Original Article

Changes of Corneal Endothelial Cells and Central Corneal Thickness in Patients with Psoriasis

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Abstract - *To evaluate corneal endothelial changes and central corneal thickness in patients with psoriasis. Methods: In this study, 90 eyes of 45 healthy persons and 90 eyes of 45 psoriasis patients attending the Eye ambulance and eye clinic at Tishreen University Hospital were studied between the years 2023-2024; all participants underwent a complete ophthalmological examination, including corneal endothelial cell counts Bynon contact specular microscopy(Perseus, CSO, Italy), where the average of three successive measurements of Endothelial Cell Density (ECD), hexogram (EX%), coefficient of variation (CV) and central corneal thickness was taken. The dry eye evaluation was performed with tear break-up(TBUT) and the Schirmer test. Results: The values of endothelial cell density (ECD) and hexagram (EX%) decreased statistically significantly in patients with psoriasis (p=0.002, p=0.0001, respectively). At the same time, the value of the covariance (CV) increased statistically significantly in the psoriasis group (P =0.0001). We did not find statistically significant differences in (CCT) between the two groups. We also found that the PASI score had a negative correlation with (ECD) and (EX%) and a positive correlation with (CV). The mean tear break-up(TBUT) and Schirmer test values were significantly lower in the psoriasis group than in the control group (p=0.0001). Conclusion: The eye examination is important in patients with psoriasis to evaluate the corneal endothelial changes, which have an important role in planning intraocular surgeries in patients with psoriasis.*

Keywords - *Psoriasis, Central corneal thickness, Corneal endothelial cells.*

1. Introduction

Psoriasis is an inflammatory, immune-mediated, chronic disease which affects approximately 1 %–3% of the worldwide population [1]. It is considered the main pathogenic mechanism, a TH1-mediated cellular dysfunction that causes systemic inflammation and increased cytokine production. The most common extracutaneous manifestation is arthritis, which develops in up to 30% of psoriasis patients [3]. Psoriasis may cause ocular manifestations that occur in 10% of patients; the possible cause of ocular findings may be the immune-mediated inflammatory processes and the involvement of direct skin lesions. In addition, treatment modalities are used in psoriasis[4]. Psoriasis may affect any part of the eye[3]. The most important ocular manifestations that may be seen in psoriasis are blepharitis, conjunctivitis, uveitis, and dry eye syndrome [5,6]. Many previous studies have also reported a relationship between psoriasis and corneal disease, including punctate epithelial keratitis, deep corneal opacities, sterile corneal infiltrations, and corneal melting[7]. The cornea plays the main role in the refractive power of the eye; in addition to having many physiological characteristics, many factors affect its transparency; perhaps the most important is the role played by the corneal endothelial cells, which are a single non-renewable layer of cells that covers the posterior cornea and work to pump fluids out of the cornea to maintain its transparency[2].

While many studies have been conducted to evaluate the ocular manifestations and biomechanical properties of the cornea in patients with psoriasis, these studies have neglected to study the changes occurring in the corneal endothelium. Therefore, it was important to obtain normative data derived from the local population to evaluate and study the possible changes in the corneal endothelium in patients with psoriasis. Note that there is only one study by Yeter [1]that evaluated corneal endothelial alterations in patients with psoriasis.

2. Patients and Methods

90 eyes were studied for 45 patients who were diagnosed with psoriasis by the Dermatology Department and referred for an ophthalmologic examination to our ophthalmology department at Tishreen University Hospital in Lattakia during the period 2023-2024and 90 eyes of 45 healthy individuals as a control sample. Psoriasis Area and Severity Index (PASI) was used to measure the clinical severity and percentage of areas affected by psoriasis. A comprehensive eye examination was performed, including visual ability and best visual ability after correction, slit lamp examination of the anterior sections, examination of the posterior sections after pupil dilation, ocular surface tests such as Schirmer-1 and Tear Break-Up Time (TBUT) test for dry eye syndrome diagnosis were performed, and

corneal endothelial cell count: taking an average of three consecutive readings of the central part of the endothelium.

Criteria for admission to the study:
Patients with psoriasis in all its forms in adults (26-60 years).

The exclusion criteria included:
- Contact lens usage.
- A history of ocular surgery.
- Glaucoma
- Use of any topical ocular medication
- Trauma.
- Any systemic or autoimmune diseases.
- uveitis

2.1. Ethical Consideration
All patients were provided with full and clear informed consent after discussing the study. The Helsinki Declaration conducted this study.

2.2. Statistical Analysis
Descriptive Study (Cross-sectional)

2.2.1. Description Statistical
Quantitative variables were expressed in arithmetic mean, standard deviation, and qualitative variables in frequencies and percentages.

2.2.2. Inferential Statistical based on the Laws of Statistics
- Chi-square test to compare qualitative variables.
- An independent T Student test was used to compare the average of two independent groups.
- Pearson correlation to study the correlation between quantitative variables.
- The results are statistically significant, with a p-value < 5%.

Adopt IBM SPSS statistics (version25) software to calculate statistical coefficients and analyze results.

3. Results
The research sample included 90 people (180 eyes), including 90 eyes of 45 patients with psoriasis who visited the eye clinic at Tishreen University Hospital in Lattakia during the time period 2024-2023 and the investigator's criteria for inclusion in the research. 90 eyes of 45 healthy individuals as a control sample.

The research aimed to evaluate the effect of psoriasis on the density of the endothelial cells, hexagonality percentage (HEX%), Coefficient of Variation (CV), and central corneal thickness. The relationship between the PASI score and endothelial cells changes. The age of patients in the research ranged from 24 to 60 years, with an average of 43.95 ± 10.8 years.

We can see from the previous table that there were no statistically significant differences between the two research groups with regard to gender.

Table 1. Distribution of the research sample by gender

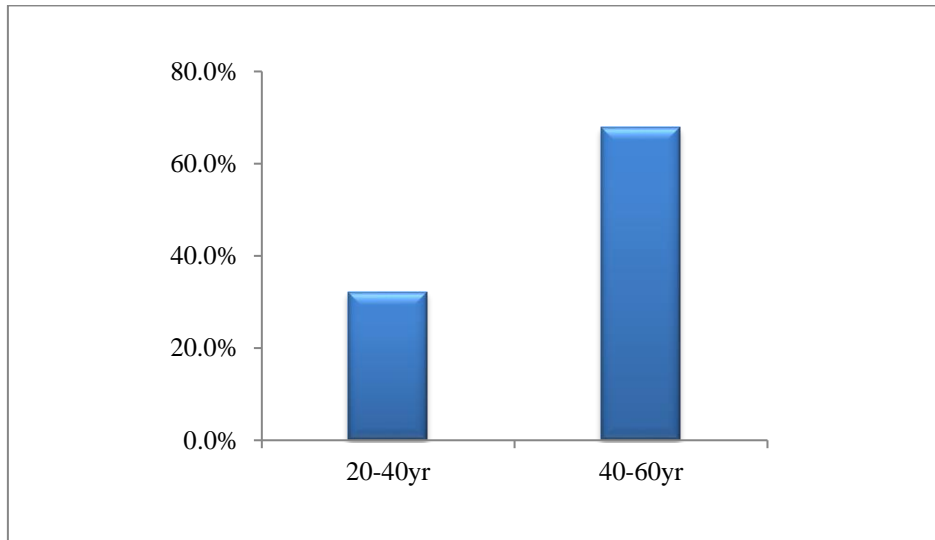| Gender	psoriasis	Healthy control	P-value
Males	20(44.4%)	20(44.4%)	1
Females	25(55.6%)	25(55.6%)	
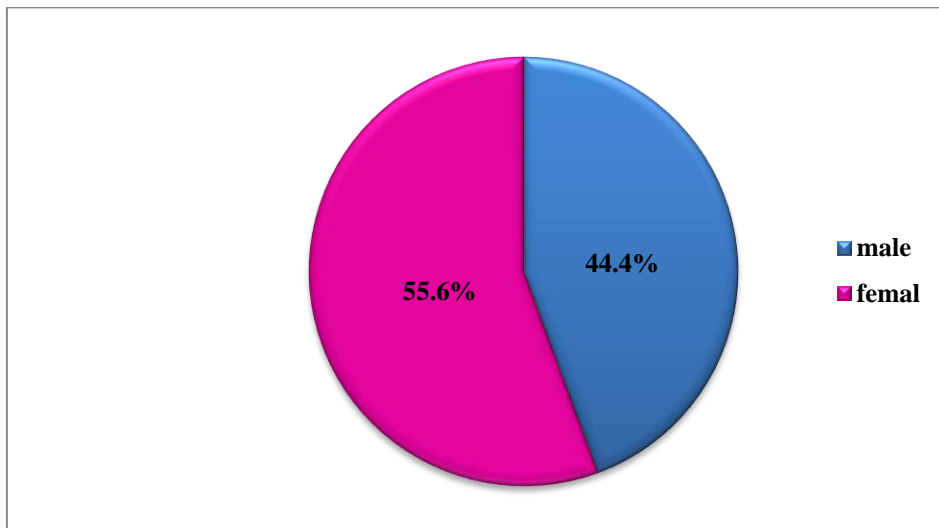
Graph 1. Distribution of the research sample by sex

Table 2. Distribution of the research sample by age

Age(year)	psoriasis	Healthy control	P-value
Mean ± SD	46.66±10.7	43.24±10.4	0.09
Min – Max	57.36- 35.96	53.64-32.84	

We can see from the previous table that there were no statistically significant differences between the two research groups with regard to age.
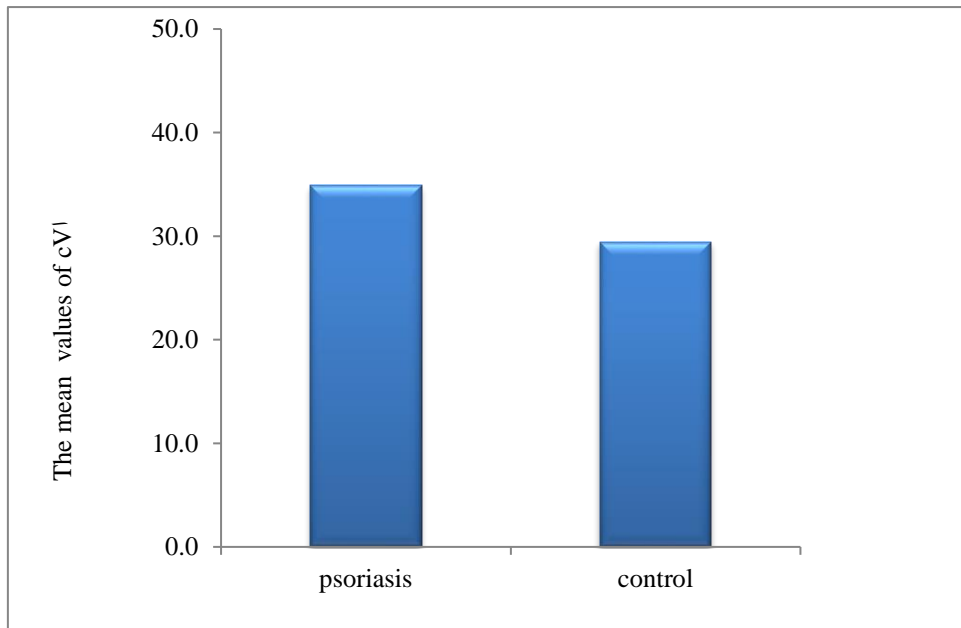

Graph 2. Distribution of the research sample by age

Table 3. Distribution of the research sample by the average values of cv(coefficient of variation)

CV (coefficient of variation)	Psoriasis group	Healthy control	P-value
Mean ± SD	34.88±5.7	29.46±2.6	0.0001

We can see from the previous table that there were statistically significant differences between the two research groups with regard to the values of cv, which was higher in the psoriasis group.
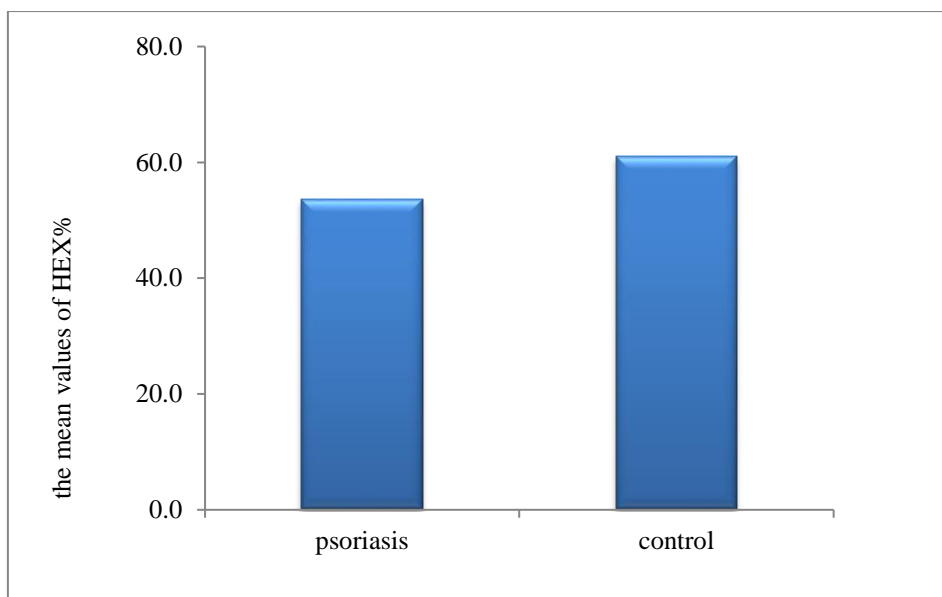

Graph 3. The research sample is distributed according to the average values of the CV coefficient of variation

Table 4. Distribution of the research sample by values of hexagonality percentage (HEX%)

(HEX%)	Psoriasis group	Healthy control	P-value
Mean ± SD	53.64±5.7	61.04±5.4	0.0001

We can see from the previous table that there were statistically significant differences between the two research groups with regard to the values of (EX%), which was lower in the psoriasis group.
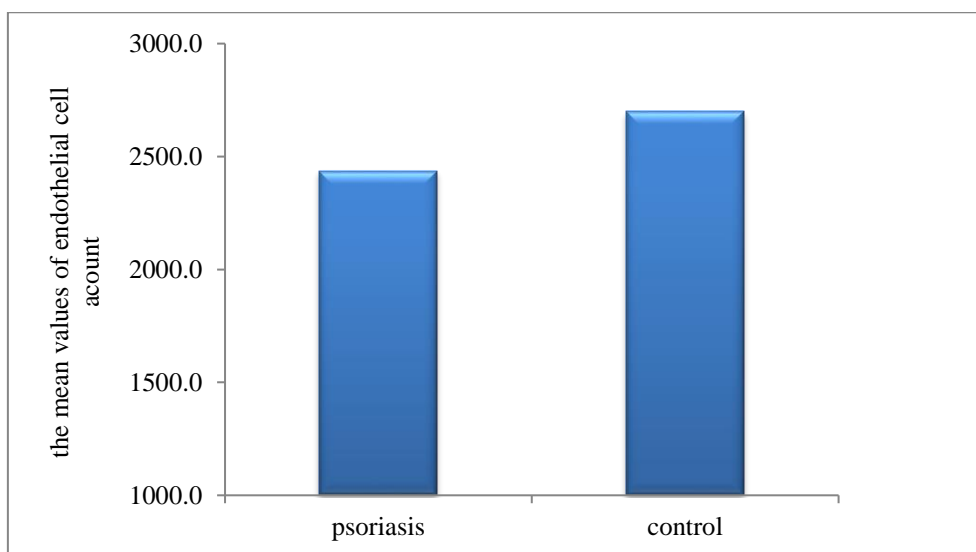
Graph 4. The research sample is distributed according to the average values of hexagonality percentage (HEX%)

Table 5. Distribution of the research sample by average values of endothelial cell count

ECD cells/mm^2	Psoriasis group	Healthy control	P-value
Mean ± SD	2436.5±182.6	2698.5±298.5	0.002

We can see from the previous table that there were statistically significant differences between the two research groups with regard to the values of endothelial cell count (ECD), which was lower in the psoriasis group.

Graph 5. The research sample is distributed according to the average values of endothelial cell account (ECD)
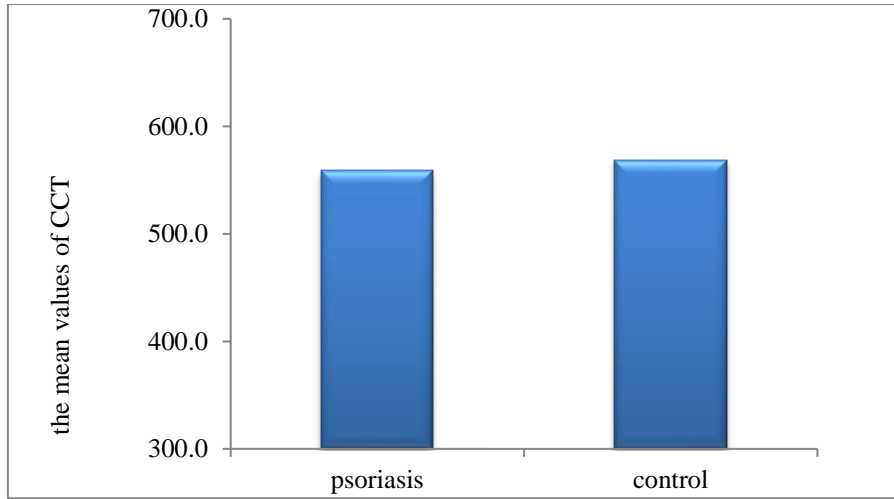
Table 6. Distribution of the research sample by average values of Central Corneal Thickness(CCT)

CCT μm	Psoriasis group	Healthy control	P-value
Mean ± SD	558.66±13.5	568.80±20.03	0.08

We can see from the previous table that there were no statistically significant differences between the two research groups with regard to values of Central Corneal Thickness(CCT). However, it was lower in the psoriasis group.
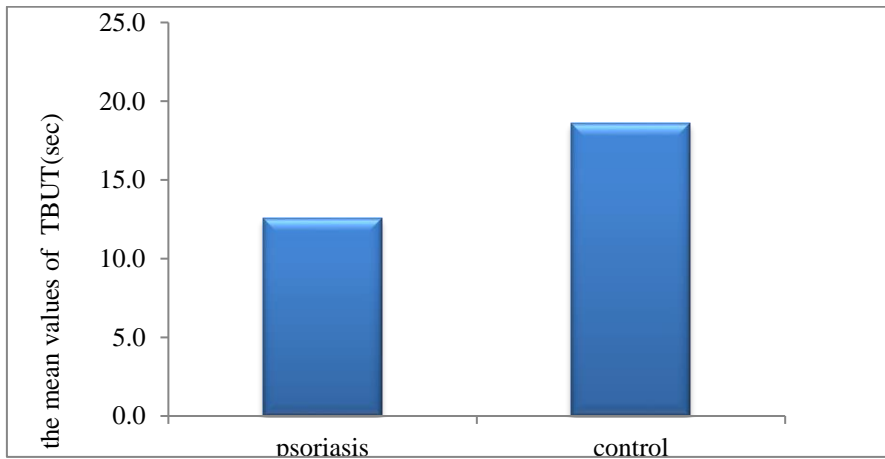
Table 7. Distribution of the research sample by average values of tear film break-up test(TBUT)

TBUT sec	Psoriasis group	Healthy control	P-value
Mean ± SD	12.57±2.5	18.57±1.7	0.0001

Graph 6. The research sample is distributed according to the average values of corneal central thickness (CCT)

We can see from the previous table that there were statistically significant differences between the two research groups with regard to the values of **the** Tear film Break-up Test (TBUT), which was lower in the psoriasis group.
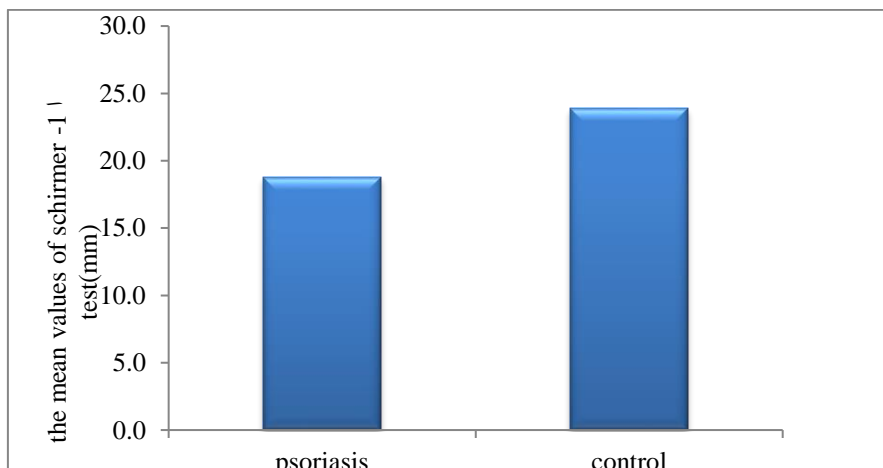

Graph 7. The research sample is distributed according to the average values of the tear film-breakup test (TBUT)

Table 8. Distribution of the research sample by average values of Schirmer -1 test

Schirmer-1 test (mm)	Psoriasis group	Healthy control	P-value
Mean ± SD	18.80±4.2	23.88±2.1	0.0001

We can see from the previous table that there were statistically significant differences between the two research groups with regard to the values of the Shirmer -1 test, which was lower in the psoriasis group.

Graph 8. The research sample is distributed according to the average values of the Schirmer -1 test

Table 9. The relationship between CV (HEX%), ECD and CCT and thePASI scores (area and severity index)

Parameters	Pearson Correlation	P-value
CV	0.83	0.0001
(HEX%)	- 0.76	0.0001
ECD	- 0.84	0.0001

We can see from the previous table that Psoriasis Area and Severity Index (PASI) scores had a negative correlation with Endothelial Cell Density (ECD), and rate of cell hexagonality (HEX%) and a positive correlation with Coefficient of Variation (CV) with statistically significant differences.

4. Discussion

In this study, 90 eyes of 45 patients with psoriasis in all its forms were studied to investigate changes in corneal endothelial cells and central corneal thickness by studying the mean values of corneal Endothelial Cell Density (ECD), coefficient of variation (CV), hexagonality percentage (HEX%) and Central Corneal Thickness(CCT).and studying the correlation between the PASI scores corneal endothelial cell parameters, as well as evaluation the dry eye by TBUT test and SCHIRMER-1 test.

Our results demonstrated a decrease in ECD and (HEX%) and an increase in CV values in terms of endothelial cell properties. On the other hand, the mean CCT was similar between groups. Also, disease severity, according to the PASI scores, was negatively correlated with ECD and (HEX%) and positively correlated with CV. Furthermore, we observed lower TBUT and Schirmer test values in patients with psoriasis compared to healthy controls, which is in agreement with previous studies.

We can explain these corneal endothelial changes in psoriasis patients by the fact that they may be similar to that of skin lesions, in which T lymphocytes, cytokines such as TNF-α, IL-2, and IFN-γ play a role[60].

Celik et al. study investigated the biomechanical changes in psoriasis patients and showed that psoriasis affects these properties. Therefore, they suggested that the chronic inflammatory process affects the ultrastructure of the cornea[61].

The results of our study were in agreement with a study conducted by Yeter et al. [1] in terms of a decrease in endothelial cell density and an increase in the coefficient of variation in psoriasis patients. With no statistically significant differences in central corneal thickness between the two groups, there was a positive correlation between PASI scores and the coefficient of variation and a negative correlation with hexagonality percentage and corneal endothelial cell density. In previous studies, it has been reported that ocular findings increase with the severity of psoriasis recorded by PASI score, which supports our findings [64]. This may demonstrate the effect of the systemic inflammation process on corneal endothelial cell loss in psoriasis patients [36].

The results of our study coincided with Yeter et al. [1] in terms of a decrease in TBUT and Schirmer test values in psoriasis patients. We can explain that because of immune-mediated inflammation, L- arginine deficiency and increased β- defensin production are major factors in both psoriasis and systemic pathogenic mechanisms related to dry eye[62]. Previous studies suggest an obstructive type of miebomian gland dysfunction in patients with psoriasis, which might result from increased turnover of the epithelial lining of the meibomian gland duct [66]. However, we disagreed with Yeter et al.'s study regarding hexagonality percentage, where they did not find statistically significant differences in (HEX%) in psoriasis patients. The difference in the machine can explain this use or the difference in the severity of the disease, which was less than those in the study by Yeter et al.

The results of our study were also in agreement with Edris's [6] study regarding central corneal thickness CCT, where we also did not find statistically significant changes between the two groups. This study was consistent with the results of our study in terms of a decrease in Schirmer test values. They did not use the TBUT test, and they did not study the changes in hexagonality percentage(HEX%), the coefficient of variation (CV)and endothelial cell account(ECD).

The results of our study coincided with the results of Celik et al. [61], where they also did not find statistically significant changes in central corneal thickness CCT between the two groups. We also agreed with Celik et al. regarding a decrease in TBUT and Schirmer test values. They did not study the changes in hexagonality percentage(HEX%), the coefficient of variation (CV), and Endothelial Cell Density(ECD).

5. Conclusion

The study showed statistically significant changes in corneal endothelial cells in terms of cell density(ECD), hexagonality percentage (HEX%) and coefficient of variation(CV), and statistically significant differences in inTBUT and Schirmer-1 test values in psoriasis patients, while we didn't find statistically significant differences in central corneal thickness CCT.

Recommendations

- It is recommended that the relationship between endothelial cell changes and the treatment used for psoriasis be studied.

- The relationship between endothelial cell changes and the form of the psoriasis.

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