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A comparison of sleep nasendoscopy and the Muller manoeuvre

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Knowledge of the level of pharyngeal obstruction during sleep is an important factor in deciding whether or not a patient suffering from obstructive sleep apnoea syndrome (OSAS) will benefit from uvulopalatopharyngoplasty. The Muller manoeuvre has been advocated as a method of obtaining this information. We compared the findings from the technique of sleep nasendoscopy, which actually allows visualization of the level of obstruction in the sleeping patient, with the results of the Muller manoeuvre performed in the same patients while awake. We found the Muller manoeuvre to be less accurate than previously believed.

Keywords *obstructive sleep apnoea* *Muller manoeuvre* *sleep nasendoscopy*

There are a number of treatment options for patients who snore or suffer from obstructive sleep apnoea (OSAS). They include weight reduction, medication, continuous positive airways pressure (CPAP), uvulopalatopharyngoplasty (UVPP), hyoid advancement, mandibular osteotomies and tracheostomy.

The simple operation of UVPP has been shown to be frequently ineffective in the treatment of OSAS.[1,2] One of the reasons for this is thought to be poor patient selection.[3–5] It has been suggested that determining the level of airway obstruction is an important part of assessment of patients with OSAS when deciding on their suitability for UVPP.[1,6–9] There are various methods of achieving this goal, one of them being the Muller manoeuvre. This involves visualizing the upper airway with a nasendoscope while the patient makes a forced inspiratory effort against a closed mouth and nose. The degree of collapse seen at different levels in the pharynx is thought to correlate with the actual site of nocturnal obstruction and to demonstrate the suitability of the patient for UVPP.[9]

We have developed a technique, sleep nasendoscopy,[10] which allows us to visualize the site of snoring and obstruction in sleeping patients. We have compared the observations made during this procedure with the results of a Muller manoeuvre performed on the same patients.

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Patients and methods

Fifty patients who presented with a history of snoring or OSAS were assessed with sleep nasendoscopy and a Muller manoeuvre; 90% also had an overnight 'mini sleep study'[11] which involved overnight observation of their sleeping pattern by a trained nurse observer and recording of their pulse and transcutaneous monitoring of their p_{O_2} levels using a pulse oximeter.

The Muller manoeuvre was performed as follows: the most patent nasal airway was sprayed with 10% cocaine solution. A roll of cotton wool soaked in 10% cocaine was then laid along the floor of the nose. After 15 min, with the patient in a sitting position, an Olympus ENFP nasendoscope was introduced into the anaesthetized nasal cavity and the pharynx and larynx examined. The tip of the nasendoscope was then placed just below the level of the soft palate. The patient's nose was occluded and his mouth closed. He was then instructed to make a powerful inspiratory effort. The resulting degree of collapse of the oropharyngeal airway was recorded. The procedure was repeated a number of times. The scope was then withdrawn into the postnasal space so that the whole of the velopharyngeal (VP) sphincter could be seen and the procedure was repeated. The approxi-

mate percentage decrease in cross-sectional area was recorded and then classified in a similar manner to that suggested by Sher:[9]

1+ none or minimal collapse;
2+ up to 50% collapse;
3+ greater than 50% collapse;
4+ complete collapse obliterating the airway.

Sleep nasendoscopy involved sedating the patient with a small dose of benzodiazepine, Hypnovel, and with the onset of sleep visualizing the upper airway with an Olympus ENF-P nasendoscope introduced through a nasal cavity which had been anaesthetized as above. Full details of the technique are described elsewhere.[10] The technique allows visualization of the patient snoring, and obstructing, and gives an excellent view of the actual levels of airway obstruction. We were able to record obstructive episodes with a video recorder for review and analysis.

This allowed the patients to be divided into five main grades. Grade 1 patients exhibited simple snoring and no obstruction. Grade 2 patients demonstrated obstruction at the VP level only, without any oro/hypopharyngeal involvement. Grades 3 and 4 were varying degrees of multisegment involvement. In Grade 3 there was VP obstruction accompanied by intermittent collapse (to varying degrees) of the oro/hypopharyngeal airway associated with each inspiratory effort during an apnoeic attack. In Grade 4 patients there was VP obstruction and complete oro/hypopharyngeal airway collapse throughout the obstructive episode. Grade 5 represented hypopharyngeal obstruction only, in which the tongue base itself seemed to fall back against the posterior pharyngeal wall causing the major part of the obstruction; as compared to Grade 4 in which there appeared to be a circumferential collapse of the oro/hypopharyngeal walls onto the tongue base, as well as VP collapse.

Results

Muller manoeuvres were recorded in 50 patients who also had sleep nasendoscopies. The results are shown in Tables 1 and 2.

None of the grade 1 (simple snoring) or grade 2 (VP obstruction only) patients showed a greater than 50% collapse of the oro/hypopharyngeal level on Muller manoeuvre. Half of these patients showed minimal or no collapse (1+) at this level and the other half showed up to 50% collapse (2+). In contrast the degree of velopharyngeal collapse varied from none or minimal to 100%.

Of the 17 grade 3 patients (VP collapse with intermittent oro/hypopharyngeal involvement) in whom the Muller manoeuvre was performed, 13 showed over 50% VP collapse and seven showed over 50% oro/hypopharyngeal collapse but, interestingly, another 7 showed no or minimal oro/hypopharyngeal collapse.

Table 1. Degree of collapse on Muller manoeuvre related to sleep nasendoscopy findings

Sleep endoscopy grade									
I		II		III		IV		V	
VP	OH	VP	OH	VP	OH	VP	OH	VP	OH
2+	1+	1+	1+	1+	1+	3+	1+	1+	1+
3+	1+	1+	2+	1+	1+	3+	1+	2+	2+
3+	2+	2+	1+	2+	1+	3+	3+	3+	3+
3+	1+	2+	1+	2+	2+	4+	1+	3+	3+
3+	1+	2+	1+	3+	1+	4+	1+	3+	4+
		2+	1+	3+	1+	4+	1+		
		2+	1+	3+	2+				
		2+	1+	3+	2+				
		3+	1+	3+	3+				
		3+	2+	3+	3+				
		3+	2+	4+	1+				
		3+	2+	4+	1+				
		3+	2+	4+	1+				
		4+	2+	4+	3+				
		4+	2+	4+	3+				
		4+	2+	4+	3+				
		4+	2+	4+	4+				

VP, OH, Site of collapse during Muller manoeuvre.

Table 2. Numbers of patients per sleep nasendoscopy grade and Muller manoeuvre result

Muller result		Sleep nasendoscopy grade				
VP	OH	I	II	III	IV	V
1+	1+		1	2		1
1+	2+		1			
1+	3+					
1+	4+					
2+	1+		5	1		
2+	2+	1		1		1
2+	3+					
2+	4+					
3+	1+*	4	1	1	2	
3+	2+*		5	2		
3+	3+			2	1	2
3+	4+					1
4+	1+*			3	3	
4+	2+*		4			
4+	3+			4		
4+	4+			1		

Grades I and II, suitable for UVPP.
Grades III–V, suboptimal or not suitable for UVPP.
*Suitable for UVPP using Sher's criteria.

All 6 of the grade 4 (complete VP and oro/hypopharyngeal collapse) patients showed greater than 50% VP collapse but surprisingly 5 of these patients had no or minimal collapse at the oro/hypopharyngeal level on Muller manoeuvre. This group included 3 patients who had failed to improve following UPPP.

The 5 grade 5 patients showed no set pattern of results (see Table 1).

Discussion

Sher *et al.*[9] used the Muller manoeuvre to select patients with OSAS for uvulopalatopharyngoplasty. Patients with 3+ and 4+ collapse at the level of the soft palate and no oro/hypopharyngeal collapse were considered ideal candidates. Those with 3+ or 4+ soft palate collapse and 1+ or 2+ oro/hypopharyngeal collapse were considered suboptimal but acceptable. Patients with less than 3+ collapse at the soft palate level or greater than 2+ collapse at the oro/hypopharyngeal level were not considered suitable. Using these selection parameters 87% of the patients had a greater than 50% decrease in apnoea index compared with 52% in an unselected group; and 73% demonstrated a greater than 50% decrease in apnoea/hypoapnoea index compared to 50% in another unselected group.

From our sleep nasendoscopy results we would recommend all our grade 1 and grade 2 patients would benefit from surgery (UVPP) but that the grade 3, 4 and 5 patients would not be suitable for UVPP, though some of the grade 3 patients with minimal oro/hypopharyngeal involvement may benefit.

Looking at the Muller manoeuvre of the sleep nasendoscopy grade 1 and 2 patients, all had oro/hypopharyngeal collapse of less than 3+ but using the above criteria 8 patients would be excluded from UVPP because their soft palate collapse was less than 3+ (Table 2). We are not sure why Sher should exclude this group of patients, the main function of the Muller manoeuvre being to look for areas of collapse which the UVPP will not affect.

All our patients in whom there was a Muller manoeuvre collapse at the oro/hypopharyngeal level of greater than 2+ occurred in the groups with multisegment collapse. Yet 11 of the patients with multisegmental collapse, whom we would consider suboptimal or not suitable at all for UVPP, would have been acceptable on Sher's criteria in that they had a greater than 2+ soft palate collapse and less than 3+ oro/hypopharyngeal collapse (Table 2). Two of our patients who had failed UVPP had Muller manoeuvre classification of 4+ 1+. Sher alludes to these findings in his paper saying 'not all patients who had ideal Muller manoeuvre results had optimal surgical results'.[9]

Our results suggest that a Muller manoeuvre in which a greater than 2+ oro/hypopharyngeal collapse is used to exclude the patient from UVPP appears to be an accurate representation of the site of collapse, and hence leads to appropriate exclusion of patients. Unfortunately it seems that a Muller manoeuvre with an oro/hypopharyngeal collapse of less than 3+ does not necessarily mean that the patient is not obstructing at that level and relying on this may lead to the selection of unsuitable patients for surgery.

We also feel that a soft palate collapse of less than 3+ should not be an exclusion to UVPP. We visualized soft palate vibration causing loud snoring and soft palate collapse causing obstruction in a number of patients with none, 1+ or 2+ soft palate level scores on Muller manoeuvre, and we feel that these patients would benefit from UVPP.

Sleep nasendoscopy has shown that in a patient suffering from OSAS the obstruction can occur at a single level in the pharynx, such as the velopharynx or tongue base, or the obstruction can be multisegmental; emphasizing the importance of assessing the site of obstruction before using surgery to treat a patient with OSAS.

The Muller manoeuvre is relatively simple to perform but the results are dependent to a certain extent on the enthusiasm, understanding, coordination and effort made by the patient. Despite this and the above results it is still worth performing the Muller manoeuvre because, firstly, the use of the nasendoscope allows a good examination of the upper airway and the exclusion of any other lesion and, secondly, the high specificity of a 'positive' result (greater than 2+ oro/hypopharyngeal level collapse) gives valuable information towards the final assessment. But it must be remembered that a 'negative' result (less than 3+ oro/hypo level collapse) does *not* exclude the presence of collapse and obstruction at that level during sleep. As the findings are not always representative of what occurs during sleep and can be positively misleading, Muller manoeuvre results should not be relied upon in isolation.

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