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Intraocular Pressure: Epidemiological, Clinical and Therapeutic Aspects in Patients Seen at the EYE Center Ophthalmology Clinic in Conakry, Guinea

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Abstract

This research examines intraocular pressure (IOP) in patients at the EYE Center Ophthalmology Clinic in Conakry, Guinea. It is an observational, descriptive study of 148 patients, with IOP measured by Goldmann applanation tonometry. The study analyzes epidemiological data, IOP values, iridocorneal angle characteristics, and therapeutic strategies. Results indicate mean IOP is within normal range for most patients, with age but not sex associated with increased IOP. Pigmentation of the angle may be a risk factor for hypertonia, even when the angle is open.

Keywords

Epidemiolgy, Clinic, Therapeutic, Intraocular Pressure, EYE Center Ophthalmology Clinic, Conakry

1. Introduction

Intraocular pressure is a dynamic parameter. It is the result of a balance between the secretion of aqueous humour and its drainage through conventional and non-conventional channels [1]. The iridocorneal angle is the main route for drainage of aqueous humour from the eye. The trabeculum controls intraocular pressure

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(IOP) by regulating the drainage of aqueous humour from the anterior chamber of the eye into the systemic veins via the adjacent canal of Schlemm [2]. Trabecular dysfunction is at the root of the rise in IOP, which is the main risk factor for the development of chronic hypertonic glaucoma, a potential cause of untreatable blindness. This justifies the study of intraocular pressure, although it can be isolated from any glaucomatous condition. Clinically, gonioscopy alone makes it possible to visualise the constituent parts of the iridocorneal angle and to explain the factors that can lead to a variation in IOP [3], which are the opening of the angle, the pigmentation of the trabeculum, the pre-trabecular congestion and the level of insertion of the iris. The state of the iridocorneal angle should therefore be determined in all cases of intraocular hypertension, whether isolated or associated with glaucoma. The aim of this study was to examine the epidemiological, clinical and therapeutic aspects of intraocular pressure in patients attending the EYE Centre ophthalmology clinic in Conakry, Guinea.

2. Patients and Methods

This was an observational, descriptive study lasting six months from April to September 2024, including all patients in whom intraocular pressure had been measured by a Goldmann aplanation tonometer, after instillation of a drop of Proparacaine 0.5% and fluorescein, in blue light. Patients who failed to keep follow-up appointments or were lost to follow-up or simply withdrew from the study were excluded from the series. Follow-up appointments were scheduled at the first month (M1), at the third month (M3) and at the sixth month (M6) from inclusion. The IOP was measured by the same operator using the same technique. Gonioscopy was performed in some patients. The reason was that the gonioverre was lost during the study. The study variables were qualitative and quantitative, covering the epidemiological characteristics of the patients (age, sex, background, history), clinical characteristics (intraocular pressure, state of the iridocorneal angle) and therapeutic characteristics (strategy, evolution of the IOP). IOP, expressed in millimetres of mercury (mmHg), was assessed at inclusion and at the end of each patient's follow-up. Normal IOP was defined as values ≤ 21 mmHg, mild hypertonia as values between 22 - 29 mmHg, moderate hypertonia as values between 30 - 39 mmHg and severe hypertonia as values ≥ 40 mmHg. Mean IOPs were calculated for each of these classes. The condition of the angle was assessed using the Shaffer classification [4] for the aperture. The Scheie classification [5] was used for the angle pigmentation and the Spaeth classification [6] was used for the iris insertion level. Pre-trabecular congestion was assessed for neovessels, peripheral anterior synechiae (PAS) and exfoliative material. The data were processed manually using SPSS software version 21.0. Proportions and ratios were calculated for qualitative variables, and means and standard deviations for quantitative variables. For statistical comparisons, any P-value below 0.05 was considered statistically significant.

The absence of pachymetry and the loss of the gonioverre were the main limitations of this study.

3. Results

In this series, 148 patients who had IOP measurements taken were included, thirty-four of them had gonioscopy performed. The patients were aged 15 to 87 years, the mean age was 47.15 ± 20.82 years, and the sex ratio was 1.0 (50.7% men and 49.3% women). More patients had systemic hypertension (29.1%) than diabetes (9.5%). Cataracts were known to be present in 18.9% of patients, and glaucoma in 2%. For all patients, mean IOP at inclusion was 17.9 ± 8.3 mmHg, with extremes of 9 and 50 mmHg and at the end of the study, it was 16.15 ± 6.6 mmHg, with extremes of 9 and 40 mmHg. The hospital prevalence of hypertonia was 1.02%, with a mean IOP at inclusion of 30.8 ± 4.1 mmHg in hypertonic patients (IOP > 21 mmHg). This means IOP was reduced to 25.5 ± 4.7 mmHg at the end of the study. Table 1 shows the distribution of mean intraocular pressure and the proportion of eyes for each modality.

Table 1. Mean IOP at baseline and end of follow-up.

Mean IOP value	OD		OS	
	Inclusion mmHg (%)	End of follow-up mmHg (%)	Inclusion mmHg (%)	End of follow-up mmHg (%)
Normotonia	13.4 (36.8)	15.6 (47.3)	13.1 (36.5)	15.6 (47.3)
Hypertonia				
Mild	24.2 (7.4)	20.8 (2.0)	26.0 (7.1)	24.0 (1.7)
Moderate	35.1 (4.1)	30.5 (0.7)	33.3 (3.7)	31.0 (0.7)
Severe	40.8 (1.7)	0 (0)	45.6 (2.7)	40.0 (0.4)

The iridocorneal angle could be visualised in 23.0% of the patients and all were open to grade 3 or grade 4 of the Shaffer classification. Table 2 shows a significant statistical correlation between angle opening and IOP (P = 0.04). In the series, age at 40 was found to be a factor strongly associated with ocular hypertonia (P = 0.01). However, there was no association between gender and the occurrence of a change in intraocular pressure (P = 0.28) (Table 2).

Table 2. Correlation between age, sex, angle opening and intraocular pressure in 148 patients.

		Intraoculaire Pressure (mmHg)				***P-value***
		Normal	Hypertonia			
			Mild	Moderate	Severe	
Age	≤39 ans	43	5	0	5	**0.01**
	≥40 ans	65	15	12	3	
Sex	Male	51	10	9	5	**0.28**
	Female	57	10	3	3	
Wided of the angle	Grade 3	8	3	1	2	**0.04**
	Grade 4	12	6	0	2	
no gonioscopy		88	11	11	4	
Monotherapy		50	3	1	1	**0.01**
Bitherapy		18	2	2	1	

In the 34 patients who underwent gonioscopy, the angle was in a state of stage 2 (61.8%) and grade 3 (38.2%) pigmentation according to Scheie's classification, with a maximum of pigment in the area from 4 o'clock to 8 o'clock in 100% of cases. No exfoliative material or neovascularisation or peripheral anterior synechiae were found. According to iris insertion, all angles were at level D of the Spaeth classification.

4. Discussion

Intraocular pressure (IOP) is a dynamic parameter [1]. It results from the balance between the secretion of aqueous humour in the posterior chamber and its excretion at the iridocorneal angle by the trabeculum in the anterior chamber. Elevation of IOP has been identified as the only modifiable risk factor in the onset of glaucoma [1] [7], or at least in its progression. Hypertonia, defined as an intraocular pressure > 21 mmHg [7] [8], is always associated with glaucoma when it is a symptom. As a syndrome, hypertonia may be primary or secondary, isolated from any glaucomatous condition. For its definition, a normal optic disc examination and a normal visual field examination are required [1]. This study was not interested in the search for glaucoma associated with the different intraocular pressure figures, but rather in the factors modifying ocular tone in the study's population. The population in this series was similar to that of the Beninese population in the study by Tchabi S *et al.* [9], who reported an age range of between 20 and 85 years. The discrete male predominance in this series, with no significant static difference, had been reported by Bernardin P *et al.* [10] in the "Merina" in Madagascar, where the sex ratio was 1.2. This was in contrast to the population characteristics of Tchabi S *et al.* [9] who reported a discrete female predominance with a sex ratio of 0.8. In all these studies, there was no statistically significant predominance between the sexes. This suggests that, in these regions, women consult doctors in the same way as men. The intraocular pressure of Guinean patients is relatively normal and the average in this series is slightly higher than the average for the normal French population in the study by Renard JP [11], which was 15.5 ± 2.5 mmHg. Tchabi S *et al.* [9] found a predominance of patients with IOP around 11 - 13 mmHg. The prevalence of ocular hypertonia found in this study is much lower than those found in the Beninese (1.9%) [9] and Ivory Coast (3.8%) [12] studies. According to Renard JP [11], ocular hypertonia affects 3.8% of subjects under the age of 40. These differences may lie in the methods and size of the populations studied. In numerous African studies [7] [9] [11] age was identified as a factor strongly associated with increased intraocular pressure. In the Barbados Eye Study [13], IOP increased with age independently of corrective factors. In contrast, the Blue Mountains Eyes Study [14] showed no significant correlation between age and IOP after adjustment for systolic blood pressure. In contrast, the Japanese study by Nomura *et al.* [15] found a decrease in IOP with age after adjustment for central corneal thickness. The lack of application of corrective factors is a major limitation in this series. However, degeneration of structures such as the trabeculum in

elderly subjects could lead to resistance to aqueous humour outflow and explain the increase in IOP. The difference between these African and Western studies could be linked to racial or methodological factors. Tonnu *et al*. [16] showed a long time ago that age led to differences in IOP measurement depending on the techniques used. In this series, no link was established between gender and an increase in IOP ($p = 0.28$), unlike the Benin study [9] which showed a higher intraocular pressure in men than in women, without giving a clear explanation. The state of the iridocorneal angle is an essential factor of intraocular pressure both in terms of its opening and its structure. In the presence of an exfoliative syndrome, the risk of ocular hypertension is increased and the risk of glaucoma is doubled [7]. Pigment dispersion, strongly associated with elevated IOP in this series, could be the result of the iris resting on the trabeculum or of the detachment of iris pigments under the effect of pupillary dance. That can lead to an immersive deposit on the sloping part of the angle due to gravity. As some of the patients had diabetes or systemic hypertension, the study did not focus on the relationship between IOP and these general pathologies. However, several studies [7] [17] [18] had already shown a significant relationship between diabetes and IOP, which increased on average by around 0.5 mmHg compared with non-diabetic patients. Several studies [7] [19] [20] have established a relationship between blood pressure level and IOP. Bron *et al*. [7] found that untreated or uncontrolled hypertension was a factor in increased IOP. In another study, increases in IOP in melanoderma were correlated with hypertension and diabetes [21]. These findings could open up avenues for further research. Although the angles were highly pigmented, the patients responded very favourably to drug treatment. In the literature, the question of treating isolated hypertensive patients had been raised. Data from multicentre studies on ocular hypertonia confirmed the value of hypotonising treatment for subjects at high risk of progression to glaucoma, but also demonstrated its uselessness in a very large number of cases of hypertonia. These were the results of the second phase of the Ocular Hypertension Trial Study (OHTS), which put all previously untreated patients on treatment, thereby allaying fears of glaucomatous conversion by the hypothesis of a masked acceleration of visual fibre loss in hypertensive patients [22]. This series raised the question of the need to systematically treat all patients with hypertonia, given that this risk had not been assessed in the study. This could simply be a matter of jurisprudence.

5. Conclusion

Intraocular pressure in Guinean patients is relatively normal. Ocular hypertonia is proportionally correlated with age, without one sex being more at risk than the other. Pigmentation of the lower portion of the trabeculum could be a risk factor for hypertonia, although the angle remains open. Drug treatment for hypertonia could well be offered to the Guinean patient. A more inclusive study with a more representative sample could better help to confirm these assertions.

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Conflicts of Interest

There's no conflict of interest in relation to this article.

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