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

Fatma Yola Mutlu¹ and Zeynep Tas Cengiz²

¹Research and Application Hospital, Dicle University, Diyarbakır; ²Department of Parasitology, Faculty of Medicine, Yuzuncu Yil University, Van, Turkey

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 cm² 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).
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.

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 \( \geq 5 \), 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
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 $51 \pm 16$ (range: 18 - 86 years); 40 were females; 55 were aged $\geq 35$ 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 $\leq 35$ years (23.1%) had a positive test than those aged $\geq 36$ (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 ($\leq 35$ years vs $\geq 36$ years),

<table>
<thead>
<tr>
<th>Table 1</th>
<th><em>Demodex</em> sp prevalence in the patient and control groups based on age groups.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group (years)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\leq 35$</td>
</tr>
<tr>
<td></td>
<td>No. (%)</td>
</tr>
<tr>
<td><strong>Patient group</strong></td>
<td></td>
</tr>
<tr>
<td>CA (a: 9, b: 41)</td>
<td>3 (33.3)</td>
</tr>
<tr>
<td>*Z = 0.52 $p&gt;0.05$</td>
<td>**Z = 3.07; $p&lt;0.01$</td>
</tr>
<tr>
<td>HD (a: 7, b: 43)</td>
<td>2 (28.6)</td>
</tr>
<tr>
<td>*Z = 1.09 $p&gt;0.05$</td>
<td>**Z = 1.26; $p&gt;0.05$</td>
</tr>
<tr>
<td>DM (a: 10, b: 40)</td>
<td>1 (10)</td>
</tr>
<tr>
<td>*Z = 1.28 $p&gt;0.05$</td>
<td>**Z = 2.6; $p&lt;0.01$</td>
</tr>
<tr>
<td>Total (a: 26, b: 124)</td>
<td>6 (23.1)</td>
</tr>
<tr>
<td>*Z = 0.41 $p&gt;0.05$</td>
<td>**Z = 3.52; $p&lt;0.01$</td>
</tr>
<tr>
<td><strong>Control group</strong></td>
<td></td>
</tr>
<tr>
<td>Healthy people (a: 20, b: 55)</td>
<td>1 (5)</td>
</tr>
</tbody>
</table>

a, Number of $\leq 35$ age group patients; b, Number of $\geq 36$ age group patients. *Patients were compared based on their age groups. **Patient groups and control group were compared.
Table 2
Demodex sp prevalence in the patient and control groups based on gender.

<table>
<thead>
<tr>
<th>Patient group</th>
<th>Female No. (%)</th>
<th>Male No. (%)</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA (a: 25, b: 25)</td>
<td>6 (24)</td>
<td>7 (28)</td>
<td>0.32</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>HD (a: 30, b: 20)</td>
<td>4 (13.3)</td>
<td>2 (10)</td>
<td>0.36</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>DM (a: 15, b: 35)</td>
<td>7 (46.7)</td>
<td>4 (11.4)</td>
<td>2.52</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Total (a: 70, b: 80)</td>
<td>17 (24.3)</td>
<td>13 (16.3)</td>
<td>1.22</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Control group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy people (a: 40, b: 35)</td>
<td>3 (7.5)</td>
<td>1 (2.9)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
*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; Karinaöglu 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 Erkulç (2000) found 44.68% of 94 basal cell carcinoma patients and 25% of the control group were positive for Demodex folliculorum. Seyhan et al (2004) reported positivity of Demodex sp in 28% of 50 patients with hematological 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 (Yağdırın Düzgün and Aytekin, 2007) on Demodex sp prevalence in HD patients and only two studies (Karinaöglu et al, 2005; Öçelik 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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REFERENCES


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