

Age Related Analysis of Improvement Regression after Repair by Superiorly Pharyngeal Flap in Velopharyngeal Insufficiency Patients

MEDHAT S. HASSAN, M.D.* and AHMED M. ZEIN, M.D.**

The Departments of Plastic, Reconstructive & Burn Surgery and Otorhinolaryngology & Phonetics**, Faculty of Medicine, Menoufia University*

ABSTRACT

Velopharyngeal insufficiency (VPI) has many signs that usually affects social relations and mental health of patients including hypernasality, misarticulating, and grimacing. The most commonly used method has been the pharyngeal flap method especially the superiorly based pharyngeal flap, due its ability to solve former problems with high grades of improvement. However, with long term follow-up, these high grades of improvement showed regression. It has been reported that these flaps tend to contract, resulting in narrowing and tethering of the palate, and that the age factor has a rule in this regression. The aim of this study is to evaluate the relation between age of repair and the changes that happen in superior pharyngeal flap after surgery leading to regression of the improvement we have gained. In this cross-sectional study, 36 patients with velopharyngeal insufficiency who aged between 3 and 15 were included in this study, the study was performed at Department of plastic, reconstructive and burn surgery, Menoufia University Hospital, Egypt. The hypernasality degrees and misarticulating was measured by Menoufia hospital speech therapists on the basis of special professional parameters preoperatively, 3 months and 18 months after superiorly based pharyngeal flap surgery was performed. This was also associated with video recorded endoscopic investigations to determine the shape and size of the flaps performed and the postoperative lateral ports dimensions during each follow-up. Following repair by superiorly based pharyngeal flap, improvement in the variant degrees of hypernasality was recorded among different age categories and statistical analyses expressed loss of significant differences between the responses of patients undergoing superiorly based pharyngeal flap repair among different ages. But after 18 months, Ages below 6 years showed regression in this improvement more than ages above 6 years. Video recordings revealed that degree of flap tubing was obvious in ages below 6 than those above 6 years. Results of this study suggest that most of patients undergoing superiorly based pharyngeal flaps experience a significant improvement of hypernasality and misarticulating. But after 18 months, regression in this improvement is noticed especially in ages below 6 years due to flap tubing unless certain precautions are followed to decrease this regression.

Key Words: Age – Repair – Flap – Velopharyngeal insufficiency.

INTRODUCTION

The Velopharynx main function is the separation of the oral cavity from the nasal cavity during swallowing or talking. In which adequate closure of the velopharynx flap and good consistency in the speed of flapping are the main aspects for performing its normal function [1].

It extends to the soft palate anteriorly, posterior pharyngeal wall posteriorly and lateral walls of the pharynx laterally. In children, upper and lateral walls are partially overlaid by adenoids and lateral tonsils [2].

In 1863, Passavant described Velopharyngeal inadequacy (VPI) as a variety of signs such as hypernasality, misarticulating and grimacing [3]. The main causes of velopharyngeal insufficiency would be presence of cleft palate (complete or sub mucosal) and improper cleft palate repair. Other causes include complications of adenoidectomy or neuromuscular disorders which are less common [4].

Plenty methods have been described for management of VPI including continuous positive airway pressure (CPAP), speech therapy, prosthetic treatment, and surgical interventions. But for the last three decades, the most reliable method has been pharyngeal flap surgery. Other surgical methods include pharyngoplasty, and posterior wall reinforcement [5].

But, With postoperative follow-up, it has been reported that these flaps tend to contract, resulting in narrowing and tethering of the palate. If lateral pharyngeal-wall movement does not close against the contracted flap or if the flap migrates below

the plane of closure, velopharyngeal insufficiency will not be adequately corrected [6].

It has also been reported that non lined flap shrinkage greatly reduces the original flap dimensions, and in some patients secondary surgery becomes necessary. But although of what has previously been reported. It was found that by long term follow-up, late results would differ according to the age of repair showing various degrees of improvement regression among patients [7].

So, this study was performed to evaluate the relation between age of repair and the changes that happen in superiorly based pharyngeal flap after surgery leading to regression of the improvement we have gained.

PATIENTS AND METHODS

36 patients were included in this study which was performed at Department of plastic, reconstructive and burn surgery, Menoufia University Hospital, Egypt from December 2016 to April 2017.

Inclusion criteria: All ages from 3 to 15 years who expressed the following:

- Presence of repaired cleft palate.
- Presence of repaired palatal fistula.
- Absence of obstructive sleep apnea syndrome after adenoidectomy.
- Non-syndromic cleft palate.
- Patients with hyper nasality and with deficiency of lingual development.

Preoperative preparations:

At first, detailed history taking and general examination was performed to record any medical problems such as: Any other congenital anomalies, especially anomalies concerning the heart and the cardiovascular system. Routine laboratory investigations including complete blood count, kidney and liver enzymes, random blood sugar, prothrombin time & ratio, hepatitis B, C markers and chest X-ray were performed to complete evaluation of general condition of patients.

The severity of hyper-nasality of patients was examined by speech therapists according to specific professional parameters. Also Video endoscopic recordings of all patients were examined to get accurate dimensions and record degree of movement of the posterior and lateral pharyngeal walls.

A detailed consent concerning operative procedure was taken, in addition to taking standard photos for the soft palate and the posterior pharyngeal wall preoperatively, intra and postoperatively.

Operative procedure:

All patients were operated under general anesthesia, and were positioned in the supine position with the mouth widely opened by a Dingman mouth gag. The soft plate defect was dissected meticulously to separate the nasal mucosa from the oral mucosa. After that, the flap was raised from the posterior pharyngeal wall mucosa including the full thickness of the muscle till the level of the prevertebral fascia with the base of the flap positioned superior (Figs. 1a,2a). The width of the flap was determined by the degree of preoperative lateral pharyngeal wall adduction. So, the less the lateral pharyngeal wall movement preoperatively was, the wider would be the flap raised. The donor area was closed meticulously by absorbable surgical sutures till the base of the flap (Fig. 2b). After that, the apex of the flap was positioned and sutured in the midline of the apex of the defect. Then, the nasal mucosa was separated from the underlying palatal muscles in order to create the lining flaps (Fig. 1b), and were sutured to the under surface of the flap from inside to outside around an endotracheal tube on each side of the flap to narrow the lateral ports and provide a mucosal lining for the flap.

Postoperative evaluation and follow-up:

After 3 months, these patients were examined again by same speech therapists based on universal parameters to evaluate the improvement achieved in hyper nasality, misarticulating and grimacing. Video endoscopic recordings were examined to determine the shape and size of the flaps and the lateral ports. After 18 months, the same procedures by speech therapists was repeated and the results were compared with the preoperative and the postoperative data previously recorded.

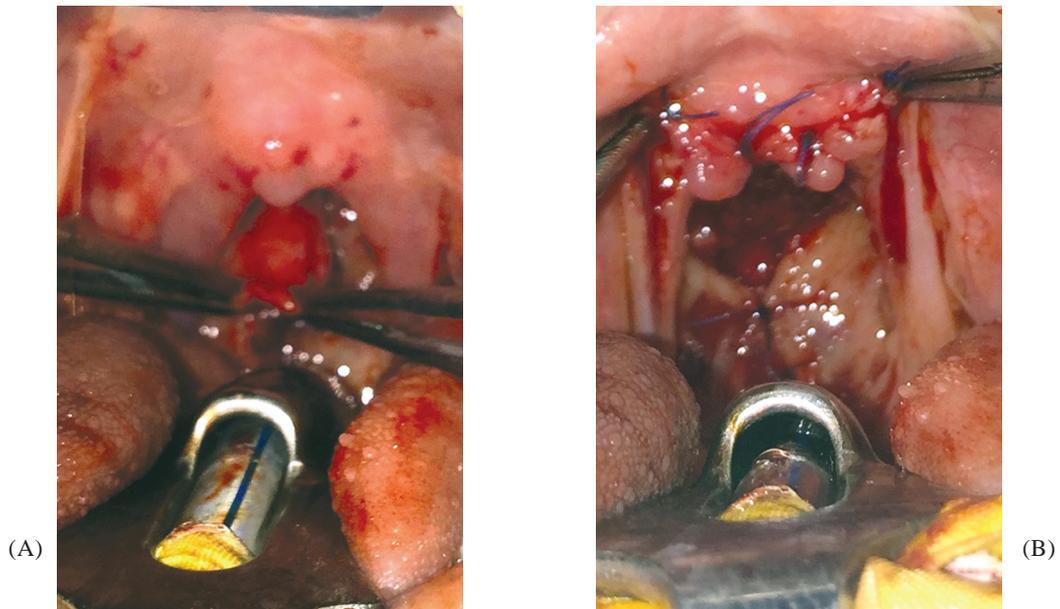


Fig. (1): A 4 years old male patient with velopharyngeal insufficiency undergoing superiorly based pharyngeal flap: (A) After raising the flap, (B) After closure of the posterior pharyngeal wall mucosa and suturing the lining flaps to the undersurface of the pharyngeal flap.

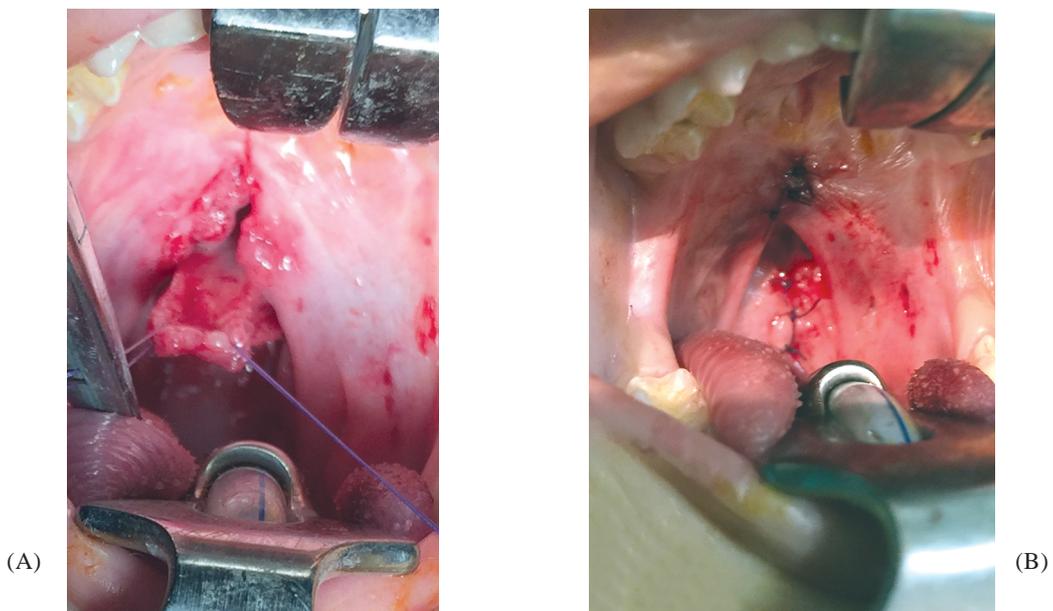


Fig. (2): A 9 years old male patient with velopharyngeal insufficiency undergoing superiorly based pharyngeal flap: (A) After raising the flap, (B) After closure of the posterior pharyngeal wall mucosa.

RESULTS

In this study, 36 patients aged between the age of 3 and 15 years were studied. 17 (47.22%) were males and 19 (52.78%) were females (Table 1). In addition, 35 (97.22%) patients had a history of cleft palate repair and 1 patient (2.78%) had pharyngeal inadequacy and therefore showed no response to speech therapy because of the presence of hyper-nasality and short soft palate.

No significant difference was present between the participating males and females ($p=0.186$). Furthermore, there was no significant statistical difference between the age distributions among patients based on gender ($p=0.95$).

Following repair by superiorly based pharyngeal flaps, improved hyper-nasality, mild hyper-nasality and severe hyper-nasality were recorded in 66.67%, 22.22% and 11.11% of the patients respectively.

These results were documented by speech therapists in the postoperative evaluation after 3 months (Table 2).

But in the postoperative evaluation after 18 months of the same patients, it was found that there was some shift in postoperative outcomes from improved to mild hyper-nasality, and from mild to severe hyper nasality that differed according to the age categories (Table 3).

In the first age category (3-6 years): The shift was 33.33% of patients from improved to mild hypernasality. With a mean total value of 33.33% regression shift in the postoperative outcome. In the second age category (7-10 years): The shift was 25% of patients from improved to mild hypernasality, and 33.33% of patients shifted from mild to severe hypernasality, with a mean total value of 29.17% regression shift in the postoperative outcome. In the third age category (11-15 years): The shift was 25% of patients from improved to mild hypernasality. And 25% of patients shifted from mild to severe hypernasality, with a mean total value of 25% regression shift in the postoperative outcome.

Table (1): Number of velopharyngeal insufficiency patients based on gender.

Age (years)	Number	Male	Female
3-6	14	8	6
7-10	12	6	6
11-15	10	5	5

Table (2): Recovery of patients with hypernasality by age (Numbers) after 3 months of operation.

Age	Improved hypernasality	Mild hypernasality	Sever hypernasality
3-6 yeras	12	1	1
7-10 years	8	3	1
11-15 years	4	4	2

Table (3): Recovery of patients with hypernasality by age (Numbers) after 18 months of operation.

Age	Improved hypernasality	Mild hypernasality	Sever hypernasality
3-6 yeras	8	5	1
7-10 years	6	4	2
11-15 years	3	4	3

DISCUSSION

Cleft palate is a commonly seen head and neck congenital disorder with the prevalence rate of one in every 700 live births. Among 25-43% of these patients, velopharyngeal inadequacy develops after undergoing cleft palate repair. The explanation of this incidence depends mainly on the selection of patients, the surgical technique and experience of the surgeon [5].

This study results revealed that approximately 67% of patients experienced complete improvement and 22% of patients experienced relative improvement of hyper-nasality 3 months after repair by pharyngeal flaps. This finding complies with the results of Schmelzeisen et al. (1992), who declared that of the 51 patients receiving pharyngeal flap surgery, 37 patients (72%) gained normal or close to normal speech [8]. A multicenter study carried out by Abiholme et al., also showed that hypernasality was treated in 83% of patients (43 of 52 patients) one year after pharyngeal flap surgery [9]. Morris et al., examined 65 patients of velopharyngeal insufficiency, 43 patients (66.1%) of them gained normal or close to normal speech after pharyngeal flap surgery [10].

After 18 months, this study noticed regression in the improvement gained after pharyngeal flap surgery which was more obvious in young patients (3-6 years old) rather than other groups. By further evaluation of the video recording of the patients after 3 months and 18 months of operation in correlation with review of the operative procedures of each patient operated, it was realized that patients in the 1st and 2nd age categories in which the nasal layer of the pharyngeal flap was not covered properly by nasal mucosa showed a higher degree of flap contraction than other age categories, this resulted in a higher percentage of improvement regression. Also Improper closure of the mucosa of the posterior pharyngeal wall mucosa caused of a higher degree of improvement regression in all age categories. But was noticed to be more obvious in the 2nd and 3rd age category.

Similar results were concluded in other studies such as Vandervoort et al. [11] who declared presence of variation in shrinkage of the superiorly based pharyngeal flap, despite of the high success rates in reducing or eliminating velopharyngeal incompetence observed. He also stated that there is a need for more physiological flaps in cases where palatal repair has failed or is inappropriate. These problems were also noticed by Johns et al. [12] who tried to overcome this problem of unre-

dictable flap contracting by designing a self-lined superiorly based pull-through velopharyngoplasty. However, the main problem with this technique was that the length of the flap required exceeded the safe 2 : 1 length-width ratio, especially in the congenital short palate. This caused obvious ischemia in the flap tip which could result in wound-healing problems, sloughing, scar contraction and fibrosis.

Conclusion:

Results of this study suggest that after repair by pharyngeal flaps, most of patients experience a significant improvement of hyper-nasality and misarticulating. But after 18 months, regression in this improvement is noticed especially in ages below 6 years due to obvious flap tubing. And to decrease this regression, it very important to cover the nasal layer of the flap properly by surrounding mucosa even if the posterior pharyngeal wall mucosa was not properly closed in young patients. And to close the posterior pharyngeal wall properly in order to decrease the distance between the lateral pharyngeal walls and the lateral edges of the flap even if the nasal layer of the flap was not covered properly by mucosa in elder patients.

REFERENCES

- 1- Saki N., Ghasem Saki, Fakher Rahim and Nikakhlagh S.: Incidence of head and neck birth defects in Iran; A Cross-sectional study from southwest region of Iran. *Pak J. Med. Sci.*, 25 (5): 770-5, 2009.
- 2- Leuchter I., Schweizer V., Hohlfeld J. and Pasche P.: Treatment of velopharyngeal insufficiency by autologous fat injection. *Eur. Arch. Otorhinolaryngol.*, 267 (6): 977-83, 2010.
- 3- Fatemeh D. and Marziyeh P.: The study of speech disorders and middle ear diseases following primary palatoplasty in children with cleft palate. *Journal of Isfahan Medical School*, 29 (130): 222-9, May 2011.
- 4- Lesavoy M.A., Borud L.J., Thorson T., Riegelhuth M.E. and Berkowitz C.D.: Upper airway obstruction after pharyngeal flap surgery. *Ann. Plast. Surg.*, 36 (1): 26-30, 1996.
- 5- Pensler J.M. and Reich D.S.: A comparison of speech results after the pharyngeal flap and the dynamic sphincteroplasty procedures. *Ann. Plast. Surg.*, 26 (5): 441-3, May 1991.
- 6- Argamaso R.V., Shprintzen R.J. and Strauch B.: The role of lateral pharyngeal wall movement in pharyngeal flap surgery. *Plast. Reconstr. Surg.*, 66: 214-19, 1980.
- 7- Owsley J.Q. Jr., Creech B.J. and Dedo H.H.: Poor speech following the pharyngeal flap operation: Etiology and treatment. *Cleft Palate J.*, 9: 312-18, 1972.
- 8- Schmelzeisen R., Hausamen J.E., Loebell E. and Hacki T.: Long-term results following velopharyngoplasty with a cranially based pharyngeal flap. *Plast. Reconstr. Surg.*, 90 (5): 774-8, Nov 1992.
- 9- Abyholm F., D'Antonio L., Davidson Ward S.L., Kjöll L., Saeed M., Shaw W., Sloan G., Whitby D., Worthington H. and Wyatt R.: VPI Surgical Group. Pharyngeal flap and sphincterplasty for velopharyngeal insufficiency have equal outcome at 1 year postoperatively: Results of a randomized trial. *Cleft Palate Craniofac. J.*, 42 (5): 501-11, Sep 2005.
- 10- Morris H.L., Bardach J., Jones D., Christiansen J.L. and Gray S.D.: Clinical results of pharyngeal flap surgery: The Iowa experience. *Plast. Reconstr. Surg.*, 95 (4): 652-62, Apr 1995.
- 11- Vandevoort M.J., Mercer N. S. and Albery E.H.: Superiorly based flap pharyngoplasty: The degree of postoperative 'tubing' and its effect on speech, *British Journal of Plast. Surg.*, 54: 192-196, Feb 2001.
- 12- Johns D.F., Cannito M.R., Rohrich R.J. and Tebbetts J.B.: The self-lined superiorly based pull-through velopharyngoplasty: Plastic surgery-speech pathology interaction in the management of velopharyngeal insufficiency. *Plast. Reconstr. Surg.*, 94: 436-45, 1994.