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Research Article

To Examine the Clinical Features and Risk Factors Associated with Lens-Induced Glaucoma

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ABSTRACT

Background: Lens-induced glaucoma (LIG) is a secondary glaucoma resulting from complications related to the lens. It includes several distinct forms, such as phacomorphic, phacolytic, traumatic, pseudoexfoliation, lens particle, and phaco-anaphylactic glaucoma. Understanding the clinical features and risk factors associated with LIG is crucial for early diagnosis and effective management. Regular eye examinations are crucial for early detection of lens-related issues and risk factors. Identifying and addressing conditions such as advanced cataracts or pseudoexfoliation syndrome can help prevent the development of LIG. Prompt surgical intervention for cataracts, management of traumatic injuries, and treatment of inflammatory conditions are essential in preventing or mitigating lens-induced glaucoma. Educating patients about the risks and symptoms of lens-induced glaucoma, especially those with known risk factors, can lead to earlier diagnosis and treatment. Employing modern surgical techniques and ensuring thorough postoperative care can minimize the risk of complications such as lens particle glaucoma.

Aim: This study aims to evaluate the clinical features and risk factors associated with various types of lens-induced glaucoma, providing insights into their diagnosis, management, and prevention.

Material and Method: This observational cohort study aimed at examining the clinical features and risk factors associated with lens-induced glaucoma was conducted in the Department of Ophthalmology. It involved 80 cases of secondary glaucoma across multiple hospital settings and specialized ophthalmology clinics to ensure a diverse patient population. Each patient underwent a comprehensive evaluation, which included detailed medical history covering personal details (name, age/gender, and address), presenting complaints, and past medical history, including systemic conditions such as diabetes mellitus, hypertension, cardiovascular disease, asthma, use of eye or oral steroids, and ocular diseases like ocular sclerosis. Patients meeting the inclusion criteria provided informed consent.

Results: The result provides a distribution of visual acuity levels among patients, showing a range from near-normal vision to no light perception. Result shows a variety of findings related to the optic disc and retinal pathology, with high percentages of patients exhibiting changes associated with glaucoma, peripapillary atrophy, and disc hemorrhages. Other conditions like hypertensive retinopathy and proliferative diabetic retinopathy are less prevalent. The result shows that the most common types of lens-induced glaucoma are phacomorphic (53.3%) and phacolytic glaucoma (33.3%), with traumatic and pseudoexfoliation glaucoma being less common. No cases of lens particle or phaco-anaphylactic glaucoma were observed in this group.

Conclusion: Lens-induced glaucoma encompasses a range of conditions, each with specific clinical features and risk factors. Understanding these aspects is vital for effective management and prevention. By focusing on early detection, timely intervention, and addressing risk factors, healthcare providers can significantly improve outcomes for patients with lens-induced glaucoma. Continued research and advancements in surgical techniques will further enhance our ability to manage and prevent this complex condition. Further research is needed to refine treatment strategies and enhance our understanding of LIG.

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Keywords: Lens-Induced Glaucoma, Phacomorphic Glaucoma, Phacolytic Glaucoma, Traumatic Glaucoma, Pseudoexfoliation Glaucoma, Lens Particle Glaucoma, Phaco-Anaphylactic Glaucoma, Intraocular Pressure, Cataract

Introduction

Lens-induced glaucoma (LIG) is a form of secondary glaucoma that arises as a result of complications associated with the lens of the eye. It is a critical condition that can significantly impact visual acuity and overall eye health. Understanding the clinical features and risk factors associated with LIG is essential for early diagnosis, effective management, and improving patient outcomes. LIG is not as common as primary open-angle or angle-closure glaucoma, but it remains an important clinical entity. It is often seen in patients with advanced cataracts or those who have undergone previous eye surgeries.[1] The condition can significantly affect visual function, with potential outcomes ranging from reduced visual acuity to complete vision loss. Early detection and management are crucial in mitigating these adverse effects. LIG is often associated with elevated intraocular pressure, which can result from obstruction of aqueous humor outflow. This obstruction may be due to the lens becoming swollen or dislocated, leading to impaired drainage through the trabecular meshwork.[2] Intraocular Pressure (IOP) elevation in LIG can be acute or chronic. Acute elevation may present with symptoms such as severe eye pain, redness, and nausea, while chronic cases might be asymptomatic initially. Mature or hyper-mature cataracts are commonly implicated in LIG. As cataracts progress, the lens becomes opaque and may increase in size, leading to secondary glaucoma.[3]

Lens dislocation, either spontaneous or due to trauma, can cause secondary glaucoma by obstructing the aqueous humor outflow or causing inflammatory reactions. Patients may experience ocular discomfort, pain, and redness due to increased IOP and inflammation. Blurred vision or decreased visual acuity may result from the opacified lens and elevated IOP. Elevated IOP can lead to corneal swelling, which may be observed during a clinical examination. Redness of the conjunctiva can be an indicator of elevated IOP or inflammation.[4]

Chronic LIG can lead to glaucomatous changes in the optic nerve head, such as cupping and thinning of the neuroretinal rim. Older adults are more susceptible to developing cataracts, which are a major risk factor for LIG. Age-related changes in lens morphology and elasticity contribute to increased risk. Advanced cataracts, particularly those that are hyper-mature are strongly associated with LIG due to their impact on lens size and consistency. History of cataract surgery can alter the lens position and integrity, potentially increasing the risk of LIG.[5] Intraocular lens implants or complications from surgery may also be factors. Trauma to the eye can cause lens dislocation or rupture of the lens capsule, which can precipitate LIG by disrupting normal aqueous humor flow. Diabetes mellitus can contribute to cataract formation and lens opacities, thus increasing the risk of LIG. ystemic hypertension may exacerbate the progression of secondary glaucoma. A family history of glaucoma or lens-related disorders may predispose individuals to LIG due to inherited structural or functional abnormalities. Long-term use of corticosteroids can induce cataract formation and contribute to the development of LIG.[6,7]

A thorough eye examination, including IOP measurement, slit-lamp bio-microscopy, and fundoscopic assessment, is crucial for diagnosing LIG. Imaging techniques, such as anterior segment OCT or ultrasound bio-microscopy, can provide detailed information on lens status and anterior chamber configuration. Initial management may involve controlling IOP with medications such as topical beta-blockers, prostaglandin analogs, or carbonic anhydrase inhibitors. In cases where medical management is insufficient or where lens-related issues are significant, surgical options such as cataract extraction or lens replacement may be necessary.[8,9]

Investigating the clinical features and risk factors associated with lens-induced glaucoma provides valuable insights into its etiology and

progression. By understanding these aspects, healthcare providers can enhance diagnostic accuracy, tailor preventive strategies, and improve therapeutic interventions. Early recognition of symptoms, coupled with a thorough assessment of risk factors, can help mitigate the impact of LIG and improve patient outcomes. Ongoing research and clinical vigilance are key to advancing our knowledge and treatment approaches for this potentially debilitating condition.[10,11]

Material and Methods

This observational cohort study aimed at examining the clinical features and risk factors associated with lens-induced glaucoma was conducted in the Department of Ophthalmology. It involved 80 cases of secondary glaucoma across multiple hospital settings and specialized ophthalmology clinics to ensure a diverse patient population. Each patient underwent a comprehensive evaluation, which included detailed medical history covering personal details (name, age/gender, and address), presenting complaints, and past medical history, including systemic conditions such as diabetes mellitus, hypertension, cardiovascular disease, asthma, use of eye or oral steroids, and ocular diseases like ocular sclerosis. Patients meeting the inclusion criteria provided informed consent. They were given an informational sheet, and the procedures to be conducted were explained to them in their native language.

Inclusion Criteria:

- **Diagnosis of LIG:** Patients diagnosed with lens-induced glaucoma based on clinical examination and diagnostic criteria.
- **Age Range:** Patients of age above 35 years
- **Consent:** Written informed consent obtained from all participants.

Exclusion Criteria:

- **Primary Glaucoma Types:** Patients with primary open-angle glaucoma, primary angle-closure glaucoma, or other types of secondary glaucoma not related to lens abnormalities.
- **Inadequate Data:** Patients with incomplete medical records or those who cannot comply with follow-up requirements.

Diagnostic Tools:

- **Slit-Lamp Biomicroscopy:** For detailed examination of the anterior segment, including lens opacities and dislocations.
- **Tonometry:** To measure intraocular pressure (IOP). Instruments such as Goldmann applanation tonometer or non-contact tonometer will be used.
- **Fundoscopy:** To assess the optic nerve head and look for glaucomatous changes.
- **Ultrasound Biomicroscopy or Anterior Segment OCT:** To evaluate lens position and anterior chamber angle.

Clinical Examination:

- Comprehensive eye examination including assessment of visual acuity, IOP measurement, and lens examination using slit-lamp biomicroscopy.

Patient Interview:

- Structured interviews to gather information about symptoms, medical history, and risk factors such as age, systemic diseases, and medication use.

LIG Diagnosis:

- Diagnosis based on elevated IOP in the context of lens-related abnormalities such as mature cataracts or lens dislocation.

Classification:

- LIG cases will be classified based on lens status (e.g., cataract type, lens dislocation) and IOP levels (e.g., mild, moderate, severe).

Collected the patients detailed records including previous eye surgeries, trauma history, systemic conditions, and medication use and Age, gender, and other relevant demographic information. To screen for systemic conditions that may influence glaucoma risk. Detailed imaging of the anterior segment as needed. To gather and record the necessary data from each case, a semi-structured questionnaire was created. Five

pilot tests were conducted on the Performa to determine its viability. After the questionnaire had undergone the necessary adjustments, the final Performa was created. Written informed consent will be obtained from all participants, ensuring they are aware of the study's purpose, procedures, and potential risks. Regular follow-up visits to monitor changes in IOP, lens status, and other relevant parameters. The evaluation of treatment outcomes and any progression of glaucoma over time.

Statistical Analysis

Data were entered in an excel sheet and analyzed using the software Epi-info, quantitative variables were expressed in terms of means, standard deviations (Sds), and qualitative in terms of proportion and percentage (%).

Result: -

The present study was conducted among 80 cases of secondary glaucoma.

Table 1: Shows the Distribution of Cases according to BCVA

BCVA	Cases	Percentage
6/12-6/6	15	18.7
6/60-6/18	25	31.2
5/60&PL+	22	27.5
NOPL	18	22.5

The table provides a distribution of visual acuity levels among patients, showing a range from near-normal vision to no light perception. 15 patients have a visual acuity between 6/12 and 6/6, which means their vision ranges from slightly worse than average (6/12) to normal vision (6/6). 25 patients have a visual acuity between 6/60 and 6/18, indicating significantly reduced vision compared to normal. 22 patients have visual acuity of 5/60 (very poor vision) or just a perception of light (PL+), meaning they can perceive light but have very limited vision. 18 patients have no perception of light (NOPL), indicating complete loss of vision.

Table 2: Shows the Finding of Fundus examination in cases of secondary glaucoma

Fundus		Cases	Percentage
Neuroretinalrim	Inferior and superior	26	32.5
	Inferior, Superior, and Nasal	28	32
	Inferior, Superior, Nasal, and Temporal	12	15
C: D	<0.5	25	31.2
	>0.5	55	68.7
The bearing of circumlinear blood vessels	Present	43	53.7
	Absent	37	46.2
Lamellardot sign	Present	30	37.5
	Absent	50	62.5
Bayoneting	Present	44	55
	Absent	36	45
Disc-hemorrhage	Present	48	60
	Absent	32	40
Peripapillaryatrophy	Present	52	65
	Absent	28	35
Hypertensive retinopathy	Present	10	12.5

(n=20)	Absent	10	12.5
Proliferative Diabetic Retinopathy (n=8)	NVD	3	3.75
	NVE	4	5
Any other finding in the retina	CRVO	1	1.25
	BRVO	0	0

Most patients show neuro-retinal rim loss in the inferior and superior regions or in those regions plus nasal. The majority of patients have a cup-to-disc ratio greater than 0.5, suggesting significant optic disc cupping. More than half of the patients have circumlinear blood vessels, which could be a relevant finding in various retinal conditions. More than half of the patients show bayoneting of blood vessels, a feature often linked to retinal vein occlusions. A majority of patients have disc hemorrhages, which can be indicative of various retinal conditions including glaucoma. A small proportion of the 8 patients with proliferative diabetic retinopathy show signs of neovascularization. The table shows a variety of findings related to the optic disc and retinal pathology, with high percentages of patients exhibiting changes associated with glaucoma, peripapillary atrophy, and disc hemorrhages.

Table 3: Shows the Various types of Lenses Induced Glaucoma

Lens Induced Glaucoma	Cases	Percentage
Phacomorphic glaucoma	8	53.3
Phacolytic glaucoma	5	33.3
Traumatic	1	6.6
Pseudoexfoliation	1	6.6
Lens Particle	0	0.0
Phaco-anaphylactic	0	0.0
Total	15	100.0

The table shows that the most common types of lens-induced glaucoma are phacomorphic (53.3%) and phacolytic glaucoma (33.3%), with traumatic and pseudoexfoliation glaucoma being less common. No cases of lens particle or phaco-anaphylactic glaucoma were observed in this group.

Discussion

Lens-induced glaucoma is a significant concern due to its potential to cause severe visual impairment. The condition arises from various lens-related complications and involves different mechanisms leading to elevated intraocular pressure. Understanding its clinical features, underlying mechanisms and risk factors is essential for effective management and prevention. Early diagnosis and appropriate intervention are key to preserving vision and improving patient outcomes in cases of LIG.[12] **Lens-induced glaucoma** (LIG) is a type of secondary glaucoma that occurs due to complications related to the lens of the eye. Understanding its clinical features and risk factors is essential for early diagnosis, effective management, and prevention of vision loss. **Lens Swelling** this condition occurs when the lens swells, typically due to cataract, leading to increased intraocular pressure (IOP). Patients may experience sudden onset of severe eye pain, redness, headache, and decreased vision. The eye may appear tense with a mid-dilated or fixed pupil. The cornea can be edematous (swollen) and cloudy.[13,14]

Lens Leakage It is characterized by the leakage of lens proteins into the anterior chamber, causing inflammation and increased IOP. The marked by anterior chamber inflammation with possible hypopyon. Patients might present with redness, pain, and blurred vision. **IOP** can be elevated due to the inflammatory response and blockage of the trabecular meshwork. **Lens**

Injury results from trauma causing either direct injury to the lens or secondary effects such as dislocation. The variable depending on the severity of trauma, including pain, redness, and visual disturbances.[15] **IOP** can be elevated if there is damage to the drainage structures or inflammation. **Material Deposition** Characterized by the accumulation of pseudoexfoliative material on the lens, anterior capsule, and other ocular structures. Gradual increase in IOP leading to progressive vision loss. **Signs** may include a characteristic ring of deposits around the lens and signs of elevated IOP.[16]

Increased risk due to age-related changes in the lens, such as cataract formation. Older adults are more likely to develop lens-related complications leading to glaucoma. The risk of LIG increases with advanced cataract stages where the lens becomes hypermature or swollen, especially in cases of phacomorphic and phacolytic glaucoma. Trauma to the eye can lead to traumatic glaucoma, especially if the lens is damaged or dislocated.[14] Prior ocular surgeries, including cataract surgeries, can lead to complications such as lens dislocation or lens particle glaucoma. Individuals with pseudoexfoliation syndrome are at higher risk of developing pseudoexfoliation glaucoma due to the accumulation of exfoliative material affecting the drainage system. Risk is higher in patients with a history of allergic reactions to lens material, leading to phaco-anaphylactic glaucoma. Patients with a history of glaucoma or those at risk of glaucoma may develop lens-induced glaucoma as a complication.[18]Incomplete cataract surgery or poor lens hygiene can result in residual lens particles causing secondary glaucoma. The variety of findings related to the optic disc and retinal pathology, with high percentages of patients exhibiting changes associated with glaucoma, peripapillary atrophy, and disc hemorrhages. Other conditions like hypertensive retinopathy and proliferative diabetic retinopathy are less prevalent.[16]

Conclusion:

Lens-induced glaucoma encompasses a range of conditions, each with specific clinical features and risk factors. Understanding these aspects is vital for effective management and prevention. By focusing on early detection, timely intervention, and addressing risk factors, healthcare providers can significantly improve outcomes for patients with lens-induced glaucoma. Continued research and advancements in surgical techniques will further enhance our ability to manage and prevent this complex condition.

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