Pterygium Morphology And Corneal Endothelial Cell Density(CECD)?

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BACKGROUND

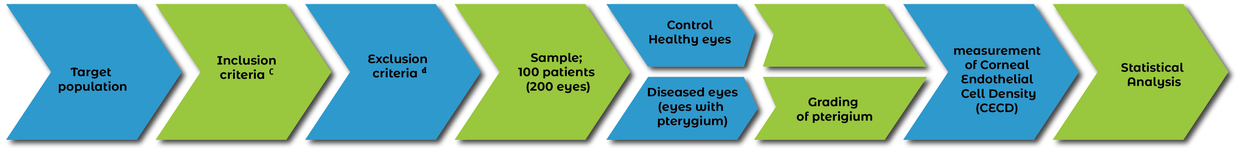
1. **Pterygium** and its increase in size is **associated with significant corneal endothelial cell loss** compared to healthy eyes with some conflicting findings from other research groups[1,2,3].
2. Various **factors** contribute to corneal endothelial cell loss : Matrix metalloproteinsases and inflammatory cascades4.
3. **Confounding variables** for CECD loss include Age, Smoking and Ultraviolet exposure.
4. An **internal audit** at Al-Shifa trust eye Hospital Rawalpindi (ASTEH), Pakistan on patients with cataract surgery for mature cataract with ipsilateral pterygium depicted that significant corneal oedema was present at three months postoperatively compared to those patients without pterygium (P<0.01).
5. There is **scarcity of work** to establish a relationship between the **pterygium morphology and CECD loss**.
6. This is the **first study in Pakistan** to depict the relationship between morphology of pterygium and corneal endothelial cell density loss.

PURPOSE

1. To determine the difference in mean corneal endothelial cell density (CECD) between the healthy and diseased eyes of the patients with unilateral pterygium with different morphology patterns by using a non-contact specular microscope (SP2000: Topcon Corporation, Japan).
2. To find out any relationship between severity of pterygium and daily sunlight exposure with the CECD loss.

RESEARCH METHODOLOGY

A descriptive cross-sectional prospective study was carried out at Al-Shifa Trust Eye Hospital (ASTEH), Rawalpindi, Pakistan from 21st January 2019 to 22nd January 2020. Two hundred eyes (n= 100 patients) of age range18 -68 years with unilateral pterygium were selected. Necessary demographic data and essential variables like age, smoking status, occupation, and daily direct sunlight exposure were determined. The severity of pterygium (grading) based on its morphology(as described by Tan et al [6]) was determined by slit-lamp examination. CECD of each patient was carried out using a non-contact Specular Microscope. The healthy eye (without pterygium) of a patient was considered as control.



[c] Adults with unilateral pterygium

[d] included eyes with pseudo-pterygium, recurrent pterygium, corneal degenerative and hereditary conditions, previous ocular surgery, history of trauma and chemical injuries, uveitis, previous or concurrent contact lens use, keratitis, glaucoma, intraocular pressure of ≥21mm Hg, and diabetes mellitus.

RESULTS

1. **Age :** range of the study = 18–68 years
2. **Gender:** Male to female ratio of 1.6:1
3. **CECD:** The study reported a mean corneal endothelial cell density **(CECD)** of 2411.61±143.64 vs 2751.41 ± 123.674 cells/mm² in diseased and normal eyes, respectively (p-value = 0.0001).
4. **CECD in pterygium**:
   - Grade 3 (Fleshy) pterygium2261 cells/mm²
   - Grade 2 (Intermediate)= 2413 cells/mm²
   - Grade 1 (Atrophic)=2459 cells/mm²

   ➢ this difference between the groups was not found to be significant (p=0.065).
5. **Sunlight exposure:** No significant association between sunlight exposure and CECD loss was observed (p=0.065).

Figure 1 Basic demographic details of 100 patients with unilateral pterygium

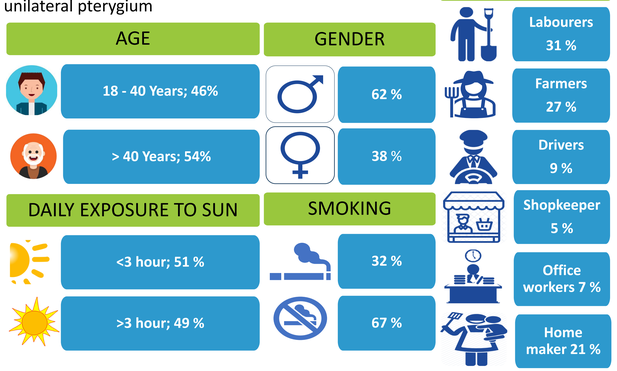
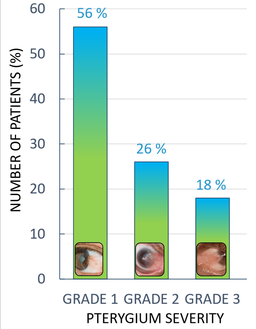


Figure 2 Distribution of pterygium severity in sample population



RESULTS

Table 1 Stratification of CECD with Respect to Various Confounding Variables

Variables	Corneal endothelial cell density(CECD) in pterygium group		P- Value
	Mean(cells /mm²)	SD	
1. AGE GROUPS (years)			
18-40	2401.17	137.08	0.078
>40	2419.70	136.98	
2. GENDER			
Male	2408.77	131.98	0.563
Female	2415.10	134.68	
3. SMOKING			
Yes	2420.06	131.23	0.249
No	2407.02	129.05	
4. DAILY SUNLIGHT EXPOSURE			
Less than 03 hours	2406.06	132.23	0.650
Greater than 03 hours	2414.05	133. 76	

Figure 3 Relationship between mean corneal endothelial cell density (CECD) and severity of pterygium (graded according to morphology).

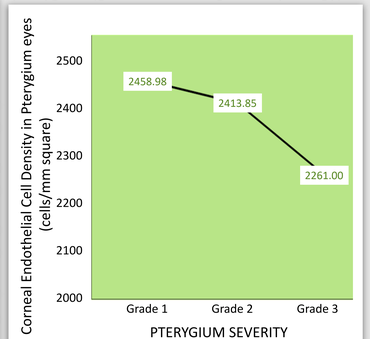


Table 2: Paired sample t-test was applied to compare the corneal endothelial cell density (CECD) between Pterygium (n=100) and healthy eyes (n=100). A significant difference (MD= -339.80, t (df)= -16.120 (99), p-value= <0.05) of CECD was found between pterygium and healthy eyes.

		Mean (cells/mm²)	Number of eyes (N)	Std. Deviation (SD)	Std. Error Mean (SEM)
Pair	CECD pterygium	2411.6100	100	143.64574	14.36457
	CECD in Control (Healthy) eyes	2751.41	100	123.674	12.367

CONCLUSIONS

This study concluded that the mean corneal endothelial cells in patients with unilateral pterygium using a non- contact specular microscope were 2411.61±143.64 cells/mm2. So, we recommend that corneal endothelial cell density be used in every patient with pterygium by using a non-contact specular microscope to take appropriate measures to improve patients' outcomes, especially in patients requiring cataract surgery.

References:

1. Cárdenas E, Zavala J, Valenzuela J, Valdez JE. Molecular Basis of Pterygium Development. Semin. Ophthalmol. 2014;31(6). Doi:10.3109/08820538.2014.971822.
2. Sousa HCC, Silva LNP, Tzelikis PF. Corneal endothelial cell density and pterygium.- a cross-sectional study. Arq Bras Oftalmol. 2017;80(5):317-20
3. Hsu MY, Lee HN, Liang CY, Wei LC, Wang CY, Lin KH, et al. Pterygium is related to a decrease in corneal endothelial cell density. Cornea. 2014;33(7):712-5
4. Tsai YY, Chiang CC, Yeh KT, Lee H, Cheng YW. Effect of TIMP-1 and MMP in pterygium invasion. Investig. Ophthalmol. Vis. Sci. 2010;51(7):3462–3467.
5. Mooren P, Gobin L, Bostan N, Wouters K, Zakaria N, Mathysen DG, et al. Evaluation of UVA cytotoxicity for human endothelium in an ex vivo corneal cross-linking experimental setting. J Refract Surg. 2016;32:41–6.
6. Tan DT, Chee SP, Dear KB, et al. Effect of pterygium morphology on pterygium recurrence in a controlled trial comparing conjunctival autografting with bare sclera excision. Arch Ophthalmol 1997;115:1235–40
7. Hu, Y., Atik, A., Qi, W. and Yuan, L. The association between primary pterygium and corneal endothelial cell density. Clin Exp Optom, 2020;103: 778-781.

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