

Influence of Waldeyer's Ring Hypertrophy on Snoring and Sleep Apnea

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Abstract

Severe adenotonsillar hypertrophy can be the main cause of nocturnal respiratory affections, as confirmed by the improvement of symptoms seen after adenotonsillectomy. Unsuccessful surgical treatment can be due to craniofacial morphological alterations. Hypotony of the pharyngeal muscles could also be responsible together with tonsil hypertrophy. In our study, we enrolled 125 patients (87 males and 38 females), aged from 3 to 8 years, suffering from chronic snoring. All the patients underwent adenotonsillectomy. The follow-up was carried out at 2, 4 and 6 months after the operation. Snoring and nocturnal apneas were no longer present in almost all the patients. Overnight polysomnography remains the gold standard diagnostic test for obstructive sleep apnea syndrome, but its feasibility in clinical practice is debated. Rhinomanometry, which gives an objective evaluation of ventilatory nasal function, acoustic rhinometry, which measures the cross-section in fixed nasal areas, and nasal mucociliary transport time can be considered useful tests to evaluate the cause of respiratory obstruction.

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Obstructive sleep apnea syndrome (OSAS) cannot be left untreated. Evaluation of the individual pathophysiology gives the best opportunity to

restore adequate upper respiratory ventilation by a rational choice between medical and surgical treatment [1].

Severe adenotonsillar hypertrophy is the most frequent cause of respiratory alterations in children: about 80% of children may benefit from the surgical procedure [2]. Nevertheless, the role of the pharyngeal obstruction in the pathogenesis of OSAS is still debated in literature.

According to Suen et al. [3], a severe adenotonsillar hypertrophy can be the only reason for nocturnal respiratory affections: this is confirmed by the improvement of symptoms and of the 'respiratory disturbance index' after adenotonsillectomy. However, adenotonsillar hypertrophy is not always accompanied by nocturnal obstructive disturbances and there is no clear relationship between the size of the adenoids/tonsils and apnea indexes. Therefore, according to some authors, other anatomopathological factors can influence the respiratory disturbances.

According to Shintani et al. [4, 5] maxillary and mandibular protrusion was significantly smaller in OSAS patients and the hyoid bone was significantly lower in an OSAS group than in a control group.

The effect of adenotonsillectomy on changes of position during sleep was evaluated by Choi et al. [6]. Forty-four polysomnograms from 22 children with OSAS were analyzed. By comparing the frequency of positional changes during sleep and the distribution of sleep positions before and after surgery, the authors concluded that adenotonsillectomy significantly improved all the respiratory parameters studied. The total number of positional changes during sleep ($p < 0.001$) and the positional change index ($p < 0.001$) decreased significantly. The proportion of sleep time spent in the supine position was significantly increased ($p = 0.001$), and the proportions spent in the lateral ($p = 0.003$) and upright ($p = 0.018$) positions were significantly decreased.

Adenotonsillar hypertrophy seems to be strictly linked to nocturnal respiratory disturbances; nevertheless, the obstruction in the condition of 'rest' does not always allow to evaluate or foresee the degree of obstruction during sleep when there is a physiological reduction of muscular tone, especially of the genioglossus muscle. Perhaps hypotony or alterations of the neural control of the pharyngeal muscles or a particular laxity of the ligaments can be responsible together with tonsil hypertrophy for the pharyngeal obstruction, as it sometimes occurs in very young children. The attempt to look for histological changes of the palatopharyngeal muscle that are typical for OSAS children was not successful. Vuono et al. [7] analyzed the palatopharyngeal muscle in 34 oral-breathing children with hypertrophic tonsils and adenoids. The participants were divided into children without sleeping disorders (group I) and children with primary snoring (group II) or apnea (group III). The main histological findings (fiber size variability, perimysial connective tissue infiltration, intracytoplasmatic mitochondrial proliferation, internal architecture alteration) were similar in the three groups. The authors concluded that such changes could be a normal histological feature of this muscle rather than a sign of a neurogenic or myopathic pathology.

Since breast-fed babies' airways are very narrow, a reduction of a few millimeters can cause a 65% decrease in diameter, determining a remarkable obstruction. According to our experience, adenotonsillar hypertrophy remains one of the most frequent causes of respiratory disturbances in children, especially snoring, that sometimes can be followed by a real OSAS.

Personal Experience: Snoring and Adenotonsillectomy

In our study, we enrolled 125 patients (87 males and 38 females), aged from 3 to 8 years, suffering from chronic snoring. Clinical history elicited persistent and noisy day-night oral breathing. Particular attention was paid to other night disturbances such as apnea episodes, nocturnal awakening and enuresis and daytime disturbances such as sleepiness, hyperreactivity, aggressiveness, absentmindedness, and bad scholastic results.

Flexible optic fibers evaluation of the upper airways stenosis had been performed in all the children. In 65% of the patients snoring was not accompanied by nocturnal apneas. All the patients underwent adenotonsillectomy. The follow-up was carried out at 2, 4, and 6 months after the operation.

Snoring and nocturnal apneas were no more present in almost all the patient.

A second adenoidectomy was necessary in 2 children, because the increasing lymphoid activity was responsible for an incomplete surgical removal of the lymphoid tissue in the youngest patients (3 years old).

Etiopathogenesis and Diagnosis of Upper Respiratory Obstruction

According to our results, management of OSAS includes tonsillectomy and/or adenoidectomy to which most of the cases responded. Nevertheless, other risk factors and coexisting conditions should

be investigated and treated prior to considering surgical treatment.

Ng et al. [8] reviewed the literature to evaluate the association between allergic rhinitis (AR) and OSAS in childhood. They concluded that allergic rhinitis affected approximately 40% of children and OSAS occurred in 2% of children. As AR is associated with nasal obstruction, enlargement of tonsils and adenoids, and an elongated face, it can be considered a risk factor for OSAS. The treatment of AR is helpful to decrease the severity of OSAS and prevent emergence of an elongated face, which is responsible for a smaller upper airway size.

Overnight polysomnography remains the gold standard diagnostic test for OSAS, but its feasibility in clinical practice is debated because its use is complex and expensive. Furthermore, interpretation of its results is not unanimously agreed on. History and physical examination can still be considered useful diagnostic tools. A significant contribution to the clinical picture can be given by some tests, which are specific for evaluating nasal physiopathology.

Rhinomanometry gives an objective evaluation of the ventilatory function of the nose and the physiology of the rhino-pharyngo-tubal area. When anterior rhinomanometric examination reveals lower than normal values for nasal conductance, we carry out the nasal decongestion test (NDT). It allows to differentiate functional from structural stenosis and to address the patient to medical or surgical therapy. The NDT is performed as follows: (1) basal anterior active rhinomanometry (AAR), (2) nasal decongestant: 2 sprays in each nostril, (3) after 10 min control ARR. If this test proves negative (total nasal resistance unchanged), one might envisage the possibility of a surgical correction of the pathology, already revealed in the course of the objective examination and confirmed by X-ray examination.

Acoustic rhinometry is a relatively new method of using acoustic reflections from the airway to estimate their shape and the morphological changes induced by the congestion of the mucosa.

By comparing the acoustic wave reflected from the nasal cavity to the incident wave, this technique makes it possible to measure the cross-section in fixed areas at varying distances from the nostril. This method needs more standardization such as the choice of the most suitable acoustic wave, the way of connecting the nosepiece to the nostril or the positioning of the head in respect to the incident wave. We perform acoustic rhinometry with the aid of an optometric craniostat [9].

The degree of involvement of the nasal mucosa in pathologic reactions is also well documented by the determination of the efficiency of nasal mucociliary transport (muco-ciliary transport time). All the above-mentioned methods are useful in the differential diagnosis between sleep apnea syndrome and other noises caused by the turbulence that inspired air causes when coming into contact with the walls of the nose and the pharynx.

Conclusions

Together with history and clinical examination, the above-mentioned tests are sensitive tools, even though relatively aspecific. Surgery can restore the patency of the upper airways, contributing to contrast the neuromuscular hypotonia as a result of the effect of the surgical scar. Primary snoring and OSAS are a continuum, and surgery may be defined as a form of prevention against pathology with potential complications. As suggested by Ameli et al. [2], polysomnography cannot be carried out routinely due to the lack of specialized centers and because of its excessive cost. It could be prescribed only in unsuccessful adenotonsillectomies and for those children who have complicated presentations from the outset.

In any case, OSAS cannot be left untreated: evaluation of the individual pathophysiology gives the best opportunity to restore adequate upper respiratory ventilation by the rational choice between medical and surgical treatment.

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