Expansion Pharyngoplasty by New Simple Suspension Sutures without Tonsillectomy

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Abstract
The aim of this study was to introduce and assess a new minimally invasive expansion pharyngoplasty for obstructive sleep apnea (OSA) using bilateral new advancement sutures without tonsillectomy. Among 24 patients who had OSA with Friedman stage II or III and type I Fujita, bilateral sutures were performed to advance and stabilize palatopharyngeus and palatoglossus muscles anterolaterally. Mean apnea hypopnea index decreased significantly from 28.6 ± 4.2 preoperatively to 8.9 ± 4.9 postoperatively. The lowest oxygen saturation increased significantly from 79.25 ± 4.12 to 89.29 ± 4.12. Moreover, the visual analog score showed statistically significant reduction in the snoring intensity from a preoperative mean of 8.2 ± 1.4 to 2.1 ± 1.4 at 6 months postoperatively. Significant improvements were also documented in the Epworth Sleepiness Scale, as its mean decreased from 11.7 ± 2.9 preoperatively to 5.1 ± 2.2 postoperatively. In conclusion, the described new sutures could significantly correct OSA in patients with retro-palatal obstruction and lateral pharyngeal walls collapse with easy applicability and no reported complication.

Keywords
obstructive sleep apnea, snoring, suspension sutures, expansion pharyngoplasty, tonsillectomy

Materials and Methods
This study was conducted from October 2012 to December 2014. The institutional review board approved the research.

Inclusion criteria included patients who had OSA symptoms with apnea hypopnea index (AHI) >15, Friedman palate position stage III or IV, tonsil size 0 to 2, type I Fujita (retropalatal obstruction), and body mass index <30 kg/m². Flexible nasoendoscopy during Muller’s maneuver and drug-induced sleep endoscopy was performed for all patients; all included subjects had obstruction at soft palate level, while those with retroglossal airway collapse were excluded.

Operative Technique
With the patient under general anesthesia, a large rounded needle (size, 40-60 mm) with Vicryl size 0 was introduced near the junction between the upper tonsillar pole and posterior pillar and passed through the palatopharyngeus muscle at its most upper part. Then, the needle was curved around the pterygoid hamulus directly or with 1 stop midway through the palatal muscles. The hamulus was identified medial and posterior to last molar tooth and confirmed by palpation. Then, the needle was returned near the start area in the tonsillar bed, passing through the palatoglossus muscles. The suture was tightened with proper tension to pull and advance the palate and lateral pharyngeal wall collapse with easy applicability and no reported complication.

OObstructive sleep apnea (OSA) is common problem; surgery is one of the treatment options to enlarge the airway or diminish airway collapsibility by removing or reconstructing soft tissues, and most operations target velopharyngeal region.¹

Many modifications of uvulopalatopharyngoplasty were investigated in last 2 decades, shifting to less aggressive surgical options. The recent evolution focused on the concept of obtaining expansion and stabilization of the collapsible pharyngeal tissues.²

This work aimed to introduce a new modification of expansion pharyngoplasty using bilateral suspension sutures without tonsillectomy.

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Hypopnea was defined as a decrease in airflow ≥30%, accompanied by 4% desaturation.

Pre- and postoperative evaluations were statistically compared with tests from SPSS 17.0 (IBM, Chicago, Illinois). P ≤ .05 is considered significant.

Results

Twenty-four patients—15 men (62.5%) and 9 women (37.5%)—were included. Their ages ranged from 24 to 43 years (mean ± SD, 34.7 ± 3.1). The preoperative body mass index was 25.3 ± 1.4 (range, 22.3-29.3), which did not significantly change at all postoperative visits.

The mean operative time was 6.5 ± 1.3 min (range, 4.5-10.5). The follow-up period ranged from 6 to 14 months (9 ± 2 months) with no reported velopharyngeal incompetence, fistula, swallowing problems, infection, or primary/secondary hemorrhage. Additionally, no mouth dryness, globus sensation, crustation, relapse, suture exposure, or extrusion was encountered.

Mean AHI dropped significantly (P < .0001) from 28.6 ± 4.2 preoperatively to 8.9 ± 4.9 postoperatively. The mean lowest oxygen saturation level increased significantly from 79.25 ± 4.12 to 89.29 ± 5.28 (P < .0001). Moreover, the visual analog scale significantly reduced (P < .0001) from a preoperative mean of 8.2 ± 1.4 to 2.1 ± 1.4 at 6 months postoperatively. Significant improvements (P < .0001) were also documented in Epworth Sleepiness Scale, as its mean decreased from 11.7 ± 2.9 preoperatively to 5.1 ± 2.2 postoperatively (Table 1). Snoring disappeared in 18 (75%) patients and decreased in 6 (25%) patients.

Discussion

The ideal procedure for the palatal component of OSA should be anatomically based and effective, with consistent results and minimal or no complications.\(^1\)

Functional expansion pharyngoplasty was suggested if the obstructive problem was mostly linked to an increase in lateral pharyngeal wall collapsibility such that physiologic correction could be obtained by taking advantage of the anatomic characteristics of the palatal pharyngeal muscle.\(^2\) However, expansion pharyngoplasty needs dissection and relocation of mucosa-

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**Figure 1.** A. Redundant long palate and small tonsil. B. Entry through the palatopharyngeus muscle. C. Second entry passing around the hamulus. D. Needle returned to start area. E. Suture tightened, pulling palate (arrow). F. Other side.

**Figure 2.** The suspension sutures are turned around the pterygoid hamulus (as referenced by the dissector), while the suction tip points to the pterygomandibular raphe.
deprived muscles that are not devoid of muscular tear, weakness, and fibrosis and mucosal disturbance.

Hur\(^5\) was the first to describe sling snoreplasty. He used permanent (nylon) suture to address snoring (not OSA), using 3 triangular, tetragonal, or pentagonal soft palate stitches.

In the current study, minimal invasive suspension sutures were utilized in an attempt to (1) lateralize and anteriorly advance the soft tissue of the lateral pharyngeal wall by pulling and plicating the palatopharyngeus and palatoglossus muscles, leading to elevation and anterior displacement, and (2) resume tension of the intact uvula and free edge of the palate by a nonablative procedure that minimizes velopharyngeal insufficiency risk. This widens the retropalatal space and decreases airway resistance without jeopardizing the physiologic functions of the soft palate (speech and deglutition). This was achieved by simple suspension sutures without tonsillectomy, pharyngeal tissue removal, or dissection, so bleeding was not a matter of concern.

The described suspension sutures are much less invasive than uvulopalatopharyngoplasty, its modifications, and other expansion pharyngoplasty procedures, without mucosal or palatal muscles disruption. The procedure is anatomically based and function preserving, allowing possible early and future revision and correction if needed. It can be used in previously tonsillectomized patients.

The utilized procedure is fast, low cost, and easily applicable, and it does not require implants. Furthermore, it produces excellent results, negligible pain, and rapid recovery without significant complication. These sutures need to be investigated under local anesthesia and as part of multilevel surgery.

**Conclusion**

The described new suspension sutures could properly correct OSA in patients with retropalatal obstruction and lateral pharyngeal wall collapse, with easy applicability and no reported complication.

**Author Contributions**

Magdy Abdalla Sayed El-Ahl, suggesting and developing the research idea, performing the surgery, following up the work progress, reviewing the written manuscript, revising it critically for important intellectual content, and final approval of the version to be published; Mohammad Waheed El-Anwar, modifying and developing the research idea, reviewing literature, defining the study protocol, preparing institutional review board forms, assisting in surgery, follow up of the patients, writing the manuscript, preparing figures, keeping record of patients’ information, tabulating data and statistical analysis.

**Disclosures**

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**Supplemental Material**

Additional supporting information may be found at http://otojournal.org/supplemental.

**References**


