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SMALL PUPIL IN PSEUDOEXFOLIATION: AN OBSTRUCTION FOR CATARACT SURGERY.

Ophthalmology

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ABSTRACT

PURPOSE- To study the pupil size and effect of mydriatics in patients with pseudoexfoliation.
METHODS- A group of 50 patients above the age of 40 years with pseudoexfoliation were selected over a period of 6months in a tertiary care hospital.
RESULTS – It was observed that 50% of our patients belonged to the age group of 61-70 years. There were an equal number of male and female patients. 38% of the participants had small pupil prior to dilatation and 82% had small pupil after dilatation. There was no significant correlation between age, sex and small pupil in patients with pseudoexfoliation.-
CONCLUSION- Thus, thorough and careful planning, surgery and postoperative care, the risk of complications in PXF patients can be minimized, thereby allowing them to achieve good visual results.

KEYWORDS

INTRODUCTION:

Pseudoexfoliation (PXF) is an abnormal, age-related, fibrillopathy that is characterized by the synthesis, accumulation and deposition of exfoliation material in the anterior segment of the eye and other tissues in the body[1].

It is estimated that about 60–70 million people in the world are affected by PXF. Prevalence of PXF increases with age, but shows variation between different geographical regions [2].

PXF is usually diagnosed by visualizing the greyish white PXF material on the pupillary rim or the anterior lens capsule[6].

PXF material has also known to be accumulated within conjunctiva, iris, ciliary epithelium, and the pupillary of eyes with PXF syndrome.[6]

Studies have shown that the most common cause of inadequate dilatation of the pupil was found to be PXF, as it was identified in almost 50% of eyes with small pupil[3].

One of the major risk factors involved in the development of PXF is single nucleotide polymorphisms in the lysyl oxidase-like-one (LOXL1) gene [4].

The LOXL1 gene product is responsible for catalysing the formation of elastin fibres [2].

About 90% of people with the PXF carry this risk factor. However, it has been observed that, about 80% of normal people also carry the same risk factors, thus concluding that *LOXL1* is necessary, but not sufficient, for disease progression[5].

Researchers in Singapore have identified another genetic association which showed the involvement of the calcium channel protein gene *CACNA1A. Variations in CACNA1A* gene may result in altered calcium concentration, that may stabilize or destabilize the fibrillar material, which we characteristically find in patients with PXF [5].

Another gene contributing to the PXF is clusterin, which is an extracellular matrix chaperone that is required to prevent extracellular protein aggregation.[5]

PXF poses a threat preoperatively, intraoperatively and postoperatively during cataract surgery.

Preoperatively, patients with PXF may have miosis and intraoperatively, they may have weakness of zonules, which complicates cataract surgery [2].

Postoperatively, PXF patients may develop spikes in intraocular pressure (IOP) and corneal decomposition[2].

Studies have shown that the rate of complications of PXF in cataract surgery have up to a 10-fold increase in complications [7,8].

Even though there is an increase in the complications, with the combined use of appropriate devices, techniques and approaches, the overall outcome for patients with PXF undergoing cataract surgery can be similar to those for non-PXF patients.[9,10]

MATERIALS AND METHODS

A group of 50 eyes of patients with PXF, who were more than 40 years of age, attending a tertiary care hospital were included in this study over a period of 6 months. A thorough ocular examination was conducted for all of them with a slit lamp. The diagnosis of PXF was made by visualising the pseudoexfoliative material on the pupillary ruff and/or on the anterior lens capsule. For all patients, vertical pupil diameter was measured (to the nearest 0.2 mm) on a Haag-Streit slit lamp with a 1 mm slit width and dim illumination settings in a semi dark room. One drop of Tropicamet PLUS (tropicamide 0.8% with phenylephrine 5%) was administered at 0, 5, 10, 15 and 20 minute intervals. The pupillary diameter was measured before instillation of drops, and at the final dilatation achieved at 60 minutes.Pupil size less than or equal to 6mm at the end of full dilatation was considered as small pupil.

RESULTS

Table 1: Distribution of study participants by age

AGE CATEGORY	FREQUENCY	PERCENT
< 60 yrs	11	22.0
61 to 70 yrs	25	50.0
71 to 80 yrs	14	28.0
Total	50	100.0

Majority of the participants (50%) in our study belonged to the age group of 61-70. Of the 50 participants, 25 males (50%) and 25 females (50%).

Table 2: Distribution of study participants by size of the pupil before dilatation

PUPIL SIZE	NUMBER OF EYES	PERCENTAGE
2mm	19	38%
3mm	21	42%
4mm	10	20%

Table 3 : Distribution of study participants by pupil size after dilatation

PUPIL SIZE	NO. OF EYES
4mm	5
5mm	24
6mm	12
7mm	6
8mm	3

Our study showed that about 38% of the patients had a small pupil prior to dilatation. The average pupil size prior to dilatation was found to be 2.82mm.

Post dilatation we found that 82% of the patients had a pupil of size less than or equal 6mm. The average pupil size was found to be 5.48mm .

Table 4: Distribution of study participants by normal size vs small pupil before and after dilatation

	Before Dilatation	After Dilatation
NORMAL PUPIL	31 (62%)	9(18%)
SMALL PUPIL	19 (38%)	41(82%)

Our study showed no statistical significance in the relationship between pupil dilatation with age or sex (p= 0.702).

DISCUSSION

Pseudoexfoliative material has been found on iris tissues, which include pigment epithelium, stroma, smooth muscle and vessels. Pseudoexfoliative material within the stroma mainly causes mechanical obstruction and atrophy of the iris. This, along with hypoxia due to vascular abnormalities leads to limited mydriasis [11]. The use of the ultrasound biomicroscopy (UBM) is helpful in assessing the zonular apparatus. It can demonstrate the deposition of PXF material on the zonules as well as zonule fragmentation, reduplication and loss. UBM also demonstrates subtle signs of zonular loss such as rounding of the lens equator[2].

A small pupil limits the size of the continuous curvilinear capsulorhexis (CCC). A small CCC can lead to difficulty in nucleus delivery, increased force on the zonules due to additional manipulation, increased risk for anterior and posterior capsular tears, and iris trauma during phacoemulsification. Exfoliative material which is present with in the iris stromal vessels also increases the susceptibility to intraoperative bleeding.[12,13] .

Intraoperative considerations - several management techniques are available that help in managing small pupils, zonular weakness and in preserving the corneal endothelium. The use of a dispersive ophthalmic viscosurgical device (OVD) can help in coating and protecting the cornea during surgery. A cohesive OVD can help in maintaining the anterior chamber depth and avoids vitreous prolapse around capsular bag [2].

Managing a small pupil - The small pupil can be dilated with the help of pharmacological agents or mechanically. Preoperative topical nonsteroidal anti-inflammatory drugs (NSAIDs) along with mydriatic agents may help in reducing the incidence of intraoperative miosis [14]. Mechanical options consist of highly cohesive OVDs, stretching, synechiolysis and mechanical devices. Manipulation hooks can be used to release posterior synechiae and forceps for stripping a synechial ring, thereby helping in expansion of the pupil. A manipulation hook can be used to displace the iris temporarily, thereby allowing us to visualize the peripheral part of the capsule, a technique which is useful during removal of the cortex [15]. Dilatation using bimanual stretching with the help of Y-hooks, iris retractors, Beehler pupil dilators or pupil dilator rings have proven to be equally effective throughout surgery. The iris should be handled cautiously as excessive manipulation of the iris can result in tears, hyphema, pigment release, increased postoperative inflammation and postoperative pupil dilation or atonicity. Techniques involving pupil stretching and cutting should be avoided in patients who are likely to have floppy-iris syndrome[16].

CONCLUSION

Cataract surgery in PXF patients presents challenges in the preoperative, intraoperative and postoperative settings. A thorough preoperative assessment should be performed to identify problems with zonules , small pupils, corneal decompensation and glaucoma. This assessment will help in surgical planning, particularly in predicting the possible need for OVDs, pupil expanders and capsular support devices. These tools, along with several technique modifications, can significantly increase the safety during surgery.

Thus by thorough and careful planning, surgery and postoperative care, the risk of complications in PXF patients can be minimized, thereby allowing them to achieve good visual results.

ABBREVATIONS

CCC - Continuous Curvilinear Capsulorrhexis
IOP – Intra Ocular Pressure
LOXL1 - Lysyl Oxidase-Like-One Gene
NSAIDS – Non Steroidal Anti Inflammatory Drugs
OVD – Ophthalmic Viscosurgical Devices
PXF – Pseudoexfoliation

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