

# Modified Expansion Sphincter Pharyngoplasty (MESP) vs Modified Barbed Reposition Pharyngoplasty (MBRP): A Comparative Study for Single Level Palatal Surgeries

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## ABSTRACT

**Background:** Uvulopalatopharyngoplasty is the most common surgical procedure used for management of obstructive sleep apnea syndrome (OSAS). Recently, more conservative surgical techniques were used with promising results, and less morbidity. **Objective:** This study compares the results and outcomes of two surgical modalities for the retropalatal collapse in OSAS studied cases. We compared modified expansion sphincter pharyngoplasty (MESP) with modified barbed reposition pharyngoplasty (MBRP). **Methods:** Forty studied cases with OSAS had been contained in this research, separated into 2 groups, with 20 studied cases for each group: MESP and MBRP. All enrolled patients had an apnea hypopnea index >fifteen. Only patients with oropharyngeal obstruction were comprised in our study. All studied cases underwent full clinical otolaryngology examination. Drug induced sleep endoscopy (DISE) and Epworth Sleepiness Scale (ESS) were evaluated preoperatively and 1 year postoperatively. **Results:** According to Sher's criteria, we found a significant decrease in AHI and oropharyngeal blockage in both groups ( $p = 0.01$ ), with a success rate of eighty-eight percent for MESP and eighty percent for MBRP. **Conclusion:** BRP and ESP appear to be effective for oropharyngeal obstruction as a single-level surgery. MESP patients showed a greater decrease at the hypopharyngeal level.

**Keywords:** Obstructive sleep apnea syndrome, Drug-induced sleep endoscopy, Modified expansion sphincter pharyngoplasty, Modified barbed reposition pharyngoplasty.

## Introduction:

Chronic OSAS is characterized by recurrent bouts of upper airway collapse throughout sleeping<sup>(1)</sup>. Disease prevalence is estimated to be between three and seven percent, and there have been a variety of factors that increase a person's risk of developing this ailment, including years old, male sex, obesity, family history, menopause, deformities of the face and cranium, and vices including cigarette and alcohol use<sup>(2-4)</sup>. The collapse of the upper airway has been the main pathophysiological event that occurs in OSAS. However, it occurs at the same time at different levels, like nasal, retropalatal and retro-lingual and laryngeal collapse<sup>(4)</sup>. Nevertheless, the soft palate collapses is the most frequent, then pharyngeal walls, the base of the tongue, and palatine tonsil<sup>5</sup>.

Variety of instruments are used to evaluate upper airway blockage. Currently, drug-induced sleep endoscopy has been thought to be the most efficient method for precisely localizing collapse sites<sup>6</sup>.

Improvements in sleep hygiene, weight loss, use of dental splints, and continuous positive airway pressure therapy are typically the mainstays of OSAS treatment<sup>(7-11)</sup>. CPAP is considered the gold standard for the management of OSAS. Nevertheless, about forty percent of studied cases are unable to use CPAP machines and need alternative therapies, such as surgery<sup>12,13</sup>. To treat OSA, uvulopalatopharyngoplasty has been the most often used surgical surgery. Difficult part of this treatment is figuring out how much soft tissue can be removed while still being effective<sup>14</sup>.

Imaging investigations have shown that lateral pharyngeal muscle wall collapse plays a significant role in the aetiology of OSA<sup>15,16</sup>. Lateral pharyngoplasty method published by Cahali had been intended to treat individuals with OSA who had lateral pharyngeal wall collapse. Although surgery produced encouraging

outcomes, several individuals experienced dysphagia afterward<sup>17</sup>. Another often employed procedure has been called sphincter pharyngoplasty, which entails partial uvulectomy, closure of anterior and posterior tonsillar pillars, rotation of palatopharyngeus muscle, and its attachment to pterygoid hamulus<sup>18</sup>.

New palatal surgery was proposed by Mantovani *et al.*, where oropharyngeal inlet and retropalatal space are increased by barbed reposition pharyngoplasty, which laterally and anteriorly displaces the posterior pillar<sup>19</sup>.

Our research's goal is to share our surgical expertise with a group of OSAS-studied cases. We compared MESP and barbed MBRP in a single stage of treatment in studied cases with retropalatal collapse.

## MATERIALS AND METHODS

Forty studied cases with obstructive sleep apnea syndrome had been involved in this research. This study was performed from May 2014 to December 2017. It was separated into 2 groups, with 20 studied cases for every group: MESP and MBRP. Years old between twenty-five and sixty years, BMI >fifteen and thirty-five kg/m<sup>2</sup>, the tonsillar volume of any degree, apnea-hypopnea index >fifteen, and DISE showing solely retropalatal blockage had been inclusion criteria. However, exclusion criteria were patients with previous airway surgery such as UPPP tonsillectomy, severe medical conditions, DISE indicating nasal obstruction, hypopharyngeal, and laryngeal obstruction, and cases with craniofacial anomalies that had affected airways.

Each studied case's complete medical history had been gathered, together with their preoperative and postoperative Epworth sleepiness scores. Preoperative otolaryngology clinical examination had been completed on all recruited studied cases, and drug-induced sleep endoscopy had been carried out

by European position paper<sup>6</sup>, we used NOHL grading recommended by **Vicini et al.**<sup>21</sup>. Assessment of the oxygen desaturation index and AHI using polysomnography. The following details had been noted for each instance: years old, gender, BMI, ESS before and one year after surgery, AHI—before and one year after surgery, and ODI—before and one year after surgery.

Post operative pain was assessed by 0-10 visual analogue scale, where 0 means no pain and 10 maximum pain you have ever experienced.

**Surgical Procedures:** All studied cases underwent single-step oropharyngeal surgery, and we divided studied cases into two groups according to the type of operation done: Modified expansion sphincter pharyngoplasty was used in Group A. Modified barbed reposition pharyngoplasty was used in Group B.

Bilateral tonsillectomy had been performed using cold steel instruments and bipolar cautery. The main goal of tonsillectomy has been to completely maintain tonsillar pillars (Palatoglossus and palatopharyngeus).

**In MESP**, the muscle of the palatopharyngeus has been recognized during tonsillectomy. With care taken to keep its fascia connected to the deeper horizontal constrictor muscle, the palatopharyngeus muscle's inferior end was divided horizontally. By mucosal tunnel at the anterior pillar, an absorbable suture was employed to attach the palatopharyngeus muscle to the pterygomandibular raphe. To perform mucosal closure, ESP tightened the lateral pharyngeal wall. **In MBRP**, three landmarks needed to be noted; the first was the posterior nasal spine, which can be felt at the midline junction of hard and soft palates. After palpation, the pterygomandibular raphes on both sides were noted. 3<sup>rd</sup> significant landmark was positioning that lies roughly halfway among the raphe and midline of the soft palate. A thread was pulled until it hung at the central transition zone, which is a free zone present between 2 directions of the thread. 1 needle was inserted at the postnasal spine point, and passed laterally through the palate, turning around the pterygomandibular raphe until it came out at the most superior part of the raphe on 1 side. The needle was inserted close to the point of exit once more, going around the pterygomandibular raphe until it emerged into the tonsillectomy bed, then through the upper section of the palatopharyngeus muscle and exiting close to the mucosa of the posterior pillar rather than through it. The intersection of the top 3<sup>rd</sup> and lower 2-3<sup>ds</sup> was where the posterior pillar was accessed. Tonsillectomy bed was once more punctured by a needle, and suture was then once more suspended around the raphe; light traction was then applied to thread alone with no knots being made.

When the posterior pillar was successfully moved to more anterior and lateral positions without tying the knot, this stitch was repeated at least 3 times among raphe and muscle until the lower pole of muscle

was reached. Other side was completed in the same manner.

**Ethical considerations:** The local Board of Ethics of the Faculty of Medicine, Al Azhar University has given its approval for this research, which conforms with Helsinki. Written signed consent was taken from all patients participating in our study.

**Statistical Analysis**

The data of this study was analyzed using the Statistical package for social sciences (SPSS). Qualitative data were reported as raw numbers or percentages, while quantitative data were typically shown as means and standard deviation (SD). Student T test was used to assess the statistical significance of the difference between two study group means. Chi-square test was used to examine the relationship between two qualitative variables. Results were considered significant when the P value ≤ 0.05 and highly significant when it was ≤ 0.01.

**RESULTS**

Forty studied cases were comprised in this research, 20 for MESP and 20 for MBRP. The studied 2 groups showed no significant variation in age, BMI, preoperative AHI and preoperative ESS (Table I).

Table I: Comparison of preoperative clinical data between both group

		Number	Mean	SD	P
Age	MESP	20	2.21	11.31	0.19
	MBRP	20	9.72	11.37	
BMI	MESP	20	28.9 kg/m <sup>2</sup>	2.56	0.07
	MBRP	20	29.6 kg/m <sup>2</sup>	3.02	
Pre AHI	MESP	20	25.7	8.38	0.12
	MBRP	20	24.4	7.16	
Pre ESS	MESP	20	12.1	4.05	0.08
	MBRP	20	11.4	3.87	

BMI: Body Mass Index; AHI: Apnea-HypopneaIndex; ESS: Epworth SleepinessScale, SD: Standard Deviation

Success rates according to **Sher** criterion<sup>21</sup> (AHI reduction > fifty percent and AHI value< twenty) were verified by comparison of pre-and postoperative PSG data. The success rate was 88% and 80% in MESP Group and MBRP Group, respectively. The results of postoperative AHI values showed a significant decrease in both groups. In group A, we noted a decrease of 47.4% in mean AHI. Similar outcomes were obtained in group B with a decrease of 49.5% AHI. This reduction of AHI was more in the MESP group than MBRP, but the difference between both groups was statistically insignificant (Table II). Similarly, the ESS was decreased postoperatively significantly in both groups. Oropharyngeal collapse decreased postoperatively in the 2 groups, while hypopharyngeal obstruction decreased significantly only in the MESP group (Table II). As regard to postoperative pain, group B showed a significant decrease in postoperative pain P <0.05. As, VAS mean was 6.23 and 3.41 in group A and group B, respectively.

Table II: Preoperative and postoperative comparison of outcomes among MESP and MBRP

	Pre-op MESP	Post-op MESP	P value	Pre-op MBRP	Post-op MBRP	P value	Post MBRP Vs MESP P value
AHI	25.7 (SD 8.38)	12.2 (SD 4.37)	0.01	24.4 (SD 7.16)	12.1 (SD 4.27)	0.01	0.06
ESS	12.1 (SD 4.05)	5.9 (SD 3.6)	0.02	11.4 (SD 3.87)	5.5 (SD 3.6)	0.04	0.08
Grade N	1.1 (SD 0.46)	1.1 (SD 0.46)	0.09	1.2 (SD 0.39)	1.2 (SD 0.39)	0.07	0.06
Grade O	3.6 (SD 0.61)	1.3 (SD 0.57)	0.01	3.4 (SD 0.590)	1.2 (SD 0.51)	0.02	0.07
Grade H	1.7 (SD 0.81)	1.2 (SD 0.43)	0.01	1.6 (SD 0.65)	1.5 (SD 0.67)	0.09	0.04

AHI: Apnea-Hypopnea Index; ESS: Epworth Sleepiness Scale; GradeN: Nasopharyngeal collapse; Grade O: Oropharyngeal collapse; Grade H: Hypopharyngeal collapse SD: Standard Deviation.

## DISCUSSION

Lateral pharyngeal wall has been the primary anatomical feature for airway narrowing in OSA-studied cases because it has been more collapsible in studied cases with OSA than in healthy individuals and may be thicker in studied cases with OSA than in people without OSA<sup>16</sup>.

**Cahali**, showed how ten studied cases with moderate to severe OSA and mostly lateral pharyngeal wall collapse responded to lateral pharyngoplasty procedures. The results showed a marked reduction in AHI from 45.8 to 15.2 (P=0.009). All studied cases, nevertheless, had considerable swallowing issues<sup>17</sup>.

As an evolution of lateral pharyngoplasty, two surgical modalities were developed; First; was “Expansion sphincter pharyngoplasty”, which had been described by **Pang and Woodson**<sup>18</sup>, compared to earlier methods, this one has been far more cautious and considerate of palate structure; expanding transverse space at the pharyngeal level. At the level of the oropharynx, it likewise tends to broaden anterolaterally.

The second technique was barbed reposition pharyngoplasty, which was recommended by **Vicini et al.**<sup>5</sup>. Self-locking wires are intended to be used, which is comparable to relocation pharyngoplasty but more considerate to palate architecture.

In our study, to be more considerate of anatomical structures included in surgical incisions, we modified both original ESP and BRB procedures.

**Lorusso et al.**, showed improvement in postoperative AHI, and ESS in both MESP and MBRP. The MESP had been better than MBRP, which is consistent with our results<sup>22</sup>.

Regarding DISE data, we saw comparable oropharyngeal blockage reduction in both methods. However, we found that studied cases receiving MESP experienced a greater decrease at the hypopharyngeal level than studied cases receiving MBRP.

The main advantage of these techniques has been that major downsides including regurgitation and velopharyngeal insufficiency have been less common because there has been no noticeable tissue excision.

## CONCLUSIONS

We compared results after MESP and MBRP, in OSAS patients with oropharyngeal obstruction. Both techniques are effective in OSAS with retropalatal collapse. MESP showed a variation decrease in hypopharyngeal obstruction. However, MBRP recorded better results in postoperative pain.

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- **Competing interests:** Nil.

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