DEMODEX SPECIES POSITIVITY AMONG PATIENTS WITH CANCER, ON HEMODIALYSIS AND WITH DIABETES MELLITUS

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Abstract. The objective of the present study was to determine the prevalence of *Demodex* sp among patients with cancer, on hemodialysis and diabetes mellitus and among controls in order to investigate if there are significance differences in *Demodex* sp positivity. The study was conducted at Atatürk University Research and Application Hospital, Turkey and the Yuzuncu Yil University Parasitology Laboratory, Turkey between 22 August 2011 and 31 May 2016. Study subjects consisted of 50 patients with cancer, 50 patients diagnosed with chronic renal failure and were on hemodialysis, 50 patients with diabetes mellitus and 75 healthy controls. Each patient and each control had a skin surface biopsy using a slide with cyanoacrylate applied wet to the skin until it dried and then was removed and examined under light microscopy at x10 and x40 magnification. A positive sample was one in which ≥5 mites / 1 cm^2 of skin were identified. Twenty percent of the total patient group (n=150) and 5.3% of the control group (n=75) had a positive result. Among the patient groups, 26% of cancer patients, 22% of diabetes mellitus patients and 12% of patients on hemodialysis were positive. A significant association was seen between a positive skin biopsy for *Demodex* sp and cancer (p<0.01) and between a positive biopsy and diabetes mellitus (p<0.01). In conclusion, patients with cancer and diabetes mellitus are more likely to have a positive skin biopsy for *Demodex* sp than controls.

Keywords: *Demodex* sp positivity, cancer, hemodialysis, diabetes mellitus

INTRODUCTION

Demodex Owen, 1843 genus of mites are permanent ectoparasites that generally infest the face of humans (Akilov and Mumcuoglu, 2004; Özcel *et al*, 2007a). *Demodex folliculorum* and *Demodex brevis* cause infestations in humans (Markell *et al*, 1992; Özcel *et al*, 2007a). *D. folliculorum* primarily infests facial hair follicles (Gunn and Pitt, 2012; Elston and Elston, 2014), but has also been found to infest the hair follicles in the external auditory canal, on the back, nipple and penis and in sebaceous glands (Özcel *et al*, 2007a; Karaman *et al*, 2016). Large numbers of *Demodex* sp may cause symptoms, such as acne rosacea, acne vulgaris, seborrheic dermatitis, and blepharitis by carrying microorganisms (Özcel *et al*, 2007a,b; Elston, 2010; Elston and Elston, 2014).

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Some researchers consider this mite to be a pathogen when its density exceeds five per square centimeter (Özcel *et al*, 2007a).

The pathogenicity of these mites may increase in patients with poor skin hygiene, those who use excessive cosmetics without removing them after use, among those with increased sebum production due to perspiration, especially during the summer, those with oily skin, the elderly, those with inadequate immunity and those with suppressed immunity due to steroid use (Bonnar *et al*, 1993; Aydingöz *et al*, 1997; Özcel *et al*, 2007a,b; Garbacewicz *et al*, 2012; Elston and Elston, 2014). However, some authors argue *Demodex* mites do not have a pathogenic role (Özcel *et al*, 2007a; Elston, 2010; Elston and Elston, 2014).

The objective of the present study was to determine the prevalences of *Demodex* sp in patients with cancer (CA), on hemodialysis (HD), with diabetes mellitus (DM) and controls and to determine if there is a statistical significance of *Demodex* sp positivity versus controls.

MATERIALS AND METHODS

Study site

The cross sectional study was conducted at Atatürk University Research and Application Hospital, Erzurum, Turkey and the Yuzuncu Yil University Research and Application Hospital, Parasitology Laboratory, Van, Turkey between 22 August 2011 and 31 May 2016.

Study subjects

The study subjects consisted of 50 patients with CA, 50 patients diagnosed with chronic renal failure (CRF) and being on HD, 50 patients with DM (patient group) and 75 healthy individuals (control group). Inclusion criteria for the patient group were: patients with only 1 of the selected medical conditions (CA, DM or HD) who were willing to participate and who denied a history of tobacco or alcohol dependency. Inclusion criteria for the control group were: having no history of any chronic medical conditions, who were not taking medication and were willing to participate.

Fig 1–View of the *Demodex* sp identified by SSSB method in the study.

Collection and evaluation of the samples

A standardized skin surface biopsy (SSSB) was obtained from each participant. The skin samples were taken from alae nasi, cheek and forehead of each participant. The skin sample was obtained by placing a drop of cyanoacrylate on a slide, the slide was applied to the sample site until dry, approximately one minute, and then removed carefully. A drop of Hoyer solution was then applied to the slide, which was examined under a light microscope at x10 and x40 magnification. If the mite density per square centimeter was ≥5, then the sample was considered to be positive (Özcel *et al*, 2007a; Sönmez Uysal *et al*, 2013; Fig 1).

Statistical analysis

Categorical variables were described using descriptive statistics as quantities and percentages where appropriate. The

Table 1
Demodex sp prevalence in the patient and control groups based on age groups.

	Age group (years)		
	≤ 35 No. (%)	≥ 36 No. (%)	Total No. (%)
Patient group			
CA (a: 9, b: 41)	3 (33.3)	10 (24.4)	13 (26)
	*Z = 0.52 p>0.05		**Z = 3.07; p<0.01
HD (a: 7, b: 43)	2 (28.6)	4 (9.3)	6 (12)
	*Z = 1.09 p>0.05		**Z = 1.26; p>0.05
DM (a: 10, b: 40)	1 (10)	10 (25)	11 (22)
	*Z = 1,28 p>0.05		**Z = 2.6; p<0.01
Total (a: 26, b: 124)	6 (23.1)	24 (19.4)	30 (20)
	*Z = 0.41 p>0.05		**Z = 3.52; p<0.01
Control group			
Healthy people (a: 20, b: 55)	1 (5)	3 (5.5)	4 (5.3)

a, Number of ≤35 age group patients; b, Number of ≥36 age group patients. *Patients were compared based on their age groups.**Patient groups and control group were compared.

chi-square test was used to determine correlations between categorical variables. The Z (t) test was used to compare ratios. Variable characteristics were described using means, standard deviations minimums and maximums. Significance was set at p<0.05. SPSS (version 13; SPSS, Chicago, IL) was used to make all the statistical calculations.

Ethical approval

Ethical approval for the study was obtained from the Yuzuncu Yil University Scientific Research Ethics Committee. Written informed consent was obtained from each subject prior to participation in the study.

RESULTS

Of the 150 subjects in the patient group, the mean age was 51 ± 16 (range: 18 - 82 years); 80 were males; 124 were aged ≥ 35 years. Of the 75 subjects in the control group, the mean age was 50 ± 19 (range: 19 - 86 years); 40 were females; 55 were aged ≥35 years. Thirty (20%) of the patient group and 4 (5.3%) of the control had a positive skin sample for *Demodex* sp. Twenty-six percent of CA patients, 22% of DM patients and 12% of HD patients had a positive skin sample for *Demodex* sp. More subjects aged ≤35 years (23.1%) had a positive test than those aged ≥36 (19.4%) (Table 1). More female subjects (24.3%) than male subjects (16.3%) had a positive skin samples for *Demodex* sp (Tables 2).

There were significant associations between having CA and *Demodex* positivity (p<0.01) and having DM and *Demodex* positivity (p<0.01). Comparison of all patients groups (150 patients) with control group (75 subjects) demonstrated that there was a significant difference (p<0.01) between the two age groups based on the parasite positivity (Table 1). When comparing patients with CA, DM and on HD with *Demodex* positivity according age group (≤35 years *vs* ≥36 years),

Table 2
Demodex sp prevalence in the patient and control groups based on gender.

	Female No. (%)	Male No. (%)
Patient group		
CA (a: 25, b: 25)	6 (24)	7 (28)
	*Z = 0.32 p>0.05	
HD (a: 30, b: 20)	4 (13.3)	2 (10)
	*Z = 0.36 p>0.05	
DM (a: 15, b: 35)	7 (46.7)	4 (11.4)
	*Z = 2.52 p<0.05	
Total (a: 70, b: 80)	17 (24.3)	13 (16.3)
	*Z = 1.22 p>0.05	
Control group		
Healthy people (a: 40, b: 35)	3 (7.5)	1 (2.9)

*Comparing females and males in the patient groups. a, Number of females; b, Number of males.

there was no statistically significant difference. When these 3 patient groups are compared based on gender for *Demodex* sp positivity, a statistically significant difference was found only in patients with DM, however a statistically significant association was not found in patients with CA and on HD. When all patients are considered (150 patients), there was no significant association between age groups or gender based on *Demodex* sp positivity (Table 1, 2).

DISCUSSION

Some studies have evaluated the association between findings *Demodex* sp on skin sample and having impaired immunity as seen in CA and DM patients (Bonnar *et al*, 1993; Karaman *et al*, 2010; Gökçe *et al*, 2013; Bhandari and Reddy, 2014; Elston and Elston, 2014). Some studies did find a significant association between having CA, DM or being on HD and having a positive skin sample for *Demodex* sp similar to our study (Sun *et al*, 2005; Inci *et al*, 2012; Gökçe *et al*, 2013; Karincaoglu *et al*, 2014).

In the present study, *Demodex* sp positivity was found in 26% of the CA patients and there was significant association between having CA and *Demodex* positivity (p<0.01). Similar findings were reported in some studies. Sun *et al* (2005) determined *Demodex* positivity in 56% of patients with basal cell carcinoma (p<0.05). Inci *et al* (2012) reported 22.4% of 49 patients with urological cancers and 3.2% of 31 people in control group (p<0.019) were positive for *Demodex folliculorum*. Erbağci and Erkılıç (2000) found 44.68% of 94 basal cell carcinoma patients and 25% of the control group were positive for *Demodex* sp (p<0.05), Seyhan *et al* (2004) reported positivity of *Demodex* sp in 28% of 50 patients with kematological malignancies (p<0.05), and Sönmez Uysal *et al* (2013) found *Demodex* sp positivity in 76.2% of 101 patients with various types of cancer (p<0.05). In the study of Karaman *et al* (2010), 31.6% of 38 patients with squamous cell carcinoma and 44.8% of 58 patients suffured from basal cell carcinoma were positive for *Demodex* sp. It was emphasized by Karaman *et al* (2010) that this infestation should be monitored in the follow-up of the treatment of CA patients.

In our study, although *Demodex* sp positivity was significantly higher in CRF on HD patients (12%) when compared to the control group (5.3%), there was no statistically significant correlation between being on HD and the parasite positively. Literature review revealed only one study (Yagdiran Düzgün and Aytekin, 2007) on *Demodex* sp prevalence in HD patients and only two studies (Karincaoglu *et al*, 2005; Özçelik *et al*, 2007) on *Demodex* sp

prevalence in CRF patients. In the study of Yagdiran Düzgün and Aytekin (2007), the parasite positivity was determined in 19.54% of HD patient and 10.34% in the control group. In another study, *Demodex* sp was found in 44.4% of CRF patients and in 33.4% of the control group (Karincaoglu *et al*, 2005). In the study of Özçelik *et al* (2007), 38.29% of CRF patients and 26.31% of the control group were *Demodex* sp positive. There was no statistically significant association between the patient group and the control group in these three studies (Karincaoglu *et al*, 2005; Yagdiran Düzgün and Aytekin, 2007; Özçelik *et al*, 2007) similar to the results of the present study.

In our study 22% of DM patients had *Demodex* sp on skin sample and there was a significant association ($p<0.01$) between having DM and *Demodex* sp positivity. Gökçe *et al* (2013) found *D. folliculorum* in 24.6% of 69 female patients with type 2 diabetes ($p<0.05$). Keskin Kurt *et al* (2014) found *Demodex* sp in 24.2% of 33 pregnant women with gestational diabetes and in 3.3% of 30 pregnant women without gestational diabetes ($p<0.001$).

In this study when age groups in CA, DM and HD patients were compared based on *Demodex* sp positivity, no statistically significant association was found. This result was similar to the findings obtained in the studies of Gökçe *et al* (2013), Sönmez Uysal *et al* (2013) and Karaman *et al* (2010). In a study conducted on CA patients (İnci *et al*, 2012), a positive association was identified between *Demodex* sp prevalence and the age groups. In our study when gender was compared based on *Demodex* sp positivity in these 3 patient groups, it was found that there was a statistically significant difference only in patients with DM, however there was no significant differences in patients having CA or being on HD. This finding was similar to the results of the studies of Gökçe *et al* (2013), Sönmez Uysal *et al* (2013) and Karaman *et al* (2010).

In conclusion, it was found that *Demodex* sp infestation was more likely among patients with CA and DM.

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