

Effects of adenotonsillar hypertrophy corrective surgery on nocturnal enuresis of children

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ABSTRACT

Background: Nocturnal enuresis is considered a common urological complaint especially among children. Respiratory obstructive diseases have been one of the possible etiologies of such a condition. The most common type of upper respiratory obstructive diseases in childhood is adenotonsillar hypertrophy. In this study, it was tried to estimate the prevalence of nocturnal enuresis in adenotonsillar hypertrophy as an upper obstructive airway disease and cure rate after corrective operation. **Materials and Methods:** In this longitudinal study, 184 children with adenotonsillar hypertrophy as case group and 200 healthy children as control group were randomly compared for nocturnal enuresis incidence and risk factors. Then they were followed after 6 months to estimate the cure rate after corrective operation. **Results:** In case group, nocturnal enuresis was more common than control group (26% vs. 17%, $P = 0.1$). Factors which had a role in enuresis in case group were family history ($P = 0.03$) and male sex ($P = 0.05$). Three months after surgery, 48% of children totally cured from enuresis ($P = 0.001$) and 71% cured both partially or totally ($P = 0.03$). The response rate after moderate obstruction relieving was 100% while that in severe cases was 60% ($P = 0.2$). **Conclusions:** Nocturnal enuresis due to upper obstructive airway disease occurs more in male and in the presence of family history. The cure rate after 6 months of operation was more prominent in moderate obstruction which suggests enuresis in severe airway obstruction may need a longer time to subside. Cure rate of primary enuresis due to obstructive airway disease after 6 months of relieving was 48% in children over 5 years old.

Key words: Adenotonsillar hypertrophy, enuresis, incidence

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INTRODUCTION

Enuresis which is defined as involuntary urinary passage during sleeping is considered a common urological complaint, especially among children. Enuresis incidence may reach up to 15% in 5-year-old children.¹⁻⁵ There are many suggested mechanisms for enuresis related to bladder, kidney, and nervous system defects but there is an ongoing debate about association of nocturnal enuresis with respiratory obstructive disease which may resolve after corrective operation for obstructive airway

disease (OAD).⁶⁻¹³ According to the literature, improvement of nocturnal enuresis after resolving of airway obstruction may be complete or partial, where the rate of improvement may be up to 64%.¹⁰ It seems that this resolving effect would be more prominent with nocturnal enuresis being monosymptomatic (without involvement of other defecation system).¹⁴⁻¹⁶

Adenotonsillar hypertrophy is one of the most common etiologies of OAD, which is caused by excessive lymphoid

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tissue proliferation in tonsils.¹⁷⁻¹⁹ This proliferation might lead to obstruction of airways especially nasal airway obstruction due to adenoid hypertrophy which results not only in dentofacial growth anomaly in young ages but also in obstructive sleep apnea and its devastating consequences.²⁰⁻²³ The main surgical process of relieving this obstruction is adenotonsillectomy, which involves tonsils being cauterized, curetted, lasered, or otherwise ablated.

Adenotonsillectomy as a corrective surgery for adenotonsillar hypertrophy as one of the most common causes of OAD to relieve the obstruction is accepted worldwide. Hence, in this study, in order to reveal the relationship between OAD and nocturnal enuresis, in a cross-sectional study, it was tried to find out the prominent demographic features of patients with significant upper OAD, and then the effects of corrective surgery were investigated on nocturnal enuresis. Further, in this study, it was tried to estimate the cure rate of corrective surgery after 3 and 6 months of follow up.

MATERIALS AND METHODS

In this longitudinal study, 184 children with 5–8 years who had OAD were candidated for adenotonsillectomy, the corrective surgery of upper airway obstructive disease mainly due to adenotonsillar hypertrophy with symptoms such as snoring, sleep apnea, difficulties in fall to sleep, deformed face (adenoid face), and failure to thrive, were studied. All other conditions with similar symptoms had been ruled out. All patients had no history of renal failure or structural renal diseases such as polycystic renal disease, urinary tract infection, or other voiding problems such as daily urinary incontinence, polyuria (diabetes insipidus), encopresis, or any urological issue needing surgical intervention. All patients were selected among patients attending Clinical-Educational centers of Tabriz University of Medical Sciences. Patients' demographic information was recorded and tonsillar hypertrophy grade was calculated based on Brodsky scale²⁴ [Table 1]; grades 3 (moderate obstruction) and 4 (severe obstruction) were considered obstructive. Children with adenotonsillar hypertrophy were divided into two groups of patients with nocturnal enuresis and patients without nocturnal enuresis, and then demographic characteristics were compared and the

severity of adenotonsillar hypertrophy was evaluated in relation to nocturnal enuresis.

Patients underwent a 6-month follow-up to evaluate how much the obstruction had diminished, and then their answers about the changes in enuresis pattern or possible relief were recorded.

All patients had entered the study after writing a written consent. This study was confirmed by Tabriz University of Medical Sciences Ethics Committee and is based on Helsinki's declaration.

Statistical analyses

Results were expressed by ratio and percent; the Student's *t*-test and Chi-square test were used to compare parameters. Wilcoxon test was used to evaluate enuresis, and Kruskal–Wallis test was used to evaluate the relationship between adenotonsillar hypertrophy grade and nocturnal enuresis occurrence or response to therapy. Statistical Package for the Social Sciences TM version 15 (SPSS Ltd., Chicago, IL, USA) was used for statistical analyses. $P < 0.05$ was considered statistically significant.

RESULTS

Of all 384 patients, 184 children (Group 1) suffering upper OAD due to adenotonsillar hypertrophy aged over 5 and 200 children (Group 2) with same age and without any obstructive airway disease such as allergy, asthma, or adenotonsillar hypertrophy were included in study who were selected from patients attending Clinical-Educational centers of Tabriz University of Medical Sciences. The prevalence of nocturnal enuresis in Group 1 was more than that of Group 2 (26% vs. 17%); however, this difference was not statistically significant ($P = 0.1$). Constipation was not different between two groups (20% in Group 1, 19% in Group 2). There was no statistically significant difference between two groups considering age, gender distribution, and family history (concerning nocturnal enuresis) [Table 2]. Children with adenotonsillar hypertrophy were divided into two groups of patients with nocturnal enuresis and patients without nocturnal enuresis. The severity of adenotonsillar hypertrophy was evaluated in relation to nocturnal enuresis, which there was no statistically significant relation between adenotonsillar hypertrophy severity and nocturnal enuresis prevalence ($P = 0.6$). The comparison of two groups with and without nocturnal enuresis based on some characteristics is shown in Table 3. There was no statistically significant difference in mean age of patients with and without nocturnal enuresis (7 ± 2 years vs. 7.5 ± 2 , $P = 0.1$).

Six months after corrective surgery, these patients were asked about nocturnal enuresis relief or failure in response to operation which has been shown in Table 4. Of all

Table 1: Brodsky scale of grading tonsillar hypertrophy

Grade	Description
Grade 0	Palatine tonsils located inside the tonsillar fossa
Grade 1	Tonsils located beyond the tonsillar fossa, occupying <25% of oropharyngeal airspace
Grade 2	Tonsils occupying >25 and <50% of the oropharyngeal space
Grade 3	Tonsils occupying >50 and <75% of the oropharyngeal space
Grade 4	Tonsils occupying >75% of the oropharyngeal space

Table 2: Demographic characters of control and case group

	Case group	Control group	P
Age (year)	7±2.5	7±2	0.7
Gender (female/male)	86/114	84/116	0.8
Familial history* (%)	22	24	0.7
Nocturnal enuresis (%)	26	17	0.1
Constipation (%)	20	19	1

*Familial history of nocturnal enuresis

Table 3: Demographic characters of patients with adenotonsillar hypertrophic divided into two groups of patients with and without enuresis

	Patients with enuresis	Patients without enuresis	P
Age	6±1.5	7.5±2.5	0.004
Gender (female/male)	0.33	0.5	0.05
Familial history (%)	39	15	0.03
Snoring (%)	87	90	0.6
Allergy (%)	16	19	1
Constipation (%)	20	17	0.7

Table 4: Characteristics of followed-up patients after corrective surgery (adenotonsillectomy)

	Responded to corrective surgery	Not responded to corrective surgery	P
Partial or complete adenotonsillectomy	30	12	0.03
Gender (female/male)	0.29	0.66	0.5
Age	6.5±2	6.4±2	0.9
Snoring (%)	90	60	0.1
Allergy (%)	20	0	0.5
Constipation (%)	30	0	0.2
Familial history (%)	25	80	0.1

46 patients with nocturnal enuresis before operation, 42 patients could be followed 6 months later, of which 30 (71%) of them were free of symptoms; all patients with moderate obstruction and 60% of the patients with severe OAD ($P = 0.3$). The prevalence of nocturnal enuresis among children with OAD who had undergone adenotonsillectomy after 6 months of follow-up was more than control group (29% vs. 15%, $P = 0.04$).

DISCUSSION

Adenotonsillar hypertrophy is one of the main causes of upper airway obstruction which can be associated with nocturnal enuresis.^{25,26} The mechanism of nocturnal enuresis may be due to some neurohormonal changes such as serum levels of atrial and brain natriuretic peptide.²⁷ In the present study, prevalence of enuresis among children with adenotonsillar hypertrophy was 26%. Prevalence of enuresis had no statistically significant relationship with adenotonsillar hypertrophy severity. In a study by Aydil *et al.* about obstructive upper airway problems and

nocturnal enuresis relationship in pediatric patients, of all patients suffering nocturnal enuresis, 65.6% had obstructive upper airway which consisted of etiologies such as adenotonsillar hypertrophy and septal deviation; 3 months after corrective surgery, 40% of patients were free of enuresis.⁷ Although results of this study might be similar to the results of the present study, this study has included patients with nocturnal enuresis and investigated upper airway diseases, while in the present study patients with adenotonsillar hypertrophy was included and prevalence of nocturnal enuresis was investigated.

In another study estimating prevalence of adenoid hypertrophy and nocturnal enuresis in primary school children by Aydin *et al.*, it was concluded that there was no statistically significant relation between adenoid hypertrophy and enuresis prevalence.⁸ This study is similar to the present study, but this study had just compared prevalence of adenoid hypertrophy and nocturnal enuresis instead of investigating prevalence of nocturnal enuresis in two different groups of patients with and without adenoid hypertrophy which could have been a better substitute.

In a study by Cinar *et al.* investigating prevalence of nocturnal enuresis among patients with adenotonsillar hypertrophy, it was concluded that 35% of patients with adenotonsillar hypertrophy had nocturnal enuresis, and 3 months after corrective surgery, 63% of prior patients were free of symptoms.¹⁰ The results of this study are similar to the present study.

In a study by Kalorin *et al.* about the effects of tonsillectomy on enuresis, it was concluded that not only there was no significant difference between tonsillectomy and control group (patients undergoing nonrelevant surgery such as inguinal hernia) in terms of nocturnal enuresis prevalence but also nocturnal enuresis cure prevalence was not different significantly between two groups.²⁸ Although the first part of this study is similar and the second part is in contrast with present study, there was a significant difference between populations of two groups (257 vs. 69) which might cast shadow on results of this study.

In a study similar to the present one by Basha *et al.*, which investigated effectiveness of adenotonsillectomy in the resolution of nocturnal enuresis secondary to obstructive sleep apnea, it was shown that of all patients who had undergone tonsillectomy or adenotonsillectomy 32.8% had positive history of nocturnal enuresis, and also 61% of patients who had undergone tonsillectomy or adenotonsillectomy with positive history of nocturnal enuresis were free of enuresis after the follow-up period.⁹ The results of the study are similar to the present study.

In a study by Jeyakumar *et al.* reviewing the association between sleep-disordered breathing and nocturnal enuresis in children, preoperative statistics showed

that 31% of patients undergoing adenotonsillectomy suffered nocturnal enuresis, but after corrective surgery, prevalence of nocturnal enuresis was 16%, which indicates a statistically significant difference and supports effectiveness of aforementioned surgery.²⁹ Results of this study are similar to the present study.

Kovacevic *et al.* in a study evaluating effectiveness of OAD corrective surgery on nocturnal enuresis showed that 24% of patients with adenotonsillar hypertrophy had nocturnal enuresis, which 49% of them responded to corrective surgery after 1-year follow-up,³⁰ which is similar to the present study. In another part of this study, it was shown that having family history of nocturnal enuresis was associated with less probability of response to corrective surgery, which is in contrast with the current study.

Although most of the aforementioned studies supported effectiveness of corrective surgery for OAD, some recent studies have suggested administration of intranasal steroids to subside OAD symptoms such as sleep disorders.³¹⁻³⁵ Although some preliminary studies have confirmed the association between allergy and enuresis more studies are needed to prove this association³⁶ at present, no statistically significant relation was detected between allergy and nocturnal enuresis among patients with adenotonsillar hypertrophy.

To mention limitations of the present study, as far as this study was designed in a cross-sectional setting, it is difficult to consider this study a main study for guidelines, but present study may be useful to form an outline for further studies with higher class of evidence. One of the other limitations of the present study was using subjective questions about symptoms such as nocturnal enuresis, constipation, and allergy which might not be accurate enough.

CONCLUSION

Nocturnal enuresis occurrence due to upper airway obstruction or adenotonsillar hypertrophy in case group commonly occurs 1.5 times more than that in control group, and it is cured near 70% by elimination of obstruction. There are some factors that predict nocturnal enuresis in upper airway obstruction such as family history of nocturnal enuresis, male gender, and lower age while responding occurs in children with family history, and in 6 months, this response was more prominent in moderate obstruction than severe form of upper airway obstruction.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Forsythe WI, Redmond A. Enuresis and spontaneous cure rate. Study of 1129 enuretics. Arch Dis Child 1974;49:259-63.
2. Hellström AL, Hanson E, Hansson S, Hjälmsås K, Jodal U. Micturition habits and incontinence in 7-year-old Swedish school entrants. Eur J Pediatr 1990;149:434-7.
3. Nørgaard JP, Hansen JH, Wildschjötz G, Sørensen S, Rittig S, Djurhuus JC. Sleep cystometries in children with nocturnal enuresis. J Urol 1989;141:1156-9.
4. Ghojzadeh M, Mohammadi M, Azami-Aghdash S, Sadighi A, Piri R, Naghavi-Behzad M. Estimation of cancer cases using capture-recapture method in Northwest Iran. Asian Pac J Cancer Prev 2013;14:3237-41.
5. Fattahi S, Vosoughhosseini S, Moradzadeh Khiavi M, Mahmoudi SM, Emamverdzadeh P, Noorazar SG, *et al.* Prevalence of head and neck tumors in children under 12 years of age referred to the pathology department of children's hospital in tabriz during a 10-year period. J Dent Res Dent Clin Dent Prospects 2015;9:96-100.
6. Alexopoulos EI, Kostadima E, Pagonari I, Zintzaras E, Gourgoulanis K, Kaditis AG. Association between primary nocturnal enuresis and habitual snoring in children. Urology 2006;68:406-9.
7. Aydil U, Iseri E, Kizil Y, Bodur S, Ceylan A, Uslu S. Obstructive upper airway problems and primary enuresis nocturna relationship in pediatric patients: Reciprocal study. J Otolaryngol Head Neck Surg 2008;37:235-9.
8. Aydin S, Sanli A, Celebi O, Tasdemir O, Paksoy M, Eken M, *et al.* Prevalence of adenoid hypertrophy and nocturnal enuresis in primary school children in Istanbul, Turkey. Int J Pediatr Otorhinolaryngol 2008;72:665-8.
9. Basha S, Bialowas C, Ende K, Szeremeta W. Effectiveness of adenotonsillectomy in the resolution of nocturnal enuresis secondary to obstructive sleep apnea. Laryngoscope 2005;115:1101-3.
10. Cinar U, Vural C, Cakir B, Topuz E, Karaman MI, Turgut S. Nocturnal enuresis and upper airway obstruction. Int J Pediatr Otorhinolaryngol 2001;59:115-8.
11. Weider DJ, Hauri PJ. Nocturnal enuresis in children with upper airway obstruction. Int J Pediatr Otorhinolaryngol 1985;9:173-82.
12. Weider DJ, Sateia MJ, West RP. Nocturnal enuresis in children with upper airway obstruction. Otolaryngol Head Neck Surg 1991;105:427-32.
13. Aliasgarzadeh A, Ghojzadeh M, Haji-Hoseini R, Mehanfar F, Piri R, Naghavi-Behzad M, *et al.* Age related secretory pattern of growth hormone, insulin-like growth factor-I & insulin-like growth factor binding protein-3 in postmenopausal women. Indian J Med Res 2014;139:598-602.
14. Elsfour A, El-Ayouty M, Mokhtar A, Abdel-Mageed N, editors. Nocturnal Enuresis in Children with Adenotonsillar Hypertrophy. International Congress Series, Elsevier; 2003.
15. Oglu PH, Maleki M, Rezazadehsaatlou M, Zamani M. The association between sacral ratio and the vesicoureteral reflux. Med J Tabriz Univ Med Sci Health Serv 2014;36:26-31.
16. Aghamohammadi D, Eydi M, Hosseinzadeh H, Amiri Rahimi M, Golzari SE. Assessment of mini-dose succinylcholine effect on facilitating laryngeal mask airway insertion. J Cardiovasc Thorac Res 2013;5:17-21.
17. Havas T, Lowinger D. Obstructive adenoid tissue: An

- indication for powered-shaver adenoidectomy. Arch Otolaryngol Head Neck Surg 2002;128:789-91.
18. Huang SW, Giannoni C. The risk of adenoid hypertrophy in children with allergic rhinitis. Ann Allergy Asthma Immunol 2001;87:350-5.
 19. Habibi Asl B, Vaez H, Imankhah T, Hamidi S. Impact of caffeine on weight changes due to ketotifen administration. Adv Pharm Bull 2014;4:83-9.
 20. Brietzke SE, Gallagher D. The effectiveness of tonsillectomy and adenoidectomy in the treatment of pediatric obstructive sleep apnea/hypopnea syndrome: A meta-analysis. Otolaryngol Head Neck Surg 2006;134:979-84.
 21. Cassano P, Gelardi M, Cassano M, Fiorella ML, Fiorella R. Adenoid tissue rhinopharyngeal obstruction grading based on fiberoendoscopic findings: A novel approach to therapeutic management. Int J Pediatr Otorhinolaryngol 2003;67:1303-9.
 22. Derkay CS, Darrow DH, Welch C, Sinacori JT. Post-tonsillectomy morbidity and quality of life in pediatric patients with obstructive tonsils and adenoid: Microdebrider vs electrocautery. Otolaryngol Head Neck Surg 2006;134:114-20.
 23. Major MP, Flores-Mir C, Major PW. Assessment of lateral cephalometric diagnosis of adenoid hypertrophy and posterior upper airway obstruction: A systematic review. Am J Orthod Dentofacial Orthop 2006;130:700-8.
 24. Brodsky L. Modern assessment of tonsils and adenoids. Pediatr Clin North Am 1989;36:1551-69.
 25. Leiberman A, Stiller-Timor L, Tarasiuk A, Tal A. The effect of adenotonsillectomy on children suffering from obstructive sleep apnea syndrome (OSAS): The Negev perspective. Int J Pediatr Otorhinolaryngol 2006;70:1675-82.
 26. Nahaie M, Mahdizadeh J. Outpatient Palatoplasty: A Simple, Single-Stage Procedure for the Relief of Snoring. Med J Tabriz Univ Med Sci 2004;15:68-71.
 27. Kaditis AG, Alexopoulos EI, Hatzi F, Kostadima E, Kiaffas M, Zakyntinos E, *et al.* Overnight change in brain natriuretic peptide levels in children with sleep-disordered breathing. Chest 2006;130:1377-84.
 28. Kalorin CM, Mouzakes J, Gavin JP, Davis TD, Feustel P, Kogan BA. Tonsillectomy does not improve bedwetting: Results of a prospective controlled trial. J Urol 2010;184:2527-31.
 29. Jeyakumar A, Rahman SI, Armbrrecht ES, Mitchell R. The association between sleep-disordered breathing and enuresis in children. Laryngoscope 2012;122:1873-7.
 30. Kovacevic L, Jurewicz M, Dabaja A, Thomas R, Diaz M, Madgy DN, *et al.* Enuretic children with obstructive sleep apnea syndrome: Should they see otolaryngology first? J Pediatr Urol 2013;9:145-50.
 31. Cengel S, Akyol MU. The role of topical nasal steroids in the treatment of children with otitis media with effusion and/or adenoid hypertrophy. Int J Pediatr Otorhinolaryngol 2006;70:639-45.
 32. Zhang L, Mendoza-Suazi R, Cesar J, Chadha N. Intranasal corticosteroids for nasal airway obstruction in children with moderate to severe adenoidal hypertrophy. Otolaryngol Head Neck Surg 2009;140:451-4.
 33. Kheirandish-Gozal L, Gozal D. Intranasal budesonide treatment for children with mild obstructive sleep apnea syndrome. Pediatrics 2008;122:e149-55.
 34. Saleh P, Bastani P, Piri R, Goldust M, Naghavi-Behzad M. Antimicrobial prophylaxis for surgical site infections in surgical wards in Northwest Iran. Life Sci J 2013;10:1977-81.
 35. Jannatdoust A, Samadi M, Yeganehdoust S, Heydarzadeh M, Alikhah H, Piri R, *et al.* Effects of intravenous indomethacin on reduction of symptomatic patent ductus arteriosus cases and decreasing the need for prolonged mechanical ventilation. J Cardiovasc Thorac Res 2014;6:257.
 36. Mungan NA, Seckiner I, Yesilli C, Akduman B, Tekin IO. Nocturnal enuresis and allergy. Scand J Urol Nephrol 2005;39:237-41.