TEXT DR KENNY PETER PANG

Expansion sphincter

A new technique for obstructive sleep apnoea

Vibrations of the soft tissues in the oral cavity – the soft palate, uvula, tonsils, base of tongue, epiglottis and lateral pharyngeal walls – result in snoring. These vibrating soft tissues when subjected to negative pressure within the upper airway may lead to collapse of the upper airway. It is known that when inspiratory transpharyngeal pressure exceeds the pharyngeal dilating muscle action, apnoeas and hypopnoeas occur.

Obstructive sleep apnoea (OSA) is a disease related to collapse of the upper airway. Collapse of the upper airway is frequently multilevel – at the level of the velopharynx, at the level of the base of tongue, and the lateral pharyngeal walls. The level of collapse is traditionally assessed using the Müller's (or reverse Valsalva's) maneuver, noted with fibre-optic flexible nasopharyngoscopy.

Patients with multilevel obstruction, who undergo surgery, should have surgery to address all these areas including the lateral pharyngeal wall collapse. The lateral pharyngeal wall in patients with OSA has been shown to be more distensible and collapsible than normal subjects when pressured by airflow.[1] Moreover, in patients with OSA, the lateral pharyngeal walls have been shown to be thicker than normal and contribute to narrowing of the airway.[2]

Although it is well known that the lateral pharyngeal wall collapse plays a significant role in the pathogenesis of OSA, there has not been any surgery that specifically addresses this issue, and most surgeons concur that it is difficult to create, surgically, adequate lateral pharyngeal wall tension to prevent its collapse.

Beauty in simplicity

The expansion sphincter pharyngoplasty is a simple new technique, introduced by the author, which stiffens the lateral pharyngeal walls and prevents its collapse in patients with OSA. Orticochea[3] was first used to describe the construction of a dynamic muscle sphincter, by isolating the palatopharyngeus muscle, and apposing them bilaterally superiorly in the midline, for treatment of velopharyngeal incompetence in patients with cleft palates. The modified Orticochea procedure, described by Christel et al,[2] differs in that the palatopharyngeus muscle is isolated bilaterally, and apposed more superiorly, while the lateral pharyngeal defects are closed with Z-plasty sutures.

Utilising these procedures, the author presents an innovative technique in creating this tension in the lateral pharyngeal walls, and preventing its collapse, thereby reducing the number of apnoeic episodes. The technique basically consists of a tonsillectomy, expansion pharyngoplasty, rotation of the palatopharyngeus muscle (oro-pharyngeal muscle), a partial uvulectomy, as well as closure of the anterior and posterior tonsillar pillars. The procedure can be performed alone or as part of the multilevel surgical algorithm in the management of OSA.

The procedure is done under general anaesthesia, with the patient in the supine position. The procedure is performed with oro-tracheal intubation, and a mouth gag within the oral cavity. A bilateral tonsillectomy is first performed. Then the palatopharyngeus muscle is identified; its inferior end is transected horizontally and rotated supero-laterally with a "figure 8" suture, through the muscle bulk itself, with a Vicryl 3/0 round body needle.

Once done, the muscle is isolated and left with its posterior surface partially attached to the posterior horizontal pharyngeal constrictor muscles (Figure 1). The palatopharyngeus muscle is then attached to the arching fibers of the soft palate anteriorly (Figure 2). A partial uvulectomy is then performed. The anterior and posterior tonsillar pillars are then apposed with Vicryl sutures (Figure 3). The same steps are then repeated on the opposite side.

Success story

The author conducted a prospective randomised clinical trial in 45 adults, all

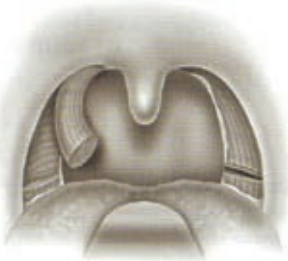

Figure 1: **The palatopharyngeus muscle is mobilised, not completely, being careful to leave its fascia attachments to the deeper horizontal constrictor muscles.**

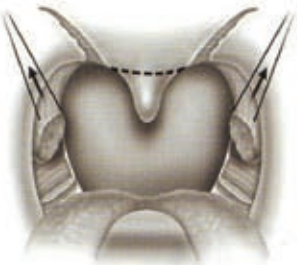

Figure 2: **Vicryl sutures used to hitch up the palatopharyngeus muscle to soft palate muscles supero-laterally.**

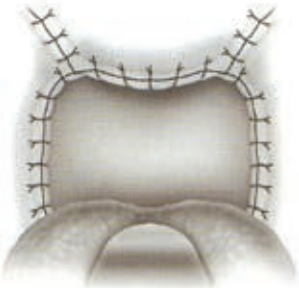

Figure 3: **Closure of the palatal incisions.**

above 18 years, who have mainly retro-palatal obstruction and lateral pharyngeal wall collapse. The patients also had small tonsils (tonsil size 1 and 2), BMI of less than 30, and had previously undergone unsuccessful medical therapy.

These patients were randomised into either the traditional uvulopalatopharyngoplasty (UPPP) procedure or the expansion sphincter pharyngoplasty (ESP). The mean follow up time was 6.5 months. Of the 45 patients enrolled, 22 underwent UPPP while 23 underwent ESP. There were 41 men and 4 women. The mean age was 42.1 years (range of 24 to 47 years), while the mean BMI was 28.7 (range of 21.7 to 29.8).

The mean pre-operative AHI (apnoea-hypopnoea index) for the entire group improved from 42.3 ± 17.1 to 19.2 ± 12.0 post-operative with a mean follow up of 6.5 months. The AHI improved from 44.2 ± 10.2 to 12.0 ± 6.6 ($p<0.005$) following ESP, and from 38.1 ± 6.46 to 19.6 ± 7.9 in the UPPP group ($p<0.005$). Mean change was 27.5 ± 8.4 in ESP and 18.5 ± 7.6 in the UPPP group. Lowest oxygen saturation improved similarly from 78.4 ± 8.52 to 85.2 ± 5.1 in the ESP group ($p=0.003$) and from 75.1 ± 5.9 to 86.6 ± 2.2 in the UPPP group ($p<0.005$).

Selecting an arbitrary threshold of a 50% reduction in AHI and AHI of less than 20, success was 82.6% in ESP compared with 68.1% in UPPP ($p<0.05$). Post-operative endoscopic findings demonstrated significant reduction of lateral pharyngeal wall collapse in the ESP group. There were no post-operative complications noted in both groups.

This new technique of expansion sphincter pharyngoplasty offers benefit over traditional methods of UPPP in OSA patients with small tonsils, and significant lateral pharyngeal wall collapse noted on naso-endoscopic examination. The procedure has promising results, it is anatomically sound, and has minimal complications.

Dr Kenny Peter Pang is an ENT consultant and sleep surgeon, and director of the Pacific Sleep Centre. He is also the board director of the International Sleep Surgical Society.

References

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