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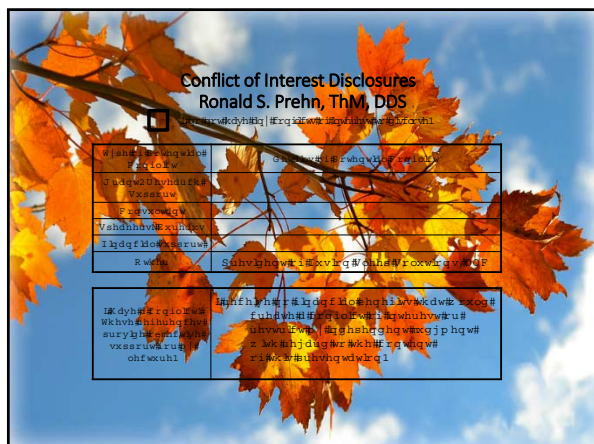
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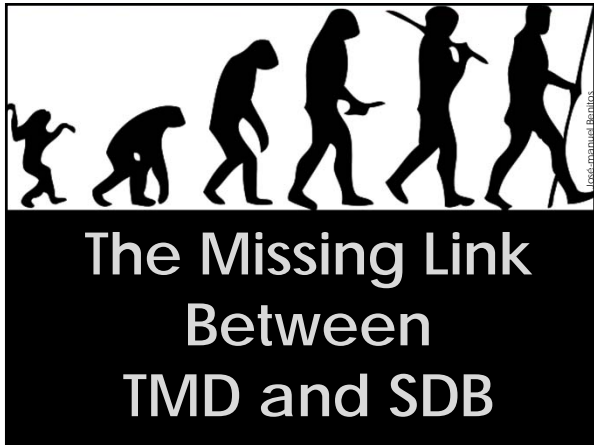
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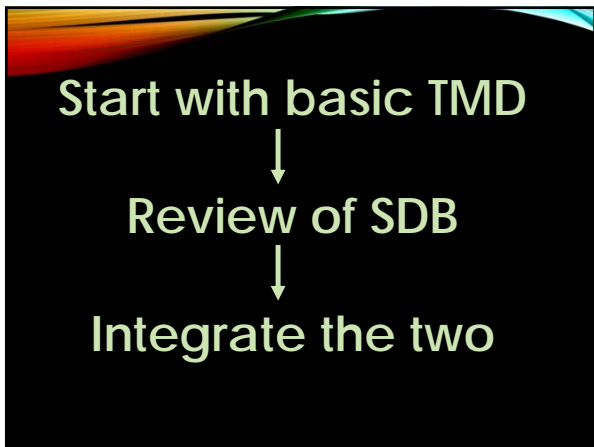
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# TMJ FUNCTION

Four Parts Work in Harmony:

1. Hinge (TMJ)
2. Teeth
3. Alveolar bone & gingiva
4. Muscles

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TEETH BONE MUSCLE TM JOINT

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## TM Joint Degenerates like any other joint

Risk Factors → Degeneration ← Adaptation ← Intervention

normal | Episodic clicking | Full lock | Mild bone changes | Severe bone changes | TM Joint destroyed

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## Risk Factors

- Pain
- Sleep disorders
- Bruxing
- Gender
- Malocclusion
- Stress/Habits
- Systemic
  - Arthritides
  - Autoimmune
  - Fibromyalgia
  - Hormones

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## Basic orthopedic principle:

The key to the health of the TM joint is **LUBRICATION**.

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The lack of lubrication causes **three** main TMJ issues:

- disc instability (gets sticky –drags)
- lack of nutrients to surface of condyle
- pain from inflammation

Goal of TMJ therapy is to restore the lubrication

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**Contributing Factors**

**What ever is driving the clenching muscles is what the treating dentist, must address.**

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**Clenching**

Daytime – later in this presentation

Can be influenced by behavior modification

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**Clenching**

Nighttime – Many theories

- 1) Occlusal trigger
- 2) Anxiety driven
- 3) Brain stem arousal
- 4) Airway protection

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# Airway protection Theory

Clenching as a compensatory mechanism to stabilize a collapsing airway

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# AIRWAY Determinants:

Size?  
Collapsibility?



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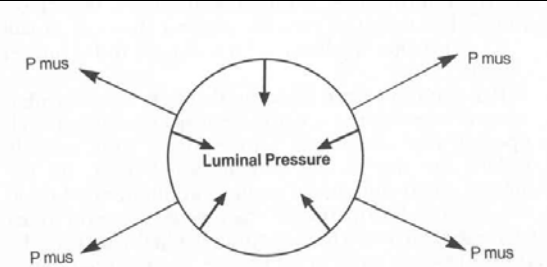
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# NEUROMUSCULAR FACTORS



Pharynx open:  $P_{mus} + P_{lumen} > P_{close}$   
Pharynx closed:  $P_{mus} + P_{lumen} < P_{close}$

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## Bernoulli's principle

“As the speed of a moving fluid (liquid or gas) increases, the pressure within the fluid decreases.”  
Wikipedia

**\*\*\*Increased speed = decreased pressure**

Examples: shower curtains, sail boats and jet wings

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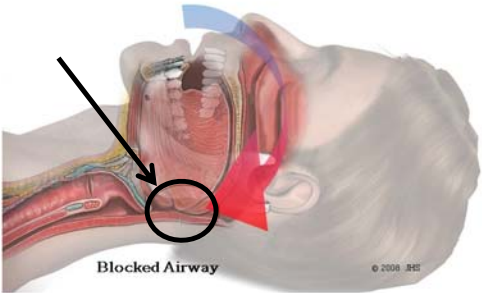
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**Problem: Airway Obstruction at Base of Tongue**



Blocked Airway

Image courtesy of Jerald H. Simmons MD

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“The upper airway reflex opposes the negative pressure collapsing forces generated during inhalation. This reflex is accomplished through activation of pharyngeal dilator muscles [“and increase activity in the genioglossus”], which can increase airway patency. ... Most of these receptors seem to be located in the upper trachea and transmit information through the superior laryngeal nerve as well as the glossopharyngeal and trigeminal nerves”

Guilleminault, C., Savani, A., *Neurological Basis of Sleep Breathing Disorders*, Sleep Med Clin 7 (2012), 557

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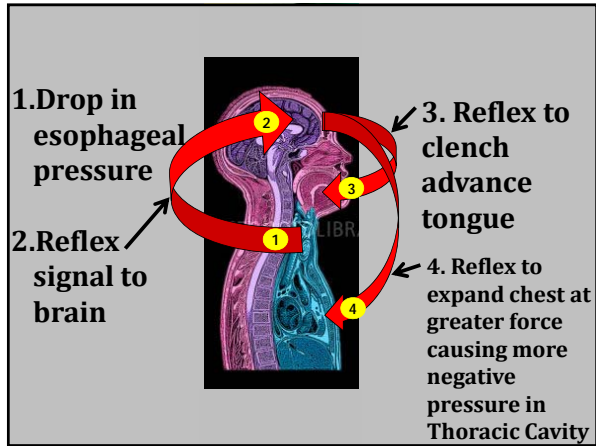
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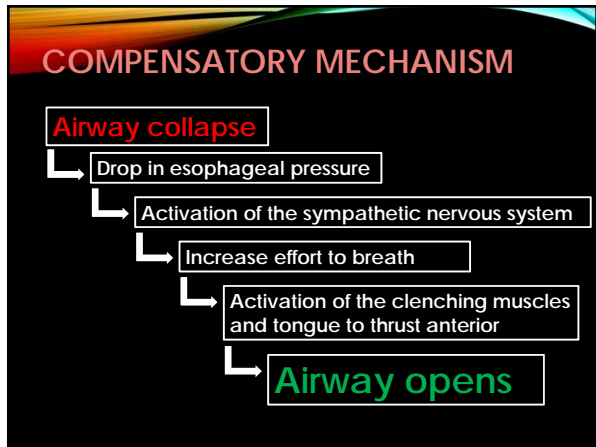
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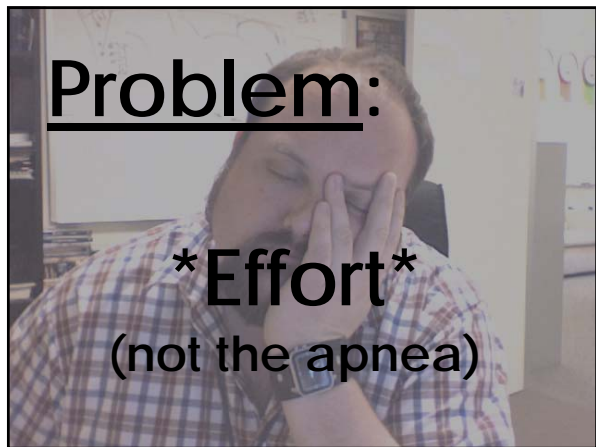
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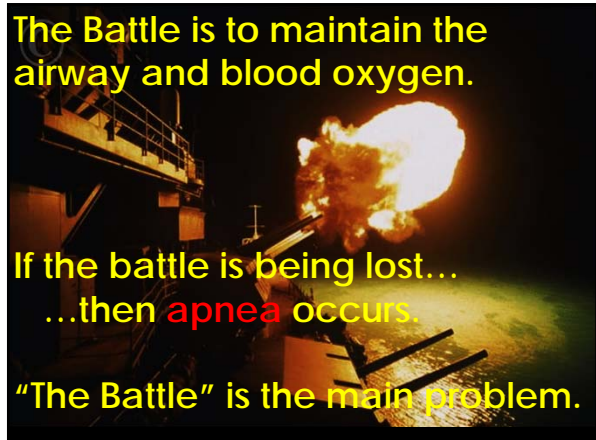
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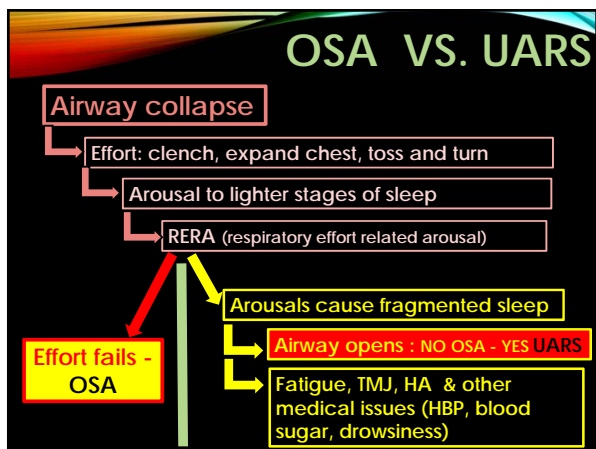
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- ### "Battle" causes sleep fragmentation
- Fatigue and/or drowsiness
  - Metabolic syndrome
  - Weight gain
  - Daytime hyperactivity (to compensate for fatigue)
  - Nocturia
  - Insomnia
  - Anxiety and/or depression
  - More

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**Airway collapse causes Negative Esophageal Pressures**

- Cardiovascular stress
  - HBP
  - Epithelial dysfunction
- Increased clenching
- TM joint
- Facial changes
- Dental issues
- Headaches

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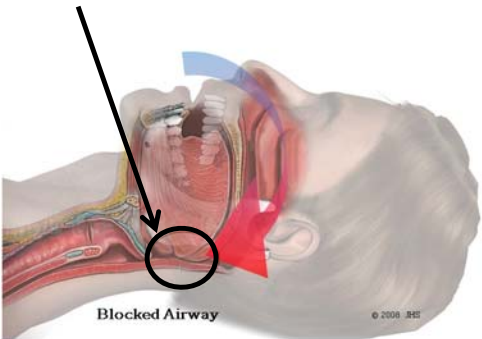
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**Problem: Airway Obstruction at Base of Tongue**



Blocked Airway

Image courtesy of Jerald H. Simmons MD from the Sadler Sleep Disorders Clinic

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**Solution: Brux to activate the tongue to bring forward**

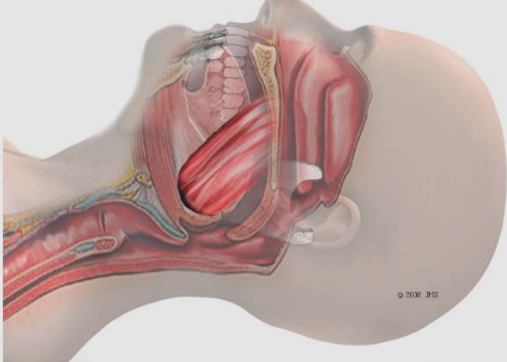


Image courtesy of Jerald H. Simmons MD

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**Solution:** Advance the Mandible or Positive Pressure

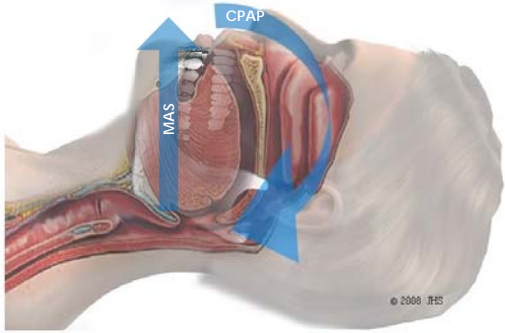


Image courtesy of Jerald H. Simmons MD

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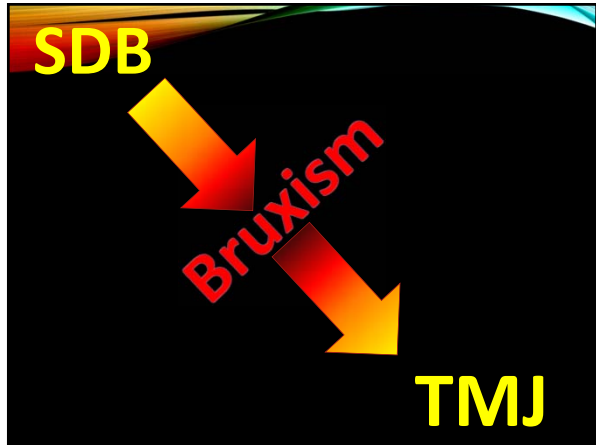
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**BRUXISM**

**Definition:**

Sleep related bruxism is an oral activity characterized by **grinding or clenching** of the teeth during sleep, usually associated with sleep arousals.

The International Classification of Sleep Disorders, second edition, pg. 189

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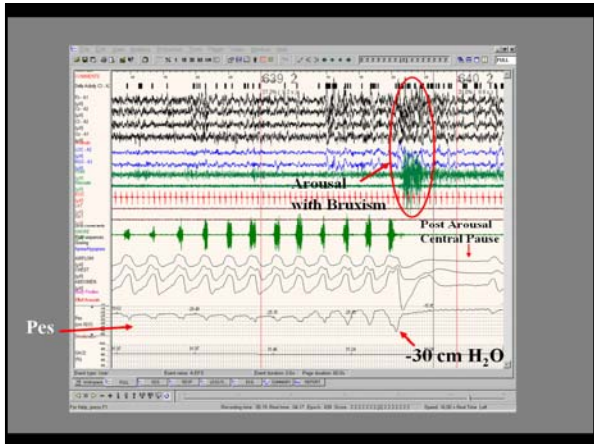
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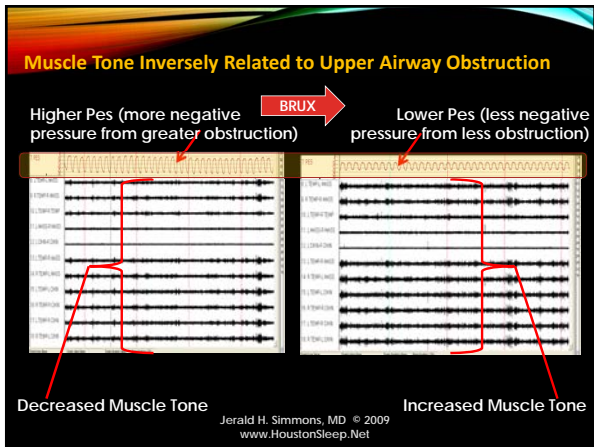
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**Why people brux and clench at night...**

**...to protect the collapsing airway!!!**

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**Do muscle relaxant splints make OSA worse?**

**“Conclusion:** This open study suggested that the use of an occlusal splint is associated with a risk of aggravation of respiratory disturbances. It may therefore be relevant for clinicians to question patients about snoring and sleep apnea when recommending an occlusal splint.”

Yves Gagnon, DMD, MSc/Pierre Mayer, MD/Florence Morisson, DMD, PhD/Pierre H. Rompré, MSc/Gilles J. Lavigne, DMD, MSc, PhD; *Aggravation of Respiratory Disturbances by the Use of an Occlusal Splint in Apneic Patients: A Pilot Study*; *Int J Prosthodont* 2004;17:447–453.

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**Do muscle relaxant splints make OSA worse?**

**“Conclusion:** The use of an occlusal stabilization splint IS associated with a risk of aggravation of OSA...”

Nikolopoulou, Ahlberg, Visscher, Hamburger, Naeije, Lobbezoo; *Effects of Occlusal Stabilization Splints on Obstructive Sleep Apnea: A Randomized Controlled Trial*; *J OROFAC PAIN* 2013; 27:199-205.

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**Clenching is secondary to the activation of the sympathetic nervous system**

**Day time clenching**

- **anxiety** (stress - psychological)
- **pain** (neuropathic, muscular, inflammatory, etc)
- **headaches** (migraine, muscle tension, sinus)
- **fatigue** (unresolved sleep drive)

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### Night time clenching

- Compensatory clenching to protect airway
- Effort to breath causes RERAs
- RERAs causes fragmented sleep
- Fragmented sleep causes fatigue
- Result is SDB (UARS or OSA)

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### Recent Study 25 subjects:

**Conclusion:** RERA's are associated with marked increase in cardiac sympathetic modulation, especially in females. Patients with a high RERA index, even in the setting of low or normal AHI, may be exposed to elevated sympathetic tone during sleep."

Chandra, Sica, Wang, Lakticova, Greenberg; Respiratory effort-related arousals contribute to sympathetic modulation of heart rate variability; Sleep Breath (2013) 17:1193-1200.

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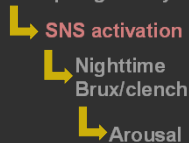
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### SLEEP

Collapsing airway



### OSA & TMD

Activation of the Sympathetic Nervous System (SNS)

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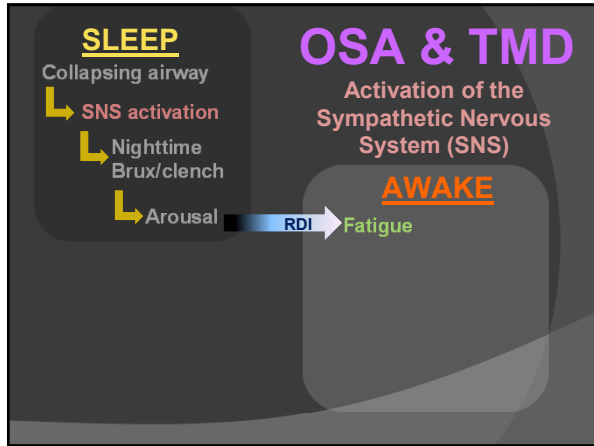
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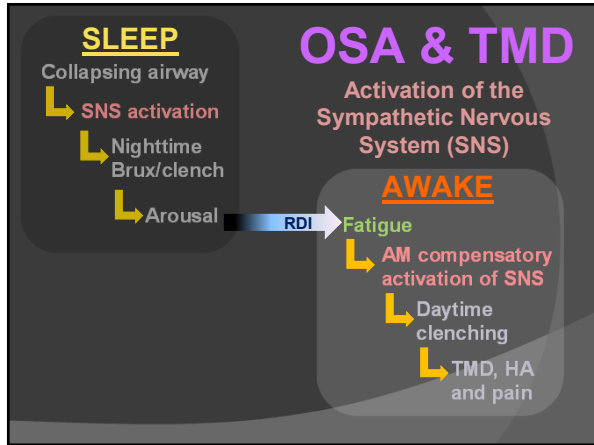
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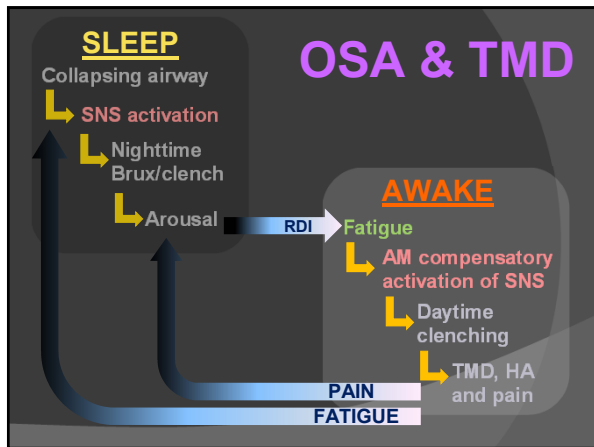
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