

Original Article

In which Rosacea Patients should *Demodex* in the Eyelashes be Investigated?

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ABSTRACT

Aim: The aim of this study was to investigate the relationship between the presence of *Demodex* on the face and within the eyelash follicles in patients with rosacea. **Subjects and Methods:** This prospective cross-sectional study included 80 participants, 40 patients with rosacea and 40 individuals with no rosacea as controls. The presence of *Demodex* on the face was assessed by standard superficial skin biopsy. Sixteen eyelashes were epilated from each patient and control. **Results:** The rate of *Demodex* infestation and severe infestation on the face in patients with rosacea was significantly higher than the control group. *Demodex* count within the eyelash follicle was significantly higher in patients with erythematotelangiectatic type rosacea than the control group. There was no increase in blepharitis in rosacea patients but when blepharitis was present, the rate of the presence of *Demodex* was higher in this group. There was a statistically significant relationship between the presence of *Demodex* within the eyelashes and itchy eyes in people without blepharitis. **Conclusion:** When at least one *Demodex* is found on the face in rosacea patients, the eyelashes should be examined for effective treatment of the mite. Itchy eyes may be an important sign of the presence of *Demodex* in people without blepharitis.

KEYWORDS: Blepharitis, *Demodex*, eyelashes, face, rosacea

INTRODUCTION

Demodex folliculorum and *brevis* are eight-legged ectoparasites those are located in the human skin in the pilosebaceous units.^[1] It has been suggested that the presence of *Demodex folliculorum* in the affected skin could be related to the development of rosacea.^[2,3] Although primarily considered a skin disease, rosacea may involve the eyes in a significant number of patients leading to ocular complications.^[4,5] In our study, we evaluated the presence and density of *Demodex* in rosacea patients and the relationship between the *Demodex* rate and density on the face and within the eyelash follicles.

SUBJECTS AND METHODS

Patient population

This prospective crass-sectional study was carried out between April 2016 and April 2017 at the

dermatology and ophthalmology departments of Gaziosmanpasa University Medical Faculty. Forty patients with rosacea and 40 individuals without rosacea as controls were enrolled as participants. The study followed the principles of declaration of Helsinki and was approved by the local institutional ethics committee (16-KAEK-080). All participants were informed about the study and written consent form was signed by each participant.

The inclusion criteria included none administration of any antibiotics, steroid ointments or drops to the face and eyelids, local or systemic radiotherapy and chemotherapy, acaricidal, or immunosuppressive treatments in the past one-month period.

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The exclusion criteria were participants who had seborrheic dermatitis, acne vulgaris, and atopic dermatitis which could affect *Demodex* density. The patient and control group were also evaluated for the presence of blepharitis.

Eye symptoms (itching, burning, feeling of foreign body, feeling of weight, adhesion in the eyelashes, discharge) and findings such as dandruff, cylindrical dandruff, crusting, and meibomian gland obstruction were recorded.

Procedure

On the facial region, *Demodex folliculorum* was assessed by standard non-invasive skin surface biopsy. Each patient had *Demodex* examination in three standard areas: the nose, chin, and right cheek. Prior to the examination, the names of the regions describing the area to be evaluated were written on each slide and areas of one cm² on the slide were drawn with a waterproof pen. A drop of cyanoacrylate adhesive (about 0.05 ml) was dropped onto the one cm² area marked on the slide. Each slide was placed on the relevant area and slowly removed after one minute. Two drops of immersion oil were placed on the slide, the lamellae was closed and examined rapidly under light microscope (x 40 and x 100 magnification) by a dermatologist. At least one *Demodex* detection in one cm² area was considered as infestation, detection of \geq five *Demodex* was considered as severe infestation. To assess the presence of *Demodex* within the eyelash follicle, a total of 16 eyelashes were taken one by one, four of which were from the lower and upper eyelids of both eyes. Preparations immersed in oil and covered with lamellae were examined under light microscope (x 40 and x 100 magnification). The number of *Demodex* detected was recorded. At least one *Demodex* entity was considered positive.

Statistical analysis

Data for continuous variables were given as mean, standard deviation or median, first quartile, third quartile. Data for categorical variables were given as frequency, percentage. Mann–Whitney U test or Kruskal–Wallis test were used to compare distribution of variables between and among groups. Spearman correlation coefficient was used for direction of strength of the linear relationship between quantitative variables. Chi-square test was used to compare the categorical data between and among groups. A *P* value < 0.05 was considered significant. Analyses were performed using SPSS 19 (IBM SPSS Statistics 19, SPSS inc., an IBM Co., Somers, NY).

RESULTS

The number of participant in the study was 80. Forty of them were rosacea patients (34 females, six males)

Table 1: The rate of Demodex infestation on the face and within the eyelash follicle in patient and control groups

Demodex		Patients' group n (%)	Control group n (%)	<i>P</i>
Nose	-	23 (57.5)	31 (77.5)	0.056
	+	17 (42.5)	9 (22.5)	
Chin	-	21 (52.5)	32 (80)	0.009
	+	19 (47.5)	8 (20)	
Cheek	-	9 (22.5)	22 (55)	0.003
	+	31 (77.5)	18 (45)	
Face	-	6 (15)	17 (42.5)	0.007
	+	34 (85)	23 (57.5)	
Face, cm ²	0	6 (15)	16 (40)	<0.001*
	1-4	16 (40)	22 (55)	
	\geq 5	18 (45)	2 (5)	
Eyelash (bilateral)	-	3 (7.5)	9 (22.5)	0.060
	+	37 (92.5)	31 (77.5)	

* Statistically significant difference between patient and control group was found between Demodex absence (zero) and Demodex of 1-4/cm² or \geq 5/cm². (+) available (-) none

and 40 were in the control group (33 females, seven males) (*P* > 0.05). The mean age of the patient and control group was 48.45 ± 9.22 years (29-65 years) and 49.18 ± 10.12 years (25-65 years) respectively (*P* > 0.05). The disease duration of patients with rosacea was 1–38 years (mean: 11.88 ± 8.51 years) while the age of onset of disease was 15–50 years (mean: 36.4 ± 7.93) respectively. Eighteen (45%) of the patients had erythematotelangiectatic and 22 (55%) had papulopustular type rosacea. The infestation rate on the face in rosacea patients was significantly higher than the control group (*P* = 0.007). The rate of infestation in the eyelashes was similar in both groups (*P* > 0.05). But the *Demodex* count in the eyelashes in the patient group was significantly higher than the control group (*P* = 0.012). The infestation rate, *Demodex* density, and count on the face and within the eyelash follicle in patient and control group were shown in Tables 1 and 2. Table 3 shows that the *Demodex* count and density within the eyelash follicle were significantly higher in erythematotelangiectatic type rosacea patients than the control group.

All rosacea patients who had *Demodex* on the face also had *Demodex* in the eyelashes, but half of the rosacea patients who did not have *Demodex* on their face had *Demodex* in the eyelashes. In the patient group, there was a statistically significant relationship between the presence of *Demodex* on the face and in the eyelashes, but not in the control group (*P* < 0.001). The rate of blepharitis in the patient and control groups was 92.5% (n = 37) and 85% (n = 34) respectively (*P* > 0.05). *Demodex* rates in patient and control groups with blepharitis were 97.3% and 79.4%,

Table 2: Demodex count and density on the face and within the eyelash follicle in patients and control groups

	Patients' group Demodex count Median [IQR]	Control group Demodex count Median [IQR]	P
Cheek, count	4[1-14]	0[0-2]	<0.001
Nose, count	4[1-14]	0[0-2]	<0.001
Chin, count	0[0-7]	0[0-0]	0.004
Face, count	9.5[2-24]	1[0-5]	<0.001
Face, density, count/cm ²	3.15[0.6-8]	0.3[0-1.66]	<0.001
Bilateral eyelashes amount, count	6[2-9]	3[1-6]	0.012
Bilateral eyelashes, density, Demodex count/16	0.38[0.13-0.56]	0.19[0.06-0.38]	0.012

IQR: Interquartile range

Table 3: Demodex mite count and density in control group and rosacea types

Demodex	Control group Median [IQR]	Rosacea type		P
		Erythematotelangiectatic Median [IQR]	Papulopustular Median [IQR]	
Nose, count	0[0-0]	0[0-3]	0[0-4]	0.088
Chin, count	0[0-0] (a)	0[0-2] (ab)	0.5[1-16] (b)	0.011
Cheek, count	0[0-2] (a)	3[2-12] (b)	4.5[1-16] (b)	<0.001
Face, count	1[0-5] (a)	10[2-24] (b)	9[4-27] (b)	0.001
Face, density, count/cm ²	0.3[0-1.66] (a)	3.3[0.6-8] (b)	3[1.3-9] (b)	0.001
Bilateral eyelash total count	3[1-6] (a)	7[4-12] (b)	4.5[2-9] (ab)	0.024
Bilateral eyelash density, Demodex count/16	0.19[0.06-0.38] (a)	0.44[0.25-0.75] (b)	0.28[0.13-0.56] (ab)	0.024

(ab): The common letter as a line means statistical insignificance. IQR: Interquartile range

respectively, and the rate of *Demodex* in the patient group with blepharitis was significantly higher than the control group with blepharitis ($P < 0.001$).

There were much more eye symptoms in control group compared with patient group and there was statistically significant difference regarding eye complaint of itching. In both groups with either *Demodex* or without *Demodex*, the symptoms were similar. In addition, in all cases without blepharitis in which *Demodex* was detected, the complaint of itching was 100% but it was 25% in cases without blepharitis and *Demodex*. There was a statistically significant relationship between the presence of *Demodex* within the eyelashes and itching in non-blepharitis cases ($P = 0.018$). The meibomian gland obstruction was significantly higher in control group than the patient group ($P = 0.007$).

DISCUSSION

It is still unclear whether the presence and/or density of *Demodex* is a triggering factor for rosacea or there is a change in the microenvironment secondary to the rosacea disease.^[6-9] It has been thought that extremely severe infestation plays an important role rather than *Demodex* infestation in the development of rosacea inflammatory process.^[10-12] In our study, the rate of *Demodex* infestation and severe infestation was significantly higher in the patient group compared to the control group. Despite studies that reported that

the *Demodex* density was significantly higher in the papulopustular type, there are conflicting results for the *Demodex* density in the erythematotelangiectatic type.^[10,13,14] Although the density of *Demodex* in erythematotelangiectatic type rosacea was found higher in our study, however, it was not statistically significant.

In a study where the *Demodex* infestations in the eyelash follicle in rosacea patients were evaluated, it was reported that 58.5% of the patients with *Demodex* infestation, including papulopustular variant, were found to be in higher prevalence and this ratio was significantly higher than the control group. In the study mentioned above, rosacea disease was seen as an important risk factor in terms of *Demodex* infestation of the eyelashes.^[5] According to our study, *Demodex* rates on the face were significantly higher in the patient group compared to the control group, but the rate of eyelash *Demodex* infestation was similar. Therefore, there was no increased risk of eyelash *Demodex* infestation in rosacea. However, the number of *Demodex* in the eyelashes was significantly higher in rosacea patients than in the control group, especially in the erythematotelangiectatic type. Although the presence of $\geq 5/\text{cm}^2$ *Demodex* in the skin is considered as an infestation, there is no clear consensus on the number of eyelashes to be examined in the evaluation of eyelash follicles and the *Demodex* count to be considered pathological in eyelash follicles. However, many studies have suggested the presence

of at least one *Demodex* mite in eyelash follicles as an infestation.^[15,16] Sedzikowska *et al.*^[17] reported that *Demodex* mite in the eyelashes should be at least seven *Demodex* observed in eight eyelashes to cause symptoms. In our study, although the rate of infestation in the eyelashes was similar in both groups, the high number of *Demodex* might be important in terms of the symptoms. However, other studies had reported that the number of *Demodex* in the eyelashes was similar in symptomatic and asymptomatic cases.^[18] Our study has shown that in patients with rosacea who did not reach the high *Demodex* density (\geq five mite/cm²) that was considered pathogenic on the facial region, *Demodex* infestation in the eyelashes could still be detected. Therefore, in cases where severe infestation has not been observed on the facial region, evaluating affected patients in terms of infestation of the eyelashes may be beneficial.

Wesolowska *et al.*^[19] reported the rate of *Demodex* mite within the eyelash follicles in the general population as 41%, whereas Yula *et al.*^[20] reported *Demodex* detection rate in blepharitis cases as 81.25%. In the study by Rodriguez *et al.*^[21] with 20 patients with chronic blepharitis and 105 patients in the control group, the rate of *Demodex* in the eyelashes was found to be significantly higher in the patient group than in the control group. Nevertheless, there was no evaluation of the presence of rosacea accompanying *Demodex* infestation in those patients. In our study, the rate of blepharitis in patient and control groups was similar, but the rate of *Demodex* in patients with blepharitis was significantly higher. This situation suggests that increased *Demodex* infestation may be accompanied by blepharitis in patients with rosacea.

The most common symptoms seen in the *Demodex*-related eyes were itching, burning sensation, foreign body sensation, redness, crusting, blurred vision, irritation, but these symptoms were also frequently seen in non-*Demodex* patients.^[17,22] Nevertheless, itching and crusting have been reported as important symptoms of *Demodex*-associated blepharitis.^[17,18,22] In our study, there was no significant difference in the presence of symptoms in *Demodex*-associated blepharitis compared to the *Demodex*-negative group. However, itchy eyes were significantly higher in *Demodex*-positive cases without blepharitis.

Limitation

This study was conducted at a single center.

CONCLUSION

Our findings suggest that, when at least one *Demodex* is found on the face in rosacea patients, the eyelashes

should be examined for effective treatment of the mite. Furthermore, itchy eyes may be an important sign of the presence of *Demodex* mite in non-blepharitis people.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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