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ORIGINAL ARTICLE

Effect of Beclomethasone Dipropionate Versus Mast Cell Stabilizer on Mucociliary Clearance in Patients of Allergic Rhinitis

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ABSTRACT

Objective: The study was conducted to compare the effect of Beclomethasone dipropionate with mast cell stabilizer on mucociliary clearance in patients of allergic rhinitis.

Patients and Methods: A randomized trial was carried out in ENT department of Nishtar Hospital Multan from December 2016 to February 2017. Patients of allergic rhinitis from both genders were included in the study after written consent. Mucociliary transport velocity was measured by saccharine dye test. The collected data was processed and analyzed by SPSS software 23 version and presented in tabulation form. Qualitative variables were analyzed in percentage and frequency form. The main outcome variable, mucociliary transport velocity, age and weight of patients were presented as mean and stranded deviation. Students' test was applied to calculate p value. P value <0.05 was taken as significant.

Results: A total number of 140 patients were included in the study and were divided in two main groups. There were 70 volunteers in each group. One group was provided Beclomethasone and other group was given mast cell stabilizer for one week. After careful analysis and calculation, it was observed that the mean of mucociliary transport velocity after one week of Beclomethasone dipropionate treatment was 7.33±1.27 mm/minute with p value 0.558 and mean of velocity after mast cell stabilizer (Nedocromil sodium) was 7.82±1.2 mm/minute with p-values 0.304.

Conclusion: No statistical significance was found with both treatment regimens.

Key words: Allergy, Beclomethasone Dipropionate, Mucociliary clearance, Nedocromil sodium, Rhinitis, Saccharine dye test.

Author`s Contribution
[1] Conception, synthesis, planning of research and manuscript writing Interpretation and discussion
[2] Data analysis, interpretation and manuscript writing, [3] Active participation in data collection.

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Introduction

In upper respiratory disorders, allergic rhinitis has important correlation with asthmatic complications.[1] Its prevalence in United States ranges between 5 to 22 percent. Major symptoms of allergic rhinitis are pruritus of nose and eyes, rhinorrhea, nasal congestion and sneezing. Less common symptoms include popping of ears, coughing and throat clearing.[2] Chronic breathing disease and the consequences of allergic rhinitis complications like sinusitis, Eustachian tube dysfunction and sleep disturbances are major complications which result in morbidity.[3] Parental history of atopic disease increases the chance of disease occurrence in next generation by 30 percent and even more risk when both parents have such disease.[4] Allergic rhinitis as itself

explains is the hypersensitivity response to the external allergens mediated by IgE antibodies. Its outcomes are nasal symptoms or upper respiratory tract disturbances presenting as its main hallmarks. There is a list of allergens, which are the cause of this hypersensitivity. These include trees and small plants pollens, house dust, insects and some foods.[5]

In allergic rhinitis, mast cells and basophils are first line of defense, which has high affinity receptors for IgE antibodies and second line of defense are Eosinophils, Monocytes and Platelets with low affinity receptors.[6] It is not necessary that all the subjects having IgE serum level show clinical significance. It is also understood that there is no probability of any specific organ to be effected by increase in IgE serum level. Although in allergic rhinitis patients mast cells degranulate, causing release of inflammatory mediators, which ultimately lead to stimulation of nasal end organs, producing different symptoms like sneezing, itching, nasal congestion and rhinorrhea.[7] Among the persons with raised IgE serum level and positive skin sensitivity test, about 90 percent population show immediate hypersensitivity response followed by the symptoms stated above.

Mediators released by first and second line defenders show collective symptomatic response with less information about individual exact response, although some individual response has been discussed on the base of nasal provocation tests. Histamine causes acute antigen antibody response, serotonin causes sneezing and rhinorrhea without congestion while leukotrienes and prostaglandins cause rhinorrhea and congestion both.[8] To cope with this nasal disease there are different ways of therapy. Before treatment, avoidance from the causative factors are more important as care is the best health remedy. All the sources of pollens, dust and other hypersensitive allergens must be avoided to cope with this disease. Otherwise frequently used medicines for the treatment of allergic rhinitis are antihistamines, decongestants, nedocromil sodium (NDS) and glucocorticoids.[9] Immunotherapy is also preferred to lower the threshold for development of clinical symptoms by injecting a series of injections with allergens.

Antihistamines provocation includes rapid onset and reducing sneezing, rhinorrhea and pruritus but not congestion. Decongestants like pseudoephedrine hydrochloride with alpha-adrenergic agonist properties constrict the nasal vascular bed, which results in decreased blood supply, and thus lowering of mucosal edema. Nedocromil sodium (NDS), a frequently used mast cell stabilizer is also the same in effectiveness as antihistamines.[10] Glucocorticoids that include Flunisolide, Beclomethasone Dipropionate and Dexamethasone are very potent and preferred drugs for the treatment of allergic rhinitis. There mode of action is the same as that of antihistamines with rapid onset reducing hypersensitivity symptoms.

To evaluate the efficacy and to find out the significant difference in treatment effects, different drugs have been compared in different studies. In this study, two drug groups discussed above have been focused to evaluate their therapeutic efficiency by certain tests. The two drugs are Beclomethasone dipropionate (BDP) a glucocorticosteroid and Nedocromil sodium (NDS) a mast cell stabilizer, both provocation results effect on mucociliary clearance.[11] There are many tests used to evaluate the mucociliary clearance like saccharine test, dye method and radiographic method. Saccharine test is inexpensive and reliable technique frequently preferred for the mucociliary clearance measurement.[12] The study was conducted to evaluate the difference between the efficacies of two drugs on allergic rhinitis.

Patients and Methods

This prospective study was conducted in ENT department of Nishtar Medical College and Hospital Multan from December 2016 to February 2017 on patients of allergic rhinitis. After proper approval from institutional ethical committee, a total 140 patients, of both gender were included in this study. Sample size was calculated by using online software raosoft by using reference study of Svendsen and colleagues with confidence interval 95%.[13] A written consent was taken from the participants with verbal briefing about procedure, purpose and protocol of study. Patients were divided into two main groups randomly by lottery method and allocated to drugs Beclomethasone dipropionate and Nedocromil sodium (NDS) in equal ratio.[14] Inclusion criteria was nonsmokers, no history of asthma, no previous chronic upper and lower respiratory disease, no nasal structural abnormality. Only

Table 1: Demographic characteristics of study participants (n=140)		
Characteristics	**Frequency**	**Percentage**
Gender		
Male	97	69.3
Female	43	30.7
Stratified Age (years)		
20-30	48	34.3
31-45	92	65.7
Stratified Weight (kg)		
50-60	54	38.6
61-71	86	61.4
Descriptive Statistics		
Age (years)	**Mean±SD** 32.65±4.93	
Weight (kg)	62.22±4.93	

patients with acute allergic rhinitis were included in the study.[15] Patients already treated with Beclomethasone dipropionate and Nedocromil sodium (NDS) were excluded from the study.

All selected patients were gone through mucociliary function test to measure mucociliary transport velocity at baseline and after treatment with Beclomethasone dipropionate and Nedocromil sodium (NDS). To measure mucociliary transport velocity (mm/min), saccharine dye test was applied.[16] The test was preferred as it was inexpensive, readily available, easy to perform and reproducible. A particle of saccharine with special blue dye was placed on the anteriomedial portion of the inferior turbinate at the point 4 cm apart from the nasal tip. The transport time was measured from the time of application of saccharine with dye up to the sweet taste in mouth. It was further confirmed by blue dye in the pharynx. The length of nasal cavity was measure with the help of cotton swab from the nasal tip to the pharyngeal wall.[17] With the help of measured transport time and length of nasal cavity mucociliary transport velocity (mm/min) was calculated. The same procedure was repeated on the same nostrils after one-week treatment of both medicine groups i.e. 1st group treated with Beclomethasone dipropionate and 2nd group treated with NDS. Mucociliary transport velocity was calculated according to same method as before treatment. The daily dose during treatment was, 4 mg Nedocromil sodium (2 mg per puff) and 0.1 mg Beclomethasone dipropionate (0.05 mg per puff) two time each medicine daily. Treatment was continued for one week on each group.[18]

Table 2: Group wise demographic characteristics of participants		
Groups	**Variable**	**Mean±SD**
Beclomethasone (n=70)	Age (years)	29.81±3.25
	Weight (kg)	60.64±3.40
Nedocromil sodium (n=70)	Age (years)	35.48±4.69
	Weight (kg)	63.80±5.68

All the data were collected and saved in excel spreadsheets and SPSS version 23. Main outcome variable of current study was mucociliary transport velocity, which was calculated by transport time, and nasal length expressed as mm/min. Qualitative data like gender were analyzed in percentage and frequency. The main outcome variable mucociliary transport velocity, age and weight of patients were presented as mean and standard deviation. Paired sample t-test was applied to calculate p value and p-value ≤ 0.05 was taken as statistically significant.

Results

Total 140 patients of both genders were included in this study. Gender distribution showed that there were more males (69.3%) than females (30.7%). Mean age and weight of the patients was 32.65±4.93 years and 62.22±4.93 kg respectively. Majority of the patients (65.7%) were in age group 31-45 years. Weight distribution showed that large number of patients (61.4%) had weight between 61-70 kg (Table 1). Mean age and weight of the patients treated with Beclomethasone was 29.81±3.25years and 60.64±3.40 kg respectively. While the mean age and weight of the patients treated with NDS was 35.48±4.69 years and 63.8±5.68 kg respectively (Table 2). Mean mucociliary transport velocity of the patients in two groups at baseline and after one week of

Table 3: Comparison of two groups before and after treatment			
Groups	**Time**	**Mucociliary transport velocity(mm/ minute) Mean±S.D**	**p-value**
Bechlomethasone	Before treatment	7.46±1.43	0.558
	After 1 week of treatment	7.33±1.27	
Nedocromil sodium	Before treatment	8.01±0.93	0.304
	After 1 week of treatment	7.82±1.2	

treatment was statistically insignificant with p-values 0.558 and 0.304 respectively (Table 3).

Discussion

Allergic rhinitis is directly correlated with different upper respiratory complications leading to acute or chronic respiratory diseases. Therefore, different treatment strategies are implemented to overcome this disease. Antihistamines, decongestants, Nedocromil sodium (NDS), glucocorticoids and immunotherapy are the preferred modes of treatment. Above all self-care and health consciousness are also very important factors to avoid these kinds of diseases. In current study, the two groups of drugs used in the treatment of this disease have been compared in their efficacy. Many studies have been presented by different researches on the effects of drugs discussed above, over different aspects of treatment outcome. Ratner et al in 2002 had conducted a research on the effect of Cromolyn sodium on allergic rhinitis, which showed positive results of drug relieving the major symptoms caused by allergic rhinitis.[19] We focused on the comparison of treatment efficacy of glucocorticoids (Beclomethasone dipropionate) and mast cell stabilizer (Nedocromil sodium (NDS). The treatment efficacy was evaluated on the basis of mucociliary transport velocity in nasal cavity by saccharine dye test. Pelucchi et al in 1995 described the effectiveness of intranasal Azelastine and Beclomethasone dipropionate on seasonal nasal symptoms which showed that the later drug had better treatment outcome.[20] A study presented by Watson et al in 1993 showed the effects of Beclomethasone on treatment of allergic rhinitis with asthmatic complications compared with placebo. The results concluded the direct effect on upper respiratory symptoms due to allergic rhinitis and indirect positive effect on lower respiratory complications like asthma.[21] Svendsen et al in 1989 proposed in their research there was no significant difference in efficacy of Nedocromil sodium and Beclomethasone dipropionate in the treatment of allergic rhinitis accompanied by asthmatic respiratory disorders.[21] Another study by stafanger et al in 1987 showed effect of Beclomethasone dipropionate and Flunisolide on the movement of nasal cilia obtained from healthy volunteers by gentle scraping. The results showed a minor but irreversible decrease in Ciliary Beating Frequency (CBF) of the cilia by both drugs.[22]

Rudd et al in 1983 described the effect of orally taken mast cell stabilizers on exercise-induced asthma. The results showed that M&B 22,948 (Z-0-propoxyphenyl-8azapurin-6-one) a mast cell stabilizer had no significant effect on histamine hypersensitivity but significant effect on exercise induced asthmatic complications.[23] In another study, Holmberg et al in 1986 demonstrated the effects of Beclomethasone on mucociliary activity in comparison with placebo which revealed no significance in the results.[24] The current study is in comparison with that study, especially focusing on outcome variable. The results showed that mucociliary transport velocity after one week of Bechlomethasone treatment was 7.33±1.27 mm/minute and of mast cell stabilizer (Nedocromil sodium) treatment was 7.82±1.2 mm/minute with p-values 0.558 and 0.304 showing no significant difference.

Conclusion

There was no significant difference between the mucociliary transport velocity after treatment of Beclomethasone and mast cell stabilizer. This shows the same effectiveness of both drugs in treatment of allergic rhinitis.

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