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Medical treatment of adenoid hypertrophy with "fluticasone propionate nasal drops"

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ABSTRACT

Background: Adenoid hypertrophy treatment for children is generally planned in accordance with the degree of airway obstruction and related morbidity. If surgical treatment is indicated, the individual risk/benefit analysis of patients should be assessed in terms of anesthetic and postoperative complications. Although there are few alternative treatment options, these may be considered as a nonsurgical approach in less serious cases. Accordingly, studies about intranasal steroid applications under various protocols have been presented.
Study design: The prospective, randomized, placebo-controlled study.
Setting: Tertiary referral center.
Patients and methods: Patients indicated for surgery were randomly divided into two groups. The study group was treated by fluticasone propionate nasal drops (NSD-nasal steroid drops) of 400 μg/day for 8 weeks. The control group was treated by normal saline (NS) in the same way. All the patients were called for follow-up every 4 weeks.
Results: At the end of 8 weeks, statistically significant improvement ($p < 0.05$) was observed in the NSD treated group compared to the NS treated group in terms of nasal airway obstruction, mouth breathing, speech abnormalities, apnea and night cough. At the end of 8 weeks, the average total symptoms score of the NSD treated group dropped from 13.7 to 2.9 while the NS treated group's score changed from 14.8 to 14.6. After 8 weeks of NSD treatment the initial adenoid/choana (A/C) rate had dropped from 87 to 56% and a total decrease of 35.6% was observed. After 8 weeks of NS treatment the A/C rate dropped from 87 to 85% and a total decrease of 2.2% was observed.
Conclusions: In this study, the effect of fluticasone propionate nasal drops on adenoid hypertrophy is examined for the first time. This method provides an effective alternative to surgical treatment in children with adenoid hypertrophy. With the protocol applied in this study 76% of the patients were eliminated the surgery and removed from the surgical waiting list.

1. Introduction

Adenoid is a lymphoid tissue located in the roof and posterior wall of the nasopharynx. Normally being a resistance center against upper respiratory infections, it may become a source of recurrent and chronic infection itself.

Adenoid hypertrophy is a common childhood disease. An enlarged adenoid can occlude the choana, especially when sleeping in a supine position. Symptoms due to airway obstruction like mouth breathing, hyponasal speech and snoring in children are observed [1]. It may also cause otitis media with effusion and accompanying conductive hearing loss [2] and in the most serious cases, obstructive sleeping apnea and accompanying growth retardation and cor pulmonale [3–6].

Adenoid hypertrophy treatment for children is determined according to the degree of airway obstruction and related morbidity. If surgical treatment is indicated, the individual risk/benefit analysis of patients should be assessed in terms of anesthetic and postoperative complications. Although there are few alternative treatment options, these may be considered as a nonsurgical approach in less serious cases. Accordingly, studies about intranasal steroid applications under various protocols have been presented in the literature [7–13].

In this study, the effect of fluticasone propionate nasal drops on adenoid hypertrophy is examined for the first time and elimination of surgical treatment needs in the patients.

2. Materials and methods

The prospective, randomized and placebo-controlled study was approved by the Local Ethics Committee. Consent was obtained from the patients' parents after they were informed about the

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Table 1
Demographic data.

Group	*n*	Age	Male	Female
NSD[a]	25	4–16 (9.8)	8 (40%)	17 (68%)
NS[b]	20	5–15 (9.5)	12 (60%)	8 (32%)

[a] NSD = nasal steroid drops.
[b] NS = normal saline.

objectives of the study and the use of the drugs. Inclusion criteria for the study; adenotonsillectomy-indicated patients with recurrent tonsillitis presenting with normal sizes tonsils rather than hypertrophic, were included having symptoms associated with adenoid hypertrophy for at least 6 months, were divided randomly into two groups. Six drops of NSD was applied to each nostril once a day. The patients were evaluated by the physicians other than the treating physicians; the grade of adenoid was taken into account during patient selection. The demographic data for 45 patients is presented in Table 1.

Based on the data obtained from parents for a clinical examination, the symptoms of nasal airway obstruction were assessed according to fiberendoscopic images or rigid nasal endoscopic images; using the nasal passage way, choanal openings from top to bottom were graded (grade 1–4) and determined as: 1st grade: only top segment of the choana is obstructed <%25, 2nd grade: upper half of the choana is obstructed <%50, 3rd grade: lying to the rhinopharynx and tuba opening is partially obstructed <%75, 4th grade: the choana is almost completely obstructed [14]. Patients who had undergone adenoidectomy previously or patients with upper respiratory tract infection or allergic rhinitis or turbinate hypertrophy were excluded from the study. No patient discontinuation occurred during the study. Patients were not accepted to the study who had taken intranasal topical or systemic steroid in the last 1 year; who had taken any intranasal medical treatment; who had a history of chronic nose-bleeding, immunodeficiency and history of hypersensitivity, positive allergy or atopy against fluticasone; who had tonsillar hypertrophy; who had chronic otitis media with effusion and type B tympanogram; who had anatomic deformity in noise or sinonasal diseases such as nasal polyp or inferior turbinate hypertrophy and craniofacial abnormalities such as cleft lip/cleft palate, genetic diseases (Down Syndrome), neurological diseases and cardiovascular diseases. Symptom scale was scored before and after treatment. In this study, nasal congestion, mouth breathing, snoring, nasal speech, apnea and night cough were examined by clinical evaluation; nasal congestion, mouth breathing, snoring, nasal speech, scored as; apnea 0 = none, 1 = sometimes, 2 = often, 3 = day-long and night-long, scored as; cough 0 = none, 1 = mild, 2 = moderate, 3 = severe [15].

Tonsil size of each patient was determined and recorded. The tympanometry test was performed in patients before and after the treatment.

Patients indicated for surgery were then randomly divided into two groups. The first group was treated by fluticasone propionate nasal drops (NSD-nasal steroid drops) of 400 μg/day for 8 weeks. In supine position patients' heads were extended 20° and NSD applied by their parents. They remained in that position for 10–15 min. The other group was treated by normal saline (NS) in the same way. All the patients were called for follow-up every 4 weeks.

3. Statistical analysis

SPSS 16.0 software was used for statistical analysis. When comparing the groups, according to the result of Kolmogorow Smirnov test, the independent sample *t*-test was applied to those who remained within the normal range and; the Mann–Whitney *U*-test was applied for those who tested outside the normal range. *p* values that were <0.05, were accepted as statistically significant.

4. Results

At the beginning of the treatment and at the end of an 8 weeks follow-up period, symptoms of nasal airway obstruction were assessed. Statistically significant improvement ($p < 0.05$) was observed in the NSD treated group compared to the NS treated group in terms of nasal airway obstruction, mouth breathing, speech abnormalities, apnea and night cough at the end of 8 weeks.

The average value was calculated separately for each nasal airway obstruction symptom both before and after the treatment (Fig. 1). Before the treatment there was no statistically significant difference between the NSD and NS group; however after the treatment a statistically significant differences ($^*p < 0.05$) in average values for all the symptoms were observed between the two groups.

By taking all the symptoms into consideration, the average total symptoms score for each group was calculated and compared. For both NSD and NS groups the total symptoms score was similar prior to the treatment ($Z = -1588$, $p = 0112$). At the end of 8 weeks, the average total symptoms score of the NSD treated group dropped from 13.72 to 2.96 while the NS treated group's score changed from 14.85 to 14.65. After the treatment, a statistically significant difference was observed between the average total symptoms scores of the two groups ($Z = -5713$, $p < 0.05$).

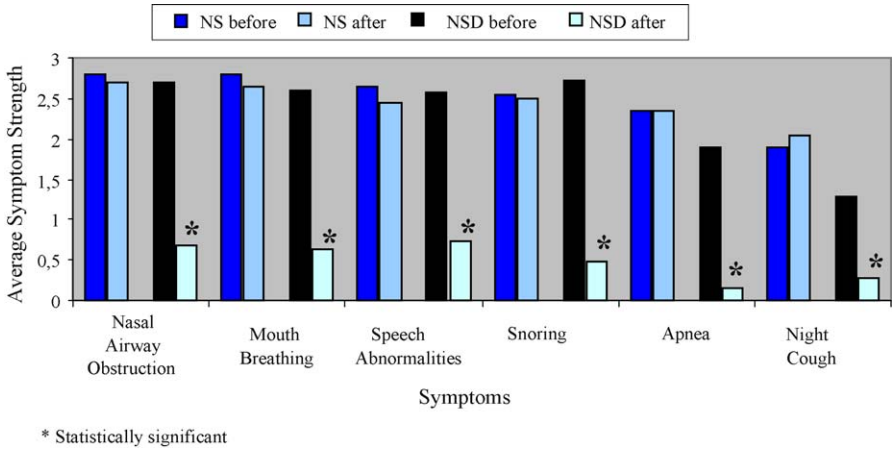

Fig. 1. Change in the nasal airway obstruction symptoms. *Statistically significant.

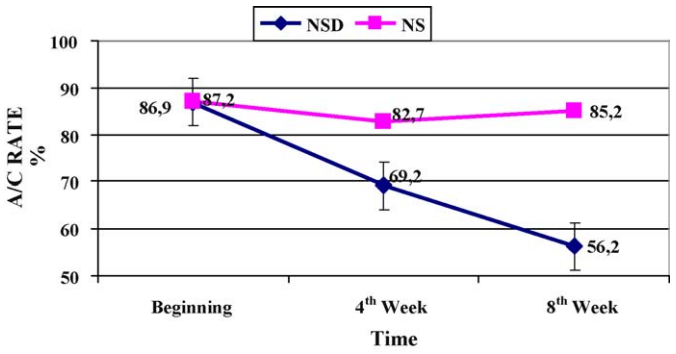

Fig. 2. Change in adenoid/choana ratio in time (NSD; nasal steroid drops, NS; normal saline).

The adenoid/choana (A/C) (Fig. 2) rate of the NSD treated group after 4 weeks dropped from 86,9 to 69,2%. Between 4th and 8th weeks the A/C rate further declined to 56,2%. Thus, after 8 weeks of NSD treatment the initial A/C rate dropped from 86,9 to 56% and a total decrease of 35.6% was observed. As for the NS treated group the A/C rate after the first 4 weeks declined from 87,2 to 82,7%. Between the 4th and 8th weeks this rate increased to 85,2%.

On the other hand, after 8 weeks of NS treatment the A/C rate dropped from 87,2 to 85,2% and a total decrease of 2.2% was observed.

In this study, for 19 out of 25 patients who had NSD treatment (76%) there was no longer a need for surgery. Adenoidectomy was applied to 3 patients (12%). The remaining 3 patients (12%) were informed of their ongoing need for surgery but their parents refused the surgery declaring that NSD had sufficiently improved their conditions. Out of 20 patients who were treated with normal saline, 16 of them (80%) underwent the operation and the remaining 4 patients postponed their adenoidectomy at the request of their parents for further monitoring in spite of persistant surgical indication.

Before the treatment and at the end of the 8 week follow-up, there was no statistically significant difference observed between the two groups, in terms of their tonsil size. No statistically significant difference was observed as a result of the tympanometry test between two groups before and at the end of the treatment.

5. Discussion

The successful use of intranasal steroid treatment in children with adenoid hypertrophy was first introduced by Demain and Goetz [7]. Although it is not yet clear by which mechanisms the steroids reduce the nasal airway obstruction there are some plausible theories. Some of these include reduction of the adenoid size directly by lympholytic effect; the anti-inflammatory effect of steroids help to reduce adenoidal and nasopharyngeal inflammation or they reduce the possibility of the adenoid acting as an infection reservoir [7]. Studies which proved the fact that adenoid tissue includes many glucocorticoid receptors and messenger RNA strengthens these probable mechanism [16].

While, the mechanism through which topical steroids improve nasal airway obstruction symptoms has not been determined yet. In some studies a significant correlation has been observed between the A/C ratio and nasal symptoms score [7]. These results suggest that the improvement in nasal airway obstruction symptoms is related to the effect of intranasal corticosteroids on adenoid size. On the other hand, it should also be taken into consideration that the use of fluticasone propionate increases the nasal airway and additionally enables improvement of symptoms by reducing soft tissues of the inferior turbinate [17]. Regarding the usage of intranasal steroids, which dosage and which position should be used is still a matter of debate. In a study about the spread of topical steroid sprays in nasal cavity, it has been shown that nasal steroid sprays do not spread enough in the nasal cavity [18,19]. On the contrary, the topical application of intranasal steroid in drop form provides a better spread in the nasal cavity, and reaches the nasopharynx and pharynx faster [20]. However, one of the disadvantages of using nasal steroid drops is that its application position is uncomfortable. For both spread and comfort the best way to apply nasal drops is shown to be the supine position with an extended head [21,22]. In this study, nasal drops form and supine position were preferred. No complaints regarding usage have been reported by the patients in this study.

Demain and Goetz [7] in a study where they used placebo-controlled nasal Beclomethasone spray reported an 82% decrease in average nasal airway obstruction symptoms score. Berlucchi et al. [9] in a placebo-controlled study observed that the average symptoms score dropped from 11 to 3 in the group treated by Mometasone furoate spray and from 10 to 9 in the placebo treated control group. Criscuoli et al. [8] reported 45% clinical improvement in children with adenotonsillar hypertrophy after 2 weeks of intranasal Beclomethasone treatment. Lepcha et al. [23] reported, on the contrary to other studies, that although there was a decrease in symptom scores after 8 weeks with Beclomethasone treatment ($n = 13$), it did not constitute a statistically significant difference comparing to placebo control group's scores ($n = 13$).

In our study, at the end of 8 weeks treatment statistically significant improvements in nasal airway obstruction symptoms were observed in the NSD treated group compared to the NS control group ($p < 0.05$). Patients' average total symptoms score dropped from 13,7 to 29,6 in the NSD group and from 14,8 to 14,6 in the control group. The average total symptom score of the NSD treated group decreased 78,3%.

Demain and Goetz [7] reported a 29% decrease in A/C ratio average. Cengel and Akyol [12] used intranasal Mometasone furoate monohydrate in their study and reported a 50% decrease in initial adenoid size. Berlucchi et al. [9] observed a 20% (12,5–32,5) decrease in average choanal obstruction in the Mometasone group and 0.0% (0.0–0.0) in the placebo group. Ciprandi et al. [13] showed significant decrease ($p < 0.05$) in average adenoid size after 8 weeks of Flunisolide treatment compared to normal saline treatment. Brouillette et al. [10] contrary to other studies reported that reduction in adenotonsillar hypertrophy caused by Fluticasone spray did not show statistically significant difference compared to placebo.

In our study, after 8 weeks of treatment the decrease in the A/C ratio was 35.6% in the NSD group and only 2.2% in the NS group.

In two studies, results concerning the ongoing necessity for surgery were reported. Criscuoli et al. [8] reported in their first long-term study of 100 weeks that out of a total 24 patients who responded well to the initial treatment, 13 patients (54%) were still in need of surgery. Usta et al. [11] informed that after Mometasone furoate treatment only 2 of 39 patients who were indicated for adenoidectomy underwent the surgery.

In this study, for 19 out of 25 patients who had NSD treatment (76%) there was no longer a need for surgery. Adenoidectomy was applied to 3 patients (12%). The remaining 3 patients (12%) were informed of their ongoing need for surgery but their parents refused surgery declaring that NSD had sufficiently improved their conditions. Out of 20 patients who were treated with normal saline, 16 of them (80%) underwent the operation and the remaining 4 patients postponed their adenoidectomy at the request of their parents for further monitoring in spite of persistant surgical indication.

Corticosteroids are generally well tolerated in children. Studies show only one case of episodic nose-bleeding [9] and sneezing in 1

patient [7]. The effects of intranasal steroids on growth were studied by Allen et al. [24] in a randomized, double-blind, placebo-controlled study. The growth rate in pre-puberty children who had used Fluticasone propionate aqueous nasal spray for 1 year was reported to be equal to the growth rate of the placebo control group. At the end of the study, they suggested a maximum dose of 200 μg/day for each nostril. In our study, for each nostril a maximum dose of 200 μg/day, and for each patient total dose of 400 μg/day, was used for 8 weeks. We have not observed any side effects in our patients.

6. Conclusion

The reliability of nasal steroids for the pediatric population is widely recognized. Although the mechanism itself has not yet been clearly and totally explained, it is important to determine the role of intranasal corticosteroids in treating children with adenoid hypertrophy. This method provides an effective alternative to surgical treatment in children with adenoid hypertrophy. With the protocol applied in this study 76% of the patients were eliminated the surgery therefore they were removed from the surgical waiting list.

Intranasal corticosteroids are well tolerated by children; however, the most appropriate drug, the most efficient dose and optimal treatment duration continue to be investigated and determined by way of further prospective and randomized studies.

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