

# Effects of Uvulopalatopharyngoplasty: A Seven Year Review

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## SUMMARY

To review the long term outcome of Uvulopalatopharyngoplasty (UPPP) for obstructive sleep apnoea syndrome in a tertiary referral centre. 38 records were traced where UPPP was done from July 2000 to December 2007. 14 patients were followed up for one to seven years where the Epworth sleepiness scale was scored, long term side effects documented and post operative muller's manoeuvre done. Success of UPPP is defined as a reduction in apnoea hypopnea index (AHI) more than 50%. Sixty percent (60%) were successfully treated with UPPP in the long term. Mean ESS was significantly reduced from  $12 \pm 6$  to  $7 \pm 4$ . 11 out of 14 patients (78.5%) were reported to develop long term side effects of UPPP, the highest being velopharyngeal insufficiency (42.8%). In conclusion, UPPP is effective in improving symptoms of OSA in the long term. However, in view of its side effects, uvula preserving surgery should be considered as a surgical option.

## KEY WORDS:

*Uvulopalatopharyngoplasty, Sleep apnoea Syndrome, Outcome Assessment*

## INTRODUCTION

Obstructive sleep apnoea syndrome (OSA) is a common sleep breathing disorder diagnosed based on an individual who has daytime somnolence and snoring with an apnoea hypopnoea index (AHI) of more than five on polysomnogram<sup>1</sup>. Continuous positive airway pressure (CPAP) device is the treatment of choice. However, selected patients with OSA or those unable to tolerate CPAP may be treated surgically. Furthermore CPAP is expensive and may not be affordable to some individuals especially in a developing country. Uvulopalatopharyngoplasty (UPPP) is a surgical procedure which aims to correct obstruction at the retropalatal level<sup>2</sup>. This procedure is usually combined with other surgeries such as nasal septal or turbinates surgery depending on the site of upper airway obstruction.

There are also other surgical options for obstruction causing snoring at the palate level such as Radiofrequency Tissue Volume Reduction (RFTVR) of soft palate, laser assisted uvuloplasty (LAUP) and the now popular modified cautery assisted palatal stiffening operation (CAPSO). A study by Rombaux *et al* demonstrated that the side effects (taste alteration, pharyngeal dryness, globus sensation, voice

change and pharyngonasal reflux) were more present in UPPP compared to RFTVR and LAUP<sup>3</sup>. These side effects have influenced the current trend of moving towards uvula preserving surgery such as modified CAPSO.

We realise that there are numerous publications reporting the outcome of UPPP. However, the results are also difficult to compare owing to different definitions of response and different criteria of patient selection. There is also lack of data on the long term outcome of UPPP in the local setting. Realising this, we reviewed our cohort of patients to assess the efficacy and safety of UPPP in our centre which is in a developing country where CPAP is not readily available due to its cost. The primary outcome is measured using the polysomnogram. Secondary outcome was assessed using the Epworth sleepiness score (ESS). We also wish to assess the immediate and also late complications of UPPP and also to identify patient's characteristics which lead to poor outcome.

## MATERIALS AND METHODS

This was a retrospective study in a tertiary medical center. The Department of Otorhinolaryngology-Head and Neck Surgery (ORL-HNS) of UKMMC operation list were manually reviewed and a total of 38 patients had undergone this procedure from July 2000 to December 2007. 14 patients were followed up and reviewed for long term outcome of UPPP ranging from one to seven years. Ten patients had repeat sleep study within these one to seven years after UPPP.

All patients diagnosed to have OSA and had undergone UPPP in our centre were selected. They were OSA patients who failed or were unable to tolerate CPAP. The procedure was performed mainly by the senior co-author (A. Sani) who used the technique previously described by Fairbanks *et al*<sup>4</sup> for all patients.

The review was done using a standard form for all patients to assess the outcome of UPPP in our centre where baseline characteristics were documented. Patients under long term follow up were assessed for:

- 1) The baseline AHI and postoperative AHI after 1 year when available. A 6 channel polysomnogram was done for all the patients. Patients had severe OSA if AHI was more than 30, moderate; AHI 15 to 30, mild; AHI 5 to 15 and normal if AHI less than 5. A successful operation is defined as reduction of AHI more than 50% from baseline.

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- An unsuccessful operation is defined as reduction in AHI of less than 50% from baseline. Patients who worsened are defined as increase in AHI more than 10% from baseline
- 2) The Epworth sleepiness scale (coded 0 to 3 for eight everyday situations to be totalled to maximum of 24) to assess daytime sleepiness. An ESS of 0-9 was assigned as normal, 10-13 as mild, 14-19 as moderate and 20-24 as severe daytime sleepiness.
  - 3) Patient's physical characteristics ie. BMI, tonsil size, Friedman Tongue Position (FTP) and adenoid size were documented when available.
  - 4) Side effects of UPPP (velopharyngeal insufficiency, foreign body sensation, taste alteration, excessive phlegm and hypernasal speech).
  - 5) Post operative muller manoeuvre<sup>s</sup> to measure airway collapse at 3 different levels (velopharyngeal, lateral pharyngeal and tongue base) was noted. Airway collapse was graded from 0 to 3+ to indicate severity of collapse 0 being no collapse and 3+ meaning complete collapse.
  - 6) Patient satisfaction using the 5 point scale (1-very unsatisfied, 2- unsatisfied, 3-slightly satisfied, 4- satisfied and 5- very satisfied).

The data was then entered into SPSS version 16 for analysis. Wilcoxon ranked test was used to compare preoperative and postoperative AHI and ESS. Mann Whitney test and Kruskal Wallis test were used to explore the relationship between patient characteristics and outcome of UPPP.

## RESULTS

33 out of 38 patients had a preoperative sleep study with mean AHI of  $39 \pm 25$ . 23 patients had severe OSA (69.6%). The study population is summarised in figure I.

14 out of 38 patients remained under follow up till date. These patients had undergone UPPP from August 2001 to December 2007. Among those who remained under follow up, most of them were male (78%), with mean age of  $37.6 \pm 10.34$  (SD) years and had mean BMI of  $30.1 \pm 6.44$  kg/cm<sup>2</sup>. Among those who were lost to follow up, 83.3% were male, with mean age of 39.1 years and had mean BMI of 30.6 kg/cm<sup>2</sup>. There is no significant difference in gender ( $p=0.98$ ), age ( $p=0.79$ ), and BMI ( $p=0.85$ ) between this group and the group lost to follow up.

### *Immediate Outcome*

Among the 38 patients who had undergone UPPP, 4 patients (10.5%) developed postoperative minor bleeding which resolved with conservative management. There were no reports of major complications such as haemorrhage, airway obstruction or death post UPPP in our study population. 26 (68.4%) patients had documentation of subjective early improvement at one to three months after UPPP. 20 patients (76.9%) reported improvement in snoring and daytime sleepiness while 6 (23.1%) patients did not have any subjective improvement. 16 (42.1%) of these patients had FTP grade I or II, seven (18.4%) were FTP grade III or IV while there was no data for the other 15 patients. 14 out of 20 patients with symptom improvement had FTP grade I or II. Tonsil size was not found to be significantly related to improvement of symptoms after UPPP ( $p=0.489$ ). Preoperative BMI and

baseline AHI was also found not significantly related to early symptoms improvement ( $p=0.28$  and  $p=0.52$  respectively).

15 patients underwent additional procedures. The most commonly done procedure was RFTVR of tongue base (8 patients) or Inferior turbinate (7 patients), followed by trimming of inferior turbinate (3 patients) and submucosal diathermy (2 patients). The group with additional procedures did not experience significant improvement of symptoms over the group of patients who had UPPP only ( $p=0.785$ ).

### *Long Term Response to UPPP*

In this study, two out of 14 patients had deterioration of symptoms at five and 27 months postoperatively after initial subjective improvement. Ten patients were agreeable for a postoperative sleep study. Overall the mean AHI reduced from  $52 \pm 28$  to  $31 \pm 34$  but this was found not significant ( $p=0.14$ ). Six patients had reduction of AHI of more than 50% therefore deemed successful operation. One patient had reduction of AHI but was not significant and three patients had worsening of AHI postoperatively. Weight gain was not a significant factor for outcome of UPPP ( $p=0.610$ ). Seven out of ten patients had additional procedures together with UPPP however, only four out of these Seven had successful surgery, one did not improve and two worsened. Again, There was no statistical difference ( $p=0.869$ ) in between group who had additional procedure compared to those who underwent UPPP alone.

All 14 patients had scored their daytime sleepiness using the Epworth sleepiness score (ESS) pre operatively and one to seven years postoperatively. Eight patients (57.1%) had improvement of ESS while 6 patients had no improvement. Preoperative ESS of  $12.67 \pm 5.36$  was reduced to  $6.93 \pm 3.49$ . A Wilcoxon Signed Rank test was performed to evaluate long term response to UPPP on ESS. The z value was -2.539 with a significance level of  $p=0.01$ , therefore UPPP significantly reduces the ESS in the long term.

13 out of 14 patients had a mullers manoeuvre done between 1 to 7 years postoperatively. 4 out of 13 (30.8%) had velopharyngeal collapse graded as 3+. All 4 of these patients did not have improvement of ESS and were also the not successfully treated with UPPP. Weight gain was not found to be significant a factor in causing velopharyngeal collapse after UPPP ( $p=0.343$ ). The summary of patient characteristics is in table I.

### *Long Term Side Effects of UPPP*

11 out of 14 patients suffered from at least 1 out of 5 common side effects of UPPP which are foreign body sensation, altered taste, excessive phlegm, hypernasal voice and velopharyngeal insufficiency (VPI). Most patients (35.7%) suffered 2 out of 5 symptoms while none had all 5 symptoms.

The commonest complaint from UPPP was VPI (6 patients), however this was temporary and patients had learned to compensate (table II).

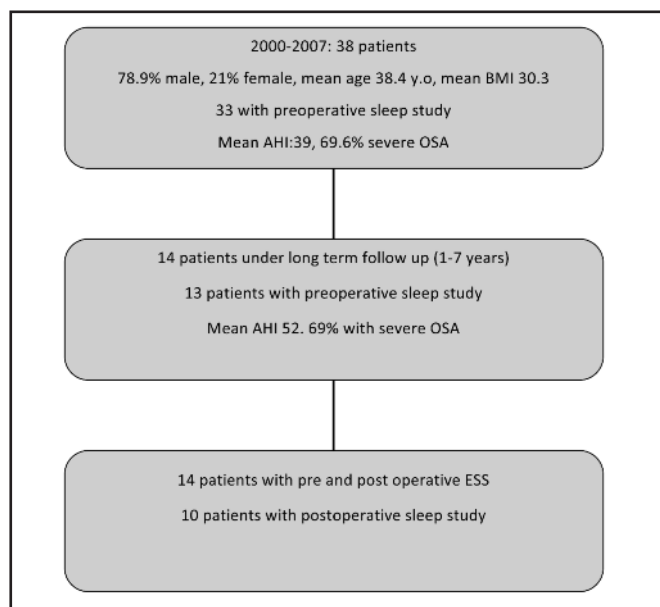
Presence of VPI does not significantly affect the success of UPPP ( $p=0.11$ ).

**Table I: The characteristics of fourteen patients who remained under follow up one to seven years after UPPP. Lat wall, velophar: Lateral wall collapse and velopharyngeal wall collapse on muellers manoeuvre after UPPP**

Pt	AHI		ESS		Tonsil grade	Lat wall Collapse (post)	Velophar Collapse (Post)	BMI		Satisfaction
	pre	Post	pre	post				Pre	Post	
1	58.0	87.0	11	11	III	2+	3+	30	31.8	slightly satisfied
2	27.0	14.0	14	14	0	2+	3+	20	20	Unsatisfied
3	83.0	23.0	18	7	II	2+	1+	26.7	30.6	Satisfied
4	49.0	5.0	13	9	II	1+	0	22.2	22.0	Satisfied
5	72.0	3.0	23	10	IV	1+	0	33.6	34.8	very satisfied
6	26.0	12.0	13	2	II	1+	0	33.0	31.4	Satisfied
7	86.0	106.0	4	4	III	2+	3+	30.8	31.2	Satisfied
8	16.0	62.0	11	7	II	2+	2+	26.9	27.9	Satisfied
9	59.0	8.0	10	2	I	.	-	31.9	31.2	Satisfied
10	93.0	15.0	16	5	III	1+	2+	31	35.9	Satisfied
11	-	-	5	5	III	1+	0	30	32.9	Satisfied
12	47	-	10	10	I	3+	1+	32	36.1	Unsatisfied
13	-	-	6	6	I	1+	3+	25	24.8	Satisfied
14	52	-	18	5	IV	1+	2+	33	35	Satisfied

**Table II: Long term side effects suffered by patients after UPPP**

Long Term side effects	No. Of patients (n= 14)	%
Velopharyngeal insufficiency	6	42.8
Excessive phlegm	5	35.7
Altered speech	5	35.7
Foreign body sensation	4	28.5
Taste alteration	1	7.1



**Fig. 1:** The flow chart of our study population depicting the study population characteristics. 38 records were traced and further narrowed down to 14 patients who remained under long term follow up.

8 patients developed cicatritious scarring post UPPP, but only 1 patient had stenosis of uvulopharyngeal opening needing repair due to worsening of symptoms. The cicatritious scarring (figure II) in absence of stenosis did not affect the outcome of UPPP (p=0.76). All patients with cicatritious scarring without stenosis were successfully treated with UPPP.

Overall majority of patients were satisfied with UPPP which includes those who had severe OSA. One patient was very



**Fig. 2:** A patient with cicatricious scarring which is a complication of UPPP that may cause deterioration of symptoms.

satisfied, ten patients were satisfied, one patient was slightly satisfied while two patients were unsatisfied. None were very unsatisfied with this procedure.

**DISCUSSION**

It has been the practice in Department of Otorhinolaryngology-Head and Neck Surgery (ORL-HNS) of UKMMC to reserve ICU bed for patients with severe OSA or undergoing multilevel procedure. This practice has led to many unwanted cancellations when these beds were not available. Again, this practice was questioned as in this study; none of the 38 patients had suffered from immediate major complications of UPPP that requires intensive care unit treatment. However, this may be due to the small sample size of the study, patient selection and also surgeon factor. A large study by Kezerian et al found that the rate of serious non fatal complications such as respiratory distress, cardiovascular events and major haemorrhage was 1.2%<sup>6</sup>. Hathaway *et al* reviewed 110 patients that underwent UPPP as outpatient surgery where there were no incidence of major complications. Further study is needed to assess the need of

ICU backup for patients with severe OSA after palatal surgery. In this study, (76.9%) reported reduced snoring and daytime sleepiness one to three months after UPPP. However, 2 patients (14.2%) reported deterioration of symptoms at 5 and 24 months respectively. Comparatively Boot *et al*<sup>8</sup> reported that 63% had sustainable improvement in snoring and daytime sleepiness respectively at 11 months but reduced to 38% at 74 months after surgery. Levin *et al* reported that improvement in snoring was short lived and patient's symptom will deteriorate after 1 year<sup>9</sup>.

This study found that tonsil size alone was not related to subjective improvement. Friedman *et al* recommends that anatomic factors such as Friedman tongue position together with tonsil size and BMI are superior in predicting outcome<sup>10</sup> and this has been incorporated in UKMMC to select patients for UPPP. Baseline AHI was also not related to early subjective improvement. This agrees with another study which found that patient with lower AHI did not have higher chance of success compared to those with high AHI<sup>11</sup>.

UPPP is commonly combined with additional surgery that addresses the nasal airway and also the tongue base. Our study did not find any significant difference in terms of subjective improvement or successful reduction of AHI between patients who had additional surgery and those who did not. A study by Friedman *et al*<sup>12</sup> found significantly higher success of UPPP when combined with RFTVR of tongue base in patients with FTP grade II to III. This highlights the importance tailoring the additional surgery in accordance to the level of obstruction in order to achieve a better outcome.

Postoperative Mullers manoeuvre was performed in 13 out of 14 patients who had long term follow up. This study noted that patients with velopharyngeal collapse of 3+ after UPPP had no improvement in ESS. Patients who deteriorated also had both significant velopharyngeal and lateral pharyngeal wall collapse. This supports Isono *et al*<sup>13</sup> who found that retropalatal airway collapsibility will recur after 1 year of UPPP which could lead to recurrence of symptoms. Therefore, although selection of patients with retropalatal airway collapse for UPPP may harbour good success<sup>14, 15</sup> the effects may be temporary and patients need to be on long term follow up. Other causes of failure in UPPP are postoperative scarring with stenosis, multilevel obstruction, and operative technique. This study found that weight gain was not a risk factor for retropalatal collapse after UPPP. This agrees with Sasse *et al*<sup>16</sup> who disputed the popular belief that patients deteriorate due to post operative weight gain.

We found a high rate of long term side effects in patients where 42.8% reported to have VPI one to seven years later. However, none of the patients found the VPI to be bothersome as it only occurs occasionally. This incidence of VPI is higher compared to a study done by Goh *et al*<sup>17</sup> who reviewed 49 patients 17 to 20 years after UPPP. That study reported 28.5% of patients had VPI, followed by dry throat (12.2%). This suggests that long term side effects may subside with following years but may nevertheless be present even after 2 decades. The symptoms are attributed to the absence of uvula which was removed during UPPP. As with Goh *et al*<sup>17</sup>, this study also disputed the assumption that a more radical surgery resulting in VPI will lead to a better outcome of UPPP.

Therefore, uvula preserving surgery such as modified CAPSO had gained popularity to lessen the above side effects. This had also given impact to UKMMC practice adapted modified CAPSO to be the palatal surgery of choice for OSA. However, there is yet available data to assess its long term outcome.

## CONCLUSION

UPPP is a safe, effective and affordable surgery. Two thirds of our patient reported subjective improvement and majority were satisfied with this surgery. Patients who refuse CPAP may be offered this surgery but counselling and careful assessment is needed preoperatively especially for patients with severe OSA. Additional procedures should also be tailored to patient's needs. In view of the high rate of cicatricious scarring and long term side effects, other forms of palatal surgery preserving the uvula and arch of soft palate should be considered. Further study is needed to compare the outcome of UPPP and uvula preserving surgery.

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