Sleep bruxism: causes and management when associated to comorbidities such as orofacial pain-headache and/or insomnia, apnea.

Tampa, FL, 2020

What is Bruxism?
An open and ongoing debate for years

An oral activity (clenching and grinding) that can occur, in some person(s), during WAKE and SLEEP...

Spectrum – a continuum?
- A usual oral motor activity in reaction to life…
- Or an oral behavior?
- Or a disorder?
(signs & symptoms, presence of risk factors, co morbidities, etc) // (small % of population)

Sleep Bruxism definition – MEDICAL & DENTAL
PAST: Parasomnia (Medicine) Parafuntion (Dentistry) (Int Class Sleep Disorders 1 / Am Acad Sleep Med)

PRESENT:
- MEDICAL: SLEEP Movement Disorder (ICSD 2 and 3 (2014)
- DENTAL: Revisited - Repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible.
  (Lobbezoo et al, JOR 2013-18 and ICSD 3)

Two distinct circadian manifestations: sleep (indicated as sleep bruxism) or wakefulness (indicated as awake bruxism).

POLYGRAPHY: A sleep bruxism episode with a cessation of breathing OCCASIONAL – NOT IN all patients

Autonomic & EEG arousal

HR interval
Periodic Limb Mvt
RMMA of SB

Flow
O₂
Children: 14-20%
Teenagers and Adults: 12 to 8%
Over 50 years of age: 5-3%

See Mayer, Heinzer and Lavigne, CHEST 2016; 5.0% of Dutch population for awake bruxism and of 15.5% for sleep bruxism, drop /age Wetselaar et al JOR 2019

Self reports: Not very solid
Am Acad Sleep Medicine: Criteria suggested to screen patients with SB (Int Class Sleep Disor 3 - 2014) not absolute answer

Your clinical interview:
You ask about awareness of tooth grinding (sleep) and/or clenching (wake and sleep)
SELF REPORTS

From quest and sleep lab: PREVALENCE
Maludy M et al, J Dent Red 2013, Sao Paolo, Brazil GENERAL POPULATION

One night

12%
5%
47%
### Criteria suggested to screen patients with SB

**Int Class Sleep Disor 3 - 2014**

1. **Recent history of tooth grinding sounds** occurring at least 3-5 nights per week over 6 months (if sleep alone???)
   + in less than 50% of AWARE cases with sleep lab PSG

2. **Presence of tooth wear**:
   - it is a YES or NO
   - No association for current or severity assessment
   - AND no difference in EMG measures

**Not reliable since can be past SB episodes**

?? Masseter muscle hypertrophy: due to CLENCHING alone and/or chewing gum, tic, etc?

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### Criteria suggested to screen patients with SB

**Int Class Sleep Disor 3 - 2014**

3. **Muscle FATIGUE, & temporal HEADACHE = Morning masticatory muscle pain:**

   - Rompré et al, J Dent Res 2007, Montreal;
   - Schmitter et al, Sleep Med 2015, Germany;
   - Palinkas M et al, J Clin Sleep Med 2015, Brazil:
     - High sensitivity (78% & 67%; OR 9.6 & 9.2)/
     - Debated: see Raphael K note, JCSM, 2016

   - Stuginski-Barbosa J et al, J Prostho Dent 2016, Brazil:
     - The report of regular or frequent SB (4X/week) and the presence of (1) incident of abnormal tooth wear or (2) incidents of transient morning jaw muscle pain or fatigue: best discriminatory items of ICSD-3 for SB diagnosis.

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### Diagnostic (Dx) tools

**‘Sleep bruxism/apnea’**

**RMMA EMG index (/hr sleep):**

- Rhythmic Masticatory Muscle Activity
- 2-4 low frequency
- 4 and more: modest to high frequency
- Need to be validated in general population of all ages

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### Etiology: putative CAUSES – RISKS of SB ??

- **Mayer, Heinzer, Lavigne. CHEST, 2016**
- **Debated**

<table>
<thead>
<tr>
<th>Role</th>
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</table>

? in young for arousal and older?? insomnia, apnea

?? Personality, anxiety, maladaptive coping

?? Chronic/childhood Rhythm: Wake/sleep rhythm, feeding cues, AND/OR Carryover from wake time life (anxiety, stress, etc) ?

?? Genetics: Familial and Environmental + specificity of a serotonin candidate to carryover to other??

?? Familial/environment + Epigenetic

?? Need to be validated in general population of all ages

?? Need to be validated in general population of all ages

Debated

Manfredini JOPH 2016

JP 2017, etc

Polmann JOR 2019
Sleep arousal

the coucou survival system

AROUSAL during sleep = Transient activation (3-15 sec/ 7 to 14 times per hr) of brain, muscle and heart + respiratory system

A sleeping brain is filtering the outside world for irrelevant/relevant or threatening events every 20 to 40 sec:
- Protection of sleep continuity
- Fight or flight physiological readiness!

CYCLIC ALTERNATING PATTERN
Or Coucou system – VIGILANCE & SURVIVAL

Strong association between RMMA/SB and CAP A3 Arousal dominant phase
Carra MC et al, SLEEP 2010

Fig. 2. Genesis of an RMMA episode. The cascade of physiologic events that precedes RMMA onset is shown (schematic representation). A detailed explanation is provided in the text. RR, blood pressure; ECG, electrocardiogram; LM, laryngeal movements, 4H, EMG of the suprahyoid muscles, Max R and Max L, EMG of the right and left masseter muscles. (Data from...)
Central Nervous System and SB:
Brainstem to Cortex if AROUSAL

RMMA with Autonomic & EEG arousal
NOT EXPLAINING ALL RMMA ONSET
- Concomitant in young subjects:
  60-90% of SB episodes
  Lavigne et al – many papers; Nukazawa C et al, Cranio 2017;
  Tsujisaka A et al, J Prostho Res 2018
- About ¼ with respiratory arousal
  Tsujisaka A, J Prostho Res 2018
- Less in general population: 50% Maluly M, JDR 2013

Medical and Behavioral/psychological conditions = comorbid SB
Medical and dental collaboration mandatory

Identify single or combination of risks / causes
- Stress-psychology
- Tooth grinding-tooth wear
- Sleep arousal: brain and autonomic
- Exacerbated by brain activation
- Insomnia related
- Headache: ? If in morning OSA or SB…
- Temporomandibular pain
- Periodic limb movement/RLS awake…
- Obstructive sleep apnea (OSA)
- Gastro esophageal reflux (GERD),
- REM Behavior Disorder (RBD), Epilepsy, etc…

Differential Dx critical
COMORBID SB & Neurological sleep disorders:

1- Oromandibular myoclonus/tooth tapping in 10% of SB subjects (Kato T, 1999) – mostly asymptomatic BUT can be:
2- Sleep Epilepsy: rare occurrence with SB….
3- REM behaviour disorder (Sleep bruxism and mainly Oromandibular Myoclonus found in RBD subjects; Abe, Sleep Med 2013)….

TOOTH TAPPING: mostly normal but ????? & refer to neurology if unusual or violent movements in sleep …
Differential Dx critical

**COMORBID SB & Neurological sleep disorders:**

3. **REM behaviour disorder** (Sleep bruxism and mainly Oromandibular Myoclonus found in RBD subjects; Abe, Sleep Med 2013) ...

**UNKNOWN IF LINKED TO:**

**RISK of Disease Conversion such as Parkinson Disease, Multiple System Atrophy, Dementia**

- 30% at 3 y & 66% at 7.5 y (Postuma RB, Neurology 2015)
- 30 to 90% from 5 to 14 y (Galbiati A, Sleep Med Rev 2018)

- **Hazard ratio [HR] = age/1.07, olfactory loss/2.8,** abnormal color vision/3.1, subtle motor dysfunction/3.9

Psychophysiologica aspects: debated

**Role of life pressure ???**

Psychological if following debated...

- Obsessive-compulsive behavior*, interpersonal sensitivity, depression*, anxiety*, paranoid ideation and psychosomatic ASSOCIATED to SB-RMMA

(R²: T score 0.359...so it EXPLAIN about 36% of variability

*** more than 25% of variability)

FROM: Potential association between psychopathological status and rhythmic masticatory muscle activity of young patients with sleep bruxism in Tianjin, China
Z Shen et al, SLEEP Medicine 2018

40% (10/25, small sample size) scored + on psychopathology scale – Mean age 28 y.o.

(SCL-90; T score 1.76 ± 0.43/SB vs. 1.19 ± 0.56: Ctl; p: 0.000)

Destructive Bruxism: secondary to what...

Concept from Ware and Rugh, Sleep 1988

- Data extracted from 5 destructive cases (tooth wear TMD pain ++), all with depression (3 under benzo...)
- SB scored on EEG artifact...
- Dominance in REM, not surprising with depression
INSOMNIA in PAIN & SLEEP interaction

INSOMNIA: 20 to 30 min (if NAP) to fall asleep or cannot resume sleep if awakening
Prevalence: 10% general population up to 30% in chronic pain patients

Initial insomnia induce significant rise in pain over time (explain 16% of the variance; Temporomandibular pain, n=53; Quartana et al, PAIN 2010)

NB: Insomnia is present in 56% of Substance Abuser Subjects (Mafoud Y et al, 2009 Pilot study)

CLASSIC STATISTICS: LOGISTIC REGRESSIONS from QUESTIONNAIRES and PSG

<table>
<thead>
<tr>
<th>Predictor</th>
<th>N</th>
<th>OR 95% CI</th>
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<tbody>
<tr>
<td>Male</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>AHI</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Overweight &amp; Obese</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>INSOMNIA DSM IV</td>
<td>2.7</td>
<td></td>
</tr>
</tbody>
</table>

No OR for age or AHI/OSA

Previous analysis: regular statistics

What about if we use Machine Learning, a more powerful mathematical method?

Decision Tree Method was used to identify best predictor of SB among AGE, GENDER, BMI, AHI, INSOMNIA
OSA and Sleep Bruxism Association: Yes and No

Is there an association between sleep bruxism and obstructive sleep apnea syndrome? A systematic review.


From 270 papers= 7 in analysis  PROGRESS

- **4 studies support the association** between SB and OSA: (a) a subtype of OSA patients may have SB as a protective response to respiratory events, (b) most episodes of bruxism occur shortly after the end of apnea-hypopnea (AH) events, (c) bruxism episodes occur secondary to arousals arising from AH events, and (d) there is a correlation between the frequency of SB and AH events.
- **3 studies did not support:** (e) AH episodes are related to non-specific SB oromotor activities, (f) SB episodes are not directly associated with the end of AH events, and (g) patients with OSA did not experience more SB events than control group.

There is no scientific evidence to support a conclusive relationship between SB and OSA. **THEN we have work to do**

Literature Reviews

Systematic & meta-analysis

**Progress**
from 1 in 2014
to 7 papers in 2019

PSG studies:
Sleep bruxism CONCOMITANT to OSA - sleep disordered breathing
(older cohort with + OSA)

SB and OSA Concomitant in 54% of mild and 33% of moderate AHI

Sjoholm T et al, 2000

See also: Maluly 2013, Hosaya H et al 2014; Tan, M et al, JOPPH 2019
Martynowicz H et al, J Clin Med 2019
PSG studies
Hosaya H et al. Sleep Breathing 2014
Tan, M et al. JOPPH 2019

Japan = 48% of mid age OSA subjects diagnose as SB

Poland = 50% of OSA that also had SB related muscle activity ≥ 2 RMMA per hour.

Singapore = 33% of OSA patients that presented concomitant SB (10 years younger)

SUPINE is dominant for both OSA and SB

In a PSG of OSA subjects, AHI and clenching index, a surrogate of current RMMA/bruxism episode index, correlated significantly (r= 0.49) and supine sleep position exacerbate both variables.


See also Miyawaki et al Sleep 2003
And ongoing work at the Instituto do Sono (D Poyares, S Truje, S Giamas Iafigliola et al)
**Intersecting prevalence with age** may explain why you see in your practice SELF REPORTS of Sleep Bruxism decreases \(↓\) Sleep Apnea increases \(↑\).

**Tooth Grinding Bruxism**

- Female
- Male

**Overlap period**

- 35-50 yo
- Apnea

**SB**

- 12% to 3%
- Peppard 2013

**AHI 15 and over:**

- 9.5% to 17.4
- Lavigne & Montplaisir
- Sleep 1994

**SB**

- Apnea

- Overlap period

- 35-50 yo

- Age transition

- Maluly et al., Sao Paolo, Br unpublished

**Comorbidities**

**PSG study** \((n=110)\) Martynowicz H, J Clin Med 2019

The bruxism episode index increased in mild and moderate OSA \((AHI < 30)\) BUT decrease in severe OSA \((AHI \geq 30)\) \((5.50 \pm 4.58 \text{ vs. } 1.62 \pm 1.28, p < 0.05)\).

Independent predictors for the increased BEI in \(AHI < 30\) =

- higher AHI (cut off 5.3; prediction 0.65),
- **male gender and diabetes**
  \((5.8 \text{ vs. } 2.6 \text{ brux/h, } p < 0.05)\).

The relationship between OSA and SB depends on the degree of severity of OSA.

**OSA is correlated with SB in mild and moderate** cases of OSA.

**Association to arousal**
Sequence

What precede indicate dominance

SB & OSA
- Noises in sleep
- Supine position
- Male, BMI, jaw morphology

OLDER PATIENTS (mid 50ties) OVERLAP SB and OSA
What is first: SB-RMMA or Apnea?
Saito M et al, Hokkaido University, Sapporo, Japan
(J Sleep Res 2014)

55% to Sleep Bruxism
A sub group of SB patients (27%) present mild hypoxia (SaO2 1-1.8%) in relation to RMMA?

I Dumais et al J Oral Rehab 2015

It is the mild drop in O2 that precede RMMA not the one in CO2

Y Suzuki, J Prostho Res 2019

CONCOMITANT
mid age OSÄ and SB

Sub group of patients?

O2 Reaction delay 3-110-24 sec

0 is SB onset

02

02

It is the mild drop in O2 that precede RMMA not the one in CO2

Y Suzuki, J Prostho Res 2019

Association to hypoxia
Reduction in oxygen
PSG studies
Hosaya H et al. Sleep Breathing 2014

Japan = 48% of mid age OSA subjects diagnose as SB cases with an OR of 3.9 to be a positive SB in comparison to control subjects. It is noteworthy that frequency of phasic SB activity were significantly associated to AHI, micro-arousal and oxygen desaturation.

Another piece of evidence can be added; a high correlation was noted for OSA events preceding micro-arousal and phasic RMMA activity (r= 0.61; i.e., explaining about 36% of the variability)

SB as a protective reaction to OSA

Revisit the concept of a protective role of SB i.e., opening airway in OSA

Phenotype??? subgroup?

First studies

Masseter contraction does not close the jaw but may serve to stabilize it.

MORE Genioglossus PHASIC activity in OSA before APNEA
Protective role of SB i.e., opening airway in OSA?
Suggested from a 2003 review

Crit Rev Oral Biol 2003
The final section of this review proposes that RMMA during sleep has a role in lubricating the upper alimentary tract and increasing airway patency.

Protective role of SB i.e., opening airway YET unidentified OSA phenotype?

See also:
Abstract from Simmons and Prehn 2009
Airway protection: the missing link between nocturnal bruxism and obstructive sleep apnea.

EXPERT OPINION from Manfredini et al,
Sleep and Breathing, 2015

Conclusion of case series: Tan et al,
J Orofacial Pain and Headache 2019

As for OSA 4 phenotype traits WE need to assess phenotypes of SB patients

Carberry et al, Chest 2017

OSA and Temporomandibular Disorder

https://yummylooks.com/teeth-clenching
Female 33 yo, TMD and OSA CPAP + but struggle in sleep
TX ??? CF in ENT

Functional somatic complaints:
66.3% headaches,
41.9% neck aches,
53.5% masticatory muscle myalgia,
68.6% temporomandibular joint (TMJ) arthralgia
90.7% reported sleep bruxism (SB)
AND 91% Nasal congestion (mouth breathing?)

Conclusion:
‘Patients with persistent TMD and/or reporting SB should be screened for UARS and chronic nasal obstruction, especially when they also present with FHP’

NB: Forward head posture in 60% with narrow space C0 to C3 and high hyoid bone:
A South East Asian PHENOTYPE?
Dr. Gilles Lavigne, Faculté de médecine dentaire, Université de Montréal, copies réservées

Differential Dx critical - Concomitant sleep disorders breathing:

QUESTIONNAIRE only:
IF TMD= 4% S&S of OSA with OR= 3.6 for chronicity of TMD pain (Sanders, JDR, 2013 – OPPERIA study)

### TMD population: RERA are higher in TMD female than in Control Subjects (B Dubrosky, J Clin Sleep Med 2014)

<table>
<thead>
<tr>
<th>TMD Parameters</th>
<th>TMD Females (%)</th>
<th>TMD Males (%)</th>
<th>Controls (%)</th>
<th>K-Fisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep Continuity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Sleep Time (TST, min)</td>
<td>360 ± 43</td>
<td>331 ± 48</td>
<td>456 ± 25</td>
<td>0.016</td>
</tr>
<tr>
<td>Sleep Efficiency (SE) (%)</td>
<td>89 ± 11</td>
<td>91 ± 9</td>
<td>84 ± 10</td>
<td>0.026</td>
</tr>
<tr>
<td>Number of awakenings</td>
<td>10.2 ± 11.9</td>
<td>14.3 ± 7.8</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td>Snore Intensity</td>
<td>7.2 ± 4.6</td>
<td>9.2 ± 5</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>% of TST</td>
<td>31.8 ± 10.6</td>
<td>51.5 ± 10.5</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Number of Events (S)</td>
<td>10.1 ± 6.1</td>
<td>10.9 ± 9</td>
<td>0.024</td>
<td></td>
</tr>
<tr>
<td>Apnea Index</td>
<td>9.9 ± 4.6</td>
<td>9.9 ± 4.6</td>
<td>0.024</td>
<td></td>
</tr>
</tbody>
</table>

More RMMA/SB do not = more pain for all conditions and all individuals

**effect of phenotype / subgroup to identify**
To what extent is bruxism associated with musculoskeletal signs and symptoms? A systematic review Baad-Hansen L et al, 2019

MAY BE CONCLUDED THAT BRUXISM TO SOME EXTENT IS ASSOCIATED WITH MUSCULOSKELETAL SYMPTOMS. HOWEVER, THE EVIDENCE IS CONFLICTING AND SEEMS TO BE DEPENDENT ON MANY FACTORS SUCH AS AGE, WHETHER THE BRUXISM OCCURS DURING SLEEP OR WAKEFULNESS, AS WELL AS DIAGNOSTIC METHODOLOGY REGARDING BRUXISM AND MUSCULOSKELETAL SIGNS AND SYMPTOMS.

No TMD = pain for short period of time or headache
PSG studies

No more RMMA contraction in Morning Transient Pain (Abe S, JOPF, 2013)

THE LITERATURE DOES NOT SUFFICIENTLY SUPPORT A DIRECT LINEAR CAUSAL RELATIONSHIP BETWEEN BRUXISM AND SUCH SIGNS AND SYMPTOMS, BUT POINTS MORE IN THE DIRECTION OF A MULTIFACETED RELATIONSHIP DEPENDENT ON THE PRESENCE OF OTHER RISK FACTORS.
Comparison of the EMG data (# of EMG events per hour of sleep) between different groups – ONE CHANNEL EMG: temporalis

Clinical jaw-muscle symptoms in a group of probable sleep bruxers.
Thymi M, Shimada A, Lobbezoo F, Svensson P. J Dent 2019

- Jaw symptoms: tiredness (78%), tension, soreness, unpleasantness, stiffness and Pain (30% overall, in 57% of TMD +)
- Ambulatory one channel EMG, ++ nights

No association EMG and jaw symptoms

SB and Temporomandibular Disorder
With TMD
PSG studies
Sleep Lab, TMD population

- **35.8% INSOMNIA**
- **28.4% OSA**
- **17.3% SLEEP BRUXISM**

*SMITH, SLEEP 2009*

- 45% of TMD patients 1 sleep disorder
- 26% of TMD patients 2 sleep disorder
- 17% of TMD patients 3 sleep disorder

*Again, no more EMG SB related difference but poorer sleep if TMD (pain 4.9/10; 76% morning pain or soreness)*

*Schmitter M et al, Sleep Med 2015*

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EMG of SB (RMMA 2 +/-) and TMD Pain: No association

*Smardz J et al, Frontier Neurol 2019*

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Table 1: Results from EMG recordings.

<table>
<thead>
<tr>
<th>Variable</th>
<th>TMD group</th>
<th>Control group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode per hour (/hr)</td>
<td>4.0 ± 2.6</td>
<td>3.1 ± 1.8</td>
<td>0.03</td>
</tr>
<tr>
<td>Burst per hour (/hr)</td>
<td>14.7 ± 10.3</td>
<td>16.2 ± 18.3</td>
<td>0.61</td>
</tr>
<tr>
<td>Average burst duration (sec)</td>
<td>45.40 ± 104.87</td>
<td>53.25 ± 108.2</td>
<td>0.25</td>
</tr>
<tr>
<td>Measurement hours (hrs)</td>
<td>3.3 ± 1.2</td>
<td>3.6 ± 1.4</td>
<td>0.44</td>
</tr>
</tbody>
</table>

71% fits ICSD 3 -2014 screening criteria
Absence of joint pain identifies high levels of sleep masticatory muscle activity in myofascial temporomandibular disorder.
Santiago V and Raphael K, 2019

2 groups of TMD female, around 4 yo:
Muscle pain alone (pain 4.7/10; n 34)= more SB (2X MMA but less pain)
and higher EMG background level = no muscle tone dipping

Joint & muscle PAIN (pain 5.5/10; n 90)= During sleep: EMG dipping as controls

Women with TMD cannot fully relax their jaw muscles… HYPERVIGILANCE/arousal th?
K Raphael, JOR 2013: Elevated - Sustained Activity in all sleep period for 72% of TMD cases (n:124/ 42 Ctl)
- Background EMG during non-SB event periods is significantly higher for women with myofascial TMD
- Background EMG was positively associated with pain intensity
NON dipping= no drop in muscle tone as expected during sleep
Manfredini et al, JOR, 2011 --- Healthy subjects...
The duration of MMA events and the muscle work during the first hour of sleep was related to trait anxiety scores for both masseter (P = 0.007) and temporalis muscles (P = 0.022).
Think comorbidity…
Overlapping Chronic Pain Conditions
Maixner W et al, J of Pain, Sept 2016

Another PARAFUNCTION (long-lasting and low-intensity muscle contraction) during WAKE as a RISK factor for Chronic TMD pain
Non functional tooth contact
Not bruxism
Long-lasting, not forceful clenching

Wake time collection/ 20 min beeper, cell phone, etc

TMD & Non functional tooth contact
(Not bruxism: long-lasting, not forceful clenching)
- FREQUENCY: median TMD 35% / Ctl 9%
- link with STRESS
Chen, Pallà et al, J of Orofacial Pain, 2007

IN 52% of TMD cases: Sato F et al 2006
Also reported by: Glaros et al, Cranio 2005

REPRODUCED:
TMD & Non functional tooth contact
- Frequency of non-functional tooth contact significantly higher in patients with TMD than in the healthy subjects (35.0% vs. 9.6%, P < 0.001)
- No significant group difference for the frequency of functional tooth contact, the stress, anxiety, depression and personality.
Funato et al, J Oral Rehab 2014
Emerging concept: SB and cardiovascular risk?

- SB & hypertension = higher frequency of RMMA index, body mass index, etc. Dominant in severe apnea. (Martynowicz et al., J Clin Med, 2018)
- Tooth wear scores (weak biomarker) & cardiopathies: OR = 3 for AW and SB (Marconcini et al., J Cardio Ther, 2018)
- Association ?? after controlling for apnea, BME, etc / Phenotype- subgroup ???
ORAL APPLIANCES

- Occlusal Splint: to prevent tooth damage
  Ideal on lower jaw if risk of Sleep Breathing Disorder/snoring-apnea

- Mandibular Advancement Device/Appliance
  If you suspect breathing issues...
  Then follow-up in sleep medicine to monitor
  BREATHING (home recording)

- NTI™ or home made deprogrammer:
  For short term use + evidence but risk/hr use
  Svensson, J Oral Rehab 2007

Splint studies = SHORT TERM changes in EMG level
Over time: Muscle fibers length = adaptation / Motoneurons activity “stabilisation”?

- Svensson, J Oral Rehab 2007
- Somnomed
- Narval, ResMed
- Splint studies = SHORT TERM changes in EMG level
Over time:
  Muscle fibers length = adaptation / Motoneurons activity “stabilisation”?

- Dubé, JDR, 2004
- Narval appliance: L Franco

Can Morning headache be relieved by appliance preventing backward mandibular displacement?

- O.R.M., Narval, Fr
- No need for titration

Reduction of Morning headache in young adults

- (100 mmVAS SELF REPORTS)
- Mandibular advancement 10% and 50%
- Non SB & Non apneic subjects

Can Morning headache be relieved by appliance preventing backward mandibular displacement?

- Sequence: Off – On – Off – On – Off
- Open study – Narval appliance; L Franco – J Orofacial Pain 2011

Lower # RMMA episodes/hr with occlusal (bite) splint (lower) and a MAA (Silencer, BC)

- (A. Landry-Schonbeck, Int J Prostho 2009)
Example of tooth contact recorder and stimulator (BruXane, EU) ?? Since very big and upper jaw: tongue space....

See also P McAuliffe, J Oral Rehab 2015

<table>
<thead>
<tr>
<th>IF BRUXISM: PHARMACOLOGICAL management for SB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect &amp; Level of evidences – Winocur, Sleep Med for Dentist, Quintessence, 2009</td>
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<tr>
<td>- Sedative and muscle relaxants: (see Sakai et al, J Sleep Res 2016)</td>
</tr>
<tr>
<td>- Clonazepam: Positive effect to negative, Risk of dependence: DEBATED</td>
</tr>
<tr>
<td>- Diazepam, buspirone: Positive effect / Case reports - Risk of dependence</td>
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<tr>
<td>- Serotonin-related: (Uca et al, Clin Neuropharmacol 2015) PARADOX WITH GENETIC FINDINGS – secondary SB by some SSRI???</td>
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<tr>
<td>- Tryptophan: No effect</td>
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<tr>
<td>- Amitriptyline: No effect in RCT or RISK to increase</td>
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<tr>
<td>- Dopaminergic: (us and Cahlin et al, J Sleep Res 2016)</td>
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<tr>
<td>- Levodopa: Modest effect in RCET (30%) – Moderate evidence</td>
</tr>
<tr>
<td>- Pergolide: Positive effect - Case report – implant related</td>
</tr>
<tr>
<td>- Bromocriptine, Pramipexole: No effect in RCT</td>
</tr>
<tr>
<td>- Cardioactive: (Huynh et al SLEEP 2006; Sakai et al J Sleep Res 2016)</td>
</tr>
<tr>
<td>- Clonidine: Positive effect in RCET – Moderate evidence - risk of hypotension in morning – MEDICAL supervision and lowest dose</td>
</tr>
<tr>
<td>- Propanolol: No effect in RCET</td>
</tr>
</tbody>
</table>

OFF LABEL

Botulinum Toxin reduces the intensity rather than the generation of the contraction in jaw-closing muscles

Amplitude is smaller, not less SB-RMMA So the generator remain active SUGGESTING a Central Origin


Early molecular response and microanatomical changes in the masseter muscle and mandibular head after botulinum toxin intervention in adult mice. Balanta-Melo J et al, Ann Anatomy 2018

Masseter muscle mass, as well as individual muscle fiber diameter, were significantly reduced in BoNTA-treated side after 14 days post-intervention. At the same time, in the mandibular heads from the treated side, the subchondral bone loss was evidenced by a significant reduction in bone per tissue area (-42%) and trabecular thickness (-25%).
If REFLUX
- Proton Pump Inhibitor
- Sleep Position corrections: device?
- Diet advices


Caution

Findings reproduced Nikolopoulos M et al JOFP, 2013

Tonsil removal
- Tonsillectomy: may improve child behavioural problems such as attention, hyperactivity and sleepiness (Wei JL et al. Arch Otolaryngol Head Neck Surg. 2007 + Chervin RD et al Pediatrics, 2006)
- AFTER tonsil removal 10-15% child still present sleep apnea-hypopnea (Michell RB. Laryngoscope 2007)
- debate on surgery: total reduction in only 25% (Tauman R et al J Pediatric 2006) and 44% cure (NG et al Sleep Med 2010)
The effect of rapid palatal expansion (5.6-6.6 mm) on sleep bruxism in children (11 yo). Bellerive A et al, Sleep Breathing 2015

In 65% of subjects= reduction over 25% in RMMA-SB index

**SUMMARY SB** (modified from Mayer, Heinzer and Lavigne; CHEST 2016)

**Clinical INDICATORS:**
- Tooth Grinding Sounds (current?)
- Awareness of Clenching
- Tooth Wear (not reliable for current SB)

**Sleep Recording**
- PSG (at least one Masseter muscle)
- Mild frequency of SB (2-4 RMMA episode/hr)
- Moderate to high frequency of RMMA episode/hr

**Presence of Sleep Disordered Breathing**
- ENT and/or Orthodontist + PSG (Mt. home)
- CPAP
- With or without medication (see above)

**Absence of Sleep Disordered Breathing**
- Cognitive Behavioral Treatment (modest level of evidence)
- Occlusal Splint (yes, SB?)
- ? Biofeedback, sleep positional devices
- Medication: clonazepam ?, clonidine, botulinum toxin (short term, low dose & medical supervision)

**If headache, breathing ?**
- Medical collaboration

**If GERD:**