

Airway Friendly Orthodontics

Part 1: Diagnosis

Part 1 of a series designed to raise awareness of breathing problems and the procedures currently available to orthodontists to assist patients in improving their breathing, sleeping, and overall health.

BY ROBERT "TITO" NORRIS, DDS

As members of the dental profession, orthodontists are in a unique position to recognize early signs and symptoms of upper airway obstruction and sleep disordered breathing (SDB). Three important elements of a new patient process can bring these indicators to light:

1. Thorough health history including a specific questionnaire dedicated to breathing and sleeping;
2. Comprehensive extraoral and intraoral clinical examination; and
3. Radiographic examination.

Recognizing Upper Airway Obstruction and Sleep Disordered Breathing

The world is waking up to the importance of unobstructed breathing, particularly while sleeping. We have wearables, apps, beds, pods, pillows, drinks, medications, supplements, and literally hundreds of intraoral appliances designed to help us identify and improve our breathing while we sleep. Public awareness of the importance of SDB has never been higher. Therefore, patients and parents are quite amenable to engage in a conversation about this subject during a new patient examination (NPE). These conversations are an integral part of a holistic approach to orthodontic and dento-facial orthopedic care, and differentiate between those practitioners who desire to not only straighten teeth, but also improve the

Airway History			Figure 1	
Patients Age:	For internal use only:	• Exp	• Non-exp	
Sex:	Number:	• Initial	• Final	
If this patient is under the age of 18 please answer the following questions:				
While sleeping, does your child...				
... snore more than half the time?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
... always snore?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
... snore loudly?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
... have "heavy" or loud breathing?		• Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
... have trouble breathing, or struggle to breathe?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Have you ever seen your child stop breathing during the night?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Does your child...				
... tend to breathe through the mouth during the day?		• Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
... have a dry mouth on waking up in the morning?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
... occasionally wet the bed?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Does your child...				
... wake up feeling <i>un</i> -refreshed in the morning?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
... have problem with sleepiness during the day?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Has a teacher or other supervisor commented that your child appears sleepy during the day?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Is it hard to wake your child up in the morning?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Does your child wake up with headaches in the morning?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Did your child stop growing at a normal rate at any time since birth?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Is your child overweight?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
This child often does not seem to listen when spoken to directly.		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
This child often has difficulty organizing tasks and activities.		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
This child is often easily distracted by extraneous stimuli.		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
This child often fidgets with hands or feet or squirms in seat.		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
This child is often "on the go" or often acts as if "driven by a motor".		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
This child often interrupts or intrudes on others (e.g. butts into conversations or games)		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
Have your child's tonsils/adenoids been removed?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know		
And if so, when?				

quality of life, health, and longevity of the patient. And this comprehensive approach begins with asking the right questions by having every new patient complete a sleep questionnaire.

Implementing Sleep Questionnaires in the Orthodontic Practice

Several standardized sleeping and

breathing questionnaires have been developed by researchers in the specialties of sleep medicine and otorhinolaryngology (ENT). Unfortunately, there is not a global consensus as to which one is most comprehensive, effective, or diagnostic. Examples include the Epworth Sleepiness Scale (ESS),¹ Pittsburgh Sleep Quality Index (PSQI),² Sino-Nasal Outcome Test (SNOT-22),³ and Chervin Pediatric Sleep Questionnaire (CPSQ).⁴ After consulting with several sleep medicine specialists and ENTs in our area, our practice chose to implement the CPSQ (Figure 1) as a screening tool for all children and a SNOT-22 (Figure 2) questionnaire for all adults, as they are both validated patient-reported outcome measure (PROM) instruments. The SNOT-22 assesses 22 nasal, otologic,



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emotional, and sleep quality symptoms.

Since most new orthodontic patients are children, the CPSQ is the most commonly used screening tool in our practice. An increasing score on the CPSQ or SNOT-22 correlates with the severity of sleep disordered breathing. During the exam, we discuss any positive responses to those screening tools with the patient/parent and then review with them our clinical and radiographic findings in relation to those positive responses.

Correlating Questionnaire Scores with Clinical and Radiographic Findings

On the cephalometric radiograph, we first look at maxillo-mandibular positions in relation to the cranium (Figure 3). Retrusive maxillo-mandibular positions can be a key factor in SDB.⁵ The “ceph” also provides 2D visualization of the adenoid tissues and pharyngeal airway space (Figure 4). We then move on to our Cone Beam Computed Tomography (CBCT) findings, where we analyze the Minimal Axial Airway (MAA) (Figure 5). The probability of severe OSA is high with a MAA of less than 52 mm², intermediate if the airway is 52 to 110 mm², and low if the airway is more than 110 mm², according to an article in the *Journal of Oral and Maxillofacial Surgery*.⁶ However, these values must be correlated to the symptoms revealed by the Sleep Questionnaire responses, as a CBCT is a static image taken in an erect position of dynamic tissues which are most often in a supine position while sleeping. From a transverse CBCT slice through the first molars (Figure 6), maxillary and mandibular alveolar widths can be compared. This view also affords imaging of the nasal septum, turbinates, paranasal sinuses (PNS), and resting tongue position. A midline cleft or groove in the dorsal surface of the tongue can be indicative of a posterior tongue tie, and an air space between the tongue and the palate indicates low tongue posture. Low tongue posture can be the result of simply a habitual posture, an anterior or posterior tongue tie, or a constricted nasal airway resulting in habitual mouth breathing.

Comprehensive Clinical Examination for SDB Indicators

In addition to a typical orthodontic clinical examination, our clinical exam encompasses a number of observations to screen for SDB. These include a high or narrow palatal vault, anterior or posterior crossbites,

I.D.: _____		SINO-NASAL OUTCOME TEST (SNOT-22)						DATE: _____	
<p>Below you will find a list of symptoms and social/emotional consequences of your rhinosinusitis. We would like to know more about these problems and would appreciate your answering the following questions to the best of your ability. There are no right or wrong answers, and only you can provide us with this information. Please rate your problems as they have been over the past <u>two weeks</u>. Thank you for your participation. Do not hesitate to ask for assistance if necessary.</p>									
	No Problem	Very Mild Problem	Mild or slight Problem	Moderate Problem	Severe Problem	Problem as bad as it can be		5 Most Important Items	
1. Considering how severe the problem is when you experience it and how often it happens, please rate each item below on how "bad" it is by circling the number that corresponds with how you feel using this scale: →									
1. Need to blow nose	0	1	2	3	4	5		<input type="radio"/>	
2. Nasal Blockage	0	1	2	3	4	5		<input type="radio"/>	
3. Sneezing	0	1	2	3	4	5		<input type="radio"/>	
4. Runny nose	0	1	2	3	4	5		<input type="radio"/>	
5. Cough	0	1	2	3	4	5		<input type="radio"/>	
6. Post-nasal discharge	0	1	2	3	4	5		<input type="radio"/>	
7. Thick nasal discharge	0	1	2	3	4	5		<input type="radio"/>	
8. Ear fullness	0	1	2	3	4	5		<input type="radio"/>	
9. Dizziness	0	1	2	3	4	5		<input type="radio"/>	
10. Ear pain	0	1	2	3	4	5		<input type="radio"/>	
11. Facial pain/pressure	0	1	2	3	4	5		<input type="radio"/>	
12. Decreased Sense of Smell/Taste	0	1	2	3	4	5		<input type="radio"/>	
13. Difficulty falling asleep	0	1	2	3	4	5		<input type="radio"/>	
14. Wake up at night	0	1	2	3	4	5		<input type="radio"/>	
15. Lack of a good night's sleep	0	1	2	3	4	5		<input type="radio"/>	
16. Wake up tired	0	1	2	3	4	5		<input type="radio"/>	
17. Fatigue	0	1	2	3	4	5		<input type="radio"/>	
18. Reduced productivity	0	1	2	3	4	5		<input type="radio"/>	
19. Reduced concentration	0	1	2	3	4	5		<input type="radio"/>	
20. Frustrated/restless/irritable	0	1	2	3	4	5		<input type="radio"/>	
21. Sad	0	1	2	3	4	5		<input type="radio"/>	
22. Embarrassed	0	1	2	3	4	5		<input type="radio"/>	
2. Please mark the most important items affecting your health (maximum of 5 items) _____ ↑									
<p><small>SNOT-20 Copyright © 1996 by Jay F. Piccirillo, M.D., Washington University School of Medicine, St. Louis, Missouri SNOT-22 Developed from modification of SNOT-20 by National Comparative Audit of Surgery for Nasal Polyposis and Rhinosinusitis Royal College of Surgeons of England.</small></p>									

Figure 2

worn dentition, abfraction lesions, and localized gingivitis due to anterior xerostomia. The clinical exam also includes assessment of the nares for adequate width and valvular collapse during inhalation, measurement of the upper lip lengths at the philtrum and commissures, measurement of upper lip dynamics, grading of the anterior tongue mobility using the Tongue Range of Motion Ratio (TRMR),⁷ examining for signs of a posterior tongue tie and/or tongue scalloping, grading of the palatine tonsils using the Brodsky grading scale of tonsil size,⁸ and grading of the Mallampati index.⁹

Discussing Findings and Making Referrals

All of these findings are then discussed with the patient/parent. More often than

not, there is an element of a compromised airway which is contributing to the malocclusion, and our duty as health care providers is to educate our patients as to where these problems lie and make the appropriate referrals when indicated. In certain cases where Obstructive Sleep Apnea (OSA) or Upper Airway Resistance Syndrome (UARS) is suspected, a patient will be sent home with a Home Sleep Test (HST) for further screening. Results will be reviewed on the following day as they relate to the patient's overall orthodontic treatment plan.

Constructing Effective Referrals to ENT and Sleep Physicians

Although as orthodontists, we are not qualified nor authorized to make a diagnosis of

Treatment Plan

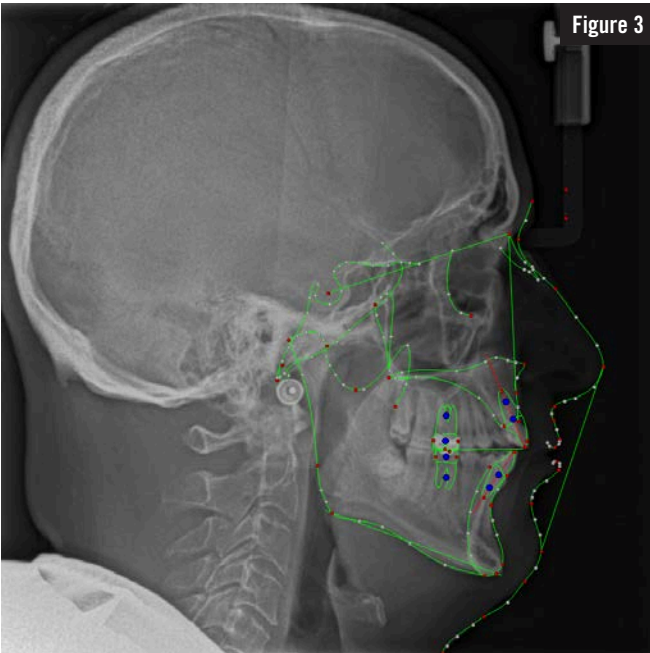


Figure 3

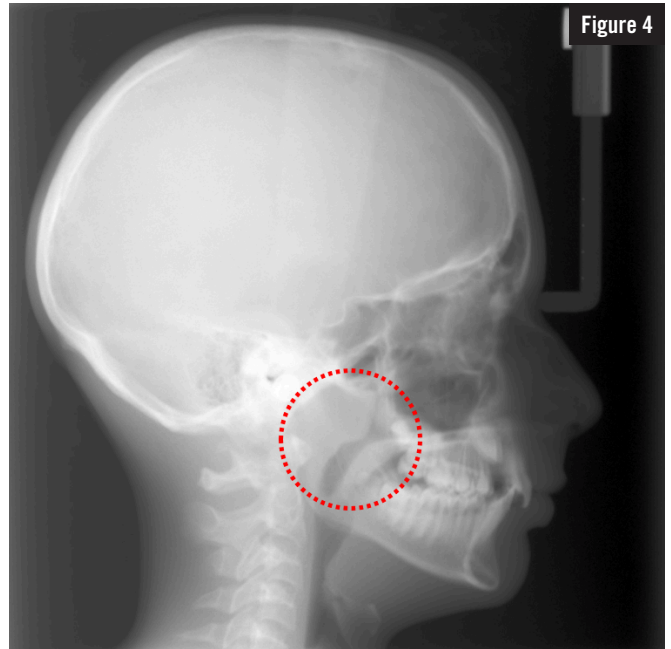


Figure 4

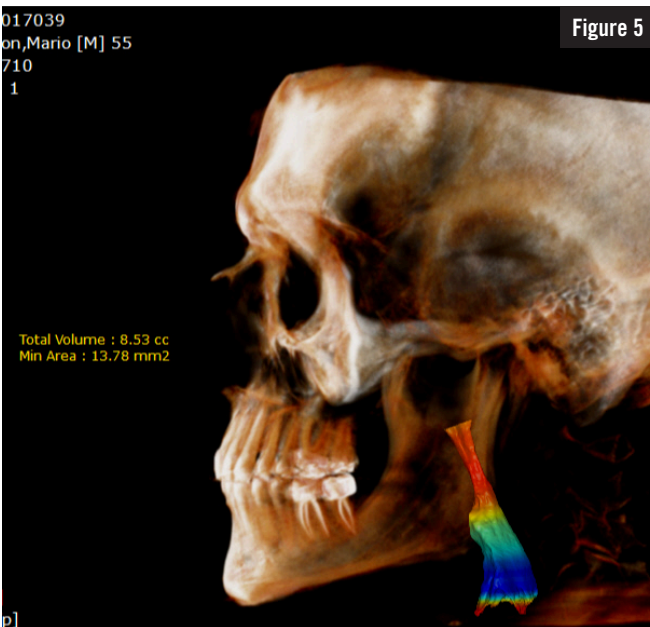


Figure 5

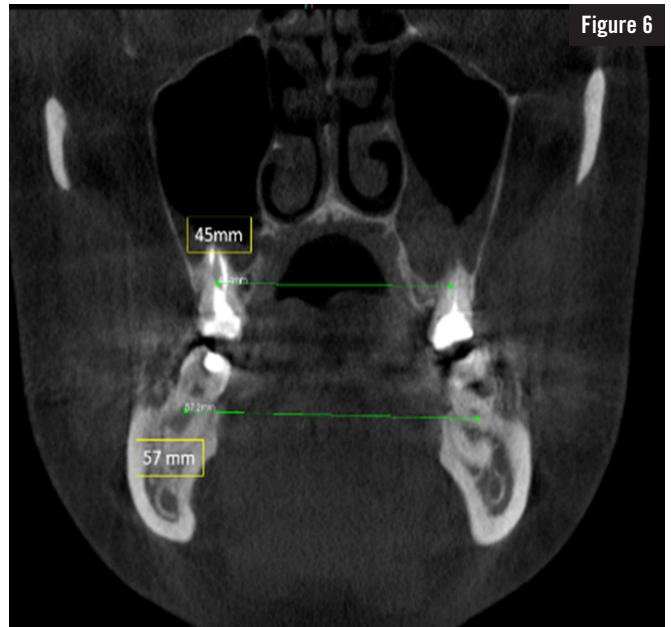


Figure 6

OSA or UARS, we can construct an influential referral to an ENT or sleep physician colleague who is educated to the notion that we, as physicians of the mouth, are in a unique position to identify early signs and symptoms of SDB. After all, the specific and most common structures involved with airway obstruction include those that we can evaluate:

- Nasal valve collapse
- Deviated septum
- Hypertrophic turbinates
- Nasal polyps
- Obstructed paranasal sinuses
- Narrow maxilla and associated nasal airway width
- Retrusive maxilla and/or mandible
- Hypertrophic pharyngeal tonsils (adenoids)
- Hypertrophic palatine tonsils
- Hypertrophic lingual tonsils

- Hypertrophic tongue due to excessive fat
- Tongue tie and subsequent muscular hypertrophy

Understanding the naso-pharyngeal anatomy and possible sources of obstruction is key in building a strong referral to our ENT and Sleep Medicine colleagues. They can then assist in further testing patients, diagnosing airway problems, and pharmacologically or surgically reducing or removing airway obstructions to reduce airway resistance.

These well-educated colleagues understand that SDB is a progressive disease, and that early intervention is in the best interest of the long-term health, cognitive development, athletic and academic performance, and longevity of the patient. **OP**

References available with the online edition.