

Pseudoexfoliation glaucoma in Sri Lanka

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Abstract

Introduction: Pseudoexfoliation glaucoma (PXG) is a secondary, open angle glaucoma, subject to wide geographical variation. It is a progressive disease without cure, and treatment is directed at control of intraocular hypertension.

Objectives: To determine the prevalence and characteristics and to evaluate the hypotensive response to differing types of treatment, on pseudoexfoliation glaucoma (PXG).

Methods: The study consists of 342 patients with PXG, detected among a 2083 glaucoma clinic population, during a five year period. Clinical features were recorded and patients subjected to initial medical therapy. The non-responders at the end of 12 to 16 weeks of treatment had trabeculectomy (n=42) or combination of trabeculectomy, lens extraction and intraocular lens implant - triple procedure (n=145).

Results: The prevalence of PXG in the glaucoma population was 16.4%. Notable features were: high incidence of unilaterality (71.6%) and lens opacification (60%). The success rate of treatment (restoration of normal intraocular pressure) at the end of 12 to 16 months of treatment were as follows: medical 21%, triple procedure 61%, and trabeculectomy 80% ($p < 0.001$). Postoperative complications were high in triple procedure due to associated cataract extraction ($p < 0.001$).

Conclusion: The prevalence of PXG was relatively high. Trabeculectomy offers the best results. Studies are required to portray the cause of the disease, to effect cure and or arrest its progression.

Introduction

Pseudoexfoliation glaucoma (PXG) is a secondary open angle glaucoma, developing as a consequence of the pseudoexfoliation syndrome (1,2). When an eye with pseudoexfoliation develops a secondary trabecular block glaucoma, the condition is referred to as PXG. Pseudoexfoliation syndrome is characterized by the deposition of fibrillar material in the anterior segment of the eye. This material has been found in and on the lens epithelium and capsule, pupillary margin, ciliary epithelium, iris pigment epithelium, iris stroma, blood vessels and subconjunctival tissues (3,4). It probably arises from multiple sources such as part of a generalised basement membrane disorder, and the material resembles amyloid (5,6). The average intraocular pressure in PXG tends to be on a higher range than in primary open angle glaucoma and the field loss more marked than for a similar and comparable period of time (6). Medical treatment usually produces a significant initial hypotensive response, but this is often not sustained (7). Recourse to filtration procedure (trabeculectomy) is often associated with good results (6). PXG is subject to wide geographical variation, the highest recorded incidence being from Scandinavian countries (8).

The objective of the study was to highlight the prevalence of PXG in the glaucoma clinic population, to determine the clinical characteristics and evaluate the results of different modalities of treatment.

Patients and Methods

The study population consists of 342 patients with PXG, treated during a five year period, from June 1990 to May 1995, at the St Michael's Hospital, Colombo, Sri Lanka. During this period there were 2083 patients with glaucoma, and 431 with

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pseudoexfoliation utilising the criteria of Konstas and Allen (9) shown in Table 1. In the absence of glaucoma, the diagnosis of pseudoexfoliation was made if any of the criteria I or II were fulfilled. The preclinical data obtained at the first clinic visit is shown in Table 2. For patients with bilateral PXG, the data presented refers to the poorer eye.

Table 1

Criteria used for clinical diagnosis of pseudoexfoliation glaucoma*

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- I. Observation of pseudoexfoliation material by slit lamp examination with pupillary dilatation when material not observed within the pupillary aperture.
 - II. Presence of Sampaolesi's line on gonioscopy, together with black pigmentation of the trabecular meshwork (the diagnosis was made only when Sampaolesi's line was present in its complete form).
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* Konstas and Allan (9)

Table 2

Data sought at clinical examination

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1. Visual acuity
 2. Assessment of bleb (cystic or diffuse, size)
 3. Intraocular pressure
 4. Slit lamp examination for exfoliation within the pupil or upon the lens (with dilatation of the pupil if material is not evident)
 5. Gonioscopy for the presence of Sampaolesi's line, presence of pigmentation, exfoliation material, to assess the angle depth and abnormalities
 6. Assessment of the lens including evidence of anterior capsule dehiscence and phakodonesis
 7. Cup/disc ratio
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Treatment:

The initial treatment was medical, with beta blockers, miotics, propine and carbonic anhydrase inhibitors and the patients were seen at the end of two weeks. A fall of intraocular pressure by more than 6 mm of Hg in the treated eye was considered significant. Three hundred and thirty of the total 342 patients showed the above response. In the balance 12 non-responders, the intraocular pressure was uncontrolled (above 35mm of Hg) and were therefore subjected to early surgery. In the 330 patients on medical treatment, when the intraocular hypotensive response was not sustained, the treatment was amended by increasing the strength of timolol from 0.25% to 0.5% and pilocarpine with beta blockers and adrenaline combination. At the end of 12 to 16 weeks the patients were reassessed. Of the 330 patients on medical treatment, 82 responded (intraocular pressure < 22 mm Hg, no progressive reduction of visual fields). The responders to medical treatment were assessed after one month and then at about four monthly intervals.

Of the 248 non-responders to medical treatment at the end of 12 to 16 weeks, 189 had PXG with cataract and 59 uncomplicated PXG. Surgery was considered when the intraocular pressure was uncontrolled (> 23 mmHg) or when there was progressive visual field loss, despite combination of two to three hypotensive agents. Of the 189 patients with PXG and cataract, 145 (163 eyes) underwent cataract extraction, intraocular lens implantation and trabeculectomy (Triple procedure). In the remaining 44 patients this procedure was not carried out for the following reasons: poor perception of light in 7, tunnel vision in only eye in 5, poor general condition in 9 and refusal by 23. Trabeculectomy was done in 42 of the 59 patients with uncomplicated PXG and in the balance 17 trabeculectomy was not done due to poor visual acuity in 5, poor general condition in 4 and refusal in 8.

Follow up: Patients were followed up at monthly intervals for three months and then at four monthly intervals. The mean follow up time was 1.8 years (range 1 to 3 years). At the end of 12 to 16 months, the following parameters were assessed; intraocular pressure visual fields, cup/disc ratio, and complications of triple procedure and trabeculectomy.

Statistical analysis: Patient groups, were compared statistically with use of the Student t test and Chi-square analysis where appropriate. A p value ≤ 0.05 was considered statistically significant. Values are presented as mean \pm SD.

Results

Prevalence: Three hundred and forty two patients with PXG were encountered among a 2083 glaucoma clinic population, a prevalence rate of 16.4%, while the figure for pseudoexfoliation was 20.6%. Of the 431 patients with pseudoexfoliation, 342 (79.3%) had PXG. This disorder is subject to wide geographical variation. The true prevalence of the disease remains uncertain, owing to the subtlety of the clinical signs in many cases.

Age and sex distribution: the average age of the patients with PXG was 63.5 years (range 44 to 84 years), with the maximum age incidence (52.4%) between 60 and 69 years (Table 3). There were 187 (54.7%) males and 155 (45.3%) females, giving a ratio of 1.2:1.

Table 3

Age and sex distribution in pseudoexfoliation glaucoma

Age	Males n (%)	Females n (%)	Total n (%)
40 - 49	4 (2.1)	5 (3.2)	9 (2.6)
50 - 59	38 (20.2)	25 (16.1)	63 (18.4)
60 - 69	103 (55)	89 (57.5)	192 (56.2)
70 - 79	36 (19.1)	33 (21.3)	69 (20.2)
80 - 89	6 (3.1)	3 (0.9)	9 (2.6)
Total	187	155	342

Incidence of pseudoexfoliation in patients with PXG: Unilateral pseudoexfoliation (71.6%) were commoner than bilateral (unilateral = 245, bilateral n=97).

Visual fields: Estimation of visual fields were

assessed in 293 of the 342 patients with PXG. In the balance 49 patients, the fields could not be assessed due to poor visual acuity. Normal visual fields were present in 33 (11.3%). In others, various grades of reduction of fields to tunnel vision in one or both eyes were present.

Cup to disc ratio: Table 4 shows the cup/disc ratio values in the patients with PXG. Cup/disc ratio was measured in 248 patients; in the balance 94, lens opacities precluded adequate visualisation of the optic disc. In 140 (56.4%) the cup/disc ratio was 0.5 and in 41 (16.5%) over 0.8.

Table 4

Cup to disc ratio (n=248)

Ratio	n (%)
< 0.5	140 (56.5)
0.6 - 0.7	67 (27)
> 0.8	41 (16.5)
Unable to assess	94

n= number of subjects

Lens opacities: Lens opacities sufficient to diminish visual acuity to 16/18 or worse, were present in 207 (60.5%) of patients; of these 18 were in the group that responded to medical therapy. The presence of cataract precludes interpretation of visual acuity of visual field data as indices of satisfactory outcome.

Intraocular pressure: The pre-treatment (first clinic visit) intraocular pressure ranged from 22 to 52 mm of Hg, with a mean value of 33 ± 6 (Table 5). In bilateral PXG, the pressure refers to the bad eye. In 7 patients the pressure could not be recorded. In 134 (54.6%) patients with unilateral PXG, the intraocular pressure ranged from 30 to 39mm of Hg, while 59 (60.8%) with bilateral PXG had the corresponding pressure in the worse eye.

Table 5
Intraocular pressure

Pressure mm Hg	Unilateral n (%)	Bilateral* n (%)
20 - 24	29 (11.8)	4 (4.1)
25 - 29	64 (26.1)	22 (22.7)
30 - 34	118 (48.3)	36 (37.1)
35 - 39	16 (6.5)	23 (23.7)
40 - 44	11 (4.5)	7 (7.2)
> 45	7 (2.8)	5 (5.2)
Total	245 (100)	97 (100)

* pressure in the worse eye
n=number of subjects

Associated complications in patients with PXG: The complications in the study patients when first seen is shown in Table 6; 36 (10.5%) patients had complications; the common ones were, corneal oedema, congestion of eyes, intraocular pressure over 45mm of Hg, and pigmentary flare.

Table 6

Associated complications* in patients with pseudoexfoliation glaucoma

Complications	n (%)
Central retinal vein occlusion	1 (1.6)
Branch retinal vein occlusion	5 (8.2)
Thrombotic glaucoma	4 (6.5)
Pigmentary flare	7 (11.5)
Corneal oedema	13 (21.4)
Congestion of eyes	11 (18)
Absolute glaucoma	5 (8.2)
Intraocular pressure > 45 mm Hg	12 (19.7)
Acute angle glaucoma	3 (4.9)
Total complications	61 (100)
Patients without complications	36 (10.5)

* one or more complications in each eye.

Medical treatment: Of the 342 patients with PXG, except in 12 there was reduction on intraocular pressure by 6 or more mm of Hg, at the end of two weeks. The 12 non-responders had uncontrolled intraocular hypertension and five of these had associated cataract; they were subjected to triple procedure or trabeculectomy. The balance 330 patients on medical treatment were assessed at the end of 12 to 16 months, to determine the sustained response to treatment. In 82 (23.9%) medical treatment was effective (pressure reduction range 4 to 12 mmHg, mean 7 ± 3). In the 248 non-responders surgical treatment was considered.

Trabeculectomy: Fifty nine (23.7%) of the 248 non-responders to medical therapy had PXG without associated cataract; of these 42 (48 eyes) underwent trabeculectomy.

At the end of 4 to 6 weeks; 37 (81.5%) patients showed good hypotensive response to trabeculectomy (intraocular pressure range 12 to 18 mm Hg, $p < 0.001$).

Triple procedure: One hundred and forty five (163 eyes) patients with PXG and cataract underwent triple procedure. The preoperative intraocular pressure in 163 eyes ranged from 20 to 35 mm of Hg (mean 30 ± 6). At the end of 4 to 6 weeks following triple procedure, in 105 (64.5%) eyes the intraocular pressure was reduced to normal levels (range 14 to 18 mmHg, $p < 0.001$).

Follow up: Patients on medical and surgical treatment were assessed at the end of 12 to 16 months.

Of the 82 patients on medical treatment 16 were lost for follow-up. The post treatment intraocular pressure in 14 (21.2%) of the 66 patients followed up was between 16 to 24 mm Hg. In quarter of the patients who showed response to medical therapy at 12 to 16 weeks, the hypotensive response was sustained at longterm follow-up.

The longterm major postoperative complications are shown in Table 7. The incidence of complications were significantly low in patients who had trabeculectomy ($p < 0.001$). Relatively high incidence of post capsular opacification (18.9%) was noted in patients who had triple procedure.

Table 7
Postoperative complications

Complications	Trabecu- lectomy N=48 n (%)	Triple procedure N=163 n (%)
Posterior capsular opacification	0	30 (18.9)
Failed bleb	5 (10.4)	22 (13.4)
Chronic scleritis of wound site	0	2 (1.2)
Endophthalmitis	0	3 (1.8)
Panophthalmitis and evisceration	0	1 (0.6)
Total	5 (10.4)	58 (35.5)

The assessment of visual acuity in surgically treated patients is shown in Table 8. There was no significant difference in visual acuity in the two groups ($p=NS$).

Table 8
Postoperative visual acuity at end of 12 to 16 months after trabeculectomy and triple procedure

Visual acuity	Trabecu- lectomy N=48 n (%)	Triple procedure N=163 n (%)
> 6/18	32 (66.6)	106 (65)
6/24-6/00	9 (18.7)	28 (17)
5/60 1/60	6 (12.7)	18 (11)
Counting fingers-		
Hand movements	1 (2.0%)	8 (5)
No perception of light	0 (0.0)	3 (2.0)

Discussion

The true prevalence and clinical attributes of pseudoexfoliation glaucoma remains controversial (5). PXG is subject to geographic variations. The prevalence in the glaucoma population in different countries are as follows; Scandinavia 50 to 62% (8), United States of America 6% (10), Great Britain 12.5%, Greece 40 to 50% (9), Sri Lanka 12.9% (11) and in the present study 16.4%. Studies show that PXG is more common and the variation in prevalence, could be attributed to techniques of examination chosen, and the selection criteria used for the population studied (9). The clinical examination for the diagnosis of PXG had an 85% sensitivity rate and a 100% specificity rate (5). The diagnosis of PXG in our study was made by clinical examination and the special techniques of cycloscopy and conjunctival biopsy were not done. Hence the expected prevalence rate should be higher than the figure of 16.4%.

In a number of reports, females are more commonly affected than males (9,12). The male to female ratio was unusually high in Greece (9), 2.6:1 and in our study it was 1.2:1.

The reported proportion of bilaterality to unilaterality for PXG varies considerably. In the present study, the incidence of unilaterality was high (71.6%), while bilaterality was a feature in Greece, 86.2% (9). This may reflect the early stage of the disease in our clinic population studied, or underdiagnosis. The underdiagnosis may be attributed to non utilisation of newer techniques, such as cycloscopy and conjunctival biopsy. The high frequency of bilaterality in reports from other countries (7,9), suggests the necessity for vigilance in patients with diagnosis of unilateral disease.

The 60.5% prevalence of lens opacities in our study is in excess of the reported prevalence of cataract with PXG in other countries; Scotland 2.5% (13), USA 20% (14), and Finland 33% (15). However our findings are in accordance with a report from Southern Ireland, 51 to 64% (16). The complications of cataract extraction in patients with PXG is

greater than that of normal eyes (17,18) and this has been attributed to the weakness of the zonules and the presence of iridocapsular adhesions (9).

The success rate judged by the reduction of intraocular pressure to normal levels (15 to 20 mm Hg) at the end of 12 to 16 months, of diverse modalities of treatment were as follows; medical 21.5%, trabeculectomy cataract extraction lens implantation (Triple procedure) 60.8% and trabeculectomy 80.4%, reflecting the effectiveness pressure ($p < 0.001$). However, the two groups are not comparable, as in the triple procedure the patients had cataract extraction, in particular patients in the early period had non-phaco-extracapsular extraction and high incidence of preoperative complications, contributing to relatively inferior results to trabeculectomy.

The longterm complications were higher in the triple procedure (36.8%) than in trabeculectomy (10.9%) ($p < 0.001$). The commonest complications in the triple procedure were posterior capsular opacification (PCO) (18.9%), failed bleb (13.4%) and PCO in part be attributed to non-phaco-cataract extraction in some patients. Longterm follow-up is required to assess the outcome of surgical procedures. Filtration procedures (laser therapy or trabeculectomy) appears to offer good results. In the non-responders (20%) to trabeculectomy, it is appropriate to look for causes other than trabecular obstruction, which result in elevated intraocular pressure. Other causes of elevated ocular pressure are; disturbance of facility of outflow and angle closure glaucoma (19), and these may account for the failures of trabeculectomy.

The drawback of the filtration procedures are; they do not effect cure of the disease and sustainability of maintaining the reduced ocular pressure is not certain. Studies are required to portray both the cause of the disease and its contribution to blindness.

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