PAEDIATRIC SNORING AND OBSTRUCTIVE SLEEP APNOEA IN CHILDREN AND ADOLESCENTS

Portuguese (Brazil): Ronco e apnéia do sono na população pediátrica

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Background Information

Definitions of levels of care (in this guideline)

- Level 1: Community healthcare worker/non-doctor
- Level 2: Medical doctor
- Level 3: ENT Surgeon

Sleep disordered breathing is a spectrum. It is important to understand that not all children who snore suffer from apnoea. Primary snoring, also known as simple or non-apnoeic snoring, is regarded as the first stage of sleep disordered breathing without severe medical consequences for the snorer (De Meyer, 2019). Many children undergo a transient state of primary snoring when going through an upper airway infection - when in this state, the buildup of mucous within the nasal cavity, swelling of the nasal mucosa and the adenoids causes snoring. However, some of the children and adolescents who suffer from permanent snoring may have moments where they stop breathing during sleep (this is called apnoea) and this can range in severity. The causes of these conditions in the paediatric population are usually different from those in adults.

Signs and symptoms associated with sleep disordered breathing may include:

- Loud snoring - "he snores louder than his dad"
- Breathing stops for a while during sleep and resumes spontaneously usually accompanied by “gasping”
- Child grinds his or her teeth during the night (bruxism)
- Child is often tired during the day or can be hyperactive
- Child can have poor academic performance
- Child can have poor athletic performance
- "Mouth breather" facial appearance

Causes:

The main cause of obstructive sleep apnoea (OSA) in children is enlarged tonsils and/or adenoids. The tonsils are found at the back of the mouth, on either side of the uvula.

The adenoids are at the back of the nose, in the post-nasal space. They can't be seen without a camera (rigid or flexible endoscopy) or an X-ray. The air enters the nose and needs to go through this area to go down to the lungs. If the adenoids are too big, the airway gets impaired.

Complications:

Paediatric OSA has adverse effects as a result of abnormal ventilation and disruption of sleep. Behavioural and learning issues are commonly seen in younger children, which can present as attention problems, hyperactivity, irritability, and poor school performance. Long term, if untreated, paediatric OSA can lead to adverse cardiovascular, endothelial, metabolic, endocrine, neurocognitive, and psychological outcomes that affect quality of life. The costs of treating long-term sequelae pose an additional burden on children, their families, as well as the entire health care system (Thomas, 2022).

One important consequence of chronic mouth-breathing is orofacial deformity . These children usually have poor oral health status (more difficulty breathing while brushing their teeth, for example, leads to a poor brushing technique; increased salivary flow rate). Oral cavity malformation with high palate, crooked teeth and a long and narrow face is also very common ("mouth-breather facies").

Examination and Investigations

General:

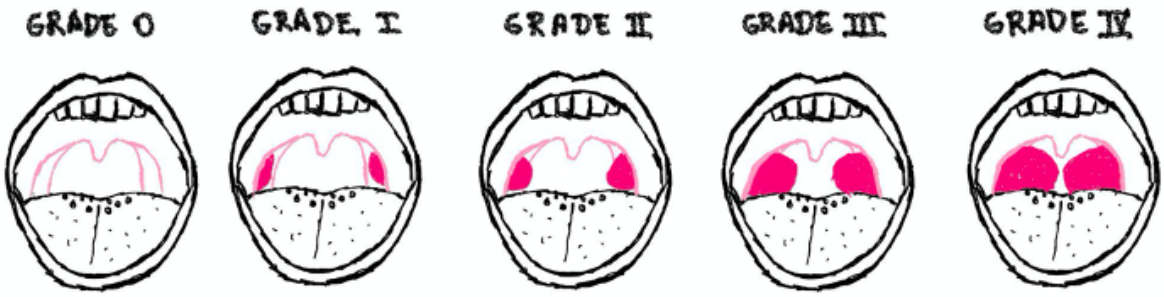
- Look inside the mouth with a light source. If necessary, ask the patient to stick his or her tongue out and say "aaah": large tonsils - which impair the airway - are close to the uvula. Small tonsils can be hidden or be far apart from the uvula.
- Examine airflow at the front of the nose with a wisp of cotton wool on each side (looking for movement) or with a metal spoon / instrument (checking the amount of misting).

Level 1:

- Ask the child to open his or her mouth and look inside using a light source. Ask the child to keep the tongue **within** the oral cavity - this is important to reduce the gag reflex. Use a tongue depressor to assess the tonsils.

Level 2:

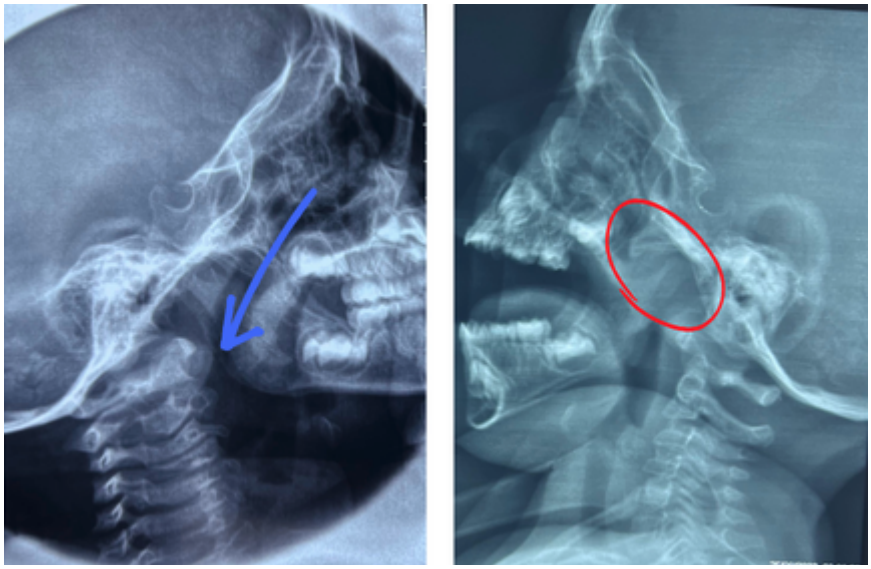
- Ask the patient to keep the tongue within his or her open mouth. Look inside using a headlight. Use a tongue depressor (if needed) to visualise the tonsils and analyse size using the Brodsky classification as seen below:



0 – no tonsillar tissue
1 - tonsils hidden within the tonsil pillars
2 - tonsils extending beyond the anterior pillar and between 25% to 50% of the pharyngeal space
3 - tonsils occupying 50-75% of pharyngeal space
4 - tonsils occupying > 75% of pharyngeal space

Grades 3 and 4 are associated with higher risk of snoring and sleep apnoea. The Friedman grading scale is an alternative.

- Adenoids may be assessed through a profile / lateral post-nasal space X-ray.



On the left, a normal X-ray showing an unobstructed airway (small or absent adenoids).
On the right, a near 100% obstruction (enlarged adenoids).

Level 3:

- Classify tonsil size as per level 2.

- Another option for adenoid evaluation is nasal endoscopy, if available. This makes it easier to assess the airway obstruction percentage (which can also be done by looking at the X-ray).

- Polysomnography is the gold standard in the diagnosis of sleep disordered breathing in children. The apnoea/hypopnoea index (AHI) is used to diagnose the presence of apnoea and its severity. However, polysomnography is not usually available in low resource settings. It is not essential for surgical planning; a clinical decision can be made.
  There are very few studies assessing the polysomnographic predictors of morbidity in children, and these outcome studies need to be performed before clear clinical recommendations can be made. That being said, children do tend to have clinical complications of OSA with a much lower apnoea-hypopnea index (AHI) than adults, and many centres will treat children with an AHI in the 2–5/hr range. An AHI of 10/hr, which is considered mild in adults, is generally considered to be moderately severe in children. (Beck, 2010)

- There are other tools that may be helpful in screening for sleep apnoea in children. Overnight oximetry studies may be used for this purpose, though they have limited sensitivity. Scoring systems can be applied, e.g. the McGill Oximetry score (MOS):
  1: < 3 desaturations below 90%
  2: ≥ 3 desaturations below 90% but ≤ 3 desaturations below 85%
  3: > 3 desaturations below 85% but ≤ 3 desaturations below 80%

4: > 3 desaturations below 80%

In resource-limited settings waiting for surgery can take years. Overnight oximetry may be used as a tool to stratify risks and prioritise the surgical list.

- There are also several life and sleep quality questionnaires available which help to assess sleep disordered breathing in the paediatric population. They are less accurate but can help assess severity and how the disease affects the child and their parents in a more practical manner. An example of a questionnaire is the *Pediatric Obstructive Sleep Apnea Screening Tool (PosaST).*

	Never	Rarely (once per week)	Occasionally (twice per week)	Frequently (3-4 times per week)	Almost always (more than 4 times per week)
Does your child stop breathing during sleep?					
Does your child struggle to breathe while sleeping?					
Do you ever shake your child to make him/her breathe again when sleeping?					
How often does your child snore?					
Do you have any concern about your child's breathing while asleep?					
How loud does your child snore?	Mildly quiet	Medium loud	Loud	Very loud	Extremely loud

From: Spruyt K, Gozal D. Screening of pediatric sleep-disordered breathing: a proposed unbiased discriminative set of questions using clinical severity scales. Chest. 2012;142:1508-15.

Management

General:

- If sleep apnoea is due to large tonsils and/or adenoids it is important to seek help from a surgeon as the first-line treatment is surgery (adenotonsillectomy)
- If the child is overweight this should also be addressed, as this can also cause or worsen sleep apnoea.

Level 1:

- Guidance is important: most parents are terrified that the child will suffocate in their sleep. They should be advised that this is not likely but that OSA should be treated because it can be detrimental in the long term
- Refer patient to ENT for adenotonsillectomy and when necessary, to an appropriate professional to aid weight loss.

Levels 2:

- In low resource settings, adenotonsillectomy surgery may not be available or have a long waiting time. While the child waits, there are some measures that can help reduce symptoms, for example:
    - Medical treatment: there is limited evidence to support the use of anti-inflammatory medications such as steroids and leukotriene receptor antagonists (e.g. montelukast). There is however a lack of long-term efficacy and safety data. Daily intranasal corticosteroids for 6-12 weeks may reduce the size of the adenoids. The response to treatment should be monitored and adverse effects considered. In very severe cases, some might consider a short (less than 1 week) course of oral steroids if other treatments are not available.
    - Referral to a nutritionist/dietician (or endocrinologist when necessary) to aid weight loss for the obese child
- If rhinitis is present, this should also be treated.

Level 3:

- There are several methods for adenotonsillectomy. All of them aim to dissect the tonsils and remove as much adenoid as possible. The patient should be under general anaesthesia (in the past, some surgeons performed this procedure with the patient sitting up, under local anaesthesia. This is not done any more.)

- The most common methods of tonsillectomy use either 'cold' dissection (instruments alone) or electrocautery. Other less available techniques include the use of coblation, ultracision (harmonic scalpel) and lasers. There are also extracapsular and intracapsular tonsillectomy techniques.

- The adenoidectomy may be performed blindly using the Beckman's curette (the surgeon feels the adenoid tissue with their index finger and uses the curette to remove it). It can also be done under direct vision using either a mirror or an endoscope. Suction monopolar diathermy, microdebrider and coblation are methods of adenoid removal under direct vision (and may not be available in low resource locations).

- The most common postoperative complications are stated in the table below:

IMMEDIATE	Anaesthetic Haemorrhagic Dental Musculoskeletal
EARLY	Haemorrhage Pain Pulmonary oedema Hypoventilation syndrome Nausea, vomiting Odynophagia, otalgia
LATE	Haemorrhage Dehydration Velopharyngeal insufficiency Pharyngeal stenosis Eagle's syndrome

- Postoperative care should focus on pain and bleeding, which are the most common complications.

- For pain, opioids can be reserved as 3rd line pain relief and may not be required. Ibuprofen (alongside paracetamol / acetaminophen) is proven to reduce postoperative discomfort without increasing risk of bleeding.

- To reduce bleeding postoperatively, the technique and ability of the surgeon is important, as well as the type of anaesthetic used.

- For the first 2 post-operative weeks it is recommended that the patient stays in a geographical location with reasonable access to a centre with ENT emergency service and who are able to surgically control post tonsillectomy bleeding if it occurs.

- Regular use of antibiotics following tonsillectomy should not be advised as they do not prevent or reduce post-operative complications

- The care of children with risk factors (e.g. severe OSA, low age / weight, obesity, comorbidities) should be delivered by experienced anaesthetic and surgical teams in centres with appropriate nursing expertise and postoperative monitoring.

- Proven persistent OSA after adenotonsillectomy is best managed by a specialist and multidisciplinary input including sleep and respiratory physicians. Further investigation can

identify sites of upper airway obstruction that may be amenable to intervention. Non-invasive ventilation (CPAP) may also be an option.

Further reading:

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