

Practice Parameters for the Treatment of Obstructive Sleep Apnea in Adults: The Efficacy of Surgical Modifications of the Upper Airway

An American Sleep Disorders Association Report

Standards of Practice Committee of the American Sleep Disorders Association

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Summary: These clinical guidelines, which have been reviewed and approved by the Board of Directors of the American Sleep Disorders Association, provide recommendations for the practice of sleep medicine in North America regarding the role of surgical procedures in the treatment of obstructive sleep apnea in adults. Surgical procedures that are considered include: uvulopalatopharyngoplasty, laser midline glossectomy and lingualplasty, inferior sagittal mandibular osteotomy and genioglossal advancement with hyoid myotomy and suspension, maxillomandibular osteotomy and advancement, and tracheotomy. Whenever possible, conclusions are based on evidence from review of the literature. In instances where scientific data are absent, insufficient or inconclusive, recommendations are based on consensus of opinion. The Standards of Practice Committee of the American Sleep Disorders Association appointed a task force to review the topic, the surgical treatment of obstructive sleep apnea. Based on the review and consultation with specialists, the subsequent recommendations were developed by the Standards of Practice Committee and approved by the Board of Directors of the American Sleep Disorders Association. Recommendations are as follows: The presence and severity of obstructive sleep apnea must be determined before initiating surgical therapy. The desired treatment outcomes include resolution of the clinical signs and symptoms of obstructive sleep apnea and the normalization of the apnea-hypopnea index and oxyhemoglobin saturation levels. Because of the complexity of airway narrowing or collapse during sleep, any one surgical procedure may not eradicate a patient's sleep apnea. A stepwise approach to surgical management is acceptable if the patient is advised at the onset of treatment about the likelihood of the success of each procedure and that multiple operations may be necessary. After the surgical site has healed, a follow-up evaluation, including an objective measure of respiration and quality of sleep, must be performed to ensure that the abnormalities noted in the original study are corrected.

Key Words: Practice guidelines; Sleep apnea syndromes, surgery; Sleep disorders; Snoring; Polysomnography; Surgery; Sleep apnea syndrome, therapy.

[This position paper is referenced by square-bracketed numbers to the numbered sections in the accompanying review paper.⁽³⁾]

Obstructive sleep apnea (OSA), a syndrome that results from repetitive pharyngeal narrowing or collapse during sleep, is associated with loud snoring, observed apneas during sleep, and sleep fragmentation. Sequelae include excessive daytime sleepiness, cognitive and personality problems, and hypertension. The syndrome occurs more com-

monly in men than in women. Predisposing risk factors include upper-body obesity, adenotonsillar hypertrophy, retrognathia, hypothyroidism, nasal obstruction, and evening alcohol ingestion. Conservative treatments include weight loss, modification of the patient's sleep position, medications to relieve nasal obstruction, and avoidance of evening alcohol. The main treatment modality is nasal positive airway pressure. Oral appliances ⁽¹⁾ and surgical procedures that specifically address the tonsils, soft palate, tongue, and skeletal anatomy have been developed over the

last 15 years to treat OSA. No specific nationally accepted guidelines for surgical therapy currently exist. The Standards of Practice Committee of the American Sleep Disorders Association appointed a task force to review the current role of surgical modifications of the upper airway in adults with OSA. The use of laser-assisted uvulopalatoplasty for the treatment of sleep-disordered breathing is covered elsewhere ⁽²⁾ and will not be included here.

METHODS

Based on the accompanying review and appropriate texts, the Standards of Practice Committee of the American Sleep Disorders Association, in conjunction with specialists and other interested parties, developed the following review and recommendations. Whenever possible, the conclusions are based on evidence from controlled studies that were published in peer-reviewed journals; however, when scientific data are absent, insufficient or inconclusive, the recommendations are based upon consensus opinion.

The Board of Directors of the American Sleep Disorders Association approved these recommendations. All members of the American Sleep Disorders Association's Standards of Practice Committee and Board of Directors completed detailed conflict-of-interest statements and were found to have no conflicts of interest with regard to this subject.

These practice parameters define principles of practice that should meet the needs of most patients in most situations. These guidelines should not, however, be considered inclusive of all proper methods of care or exclusive of other methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding the propriety of any specific care must be made by the physician in light of the individual circumstances presented by the patient and the available diagnostic and treatment options and resources.

The American Sleep Disorders Association expects these guidelines to have an impact on professional behavior, patient outcomes and, possibly, health care costs. These practice parameters reflect the state of knowledge at publication and will be reviewed, updated, and revised as new information becomes available.

BACKGROUND

The location of pharyngeal narrowing or collapse in patients afflicted with OSA varies between individuals. Patterns of airway narrowing or collapse have been classified in the following manner: Type I-narrowing or collapse in the retropalatal region, Type II-narrowing or collapse in both retropalatal and retrolingual regions and Type III-narrowing or collapse in the retrolingual region only. The surgical techniques for treating OSA specifically modify either the retropalatal or retrolingual region of the pharyn-

geal airway. The procedures reviewed in this article include:

1. Uvulopalatopharyngoplasty (UPPP): This procedure enlarges the retropalatal airway through excision of the tonsils, if present; trimming and reorienting of the posterior and anterior tonsillar pillars; and excision of the uvula and posterior portion of the palate.

2. Laser midline glossectomy (LMG) and lingualplasty: These two infrequently used procedures create an enlarged retrolingual airway by laser excision of a portion of the posterior half of the tongue.

TABLE 1. *Classification of Evidence* ⁽⁴⁾

Recommendations Grades	Evidence Levels	Study Design
A	I	Randomized trials with low-alpha and low-beta errors
B	II	Randomized trials with high-alpha and high-beta errors
C	III	Nonrandomized concurrent cohort studies
C	IV	Nonrandomized historical cohort studies
C	V	Case series

3. Inferior sagittal mandibular osteotomy and genioglossal advancement with hyoid myotomy and suspension (ISO, referred to also as GAHM) represents a procedure consisting of two parts: i) inferior sagittal mandibular osteotomy and genioglossal advancement; and ii) hyoid myotomy and suspension. The two components of the procedure create an enlarged retrolingual airway. In GAHM, the genio tubercle of the mandible, which serves as the anterior attachment of the tongue, is advanced by means of a limited mandibular osteotomy. In the original version of GAHM, the hyoid bone was advanced and suspended from the mandible by a fascial strip. Newer modifications involve stabilization of the hyoid bone anteriorly and inferiorly by attachment to the thyroid cartilage. There is no change in dental occlusion.

4. Maxillomandibular osteotomy and advancement (MMO): This operation, involving simultaneous advancement of the maxilla and mandible through sagittal-split osteotomies, provides maximal enlargement of the retrolingual airway and some advancement of the retropalatal airway.

5. Tracheotomy: This operation refers to the surgical procedure that creates a percutaneous opening into the trachea. The diameter of the stoma, or tracheostomy, is usually stented and maintained by inserting in it a rigid or semi-rigid hollow tube that extends to the body surface. The patient breathes through the tube when the external end is unplugged. Since the tracheostoma enters the airway distal

to the pharynx and larynx, it bypasses the portion of the airway that narrows or collapses in OSA.

RECOMMENDATIONS

Supported by either Level III or V evidence (see Table 1), the following practice parameters are Grade C Recommendations ⁽⁴⁾ and form standards, guidelines, or options according to the definitions in Table 2 ⁽⁵⁾.

Diagnosis

The presence and severity of obstructive sleep apnea in patients must be determined before initiating surgical therapy (Standard). This process identifies patients at risk due to complications of sleep apnea and provides a baseline to establish the effectiveness of subsequent therapy. Detailed diagnostic criteria for obstructive sleep apnea are available and include signs, symptoms, and the findings of polysomnography ⁽⁶⁾.

TABLE 2. Definitions ⁽⁶⁾

Term	Definition
Standard	This generally accepted patient-care strategy reflects a high degree of clinical certainty. The term standard implies the use of Level I Evidence, which directly addresses the clinical issue, or overwhelming Level II Evidence.
Guideline	This recommended patient-care strategy reflects a moderate degree of clinical certainty. The term guideline implies the use of Level II Evidence or a consensus of Level III Evidence.
Option	This recommended patient-care strategy reflects uncertain clinical use. The term option implies either inconclusive or conflicting evidence or conflicting expert opinion.

Treatment objectives

The desired outcomes of treatment include resolution of the clinical signs and symptoms of obstructive sleep apnea and the normalization of sleep quality, the apnea-hypopnea index, and oxyhemoglobin saturation levels [5.1] (Standard).

Selection of patients

a. Nasal positive airway pressure is the recommended therapy for patients with moderate to severe obstructive sleep apnea [1.2] (Guideline). Nasal positive airway pressure may also be the preference of symptomatic patients with mild apnea.

b. Surgery is indicated to treat obstructive sleep apnea in patients who have an underlying specific surgically correctable abnormality that is causing the sleep apnea [1.1,5.1] (Guideline).

c. Surgery may be indicated to treat obstructive sleep apnea in patients for whom other noninvasive treatments have unsuccessful or have been rejected, who desire surgery and who are medically stable enough to undergo the procedure [1.2,5.1] (Guideline). In the absence of an obvious anatomic deformity, the optimal manner in which to predict a response to site-specific surgery is unclear. Universally accepted and validated clinical methods for defining the specific region of pharyngeal narrowing or collapse are lacking. Because of the complexity of airway narrowing or collapse during sleep, any one surgical procedure may not eradicate the patient's sleep apnea [5.1].

Surgical Procedures

a. Tracheotomy is the only operation shown to be consistently effective as a sole procedure in successfully treating obstructive sleep apnea. This operation should be considered when other options do not exist, have failed or are refused, or when this operation is deemed necessary by clinical urgency [1.3,3,4.4] (Option). Because of both the cosmetic effects and the morbidity associated with tracheotomy, this procedure is rarely performed for the treatment of obstructive sleep apnea, and its use is limited to emergency situations or when other treatment modalities are considered to be less acceptable [4.4].

b. The patient should be advised about potential surgical success rates and complications, the availability of alternative treatment options such as nasal positive airway pressure and oral appliances, and the levels of effectiveness and success rates of these alternative treatments [1.2,4.2,6,4.3,4.4] (Standard).

c. The uvulopalatopharyngoplasty procedure, with or without a tonsillectomy, may be appropriate for patients with narrowing or collapse in the retropalatal region [4.2,4,4.3,3,5.1] (Option). Good preoperative evaluation does not guarantee surgical success; the effectiveness of uvulopalatopharyngoplasty is usually variable, and the procedure should only be performed when nonsurgical treatment options, such as nasal positive airway pressure, have been considered [5.1].

d. Of the procedures directed at enlarging the retrolingual region, inferior sagittal mandibular osteotomy and genioglossal advancement with or without hyoid myotomy and suspension appears to be most promising [4.3,2,4.3,3] (Option). i) The success of inferior sagittal mandibular osteotomy and genioglossal advancement with or without hyoid myotomy and suspension is dependent upon the surgeon's skills and expertise, and only a limited number of centers have experience with this operation [3.3,4.3.2]. ii) Inadequate data are available on the effectiveness of laser midline glossectomy and lingualplasty [3.3].

e. A stepwise approach to surgical management is acceptable if the patient is advised at the onset of treatment about the likelihood of success of each procedure and that multiple operations may be necessary [1.3.2,4.1,4.2,4.3,5.1] (Option). In selected patients for whom uvulopalatopharyngoplasty, nasal operations, laser midline glossectomy, or inferior sagittal mandibular osteotomy and genioglossal advancement with or without hyoid myotomy and suspension have failed, maxillo-mandibular osteotomy and advancement may be successful in effectively treating the obstructive sleep apnea, but this procedure is generally not considered as an initial therapy [4.3.3].

Follow-up

a. Once the surgical site has adequately healed, patients with preoperatively symptomatic or moderate to severe sleep apnea should undergo a follow-up evaluation to assess the presence of residual disease. This evaluation includes an objective measure of the presence and severity of obstructive sleep apnea and of the sleep disruption [5.1,5.2.2,5.2.3] (Guideline). This evaluation must take place with the patient off nasal positive airway pressure.

b. Insufficient evidence exists to know how long any immediate postoperative improvement is likely to be maintained. Cases of relapse after successful operations have been described; therefore, long-term follow-up is recommended for surgically treated patients [4.2.6,5.2.2] (Option).

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