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ORIGINAL ARTICLE

Role of endoscopic guided partial adenoidectomy in avoiding open nasality

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KEYWORDS

Partial endoscopic adenoidectomy;
Resonance of speech;
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Abstract *Objectives:* Assess the effects of endoscopic guided partial adenoidectomy on resonance of speech in patients with poor palatal mobility and evaluate its role in avoiding postoperative open nasality.

Materials and methods: This study was a prospective randomized trial conducted in one year duration. A total of 40 patients were assessed for eligibility; 24 patients were excluded as they did not meet the inclusion criteria. Two patients out of the eligible sixteen refused surgery. Inclusion criteria: 1-patient complaining of snoring, nasal obstruction and nasal discharge, all of which were caused by adenoid. 2-Poor palatal mobility on endoscopic examination. Exclusion criteria: any neurological deficit, muscular disorder or structural defects of the palate. All eligible patients had undergone partial adenoidectomy. Speech was evaluated preoperative and postoperative.

Results: The study group had definite poor palatal mobility on endoscopic examination and lateral videofluroscopy. Endoscopic guided partial adenoidectomy has been done to all 14 patients. Postoperative evaluation showed marked relieving of symptoms such as nasal obstruction, discharge and mouth breathing with successfully maintaining the velopharyngeal competence but there was no complete relieving of closed nasality.

Conclusion: There is necessity to screen potential candidates for adenoidectomy in order to prevent postoperative velopharyngeal dysfunction. Nasoendoscopy and lateral videofluroscopy have been useful to examine the palatal mobility, palatal length, depth of the pharynx and to exclude possible occult cleft palate. Partial adenoidectomy should be taken into consideration for risky patients. Satisfactory results were obtained as regards relieving nasal symptoms and maintaining velopharyngeal competence but didn't improve quite fully the closed nasality.

1. Introduction

Sound energy begins when the vocal folds vibrate, producing sound. The sound energy travels in a superior direction through a series of interconnected resonators that include the pharynx, the oral cavity, and the nasal cavity. The size and

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shape of the resonating cavities directly affect the perceived resonance and voice quality. The velopharyngeal mechanism is responsible for regulating and directing the transmission of sound energy and air pressure in the oral and nasal cavities.[1] For normal speech and resonance, velopharyngeal closure should be complete during the production of oral sounds; and for nasal sounds, sound energy should be relatively unimpeded through the pharynx and nasal cavity.[2]

Closed nasality is a reduction in nasal resonance during phonation, especially of nasal phonemes such as /m/, /n/, and /ng/. It typically results from either partial or complete blockage of the nasal cavity or nasopharynx from mucosal edema associated with viral upper respiratory infection (URI), hypertrophic tonsils/adenoids, allergic rhinitis, sinusitis, hypertrophic turbinates, or anatomic obstruction from a deviated nasal septum or choanal atresia.[3]

In 1958, Gibb[4] indicated an incidence of hypernasality postadenoidectomy in approximately 1 of 2000 cases. Closure pattern of velopharyngeal valve in typical children is veloadenoidal rather than velopharyngeal closure.[5] Adenoid mass is vital to velopharyngeal closure in children and removal necessitates a change in the pattern of velopharyngeal valving.[6] These changes are easily overcome if there is no anatomic abnormality.

The aim of our study was to assess the effects of endoscopic guided partial adenoidectomy on resonance of speech and evaluate its role in avoiding postoperative open nasality.

2. Material

This study was a prospective randomized trial conducted for a one year duration in Sohag University Hospital (SUH). A total of 40 patients were assessed for eligibility age of the patients ranged from 4 to 21 years. Inclusion criteria: 1-patient complaining of snoring, nasal obstruction and nasal discharge, all of which were caused by adenoid. 2-Poor palatal mobility on endoscopic examination. Exclusion criteria: any neurological deficit, muscular disorder or structural defects of the palate such as cleft palate or submucous cleft palate. Twenty four patients were excluded as they had good palatal mobility on endoscopic examination. Two patients out of the eligible sixteen refused surgery.

Approval of the ethics committee of Sohag University was obtained. A written consent to participate and to publish was taken from all patients or participants before our study procedures. None of the authors have any competing interests.

All patients had undergone ear, nose and throat examination. They have been referred to the Phoniatrics Unit in Sohag University hospital for evaluation of the auditory perceptual assessment to assess voice and speech as regards resonance (open or closed or mixed nasality). Perceptual speech assessment involves the evaluation of all the components of speech production (including voice), articulation (including misarticulations, motor speech, oral motor sequencing), velopharyngeal function, and overall speech intelligibility.

Palatal mobility was assessed through oral examination. The relative length of the velum as well as its mobility during phonation was assessed. The velum should be raised and the velar "dimple" should be back approximately 80% of the length of the soft palate. Nasoendoscopic examination was done for further evaluation of the palatal mobility. Nasoendoscopy provides a useful tool for direct visualization of the VP during speech, evaluating the velopharyngeal function and allowing for a 2-dimensional view of the VP complex. This allows the physician to evaluate lateral wall and palatal mobility during speech; determine the presence of a notch on the nasal surface of the palate; the Passavant ridge and aberrant pulsations; and estimate gap size and shape if present. In normal velopharyngeal closure, there should be good sphincter function and optimum closure during phonation.

Videofluroscopy was also done in selected patients (4 cases) when needed. A videofluroscopy speech study is a radiographic evaluation that allows the direct visualization of all aspects of the velopharyngeal sphincter during speech. It was done in selected cases such as uncooperative child during nasoendoscopy, excessive mucous, the need to evaluate the thickness and length of the palate. Videofluroscopy is used as a complementary tool to nasoendoscopy in evaluating palatal mobility as a protocol that is followed in SUH. In both procedures, the patient is asked to repeat standard vowels, consonants and sentences so that the palatal mobility is evaluated (Fig. 1).

Endoscopic guided partial adenoidectomy using the powered microdebrider was done for the risky patients with mild poor palatal mobility on endoscopic examination ($n = 14$). All eligible patients had undergone partial adenoidectomy only with no tonsillectomy. Partial adenoidectomy was started high in the nasopharynx from upper limit of adenoid tissue, choanal parts. Resection was continued in side to side fashion sparing the lower half of the adenoid.[7] The cutting and aspirating action of the shaver and simultaneous irrigation removes both adenoid tissue and the blood, thus providing a clear view. Better control of the depth of removal of adenoid is achieved thus

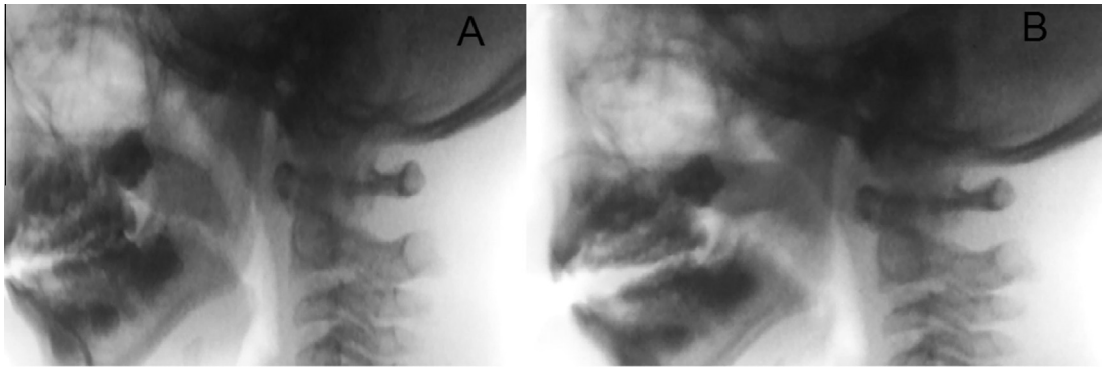

Figure 1 (A) Lateral videofluroscopy at rest. (B) Lateral videofluroscopy while saying the vowel /a/.

avoiding damage to underlying structures. Hemostasis was obtained by suction diathermy. A nasopharyngeal pack was kept for few minutes and then removed. Post operative care was given and patient discharged the same day.

Nasometry was done for all patients pre and postoperative using oral sentence, nasal sentence and 3 vowels /a/, /e/, /u/. These are the standard protocol that is usually followed in SUH. Preoperative ratios were compared with postoperative ratios. The nasometry has proven to be useful in evaluating persons suspected of having velopharyngeal dysfunction. Likewise, the safety, noninvasiveness, and ease of use of the nasometry system are significant factors in its increasing application in clinical settings throughout the world.[8] Nasometry is an objective and indirect test which measures nasal air emission. Separate microphones measure the sound output from the nasal and oral passages during speech. It allows the reproducible calculation of a ratio between nasal and oral sound emissions, known as nasalance, which can be compared with normative values of means and standard deviations (SDs).[9] It is imperative that nasalance scores be interpreted in light of the patient's speech quality.[10] It quantifies nasal air escape and allows comparison of the score against normative data. High scores, in comparison to normative data, suggest open nasality; low scores, in comparison, suggest closed nasality.

Statistical analysis was conducted using SPSS program (version 16) using *t*-test to compare between preoperative and postoperative values of nasometry.

3. Results

The study group ($n = 14$; nine females, five males) had definite poor palatal mobility on endoscopic examination and lateral videofluroscopy. On auditory perceptual assessment (APA), all the eligible patients showed evidence of closed nasality, good articulation, no oral motor deficits and good intelligibility of speech. On nasometry, there were low scores in all vowels and in both sentences. Endoscopic guided partial adenoidectomy has been done only to fourteen patients in an attempt to avoid post adenoidectomy open nasality.

In Postoperative evaluation, all patients reported complete improvement of the symptoms such as nasal obstruction, discharge and mouth breathing. There was partial relief of closed nasality. Nevertheless, all patients or the parents of children were satisfied by the quality of their voice/children's' voice.

Table 1 Nasometry findings pre and post partial adenoidectomy.

	Preoperative (%)	Postoperative (%)	*P* value
Oral sentence	3.1	3.17	0.53
Nasal sentence	32.82	41.9	0.04*
Sustained /a/	2.22	2.19	0.84
Sustained /e/	3.52	3.55	6.3
Sustained /u/	2.1	2.32	0.16

* Statistically significant

The velopharyngeal competence was maintained in all patients as evaluated by nasofiberoptic examination (Fig. 2).

Nasometry findings of patients preoperatively showed low nasalance scores for all repeated sentences and sustained vowels which indicate closed nasality. By comparing preoperative and postoperative ratios, it showed significant difference for nasal sentence (p value = 0.04) but not in the oral sentence (p value = 0.53). Vowels showed no statistical significance; /a/ (p value = 0.84), /e/ (p value = 6.3) and /u/ (p value = 0.16) (Table 1).

4. Discussion

A total of 40 patients had weak palatal mobility on oral examination but 24 patients were excluded because they had good palatal mobility on endoscopic examination. Intra-oral examination can show palatal and velar integrity but it is not adequate for a judgment regarding velopharyngeal function. Closure occurs behind the velum and above the level of the oral cavity, usually on the plane of the hard palate.[11] The examiner also can't see the point of maximum lateral pharyngeal wall movement from the intraoral perspective. Intra oral examination of palatal mobility could be misleading and always need to be confirmed by endoscopy and/or videofluroscopy.

Physiologically, adenoid hypertrophy in children between the ages of 6 and 10 years, then atrophies at the age of 16 years.[12] Yet, adenoid hypertrophy is also seen in the normal adult population.[13] Presence of lymphoid hyperplasia in the adult nasopharynx, including the persistence of childhood adenoids is associated with chronic inflammation.[14] Regressed adenoidal tissue may re-proliferate in response to infections

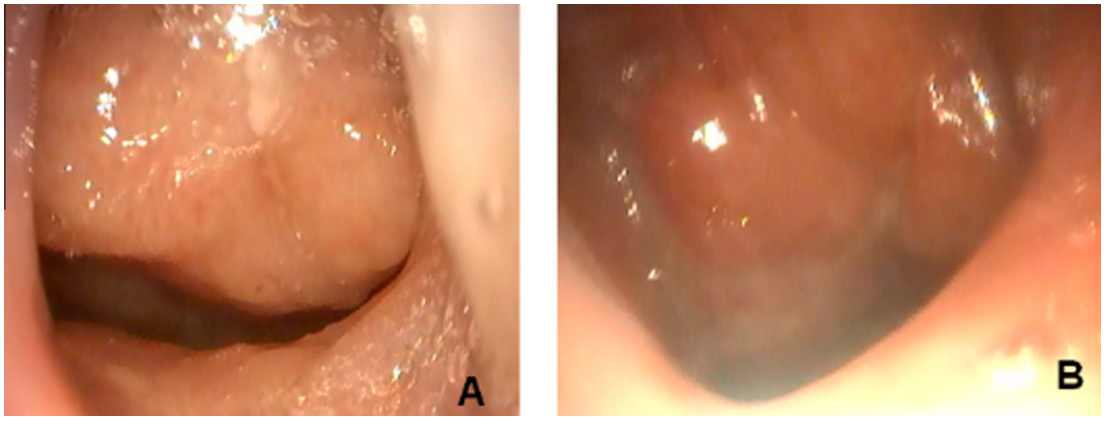

Figure 2 (A) Pre partial adenoidectomy. (B) One week post partial adenoidectomy.

and irritants.[15] Hamdan et al. (2008) prevalence of adenoid hypertrophy in adults with nasal obstruction approached 63.6% in patients with nasal obstruction.[16] In this study, there were 3 adults aged 19 years, 20 years, and 21 years giving a history of nasal obstruction since early childhood.

Transient VPD with hypernasal resonance following adenoidectomy, with or without tonsillectomy, is not uncommon. This condition may persist for several days to weeks and usually resolves spontaneously. Some nasal regurgitation of liquids may be present during this period. Witzel and Rich[17] considered persistent postadenoidectomy VPD rare but difficult to repair. Incidence of persistent VPD after adenoidectomy has been reported to range from 1 per 1500 to 1 per 10,000 patients.[18] While the adenoid pad is not necessary for normal velopharyngeal competance, it may assist in closure in children with structural or functional abnormalities of the soft palate. Occult submucous cleft palate patients can produce normal speech. However, because of their abnormal musculature, these patients may be predisposed to VPD from any changes to the velopharyngeal anatomy, such as adenoidectomy. Therefore partial adenoidectomy was performed for those that might have been at risk of open nasality postoperatively. This technique involves the removal of the superior 50–80% of the adenoid pad, which leaves an inferior tissue remnant undisturbed to ensure adequate velopharyngeal closure. Curettes are designed for the removal of the entire adenoid pad; they are less useful when the surgeon wishes to leave a specified amount of tissue inferiorly. The microdebrider meets the demand for precision that partial adenoidectomy requires.[19]

We feel that there is necessity to screen potential candidates for adenoidectomy in order to prevent postoperative velopharyngeal dysfunction. Nasoendoscopy and lateral videofluroscopy have been useful to examine the palatal mobility, palatal length, evaluate depth of the pharynx and to exclude possible occult cleft palate. Partial adenoidectomy should be taken in consideration for risky patients. Although partial adenoidectomy was successful in relieving nasal symptoms in those patients without affecting the VP competence, it couldn't fully improve the closed nasality. We are aware that this study evaluated a small number of patients and further assessment on a larger sample of group.

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