Different uvular laser surgeries in management of snoring patients (As clinical study and review of literatures)

Khaled M. Bofares
Department Otorhinolaryngology, Omar Almoukhtar University, Elbyda, Libya

Follow this and additional works at: https://pajr.researchcommons.org/journal

Recommended Citation
Bofares KM. Different uvular laser surgeries in management of snoring patients (As clinical study and review of literatures). Pan Arab J. Rhinol. 2012; 2012; 2: -. Available at: https://pajr.researchcommons.org/journal/vol2/iss2/10

This Article is brought to you for free and open access by Pan Arab Journal of Rhinology (PAJR). It has been accepted for inclusion in Pan Arab Journal of Rhinology by an authorized editor of Pan Arab Journal of Rhinology (PAJR).
Different uvular laser surgeries in management of snoring patients
(As clinical study and review of literatures)

Khaled M. Bofares
Department Otorhinolaryngology, Omar Almoukhtar University, Elbyda, Libya
Email: bofaresstat2012@yahoo.com

Background and Objectives: Recently by improvement of the education levels of general populations the snoring has been considered as one of common presented problems at otorhinolaryngeology departments which may interfere with normal personal social life thus the research for optimum procedures to resolve this problem become one of the priorities at this specialty.

Although snoring can be due to functional predisposition but still the obstructive verity of snoring is commonest. This obstruction can occur at different levels starting from nose up to oropharynx with variable degrees of obstruction severity. The uvula is considered as one of the common structures of upper air way tract which may develop certain anatomical abnormalities resulting in upper air way obstruction. In the same time it is claimed that interference with the uvula by recommended procedures including CO2 laser surgical procedures may effectively help in management of this problem.

Therefore this study was conducted prospectively to assess whether there is any significant difference between these variable uvular related laser procedures from the outcomes point of view regarding relief of snoring as well as from the postoperative complications point of view.

Patients and Methods: Thirty - six patients aged 23-55 years presented at ENT department - Althowra central hospital - Elbyda - Libya with history of snoring which disturbs the normal social life of those patients and through the local clinical examination there were four varieties of local uvular related findings via which the received patients were divided into four groups, in group-A the patients underwent laser uvulopalatopharyngoplasty (LUPPP), group - B patients operated by laser assistant uvuloplasty (LAUP), while at group-C patients proceeded by what is called laser uvular flap procedure (LUFP), and the last group was group-D in which patients were interfered by the modified laser uvular flap procedure (MLUFP). All patients were evaluated preoperatively by modified sleep study, thyroid function test, chest imaging, ECG, body-mass index measurements as well as all routine blood tests. In addition all patients were followed up for six months postoperatively to confirm the degree of improvement in snoring and to elucidate for any post procedure complications development.

Results: Regarding the snoring, all patients at all four groups showed significant postoperative improvement in snoring. 80% of patients at group-A showed non-significant intra operative and postoperative bleeding, non-significant postoperative dysphagia, odynophagia, referred otalgia, fever, and vomiting tendency as compared to other three groups where all patients showed same results. All patients of group-A stayed more than 24 hours postoperatively at hospital as compared to group-B in which 60% of patients stayed less than 24 hours at the hospital after surgery while 65% of patients in both group-C and D who showed same results. On the other hand 15% of patients in group-A developed postoperative foreign body sensation and nasal regurgitation as compared to other groups at which no patient was presented with this kind of complications. One patient of group-A was presented with recurrence of snoring after three
years from the surgery. Regarding otitis media, airway obstruction and septicemia, in all four groups no cases were registered. The healing process as sequel of all procedures completed by one week.

Conclusion: Generally speaking uvula constitutes one of important anatomical structures at upper air way tract which plays very significant role in pathogenesis as well as management of snoring. There are different varieties of laser surgical procedures which can be used to treat uvular related snoring. The selection of the proper procedure is depending up on many local as well as systemic factors. The proper selection of optimum procedure will determine the degree of intervention succeeds.

Keywords: Snoring, CO2 laser uvulopalatopharyngoplasty, CO2 laser assistant uvuloplasty, CO2 laser uvular flap procedure, CO2 modified laser uvular flap procedure.

INTRODUCTION

The upper respiratory tract obstruction can be manifested by either snoring or strider or apnea attacks. Although the snoring does not constitute any life-threatening situation as compared to strider and sleep apnea attacks which may be associated with respiratory functional disturbances that can contribute to life-threatening conditions which may extend up to level of sudden deaths thus the last two presentations make the patient more worry as compared to snoring therefore in past the commonest presentations of patients with upper air obstruction were either strider or repetitive sleep apnea attacks. In last and presenting centuries the general population’s education levels are improved for this reason the snoring became one of major clinical presentations of patient with upper airway obstruction. The psycho-social complications are considered as main problems which are associated with snoring rather than medical sequels. These problems are enough to make the patient complain.\(^{(2,3,4,6,7)}\)

The pathogenesis of snoring can be due to either local or systemic etiological factors. The local causes are considered as anatomical as well as structural defects which resulting in direct upper air way obstruction and these lesions anatomically may involve different levels starting from the nose up to the level of oropharynx. Usually this type of snoring can be managed surgically by elimination or reconstruction of causative lesions. On the other hand the systemic predisposing factors of snoring are defined as functional defects which leading to indirect upper air way obstruction (i.e.) by local examination air way tract is anatomically appearing normal but there is certain muscular malfunctioning due to systemic disorders as neurological, musculoskeletal, endocrinal, metabolic, and nutritional. This type of snoring needs conservative treatment rather than any surgical intervention.\(^{(2,3,4,6,7,17,18,19,20,30,31,32)}\)

As a part of management of snoring it is very important to confirm the class of snoring. This step is considered as corner stone at our work by which optimum type of management is decided. There are two main parameters which are used to indicate the exact classes of snoring these parameters are the arterial partial pressure of oxygen and duration of each apnea attack. Accordingly there are four classes of snoring related disorders which are: A) simple snoring: this class is manifested by just snoring without any hypoxia or apnea attacks and if there are apnea attacks they will not exceed 10 seconds as duration for each attack. B) Obstructive snoring: it is represented by that type of snoring which associated with just mild hypoxia (arterial oxygen partial pressure is decreased by value more than 10 mmHg up to 15 mmHg) with or without any apnea attacks if there are apnea attacks duration for each attack will not exceed 10 seconds. C) Sleep apnea syndrome: it is constituted by the circumstance of exceeding normal apnea index (i.e.) the duration of each apnea attack will be more than 10 seconds. Accordingly there will be three grades of sleep apnea syndrome, mild at which the duration of each apnea attack will be more than 10 seconds up to 20 seconds, moderate when the duration of each apnea attack more than 20 seconds up to 40 seconds, and severe which is diagnosed if the duration of each apnea attack more than 40 seconds. In addition to these changes of apnea attacks duration they will be accompanied with either mild or moderate hypoxia (= the arterial partial pressure of oxygen is dropped by value of more than 15 mmHg up to 20 mmHg). And finally D) upper air way resistance syndrome: this is the most advanced stage of upper air way obstruction at which the arterial partial pressure of oxygen is decreased by more than 20 mmHg (sever hypoxia) and this may be associated with hypopnea rather than apnea attacks.\(^{(2,3,4,6,7,12,23,24,29,30,31,32)}\)

The determination of the exact snoring class will be performed by what is called sleep study by using of polysomnography which measures multiple parameters changes during normal personal sleep process. These parameters will include presence of snoring, number of apnea attacks per hour, duration of each apnea attack, changes of oxygen arterial partial pressure, changes in heart rate, changes in arterial blood pressure and
Different uvular laser surgeries in management of snoring patients

Accordingly Epworth sleep scale is drown. By this way the verity of snoring can be confirmed.(22,23,24,25,26,27,28)

There is one question which initiates a controversy point (does the duration of hypoxia during sleep has any significant role to decide kind of snoring management?), in fact in our opinion the hypoxia is dangerous situation should not continue for long duration because it may become life-threatening condition thus the duration of hypoxia must be limited as much as possible therefore just appearance of hypoxia is considered as enough landmark to confirm presence of significant upper air obstruction.(2,3,4,6,7,21,23,24,29,30,31,32)

Generally speaking the reconstructive surgical treatment may play important rule in management of simple snoring, obstructive snoring, mild sleep apnea syndrome, as well as moderate sleep apnea syndrome that which is confirmed due to structural rather than functional upper airway obstruction. On the other hand functional upper airway obstruction is managed conservatively by what is called continuous positive air pressure (CPAP). Also CPAP can be used in the management of structural obstruction if there are contraindications for reconstructive surgical treatment. The surgical treatment depends up on determination of site of obstruction, type of the lesion and severity of obstruction while by using of CPAP these three factors are of no significance. Although CPAP is appearing simpler pattern of treatment as compared to the surgery but it still has many unwanted effects which make the patient refusing this type of treatment. Some of these side effects are: 1) lifting of heavy machine, 2) facial mask marks, 3) conjunctivitis, 4) exposure keratitis of cornea, 5) dehydration, 6) dryness of oral cavity and recurrent attacks of oral ulcers, 7) recurrent attacks of pharyngitis, 8) spontaneous rupture of the alveoli and this leads to spontaneous pneumo-thorax or pleural effusion, 9) air emboli. In fact the last two complications are occurring as a result of tension effect due to raising of intra-alveolar pressure, 10) cosmetically and socially is not accepted, and 11) further as sequel of over oxygenation toxicity the respiratory center is suppressed and hypoxia will be exaggerated.(2,3,4,6,7,21,23,24,29,30,31,32)

Although snoring is looking a simple problem but sometimes it will become very difficult situation. This difficulty is coming from three aspects: First are factors which will predispose to snoring i.e. sometimes these factors are systemic and habitual rather than local this will create difficulties in management and response of the patient. Second is related to formation of decision of treatment, this difficulty is mainly due to patient's demographic factors, health status of patient, and confirmation of the snoring grade. In fact there are different systems for snoring grading one pattern of snoring grading systems is depending mainly on technical factors this is represented by that system which was performed in this study, while other system is depending mainly on psycho-social factors, and other system is made on bases of sharing of multiple factors including technical, psycho-social, as well as patient's health status this wide spectrum of snoring grading systems will increase the confusion regarding the type of treatment resolution building. Third aspect which may increase the difficulties of snoring management is that presence of certain associated health problems with snoring. These problems may affect the prognosis after treatment of snoring. These problems can be classified as a) coexisting problems with snoring which contributing in pathogenesis of snoring as hypothryoidism, gastro-esophageal reflux disease, overweight, chronic obstructive pulmonary disease, congestive cardiac failure, myopathies, motor neuron disorders, metabolic as well as nutritional disorders. On the other hand b) problems which are constituted by disorders developed as sequels and complications of upper air way obstruction as psycho-social problems, uncontrolled hypertension, negative pressure pulmonary edema, and oro-facial disfigurements. These associated problems are required to be managed in a concomitantly with management of snoring too, otherwise our treatment will become incomplete thus in certain cases management of these accompanied problems may face some contraries.(22-28)

The obstructive snoring can be due turbulent flow of air as result of obstruction at different levels of upper respiratory tract starting from nose and oral cavity up to hypo-pharynx. Therefore one of common anatomical structures which may pathologically affect the normal air flow is uvula and palate. There are variable patterns of anatomical abnormalities which are related to these structures. Although the level of these two structures is considered as one of common levels where the obstruction may occur, but still it can be associated with obstruction at other levels of upper air way tract. For this reason proper pre-operative evaluation constitutes a corner stone for most suitable way of snoring grading and further treatment decision making. The pre-operative assessment can include local as well as systemic evaluation. The local evaluation is mainly focusing on status of oro-facial contour, patency of nose, nasopharynx, and oral cavity concentrating mainly on size of tongue, uvular shape as...
well as uvular size. In addition local evaluation must comment on size of tonsils and strength of palate. On the other hand pre-operative systemic assessment will elucidate the condition of respiratory system including airway, cardiovascular system, neurological system, musculoskeletal system, and endocrinial system. It was found that chronic cardio-pulmonary disorders as chronic obstructive pulmonary diseases, pulmonary edema, cor-pulmonale, and congestive cardiac failure may predispose to snoring as part of their respiratory distress manifestations. Therefore clinical examination as well as imaging evaluation is required to confirm the status of both lungs and heart.\(^{(22,23,24,28)}\)

From the other aspect both neurological as well as musculoskeletal systems are playing important role in pathogenesis of snoring because any defects belong to these two systems will interfere directly with normal muscular function which is considered as significant supportive factor for breathing function thus this may result in dysventilation during sleeping and therefore as one of manifestation of this problem is snoring. The function of thyroid gland is mandatory to be evaluated before any decision regarding management of snoring because the hypothyroidism is contributing an important role in creation of snoring. This can be explained by two related pathological changes associated with hypothyroidism a) generalized muscle weakness and b) diffuse oro-facial myxedema which may involve upper air way tract. By this way the most of snoring patients with hypothyroidism can be managed just by correction of thyroid status.\(^{(27,28)}\)

Indeed the local lesions are playing very significant role in pathogenesis of obstructive snoring. One of commonly affected levels of upper air way tract is uvular level. There are different patterns of uvular lesions which may be associated with obstructive snoring. The most common varieties of these lesions are I) Long and broad uvula, there are variable ideas to confirm the length of uvula but the most practical way is via the possibility of appearance of uvular tip i.e. normally the uvular tip must appear by direct oral cavity examination. On the other hand if the uvula is long thus its tip will not be seen through oral cavity. The palatal strength is considered as important factor which may affect the uvular length, in case of palatal flatter although the uvular length is normal but due to weakness of palate this resulting in uvular drop and tip of uvula will not appear through direct oral cavity examination. II) Webby uvula, this lesion is constituted by the appearance of uvula with webby attachments to the soft palate this increases turbulence flow of air at this region. These described uvular lesions can be presented as solitary lesions or in association with other regional obstructing predisposing lesions namely palatal flatter and hypertrophied tonsils.\(^{(2,3,4,6,7,21,23,24,29,30,31,32)}\)

Accordingly through last few years it was found that the outcomes of surgeries which performed for management of snoring are mainly depending up on the type of the procedure which is decided i.e. as we mentioned before there are different patterns of local uvulo-palatine abnormalities which can be associated with snoring, for each variety of these disorders there will be certain specific surgical procedure which was confirmed to be more suitable for that particular disorder. From this concept we can expand our clarification to that Carenfelt on 1986 who described laser partial mucosal palatal excision (LPMPE) he concluded to use this procedure if the type of local pathology is solitary palatal flatter with normal uvula as well as both palatine tonsils and lingual tonsils are accepted in their size. On the other hand Fujita on 1991 gave full description of all steps of classical laser uvulopalatopharyngoplasty (LUPPP) as most optimum surgical procedure to manage the local obstruction due to palatal flatter, long uvula, hypertrophied palatine tonsils with or without hypertrophy of lingual tonsils. Suppose the local disorder is confined in webby uvula only at this case laser assistant uvuloplasty (LAUP) is considered as procedure of choice which was described first by Kamami on 1991. Powell tried on 1996 to find a solution for the circumstance if the local pathology is solitary elongated uvula by description of most helpful procedure what is called laser uvular flap procedure (LUF). Sometimes the situation is the presence of webby uvula in association with increasing of its length with or without hypertrophied palatine tonsils, in this condition the best procedure to be decided is laser modified uvular flap procedure (LMUF) which was introduced first by Hoermann in 2006.\(^{(2,3,4,6,7,24,29,30,31,32)}\)

At the last two centuries the number of patients who presented with snoring at ENT departments is increased and they are insisting for solutions of their problems. Therefore the researches are frequently conducted to obtain optimum pattern of treatment according to type of snoring. For this reason this study was performed for same purpose.

The specific aims of the study were a) to assess the effect of different varieties of uvular related CO2 laser surgical procedures on snoring improvement rate in relation to variable types of uvula abnormalities. b) to compare in between these variable procedures regarding the incidence of postoperative complications.

**PATIENTS AND METHODS**

Thirty- six patients aged 27-55 years presented at ENT department - Al thawra central hospital - elbyda - Libya with history of snoring that disturbing patient’s normal social life those patient were confirmed with structural upper airway obstruction which is at uvular level. There were variable types of anatomical uvular abnormalities.
Different uvular laser surgeries in management of snoring patients

which are considered as predisposing etiological factors for the snoring, according to these varieties of local uvular lesions the received patients were divided into four groups, group-A which was including the patients with long uvula associated with enlarged tonsils and palatal flatter who underwent laser uvulopalatoplasty (LUPPP) and the number of patients at this group was thirteen cases, group-B which was including eight cases who were presented with elongated and webby uvula those patients operated by laser assistant uvuloplasty (LAUP), while other five cases were included at group-C with local presentation constituted by elongated uvula only who proceeded by what is called laser uvular flap procedure (LUFP), and the last group was group-D which was including ten cases too and those patients were interfered by the modified laser uvular flap procedure (MLUFP). All patients were evaluated preoperatively and this evaluation was performed for any oro-facial disfigurements, nasal patency, nasopharynx, oral cavity where the assessment was done for 1) length of uvula, 2) webbing of uvula, and 3) size of tongue, in addition to oral cavity, the assessment was done for size of palate tonsils, palatal contour, any evidences of gastro-esophageal reflux disease, air way and respiratory system, cardiovascular system, musculoskeletal system, neurological system, thyroid gland function, body mass index, apnea index, severity of hypoxia, confirmation of snoring, Epworth sleep scale preparation and any evidences of excessive sleepiness. From the other way socio-habitual history was evaluated too for exclusion of smoking as well as alcoholism at same time to confirm the personal physical exercise and feeding habits. This complete evaluation was scheduled through recommended assessment sheet at our department which will share strongly in final build of the decision and resolution regarding most suitable pattern of treatment.

An informed consent was taken from the patients involved in the research prior to their participation via the scientific committee in the department.

All patients were operated by CO2 laser surgery (by using of General project machine) with same laser parameters and different techniques according to the type of uvular abnormality. The laser parameters which were used: 1) power: 8-12 watts, 2) continuous mode of cutting and shutting, 3) with focused beam of size 3-5 mm, 4) with complete duty cycle of the active beam, and 5) modified laser endotracheal intubation (i.e. the ordinary endotracheal tube was covered at its exposed upper part with aluminum foil. All patients were induced by intravenous thiopental sodium and maintained with halothane as inhaled anesthesia and fentanyl as intravenous analgesia.

Postoperatively, all patients were covered with intravenous broad spectrum antibiotics, intravenous dexamethasone, intravenous requirement of fluids, and per-orally as well as per-rectal potent analgesics. On the other hand all groups compared postoperatively in relation to operative time consumption, intra operative bleeding, postoperative dysphagia and odynophagia, postoperative oral intake, vomiting tendency, referred otalgia, fever, otitis media, septicemia, airway obstruction; the period of postoperative hospitalization and healing process as well as the operated patients were followed up postoperatively for six months to assess the degree of succeed in relation to subsiding of snoring.

The diagnosis of snoring was based on the history from other family members of the patient e.g. the patient's wife. On the other hand the postoperative pain was confirmed clinically, from the history as well as from the appreciation of the patient's facial expression during the swallowing in addition to the measurement of oral fluid intake postoperatively. By the same manner the velopharyngeal insufficiency was postulated clinically too, just from the history of nasal regurgitation of drank fluids and further confirmation of nasal regurgitation directly by asking of the patient to drink colored fluids in front of us.

Data were expressed by using descriptive analysis as means + standard error of mean (s. e. m) and percentages, test of significance was carried out, using Chi-square test and two way analysis of variance. A probability less than 0.05 was considered as significant, the degree of significance was determined by using level of standard deviation test. Student t- test was used for dependent sample, as well as contingency coefficient was calculated as measurement of association between nominal variables.

RESULTS

The results presented in (Figs. I,II) showed significant increase in the incidence of postoperative throat pain and otalgia at group-A as compared to other three groups (P<0.5). Therefore the amount of ingested fluids was significantly decreased after LUPPP as compared to other three groups (P<0.5). In addition (Fig. III) demonstrated significant increase in vomiting tendency by performance of LUPPP as compared to other techniques (P<0.5). On the other hand (Fig. IV) illustrated non- significant difference in the risk of intra-operative or post-operative bleeding after all performed techniques (P>0.5). (Fig. V) presented the post-operative period of hospitalization which was significantly more than 24 hours by interference with LUPPP as compared to other three groups when most of patients stay less than 24 hours (P<0.5). (Fig. VI) revealed non-significant difference between all four groups regarding degree of improvement in snoring after surgery (P>0.5) i.e. among all varieties of performed procedures all operated patients got complete relief of their snoring
after surgery. From other view (Fig. VII) represented significant elevation of risk of post-operative foreign body sensation after LUPPP as compared to other used procedures (P<0.5). In same manner (Fig. VIII) shown same result regarding the risk of post-operative velopharyngeal insufficiency as in Figure-VII. Finally Figure-IX confirmed that there was significant increase in the incidence of recurrence of snoring after LUPPP as compared to other procedures which did not show any evidences of recurrence of same patient’s complain. In fact there were no any recorded complications in form of otitis media, upper air way obstruction, and septicemia in this presenting study.

![Graph](image1)

**Fig I.** Relationship between type of procedure and postoperative throat pain (P<0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LM UFP].

![Graph](image2)

**Fig II.** Relationship between type of procedure and postoperative otalgia (P<0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LM UFP].

![Graph](image3)

**Fig III.** Relationship between type of procedure and postoperative vomiting tendency (P<0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LM UFP].

![Graph](image4)

**Fig IV.** Relationship between type of procedure and incidence of intra-operative as well as post-operative haemorrhage (P>0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LM UFP].
Different uvular laser surgeries in management of snoring patients

**Fig V.** Relationship between type of procedure and hospitalization period (P<0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LMUFP].

**Fig VII.** Relationship between type of procedure and risk of post-operative foreign body sensation development (P<0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LMUFP].

**Fig VI.** Relationship between type of procedure and degree of snoring improvement by follow up of cases after surgery for six months (P>0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LMUFP].

**Fig VIII.** Relationship between type of procedure and risk of post-operative velopharyngeal insufficiency development (P<0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LMUFP].

**Fig IX.** Relationship between type of procedure and risk of snoring recurrence (P<0.5). [1=LUPPP, 2=LAUP, 3=LUFP, and 4=LMUFP].
DISCUSSION

As we can observe from our study the post-operative complications are of fewer incidences by conduction of LAUP, LUPF, and LMUF as compared to LUPPP. In same time all four procedures were found to be more effective in the management of snoring as if they are selected perfectly according to specific local lesion. These results are in agreement with many other studies and these findings are logic because from technical point of view LUPPP is more destructive and invasive procedure in relation to other three procedures (2,3,4,6,7,30,31,32).

As it was found in this presenting study the time which is required for performance of LUPPP is longer than that which may be needed for other three procedures. This can be explained by the fact that the first procedure is done through five steps which are: i) tonsillectomy of palatine tonsils. ii) resection of one-third of uvula. iii) reconstruction of soft palate. iv) reconstruction of anterior pillars of both tonsillar fossae. and v) vaporization of lingual tonsils. On the other hand LAUP is confined to one step only which is represented by two Para uvular CO2 laser triangular incisions which will be extended down to involve the uvular mucosa without any intervention in the uvular muscular bulk. While in LUPF the surgery is constituted by the step of creation of uvular mucosal flap at ventral aspect and in repair to remaining part of mucosa. The LMUF is including the steps of both LAUP and LUPF (2,3,4,6,7,30,31,32).

From the previous we can note that the LUPPP in relation to other three procedures is considered as more invasive procedure associated with multisite local surgical traumas therefore this fact can be used to discuss why LUPPP is creating higher risk of upper air way obstruction as well as local nociception sensation as compared to others. Basically speaking it is well-known that the uvulopalatopharyngeal area is highly vascular area thus any traumas at this area will cause edema of the injured mucosa as acute inflammatory reaction to this trauma. The degree of edema is directly proportional to the amount of injured mucosal tissues, for this reason the LUPPP is associated with more edema of operated area and subsequently more chance for postoperative upper air way obstruction as compared to others. On the other hand the uvulopalatopharyngeal area is rich in the sensory nerve supply too, and as the result of surgical intervention there will be tissue damages which will induce the secretion of prostaglandins at these traumatized areas. The prostaglandins act to stimulate free nerve endings thus the pain sensation will be percepted. By same explanation accordingly the amount of secreted prostaglandins is considered as one of important factors which determine the intensity of percepted pain, for this reason LUPPP is causing more postoperative pain as compared to other three procedures in which the local tissue damage is less and therefore there will be more tolerated pain perception due to limited local prostaglandins production (1-13).

All previous thoughts can be used as a base for clarification of the pathogenesis which leads to the appearance of postoperative dehydration after LUPPP in a significant higher incidence as compared to others i.e. as it was observed that LUPPP has more risk for postoperative throat pain as well as odynophagia which can be so sever to counteract the normal swallowing process thus this will contribute to occurrence of dehydration (1-13).

Subsequently the dehydration will predispose for local secondary infection which will result in more postoperative handicapping and delaying of local healing process. For this reason LUPPP was confirmed to be associated with higher incidence of postoperative local healing process delay in relation to other three. In addition the odynophagia itself which is more sever after LUPPP can be considered as other important factor which may share in the precipitation of local mal-healing due to the resulted mal-nutritional status. All mentioned explanations can be used to answer why LUPPP was noted to be associated with prolonged postoperative hospitalization as compared to others (7-17).

On the other hand, the vomiting tendency can be correlated with the pain intensity, physiologically speaking the pain severity is directly proportionate to the induction of vomiting tendency. This can be explained by the relationship between the pain and vaso-vagal attack, i.e. the pain is an important inducing factor for vaso-vagal attack, thus this will induce the vomiting (1-13). This may explain the significant raising of vomiting tendency after LUPPP compared to other three procedures.

Our study was in agreement with other many studies which confirmed that LUPPP has 5-10% risk for postoperative velopharyngeal insufficiency. This can be explained by two theories: a) Technical theory, they claimed that one of most common causes of this complication is excessive tissue resection and this can happen either at the step of uvular resection, or palatoplasty, or reconstruction of anterior pillars. b) Pathological theory, it was found that those patients who possess gastro-esophageal reflux diseases (GERD) are prone for this complication, because the excessive reflux will induce the diffuse fibrosis at area of surgery this leads to intensive local uvulopalatine contractions which will predispose to this complication. Therefore those snoring patients who confirmed to be suffering from (GERD) are usually considered for conservative treatment rather than surgical treatment. Same explanation can be used to discuss why there is raising in postoperative foreign body sensation complains as well as recurrence of snoring incidence after LUPPP as compared to other three procedures (2,3,4,6,7,29).
Different uvular laser surgeries in management of snoring patients

From the outcomes of surgery point of view, in our study all patients showed complete improvement of their snoring after performance of the four studied procedures. This simply can be correlated to the fact that the outcomes of the snoring management is mainly depending up on the proper selection of most suitable way of management and if the surgical treatment was decided we must approach to the maximum optimum procedure this actually can be done basically according to local as well as systemic defects. 

As the snoring recently became one of common problems which we face in our specialty and sometimes it may be represented as complicated situation with possibilities of difficult resolution taking regarding its management thus further frequent and continuous researches are recommended to resolve all problems which can be associated with snoring management.

REFERENCES


23. Biotech Week; Snoring is a common complaint. Study results from Ataturk University update understanding of snoring. (Clinical report). 2009.


28. Bofares EA and Bofares KM. Effect of helicobacter pylori infection on upper air way and alimentary tract related clinical presentation in GERD. USCMS. 2011;8:77-87.


32. Hoermann; modified uvular flap procedure as recent solution for snoring due to associated uvular lesion; Courier News. 2006.