of increased physical exertion.
- However, mouth breathing is not "natural" when someone is relaxing in order to go to sleep, unless the nose feels blocked. To have to be a mouth breather can be anxiety provoking and may be indicative of something else wrong.
- All patients who snore, or have UARS, or OSA are mouth breathers when they sleep, **but** the vast majority of successfully treated patients will become nose breathers during sleep.

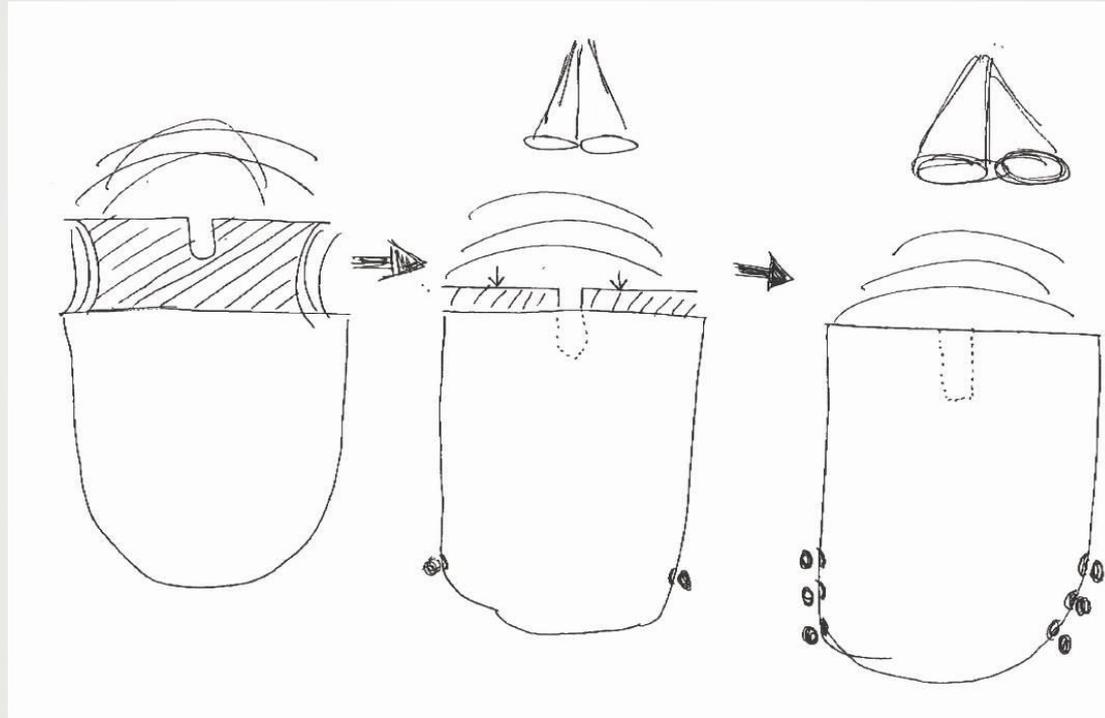
-Obstruction during Nasal Breathing

- Reversible type –allergy, vasomotor
- Fixed Type –deviated septum, polyps, stenosis or neoplasms
- **Dynamic Type** –anterior nasal valve collapse (venturi effect) during nasal inspiration across a narrow nasal valve, or **ping-pong** nasal congestion. (dependent nasal occlusion)

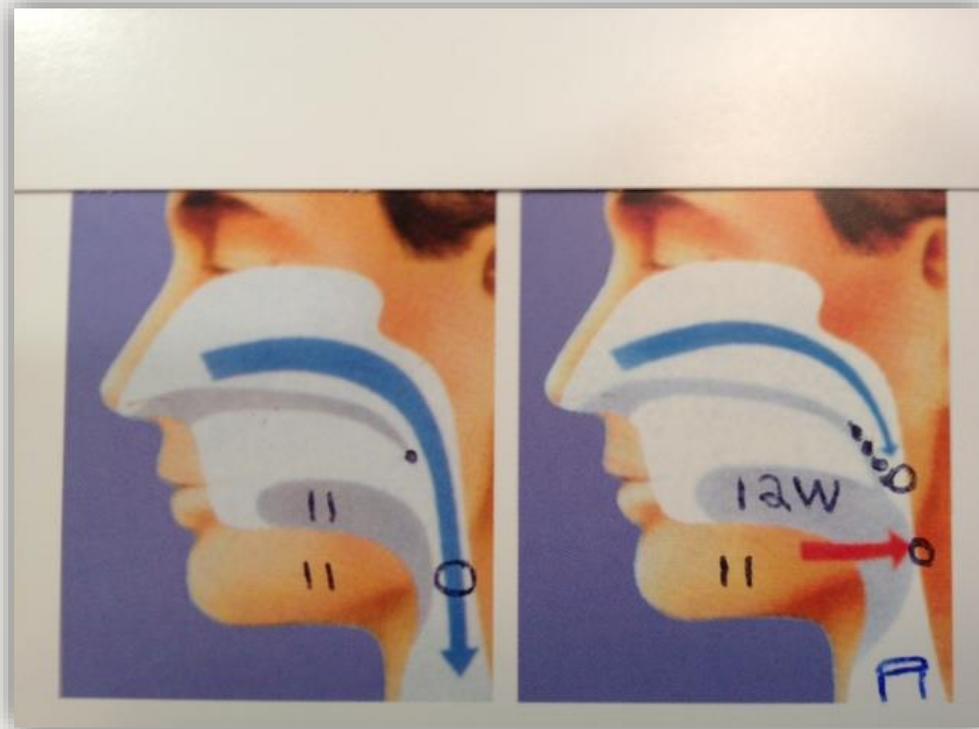
-Diagram the Upper Airway-supine



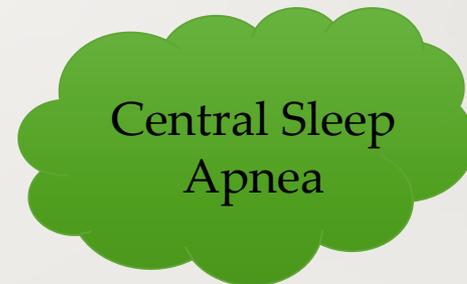
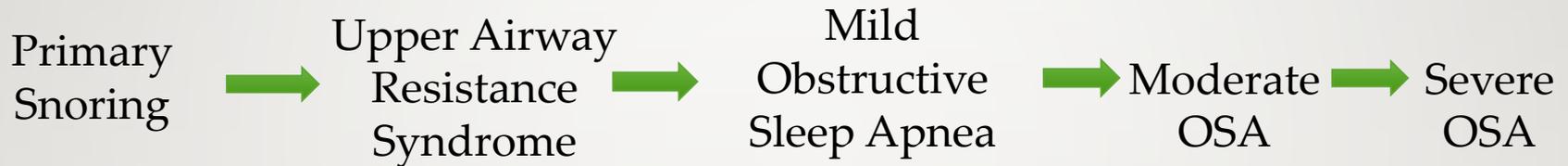
-Progression of Intrinsic Upper Airway Resistance- window shade analogy



-Respiration During Sleep (Normal vs Snoring)



-Spectrum Sleep Related Breathing Disorders



-Tips for initiating CPAP

- Patient holds mask as loosely as possible in order to avoid leaks on initial CPAP pressure, then headgear is tightened to remove any slack in headgear straps. Verbal prompts include:
 - **“sniff and relax” isolates diaphragm (REM sleep)**
 - Repeat after me: 88,88,88 which should be able to clearly enunciated unless initial pressure is too high or wearing a FFM.
 - Repeat after me: 99,99,99 which should NOT be clearly enunciated in contrast to 88,88,88 when at a comfortable initial pressure. If it is then, pressure too low in this patient.

Performing “Sniff and Relax”

- Make sure patient has been at rest for at least 2 min to insure tidal breathing, “sniff and relax”.
- Determine if any difficulty is occurring with or without an interface on. If without, then check for anterior valve collapse or not and assess for unilateral nasal stenosis.
- Now assess for any subjective improvements when tongue is positioned behind lower lip and lower jaw is jugged forward as far as comfortably can with mouth closed. If nasal breathing becomes easier, then continue with a nasal interface and address any difficulties with additional pressure adjustments following 88 and 99 rules.

-Assessing the interface fit of an experienced CPAP user having difficulty

- Troubleshooting a current CPAP user and their usual placement/tension of their own mask for the purpose of a CPAP titration study, for example.

After a patient places their own nasal/FF interface on, per usual, then remove as much dead space as you can from the setup and ask the patient if it is easier to breathe through their nose with the mask pulled directly off the face or not. If it is easier when pulled away, then they likely will need an alternative interface, given the iatrogenic nasal resistance that current mask is generating.

-Anterior Nasal Valve Collapse

- If noted using interfaces that are pillow style or masks located under the nose, then consider using a larger size interface instead, especially if collapse is not noted during tidal nasal breathing without an interface in the same patient.
- Iatrogenic nasal resistance is common in patient having challenges with nasal interfaces.

CPAP and Oral Appliance therapy
both promote nasal breathing



-Prepping the patient for CPAP

- The smaller and less bulky the interface the better, unless the size of interface reduces the ease of natural nasal breathing when applied.
- Demonstrate that the interface will, at a minimum, mimic or maintain the current natural nasal breathing or better yet, demonstrate easier nasal breathing than previously encountered naturally.
- Setting reasonable limits with a patient expectations around how an interface is supposed to appear and not what it is supposed to accomplish functionally for the patient.

- -Pitfalls of Interface Fitting prior to CPAP Initiation

- Pillows that are too small for the size of anterior nares –a very common cause of poor nasal flow.
- Nasal mask was sized smaller or more narrow than the patient's anatomical needs.
- Excessive pressure over nasal bridge arising from mask design that doesn't match patient's anatomical needs.
- The creation of excessive mechanical pressure arising from the headgear design and more often due to the overtightening of headgear.

-Fixing the Pitfalls

- Pillows — ask the patient to breathe just through the nasal pillows themselves and observe for any dynamic nasal valve collapse or not. Breathing intensity should mimic “sniffing a flower” and never be with an increased effort such as snorting or sucking intranasally in order to breathe tidally at rest.
- The patient ideally should not notice any significant difference or increased effort to breathe normally when wearing the correctly sized pillow. If they do, then increase size of the nasal pillow.

-Educating the Patient ----Pillows

- Patients have an unfortunate tendency to pick the smallest of nasal pillows for the purpose of using CPAP therapy.
- In order to make an important point to the patient, have the patient visualize with a mirror their own anterior nares opening size, then contrast to the size to the selected pillow interface. Conversely, one can try to breathe through just the pillows and contrast the ease of same between the sizes.
- Patients think their nares are always smaller!

- -Educating the Patient re:Pillow Size

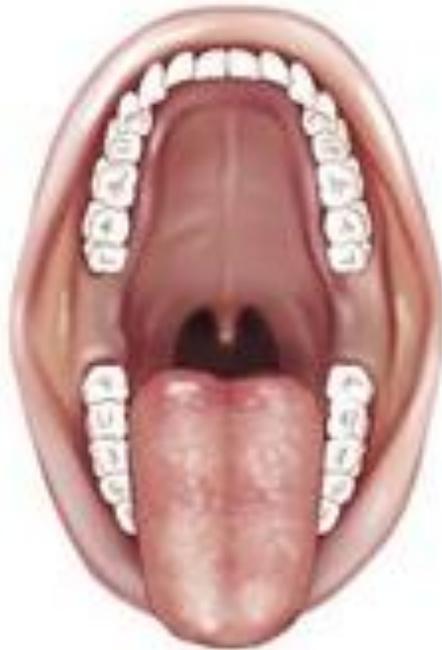
- Inserting the entire nasal pillow into the anterior nares, because you can or it prevents leaks is a **poor** strategy.
- When you do, the thickness of the nasal pillow, at its widest point, will generate excessive mechanical pressure intranasally and cause pain with regular use.
- Address this issue counterintuitively by increasing the nasal pillow size to permit only the upper (softer) portion of the pillow to enter the nares.
- Be aware that patients with a long A-P diameter nasal opening do **not** make good candidates for the nasal pillow interface due to the high risk of leakage either anteriorly or posteriorly when the pillow is unable to adequately seal the anterior nasal opening.



-Factors Impacting Upper Airway Patency

- Alternating nasal congestion- “ping-pong” - not intranasal
 - Mouth size and Tongue size
 - High Arch Palate, Retrognathia
 - Lingual grooves or scalloping of tongue
 - Tonsillar and Adenoidal Hypertrophy
 - Mandibular Tori
 - Palate Ptosis
 - Neck position
- 

Mallampati score



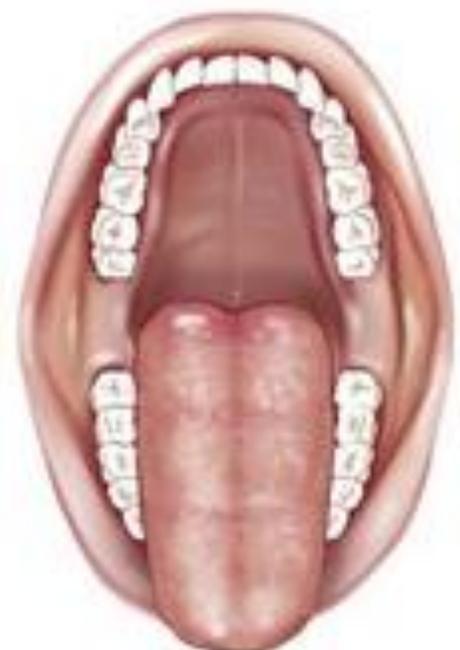
Class 1



Class 2



Class 3



Class 4

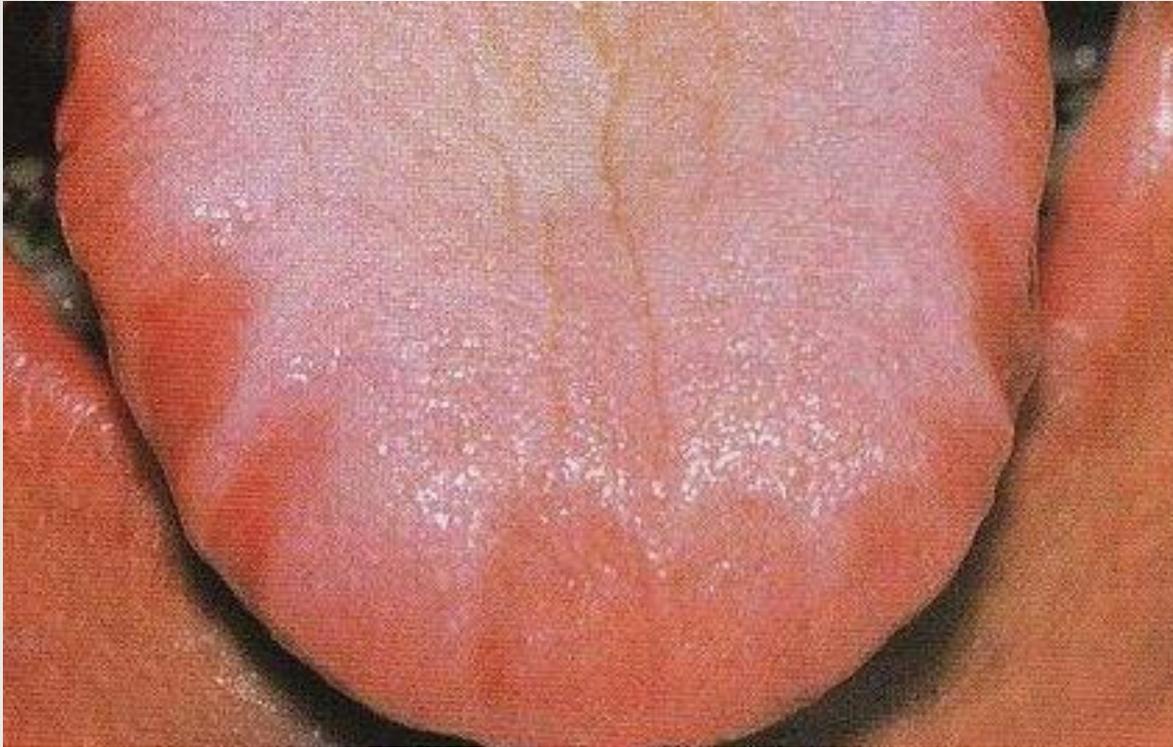
Class 1; soft palate, fauces, uvula, pillars

Class 2; soft palate, fauces, portion of uvula

Class 3; soft palate, base of uvula

Class 4; hard palate only

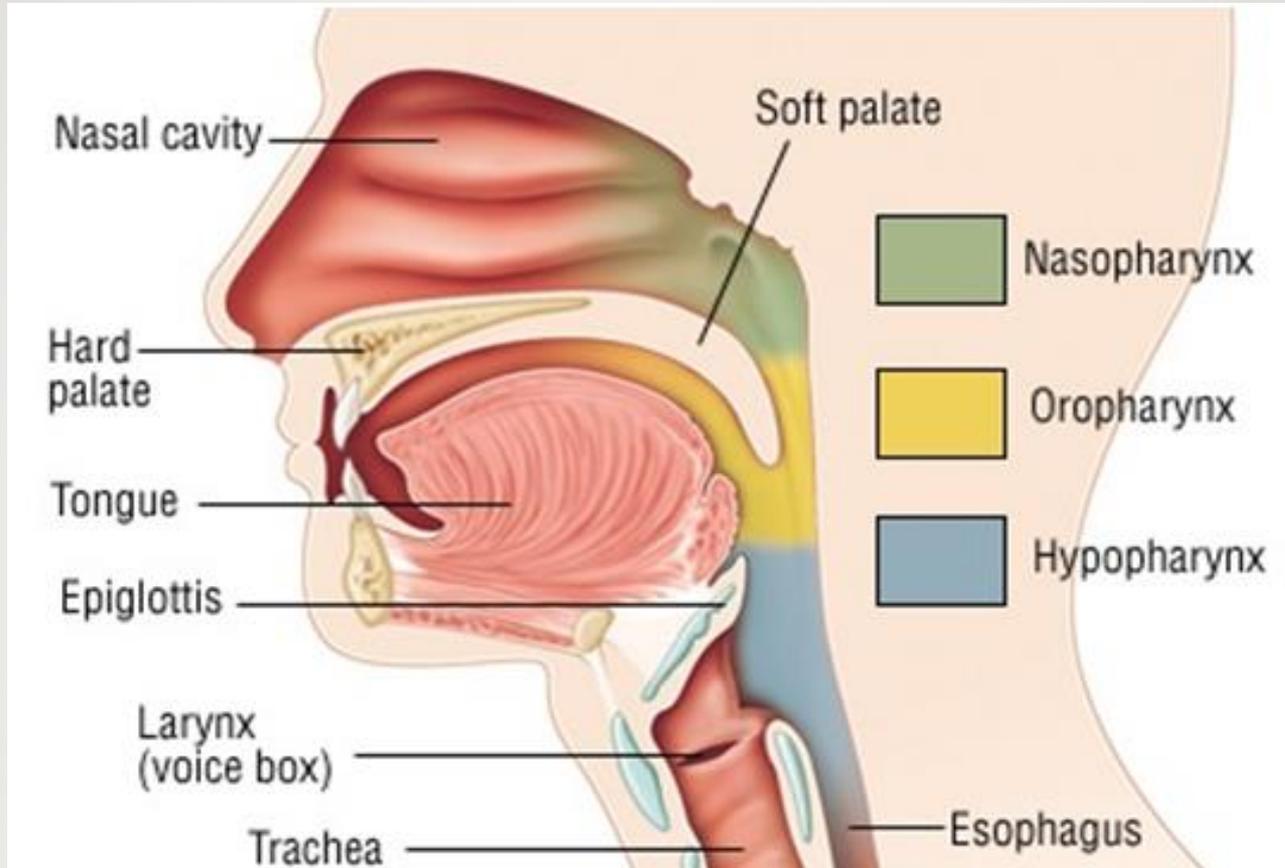
Lingual Grooves



Mandibular Tori



Anatomy of Upper Airway



-Anatomy of Upper Airway

- **Nasal cavity** (Floor, Septum)
- **Nasopharynx**
- **Velumpharyngeal opening** (palate length and Adenoids)
- **Oropharynx area**(Tongue, Tonsils, Fat Pads, retrognathia)
- **Hypopharynx area** (neck position, micrognathias)

All these areas can influence ease of respiration and contribute to sleep related breathing disturbances.

Painting the Picture of Successful Nasal CPAP use

- All patients with Obstructive sleep apnea are mouth breathers when they sleep.
- Most OSA patients who can easily breathe through their nose when relaxed in a chair, do have the potential to breathe through their nose using PAP therapy while asleep.
- Easily breathe means that a patient can meet their MV, by just “sniffing” air or “sipping air” through the nose and not having to snort or suck air.
- Needing to Snort/Suck to breathe nasally, may be indicative of significant intranasal obstruction or nasal valve collapse.

Snoring vs No Snoring

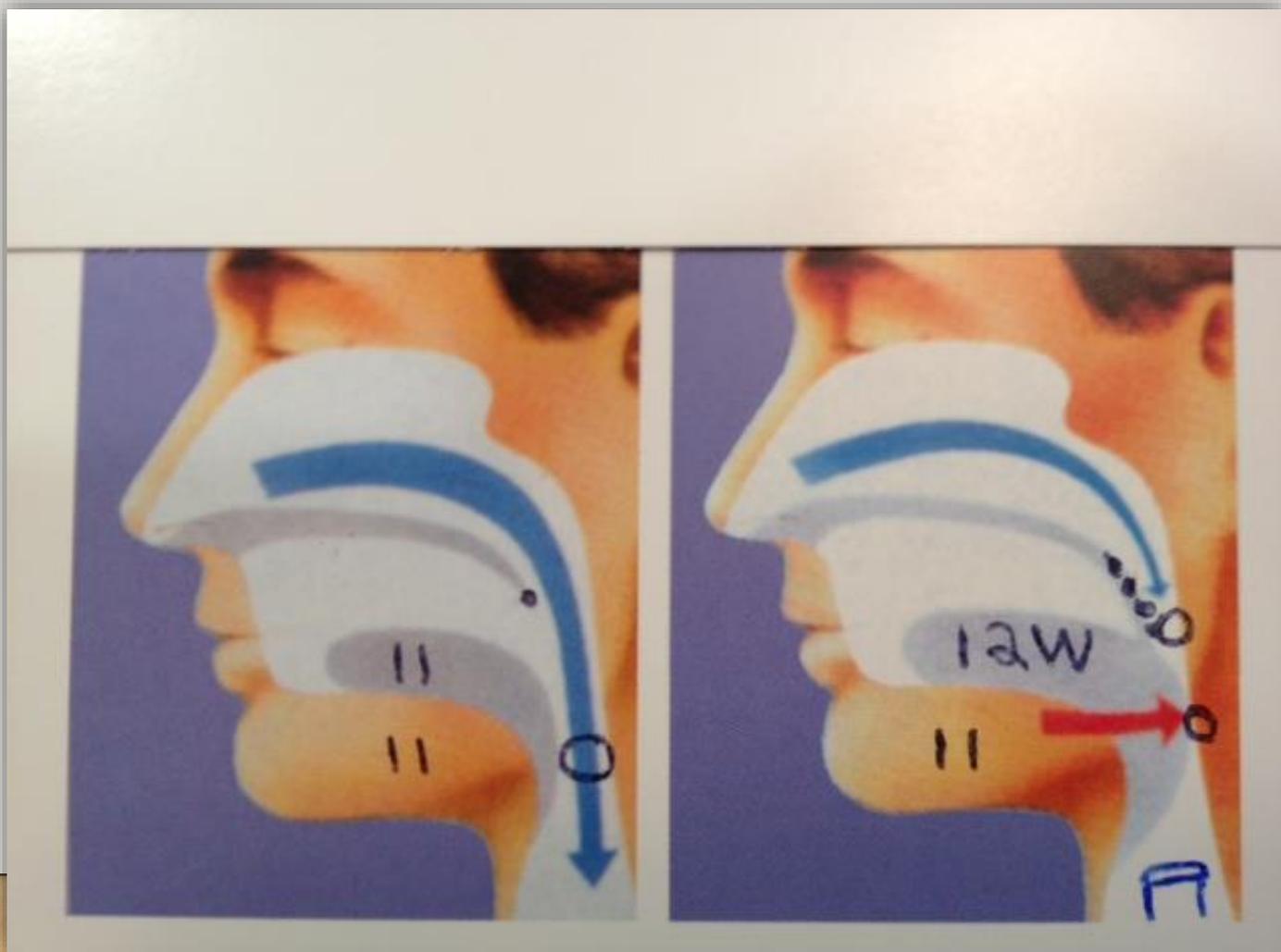
Turbulent airflow

Laminar airflow

Pressure (P) = Flow (F) x Resistance (R)

- Snoring is a sign of an increased (R) within the upper airway.
- Sufficient nasal flow must be maintained for tidal breathing; in the face of increased airway resistance, accessory muscles of inspiration are recruited (NonREM) which then creates a pressure gradient that sometimes generates airway collapse by lowering the intra-airway pressure below atmospheric pressure.
- Analogy of a drawing in with a wet straw.

Respiration During Sleep (foot in a shoe analogy) (Normal vs Snoring)



-Generating “Artificial Snoring” and Turbulent Airflow

- Helps determine the factors in a given patient that impact upper airway flow and resistance.
- First, have patient attempts to make a snorting or snoring sound, while breathing in through your nose with your mouth closed. (Most snorers can do this)
- Second, practice this so that you can replicate a comparable effort and duration of a snoring sound on command.

-Attempting to “Artificially Snore” in varied positions that impact UAR

- Third, now replicate the same snoring effort and duration while facing forward, then repeat while facing upward and lastly
- Repeat while looking downward to determine which position increases or decreases snoring volume.
- This exercise will offer anatomical insights into the impact of the oropharyngeal and hypopharyngeal airway in a given patient which correlates with intrinsic upper airway resistance.



-Artificial Snoring with Tongue and Jaw extended and mouth closed

- Determines degree of turbulent airflow arising from tongue base plus lower mouth, which can correspond to the potential utility of **oral appliance therapy** in most patients with a Mallampati 2 and some Mallampati 3 patients.

-Artificial Snoring with only tongue extended out of mouth

- Help determine impact of tongue base on turbulent airflow in a given patient. Potential TRD impact.

-Hypopharyngeal AirFlow

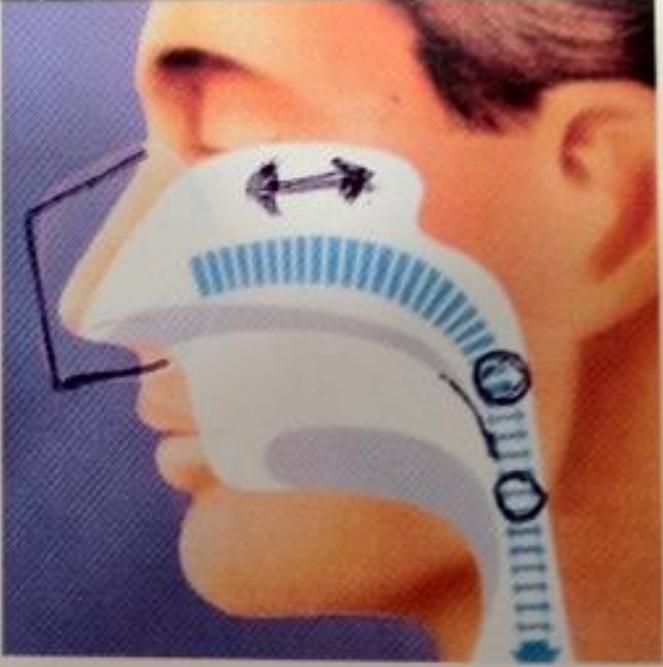
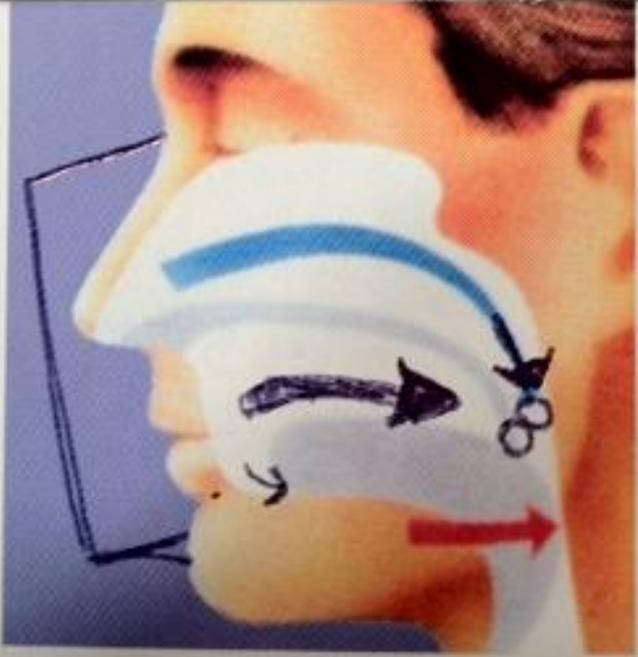
- Influenced by neck flexion and extension
- Usually neck flexion generates increased artificial snoring volume or resistance in the hypopharynx in most individuals.
- Conversely, neck extension results in less capacity for artificial snoring
- Impact of neck pillow here.

-When is a FFM a necessity?

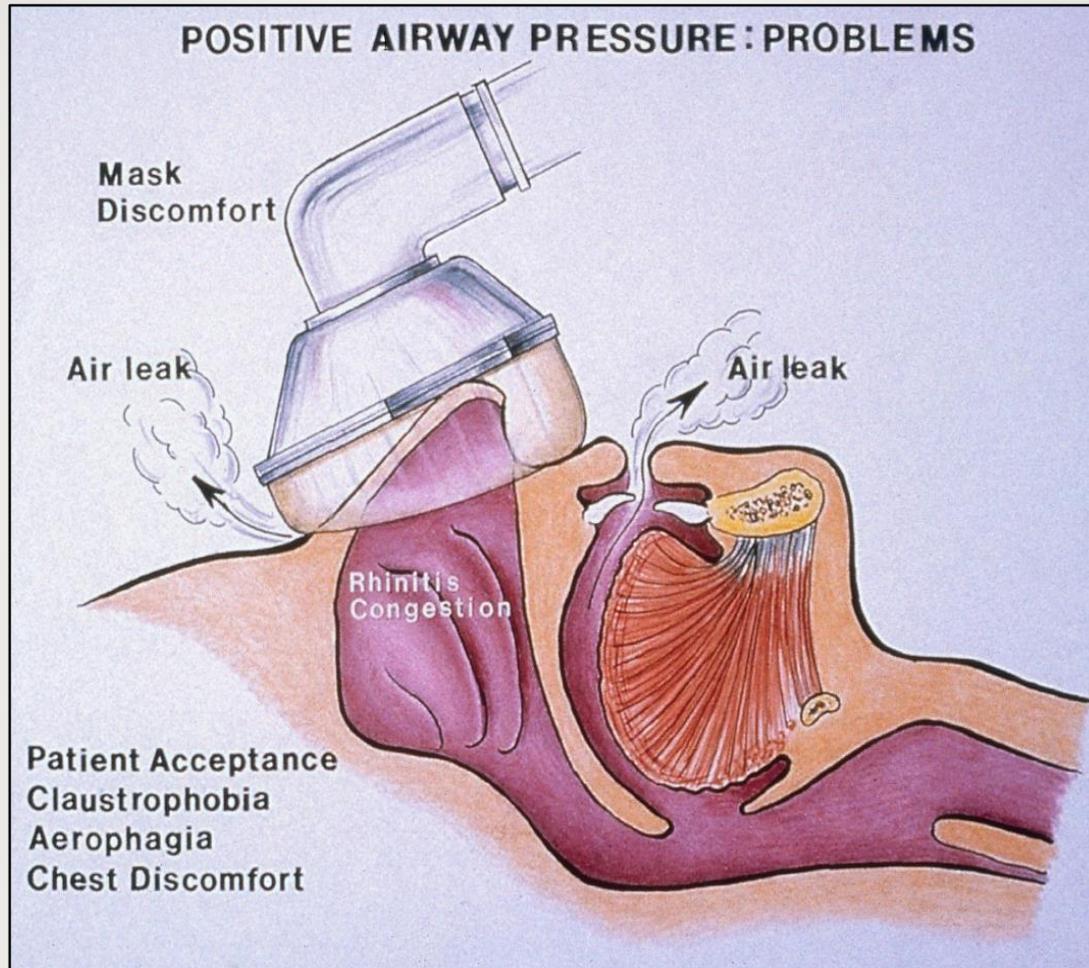
- S/P aggressive UPPP surgery, where post op PSG indicates significant sleep-related breathing disturbances remain.
- Mallampati 2-3 OSA with mouth leakage when using nasal mask.
- Inability to breathe through either nares when at rest, because of a chronic fixed obstruction.

Problems inherent to FFM use

- More perimeter for leak development
- Produces iatrogenic retrognathia and increased resistance.
- Generally requires a higher “optimal” PAP pressure
- Humidor effect
- Unsuitable for most with full beard.
- Claustrophobic effect, think PTSD in some with a prior near drowning experience.
- Aerophagia
- Bruxism ? Related to impairment of lower jaw motion



-Positive Airway Pressure: Problems



-Lip Leak vs Mouth Leak

- **Mouth leak** arises when the mouth opens during sleep while using CPAP, usually when in REM and supine position when atonia and highest APAP pressures are observed.

Rx: Consider chin strap, reverse neck pillow, reducing max set pressure, or positional aids to favor lateral position. Generally works well in Mallampati 4 patients.

- **Lip Leak** arises when there is occlusion of the upper and lower teeth and there is air leakage through the lips. More common in patients with improving Mallampati score 4→3 or Mallampati 2 trying CPAP with a just nasal interface.

Rx: Consider FFM in this instance or **OAT**, if **unable to artificially snore when prompted with tongue and jaw moved anteriorly**.

Pitfalls Estimating Initial Pressures in Experienced CPAP users

- Acceptable Min pressure usually is 3-4cm/water less than median pressure demonstrated from previous compliance data.

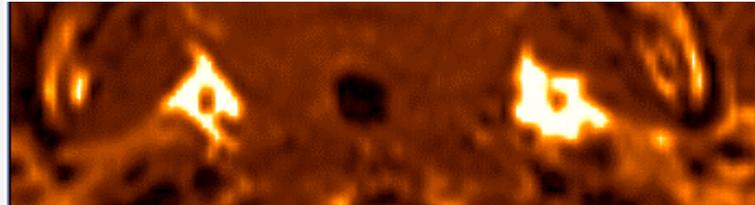
For example, if Median pressure is 12cm/water, then likely 8-9cm/water initial pressure would be most natural starting pressure in a given patient. However, if ramping from 4 cm or starting with min pressure of 5cm/water, the patient might not be able to breathe through their nose because the air pressure is insufficient to address the upper airway resistance in a given patient and for that reason they may be amenable to switching to a FFM for the wrong reason.

Best Initial Pressure- Test CPAP

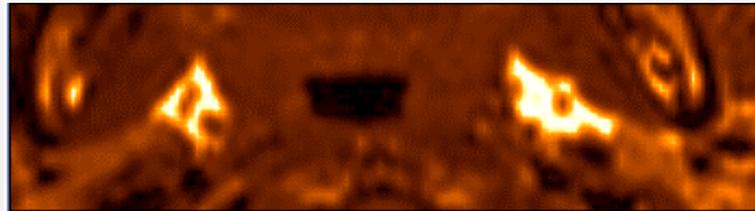
- “Sniff and Relax” Insp/Exp (passive) ratio 1:2-easy, natural breathing.
- “YES,YES,YES” versus “NO, NO, NO” (can’t enunciate)
- “88,88, 88” and “99,99, 99” (can’t enunciate)
- Enunciate both, pressure too low.
- Enunciate neither, pressure too high.
- Snoring volume reduction method, guesstimate of potential resistance
- My goal is to maximize the potential for nasal breathing .
- Give new patient the confidence to consider nasal breathing vs oral breathing.

-CPAP Acts as an Airway Stent- laterally

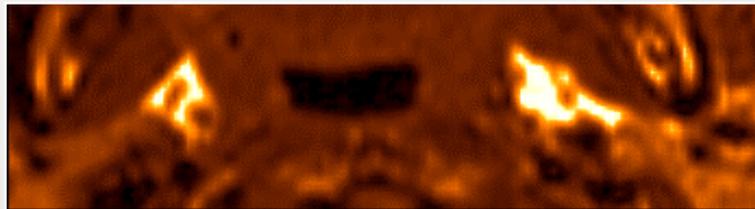
0 cm H₂O



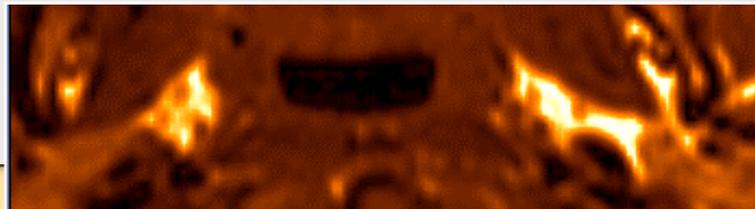
5 cm H₂O



10 cm H₂O



15 cm H₂O



-Increasing Sleep Efficiency in Challenging CPAP titration Patients

- Better to position patient in lateral position and stay with a nasal interface, (in a nasal breather) and/or raise the HOB, than to switch to a FFM and continue to attempt a supine titration that's difficult in a patient who never sleeps in the supine.
- A therapeutic pressure, in the lateral position, is better than a poor sleep efficiency in the supine position with no optimal pressure determined.
- Better sleep efficiency means more chance for REM stage.

-Analog Manometer in series with Current CPAP Setup

- Measures set CPAP pressure
- During end of inspiration, it can measure the peak inspiratory pressure (PIP) that is necessary to provide normal flow with the presence of iatrogenic and natural resistances.
 $P = F \times R$

Determine the pressure that prevents artificial snoring.

Help determine what level of pressure relief works best and what size interface results in least iatrogenic resistance or PIP.

***** $\Delta P = \text{constant tidal } F \times \Delta R$ *****

-Analog Manometry



Confirm static CPAP pressure

Check Cflex/EPR levels

Confirm PIP (Lower the change to PIP the better)

Assess immediate consequence to adjustments in CPAP pressure or snore capacity

-Clinical Pearl- enhancing compliance

- When an interface is causing an increased sense of resistance during **exhalation**, the temporary use of Pressure Relief (Cflex/EPR) can permit any undersized interface or iatrogenic nasal resistance to function adequately enough, until the correct sizing can be obtained and the patient refit.
- When an interface is causing an increased sense of resistance during **inspiration**, empirically increasing the CPAP pressure with the assistance of phonetics (88/99; yes/no) can offer a quick solution to some early stage CPAP challenges, assuming no intrinsic mask resistance.

-Insufficient Starting PAP pressures when using Auto CPAP– can cause mask or CPAP failure

- When initial ramp pressures on CPAP are insufficient to maintain minimal upper airway patency in a given patient.
- When using an APAP with a settling time or using a timed ramp pressure initialil— both can prevent the necessary initial pressure changes from occurring.
- With an insufficient initial pressure, there will be a reduction in flow that will not permit a sense of easy, relaxed breathing or the taking of “sips of air” by the patient through their own interface.
- Creates confusion during initial CPAP Rx and management choices.

Future successful management

- PAP is part of a dynamic array of potential therapies, geared to enable normal breathing during sleep.
- Over time the sum of the total resistance within the upper airway will change, both in location and degree.
- Appreciation of this will permit the necessary treatment adjustments for continued successful management of symptomatic SRBD.



THANK YOU
For your Attention

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