



# Efficacy of allergen-blocker mechanical barrier gel on symptoms and quality of life in patients with allergic rhinitis

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## Abstract

**Propose** Allergic rhinitis (AR) is a very common, chronic and global health problem. In the last two decades, the efficiency of barrier-enforcing measures in AR has been investigated. In this study, we aimed to evaluate the effect of allergen-blocker mechanical barrier gel (MBG) (AlerjiSTOP<sup>®</sup>) treatment on symptoms and quality of life score (QoLS) in patients with seasonal and perennial allergic rhinitis.

**Methods** A single-center, prospective study was conducted between January 2017 and May 2018. Patients diagnosed with allergic rhinitis with a visual analogue scale (VAS) of 5 or higher (moderate/severe) were enrolled in the study. Patients were evaluated in terms of VAS, nasal symptom score (NSS), ocular symptom score (OSS), total symptom score (TSS) and QoLS at baseline, 1 week and 1 month of MBG treatment.

**Results** A total of 83 patients with AR were enrolled in the study. Clinical and laboratory examinations showed that 50 (60.2%) patients were mono-sensitized. Allergen-blocker mechanical barrier gel treatment was performed as monotherapy in 22 (26.5%) patients. Median VAS, NSS, OSS and TSS decreased from 7 to 4, 8 to 3, 4 to 0 and 12 to 4, respectively ( $p < 0.0001$ ). Correlation analysis revealed positive correlations between lower pediatric rhinoconjunctivitis quality of life questionnaire scores for patients under 12 years of age and decrease in VAS, NSS and TSS ( $r = 0.380$ ,  $p = 0.008$ ;  $r = 0.544$ ,  $p < 0.0001$ ;  $r = 0.543$ ,  $p < 0.0001$ ). Positive correlations were detected between lower rhinoconjunctivitis quality of life questionnaire (self-administered) scores for patients  $\geq 12$  years of age and decrease in VAS, NSS, OSS and TSS ( $r = 0.703$ ,  $p < 0.0001$ ;  $r = 0.465$ ,  $p = 0.005$ ;  $r = 0.526$ ,  $p = 0.001$ ;  $r = 0.624$ ,  $p < 0.0001$ ).

**Conclusion** In conclusion, we found significant decrease in all symptom scores and improvement in QoLS of patients treated with MBG as monotherapy and combination therapy.

**Keywords** Allergen-blocker mechanical barrier gel · Allergic rhinitis · Quality of life score · Visual analogue scale · Symptom score · Pediatrics

## Introduction

Allergic rhinitis (AR) is a very common, chronic and global health problem. It is most commonly seen among children and young adults, with prevalence estimates ranging from approximately 10–50% [1].

Although not life threatening, the symptoms of allergic rhinitis, including sneezing, rhinorrhea, nasal itching and congestion, impose a significant impact on health-related quality of life, emotional functioning of patients, work

performance, academic achievement of school children, sleep and the cost of treatment [2–6].

Pharmacotherapy is the most commonly used therapeutic modality for AR; however, concerns remain regarding its safety both among patients and healthcare professionals. Current guidelines recommend second-generation oral or topical H1 antihistamines for the treatment of allergic rhinitis [7, 8]. Although medication is associated with a low rate of side effects in AR and conventional drugs are effective in symptom relief, causal treatment strategies such as allergen avoidance—which is the best treatment for diseases associated with an IgE-mediated immune response—is necessary to achieve long-term improvement of symptoms.

In the last 2 decades, efficiency of barrier-enforcing measures such as pollen blocker creams, hydroxypropyl

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methylcellulose powder, sea water gel, liposomal and eotoin nasal spray and white vaseline have been investigated [9–13].

Barrier-enforcing measures work as a facial mask to prevent inhaled pollens and allergens from reaching the lungs and interfere with the contact between inhaled allergens and mucosal cells. The absence of side effects makes these treatments particularly attractive in children. Most of the studies emphasize that barrier-enforcing measures have positive impacts on nasal symptom scores and total symptom scores of patients [14–16].

AlerjiSTOP (Fargen<sup>®</sup>, Istanbul, Turkey), the agent investigated in this study, is an allergen-blocker mechanical barrier gel (MBG) which aims to relieve allergy symptoms by entrapping aeroallergens, thereby blocking allergens from contacting the nasal mucosa and has been on the market in Turkey since 2015. This product is the gel form of hydroxypropyl methylcellulose, and is administered to each nostril and philtrum, i.e., not via intranasal route. In this study, we primarily aimed to evaluate the effect of MBG treatment on symptoms of AR in patients with seasonal and perennial allergic rhinitis. The secondary objective of the study was to determine the impact of MBG treatment on quality of life score of patients.

## Methods

### Study design

A single-center, prospective study was conducted between January 2017 and May 2018 in Pediatric Immunology and Allergy Outpatient Clinic. Patients diagnosed with allergic rhinitis with a visual analogue scale (VAS)—used to assess the severity of disease—of 5 or higher (moderate/severe) were enrolled in the study [17]. In all patients, the diagnosis of AR was established with directed history, physical examination and laboratory findings (specific IgE  $\geq$  0.7 kU/L) with positive skin-prick test (wheal diameter  $\geq$  3 mm). While the seasonal allergic rhinitis patients with tree, grass and weed pollen allergy were assessed in pollen season, patients diagnosed with perennial allergic rhinitis who had allergy to house dust mites or cat dander were included in study during the study period.

Patients with asthma, acute upper or lower respiratory tract infection, and those treated with systemic corticosteroids, other immunosuppressants or immunomodulatory therapy and patients with low adherence to treatment were excluded.

The severity of nasal symptom score (NSS) (itching, runny nose, sneezing, and nasal congestion) and ocular symptom score (OSS) (itching, redness, and tearing) was determined based on self-reports of patients (0 = no

symptom; 1 = mild symptoms; 2 = moderate symptoms; 3 = severe symptoms). Total symptom score was calculated as the sum of NSS and OSS.

Turkish-validated version of the pediatric rhinoconjunctivitis quality of life questionnaire (PRQLQ) for patients under 12 years of age and rhinoconjunctivitis quality of life questionnaire (self-administered) [RQLQ(S)] for patients  $\geq$  12 years of age were utilized to measure the impact of AR on the patient and the effect of MBG treatment [18, 19]. After the treatment period, patients were asked to rate their overall opinion of the efficacy on a 10-point scale referred to as the “efficacy point”.

Patients were evaluated in terms of VAS, NSS, OSS, TSS, PRQLQ (for patients under 12 years of age) and RQLQ(S) (for patients  $\geq$  12 years of age) at baseline and at 1 week and 1 month of MBG treatment.

### Administration of allergen-blocker mechanical barrier gel

Composition of the MBG (AlerjiSTOP, Fargen<sup>®</sup>, Istanbul, Turkey) which has been on the medical devices market in Turkey since 2015 consists of aqua, glycerin, cetyl alcohol, hydroxypropyl methylcellulose, poly-D-glucosamine, polyquaternium. Just as the adhesive activity of the product decreases during the day, lentil-sized MBG was administered to each nostril and philtrum at least twice a day for 1 month in patients included in the study. During the study period, other treatments were continued in patients who had previously been treated with nasal corticosteroids, antihistamines and anti-leukotrienes. In these patients, MBG was applied as an add-on treatment.

### Ethical approval

The study protocol was designed in compliance with the Declaration of Helsinki. Written informed consent was obtained from parents upon enrollment in the study. This study has been granted approval by the University Research Ethics Board.

### Statistical analysis

Statistical data analyses were performed with SPSS<sup>®</sup> Statistics V22.0 (IBM<sup>®</sup> Corporation, NY, USA). Categorical variables were presented as number and percentage (%). Continuous variables were expressed as mean  $\pm$  standard deviation (minimum–maximum) and median (25th–75th percentile) according to the normality of variables. The normality of the variables was assessed with Kolmogorov–Smirnov and Shapiro–Wilk tests. In each group, changes in VAS, NSS, OSS, TSS, PRQLQ and RQLQ(S) were compared by means of the Friedman test. In addition, post hoc pairwise comparisons

were performed with the Wilcoxon test and post hoc comparisons. Mann Whitney *U* test was utilized to assess the scores across the groups. Spearman’s correlation coefficient was used to analyze the associations between the scores, PRQLQ, RQLQ(S) and efficacy point. A two-sided *p* value of <0.05 was considered to indicate statistical significance.

**Table 1** Demographic and clinical characteristics of patients

Parameters	
Gender (F/M), <i>n</i> (%)	35 (42.2)/48 (57.8)
Age (year), mean ± SD (min–max)	10.9 ± 3.5 (6–18)
Etiology of AR, <i>N</i> =83, <i>n</i> (%)	
Mono-sensitized	50 (60.2)
Pollen	24 (28.9)
House dust mite	23 (27.7)
Cat dander	3 (3.6)
Poly-sensitized <i>n</i> (%)	33 (39.8)
Pollen + cat dander	14 (16.9)
House dust mite + pollen	10 (12.1)
House dust mite + pollen + cat dander	8 (9.6)
House dust mite + cat dander	1 (1.2)
Monotherapy with MBG	22 (26.5)
Add-on treatment	61 (73.5)
Nasal corticosteroids	28 (33.7)
Antihistamines	19 (22.9)
Anti-leukotrienes	2 (2.4)
Nasal corticosteroids + anti-leukotrienes	5 (6.1)
Nasal corticosteroids + antihistamines	7 (8.4)

*F* female, *M* male, *SD* standard deviation, *min* minimum, *max* maximum, *AR* allergic rhinitis

## Results

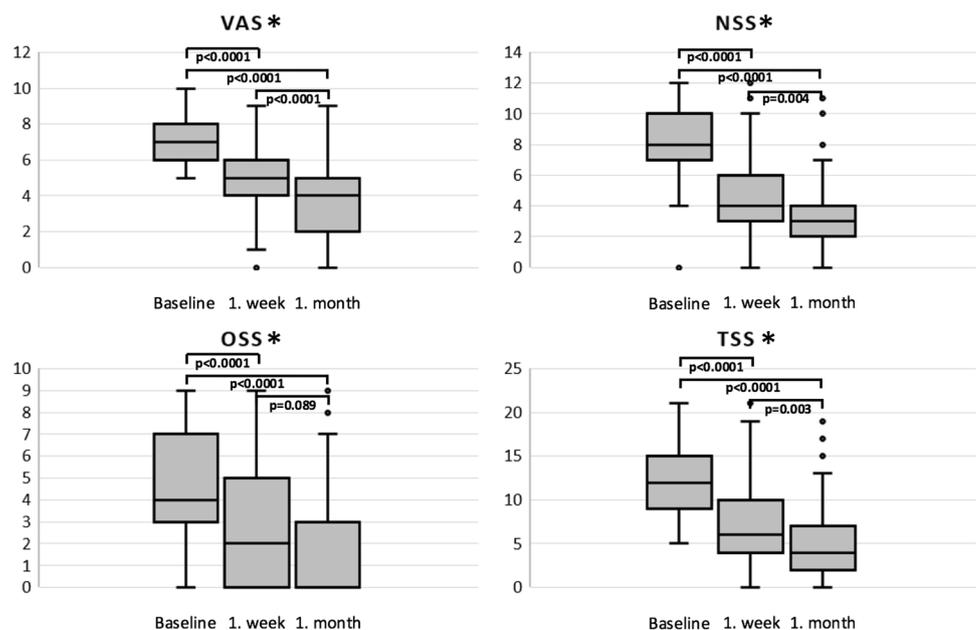
86 patients with AR were included in study. Three patients with upper tract infection during the study period were excluded. A total of 83 patients with AR were enrolled in the study. Among these, 48 (57.8%) were males and 35 (42.2%) were females and the mean age of study group was 10.9 ± 3.5 years (6–18). No adverse effects were reported. Only four patients complained of smell.

Clinical and laboratory examinations showed that 50 (60.2%) patients were mono-sensitized. Underlying etiologies were pollens in 24 (28.9%) patients, house dust mite in 23 (27.7%) patients and cat dander in 3 (3.6%) patients. 33 (39.8%) patients were poly-sensitized. Allergen-blocker mechanical barrier GEL treatment was performed as monotherapy in 22 (26.5%) patients and as add-on treatment in 61 (73.5%) patients (Table 1).

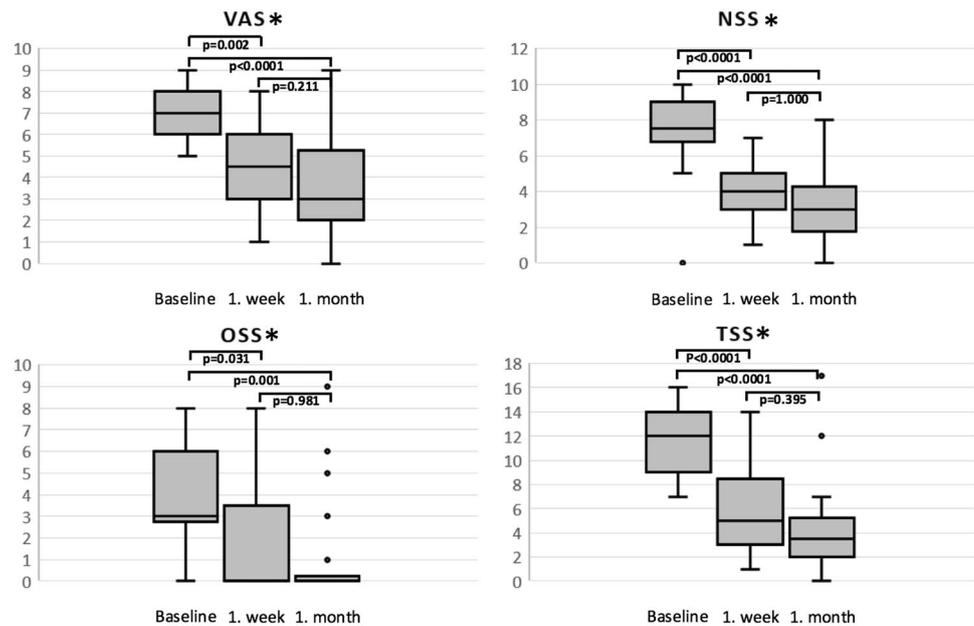
For all patients, the median, lower and upper quartiles, and minimum and maximum values of VAS, NSS, OSS and TSS at baseline 1 week and 1 month of treatment are illustrated in Fig. 1. Decrease was observed in all score groups (*p* < 0.0001). Median VAS, NSS, OSS and TSS decreased from 7 [6–8] to 4 [2–5], 8 [7–10] to 3 [2–4], 4 [3–7] to 0 [0–3] and 12 [9–15] to 4 [2–7], respectively. In terms of OSS, there was no difference between the 1st week 2 [0–5] and 1st month 0 [0–3] of treatment (*p* = 0.089) (Fig. 1).

The median, lower and upper quartiles, and minimum and maximum values of VAS, NSS, OSS and TSS at baseline, 1st week and 1st month of treatment in patients treated with only MBG (*n* = 22) are illustrated in Fig. 2.

**Fig. 1** Analysis of VAS, NSS, OSS and TSS in all patients (\*Friedman test: *p* < 0.0001)



**Fig. 2** Analysis of VAS, NSS, OSS and TSS in patients treated with only MBG (\*Friedman test:  $p < 0.0001$ )



Significant decrease was detected in all scores (VAS from 7 [6–8] to 3 [2–5.3]; NSS from 7.5 [6.8–9] to 3 [1.8–4.3]; OSS from 3 [2.8–6] to 0 [0–0.3] and TSS from 12 [9–14] to 3.5 [2–5.3]) at the end of the 1st month of MBG treatment. No significant decrease was found between the 1st week and 1st month of treatment in any of the scores. In other words, statistically significant decrease in all scores was observed by the end of the 1st week of MBG treatment (Fig. 2).

The comparison of VAS, NSS, OSS, TSS at baseline, 1st week and 1st month of treatment between the pollen allergy, house dust mite allergy and poly-sensitized groups did not reveal any statistically significant difference (data not shown).

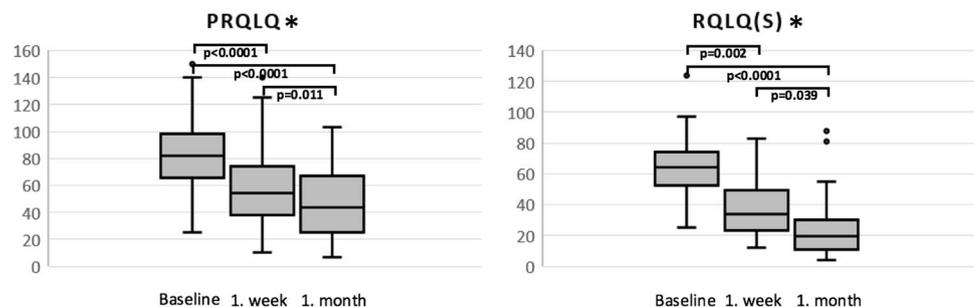
Also, no significant differences were observed between MBG monotherapy and add-on treatment groups in terms of any of the scores at baseline and at 1st month of MBG treatment (baseline VAS:  $p=0.100$ , 1-month VAS:  $0.774$ ; baseline NSS:  $p=0.253$ , 1-month NSS:  $p=0.810$ ; baseline OSS:  $p=0.259$ , 1-month OSS:  $p=0.062$ ; baseline TSS:  $p=0.194$ , 1-month TSS:  $p=0.124$ ).

In both groups (patients under 12 years of age and those  $\geq 12$  years of age), significant decrease was observed in PRQLQ and RQLQ(S). For patients under 12 years of age ( $n=48$  [57.8%]), median PRQLQ decreased from 64 [52.3–74] to 19.5 [11–30.3] ( $p < 0.001$ ). In patients  $\geq 12$  years of age ( $n=35$  [42.2%]), median RQLQ(S) dropped from 82 [66–98] to 44 [25–67] ( $p < 0.0001$ ) (Fig. 3).

Correlation analysis revealed positive correlations between lower PRQLQ scores and decrease in VAS, NSS and TSS ( $r=0.380$ ,  $p=0.008$ ;  $r=0.544$ ,  $p < 0.0001$ ;  $r=0.543$ ,  $p < 0.0001$ ). Positive correlations were detected between lower RQLQ(S) scores and decrease in VAS, NSS, OSS and TSS ( $r=0.703$ ,  $p < 0.0001$ ;  $r=0.465$ ,  $p=0.005$ ;  $r=0.526$ ,  $p=0.001$ ;  $r=0.624$ ,  $p < 0.0001$ ).

The effect of MBG treatment was rated from 1 (not effective) to 10 (very effective). Patients scored MBG treatment as  $6.9 \pm 1.9$  (2–10), referred to as the efficacy point. No difference was observed between patients treated with only MBG and those treated with combination therapy in terms of the efficacy point ( $p=0.603$ ). Positive correlations were seen between the efficacy point and decrease in VAS,

**Fig. 3** Baseline, 1st week and 1st month of PRQLQ and RQLQ(S) (\*Friedman test:  $p < 0.001$ )



NSS and TSS ( $r=0.561$ ,  $p<0.0001$ ;  $r=0.607$ ,  $p<0.0001$ ;  $r=0.468$ ,  $p<0.0001$ ).

## Discussion

In this study, we determined that MBG has a positive effect on NSS, OSS, TSS and quality of life score (QoLS) in patients with perennial and seasonal AR. It demonstrated these effects not only as add-on treatment but also as monotherapy.

Bousquet et al. showed that VAS significantly correlates with disease severity and quality of life in AR patients. In this study, a cutoff level of 5 in VAS was chosen to distinguish patients with mild AR from those with moderate/severe AR [17]. In a clinical trial that investigated the effect of micronized cellulose powder on the efficacy of topical oxymetazoline in AR, VAS was used to monitor allergic rhinitis symptoms. Significant decrease in VAS was reported in nasal symptoms on day 15 of treatment [20]. In our study, we included AR patients with  $VAS \geq 5$ . We believe that enrolling patients with  $VAS \geq 5$  allowed a better evaluation of the effect of MBG on symptom scores and quality of life scores. Consistent with the decrease in symptom scores and QoLS, VAS was also reduced with MBG treatment.

This is the first study to evaluate the efficacy of the gel form of hydroxypropyl methylcellulose. In previous studies, intranasal application has been used with the powder form of hydroxypropyl methylcellulose, which reacts with the moisture on the nasal mucous membrane and forms a gel layer [10, 14–16, 21]. Intranasal ointments have adverse effects, most of which are attributable to improper use, such as epistaxis, paraffinoma and petrolatum-induced pneumonia [15, 22]. The superiorities of MBG investigated in our study are the administration to each nostril and philtrum instead of application to the mucosa and no absorption from the skin which reduces the risk of side effects in practice. No adverse effect was documented in our study.

Schwetz et al. evaluated the effect of petrolatum-based pollen blocker cream, which exerts its effects through the same mechanism as MBG, on NSS in patients with allergy to animal dander, house dust mites and pollens. Blocker cream was found to be more effective than placebo and significant decrease in NSS was observed [14]. In another double-blind, randomized, placebo-controlled, crossover study with the same blocker cream, NSS of 30 patients with perennial allergic rhinitis was significantly decreased at the end of the 30-day treatment period [15]. On the other hand, a study testing a nasal spray containing microcrystalline cellulose revealed that the allergen blocker was no more effective than placebo in terms of NSS [23]. In these studies, OSS and TSS were not evaluated and no information was provided about the severity of AR or VAS of patients. In our study, NSS was

decreased with the administration of MBG as both add-on treatment and monotherapy.

Ocular symptoms are thought to be secondary to the nasal effects in line with the concepts of “united airways” and naso-ocular reflex [24, 25]. In addition to the studies mentioned above, we determined significant decrease in OSS. In previous studies, different findings were reported about the effect of barrier-enforcing measures on OSS (itching, redness, and tearing). A study in adult patients suggested that the inert cellulose powder does not have any effect on ocular symptoms [10]. In 2009, Aberg et al. performed a study in Sweden with 53 children and adolescents who had pollen-related AR. Ocular symptoms score was found to be lower in the active group than the placebo group; however, this difference was not statistically significant [21]. Conversely, a study performed by the same author in Ukraine with the same inert cellulose powder showed significantly less ocular symptoms in the active group compared to the placebo group [16].

Allergic rhinitis imposes a significant impact on health-related quality of life, and significant correlations have been found between AR symptoms and QoL [26]. Quality of life score is an important marker to evaluate efficacy of treatments. Weston et al. evaluated the efficiency of liposomal nasal spray in patients with seasonal allergic rhinoconjunctivitis (SAR) in Germany and revealed a significant improvement in RHINASTHMA Quality of Life Questionnaire [14]. However, another study performed with the same product showed no significant change in the QoLS of patients with SAR [12]. A multicenter, multinational clinical trial comparing topical microemulsion with normal saline solution determined significant differences in terms of QoLS between the active group and the control group [10]. Yanqing et al. conducted a double-blind placebo-controlled crossover study to determine the efficacy of petrolatum-based pollen blocker cream in 30 patients with perennial allergic rhinitis. A significant decrease in QoLS at the end of the 30-day treatment period was reported [15]. Our study showed significant improvement in the QoLS of groups receiving MBG as monotherapy or add-on treatment. As expected, all symptom scores and VAS showed significant correlation with QoLS.

There is limited data in the literature about the opinion of AR patients on barrier-enforcing measures. In a double-blind, placebo-controlled, randomized study, subjects were asked about their overall opinion regarding the effect of treatment. While 52.8% of the subjects in the placebo group reported “no effect”, 59.3% and 27.8% of those in the active group expressed their opinion as “good effect” and “very good effect”, respectively [16]. In our study, mean efficacy score reported by the patients was 6.9 out of 10, which may be interpreted as “very effective”.

This study has several limitations. First, nasal provocation test which allows an objective analysis of the results was not

performed. Second, we did not include a placebo group in our study. Third, the low number of subjects resulted in a limited conclusion regarding the effect of MBG on symptoms of allergic rhinitis as well as VAS and QoLS in patients with AR.

## Conclusion

In conclusion, we may conclude that this is the first study to evaluate the effect of allergen-blocker mechanical barrier gel (AlerjiSTOP®) on symptoms and QoL in patients with AR. We found significant decrease in symptom scores and improvement of QoLS in patients treated with MBG as monotherapy and combination therapy. Allergen-blocker mechanical barrier gel is an alternative medical device for AR in conventional medicine. However, randomized, double-blind placebo-controlled studies are warranted to confirm our findings.

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## Compliance with ethical standards

**Conflict of interest** The authors declare that there is no conflict of interest.

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