

Evaluation of Endothelial Cell Loss After Cataract Surgery in Patients with Pseudoexfoliative Syndrome

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Abstract

Introduction: Despite modern techniques and technologies for cataract surgery, pseudoexfoliative syndrome poses a challenge to surgeons due to weakness of the zonular apparatus and limited pupillary dilation.

Quantitative and qualitative morphological changes in the corneal endothelium have been demonstrated by several studies.

An accumulated risk of endothelial cell loss can be expected in these patients following more complicated and prolonged surgery, often requiring complex manipulation of the cataract, iris, and IOL.

Our present work aims to compare the loss of endothelial cells after uncomplicated phacoemulsification in patients without and with pseudoexfoliative syndrome.

Materials and methods: We conducted a prospective comparative study collected at the Rabat specialty hospital, spanning from August to December 2023.

Were included in this study 60 candidates for cataract surgery:

- 30 patients with pseudoexfoliation syndrome (PXF) and
- 30 without capsular exfoliation (non-PXF) as a control group.

We excluded from this work diabetic patients, glaucomatous patients, patients with a history of surgery, ocular trauma or uveitis, high myopia, patients with preoperative corneal abnormalities as well as all complicated cataract surgeries.

All patients underwent cataract surgery by phacoemulsification with implantation.

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All patients underwent cataract surgery by phacoemulsification with implantation.

Discussion: In our series, we did not find a statistically significant difference in the density of preoperative endothelial cells between the 2 groups, this result is similar to that obtained by KALJURAND et al, on the other hand for ken hayashi et al, and wirbelauer et al, the difference between the 2 groups was statistically significant.

Regarding postoperative cell loss, our results agreed with those obtained by Ken Hayashi et al, who also reported greater endothelial cell loss in the PXF group compared to the control, unlike Wirbelauer et al, for whom the loss of endothelial cells was similar between the 2 groups.

In the study by Kaljurand et al, the average percentage loss was 18% in the PXF group versus 11.6 in the control group, this difference had a statistically low significance.

Conclusion: The loss of corneal endothelial cells after phacoemulsification in eyes with capsular pseudoexfoliation was significantly greater than in eyes without PXF, these results suggest that corneal endothelial cells of patients with pseudoexfoliation syndrome are more vulnerable to cataract surgery than healthy endothelial cells.

To prevent serious endothelial lesions, a precise preoperative evaluation of the corneal endothelial state by specular microscopy seems necessary in these patients, with more precision and precautions during the procedure.

Introduction:

Despite modern techniques and technologies for cataract surgery, pseudoexfoliative syndrome poses a challenge to surgeons due to weakness of the zonular apparatus and limited pupillary dilation.

Quantitative and qualitative morphological changes in the corneal endothelium have been demonstrated by several studies [1, 2].

An accumulated risk of endothelial cell loss can be expected in these patients following more complicated and prolonged surgery, often requiring complex manipulation of the cataract, iris, and IOL.

Our present work aims to compare the loss of endothelial cells after uncomplicated phacoemulsification in patients without and with pseudoexfoliative syndrome.

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Specular microscopy with measurement of endothelial cell density (ECD), central corneal thickness (CCT), hexagonality and coefficient of variation was performed preoperatively and 8 weeks after surgery. (Figure 1).

We used Student's t test to perform the statistical analysis.



Figure 1: Specular microscopy device used in the study

Results:

Age:

Concerning the results, the mean age of the patients was 71 years in the PXF group, versus 68 years in the control group, this difference was not statistically significant.

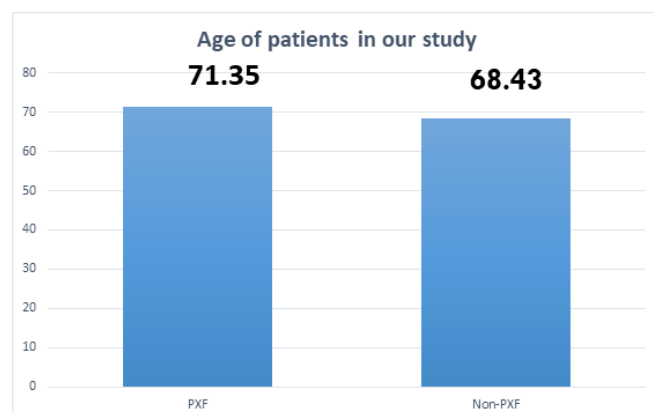


Figure 2: Mean age of patients in the two groups

Gender:

In the PXF group, men accounted for 40% versus 46.5% in the control group.

Preoperative visual acuity and types of cataracts were similarly distributed between the 2 groups.

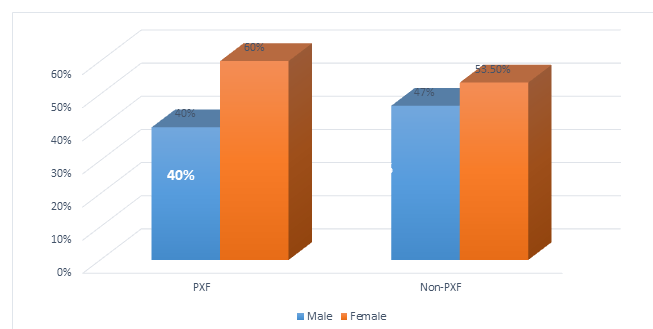


Figure 3: distribution of patients in the two groups according to gender.

Preoperative characteristics:

For preoperative characteristics, the difference in mean keratometry and axial length was not significant.

Table 1: Distribution of mean keratometry, axial length and implant power in the two groups of patients preoperatively.

	PXF	Non-PXF	P
Mean keratometry	44,57 ± 2,26		P:0.30
Axial length	22,01 ± 0,99	23,00 ± 1,61	P:0.09
Implant power	22,34 ± 2,55	20,11 ± 2,80	P:0.45

There was no statistically significant difference between the 2 groups with regard to the preoperative results of the average density of endothelial cells, the coefficient of variation, the hexagonality as well as the central corneal thickness.

Table 2: Distribution of endothelial cell density, coefficient of variation, hexagonality and central corneal thickness in the two groups preoperatively

	PXF	Non-PXF	P
Endothelial cell density	2440,42 ± 42 c/mm ²	2568.37 ± 250 c/mm ²	P: 0.3
Coefficient of variation	32 .27 ± 2.83 %	34.08 ± 6.38%	P: 0.38
Hexagonality	51.69 ± 6.65 %	54.25 ± 9 %	P : 0.4
Central corneal thickness	475,18 ± 27.58 µm	493,070 ± 32 µm	P: 0,16

Operating characteristics:

Regarding the cumulative dissipated energy used during the gesture, it was higher in the PXF group compared to the control group: 14.5 versus 11.4, this difference was not statistically significant.

Table 3: Cumulative dissipated energy used in the two groups intraoperatively.

	PXF	Non-PXF	P
EDC	14,50 ±4,80	11,49± 6,51	0,32

Post-operative results:

The mean postoperative endothelial cell density was significantly lower in the PXF group than in the non-PXF group. Mean central corneal thickness was similar between groups throughout the follow-up period. There was no statistically significant difference for the coefficient of variation and the hexagonality.

Table 4: Distribution of endothelial cell density, coefficient of variation, hexagonality and central corneal thickness in the two groups postoperatively.

	PXF	PXF Post-operative	Non-PXF	Non-PXF Post-operative
Endothelial cell density	2440,42 ± 42	1313,92 ± 368	2568.37 ± 250	1850,87 ± 467
Coefficient of variation	32 .27 ± 2.83	35.25 ± 5.89	34.08 ± 6.38	32.87 ± 4.7
Hexagonality	51.69 ± 6.65	42.57 ± 12	54.25 ± 9	52,18± 10
Central corneal thickness	475,18 ± 27.58	468 ± 47.56	493,070 ± 32	499,4 ± 36.37

The percentage of endothelial cell loss was significantly higher in the PXF group than in the control group. It was about 46% in the PXF group and 27% in the control group.

Table 5: Losses of endothelial cells between the two groups of patients.

	PXF	Non-PXF	P
Losses of endothelial cells	1126,50 ± 438,11	717,43 ± 432,94	0,01

Discussion:

Pseudo-exfoliative syndrome is a degenerative systemic pathology of the extracellular matrix characterized by an accumulation of fibrillar material in the anterior segment of the eye as well as in other organs.

The accompanying endothelopathy is characterized histopathologically by pronounced loss of endothelial cells, fibroblastic transformation, phagocytosis of melanin, and diffuse thickening of Descemet's membrane. Other reports have suggested that iris hypopropusion, anterior chamber hypoxia, and altered aqueous humor composition may also be responsible for endothelial changes.

Pseudoexfoliation as a risk factor for endothelial cell loss after phacoemulsification is a controversial subject.

In our series, we did not find a statistically significant difference in the density of preoperative endothelial cells between the 2 groups, this result is similar to that obtained by KALJURAND et al [3], on the other hand for ken hayashi et al [4, 5], and wirbelauer et al, the difference between the 2 groups was statistically significant.

Table 6: Comparing between our study and other studies with respect to preoperative endothelial cell density.

	Preoperative endothelial cell density
Our study	No statistically significant difference
KALJURAND ET AL	No statistically significant difference
KEN HAYACHI ET AL	Statistically significant difference
WIRBELAUER ET AL	Statistically significant difference

Regarding postoperative cell loss, our results agreed with those obtained by Ken Hayashi et al [4], who also reported greater endothelial cell loss in the PXF group compared to the control, unlike Wirbelauer et al [5], for whom the loss of endothelial cells was similar between the 2 groups.

In the study by Kaljurand et al [3], the average percentage loss was 18% in the PXF group versus 11.6 in the control group, this difference had a statistically low significance.

Table 7: Comparison between our study and other studies regarding postoperative cell loss.

	Perte cellulaire post opératoire 2023
Notre étude	Highest cell loss in PXF group
KEN HAYASHI ET AL	Highest cell loss in PXF group
WIRBELAUER ET AL	Similar loss between the 2 groups
KALJURAND et al	Statistically low significance

Conclusion:

In conclusion the loss of corneal endothelial cells after phacoemulsification in eyes with capsular pseudoexfoliation was significantly greater than in eyes without PXF, these results suggest that corneal endothelial cells of patients with pseudoexfoliation syndrome are more vulnerable to cataract surgery than healthy endothelial cells.

To prevent serious endothelial lesions, a precise preoperative evaluation of the corneal endothelial state by specular microscopy seems necessary in these patients, with more precision and precautions during the procedure.

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