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# Expansion sphincter pharyngoplasty in the treatment of obstructive sleep apnea

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## KEYWORDS

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The lateral pharyngeal wall has been known to contribute to the collapse of the upper airway in many patients with obstructive sleep apnea (OSA). It is difficult to create enough tension in the lateral pharyngeal walls to prevent its collapse. To our knowledge, there has not been any surgery that specifically addresses this issue. The lateral pharyngoplasty described by Cahali aims to address the lateral pharyngeal wall collapse in patients with OSA. However, postoperatively, many patients had prolonged dysphagia. The expansion sphincter pharyngoplasty is a simple technique that stiffens the lateral pharyngeal walls and prevents its collapse in patients with OSA. The technique basically consists of a tonsillectomy, expansion pharyngoplasty, rotation of the palatopharyngeus muscle, a partial uvulectomy, and closure of the anterior and posterior tonsillar pillars. This procedure can be performed alone or as part of the multilevel surgical algorithm in the treatment of OSA.  
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It is well recognized that vibration of the soft tissues in the oral cavity (ie, 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, apnea and hypopnea occur.<sup>1</sup> Collapse of the upper airway can be at the level of the velopharynx, base of tongue, and lateral pharyngeal walls. Many patients with obstructive sleep apnea (OSA) have multilevel collapse. The level of collapse is traditionally assessed using the Muller maneuver noted with the fiberoptic flexible nasopharyngoscopy. The Muller maneuver is usually graded on a 5-point scale, 0-4.<sup>2</sup> Terris et al<sup>3</sup> described the Muller maneuver finding based on 3 levels: soft palatal collapse, lateral pharyngeal wall collapse, and base of tongue collapse. Lateral pharyngeal muscle wall collapse has been important in the pathogenesis of OSA in imaging studies.<sup>4,5</sup>

It is well known that the lateral pharyngeal wall collapse plays a significant role in the pathogenesis of OSA. Most investigators concur that it is difficult to create surgically adequate lateral pharyngeal wall tension to prevent its collapse.

First described by Cahali,<sup>1</sup> the lateral pharyngoplasty was aimed at addressing the lateral pharyngeal wall collapse in patients with OSA. The procedure showed promising results; however, most of the patients had dysphagia postoperatively. The authors present an innovative technique in creating this tension in the lateral pharyngeal walls, preventing its collapse, and reducing the number of apneic episodes. The expansion sphincter pharyngoplasty basically consists of a tonsillectomy, expansion pharyngoplasty, rotation of the palatopharyngeus muscle, a partial uvulectomy, and closure of the anterior and posterior tonsillar pillars.

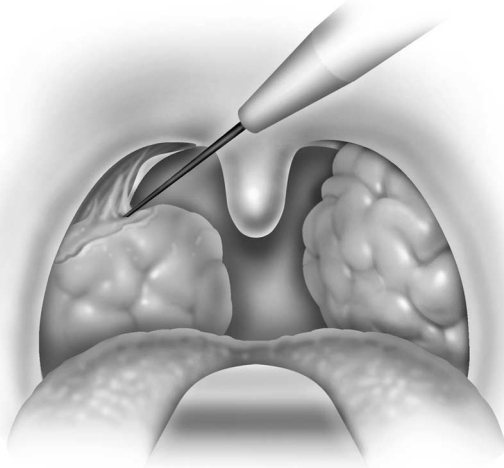
## The expansion sphincter pharyngoplasty

### Surgical procedure

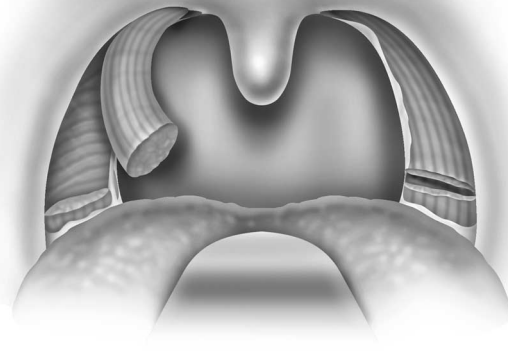
The procedure is performed with the patient under general anesthesia and in the supine position. The authors

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**Figure 1** Tonsillectomy with cautery.



**Figure 3** Palatopharyngeus muscle is isolated, but care is taken to leave some fascia attachment to the underlying horizontal constrictors to create the tension.

perform the procedure with orotracheal intubation, and a Boyle-Davis mouth gag within the oral cavity keeping the mouth open and isolating the endotracheal tube forwards. A bilateral tonsillectomy is performed (Figure 1). The palatopharyngeus muscle is identified; its inferior end is transected horizontally and rotated superolaterally with a figure-eight suture, through the muscle bulk itself, with a Vicryl 3/0 round body needle (Ethicon, Inc, Johnson & Johnson, Somerville, NJ). The muscle is isolated and left with its posterior surface partially attached to the posterior horizontal pharyngeal constrictor muscles (Figure 2). The palatopharyngeus muscle is then attached to the arching fibers of the soft palate anteriorly (Figure 3). A partial uvulectomy is then performed. The anterior and posterior tonsillar pillars are then apposed with Vicryl sutures (Figure 4). The same steps are repeated on the opposite side.

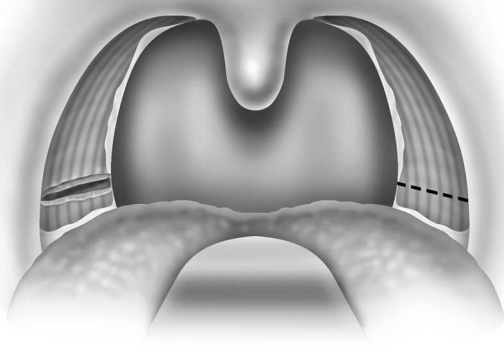
**Discussion**

OSA is a disease related to the collapsibility of the upper airway, which is frequently multilevel, at the palate, lateral pharyngeal wall, and tongue base. Patients with multilevel

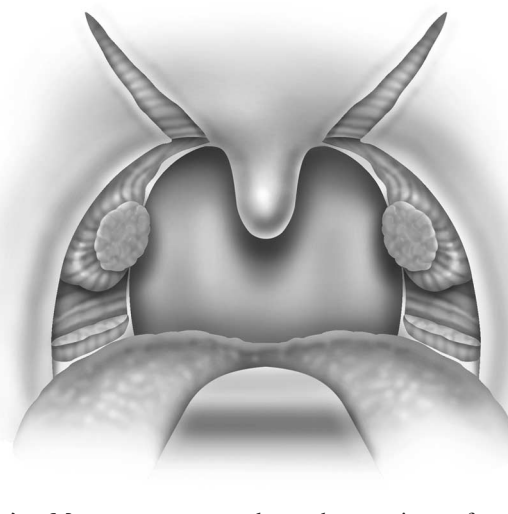
obstruction, who undergo surgery, should have surgery to address all these areas, including the lateral pharyngeal wall collapse. The lateral pharyngeal wall in patients with OSA has been more distensible and collapsible than normal subjects when pressured by airflow.<sup>5</sup> Moreover, in patients with OSA, the lateral pharyngeal walls have been thicker than normal and contribute to narrowing of the airway.<sup>6</sup>

Cahali<sup>1</sup> first described the lateral pharyngoplasty technique in 10 patients with moderate-to-severe OSA and who had mainly lateral pharyngeal wall collapse noted on clinical endoscopic examination. All 10 patients had improvements in their apnea-hypopnea index (AHI), with a mean of 45.8, reducing to 15.2 ( $P = 0.009$ ) postoperatively, with a mean follow-up of 8 months. There was also improvement in apnea index, with a reduction from a mean of 22.4 to 4.8 ( $P = 0.005$ ). However, there were significant swallowing problems in all 10 patients who underwent this procedure. All patients had dysphagia, which ranged from 8 to 70 days postoperatively (mean 20.4). One patient had persistent velopharyngeal insufficiency for up to 6 weeks. Another

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**Figure 2** Palatopharyngeus muscle transected at the inferior end of the muscle.

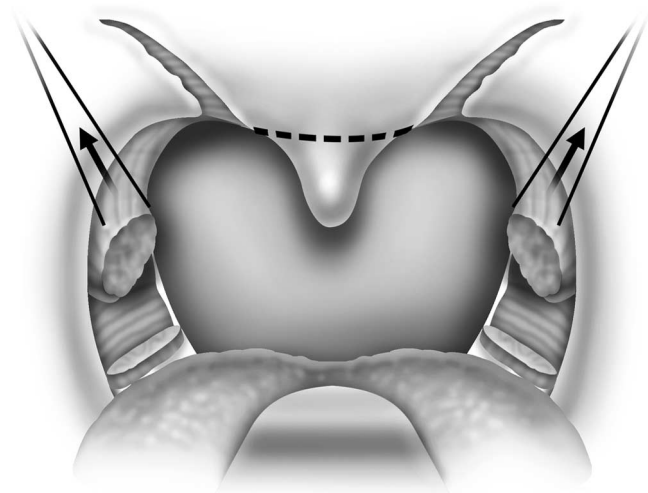


**Figure 4** Mucosa cuts are made on the anterior surface of the soft palate, revealing the arching fibers of the palatoglossus muscle.

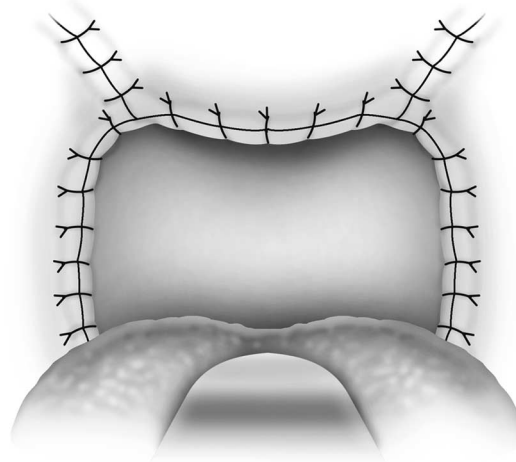
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patient had permanent lost of taste to chocolates for 6 months. Cahali et al<sup>7</sup> compared the lateral pharyngoplasty with the traditional uvulopalatopharyngoplasty (UPPP) in 27 patients with OSA. All 15 patients who underwent the lateral pharyngoplasty had significant reduction in excessive daytime sleepiness, AHI, and apnea index. There were also improvements in the rapid eye movement sleep percent and morning headaches in patients who had undergone the lateral pharyngoplasty, compared with those who underwent the traditional UPPP. They concluded that patients who underwent the lateral pharyngoplasty technique have better clinical and polysomnographic results.

The authors conducted a prospective randomized clinical trial in 45 adults, age older than 18 years, who had mainly type I Fujita (retropalatal obstruction) and lateral pharyngeal wall collapse. These patients also had small tonsils (tonsil size 1 and 2), body mass index <30, and Friedman clinical stage II and III, who had medical therapy fail. Patients were randomized into either the traditional UPPP procedure or expansion sphincter pharyngoplasty. Mean follow-up time was 6.5 months. There were 45 patients enrolled, including 22 in the UPPP and 23 in the expansion sphincter pharyngoplasty groups. A total of 41 patients were men, and 4 were women. Mean age was 42.1 years (range 24-47), and mean body mass index was 28.7 (range 21.7-29.8). Mean preoperative AHI for the entire group improved from  $42.3 \pm 17.1$  to  $19.2 \pm 12.0$  postoperatively, with a mean follow-up of 6.5 months. The AHI improved from  $44.2 \pm 10.2$  to  $12.0 \pm 6.6$  ( $P < 0.005$ ) after expansion sphincter pharyngoplasty and from  $38.1 \pm 6.46$  to  $19.6 \pm 7.9$  in the UPPP group ( $P < 0.005$ ). Mean change was  $27.5 \pm 8.4$  in expansion sphincter pharyngoplasty and  $18.5 \pm 7.6$  in the UPPP group. Lowest oxygen saturation improved similarly from  $78.4 \pm 8.52$  to  $85.2 \pm 5.1$  in the expansion sphincter pharyngoplasty group ( $P = 0.003$ ) and from  $75.1 \pm 5.9$  to  $86.6 \pm 2.2$  in the UPPP group ( $P < 0.005$ ). Selecting an arbitrary threshold of a 50% reduction



**Figure 5** Figure-eight suture used to “pull” up the isolated palatopharyngeus muscle to the anterior soft palatal arches.



**Figure 6** Closure of the incision.

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in the AHI and an AHI <20, success was 82.6% in the expansion sphincter pharyngoplasty group compared with 68.1% in the UPPP group ( $P < 0.05$ ). Postoperative endoscopic findings showed significant reduction of lateral pharyngeal wall collapse in the expansion sphincter pharyngoplasty group. There were no postoperative complications noted in either group.

### Conclusions

This new technique of expansion sphincter pharyngoplasty may offer benefits over traditional methods of UPPP in patients with OSA with small tonsils, Friedman stage II and III, and lateral wall collapse noted on endoscopic examination. The procedure has promising results, is anatomically sound, and has minimal complications.

F5, F6

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