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Olfactory cleft inflammation present in seasonal allergic rhinitis & intranasal steroids

Anita Sivam

PURPOSE: Allergic rhinitis (AR) is commonly associated with olfactory loss, although the mechanism is not well studied. This study was designed to determine the effect of mometasone furoate (MF) on olfactory loss in seasonal AR (SAR) and to study its effect on inflammation in the olfactory region.

METHODS: We performed a randomized, double-blind, placebo-controlled, parallel clinical trial in 17 patients with SAR who had symptoms of impaired olfaction **(Table 1)**. Subjects received MF or placebo for 2 weeks during their allergy season. Before and after treatment, we measured nasal peak inspiratory flow (NPIF), chemosensory quality of life, and objective olfactory function (the University of Pennsylvania Smell Identification Test) **(Figure 1)**. Additionally, nasal cytology samples were obtained from each visit, and a unilateral endoscopic biopsy specimen of the olfactory epithelium was obtained at the end of the study and scored for inflammation.

RESULTS: Treatment with MF was associated with improved nasal symptoms ($p < 0.015$) **(Figure 2a)**, NPIF ($p < 0.04$) **(Figure 2b)**, reduced nasal inflammation ($p < 0.05$) **(Figure 2c)**, and chemosensory-specific quality of life ($p < 0.03$) **(Figure 3)**. Histological analysis of the olfactory region reveals fewer eosinophils in the MF group when compared with placebo ($p < 0.012$). We found no improvement in objective olfactory function ($p > 0.05$).

CONCLUSION: The use of MF in SAR is associated with reduced eosinophilic inflammation in the olfactory region and improved symptoms of AR. The presence of eosinophils in the olfactory area in SAR may indicate a direct, deleterious effect of inflammation on olfactory epithelium in this disease. In this study, we show that inflammation in SAR can affect the olfactory cleft, implicating a direct role for allergic inflammation in smell loss. Treatment with intranasal steroids is associated with decreased inflammation in the olfactory region in humans.

Table 1. Characteristics of the Study Population.

Demographics	**Mometasone Furoate (n=8)**	**Placebo (n=9)**	
Age (mean, range), y	40 (24-49)	38 (23-52)	P=0.752
Male n/%	2 (25)	5 (56)	P=0.201
Allergen Sensitivity			
Ragweed n/%	5 (63)	6 (66)	
Grass n/%	3 (37)	3 (33)	
Baseline Values			
Chemosensory QOL (mean±SEM)	24.3 ± 0.808	28.7 ± 1.92	P=0.078
UPSIT Raw Score (median, range)	32 (27-37)	31 (17-37)	P=0.459
NPIF (median, range)	103 (90-147)	118 (67-191)	P=0.224
TNSS (median, range)	16.5 (13-26)	12 (6-26)	P=0.440
Eosinophils (median, range)	1.55 (0.5-4)	0.5 (0-1.5)	P=0.028

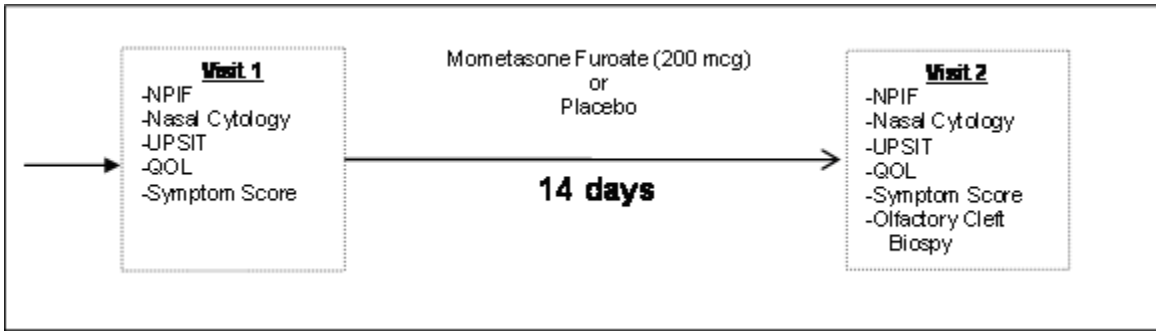

Figure 1. Study Design. Both treatments were daily nasal sprays given in the morning. NPIF indicates nasal peak inspiratory flow, QOL, quality of life, UPSIT, University of Pennsylvania Smell Identification Test.

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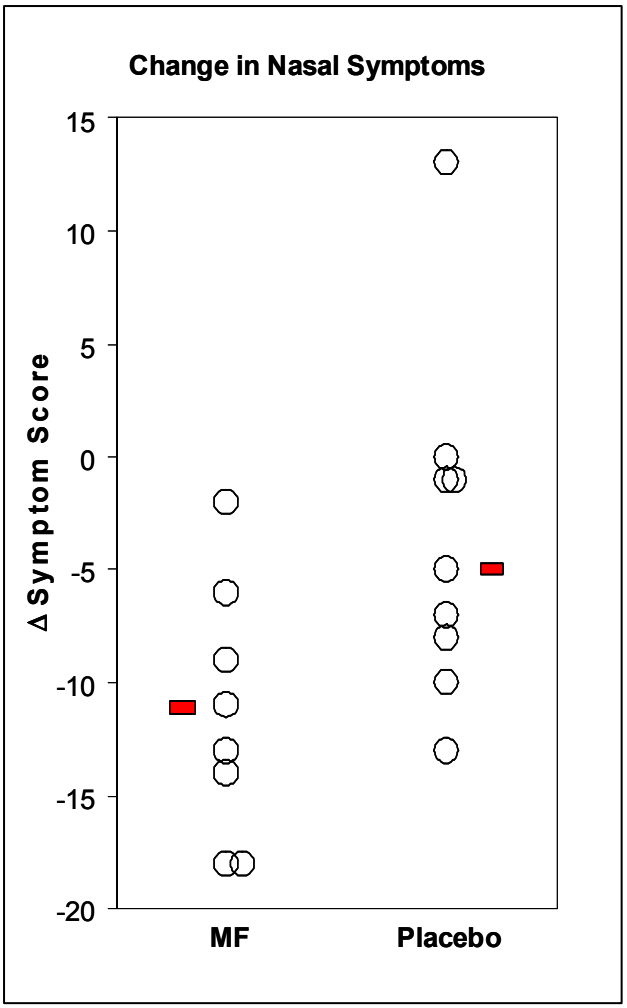

Figure 2a. Change in total nasal symptom score from initial visit to two-week treatment with mometasone or placebo. Individual data points are depicted with the horizontal bars representing medians. Mometasone led to greater reduction of symptoms than placebo.

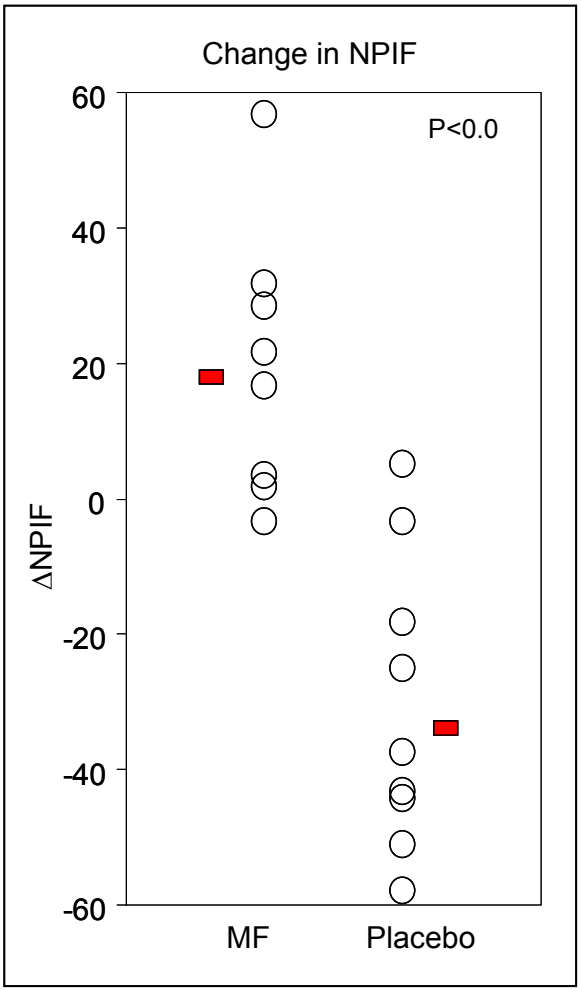

Figure 2b. Nasal peak inspiratory flow (NPIF). Regarding changes from initial visit for all measurements of NPIF, a negative number represents worsening, and a positive number represents improvement. Horizontal bars depict medians.

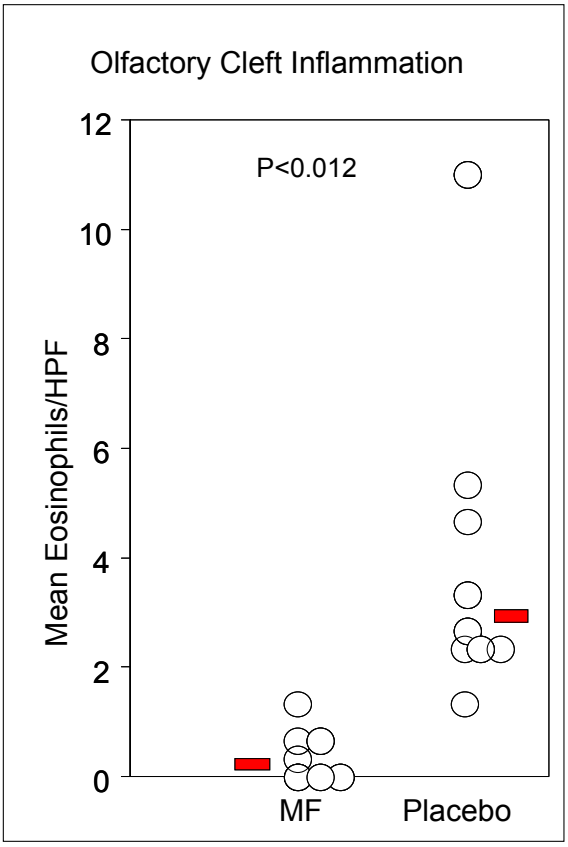

Figure 2c. Biopsy specimens were scored for inflammation by counting the number of eosinophils in three high power fields, with the average reported. Subjects receiving MF showed significantly reduced numbers of eosinophils in the olfactory region compared to placebo.

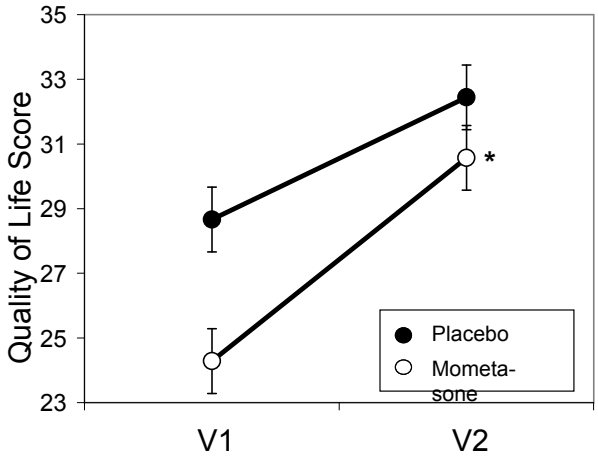

Figure 3. Change in chemosensory quality of life (QOL). The overall quality-of-life score calculated from the Coping Style Questionnaire (CSQ) is shown. Mean ± SEM for the 2 groups at enrollment (V1) and after 2 weeks of treatment (V2). Increases on the y-axis indicate better quality of life.