SLEEP DENTISTRY
Part I


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This is the first part of a two-part discussion on the diagnosis, medical and dental evaluation and treatment of sleep-related breathing disorders. Part I of this discussion will focus on the medical implications of this disorder and the diagnostic tools available for analysis.

SLEEP BRUXISM

Sleep bruxism (SB) is considered a common sleep-related motor movement disorder. The electromyography (EMG) pattern of SB is associated with repetitive and recurrent episodes of rhythmic masticatory muscle activity (RMMA) of the masseter and temporalis muscles that are usually associated with sleep arousals.

American Academy of Sleep Medicine (AASM) Clinical Diagnostic Criteria for Sleep Bruxism:

Patient history:

Recent patient, bed partner, parent, or sibling reports tooth-grinding sounds occurring during sleep for at least 3 – 5 nights per week in the last 3 – 6 months.

Clinical evaluation:

- Signs and symptoms:
  - Abnormal tooth wear
  - Hypertrophy of the masseter muscles on voluntary forceful clenching
  - Discomfort, fatigue, or pain in the jaw muscles (and transient, morning jaw-muscle pain and headache)
  - Jaw-muscle activity cannot be better explained by another current sleep disorder, medical or neurologic disorder, medication use, or substance use disorder.
- None of these signs and symptoms constitutes direct proof of current SB activity.
- Full-night polysomnography (PSG) with audio-video recording remains the gold standard for SB diagnosis.
- The epidemiology of SB is largely determined by questionnaires, self-reports or clinical findings.
- SB is reported by 8% of the general adult population (Lavigne GJ, Montplaisir JY. 1994, Ohayon MM. et al 2001). It peaks during childhood with prevalence approaching 40% in children aged less than 11 years (Simola P. et al 2010, Castelo PM. et al 2010, Strausz T. et al 2010) and tends to decrease into adulthood. No gender difference has been observed.
- SB in association with excessive RMMA and clenching during sleep can lead to headaches.
- The risk of SB increases in women after menopause (Carra MC. et al. 2012).
- Sleep-disordered breathing has been associated with SB.
- Sleep-disordered breathing in the presence of hypoxia and sleep fragmentation can lead to headaches.

WHAT ARE THE TYPES OF SLEEP APNOEA?

There are three types of sleep apnoea:

Central sleep apnoea

Central sleep apnoea (CSA) occurs when the brain does not send the signal to the muscles to take a breath and there is no muscular effort to take a breath. This usually occurs in infants or in adults with heart disease, cerebrovascular disease, or congenital diseases, but it also can be caused by some medications and high altitudes. In adults with central sleep apnoea, the apnoeas are treated by treating the underlying primary problem.

Obstructive sleep apnoea

Obstructive sleep apnoea (OSA) occurs when the brain sends the signal to the muscles and the muscles make an effort to take a breath, but they are unsuccessful because the airway becomes obstructed and prevents an adequate flow of air.

Mixed sleep apnoea

Mixed sleep apnoea occurs when there is both CSA and OSA.

HOW IS OBSTRUCTIVE SLEEP APNOEA DIAGNOSED AND EVALUATED?

History and Physical Examination

Medical examination

This is performed to examine the areas of possible airway collapse. In the nose, this includes the septum, turbinates, nasal polyps, adenoid hypertrophy, and nasopharynx (back of the nose).The mouth, the palate, tonsils, uvula, pharyngeal walls and neck circumference are all examined. A flexible nasopharyngoscopy is usually performed to examine the airway during active breathing and simulated snoring manoeuvers.

Figure 1 illustrates the association between OSA and cardiovascular disease and possible links to metabolic dysregulation. (Lopez-Jimenez F. et al., 2008).

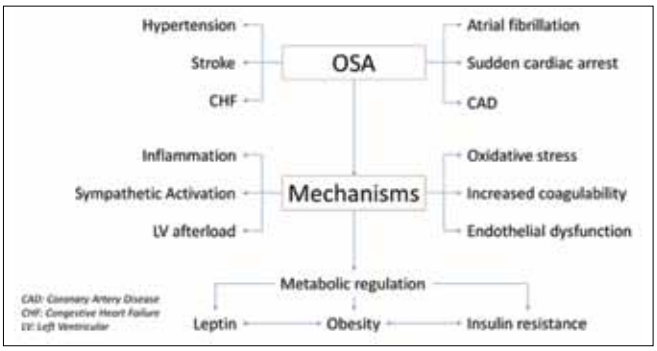
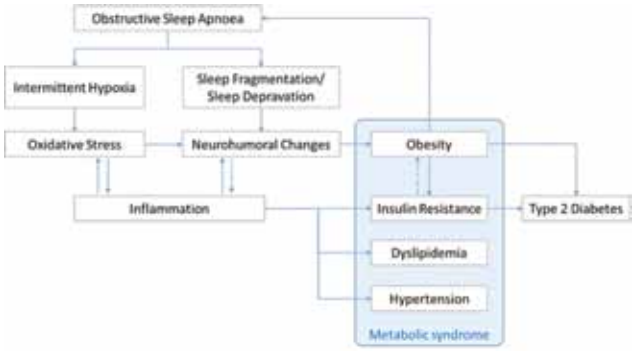


Figure 1

The possible mechanistic links between OSA, Type 2 Diabetes and metabolic syndrome are described in Figure 2 by Tasali D, Ip MS. 2008.



Neurohumoral changes refers to autonomic and circulating or hormonal factors.

Dyslipidemia refers to abnormal amount of lipids (e.g. cholesterol and/or fat) in the blood. In developed western countries, most dyslipidemias are hyperlipidemias ie. an elevation of lipids in the blood which is often due to diet and lifestyle. Prolonged elevation of insulin levels can also lead to dyslipidemia.

Figure 2

The medical conditions related to Sleep Apnoea include:

- Diabetes: This is associated with sleep apnoea and snoring. It is unclear if there is an independent relationship between the two conditions or whether obesity is the only common factor.
- Gastro-oesophageal reflux disease (GORD): This is caused by acid backing up into the oesophagus. GORD and sleep apnoea often coincide.
- Polycystic Ovary Syndrome (PCOS): OSA and excessive daytime sleepiness appear to be associated with this female endocrine disorder.

Dental examination

The Role of the Dentist

Patients now require collaborative input from dentists, sleep specialists, and ear, nose and throat (ENT) physicians. The dentist must work in conjunction with the sleep physician.

- Patients typically visit dentists more frequently, and they tend to have more direct contact with their dentists than with primary care physicians. Teeth show many attributes that identify patients as having a Sleep Breathing Disorder – bruxism, erosion (which shows evidence of GORD), scalloped tongue and other intraoral changes.
- According to Bailey DR. and Attanasio R. (2012), there are five basic questions that can be added when a dentist takes a health history to help identify the presence of a sleep disorder:
  1. Is there difficulty falling asleep or staying asleep?
  2. Does the patient snore?
  3. Is the patient tired during the day?
  4. Has the patient been aware or told that they stop breathing during sleep?
  5. Is the sleep refreshing?

If there are positive responses to these questions, further evaluation is recommended. Patients should complete:

1. **The Epworth Sleepiness Scale (ESS)** which is a questionnaire commonly used in sleep medicine to assess a patient's risk for daytime sleepiness and other risk factors and the Berlin questionnaire (see below) and
2. **The STOP-BANG questionnaire**.

THE STOP-BANG QUESTIONNAIRE

First 4 questions	Additional 4 questions
S: snore loudly	B: body mass index > 28
T: feel tired during the day	A: age > 50 years
O: observed/witnessed to have stopped breathing	N: neck size: male ≥ 43 cm female ≥ 41 cm
P: high blood pressure	G: gender; are you male
YES to 2 or more of the above: at risk for sleep apnoea	YES to 1 or more from above: Increased risk for moderate to severe sleep apnoea

It has been noted by Wright EF. (2009) that poor sleep and temporomandibular dysfunction are well-known to often coexist.

Dental/oral evaluation

- The dentist assesses conditions that may impact use of the oral appliance or may be affected by it – eg. periodontal disease with loose teeth.
- Some clinical findings include:
  - large mandibular tori
  - high palatal vault associated with narrow maxilla
  - posterior crossbite
  - short teeth which may impact on appliance retention
- The tongue should be evaluated in terms of its position in the mouth at rest relative to the soft palate and the ability to view the oropharynx. This is referred to as the Mallampati score. The more the tongue base obstructs the view of the oropharynx and even the soft palate, the more likely the patient is to be at risk for sleep apnoea.
- As the Mallampati score increases, so does the potential risk for OSA and the potential for an elevation in apnoea-hypopnea index (Nuckton TJ. et al., 2006).

DESCRIPTION OF THE MALLAMPATI SCORE

Score	What is observed with the Tongue at Rest Mouth Wide Open
I	Visualise the soft palate, uvula, tonsils, and the oropharynx
II	Visualise the soft palate, most of the uvula, superior portion of the tonsils, not the oropharynx
III	Can see the soft palate but not the uvula, tonsils, or into the oropharynx
IV	Cannot see the soft palate or any structure below this, can only see hard palate

- Airway evaluation
  The tonsils should be evaluated on a 0 to 4 scale, as is usual in medicine.

ASSESSMENT OF TONSILLAR SIZE

Grade	Evaluation of Tonsillar Size
0	Tonsils not visible, most likely have been removed
1	Barely visible, contained within the tonsillar fossa (pillars)
2	Tonsils slightly enlarged, extend beyond the tonsillar fossa (pillars) into the oropharynx
3	Cannot see the soft palate or any structure below this, can only see hard palate
4	Tonsils very enlarged, extend to the midline, often termed kissing tonsils

- Cervical spine and postural evaluation
  The head posture as it relates to the cervical spine is important to evaluate as it may indicate an existing airway problem. The hyoid position is a definitive observation which indicates an increased risk for sleep apnoea. If the hyoid bone is more inferior and posterior and at an increased distance inferior to the lower border of the mandible, this indicates an increased risk for sleep-related breathing disorder (Attanasio R, Bailey D. 2013).

Subjective Evaluations

a. Epworth Sleepiness Scale (ESS)

Obstructive sleep apnoea can be diagnosed and evaluated by subjective (perceived or biased) and objective (factual, based on empirical data) methods. The ESS is a self-report test that establishes the severity of sleepiness. A person rates the likelihood of falling asleep during specific activities. Using the scale from 0 to 3 below, the risk of dozing can be ranked from the chart below.

0 = Unlikely to fall asleep
1 = Slight risk of falling asleep
2 = Moderate risk of falling asleep
3 = High likelihood of falling asleep

Situation	Risk of Dozing
Sitting and reading	
Watching television	
Sitting inactive in a public place	
As a passenger in a car riding for an hour with no breaks	
Lying down to rest in the afternoon	
Sitting and talking with someone	
Sitting quietly after lunch without alcohol	
In a car while stopped for a few minutes in traffic	

After ranking each category, the total score is calculated.

Scoring:

- 0 to 9 = Average daytime sleepiness
- 10 to 15 = Excessive daytime sleepiness
- 16 to 24 = Moderate to severe daytime sleepiness

Self-reported, subjective measures such as the ESS are usually combined with a thorough medical history. The history includes questions about:

- work performance,
- daytime sleepiness,
- driving and accident history,
- napping,
- falling asleep during meetings, and
- decreased memory.

b. Berlin Questionnaire is a simple sleep apnoea screening questionnaire used to quickly identify the risk (low to high) of sleep disordered breathing (Netzer NC. et al., 1999). The questionnaire consists of 3 categories related to the risk of having sleep apnoea. Patients can be classified into High Risk/ Low Risk based on their responses to the individual items and their overall scores in the symptom categories.

CATEGORY 1
(Positive if total points ≥ 2)

Item	Response	Points
1	'Yes'	+1
2	'c' or 'd'	+1
3	'a' or 'b'	+1
4	'a'	+1
5	'a' or 'b'	+2

CATEGORY 2
(Positive if total points ≥ 2)

Item	Response	Points
6	'a' or 'b'	+1
7	'a' or 'b'	+1
8	'a'	+1
9	Note separately	

CATEGORY 3
(Positive if response as below)

Item	Response
10	'Yes'
Or	
BMI is greater than 30kg/m2	

High Risk if 2 or more categories are Positive
Low Risk if 1 or no category is Positive

Berlin Questionnaire

Height (m) _____ Weight (kg)_____ Age_____ Male / Female

CATEGORY 1

1. Do you snore?
a. Yes
b. No
c. Don't know

2. If you snore, your snoring is:
a. Slightly louder than breathing
b. As loud as talking
c. Louder than talking
d. Very loud – can be heard in adjacent rooms

3. How often do you snore?
a. Nearly every day
b. 3-4 times a week
c. 1-2 times a week
d. 1-2 times a month
e. Never or nearly never

4. Has your snoring ever bothered other people?
a. Yes
b. No
c. Don't Know

5. Has anyone noticed that you quit breathing during your sleep?
a. Nearly every day
b. 3-4 times a week
c. 1-2 times a week
d. 1-2 times a month
e. Never or nearly never

CATEGORY 2

6. How often do you feel tired or fatigued after your sleep?
a. Nearly every day
b. 3-4 times a week
c. 1-2 times a week
d. 1-2 times a month
e. Never or nearly never

7. During your waking time, do you feel tired, fatigued or not up to par?
a. Nearly every day
b. 3-4 times a week

8. Have you ever nodded off or fallen asleep while driving a vehicle?
a. Yes
b. No

If yes:

9. How often does this occur?
a. Nearly every day
b. 3-4 times a week
c. 1-2 times a week
d. 1-2 times a month
e. Never or nearly never

CATEGORY 3

10. Do you have high blood pressure?
Yes
No
Don't know

Objective Evaluations

The primary objective test for obstructive sleep apnoea is PSG, also referred to as a sleep study. This test measures different physical and physiological parameters while a subject is asleep. During attended PSG, a technician observes a person sleeping and monitors recording equipment in the setting of a sleep laboratory. A typical PSG test includes:

- an electroencephalogram (EEG) monitors brain waves,
- an electro-oculogram (EOG) monitors eye movements,
- an electromyogram (EMG) monitors muscle activity,
- measurement of oral and nasal airflow,
- measurement of chest and abdominal movement,
- audio recording of the loudness of snoring,
- blood oxygen levels (oximetry), and
- video monitoring of the subject during the study.

After PSG is completed the data are analyzed by a board-certified sleep specialist. The number of apnoeas, hypopnoeas, leg movements, and desaturations as well as sleep levels are all recorded in a formal report, and a diagnosis is made.

SEVERITY LEVELS IN OBSTRUCTIVE SLEEP APNOEA

Obstructive sleep apnoea can be categorized as mild, moderate, or severe. This stratification assists in determining the direction of treatment. For example, some treatments that are excellent for mild sleep apnoea nearly always will fail for severe sleep apnoea. The severity level is measured with PSG.

The Sleep Study – Interpreting the Results

One grading scale uses the apnoea-hypopnea index (AHI).

The AHI is the number of apneas or hypopneas recorded during the study per hour of sleep. It is generally expressed as the number of events per hour. Based on the AHI, the severity of OSA is classified as:

None/minimal: AHI < 5 per hour
Mild obstructive sleep apnoea: 5 ≤ AHI ≤ 15 events per hour,
Moderate obstructive sleep apnoea: 15 ≤ AHI≤ 30 events per hour,
Severe obstructive sleep apnoea: AHI ≥ 30 events per hour.

- Oxygen Desaturation
  Reductions in blood oxygen levels (desaturation) are recorded during PSG or limited channel monitoring. http://healthysleep.med.harvard.edu/sleep-apnea/diagnosing-osa/testing

Home Diagnostic Portable Monitors

- Portable Monitors should only be used if the patient receives a comprehensive sleep evaluation by a board-certified sleep specialist.

The dentist is a most important diagnostician in the evaluation of patients who have sleep-disorders.

Thorough clinical history taking and examination will enable the dentist to provide comprehensive information to the referring physician and sleep medicine specialist. The dentist is an invaluable part of a team in the management of patients with sleep-disordered breathing. ◆

Email gapmagazines@optusnet.com.au
for a complete list of references.

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Class II Restoration
with Garrison Composi-Tight® 3DXR Sectional Matrix System


Dr Terry Wong

Procedure/Study by Dr. Terry Wong B. Sc (HONS) Melb, B.D.Sc (Melb)

Case description: Male patient, aged 30, with a distal carious lesion in tooth 45 (lower right second bicuspid), detected on bite wing radiographs.

Composi-Tight 3D XR
WedgeWands
www.garrisondental.com


Cavity preparation completed and ready for etching and bonding. The sectional band and orange WedgeWand is in place.


Placement of the Garrison 3DXR ring to achieve tight contact between tooth 45/46 after burnishing band.


Taken from the buccal aspect showing insertion of wedge between "slot" on the tines of the Garrison 3DXR ring.


Taken immediate post-treatment of composite restoration showing a good contact relationship with tooth 46.


Taken 2 weeks post-treatment, again showing good contact between adjacent teeth 45/46.

Terry Wong was born in Australia and grew up in the eastern suburbs. He is married to Julie and has a daughter, Tilley. His passion is clinical dentistry with emphasis on restoring teeth, and he thoroughly enjoys the mix of teaching and practicing dentistry.