Clinical Ophthalmology

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Optometrists' Assessment of Pseudoexfoliation and Its Impact on Glaucoma Referrals

Karin Landgren [1,*], Dorothea Peters [1,2,*]

[1]Department of Clinical Sciences in Malmö, Ophthalmology, Lund University, Malmö, Sweden; [2]Department of Ophthalmology, Skåne University Hospital, Malmö, Sweden

*These authors contributed equally to this work

Correspondence: Karin Landgren, Department of Clinical Sciences Malmö, Ophthalmology, Lund University, Skåne University Hospital, SE-205 02, Malmö, Sweden, Tel +46 70 306 91 18; +46 40 33 61 52, Email karin.landgren@med.lu.se

Purpose: To determine the frequency and accuracy of pseudoexfoliation syndrome (PEX) assessment in referrals from primary care optometrists before the new Swedish glaucoma guidelines were established, and to evaluate an optometrist's ability to assess PEX.

Patients and Methods: We studied PEX assessments in 95 referrals (95 patients,189 eyes) with elevated intraocular pressure (IOP) from optometrists to the Skåne University Hospital in Malmö, Sweden, in 2019. We reviewed the frequency and accuracy of PEX assessments in referrals and compliance of these referrals with the new guidelines. In addition, an optometrist's ability to identify PEX was evaluated and compared to that of an ophthalmologist specialized in glaucoma. Patients referred were examined at the hospital for PEX, first by the study's optometrist and then by the ophthalmologist.

Results: PEX was present in 17% of the patients (16 patients, 19 eyes). The optometrist in this study positively assessed PEX in 12 of 19 eyes (63%) before dilatation and in 14 of 19 eyes (74%) after dilatation. Seven referrals included a PEX assessment (3 assessed PEX and 4 assessed non-PEX), all of which were confirmed as correct. Of the 16 patients with PEX, 13 did not undergo a PEX assessment before referral. According to the new Swedish guidelines, three of the 13 referrals would not have been accepted, meaning that two patients requiring treatment would have been missed, one with pseudoexfoliation glaucoma and one with ocular hypertension with PEX.

Conclusion: Very few referrals from primary care optometrists included a PEX assessment (7%). According to the new guidelines, necessary referrals would therefore have been rejected. Still, the study's optometrist detected PEX in the majority of patients. The risk of missing high risk patients requiring glaucoma treatment would be reduced if primary care optometrists assess PEX before referral.

Keywords: open-angle glaucoma, ocular hypertension, Sweden, referral guidelines

Introduction

The number of patients with glaucoma in Europe is predicted to increase considerably due to an aging population,[1,2] possibly leading to an increased burden on glaucoma services in the future. In Sweden, it is estimated that glaucoma accounts for every fourth patient seen within the eye care system,[3] and the number of patients with intraocular pressure (IOP)-lowering treatment is expected to increase by 50% in 2040.[4] Since health care resources are limited, glaucoma management strategies need to be adopted. Patients with glaucoma have a considerable risk of loss of vision-related quality of life (VRQoL),[5] and up to 16% become bilaterally blind due to the disease.[6,7] However, the visual disability risk and loss of VRQoL varies among patients. Patients with elevated IOP and pseudoexfoliation syndrome (PEX) are at a higher risk of developing glaucoma[8–11] compared with patients with elevated IOP alone. In addition, patients with pseudoexfoliation glaucoma (PEXG) progress faster[12–14] and become visually disabled more often compared to patients with open-angle glaucoma.[15] PEX is common in the Nordic Countries and PEXG constitutes a large proportion of all glaucoma cases found in Sweden.[16] Therefore, it is of importance to detect and treat patients with PEX and PEXG at early stages to reduce the risk of glaucoma related visual disability and loss of vision-related quality of life.

Received: 8 November 2024
Accepted: 25 February 2025
Published: 30 March 2025

In Sweden, patients with glaucoma are mainly identified based on opportunistic case findings because there is no systematic population screening for glaucoma. Since tonometers became more commonly used by Swedish optometrists around the end of the 1990s, an increasing number of patients with glaucoma have been identified because of referrals from optometrists.[17] In Sweden, primary care optometrists can refer directly to secondary eye care units (Figure 1) in cases of suspected eye pathology; however, the conditions for optometrists to examine the eye have changed considerably during the past 30 years. Since 1994, the Swedish optometry education leads to a Bachelor of Science (BSc) in optometry. In 2009, the first class of optometrists with master's degrees graduated, and these optometrists have been allowed to use diagnostic eye drops since 2016. However, optometrists in Sweden are not allowed to prescribe any therapeutic drugs and all patients with glaucoma are treated and followed by secondary eye care units (Figure 1). An increasing number of optometrists with a Master of Science (MSc) work in opticians' offices outside of the hospital system (I-level; Figure 1) but those with a BSc still form the majority. In January 2024, the national regulations for the optometry profession were revised.[18] One important change is that referrals from optometrists to physicians should now only be made in cases where further investigations are needed, and treatment is expected.

The new Swedish national guidelines for open-angle glaucoma, published in Swedish in September 2022 and in English in 2024,[19] emphasize the importance of determining the right level of eye care for patients with low risk of developing glaucoma, those with high-risk factors for glaucoma, and those with the manifest disease. In addition, specific requirements for glaucoma referrals from optometrists (I-level; Figure 1) to secondary glaucoma care facilities (II-level; Figure 1) were put in place to minimize the number of false-positive referrals and to use the limited health care resources more efficient. According to the new glaucoma guidelines, the required level of IOP for referrals from optometrists is lower (≥ 22 mmHg) when the optometrist detects PEX compared to referrals based solely on an elevated IOP (≥ 25 mmHg).[9] Hence, PEX assessment by primary care optometrists has become more important in Sweden in order to reduce

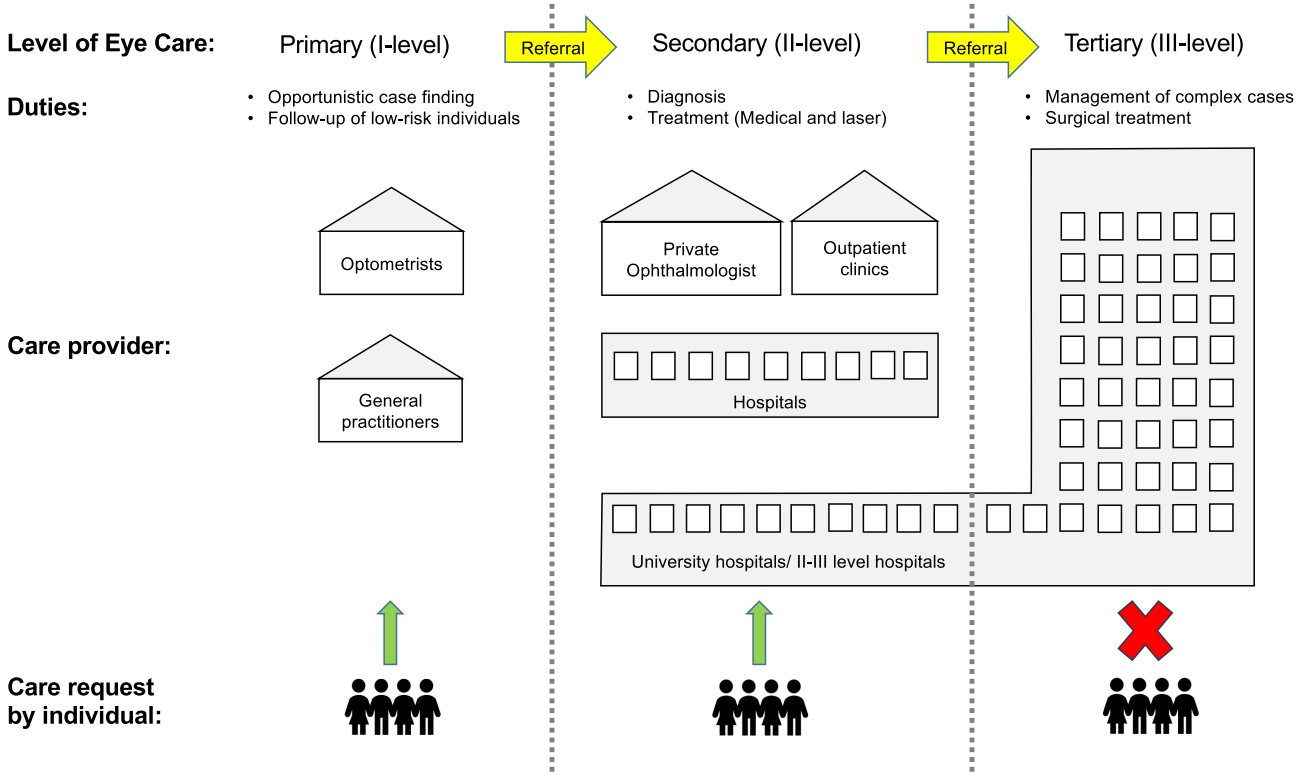

Figure 1 Organization and care levels of glaucoma care in Sweden. Eye care in Sweden is organized into three different levels. Optometrists and general practitioners deliver primary (I-level) eye care, while private ophthalmologists and public care units such as public hospitals and outpatient clinics provide secondary (II-level) eye care. Complex cases are managed, and surgical treatment is provided only in tertiary (III-level) eye care hospitals (mainly university hospitals). Usually, patients are referred from one care level to the next; however, individuals can request care without referral to a secondary eye care level. Tertiary eye care is only available through referrals from secondary care units. The image is the property of the authors.

the risk of missing individuals with high risk for glaucoma. Still the frequency and accuracy of optometrists' PEX assessments in Sweden are unknown.

In 2019, we conducted a prospective study evaluating all glaucoma referrals with elevated IOP from optometrists to the Skåne University Hospital Ophthalmology Department in Malmö, Sweden.[20] This study gave us the opportunity to evaluate PEX assessment in glaucoma referrals from optometrists before the new glaucoma guidelines were established. In addition, we evaluated an optometrist's ability to identify PEX compared to an ophthalmologist specialized in glaucoma.

Materials and Methods

The Ethics Review Board of Lund University, Sweden, approved this study and the methods used adhered to the Declaration of Helsinki. All participants provided written informed consent. We conducted a prospective study to evaluate the outcomes of glaucoma referrals over a twelve-month study period between January 1st and December 31st, 2019 from optometrists in Sweden to the Skåne University Hospital, Department of Ophthalmology Malmö. We previously published results from this study concerning the effect of elevated IOP as the only referral criterion.[20] Only referrals from optometrists based on an IOP of ≥ 21 mmHg and concerning adult patients (≥ 18 years) without symptoms of acute angle closure were eligible. Patients already receiving treatment for glaucoma or ocular hypertension (OH) were not eligible. The study design has been presented in detail previously.[20] Briefly, study visits followed a standardized examination protocol including visual acuity, automated refraction, automated visual field measurement, PEX and anterior chamber depth assessments, IOP measurement with Goldman applanation tonometry, measurement of central corneal thickness, fundus photography and optical coherence tomography of the optic disc. The study optometrist (K.L)., holding an MSc, performed all the examinations.

In addition, the study optometrist assessed PEX in the slit lamp before and after pupil dilatation, with possible options of "PEX", "no PEX" or "unsure". The study ophthalmologist then assessed PEX in the slit lamp after dilatation. The ophthalmologist's assessment of PEX was decisive. PEX was defined as the presence of small, grey-white fibrillar aggregates on the anterior lens capsule and tiny flakes of dandruff-like dustpans in the pupillary border. PEX assessment was performed with as little previous information as possible; the study optometrist did not have access to information from the referral letters before the study visit. In addition, all participants were requested not to reveal any eye-related information to the study optometrist until all assessments were completed. The study optometrist assessed PEX after visual acuity and visual field tests but before any other assessments. The eyes were dilated with 0.5% tropicamide and 2.5% phenylephrine, and the optometrist assessed PEX again 10 min after administration. The ophthalmologist was blinded to all the examination results obtained by the optometrist during the study visit until the PEX assessment was performed. Clinical examinations of the anterior and posterior segments of the slit lamp were performed by the study ophthalmologist (D.P).

The optometrist had no previous clinical experience with PEX assessment; however, some patients diagnosed with PEX had been examined by the optometrist over the course of a couple of months before the study began. During the study, the optometrist received direct feedback on the PEX assessments, as the ophthalmologist's assessments were revealed to the study optometrist directly after each visit. This clinical study was conducted over 12 months.

Similar to the previous study,[20] glaucoma was defined either as repeatable glaucoma-specific visual field defects or glaucoma-specific visual field defects confirmed by the corresponding optic nerve head appearance. In addition, patients with PEX were diagnosed with PEXG, glaucoma suspect with PEX, PEX with OH, or PEX with normal IOP.

In this study, referrals based on an IOP of up to 24 mmHg were selected and then reviewed to identify any additional examinations included in the referral (such as visual field measurements or optic nerve head evaluation) which fall under the new guidelines for accepting referrals by secondary care. In addition, all referrals, regardless of the IOP level, were reviewed to establish the number of referrals that included PEX assessment. In the first step, referrals including information from a slit-lamp examination by the optometrist were identified. Results from slit-lamp examinations in these referrals were then reviewed for any information on PEX and other glaucoma-relevant findings. In addition, referrals were reviewed for all patients for whom PEX was identified during the study visit. We recorded the diagnoses as defined above and identified hypothetical missed cases (according to the new guidelines) for referrals with PEX

assessment by the optometrists and those concerning patients found with PEX during the study visit. We also evaluated whether these referrals fell within or outside the new requirements for referrals in the national guidelines.

Results

In total, 95 referrals (95 patients; 189 eyes) were included in this study, 34% (32/95) of which included an IOP of 21–24 mmHg. Of those referrals, 19% (6/32) included the results of a slit-lamp examination, and 6% (2/32) included a PEX assessment. Five referrals included both an optic nerve head evaluation and visual field measurement (5/32, 16%) and two referrals included only optic nerve head evaluation (2/32, 6%). In total, 25 referrals were based solely on an IOP of 21–24 mmHg. We found neither glaucoma nor OH requiring IOP-lowering treatment in 80% of these referrals (20/25).

Of all the referrals, 17% (16/95) included a slit-lamp examination, but only 7% (7/95) of the referrals assessed PEX. Of these, three were positive, and four were negative for PEX (Table 1). Other glaucoma-related

Table 1 Clinical Characteristics and Hypothetical Referral Acceptance, According to the New Glaucoma Guidelines,[10] in Patients with PEX Assessment by the Referring Optometrists and All Patients Diagnosed with PEX at the Study Visit. IOP Presented in mmHg

Patient		IOP in Referral	IOP at Eye Clinic	PEX Assessment in Referral	Diagnosis	Accepted[a]
Nr	Eye					
1	(prothesis) Left	– 23	– 26	– Not done	– PEXG	No
2	Right Left	24 29	27 35	**No PEX** **No PEX**	POAG POAG	Yes
3	Right Left	28 19	44 27	Not done Not done	PEXG PEXG	Yes
4	Right Left	20 22	20 20	**No PEX** **No PEX**	Not glaucoma / no OH Not glaucoma / no OH	Yes[b]
5	Right[c] Left	24 24	18 18	Not done Not done	PEX but normal IOP Not glaucoma /no OH	No
6	Right Left	29 12	34 14	Not done Not done	PEXG Not glaucoma/ no OH	Yes
7	Right Left	26 26	29 29	**No PEX** **No PEX**	POAG Glaucoma suspect	Yes
8	Right Left	34 27	36 26	**No PEX** **No PEX**	OH OH	Yes
9	Right Left	33 17	38 22	Not done Not done	PEXG Not glaucoma / no OH	Yes
10	Right Left	38 22	34 22	**PEX** **No PEX**	PEX with OH Glaucoma	Yes
11	Right Left	15 21	16 22	**No PEX** **PEX**	Not glaucoma /no OH Glaucoma suspect + PEX	Yes [d]
12	Right Left	25 20	29 28	Not done Not done	OH Glaucoma suspect + PEX	Yes
13	Right Left	23 41	23 37	Not done Not done	OH PEXG	Yes

(*Continued*)

Table 1 (Continued).

Patient		IOP in Referral	IOP at Eye Clinic	PEX Assessment in Referral	Diagnosis	Accepted[a]
Nr	Eye					
14	Right Left	23 31	26 31	**No PEX** **PEX**	OH PEXG	Yes
15	Right Left	41 28	35 22	Not done Not done	Glaucoma suspect + PEX OH + PEX	Yes
16	Right Left	23 17	27 20	Not done Not done	OH + PEX Not glaucoma / no OH	No[e]
17	Right Left	27 37	19 25	Not done Not done	OH PEXG	Yes
18	Right Left	16 24	18 18	Not done Not done	PEXG Not glaucoma / no OH	Yes[f]
19	Right Left	27 18	27 18	Not done Not done	Glaucoma suspect + PEX Not glaucoma /no OH	Yes
20	Right Left	38 16	32 18	Not done Not done	PEXG PEX + normal IOP	Yes

Notes: Bold: PEX assessment by referring optometrist. Red: necessary referrals missed because of the lack of PEX assessment in referral. **Footnotes**: [a]Hypothetical acceptance of referral according to new guidelines. Referrals are accepted if either IOP ≥ 25 mmHg or ≥ 22 mmHg and PEX and/or assessment of visual field and/or optic nerve head suspicious for glaucoma. [b]Referral included both visual field measurements and optic disc evaluation; results were not confirmed at the eye clinic. [c]Pseudophakic eye. [d]Referral included optic nerve head evaluation suspicious for glaucoma and low CCT values. [e]Referral did not include a verified IOP difference between the eyes. [f]Referral included a > 5 mmHg IOP difference between the eyes measured twice at the optician shop.
Abbreviations: IOP, intraocular pressure; PEX, pseudoexfoliation; PEXG, exfoliation glaucoma; OH, ocular hypertension; CCT, central corneal thickness.

assessments described in the referral text were anterior chamber depth evaluation (seven referrals) and pigment dispersion syndrome assessment (two referrals, one with a positive finding later confirmed by the ophthalmologist). In total, 23% of all referrals (22/95) included either visual field measurement, optic nerve head assessment, or both.

Of all patients referred, 17% (16/95) were identified with PEX during the study visit but PEX assessment was lacking in the referral text for 13 cases (Table 1). Of the 13 referrals, three would not have been accepted according to the new national guidelines (ie, an IOP of at least 25 mmHg is needed for referrals solely based on elevated IOP), and thus two patients in need of treatment would have been missed (Table 1), which means that one patient with PEXG and another with PEX and OH requiring treatment would not have been detected.

Of the 189 eyes included in the study, the ophthalmologist diagnosed 19 with PEX during the study visit. The study optometrist positively assessed PEX in 12 of 19 eyes (63%) before dilatation and in 14 of 19 eyes (74%) after dilatation (Figure 2). In one eye, later confirmed with PEX, the optometrist noted "unsure" before dilatation but changed the assessment to "PEX" after dilatation. Only one pseudophakic patient presented with PEX (Table 1); the study optometrist did not find this case. The study optometrist never assessed that PEX was present when the ophthalmologist assessed as "no PEX" (that is, there were no false positives). Still, in 13 of 189 eyes (7%) the optometrist noted "unsure" either before or after dilatation or both. Of these cases, 12 involved eyes in which PEX was not confirmed; among those, one case had PEX in the other eye (both detected by the optometrist and confirmed by the ophthalmologist).

https://doi.org/10.2147/OPTH.S505365

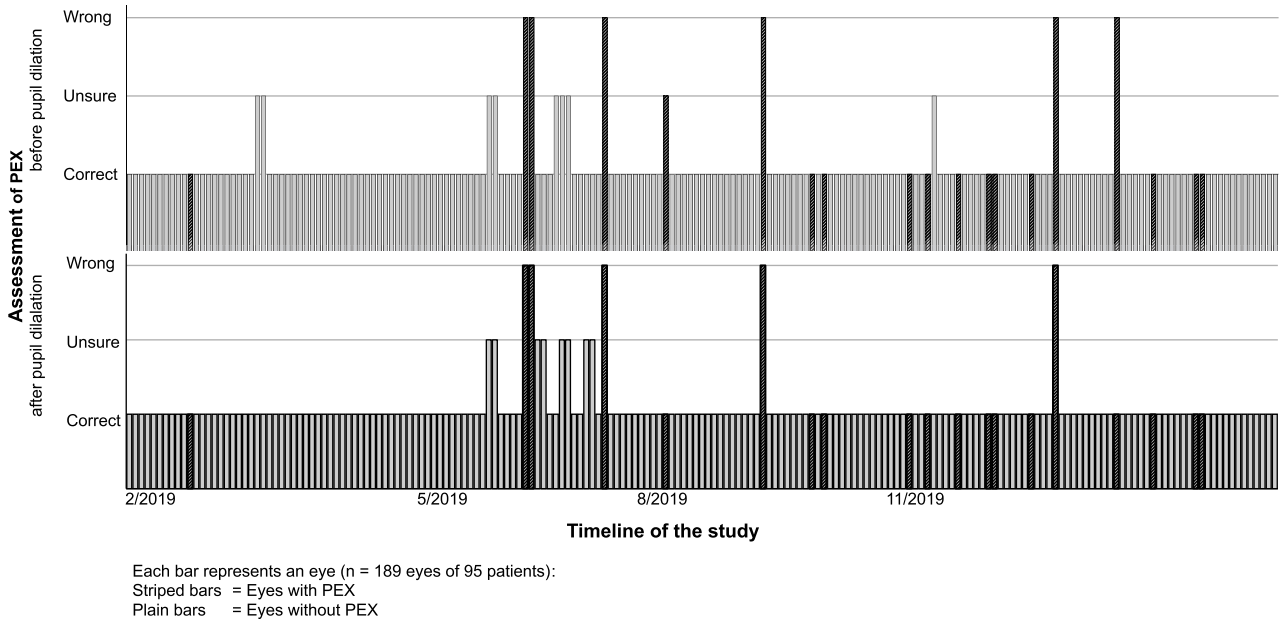

Figure 2 The study optometrist's assessment of PEX before and after dilation. The study optometrist's assessment of PEX is shown as correct, unsure, or wrong before dilation (upper section) and after dilation (lower section) in chronological order. Most "unsure" assessments took place in the first half of the study, while most patients with PEX presented in the second half of the study. None of the eyes without PEX were assessed as having PEX. The study optometrist incorrectly classified five eyes with PEX before and after dilation. Of the first six eyes with PEX, 67% (4 of 6 eyes) were missed by the study's optometrist even after dilation, but only 8% (1 of 13 eyes) of the remaining PEX-eyes were not found by the optometrist. The image is the property of the authors.
Abbreviation: PEX, pseudoexfoliation syndrome.

Discussion

Every fourth referral sent to our hospital during 2019 was based solely on an IOP of 21–24 mmHg. None of these referrals would have been accepted today according to the new Swedish glaucoma guidelines. Hence, 20 unnecessary referrals (21%, 20/95) would have been avoided. According to the new guidelines, additional examinations by optometrists are now required before referring individuals with only modestly elevated IOP (up to 24 mmHg) to secondary eye care (II-level). In this study, one-third of the referrals included IOP measurements ≤ 24 mmHg. However, findings from a slit-lamp examination were included in fewer than one-fifth of referrals with IOP ≤ 24 mmHg and even fewer comprised a PEX assessment. In contrast, the study optometrist detected PEX in a majority of the cases before dilatation and in three-quarters of the cases after dilation.

Most patients with PEX in our study had IOP > 25 mmHg, and referrals from optometrists concerning these patients would have been accepted based on the IOP level alone, according to the new glaucoma guidelines. However, one patient with PEXG and one with PEX and OH requiring IOP-lowering therapy would have been missed because the referring optometrist did not assess PEX. This finding is in line with previous studies showing that PEX is a relevant risk factor for glaucoma, even in eyes with modestly elevated IOP.[9–11,16] In addition, PEX increases the risk for disease progression and disease related loss of quality of life. Therefore, it is of importance to detect these high-risk patients early in the course of the disease. As the prevalence of PEX is high in Sweden,[16] it is relevant for primary care optometrists to address this specific risk factor for glaucoma. Accurate referrals from optometrist are essential to use the health care resources efficient and at the same time increase the chances to find high-risk patients early on.

The strengths of this study include its prospective design with the same double-blinded examiners, the use of a standard study protocol at all study visits, the relatively high number of eyes evaluated for PEX, and the fact that one-third of the referrals concerned eyes with only modestly elevated IOP. In addition, nearly all eligible referrals to our hospital were included in the study period, and all referrals were sent to our hospital before the new glaucoma guidelines were published.

Our study had some limitations. First, the proportion of eyes with PEX is relatively small. The proportion of eyes with PEX was lower than expected in our study; another study from the same catchment area found that 25% of clinically detected patients with glaucoma had PEXG.[8] In this study, most patients with PEX were discovered in the second half of the

study (Figure 2). We assume that this unexpected skewness could partly explain the higher number of uncertain assessments by the study optometrist during the first half of the study. After six eyes with confirmed PEX had run through the study, the study optometrist missed only one more eye with PEX after dilatation. Second, our hospital is not the only referral unit for secondary (II-level) glaucoma care in the catchment area. Primary care optometrists can choose to refer suspected glaucoma cases to either our hospital or several private ophthalmologists working in the same region. However, the main motivation for referral to our hospital was either geographical or because the patient wanted to be referred to the hospital.[20] Therefore, we assume it is unlikely that referrals to private practitioners differed significantly from those included in this study concerning PEX assessment by optometrists. Third, as previously reported,[20] 16% of referrals did not specify the method used for IOP measurement. Most referring optometrists used non-contact tonometry and a few used applanation tonometry. Thus, there is a variance in the data for IOP measurements from referring optometrist that we cannot control. Forth, most referrals did not specify whether the referring optometrist held a BSc or an MSc.

Recently, Carmichael et al reported the accuracy of glaucoma referrals from primary care optometrists to secondary eye care facilities in a meta-analysis of eleven studies mainly from the UK.[21] However, only one of the studies evaluated reported PEX assessment by an optometrist before referral with a rather low confirmation rate at the hospital of between 0–50% correct assessments.[22] In comparison to that study, the confirmation rate of the few PEX assessments performed by optometrists before referral in our study was much higher (100% correct assessments). A retrospective study conducted at our hospital reported that none of the referrals from optometrists sent to the same hospital based on elevated IOP during 2012 and 2013 included any PEX assessment before referral.[23] To the best of our knowledge, no other previous data is available on the frequency of PEX assessments by optometrists before referral in Sweden. Further studies are necessary to evaluate whether the rate of PEX assessment by optometrists has increased since the new glaucoma guidelines were published and to identify the need for additional education of optometrists in primary (I-level) eye care to accomplish relevant glaucoma referrals.

Conclusion

One group in great risk of visual disability is patients with PEXG. Thus, it is important to identify these patients early on. A majority of patients with glaucoma is detected through referrals from first care eye practitioners to secondary eye care units (Figure 1), but an increasing number of unnecessary referrals burdens glaucoma care units. Therefore, accurate referrals and an assessment of PEX at a primary care level is essential to use the limited health care resources wisely. In our study, PEX assessment was relatively easy to learn for an optometrist holding a Master's degree and working at the hospital. Evaluating PEX status was even successful in many undilated eyes. However, only a handful of referrals from primary care optometrists included any PEX assessment. Our results suggest that primary care optometrists should assess PEX before referral, at least in patients with a modestly elevated IOP. Otherwise, there is a risk that relevant cases of glaucoma will be missed if referrals from optometrists to secondary eye care facilities are judged according to the new Swedish glaucoma guidelines. In Sweden, stricter referral guidelines for IOP-only referrals from primary care optometrists to ophthalmologists have been established to use the health care resources more wisely. Assessment of PEX by primary care optometrists should be considered if similar requirements for IOP-only referrals are to be introduced in other countries, especially in populations with a high prevalence of PEX.

Abbreviations

IOP, intraocular pressure; VRQoL, vision related quality of life; BSc, Bachelor of Science; MSc, Master of Science; PEX, pseudoexfoliation syndrome; PEXG, exfoliation glaucoma; OH, ocular hypertension.

Acknowledgments

No acknowledgments are applicable for this paper.

Funding

This work was financially supported by grants from the Cronqvist Foundation, the Foundation for the Visually Impaired in the Former County of Malmöhus, the Margit and Kjell Stoltz Foundation, the Sancta Lucia Gille foundation and by the Järnhardt Foundation. The sponsors and funding organizations had no role in the design or results of this research.

Disclosure

Neither of the authors have any conflicts of interest for this paper.

References

1. Tuulonen A, Salminen H, Linna M, Perkola M. The need and total cost of Finnish eyecare services: a simulation model for 2005–2040. *Acta Ophthalmol*. 2009;87(8):820–829. doi:10.1111/j.1755-3768.2009.01532.x
2. Hitzl W, Bunce C, Reitsamer HA, Grabner G, Hornykewycz K. The projected increase in glaucoma due to the aging population in Austria from 2001 to 2031: results based on data of the Salzburg-Moorfields Collaborative Glaucoma Study. *Eur J Ophthalmol*. 2007;17(1):45–52. doi:10.1177/112067210701700107
3. Lindén C, Bengtsson B, Alm A, Calissendorff B, Eckerlund I, Heijl A. Glaucoma management in Sweden – results from a nationwide survey. *Acta Ophthalmol*. 2013;91(1):20–24. doi:10.1111/j.1755-3768.2011.02273.x
4. Bro T, Wickström K, Lindén C. The future is old - Patients with topical ocular hypotensive treatment in the Nordic region between 2008 and 2017 with projections for 2040. *Acta Ophthalmol*. 2021;99(8):e1442–e1448. doi:10.1111/aos.14848
5. Biggerstaff KS, Lin A. Glaucoma and Quality of Life. *Int Ophthalmol Clin*. 2018;58(3):11–22. doi:10.1097/IIO.0000000000000230
6. Forsman E, Kivela T, Vesti E. Lifetime visual disability in open-angle glaucoma and ocular hypertension. *J Glaucoma*. 2007;16(3):313–319. doi:10.1097/IJG.0b013e318033500f
7. Peters D, Bengtsson B, Heijl A. Lifetime risk of blindness in open-angle glaucoma. *Am J Ophthalmol*. 2013;156(4):724–730. doi:10.1016/j.ajo.2013.05.027
8. Coleman AL, Miglior S. Risk factors for glaucoma onset and progression. *Surv Ophthalmol*. 2008;53(1):S3–10. doi:10.1016/j.survophthal.2008.08.006
9. Ekstrom C, Alm A. Pseudoexfoliation as a risk factor for prevalent open-angle glaucoma. *Acta Ophthalmol*. 2008;86(7):741–746. doi:10.1111/j.1755-3768.2008.01248.x
10. Ekström C. Risk factors for incident open-angle glaucoma: a population-based 20-year follow-up study. *Acta Ophthalmol*. 2012;90(4):316–321. doi:10.1111/j.1755-3768.2010.01943.x
11. Topouzis F, Harris A, Wilson MR. Increased likelihood of glaucoma at the same screening intraocular pressure in subjects with pseudoexfoliation: the Thessaloniki Eye Study. *Am J Ophthalmol*. 2009;148(4):606–613e601. doi:10.1016/j.ajo.2009.03.024
12. Leske MC, Heijl A, Hussein M, Bengtsson B, Hyman L, Komaroff E. Factors for glaucoma progression and the effect of treatment: the early manifest glaucoma trial. *Arch Ophthalmol*. 2003;121(1):48–56. doi:10.1001/archopht.121.1.48
13. Leske MC, Heijl A, Hyman L, Bengtsson B, Dong L, Yang Z. Predictors of long-term progression in the early manifest glaucoma trial. *Ophthalmology*. 2007;114(11):1965–1972. doi:10.1016/j.ophtha.2007.03.016
14. Heijl A, Bengtsson B, Hyman L, Leske MC. Natural History of Open-Angle Glaucoma. *Ophthalmology*. 2009;116(12):2271–2276. doi:10.1016/j.ophtha.2009.06.042
15. Peters D, Bengtsson B, Heijl A. Factors associated with lifetime risk of open-angle glaucoma blindness. *Acta Ophthalmol*. 2014;92(5):421–425. doi:10.1111/aos.12203
16. Astrom S, Stenlund H, Linden C. Incidence and prevalence of pseudoexfoliations and open-angle glaucoma in northern Sweden: II. Results after 21 years of follow-up. *Acta Ophthalmol Scand*. 2007;85(8):832–837. doi:10.1111/j.1600-0420.2007.00980.x
17. Bengtsson B, Villalba C, Peters D, Aspberg J. Comparison of disease severity in glaucoma patients identified by screening in the 1990s and in routine clinical care in the 2010s in Sweden. *Acta Ophthalmol*. 2024;102(2):238–245. doi:10.1111/aos.15777
18. Socialstyrelsen. Socialstyrelsens föreskrifter och allmänna råd om kompetenskrav och vissa arbetsuppgifter för optiker. Available from: https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/foreskrifter-och-allmanna-rad/2023-8-8603.pdf. Accessed November 8, 2024.
19. Jóhannesson G, Stille U, Taube AB. Guidelines for the management of open-angle glaucoma: national Program Area Eye Diseases, National Working Group Glaucoma. *Acta Ophthalmol*. 2024;102(2):135–150. doi:10.1111/aos.16599
20. Landgren K, Peters D. A prospective study on effectiveness of elevated intraocular pressure as a criterion for glaucoma referrals by optometric practitioners in Sweden. *Acta Ophthalmol*. 2021;99(7):e1098–e1105. doi:10.1111/aos.14764
21. Carmichael J, Abdi S, Balaskas K, Costanza E, Blandford A. Assessment of optometrists' referral accuracy and contributing factors: a review. *Ophthalmic Physiol Opt*. 2023;43(5):1255–1277. doi:10.1111/opo.13183
22. Founti P, Topouzis F, Holló G. Prospective study of glaucoma referrals across Europe: are we using resources wisely? *Br J Ophthalmol*. 2018;102(3):329–337. doi:10.1136/bjophthalmol-2017-310249
23. Nilsson AG, Peters D. Effectiveness of Elevated Intraocular Pressure as a Criterion for Glaucoma Referral After 6 Years of Follow-Up. *Clin Ophthalmol*. 2021;15:3041–3049. doi:10.2147/OPTH.S318068