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# Efficiency of external nasal dilators in pediatric nasal septal deviation

Ziya Salturk *, Muzafer Inan, Tolgar Lutfi Kumral, Yavuz Atar, Guven Yildirim, Yavuz Uyar

*Okmeydani Training and Research Hospital, ENT Clinic, Istanbul, Turkey*

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ABSTRACT

*Inroduction:* Nasal septal deviation results from irregular development of the nasomaxillary complex and trauma. Treatment of nasal septal deviation in pediatric patients is one of the biggest challenges in rhinology. Surgery may alter craniofacial growth patterns, and so it may be indicated only in the selected cases. The use of external nasal dilators is a relatively new treatment modality in nasal obstruction.
*Objective:* This study was performed to assess the efficacy of external nasal dilator in pediatric nasal septal deviation patients.
*Methods:* Seventy-six children who were diagnosed with nasal septal deviation at our outpatient clinic were included in the study. The patients were divided into 2 groups: the external nasal dilator group was composed of 48 children that had used an external nasal dilator for at least 1 month and still been using, while the control group was comprised of 28 children that had not received any treatment and had not used an external nasal dilator. The parents of the children were asked to complete the obstructive sleep apnea 18 questionnaire. In addition, the external nasal dilator group was asked to complete the questionnaire after stopping external nasal dilator use for 2 weeks and the control group also repeated the obstructive sleep apnea 18 questionnaire.
*Results:* The obstructive sleep apnea 18 questionnaire results were significantly different between the external nasal dilator group and the control group at the beginning of the study (i.e., when patients in the external nasal dilator group were still using their dilators, $P=0.000$). On the other hand, there was no difference between the 2 groups after the patients in the external nasal dilator group had stopped using their external nasal dilator ($P=0.670$).
*Conclusion:* External nasal dilator use relieved nasal septal deviation, which narrows the nasal valve. The results of this study suggest that external nasal dilator could be used in patients that are not candidates for septoplasty.



## 1. Introduction

Nasal septal deviation (NSD), the most common deformity in humans, results from irregular development of the nasomaxillary complex and trauma [1–3]. NSD causes recurrent rhinosinusitis, upper airway infections, and middle ear problems [4]. Obligate mouth breathing also causes malocclusion and disruption of facial skeleton development in growing children [5].

The reported prevalence of NSD in children varies between 0.93% in newborns and 40.6% in 15–18-year-olds [6,7]. As various classifications have been used and different age groups can show different results, there is a wide degree of variation in NSD prevalence between studies [8]. As maxillofacial development is completed after 20 years of age, the prevalence does not change then [9].

Treatment of NSD in pediatric patients is one of the biggest challenges in rhinology. Surgery may alter craniofacial growth patterns, and so it may be indicated only in select cases [10,11]. Therefore, many otolaryngologists tend to avoid surgical treatment.

The use of external nasal dilators (ENDs) is a relatively new treatment modality in nasal obstruction. ENDs were designed to slightly enlarge the anterior aspect of the nasal valve, which contributes significantly to resistance in the upper airway [12,13], and they have been used to treat snoring problems and increase the quality of sleep in adults [14]. On the other hand, there has been limited number of studies in pediatric population [15–17]. Two recent studies were performed to assess efficacy of ENDs on adolescent athletes and both of them showed that ENDs improved oxygen intake and reduced respiratory effort [15,16]. Another study which was aimed to asses efficacy of ENDs at newborns concluded that it reduced obstructive respiratory events [17]. There has been

* Corresponding author at: Okmeydanı Eğitim ve Araştırma Hastanesi KBB Kliniği Darulaceze cad. Şişli/İstanbul,Turkey. Tel.: +90 505 5836146.
*E-mail address:* ziyasalturk@gmail.com (Z. Salturk).

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**Table 1**
Types of septal deviations according to Baumann classification.

| | Septal deviation types | | | | | | |
|---|---|---|---|---|---|---|---|
| | Type 1 | Type 2 | Type 3 | Type 4 | Type 5 | Type 6 | Total |
| END Group | 8 (16.7%) | 16 (33.3%) | 11 (22.9%) | 2 (4.2%) | 7 (14.6%) | 4 (8.3%) | 48 (100.0%) |
| Control Group | 6 (21.4%) | 8 (28.6%) | 6 (21.4%) | 2 (7.1%) | 4 (14.3%) | 2 (7.1%) | 28 (100.0%) |
| Total | 14 (18.4%) | 24 (31.6%) | 17 (22.4%) | 4 (5.3%) | 11 (14.5%) | 6 (7.9%) | 76 (100.0%) |

$Chi^2 = 0.983$; END: external nasal dilator.

no study performed to evaluate effects of ENDs on pediatric population and this study was performed to assess the efficacy of ENDs in pediatric NSD patients.

## 2. Materials and methods

Internal Review Board approval was obtained for this study from the Okmeydani Training and Research Hospital Ethics Committee. Between January 2014 and March 2014, 76 children who were admitted to our outpatient clinic for nasal obstruction, mouth breathing during sleep, snoring and attacks of apnea and were diagnosed with NSD were included in the study. Following history taking, the patients were examined endoscopically. Children with adenoid hypertrophy that obstructed the nasal choana by more than 50% endoscopically, a history of allergic rhinitis, a congenital craniofacial deformity, or a sinonasal infection were excluded. The patients were divided into 2 groups: the END group was composed of 48 children that had used an END for at least 1 month and still been using, while the control group was comprised of 28 children that had not received any treatment and had not used an END. All of the patients had used Breathe Right for Children (Glaxo Smith Kline) which is the only commercial product in Turkey. NSD was analyzed according to the classification described by Baumann and Baumann [18].

Baumann and Baumann [18] divided septal deviations into 6 types according to their clinical and anatomical properties. They defined septal pathology and concomitant pathology together—type 1: septal crest and ipsilateral vomeral spur; type 2: cartilaginous deviated nose and ipsilateral subluxation, contralateral vertical septal deviation; type 3: high septal deviation and contralateral septal crest; type 4: caudally inclined septum and contralateral subluxation, ipsilateral vertical septal deviation, ipsilateral septal crest, ipsilateral vomeral spur; type 5: septal crest contralateral and vomeral spur; and type 6: caudally inclined septum and contralateral subluxation, ipsilateral vertical septal deviation, contralateral septal crest, contralateral vomeral spur. The parents of the children were asked to complete the Obstructive Sleep Apnea 18 (OSA 18) questionnaire which is a useful tool that can be used for the subjective evaluation of obstructive disorders and was claimed to be used in diagnosis of obstructive sleep apnea [19]. In addition, the END group was asked to complete the questionnaire after stopping END use for 2 weeks and the control group also repeated the OSA 18 questionnaire. The results were subjected to statistical analysis.

## 3. Results

The mean period for which patients had used an END was 72 days (range 30–90 days). The END group consisted of 22 females and 26 males, with a mean age of $10.08 \pm 2.95$ years (range 3–14 years). The control group consisted of 10 females and 18 males with a mean age of $9.42 \pm 3.50$ years (range 3–14 years). There were no statistically significant differences between the 2 groups with regard to age or sex distribution ($P > 0.05$). There were 3 and 4 children who had apnea attacks described by caregivers in END and control groups, respectively.

There were no differences in septal deviation type between the 2 groups (Table 1).

The OSA 18 questionnaire results were significantly different between the END group and the control group at the beginning of the study (i.e., when patients in the END group were still using their dilators; $P = 0.000$). On the other hand, there was no difference between the 2 groups after the patients in the END group had stopped using their ENDs ($P = 0.670$) (Table 2). In addition, there was a significant difference in the OSA 18 results of the END group at the end of the study compared to the initial results ($P = 0.000$). There was no such difference in the results for the control group ($P = 0.925$) (Table 2).

There were no differences in the efficacy of ENDs according to the type of septal deviation. Although the OSA 18 score in type 3 septal deviation patients was slightly lower than that in patients with other types of deviations, the difference was not statistically significant (Table 3).

## 4. Discussion

Surgery on the growing nasal septum has always been a matter of discussion [11,20]. Different techniques have been introduced; however, straightening of a deviated or deformed caudal septum is the most critical component in all of these methods [21]. Animal studies in rodents indicated that resection of the mucoperichondrium in addition to cartilage caused significant deformity and growth retardation [22,23]. These observations suggest that septoplasty and rhinoplasty in children would lead to unfavorable results [24–26]. The revision rate following septoplasty in children is also very high [27–29]. On the other hand, preservation and reinsertion of remodeled cartilage had no unfavorable effect. Therefore, patient selection and conservative approaches are important in pediatric patients [11,20].

ENDs are devices that alter the nasal geometry by acting on the lower border of the upper lateral cartilage [30]. Nigro et al. [31] reported that ENDs enabled a significant increase in cross-

**Table 2**
Obstructive sleep apnea 18 questionnaire results.

| | At the beginning of the study Mean ± SD | At the end of the study Mean ± SD | Beginning–end change $P^b$ |
|---|---|---|---|
| END Group | $20.50 \pm 9.99$ | $38.88 \pm 7.95$ | 0.000* |
| Control | $38.00 \pm 7.28$ | $38.07 \pm 7.77$ | 0.925 |
| $P^a$ | 0.000* | 0.670 | |

SD: standard deviation; END: external nasal dilator.
* $p < 0.01$.
[a] Independent *t*-test.
[b] Paired Sample *t*-test.