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The Role of Demodex in Patients with Facial Dermatosis

Fasiyal Dermatozlu Hastalarda Demodeks' in Rolü

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ÖZET

Amaç: Bu çalışmada yüz dermatozu nedeniyle takip edilen hastalarda ve sağlıklı bireylerde yüzeyel deri biyopsisi yöntemi kullanılarak Demodex spp. sıklığının araştırılması ve bu patojenin yüz dermatozu, hijyen alışkanlıkları ve deri tipi ile ilişkisinin belirlenmesi amaçlanmıştır.

Gereç ve Yöntemler: Çalışmamıza klinik ve / veya histopatolojik olarak rozasea, steroide bağlı perioral dermatit, perioral dermatit, seboreik dermatit, akne vulgaris tanısı alan her yaş grubundan 103 yüz dermatozuna sahip hasta, kontrol grubu olarak ise Ankara Eğitim Araştırma Hastanesi Deri ve Zührevi Hastalıklar Polikliniği' ne başvuran, yüz dermatozu olmayan, aynı yaş ve cinsiyet dağılımında 104 gönüllü hasta dahil edildi. Demodex spp. yoğunluğunu tespit etmek için en uygun yöntemlerden biri olan non - invaziv standart yüzeyel deri biyopsisi (SYDB) seçildi. Hastalar ve dermatozların alt grupları, kontrol grubundaki gönüllülerle; yaş, cinsiyet, demodeks pozitifliği, cilt tipi, hijyen alışkanlıkları gibi değişkenler bakımından istatistiksel olarak karşılaştırıldı.

Bulgular: Hasta grubunun yaş dağılımı 8 - 81 arasında değişmekte olup yaş ortalaması 37.37, kontrol grubunun yaş dağılımı 10 - 76 arasında değişmekte olup yaş ortalaması 35.42 idi. Hasta ve kontrol gruplarında Demodex varlığı arasında yaş, cinsiyet ve hijyen alışkanlıkları açısından istatistiksel olarak anlamlı bir korelasyon saptanmadı (p>0.05). Yüz dermatozu olan hastaların alt grupları karşılaştırıldığında, seboreik dermatitli hastaların %60,7'sinde Demodex tespit edildi (p=0,015). Yağlı cilde sahip hastalarda da anlamlı Demodex pozitifliği tespit edilmiştir. (p=0.010).

Sonuç: Yağlı cilt tipi ve yüz dermatozlarından seboreik dermatit Demodex ile pozitif yönlü anlamlı bir ilişki gösterse de yaş, cinsiyet, hijyen alışkanlıkları gibi faktörler bakımından Demodex varlığı ile ilişkili bulunmamıştır.

Anahtar Kelimeler: Demodeks, fasiyal dermatoz, seboreik dermatit, yağlı cilt

ABSTRACT

Objective: In this study, we aimed to investigate the frequency of Demodex spp. using the superficial skin biopsy method in patients with facial dermatosis and healthy individuals and to determine the relationship between this pathogen and facial dermatosis, hygiene habits, and skin type.

Materials and Methods: A total of 103 patients of all age groups who were clinically and/or histopathologically diagnosed with rosacea, steroid-induced perioral dermatitis, perioral dermatitis, seborrheic dermatitis, or acne vulgaris were included in the study. As a control group, 104 volunteer patients of the same age distribution who were admitted to the Skin and Venereal Diseases Polyclinic and did not have facial dermatosis were included in the study. A non-invasive standard superficial skin biopsy (SSSB), the most appropriate method for detecting Demodex spp. density, was performed. The patients and dermatose subgroups were statistically compared with the volunteers in the control group in terms of variables such as age, sex, Demodex positivity, skin type, and hygiene habits.

Results: The age distribution of the patient group ranged between 8-81 years with a mean age of 37.37±17.15 years. The age distribution of the control group ranged between 10-76 years and the mean age was 35.42±15.76 years. There was no statistically significant relationship between the presence of Demodex in the patient and control groups in terms of age, sex, and hygiene habits (p>0.05). When the subgroups of patients with facial dermatosis were compared, Demodex was detected in 60.7% of patients with seborrheic dermatitis (p=0.015). Significant Demodex positivity was also detected in patients with oily skin. (p=0.010).

Conclusion: Oily skin type and seborrheic dermatitis, one of the facial dermatoses, has a significant association with Demodex, while factors such as age, sex, hygiene habits were not found to be associated with the presence of Demodex.

Keywords: Demodex, facial dermatosis, seborrheic dermatitis, oily skin

INTRODUCTION

Demodex mites are members of the family Demodicidae, order Prostigmata, and class Arachnida, and are commonly found in humans, especially on the face (1). Only two mite species, Demodex folliculorum (DF) and Demodex brevis (DB), have been identified in humans (2). While Demodex folliculorum settles mostly in the infundibular part of hair follicles, DB settles in the deeper sebaceous glands and ducts (2, 3). Although these parasites can be found in any part of the skin, they are most commonly seen on the face. They are found more on the forehead, cheek, nose, nasolabial fold, chin, and eyelid, where sebum production is higher than in other areas of the face (4).

Demodex mites may play a role in the etiopathogenesis of rosacea, acne vulgaris, blepharitis, perioral dermatitis, seborrheic

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dermatitis, pustular folliculitis, papulopustular lesions of the scalp, and pustular lesions in acquired immunodeficiency syndrome (AIDS) (5). It has been reported that pathogenicity against these mites may increase in conditions such as lack of attention to skin hygiene, intensive use of cosmetic products, increased sebum production with sweating, oily skin, advanced age, and immunodeficiency (6).

In this study, we aimed to investigate the frequency of Demodex spp. using the superficial skin biopsy method in patients with facial dermatosis and healthy individuals and to determine the relationship between this pathogen and facial dermatosis, hygiene habits, and skin type.

MATERIAL METHOD

This study was conducted in accordance with the Declaration of Helsinki. The study was approved by the Ankara Training and Research Hospital Clinical Research Ethics Committee, and written informed consent was obtained from all patients. 103 patients of all age groups who were clinically and/or histopathologically diagnosed with rosacea, steroid-induced perioral dermatitis, perioral dermatitis, seborrheic dermatitis, acne vulgaris and who agreed to be investigated for Demodex and who were admitted to the Ankara Training and Research Hospital Skin and Venereal Diseases Outpatient Clinic were included in the study. As a control group, 104 volunteer patients with the same age distribution who were admitted to the same outpatient clinic, did not have facial dermatosis, and accepted the study conditions were included in the study.

Data on hygiene habits (common towel, number of face washes, use and type of facial cleanser, and use of cosmetic products) and skin types were collected from the patients upon their first admission to the study. The patients and control group were examined one hour after washing and drying their faces with white soap. If the change in the napkin was in the form of a slight moistening when we gently pressed the entire face, it was classified as a neutral skin type. If the napkin appeared almost dry and not moist at all, it was classified as a dry skin type. If the napkin was dry when you did the napkin test on the cheek area, but oily around the nose and forehead, it was classified as a mixed skin type. If the napkin appeared quite oily and moist when applied to the entire face, it was classified as oily skin type

Non-invasive standard superficial skin biopsy (SSSB), which is the most appropriate method for the detection of Demodex spp. density, was performed. A drop of cyanoacrylic adhesive was placed on the clean slide. It was pressed on the lesioned skin area of the patient, held for one minute, and then withdrawn. Immersion oil was dripped onto the sample and covered with a coverslip. The preparations were examined under a light microscope at x10 and x40 magnifications to determine the density of Demodex spp. per cm2. The presence of five or more Demodex spp. per cm2 was considered positive for diagnosis.

Statistics

Data analysis was performed with SPSS (Statistical Package for Social Science (SPSS) 15.0 program, and a 95% confidence

Table 1. Demographic data of patients with facial dermatosis and control patients

Variables		Patient (n=103)	Control (n=104)	p
Age (Mean)		37,37±17,15	35,42±15,76	
Age Subgroup				0,443
	≤25 years	36 (%34,9)	36 (%34,6)	
	26-35 years	16 (%15,5)	23 (%22,1)	
	≥36 years	51 (%49,5)	45 (%43,2)	
Gender				0,027*
	Female	57 (%55,3)	73 (%70,1)	
	Male	46 (%44,6)	31 (%29,8)	

Table 2. Presence of Demodex in patient and control groups.

		Patient Group (n=103)	Control Group (n=104)	p
Demodex	Negative	59 (%57,3)	69 (%67)	0,179
	Positive	44 (%42,7)	35 (%34)	

Table 3. Distribution of Demodex in patient and control groups according to age.

		Demodex (-)	Demodex (+)	p
Patient Group	≤25 years	26 (%72,2)	10 (%27,7)	0,075
	26-35 years	8 (%50)	8 (%50)	
	≥36 years	25(%49)	26 (%51)	
Control Group	≤25 years	25 (%69,4)	11 (%30,6)	0,886
	26-35 years	15 (%65,2)	8 (%34,7)	
	≥36 years	19 (%54,2)	16 (%45,7)	

level was used. The chi-square test of independence was used to analyze the relationship between categorical variables. The p-value calculated as a result of the analysis was less than the significance coefficient of 0.05, indicating a relationship between the variables.

RESULTS

Of the 103 patients with facial dermatosis, 57 were female (55.3%) and 46 were male (44.6%). In the control group of 104 patients, 73 were female (70.1%) and 31 were male (29.8%). The demographic data of patients with facial dermatosis and control patients are shown in Table 1. The age distribution of the patient group ranged between 8-81 years with a mean age of 37.37±17.15 years. The age distribution of the control group ranged between 10-76 years and the mean age was 35.42±15.76 years. As indicated in Table 1, the patient and control groups were homogeneous in terms of age distribution. The presence of Demodex in the patient and control groups is presented in Table 2. Demodex was detected in 44 (42.7%) and 59 (57.3%) of 103 patients in the patient group. In the control group, 35 (34%) patients had Demodex, while 69 (67%) did not. There was no statistically significant difference between the patient and control groups in terms of the presence of Demodex (p>0.05)

Demodex was detected in 10 (27.7%) of 36 patients aged 25 years and younger, 8 (50%) of 16 patients aged 26-35 years, and 26 (51%) of 51 patients aged 36 years and older in the patient group. In the control group, Demodex was found in 11 (30.6%) of 36 patients aged ≤ 25 years, 8 (34.7%) of 23 patients aged 26-35 years, and 16 (45.7%) of 35 patients aged ≥ 36 years. There was no statistically significant relationship between the presence of Demodex and age in the patient and control groups (p>0.05) (Table 3). Demodex was found in 26 of 57 female (45.6%) and 18 of 46 male (39.1%) in the patient group. In the control group, Demodex was found in 25 of 73 female (34.2%) and 10 of 31 male (32.2%). There was no statistically significant relationship between the presence of Demodex and sex in the patient and control groups (p>0.05) (Table 4). Among patients with facial dermatosis, 48 (44%) had rosacea, 25 (23%) had acne, 28 (26%) had seborrheic dermatitis, 7 (6%) had perioral dermatitis, and 1 (1%) had contact dermatitis.

When the subgroups of patients with facial dermatosis were compared in terms of the presence of Demodex, Demodex was found in 22 (45.8%) of 48 patients with rosacea, 8 (32.0%) of 25 patients with acne vulgaris, and 1 (14.3%) of patients with perioral dermatitis. There was no statistically significant relationship between the presence of Demodex and rosacea, acne vulgaris, or perioral dermatitis (p=0.281). Demodex was detected in 17 (60.7%) of 28 patients with seborrheic dermatitis and a statistically positive relationship was found between seborrheic dermatitis and the presence of Demodex (p=0.015) (Table 5).

When common towel use, frequency of face washing, use of facial cleanser and cosmetic products were evaluated in the patient and control groups, the higher rate of common towel use in the patient group was statistically significant (p=0.044). In addition, the use of facial cleanser was lower in the patient group than in the control group (p=0.004). When hygiene habits were analyzed under the subheadings of common towel, number of face washes, use and type of facial cleanser, and use of cosmetic products, Demodex was found in 36% of patients who used "common towel" and in 40.6% of those who did not. Demodex was present in 54.5% of those who washed their face once a day or less and in 38.6% of those who washed their face five times or more. Mites were detected in 37.4% of those who did not use facial cleansers and 29.1% of those who did. Demodex was detected in 47.3% of those who used soap as a facial cleanser and in 30% of those who used non-

Table 4. Distribution of Demodex in patient and control groups according to gender.

		Demodex (-)	Demodex (+)	p
Patient Group	Female	31 (%54,3)	26 (%45,6)	0,645
	Male	28 (%60,8)	18 (%39,1)	
Control Group	Female	48 (%65,7)	25 (%34,2)	1,000
	Male	21 (%67,7)	10 (%32,2)	

Table 5. Relationship between Demodex and facial dermatoses.

		Demodex (-)	Demodex (+)	p
Rosacea	-	102 (%64,2)	57 (%35,8)	0,281
	+	26 (%54,2)	22 (%45,8)	
Acne vulgaris	-	111 (%61,0)	71 (%39,0)	0,648
	+	17 (%68,0)	8 (%32,0)	
Seborrheic dermatitis	-	117 (%65,4)	62 (%34,6)	0,015*
	+	11 (%39,3)	17 (%60,7)	
Perioral dermatitis	-	122 (%61,0)	78 (%39,0)	0,179
	+	6 (%85,7)	1 (%14,3)	
Contact dermatitis	-	128 (%62,1)	78 (%37,9)	0,382
	+	0 (%0,0)	1 (%100)	

Table 6. Relationship between facial dermatoses, demodex and skin type.

		Patient (n=103)	Control (n=104)	Demodex (-)	Demodex (+)	p
Skin Type	Neutral	3 (%2,9)	10 (%9,7)	11 (%84,6)	2 (%15,4)	0,010*
	Oily	52 (%50,5)	13(%12,6)	30 (%46,2)	35 (%53,8)	
	Dry	30 (%29,1)	49(%47,6)	54 (%68,4)	25 (%31,6)	
	Mix	18 (%17,5)	32(%31,1)	33 (%66,0)	17 (%34,0)	

soap cleansers. Although Demodex was found to be positive in 33.7% of those who used cosmetic products and 42.3% of those who did not. No statistically significant relationship was observed between hygiene habits and the presence of Demodex (p>0.05).

In the patient group, 2.9% had neutral skin, 50.5% had oily skin, 29.1% had dry skin, and 17.5% had mixed skin types. There was a statistically significant difference in skin structural characteristics between the patient and control groups (p<0.05). Demodex was detected in 15.4% of those with neutral skin, 53.8% of those with oily skin, 31.6% of those with dry skin and 34.0% of those with mixed skin. There was a statistically significant relationship between the presence of Demodex and the skin type(p=0.010). Demodex mites were detected at a higher rate in the group with oily skin than in the group with neutral, dry, and mixed skin type (Table 6).

DISCUSSION

DF and DB species are accepted as pathogens that settle in the human body. While it has been stated that the settlement of mites in pilosebaceous follicles may be harmless, some authors have stated that they may play a role in the etiopathogenesis of skin diseases localized on the face (2). When the incidence of Demodex according to age was examined in studies, it was reported that there were no mites in children, it was rare in adolescents, and the incidence of mites increased with age (8-10). The incidence of Demodex increases with age, with a rate of 13% between the ages of 3 and 15 years and up to 95% between the ages of 71 and 96 years (11). In our study, the total incidence rate of Demodex was 38.1%. When the distribution according to age groups was evaluated, although not significant, it was found that the rate of Demodex was positively correlated with age in accordance with the literature. This finding may be due to the increase in sebaceous activity with age, which creates a favorable environment for mite proliferation and increases the incidence of mites in older individuals. There are conflicting results in the literature regarding the relationship between sex and Demodex. In their study conducted in 2010 on patients with a diagnosis of rosacea, Taş et al. found that the rate of parasite presence in females was higher than that in males and reported a significant relationship between sex and mite positivity (12). In this study, no significant relationship was found between sex and Demodex positivity in the control and patient groups.

Different results related to the relationship between facial dermatoses and Demodex have been reported in the literature. In skin biopsy samples obtained by Roihu and Kariniemi in 1998 from 80 patients with rosacea, 40 patients with eczematous eruptions, and 40 patients with discoid lupus erythematosus, the prevalence of mites in patients with rosacea (51%) was higher than that in patients with eczema (28%) and discoid lupus erythematosus (31%) (13). Of the 103 patients who participated in our study, 44% had rosacea. Demodex was positive in 45.8% of 48 patients with rosacea. Although not significant, a high rate of Demodex positivity was found on the faces of patients with rosacea, similar to that reported in the literature. Polat et al. detected DF in 12 (15.4%) of 78 patients with acne vulgaris in samples taken from three different facial regions, including the forehead, cheek, and chin, and from pimples using the SSSB method (14). Baysal et al. detected Demodex in 11.8% of 101 patients with acne vulgaris and stated that they could not detect any mites in the control group (15). In this study, 25 (23%) of 103 patients with facial dermatosis were diagnosed with acne vulgaris, and Demodex mites were found to be positive in 32% of them. However, no significant differences were observed when compared with those without acne vulgaris (p>0.05). It was thought that the fact that acne vulgaris is generally seen in the adolescent age group and the incidence of Demodex mites increases with age may be the reason for the low rate of mites seen in this young patient group.

In contrast to the above studies, the lack of a statistically significant relationship between rosacea, acne vulgaris, and perioral dermatitis and Demodex positivity in our study may be due to the small number of patients in these groups, or it may be due to the inability to detect mites located deep in the follicles with the SSSB method.

Seborrheic dermatitis is a chronic and superficial inflammatory skin disorder that typically presents with erythematous, oily, yellow squames on sebaceous gland-rich areas, such as the scalp, face, chest, back, and flexural regions. Although its exact etiology remains unidentified, multiple factors, including increased sebum production, Pityrosporum ovale colonization, medications, immune dysfunction, genetic predisposition, neurological disorders, psychological stress, dietary habits, lifestyle, and environmental factors, have been associated with its development or worsening of its symptoms (16). In a case-control study conducted by Karabay et al. in 2020 with 127 patients, the three most common facial dermatoses, acne vulgaris, rosacea, and seborrheic dermatitis, were investigated in terms of Demodex etiopathogenesis via superficial skin biopsy (17). The findings of this study suggest a significant association between Demodex infestation and the presence of rosacea, acne vulgaris, and seborrheic dermatitis in patients with psoriasis. Immune system activation, inflammatory responses, and follicular alterations induced by Demodex mites may play a role in the pathogenesis of these conditions. In a case-control study conducted by Kilinc et al. in

2023, Demodex mites were investigated in the lesions of patients with seborrheic dermatitis, in their skin without lesions, and in the control group; mite positivity was found to be 50%, 2.6%, and 12.5%, respectively. In light of the statistical data obtained, they thought that Demodex, which is a part of the microbiota, may be a predisposing factor in the development of Seborrheic Dermatitis (18). In a study conducted by Karıncaoğlu et al. in 2009, mites were found to be positive in 50% of patients with seborrheic dermatitis (19). In this study, seborrheic dermatitis was detected in 28 of the 103 patients (26%). 60.7% of the patients with seborrheic dermatitis had Demodex, which was higher than the rate reported by Karıncaoğlu et al. in 2009 and there was a relationship between seborrheic dermatitis and the presence of Demodex ($p<0.05$). This result supports the commonly known theories that increased mite density may stimulate sebaceous follicles and increase sebum secretion, and that cytokines released from keratinocytes by reactivating the immune system or stimulating inflammation with toxic products induce Seborrheic Dermatitis and the possible role of Demodex in the pathogenesis of seborrheic dermatitis.

In a study conducted in 2005, Fabienne et al. reported that washing the face twice a day with a cleanser or soap decreased Demodex density in humans. They stated that this was because the chemical agents in the soap covered the face and controlled and prevented infestation (20). It is thought that sebum ratio increases in those who do not use facial cleanser and wash their face less frequently and creates a suitable environment for mite reproduction. However, Zhao et al. did not find a relationship between daily face washing frequency, hygienic practices such as washing the face with soap or cleanser, and Demodex infestation in their study conducted with the SSSB method in 756 students with or without facial dermatosis. They suggested that although the facial cleanser and soap used clean the skin surface, they cannot clean the sebaceous glands and hair follicles. They also reported that the use of common towels may increase the risk of infestation (21). In this study, no relationship was found between hygiene habits and the presence of Demodex ($p>0.05$). This result is consistent with the study of Zhao et al.

In two different studies conducted in 2009, Demodex mites were found at a higher rate in patients with mixed and oily skin than in patients with dry and neutral skin (22, 23). Zhao et al. reported that mite infestation was more intense in oily and mixed skin than in dry and neutral skin types (21). In this study, Demodex was present in 53.8% of oily, 34% of mixed, 31.6% of dry, and 15.4% of neutral skin types. Zhao et al. claimed that oily and mixed skin types were associated with Demodex density and that the movement of Demodex in the pilosebaceous unit increased sebum secretion by stimulating the sebaceous glands. Consistent with the literature, a statistically significant relationship was found between oily skin and Demodex positivity ($p=0.01$). This suggests that increased sebaceous activity in oily skin may create a favorable environment for mite proliferation.

Our study had some limitations. Firstly, although the SSSB technique chosen to detect mite positivity is the most useful method for this type of study, it cannot detect mites in deep-seated hair follicles. In addition, statistically significant results may not have been obtained in subgroup analyses due to the insufficient number of patients, especially in the perioral and contact dermatitis subgroups. In our prospectively designed study, all data collection, questionnaire, and microscopic evaluation phases were performed by a single physician, and blinding was not performed.

CONCLUSION

Oily skin type and seborrheic dermatitis, one of the facial dermatoses, has a significant association with Demodex, while factors such as age, sex, hygiene habits were not found to be associated with the presence of Demodex. In larger patient groups, more comprehensive studies are needed on the relationship between Demodex mites and demographic characteristics of patients, their role in the pathogenesis of facial dermatoses, especially seborrheic dermatitis, drug use, hygiene and eating habits, and structural features of the skin.

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