Personal Practice

Obstructive Sleep Apnoea Syndrome in Children: What Can ENT Surgeons Offer?

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Abstract

Obstructive sleep apnoea syndrome (OSAS) is a result of periodic partial or total collapse of the pharynx during sleep. In children, this is usually due to adenotonsillar hypertrophy. Adenotonsillectomy is usually very effective although controversy exists on the feasibility and importance of routine preoperative polysomnogram (PSG). Apart from adenotonsillectomy, ENT surgeons can also treat nasal obstruction which may be important for certain patients. For those OSAS secondary to craniofacial malformations, it is usually necessary to perform tracheostomy until definitive corrective craniofacial surgery can be performed.

Key words   Obstructive sleep apnoea syndrome; Sleep surgery

Introduction

The disordered breathing of obstructive sleep apnoea syndrome (OSAS) patient is a result of periodic partial or total pharyngeal collapse during sleep. In children, it is most commonly caused by adenotonsillar hypertrophy. Other high risk groups include children with craniofacial malformations, neuromuscular disease and obesity.[1] In managing this condition, ENT surgeons are involved in 3 main aspects – firstly the management of adenotonsillar hypertrophy, secondly the management of nasal obstruction and finally, performing the tracheostomy for special cases.

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Management of Adenotonsillar Hypertrophy

Adenotonsillar enlargement form the biggest group of OSAS in otherwise healthy children. The American Academy of Pediatrics recommends adenotonsillectomy as the first line treatment for most pediatric OSAS.[2] In our locality, OSAS is also the major indication for tonsillectomy (with or without adenoidectomy) in children.[3] Although the surgical risk is generally very small, there are concerns of potential immunological impairment after removal of the immunologically active tissue. While studies has shown that tonsillectomy may lead to certain changes in the cellular and humoral immunity markers, many of them are transient and there is no convincing evidence that they are clinically significant.[4,5]

The effectiveness of tonsillectomy and adenoidectomy in treating children OSAS is well reported. In a recent systematic review,[6] adenoidectomy and tonsillectomy were found to be highly effective with an average reduction of AHI of 13.92 events and a success rate of 82.9% in normalising polysomnograms (PSG) parameters. This review included fourteen published studies which met the following inclusion criteria:-

1. paediatric patients recruited were without craniofacial syndromes, morbid obesity, or neuromuscular disorders and

2. pre-operative and post-operative polysomnograms (PSG) were available.

The gold standard for diagnosing OSAS is nocturnal PSG but it is relatively seldomly employed due to its cost and limited accessibility. In a relevant survey of American otolaryngologists' practice patterns, 59% of adenotonsillectomies were performed for obstructed breathing and 39% specifically for OSAS. Interestingly, less than 10% of children underwent any objective testing prior to the surgery and less than 5% underwent laboratory-based PSG.[7]

The next question to be asked is how accurate is this clinical assessment? The answer is that the clinical evaluation is *not* very reliable, as concluded in a systematic review of the literature.[8] In this meta-analysis, the recruited studies were heterogeneous in terms of diagnostic PSG criteria for OSAS but the overall conclusions of these articles were very consistent. As very few subjects with a negative clinical evaluation were included in any of these studies, the sensitivity and specificity, or negative predictive value could not be calculated. The weighted average of the positive predictive value for the studies with sufficient data provided was 55.8% (95% Confidence Interval: 42.1-69.6%). This may suggest that ENT surgeons (including the authors), who often made the diagnosis of children OSAS based on the clinical assessment alone, were frequently operating on children who actually do not need it.

However, things are not as simple as they appear and controversy exists. The controversy stems from the fact that, although PSG is regarded as the gold standard of diagnosing pediatric OSAS, the polysomnographic diagnostic criteria has not been well validated. This explains the heterogeneity of definitions in different studies. As the outcome data are severely lacking in pediatric OSAS, there is no study linking the diagnostic thresholds on PSG with undesirable outcomes in OSAS. A growing body of evidence suggests that snoring alone, even without OSAS or hypoxemia, may be associated with neurocognitive impairment.[8,9] Kwok et al reported that children with primary snoring (with an Apnoea/Hypopnoea Index of 1 or less) have increased daytime systemic blood pressure and reduced arterial distensibility, which may jeopardise long-term cardiovascular health.[10]

Despite these uncertainties, to date, PSG is probably still the most objective and accepted diagnostic tool to guide treatment. Nevertheless, the decision to operate should also take into consideration the individual surgical risks as well as the severity and duration of the disease. In one study where a subgroup of children with mild OSAS ($1 < AHI < 2$) was conservatively managed, almost half of them showed spontaneous regression of the obstructive symptoms over the 6-month period of observation.[11] Given that obtaining PSG for every snoring child is not practical, the frequent practice of diagnosing OSAS based on clinical assessment alone will continue and probably still be needed.

In recognition of the limitation of this approach, the ENT surgeon should select their surgical candidates cautiously. It is the authors' practice to operate without a PSG for those snoring children with gross adenotonsillar hypertrophy and florid obstructive symptoms e.g. impaired growth, frequently witnessed apnoea episodes or restless sleep on top of laboured breathing, etc. Those less symptomatic cases or with borderline enlarged tonsils would be observed or referred for PSG to aid the management decision. There are no absolute age limits for adenotonsillectomy providing that the indication is strong. For adenoid and tonsillar size estimation, there is no universally-accepted grading system that reliably predicts obstruction. For the adenoid, if it is big enough to cause nasal obstruction and otitis media with effusion with failed medical treatment, it is already an indication for surgery irrespective of the PSG findings. For tonsils, the grading systems adopted in various studies commonly used the tonsillar pillars and uvula as landmarks of cut off.[11-15] Generally speaking, for descriptive purpose, tonsils with a medial extension close to or beyond the lateral edge of uvula are considered enlarged while those lie within the tonsillar fossae are considered small. However, where tonsils are not causing obstructive problems, they do not require excision even if they are apparently enlarged.

Management of Nasal Obstruction

Although the nasal lesions are not situated at the site of OSAS obstruction, they can be a source of upstream obstruction. This in turn would lead to increased negative inspiratory pressure downstream and thus causing and/or contributing to the pharyngeal collapse. Turbinate hypertrophy and deviated nasal septums are two of the

commonest obstructive nasal diseases. Turbinate hypertrophy is a common finding in patients with allergic rhinitis. For deviated nasal septum, it is either developmental or secondary to previous trauma.

Intranasal steroids have been shown to improve nasal obstruction in atopic individuals and to reduce adenoidal size and obstructive symptoms.[1] One randomised controlled trial showed improvement in the severity of OSAS in children treated with intranasal steroids.[16] For those who have failed medical treatment, turbinate hypertrophy can be effectively treated by turbinate reduction surgery which are usually performed under general anesthesia for children. More recently, less invasive procedures – submucosal radiofrequency tissue reduction surgery – have been made available. This is an office procedure under local anesthesia and may be considered for well-selected and more mature patients.

For nasal septal deviation, because of concerns and some evidence of possible nasal growth interference, nasal septal surgery in children is usually postponed to the time when the nasal growth is deemed complete; this is usually 16 years of age for boys and 14 years of age for girls.[17] In certain cases with very bad septal deviations or congenital problems, earlier septal surgery may be considered or even deemed necessary. It has been shown that nasal surgery, which improves the nasal patency, can reduce CPAP pressure requirement,[17] improve RDI or even abolish OSAS in some patients.[18]

Tracheostomy

Tracheostomy is almost always effective in treating OSAS. It bypasses any pharyngeal obstruction during awake and sleep. While it is a relatively simple and safe procedure for adults, it is not the case for paediatric patients. It carries a complication rate of 31-44%[19-21] with a tracheostomy-related deaths of about 3%.[19,20] Early complications include bleeding, blocked tube, tube dislodgement, wound infection, peumothorax, etc. Late complications remain tube dislodgement, suprastomal granulation requiring surgery, tracheocutaneous fistula and tracheomalacia. Nevertheless, it is often needed for those OSAS children secondary to craniofacial abnormalities as the planned corrective surgical procedures carry a high mortality until the child is several years of age.[22] Decannulation is only possible when

mandibular expansion or midface advancement (which are usually performed by maxillofacial surgeons) has improved the naso- and oropharyngeal airways.

Other Considerations

Other considerations in children with OSAS include obesity. While the association of OSAS and obesity is weak in young or pre-pubertal children, this association has been shown to be significantly stronger in adolescents in a number of studies.[23] In fact, a local study actually found a strong association between obesity and OSAS in a young age group of 7-11 years (32.6% vs 4.5% in the normal-weight peers),[24] possibly reflecting some racial difference in the body fat distribution and craniofacial features. Therefore overweight children may need a lower threshold for proper investigation and treatment, and a more vigilant surveillance for residual disease after adenotonsillectomy.

Lastly, more studies are needed to better define the PSG and clinical criteria for diagnosis and treatment guidance.

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