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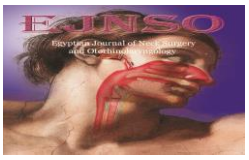

Speech outcome after partial adenoidectomy in patients with risk of hypernasality

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Abstract:

Objectives: To assess speech outcomes after partial adenoidectomy in high-risk patients for hypernasality.

Patients and methods: This randomized clinical trial was conducted on 44 children over a one-year duration at ENT department and Phoniatric unit, Sohag University hospital. We included patients who presented with symptoms of adenoid hypertrophy as snoring, obstructive sleep apnea (OSA) treated with partial adenoidectomy. Speech evaluation and nasoendoscopy were done before the operation and after operation by one month and three months.

Results: 22 patients were classified into two groups: group A was treated with antibiotic therapy and HBOT and group B only received the antibiotic therapy. The pain severity showed quite improvement as it decreased from score 6.82±1.17 to 1.09±1.22 after 1 month in group A, while in patients who were treated only with the antibiotics the pain severity score decreased from 6.36±1.12 to 2.82±1.60 which shows a significant difference between both study groups in favor of hyperbaric oxygen. After HBOT the mean ESR was 20.09±7.58 which is significantly lower than antimicrobial therapy alone group 34.46±12.88.

Conclusion: This study was conducted on 44 children with risk of hypernasality after adenoidectomy. There were 32 female and 12 male patients. The age range was from 3 to 12 years. Sleep problems (snoring, mouth nasal discharge, breathing, sleep apnea) had improved after partial adenoidectomy for all patients. After the operation there was normal resonance for 30 patients, hyponasality for 10 patients and mixed nasality for 4 patients. No nasal regurgitation of food or fluid was observed after the operation.

Key words: Hypernasality, cleft palate, Partial adenoidectomy.

Introduction

There are many indications for adenoidectomy as nasal obstruction, recurrent adenoiditis, and otitis media with effusion, chronic rhinosinusitis, and obstructive sleep apnea (Cullen et al., 2009).

Velopharyngeal insufficiency (VPI) is an important complication after adenoidectomy or adenotonsillectomy that occurs due to insufficient closure of the velopharyngeal valve during speech. The increased pharyngeal depth and

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underlying defective velopharyngeal port function have been suggested as causes for this (Lambert et al., 2021).

Hypernasality has a serious negative impact on communication and the psychological aspect of both the patient and their families as it exposes children to bullying (Askar and Abou-Elsaad, 2014).

The position of the adenoid at the posterior nasopharyngeal wall makes it act as a pad against the palate to ensure tight closure of the velopharyngeal valve. Sometimes the adenoid hypertrophies to compensate palatal abnormalities as in cases of submucous cleft palate, repaired cleft palate, short or poorly mobile palate. VPI may occur in those patients with palatal abnormities after removal of the adenoid as compensation is removed.

For those who are at high risk of developing VPI after complete removal of the adenoid, conservative or partial adenoidectomy is made. During partial adenoidectomy procedure removal of the upper part that obstructs the choanae is performed with preservation of the lower part that helps in velopharyngeal closure (Finkelstein et al., 2002).

Patients and methods:

This study was a randomized clinical trial conducted on 44 children over one-year duration at ENT department and Phoniatric unit, Sohag University hospital.

It was carried out after being approved by Sohag Faculty of Medicine Research Ethics Committee. Informed written consent from the parents or legal guardians of the participants was obtained (IRB Registration number: Soh-Med-23-11-09PD).

We included patients who presented with symptoms of adenoid hypertrophy as snoring, obstructive sleep apnea (OSA), nasal obstruction with persistent mouth breathing, and nasal discharge. Also had high risk to VPI: short palate, poor palatal mobility, submucous cleft, repaired cleft scarred palate after tonsillectomy, and deep pharynx. Exclusion criteria: any neurological deficit.

History was obtained from the patients and their parents (sex, age, complaint, and its onset, course, and duration, history of present illness, treatment used, and history of previous tonsillectomy or repaired cleft palate).

Complete general and ENT examination were done. Ear examination: for otitis media with effusion. Oral examination: tonsillar size, tonsillar pillars for a scar, velum and uvula for (cleft, scar, bluish line, bifid uvula, length, and mobility).

Speech Assessment

Speech evaluation was done in the Phoniatric Unit at Sohag University hospital. Evaluation was done before surgery, 1 month and 3 months after operation by Phoniatrican whose experience about 15 years.

The speech assessment was done according to Sohag protocol for assessment of speech that includes: assessment of resonance; nasality type (hyponasality, hypernasality, & mixed nasality) and degree (Range from 0:3), articulation errors like glottal articulation presence of nasal emission or turbulence and overall intelligibility of speech.

Nasoendoscopy

Endoscopic assessment was performed before the operation and 1 month and 3 months after the operation. The evaluation includes assessment of the size of the adenoid, palatal convexity (if the palate is notched or flat palate or there is palatal hump), Type of closure of the velopharyngeal valve, the

degree of velar movement, the degree of lateral pharyngeal wall movement and overall degree of closure of the velopharyngeal valve, if there is a gap (size and location).

Tympanometry was done to detect OME.

Surgical technique

Endoscopic guided partial adenoidectomy aided by suction diathermy was done for the risky patients. The adenoidal tissue was ablated by suction diathermy simultaneously starting at the highest part of the adenoidal tissue. The operation is considered to be complete when both choanae are seen with a smooth contour of the nasopharynx preserving the lower third of the adenoid to act as a pad for efficient velopharyngeal valve closure. A nasopharyngeal pack was reserved and removed after few minutes. Post-operative care was given and the patient went home on the same day.

Statistical analysis

Quantitative data represented in mean and standard deviation (SD). Qualitative data were presented in frequencies and percentages and compared by crosstabulation. Preoperative compared to postoperative data by Friedman test as non-parametric related data. In all analyses P value < 0.05 indicated statistical significance.

Results

This study was conducted on 44 children undergoing partial adenoidectomy. There were 32 female and 12 male patients. The mean age of the patients in the study was 7.73±3.15 and the range was from 3 to 12 years. The majority of cases were in the age group from 5 to 10 years (50%).

As regard risk factors for hypernasality 8 patient had signs of submucous cleft palate (18.2%), 2 patients had history of repaired cleft palate (4.5%), 2 patients had a short palate (4.5%). 18 patients with scarred pillars of previous tonsillectomy (40.5%) and 14 patients had poor palatal mobility (31.5%) (table 1)

Table (1): Distribution of patients according to risk factors:

	No. (22)	**Percentage %**
Submucous cleft palate	8	18.2%
Repaired cleft palate	2	4.5%
Short palate	2	4.5%
Scarred pillars	18	40.5%
Poor palatal mobility	14	31.5%

Regarding the type of operation; 45.45% had partial adenoidectomy with tonsillectomy and myringotomy, 36.4% had partial adenoidectomy, 13.6% had partial adenoidectomy and myringotomy, and 4.5% had partial adenoidectomy and tonsillectomy (table 2).

Operation	**No. (22)**	**Percentage %**
Partial adenoidectomy with tonsillectomy and myringotomy	20	45.45%
Partial adenoidectomy	16	36.4%
Partial adenoidectomy and myringotomy	6	13.6%
Partial adenoidectomy and tonsillectomy	2	4.5%
Total	44	100%

Speech assessment:

There was a very highly significant difference between preoperative and postoperative APA.

APA after one month postoperative is the same after 3 months. 30 patients improved from closed nasality to normal resonance, while, 10 patients still have closed nasality & no change occur in 4 patients with mixed nasality (Table 3).

Flexible nasoendoscopic assessment

There was a very highly significant difference between preoperative and postoperative adenoid size as 100% of cases improved from grade 2, 3, and 4 to grade 1 adenoid size ($p < 0.001$) (Table 4).

There was no change in the assessment of the type of closure and gap between preoperative and postoperative (Table 5).

There were no major complications postoperative reported as postoperative bleeding or persistent of complaints or nasal regurgitation of food and fluids, but minor complications like neck pain and bad smell were 18.2% for each, and headache was 13.6% present through one month.

Table (3): Change in Auditory Perceptual Assessment (APA) before and after partial adenoidectomy:

Parameters	Preoperative		Postoperative		χ2	P-value
Auditory perceptual assessment (APA)	n=22	100%	n=22	100%		
Normal resonance	0	0%	30	68.2%	20.0	<0.001***
Closed nasality	40	90.9%	10	22.7%		
Mixed nasality	4	9.1%	4	9.1%		

Table (4): Preoperative and postoperative change in adenoid size:

Parameters	Preoperative		Postoperative		χ2	P-value
Adenoid size	n=22	100%	n=22	100%		
Grade 1 (fill less than 25% of choanae)	0	0%	44	100%	44.0	<0.001***
Grade 2 (fill 25-50% of choanae)	2	4.5%	0	0%		
Grade 3 (fill 50-75% of choanae)	26	59.1%	0	0%		
Grade 4 (complete choanal obstruction)	16	36.4	0	0%		

*P < 0.05 (significant) **P < 0.01 (highly significant) ***P < 0.001 (very highly significant)
NS: Non significant p >0.05

Table (5): Preoperative and postoperative changes in closure type and gap:

Parameter	Preoperative		Postoperative			
Closure type	N=44	100%	N=44	100%	χ2	P- value
Veloadenoidal	44	100%	44	100%	----	-------
Gap	N=44	100%	N=44	100%	χ2	P -value
No gap	40	90.1%	40	90.9%	----	-------
Yes	4	9.9%	4	9.1%		

Discussion:

Adenoidectomy is used to treat obstructive sleep apnea, chronic adenoiditis and otitis media with effusion (Ruben, 2017). Velopharyngeal insufficiency (VPI) is a rare but well-recognized complication after adenoidectomy that is manifested by hypernasality and audible nasal air emission that is most common in children with palatal problems like short palate, scarred pillars, submucous and overt cleft palate. Partial adenoidectomy was performed to achieve adequate velopharyngeal valve closure (Shapiro, 1982). Consequently, this study was conducted and aimed to measure the effects of endoscopic guided partial adenoidectomy on speech resonance in children susceptible to velopharyngeal insufficiency (VPI).

During this study, 44 children with symptoms of adenoid enlargement, high risk of VPI and who underwent partial adenoidectomy were enrolled.

Postoperative evaluation of patients as regards symptoms; there was complete improvement of snoring, nasal obstruction, sleep-disordered breathing, and otitis media with effusion. This was achieved by excision of the adenoid tissue closing the choanae and the Eustachian tube.

Regarding preoperative palatal mobility, all patients have poor palatal mobility but after partial adenoidectomy and tonsillectomy 20 patients (45.45%) had good palatal mobility. Improvement of palatal mobility due to tonsillar hypertrophy may mechanically impair palatal mobility and tonsillectomy may improve veloadenoidal closure (Abdel-Aziz et al., 2019).

As regard change in auditory perceptual assessment (APA), our study revealed that it was the same after one and 3 months postoperatively. Fifteen patients improved from closed nasality to normal resonance, while, 10 patients still had closed nasality and no change occurred in patients with mixed nasality. Improvement of closed nasality is due to the removal of the adenoid obstructing the choanae. Children with unimproved closed nasality had allergic rhinitis that can cause nasal obstruction and hyponasal speech. Unchanged mixed nasality is due to the keeping of the lower part of the adenoid that helps in velopharyngeal closure .

Our study includes 4 patients had submucous cleft palate (one presented with closed nasality that improved postoperatively and another had unchanged mixed nasality postoperatively) and one patient with repaired cleft palate who had unchanged mixed nasality.

Abdel-Aziz et al., (2023) used the APA and nasometry to subjectively and objectively compare speech resonance preoperative and postoperative. Preoperative hyponasality was found in 59.1% of patients by APA and was found to be highly related to the adenoid enlargement. This result was expected, as many authors Lundeborg et al., (2012), Ramos et al., (2013), and Abdel-Aziz et al., (2020) have reported that hyponasality is mainly due to adenoidal hypertrophy. Postoperative hyponasal speech was resolved in all patients except for one patient with allergic rhinitis that improved with medical treatment.

Mostafa and Rezk (2016) assessed the effects of endoscopic guided partial adenoidectomy on speech resonance in patients with poorly mobile palatal and assessed its role in avoiding postoperative hypernasality. The study group had poor palatal mobility by flexible endoscopic assessment and lateral videofluoroscopy. Endoscopic guided partial adenoidectomy using the powered microdebrider has been done on all 14 patients. The postoperative

assessment revealed significant improvement in manifestations like nasal obstruction, and mouth breathing with preservation of the velopharyngeal valve competence but there was no complete relief of hyponasality. This finding matched our study results.

Waselchuk et al., (2018) studied a group 50 patients who had submucous cleft palate, a history of velopharyngeal valve insufficiency, or repaired cleft palate who had partial adenoidectomy either diathermy or microdebrider. The authors did not discover any development or worsening of VPI.

Abdel-Aziz et al., (2016) found no important changes in post-operative APA among 20 patients with repaired cleft. A transoral-endoscopic partial adenoidectomy using an adenoid curette with aided visualization by a 4 mm 70-degree endoscope that is placed transorally. Hemostasis done by suction diathermy.

For patients at high risk for hypernasality, appropriate surgical techniques are needed to treat the obstruction and preserve speech quality. Partial adenoidectomy improves sleep outcomes by removing a limited amount of adenoid tissue from the posterior nasal cavity, while preserving sufficient tissue for adequate velopharyngeal valve closure.

Conclusion:

Otolaryngologists should be aware about VPI as a complication after adenoidectomy. There are some patients with high risk to develop hypernasality after the operation like those who have signs of overt cleft palate, submucous cleft palate, short palate, poor palatal mobility, and deep pharynx.

For those high-risk patients, partial adenoidectomy should be considered. The aim is to remove the adenoid tissue needed to open the choanae while leaving a part of tissue to help in velopharyngeal valve closure.

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Conflicts of interest: No

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