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Review Articles

Simple snoring: current practice

M. I. Trotter, M.R.C.S., A. R. D'Souza, F.R.C.S., D. W. Morgan, F.R.C.S.

Abstract
Snoring is a significant problem with both social and medical manifestations. This article addresses the current management of the simple snorer from initial out-patient assessment to definitive treatment.

Key words: Snoring; Disease Management

Clinical significance

Estimates suggest that as many as 20 per cent of all adults and 50 per cent of men over the age of 60 are habitual snorers.[1,2] Snoring is a hallmark symptom of sleep disordered breathing, which encompasses a wide spectrum of conditions from simple palatal snorers where there is no evidence of arousals or oxygen desaturations to obstructive sleep apnoea (OSA) which manifests itself with frequent nocturnal arousals, excessive daytime somnolence and frequent apnoea-hypopnoea.[3] Patients are often found between these two limits with symptoms of excessive daytime somnolence (EDS). This intermediate condition has been recognized as upper airway resistance syndrome.[4]

Diagnosis and assessment

Simple snoring is a result of vibration of areas within the pharynx and can be classified into levels of severity. Grades of snoring range from I–III from those who occasionally snore (Grade I) to those whose snoring can be heard outside the room (grade III). It is the Grade III snorers who may be associated with OSA.[5]

Muscle relaxation is at its maximum during rapid eye movement (REM) sleep, this is therefore the time when most snoring occurs. The sleeping position can exacerbate this condition as the pharyngeal musculature and tongue can collapse against the posterior pharyngeal wall due to loss of tension in the pharyngeal tissue.[6]

Much emphasis has been placed on assessment of the snoring patient. The primary reason for adequate assessment is to determine those snorers who are suffering with OSA. Sleep apnoea is associated with intermittent tachycardia and bradycardia, which is known as cyclical heart rate[7] and for some time it has been recognized that heavy snoring is significantly related to hypertension, angina, myocardial infarction and cardiovascular changes during sleep.[8,9] The association of these vascular conditions was apparent even when other variables such as smoking and obesity were factored out. Treatment with uvulopalatopharyngoplasty (UPPP) may not be sufficient in obese patients to reduce mortality, but continuous positive airway pressure (CPAP) or tracheostomy has been shown to reduce mortality.[10] However, a recently published study of 400 non-obese snorers, of whom 256 were diagnosed with OSA, has reported no difference in mortality in those with OSA treated with UPPP to a standard matched control group of healthy non-snorers.[11] The significance of diagnosing OSA in snoring patients should not be underestimated but the treatment of this condition is not addressed in this paper – instead we are simply addressing treatment options in the snorer who shows no evidence of sleep apnoea.

Out-patient assessment

Assessment of the snoring patient is paramount to prevent undiagnosed OSA. A variety of methods are used to assess the patient. Assessment of weight, alcohol consumption, smoking habits, exercise and thyroid function are all helpful in managing the snoring patient although patients may not obtain sufficient relief from their snoring by conservative therapy alone. Severe nasal obstruction (e.g. nasal polyps) is an aetiological factor in snoring. A study involving almost 5000 participants looked at the role of acute and chronic rhinitis as a risk factor for snoring. They reported those that suffered with night-time symptoms of rhinitis were significantly

From the Department of Otolaryngology, Birmingham Heartlands Hospital, Birmingham, UK.
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more likely to report habitual snoring.[12] Surgical correction of nasal obstruction may relieve snoring in patients but should always be regarded as a precursor to definitive snoring surgery.[13] Smoking and alcohol consumption are also recognized as important factors in those who snore and there is a linear relationship between the number of cigarettes smoked and the degree of snoring.[14] Obesity and collar size is a factor in snoring and OSA and attempts to reduce weight should be encouraged.[6] Fat distribution in the neck is also thought to be important as non-obese patients may also suffer with sleep disordered breathing.[15] Further assessment includes attempting to ascertain at which end of the sleep disordered spectrum the patient is. A simple but effective measurement can be undertaken using the Epworth sleepiness scale and snoring scale score.[16,17]

Epworth sleepiness scale

This simple questionnaire measures the general level of daytime sleepiness in a variety of situations. The patient is asked to rate on a scale of zero to three the likelihood of falling asleep or dozing in certain situations. These are graded from those regarded to be less soporific, such as talking to someone, to highly soporific, for example lying down to rest in the afternoon. The scores are then summated to give a maximum score of 24. A score of less than 10 is regarded as normal and above this level suggests OSA. The score distinguishes between those patients with simple snoring and those who have OSA.

Snoring scale score

Further assessment of snoring severity can be undertaken using the snoring scale score.[17] This recently reported method of assessing snoring asks three simple questions and requires the patient and his/her bed partner to answer from the four responses provided. The questionnaire takes into account the loudness, frequency and periodicity of the snoring. The four statements are assigned a predetermined numerical score (zero to three) and the snoring scale score is a sum of scores to the three questions.

Clinical assessment and investigations

Clinical assessment should always begin with measurement of height, weight and collar size. Full-otolaryngological examination should take place specifically looking for evidence of malocclusion, nasal obstruction (including post-nasal space) and evidence of large palatine or lingual tonsils. Furthermore detailed examination may include:

Muller manoeuvre

The level at which snoring is generated can be assessed using the Muller manoeuvre. This technique visualizes the upper airway with a flexible nasendoscope while the patient attempts a forced inspiratory effort against a closed nose and mouth. The degree of collapse of the oropharyngeal airway is assessed and recorded. The procedure is repeated with nasendoscope in the post-nasal space to assess the velopharyngeal sphincter. The degree of collapse at the different levels within the pharynx is reported to correlate with the site of obstruction causing the snoring and therefore is able to demonstrate the suitability of patients for UPPP.[18]

Sleep nasendoscopy

Croft and Pringle described a new technique termed sleep nasendoscopy in 1991 to assess the anatomical level of snoring.[19] The rationale behind the procedure was that previous assessment on the snoring patient was conducted on awake patients, whereas snoring is a dynamic situation, and assessment of patients whilst asleep was preferable. The mandible can be brought forward to assess the effect of a mandibular advancement device on the pharyngeal airway during this procedure. Further studies have confirmed the efficacy of sleep nasendoscopy in locating the level of snoring and its benefit in predicting the success of surgery, compared to a group undergoing surgery without sleep nasendoscopy.[20]

Overnight pulse oximetry

This simple test, which can be undertaken in the patient's home, will identify most sleep apnoeics who suffer with oxygen desaturation during sleep. It will not identify those with OSA who have sleep arousals prior to oxygen desaturation. In this group where there is a high level of suspicion of OSA either oligosomnography or polysomnography is necessary.

Oligosomnography

This investigation is similar to the more complex polysomnography but it generally utilizes a smaller number of parameters than the full-scale investigation. It is able to detect sleep disturbance (caused by increased respiratory effort) without oxygen desaturation.

Polysomnography

In those who have a high Epworth score and suspicion of OSA then it is necessary to undertake a nocturnal polysomnography or sleep study.[21] However some centres particularly in North America and Canada undertake polysomnography in all patients referred with snoring as a main complaint.[3,22] Polysomnography is a complex investigation normally, but not exclusively, undertaken in the hospital environment within a dedicated soundproofed sleep study room. The investigation comprises strain gauges on the abdomen and chest (to record chest/abdomenal movement), infrared videotape and sound recording facility, pulse oximetry, cardiovascular and electroencephalography (EEG) monitoring and a nasal thermistor to detect airflow. The thermistor is important as it allows differentiation between central and obstructive sleep apnoea. If respiratory effort is present despite a lack of airflow than the apnoea is obstructive, conversely if airflow

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and respiratory effort do not take place then there is central apnoea and referral to a neurologist may be appropriate.

Apnoeas are identified as episodes of cessation of breathing lasting longer than 10 seconds: hypopnoeas are identified as incomplete episodes of cessation of breathing characterized by a >50 per cent reduction in oronasal airflow, also lasting longer than 10 seconds.[22] In combination these two figures give rise to an apnoea/hypopnoea index, a measure of hourly apnoea/hypopnoeas.

Obstructive sleep apnoea is defined as a minimum number of apnoea and hypopnoeas per hour and a figure of between 10 and 15 apnoea or hypopnoeas is indicative of OSA.[23,24]

Conservative management

In managing the snoring patient conservative treatment should be attempted although, it is rare for symptoms to be completely controlled. It is vital however to reduce body mass index (BMI) as it has been shown that improvement in snoring following surgery is far more likely if the BMI is less than 28.[25,26] Alcohol is known to effect sleep patterns and airway resistance and many studies have demonstrated the detrimental effects of alcohol on snoring and thus alcohol ingestion should be reduced.[27,28] As previously alluded to, smoking is known to have a linear relationship with level of snoring and so smoking should be discouraged in the snorer. The use of a nasal splint has been shown in some studies to decrease snoring frequency but has no effect on sleep quality, apnoea/hypopnoea index or snoring loudness.[29] Mandibular advancement prosthetic devices have also been used in the treatment of snoring and sleep apnoea with some success.[30] An orthodontic technician should fit them and the patient should be warned about temporomandibular joint pain and teeth movement. CPAP is normally only reserved for those diagnosed with sleep apnoea.

Surgical treatment

There are many operations that can be performed on the snoring patient, however some are normally reserved for the snorer with OSA. Procedures for those with OSA include mandibular osteotomy and genioglossal advancement with hyoid myotomy and suspension to enlarge the retrolingual airway, laser midline glossectomy and lingualplasty, maxillamandibular osteostomy and advancement or simply tracheostomy. We intend only to discuss those procedures that are commonly undertaken on the simple snorer. These broadly fall into three categories uvulopalatopharyngoplasty, laser-assisted uvulopalatoplasty, and radiofrequency ablation.

Uvulopalatopharyngoplasty

Fujita[31] introduced UPPP to North America in 1981 with certain modifications from the original operation undertaken by Ikematsu in Japan, subsequently this operation became very popular. It is designed to decrease the tissue bulk of the palate uvula and lateral pharyngeal walls by tonsillectomy followed by partial removal of pharyngeal arches and soft palate and complete removal of the uvula. The mucosal edges are then appositioned and sutured together. The purpose of the operation is to reduce vibratory movement of the palate and increase airflow.

Fujita's original work was treating OSA with UPPP but later this operation was recommended as the treatment of choice in simple snorers.[32] The difficulty in assessing the success of this and any type of snoring surgery is what constitutes success. Is success deemed to be a reduction in snoring, a complete cessation of snoring or somewhere in between? It is also recognized that the capacity to annoy the bed partner is not limited to just the decibel level of the snoring.[22]

Initially UPPP was reported to be successful in significantly reducing or eliminating snoring in 75–100 per cent of patients.[33–36] As the length of follow-up increased then the percentage of patients reporting a successful reduction in their snoring symptoms reduced. Tytherleigh[33] reported 100 per cent initial improvement in snoring following uvulopalatopharyngoplasty but this figure reduced to 71 per cent following one year, others have reported improvement between 83 per cent and 90 per cent over a longer term.[37–39] More recently a study that used a 50 per cent reduction in the snoring score (using a pre- and post-operative visual analogue scale) reported a long-term success of 45 per cent.[40]

There is morbidity associated with this procedure including severe pain, secondary haemorrhage and infection whilst longer-term complications include nasal regurgitation, swallowing problems and voice disturbances.[39–41]

Laser uvulopalatoplasty

Laser-assisted uvulopalatoplasty (LAUP) was first introduced by Kamani in 1990.[42] Certain modifications have taken place since Kamani's original procedure.

Commonly vertical cuts are made through the palate on either side of the uvula and the uvula is then significantly shortened. Kamani's initial results were encouraging with a short-term success rate of 97 per cent. He later reported a much larger study on 741 patients in whom snoring was abolished in 70 per cent, although length of follow-up was not reported.[43] Since this initial report few have matched this impressive figure. Others report that in the short-term the effectiveness of reducing snoring is 82 per cent at one month dropping to 68 per cent at six months and 55 per cent at between 18 and 24 months following laser-assisted uvulopalatoplasty.[44]

Further work has been reported in comparing UPPP with LAUP and no significant difference has been reported in their success at stopping snoring.[45,46] Both of these papers reported a statistically significant difference in pain scores post-operatively; LAUP being more painful. Complications from LAUP have also been reported and in a large study by Walker on 275 patients who had undergone 754 procedures there was a total complication rate of

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3.45 per cent. Post-operative haemorrhage was the most common complication, occurring in 2.12 per cent of procedures.[21] Loss of taste, palatal incompetence and the sensation of a lump in the throat following palatal surgery are all recognized side-effects of this surgery.

Radiofrequency ablation

This relatively new procedure involves placing a sheathed needle electrode in the soft palate directing the tip of the electrode towards the uvula. A generator delivers radiofrequency energy to the probe and as a result the tip of the electrode generates heat up to 90°C. Following the procedure protein denaturation occurs in the soft palate and fibrosis occurs which is thought to reduce palatal flutter. Initial results have been very encouraging with an 82 per cent reduction in the snoring score (using the visual analogue scale (VAS)) in those with a body mass index (BMI) <25. This figure decreased dramatically to only 31 per cent in those with a BMI >30.[26] Medium-term results suggest there is a reduction in success with time. A reduction of >50 per cent between pre- and post-operative snoring scores occurred in only 22 per cent of respondents after a mean follow-up time of 17.5 months.[47]

Conclusion

The management of snoring is challenging and from our review requires expertise in the selection of patients who will be best managed by surgical means. Not all patients are suitable for surgical management due to a high BMI, OSA and other social factors, however, any patient undergoing surgical management should be thoroughly informed of the operations on offer and their risks and realistic chances of success. Initial conservative management involves excluding hypothyroidism, lifestyle advice and weight reduction if BMI >25. Mandibular advancement devices may be helpful in those with tongue base collapse. The choice of surgical intervention is a balance between success rate and risk. Whichever technique is chosen the long-term success is likely to be no more than 50 per cent.

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Address for correspondence:
Mr M. I. Trotter,
Department of Otolaryngology,
Birmingham Heartlands Hospital,
Bordesley Green East,
Birmingham B9 5SS,
UK.

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