Surgery for adult obstructive sleep apnoea

Airway surgery represents an important part of contemporary treatment paradigms in adult obstructive sleep apnoea

Stuart G MacKay
BSc, MB BS(Hons), FRACS, Associate Professor of Otolaryngology Head and Neck Surgery[1]

Edward M Weaver
MD, MPH, Professor of Otolaryngology[2]

1 Illawarra ENT Head and Neck Clinic, Wollongong, NSW.
2 University of Washington, Seattle, Wash, USA.

sgmackay@ozemail.com.au

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Surgery in adult obstructive sleep apnoea (OSA) is an option used when continuous positive airway pressure (CPAP) therapy, the gold standard treatment, fails. CPAP failure usually occurs because of poor adherence or significant complications from CPAP or related devices such as a mandibular advancement splint. The best available evidence indicates that appropriate surgery can improve the quality of life and associated risk of comorbid conditions for carefully selected patients.

Evidence supporting surgery

Historically, the literature on surgical treatment for adult OSA has been challenged in terms of volume, lack of randomised clinical trial evidence, reported improvement but not eradication of polysomnographically determined OSA, and a wide array of differing surgical procedures published across surgical and physician literature creating difficulty in interpretation.

Unfortunately, previously published reviews have systematically excluded clinically important high-level studies that support surgery.[1-3] This is because they were not randomised trials, had large patient samples without individual patient-level data,[1] had clinical outcomes rather than surrogate polysomnography outcomes,[1,4] or showed equivalence rather than superiority to gold standard CPAP.[2] However, many of these studies represent higher-level (Level II) evidence and demonstrate important treatment benefits of surgery on health outcomes, function, symptoms and daily quality of life.[5]

There are well constructed trials in adult OSA surgery that reflect closely what happens in clinical practice. These trials include randomised and cohort evidence showing significant improvement in OSA-specific and general quality of life and reduction in the apnoea–hypopnoea index (AHI),[6,7] one marker of disease severity.[8] Multiple cohort studies show significant reduction in cardiovascular morbidity and mortality with upper airway surgery.[9-11] While some of the papers supporting a role for airway surgery in adult OSA included better treatment candidates, such as younger patients or those with a lower body mass index, others show promising surgery outcomes while controlling these and other potential confounding variables.

These high-level evidence studies on surgery for adult OSA show important clinical benefits, even if not polysomnographic cure of OSA. The long-term benefits have been reported in studies with follow-up ranging from 3.68 to 10 years.[7,10] A recent Australian multicentre surgical cohort study found near-normal postoperative AHI, statistically significant improvement in nadir oxygen saturation and normalisation in median Epworth Sleepiness Scale scores.[12] Surgery offers major clinical benefits over the alternative for patients in whom CPAP has failed and who would otherwise remain untreated (or inadequately treated).

Clinicians should also be aware that the significance of residual OSA after surgery (using AHI as a metric) is uncertain, particularly if only mild OSA remains. It is likely the significant clinical benefits associated with surgical improvement render minor persistent AHI elevations moot, although all patients require long-term surveillance. Because of this, improvement without cure often defines success for the patient and clinician.[13]

Evaluation

Except in special circumstances, all adult patients presenting to their general practitioner for treatment of snoring or a nocturnal breathing complaint should have polysomnography arranged under the supervision of a sleep physician. Those with moderate-to-severe OSA should then proceed to a trial of CPAP. Cardiovascular and other risks are not as clearly linked to mild OSA as they are to moderate-to-severe OSA, hence treatment in that subgroup is based primarily on symptoms.[14]

If treatment with CPAP fails, a variety of surgical procedures in a concurrent or staged fashion may be indicated (Box). The small percentage of adult OSA patients with significant tonsillar hypertrophy (size 3+ or 4+, extending more than 50% across the interfaucial distance) and minimal macroglossia, with confirmatory findings on dynamic assessment (modified Mueller manoeuvre and Woodson hypotonic method), are considered the group most conducive to surgical intervention. Other patients often require more extensive airway reconstruction.

Surgical procedures in OSA are generally well tolerated and accepted when patients are fully informed about the risk and benefit profile, and when perioperative care and analgesia requirements are carefully managed.[15]

As part of the assessment, the possibility of concurrent non-breathing sleep disorders (such as insomnia, delayed sleep-phase disorder and narcolepsy) needs to be considered. Ideally a multidisciplinary team approach includes a directing sleep physician who works closely with trained surgeons (otolaryngologists and maxillofacial surgeons), dentists, weight loss experts, sleep psychologists and technicians, and researchers to provide patients who suffer OSA (a heterogeneous disorder) with what they require most — treatment options when the primary modality cannot be used.

Pre-phase nasal surgery

The first step may be pre-phase nasal surgery — that is, nasal surgery to improve or facilitate the use of CPAP, before considering definitive surgery for OSA. Patients with nasal conditions impairing their ability to wear CPAP devices

Sample of procedures used in OSA surgery

- Tonsillectomy
- Adenoidectomy
- Uvulopalatopharyngoplasty
- Modified or variant uvulopalatopharyngoplasty*
- Expansion sphincteroplasty*
- Uvulopalatal flap*
- Lateral palatopexy*
- Transpalatal advancement*
- Radiofrequency systems*
- Coblation channeling*
- Midline glossectomy*
- Submucosal lingualplasty*
- Geniotubercle advancement
- Hyoid suspension
- Epiglottopexy
- Lingual tonsillar reduction*
- Maxillomandibular advancement

* More contemporary procedures. ◆

should have an opinion from a credentialled otolaryngologist about the best combination of nasal medical, surgical or immunological therapy to improve device use. Patients should be informed that nasal surgery is not designed to address OSA, but to permit device use or subsequent treatment to achieve optimal clinical effect.[16]

Surgery

In moderate-to-severe adult OSA, patients who have had multiple attempts at nasal or full face mask CPAP use under the supervision of a sleep physician, and who are still unable to use it adequately, should be considered for surgical opinion (from an experienced otolaryngologist or maxillofacial surgeon), dental opinion (from a general dentist with a specific sleep practice or specialist orthodontist), and/or weight loss opinion (from a suitable health professional). There is no evidence base for a set time frame to define failed CPAP tolerance, but a 3–6-month period is considered a reasonable time frame, depending on the severity of OSA. Long-term follow-up is mandatory, as OSA in adults is a chronic, progressive condition. If primary treatment (CPAP) is not possible, the goal of the above salvage options in combination or isolation should be subjective improvement (reduction in snoring, improved sleep and quality of life) and objective improvement (improvement in polysomnographic markers of disease and reduction in cardiovascular risk).

In mild adult OSA, treatment options include all of those for moderate-to-severe OSA, as well as lateral sleep positioning and novel therapies such as expiratory positive airway pressure.[17] These options may be discussed in the context of the particular patient's anatomy, phenotype, symptoms, sleep study results and desires. Cardiovascular and other risks are not as clearly linked to mild OSA as they are to moderate-to-severe OSA, therefore surgical treatment focuses primarily on socially problematic snoring, other symptoms (eg, daytime sleepiness, daytime fatigue and others) and quality of life.[14] The primary goal of treatment in these mild OSA cases is subjective improvement.

In our practices, *irrespective of degree of OSA severity*, it is uncommon for single-level surgery to be performed in isolation and any intervention is only planned after a detailed anatomical and dynamic assessment, in combination with formal polysomnography, and preferably in a multidisciplinary context; sleep physician involvement is paramount.

> “Cardiovascular and other risks are not as clearly linked to mild OSA as they are to moderate-to-severe OSA”

Summary

Surgery rarely cures OSA, but the lack of cure should not be judged as failure. New higher-level evidence shows excellent clinical outcomes with surgery, in long-term health, short-term symptoms and quality of life, even when complete cure is not achieved. It is unrealistic and inappropriate to expect that surgery must result in a cure to be considered worthwhile.

Evaluating surgical treatments is complicated because placebo control is usually not feasible with invasive therapies, randomisation to or away from invasive therapy may limit patient enrolment and generalisability, and surgery is a heterogeneous array of procedures and combinations of procedures. Despite these testing challenges, well controlled studies are showing important benefits of surgery and, moreover, of combinations of surgical procedures.

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