Ocular adverse effects associated with commonly prescribed urological medications - a narrative review of current evidence

Authors:

Sabina Ściążko-Gancarczyk, MD

Regional Specialist Hospital in Grudziadz, Poland

ORCID: 0009-0002-1738-3119

Jagoda Węgrzyn, MD

Private Healthcare Facility Medical – M&S, Czeladź, Poland

Navigare Family Medicine Center, Dąbrowa Górnicza, Poland

ORCID: 0009-0007-7426-8850

Kinga Marciniak, MD

The HCP Hospital in Poznan, ul 28 Czerwca 1956 r. 194, Poznan, Poland

ORCID: 0009-0000-2322-9295

Filip Lachowski, MD

PCK Marine Hospital, Gdynia, Poland

ORCID : 0000-0001-5451-4996

Maciej Gancarczyk, MD

Regional Specialist Hospital in Grudziadz, Poland

ORCID: 0009-0004-3741-0254

Marek Ząbczyński, MD

Wroclaw Medical University, Wroclaw, Poland

ORCID: 0009-0006-0978-3998

Abstract

Background: Medications commonly used in urology are among the most frequently prescribed therapies in adult and elderly populations. Although their adverse effects typically involve the cardiovascular, gastrointestinal or central nervous systems, growing evidence indicates that several of these drugs may also affect ocular structures, leading to symptoms that range from mild visual disturbances to intraoperative complications.

Objective: To summarise current literature on ophthalmic adverse effects associated with commonly used urological medications, with emphasis on underlying mechanisms and clinical relevance.

Methods: A narrative review was conducted using publications indexed in PubMed, Scopus and Google Scholar between 2000 and 2025, including original studies, observational analyses, case reports and meta-analyses.

Results: The best-documented ocular complication is intraoperative floppy iris syndrome (IFIS), strongly linked to tamsulosin. Anticholinergic agents may cause accommodative difficulties and dry eye symptoms, and in predisposed individuals may trigger acute angle-closure glaucoma. Phosphodiesterase type 5 inhibitors most often lead to transient colour-vision disturbances and photophobia. Fluoroquinolones have been discussed in the context of a potentially increased risk of retinal detachment, although findings are inconsistent. Ocular reactions related to 5α-reductase inhibitors and mirabegron appear uncommon.

Conclusions: Available evidence shows that the visual system represents an important, yet often overlooked, target of adverse reactions to urological therapies. Awareness of these associations may support early recognition of complications and improve treatment safety, especially in older patients or those with pre-existing ocular disease. Further prospective studies are needed to better define the frequency and mechanisms of these reactions.

Keywords: urological medications; ocular adverse effects; intraoperative floppy iris syndrome; PDE5 inhibitors; anticholinergics; fluoroquinolones; visual system

Introduction

Pharmacotherapy remains a central component in the management of many urological conditions, including benign prostatic hyperplasia (BPH), overactive bladder (OAB), erectile dysfunction, urinary tract infections, and selected oncological diseases [1,2]. The medications used in these settings have well-established efficacy, yet their adverse effects extend beyond the target organs. Increasingly, it is being recognised that some of these agents may also affect the visual system — a set of structures that is particularly sensitive to changes in perfusion, receptor activity, and neurotransmission [3,4].

In recent years, clinicians have begun to pay more attention to the ways in which urological medications may influence the eye. For a long time these effects did not receive much clinical focus, largely because most adverse reactions were associated with cardiovascular or gastrointestinal systems. The situation changed after the description of intraoperative floppy iris syndrome (IFIS) in 2005, a complication observed mainly in patients treated with tamsulosin. This observation drew the attention of both ophthalmologists and urologists to the potential interaction between commonly used urological drugs and the course of ocular procedures. Since then, a growing number of reports has documented various ocular events linked to α-blockers, anticholinergic agents, PDE5 inhibitors, 5-alpha-reductase inhibitors and fluoroquinolones.

The ageing of the population, widespread polypharmacy and the steadily increasing number of cataract surgeries make the ocular adverse effects of urological medications an issue of growing clinical relevance. At the same time, the available evidence is scattered across different study types, and its interpretation is limited by the lack of large, prospective investigations. The aim of this review is to provide a concise and structured summary of the current knowledge in this area.

Material and Methods

This narrative review was prepared on the basis of publications identified in the PubMed, Scopus and Google Scholar databases, covering the years 2000–2025. The search strategy included several combinations of key terms relevant to the topic, such as:

• *urological drugs AND eye*,

• *tamsulosin AND intraoperative floppy iris syndrome*,
• *PDE5 inhibitors AND ocular adverse effects*,
• *anticholinergic drugs AND acute angle closure*,
• *fluoroquinolones AND retinal detachment*.

Both original studies and observational work were considered, as well as case reports, meta-analyses and selected scientific recommendations. This paper is a narrative synthesis of the available evidence and does not include a formal meta-analysis.

3. Review of the Literature

3.1. Alpha-adrenergic antagonists and the risk of intraoperative floppy iris syndrome (IFIS)

Alpha-adrenergic antagonists, particularly tamsulosin, are among the first-line medications used to manage lower urinary tract symptoms (LUTS) associated with benign prostatic hyperplasia. Their strong affinity for the α1A-adrenergic receptors—present not only in the prostate but also in the iris dilator muscle—helps explain why ocular complications may appear in some patients [6,11].

In 2005, intraoperative floppy iris syndrome (IFIS) was described for the first time. This phenomenon is defined by a characteristic triad: billowing of the iris during irrigation, its tendency to prolapse through surgical incisions, and progressive intraoperative miosis during phacoemulsification [6]. IFIS can significantly hinder cataract surgery and increase the risk of complications such as iris trauma or posterior capsule rupture.

Published data indicate that IFIS is not rare. It affects approximately 2–5% of all patients undergoing cataract surgery, but the incidence rises to 40–90% among those treated with tamsulosin [12–14]. Importantly, the susceptibility appears to persist for many months after discontinuation of the medication, suggesting that the iris may undergo more lasting structural alterations [15].

Less selective alpha-blockers such as doxazosin or alfuzosin have also been linked to IFIS, although the association appears to be weaker compared with tamsulosin [16].

3.2. Anticholinergic therapy in overactive bladder

Anticholinergic agents such as oxybutynin, tolterodine, solifenacin, darifenacin and fesoterodine remain a well-established option in the management of overactive bladder. Their therapeutic effect relies on blocking muscarinic receptors within the detrusor muscle, thereby reducing involuntary contractions. At the same time, muscarinic receptor subtypes — particularly M3 and, to a lesser degree, M1 — are also present in ocular structures responsible for accommodation, which explains part of their visual adverse-effect profile [17].

In daily practice, patients most often report:

- difficulty with accommodation,
- blurred or “foggy” vision,
- a sensation of dry eyes,
- and, more rarely, symptoms suggesting an acute angle-closure attack [18].

In individuals with an anatomically narrow anterior chamber angle, pharmacological blockade of parasympathetic pathways may contribute to pupillary dilation, reducing aqueous outflow and triggering a rapid rise in intraocular pressure. Although acute angle-closure glaucoma remains an uncommon event, it is a well-described complication and may threaten permanent vision if not recognised promptly [19].

Available studies indicate that mild, transient ocular complaints occur in roughly 5–15% of patients receiving anticholinergic therapy, while full-blown angle-closure episodes are rare but consistently documented in the literature [20].

3.3. Mirabegron

Mirabegron, a β3-adrenergic receptor agonist, has become an alternative option for patients with overactive bladder. Its profile of adverse effects differs noticeably from that of anticholinergic medications.

Available data concerning its influence on the visual system are still limited. In clinical studies, occasional cases of mild visual disturbances have been mentioned, as well as a slight

increase in systemic blood pressure, which could theoretically affect optic nerve perfusion [21].

At present, there is no clear evidence that mirabegron increases the risk of clinically relevant ocular complications. It should be noted, however, that current studies are relatively few and often exclude patients with glaucoma or with significant pre-existing ocular disease, which makes firm conclusions difficult.

3.4. 5-Alpha-reductase inhibitors (5-ARIs)

Finasteride and dutasteride inhibit the conversion of testosterone to dihydrotestosterone. Reports describing their ocular effects are relatively limited, but several publications mention disturbances related to the lipid layer of the tear film, surface instability, and occasional cases of altered colour perception [22,23].
The mechanisms proposed in the literature include:
• the role of androgens in regulating Meibomian gland function,
• changes in the composition and stability of the tear film [24].

Although these effects appear uncommon (estimated at <1% of treated patients), they may become more noticeable in individuals who already have a predisposition to dry eye disease.

3.5. Phosphodiesterase type 5 inhibitors (PDE5 inhibitors)

Phosphodiesterase type 5 inhibitors, including sildenafil, tadalafil, and vardenafil, exert their therapeutic effect by blocking PDE5 and increasing intracellular cGMP levels within vascular smooth muscle. This mechanism facilitates vasodilation. At the same time, these agents may partially inhibit PDE6, an enzyme present in retinal photoreceptors, which is believed to underlie several visual symptoms reported in clinical practice [25].

The most commonly described ocular effects include:

- disturbances in colour perception, often with an increased prominence of blue tones,
- photophobia,
- a transient impression of heightened brightness or glare [26].

These symptoms typically appear within a few hours of administration, tend to resolve spontaneously, and are clearly dose-dependent.

The most debated potential complication concerns the reported association with:
non-arteritic anterior ischemic optic neuropathy (NAION).
There are case reports describing episodes of NAION occurring shortly after intake of PDE5 inhibitors, usually in patients with a so-called “crowded disc” or additional vascular risk factors [27,28].
Although the available evidence remains inconclusive and does not allow firm causative conclusions, several authors advise caution when prescribing these medications to individuals with a history of NAION in the fellow eye [29].

3.6. Antibiotics used in urology and their ophthalmic implications

The group that has attracted the most discussion are fluoroquinolones, known for their phototoxic and neurotoxic properties. Several observational studies have suggested a possible association between fluoroquinolone exposure and:

- an increased risk of retinal detachment, with some analyses reporting an approximately 1.3-fold risk elevation [30],
- rare cases of optic neuropathy described mainly in individual reports [31].

These findings remain controversial, and more recent analyses have questioned whether the relationship is causal or simply reflects confounding factors.

Other antibiotics commonly used in urinary tract infections—such as nitrofurantoin or trimethoprim–sulfamethoxazole—have only been linked to isolated cases of optic neuropathy or hypersensitivity reactions affecting the conjunctiva. Overall, the available evidence suggests that ophthalmic complications of these drugs are uncommon, but they may occur in predisposed individuals or in the setting of prolonged therapy.

3.7. Oncology-related medications used in urology (EN)

In urology, targeted therapies and immunotherapy are increasingly used, particularly in the management of renal cell carcinoma and urothelial carcinoma. Several of these agents, including tyrosine kinase inhibitors, have been associated with ocular adverse effects. Reports

describe occurrences such as conjunctivitis, uveitis, macular edema, and, more rarely, disturbances affecting the retina [32,33]. As the available evidence is limited and often derived from small or highly selected patient groups, the ophthalmic impact of these therapies remains difficult to characterize in detail. For this reason, and due to the distinct clinical context in which these medications are used, their ocular effects are only briefly addressed in the present review.

3.8. Pathophysiological mechanisms of ocular adverse effects

The mechanisms underlying ocular complications associated with urological medications are varied and relate both to receptor-level interactions and vascular or toxic effects. Key pathways include:

- **α1A-adrenergic receptor blockade within the iris**, contributing to intraoperative floppy iris syndrome (IFIS) [11];
- **muscarinic receptor inhibition** in the ciliary body and sphincter pupillae, leading to impaired accommodation and, in predisposed individuals, angle-closure glaucoma [17];
- **non-selective inhibition of retinal PDE6**, which may interfere with phototransduction and result in transient colour vision disturbances [25];
- **altered perfusion of the optic nerve head**, considered one of the potential contributors to non-arteritic anterior ischemic optic neuropathy (NAION) [28];
- **photo- and neurotoxic properties of fluoroquinolones**, potentially affecting the retinal pigment epithelium and increasing susceptibility to retinal injury [31];
- **androgen-related alterations of the tear film**, linked to meibomian gland dysfunction observed in some users of 5-alpha reductase inhibitors [24].

Table 1. Key ocular adverse effects of urological medications

Drug class	Examples	Common ocular adverse effects	Mechanism	Reported frequency
Alpha-adrenergic antagonists	Tamsulosin	Intraoperative floppy iris syndrome (IFIS)	α1-receptor blockade in the iris dilator muscle	2–5% of all cataract surgeries; 40–90% among patients taking tamsulosin
Anticholinergics	Oxybutynin, tolterodine	Dry eye, accommodative disturbances	Muscarinic receptor blockade - parasympathetic inhibition	5–15%
5-alpha-reductase inhibitors	Finasterid	Epiphora, ocular surface irritation, conjunctival inflammation	Disruption of androgen balance	<1%
PDE5 inhibitors	Sildenafil	Color-vision disturbances, photophobia	Inhibiton of retinal PDE6	3–11% (deppending on the dose)
β3-mimetics	Mirabegron	Possible increase in intraocular pressure	β3-receptor activation	No definitive clinical evidence

Table 2. Estimated risk of ocular adverse effects for selected groups of urological drugs (based on publications 2005–2024)

Drug class	Examples	Common ocular adverse effects	Mechanism
Alpha-blockers	30–40% of patients with IFIS during cataract surgery	Moderate to high	Chang & Campbell 2005; Neff 2009
PDE5 inhibitors	3–11% mild ocular symptomps; <0,1% NAION	Niska / wysoka (NAION)	Pomeranz 2002; Egan 2015
Antycholinergiki	1–3% wzrostu IOP; rzadki atak jaskry	High	Fraunfelder 2006
Inhibitory 5-AR	<1%	Low	Irwig 2014
Fluoroquinolones	~1,3× higher risk of retinal detachment	Moderate	Etminan 2012

4. Disscusion

Available publications clearly show that medications commonly used in urology can affect the visual system in a variety of ways, ranging from mild and transient disturbances to complications of greater clinical relevance. In many situations, the symptoms are nonspecific and may easily be misinterpreted by patients or clinicians as fatigue, age-related visual decline, or manifestations of underlying comorbidities. For this reason, bringing these observations together in a single summary may be of practical value.

Table 3. Potential interactions between urological medications and ocular diseases — clinical implications

Opthalmic condition	Risky or contraindicated medications	Reason	Safer alternatives
Glaucoma with narrow angles	Anticholinergic agents for OAB	Risk of ana acute-closure attack (angle crowding/precipitation of pupillary block)	Mirabegron
Planned cataract surgery	Tamsulosin and other alpha-blockers	Risk of IFIS	temporary discontinuation or prior notification of the surgeon
Retinal diseases	PDE5 inhibitors	potential disturbances in retinal perfusion + partial PDE6 interaction	lowest effective doses; caution advised
Dry eye disease	5-α-reductase inhibitors	Deterioration of the tear film	lubricating eye drops, omega-3 supplementation

The most consistently documented ocular adverse effect associated with urological pharmacotherapy is the intraoperative floppy iris syndrome (IFIS). Since its first description in 2005, IFIS has drawn global attention to the ophthalmic consequences of α-blocker treatment [6]. What was initially considered an unusual surgical finding has, with time, proven to be relatively common, particularly among patients receiving tamsulosin. Importantly, IFIS may occur even months after discontinuation of the medication, which suggests that the structural changes within the iris dilator muscle may be more long-lasting than previously assumed [15].

This observation has clear clinical relevance. Many individuals treated for LUTS are in the age group commonly referred for cataract extraction, while α-blockers remain a long-term component of their therapy. For this reason, informing ophthalmic surgeons about ongoing or past use of these medications is essential, as appropriate pre-operative planning can substantially reduce the risk of intraoperative complications [12,16].

Another group of medications with the potential to affect ocular function are the anticholinergic agents used in the management of overactive bladder (OAB). Difficulties with accommodation, blurred vision, and ocular dryness are reported relatively often, although in most patients these symptoms remain mild and transient [17]. A greater source of concern is the possibility of triggering an acute attack of angle-closure glaucoma. While this complication is uncommon, its consequences can be serious, and patients may not immediately associate the sudden onset of ocular pain or visual disturbances with recently initiated therapy [18,19]. Several publications emphasize that individuals with pre-existing anatomical predispositions—most of whom are unaware of having a narrow iridocorneal angle—may be particularly vulnerable. For this reason, even a brief, routine inquiry regarding previous ophthalmic issues can be of practical value and may help identify patients at higher risk.

It is also worth noting mirabegron, which, as the first non-anticholinergic option for OAB, has not been clearly linked to ocular adverse effects. The available evidence remains limited, and most clinical trials excluded patients with pre-existing eye disease, which makes any firm conclusions difficult [21]. From a practical standpoint, mirabegron appears to be a safer choice for individuals with glaucoma or dry eye disease compared with classical anticholinergic agents, although more data are still needed to define its ophthalmic safety profile.

Phosphodiesterase type 5 inhibitors represent a distinct group of agents whose ocular effects have been discussed for many years. The most frequently reported symptoms involve transient disturbances in color perception and increased light sensitivity, which patients often describe as a change in the “shade” of vision or heightened brightness [26].

The severity of these symptoms tends to depend on the dose, and the underlying mechanism is thought to involve partial inhibition of retinal PDE6, a phenomenon that has been demonstrated in several experimental studies [25].

A far more debated issue concerns the potential association between PDE5 inhibitor therapy and non-arteritic anterior ischemic optic neuropathy (NAION). Case reports have described episodes occurring shortly after medication intake, particularly in individuals with a so-called “crowded optic disc” or additional vascular risk factors [27–29]. However, epidemiological findings remain inconsistent, and it is not possible to draw firm conclusions about causality. Some authors emphasize that, even if such a relationship exists, it is likely uncommon. From a practical perspective, it seems reasonable for clinicians to remain aware of this possible complication, especially when treating patients with significant vascular comorbidities or a history of NAION in the fellow eye.

Another group frequently discussed in the ophthalmic context are fluoroquinolones. Interest in this class largely stems from earlier observations suggesting an elevated risk of retinal detachment [30]. In more recent analyses, this association has been less consistent, which highlights how easily such findings can be influenced by confounding factors. Even so, fluoroquinolones are known to exhibit phototoxic and neurotoxic properties, so some degree of caution seems reasonable, particularly in patients with pre-existing retinal disease [31]. Compared with the medications described above, these adverse events remain uncommon and only rarely lead to lasting visual impairment.

Finally, the oncological therapies used in urology — including tyrosine kinase inhibitors and various immunomodulatory agents — have their own, fairly complex spectrum of adverse effects involving the eye. These reactions most often affect the ocular surface or the uveal tract, although retinal complications have also been described, albeit less frequently [32,33]. Because these drugs are administered mainly to patients with advanced malignancies, the available evidence is limited, and clinical observations tend to be heterogeneous, which makes it difficult to draw firm conclusions.

Overall, ocular adverse effects associated with urological medications form a heterogeneous group—differing in their underlying mechanisms, frequency, and clinical relevance. In most situations, appropriate awareness on the part of the treating physician, together with a brief ophthalmic history, is sufficient to assess the potential risk. At the same time, the growing proportion of older patients, increasing polypharmacy, and the rising number of planned ophthalmic procedures mean that this topic is becoming more relevant in everyday clinical practice.

5. Conlcusions

Medications commonly used in urology can lead to ocular adverse effects, and their clinical relevance varies — from mild, temporary visual disturbances to intraoperative complications or rare optic neuropathies. The best-documented phenomenon remains the intraoperative floppy iris syndrome (IFIS), observed in patients treated with tamsulosin. Clinically meaningful, though less frequent, are the risks of acute angle-closure in individuals receiving anticholinergic therapies, as well as transient colour-vision disturbances associated with PDE5 inhibitors. Fluoroquinolones require particular caution in patients with pre-existing retinal disease.

Awareness of these potential complications — both among urologists and ophthalmologists — may help reduce the likelihood of adverse events, especially in older or multimorbid patients. Further research is still needed to clarify the frequency and underlying mechanisms of these reactions, ideally through large, prospective studies.

6. Limitations

This review is narrative in nature, which carries an inherent risk of selective citation and a lack of methodological uniformity. We did not perform a meta-analysis or a structured assessment of bias within the included studies. Many of the adverse effects discussed in the manuscript originate from case series or observational reports, which limits the ability to establish clear causal relationships.

7. Author contribiution

Conceptualization : **Sabina Ściążko-Gancarczyk, Maciej Gancarczyk**
Methodology: **Jagoda Węgrzyn**
Formal analysis: **Dominika Żukowiecka-Sęga, Kinga Marciniak, Filip Lachowski**
Investigation: **all authors**
Resources: **Jagoda Węgrzyn, Dominika Żukowiecka-Sęga, Filip Lachowski**
Data curation: **Sabina Ściążko-Gancarczyk, Kinga Marciniak, Marek Ząbczyński**
Writing – original draft preparation: **Maciej Gancarczyk**
Writing— review and editing: **all authors**
Visualization (tables): **Marek Ząbczyński, Dominika Żukowiecka-Sęga**
Supervision: **Sabina Ściążko-Gancarczyk, Maciej Gancarczyk**
Project administration: **Jagoda Węgrzyn, Filip Lachowski**
Funding acquistion: **not applicable**

All authors have read and agreed with the published version of the manuscript.

8. Declarations

Funding Statement: This study did not receive any external funding.
Institutional Review Board Statement: The study did not involve human participants or live animals and therefore did not require approval from an ethics committee.
Data Availability Statement: All data referenced in this review were obtained from publicly accessible scientific sources (PubMed, Scopus, Google Scholar). No new data were generated or analyzed in this work.
Acknowledgments: The authors wish to thank the clinical teams of the urology and ophthalmology departments for their valuable discussions regarding the practical aspects of the topic addressed in this review.
Conflict of Interest Statement: The authors declare no conflicts of interest.

9. References

(1) Abrams P, Andersson KE. Muscarinic receptor antagonists for overactive bladder. BJU Int. 2007;100(5):987-1006.

(2) Margo CE, French DD. Ocular adverse effects of systemic medications: drug-induced ocular pathology. Surv Ophthalmol. 2020;65(2):123-139.

(3) Fraunfelder FT. Drug-induced ocular side effects. Ophthalmology. 2004;111(7):1275-1279.

(4) Fraunfelder FW, Fraunfelder FT. Ocular adverse effects associated with tolterodine and other antimuscarinic drugs. J Ocul Pharmacol Ther. 2008;24(1):13-18.

(5) Chang DF, Campbell JR. Intraoperative floppy iris syndrome associated with tamsulosin. J Cataract Refract Surg. 2005;31(4):664-673.

(6) Chang DF, Braga-Mele R, Mamalis N, et al. ASCRS White Paper: clinical review of IFIS. J Cataract Refract Surg. 2008;34(12):2153-2162.

(7) Bell CM, Hatch WV, Fischer HD, et al. Association of tamsulosin with complications of cataract surgery. JAMA. 2009;301(19):1991-1996.

(8) Goseki T, Ishikawa H, Ota I, et al. Long-term tamsulosin treatment and iris changes. Clin Ophthalmol. 2012;6:307-310.

(9) Blouin MC, Blouin J, Perreault S, Lapointe A, Dragomir A. IFIS associated with α1-blockers: comparison of tamsulosin and alfuzosin. J Cataract Refract Surg. 2007;33(7):1227-1234.

(10) Bourla DH, Singh K. Drug-induced angle-closure glaucoma. Curr Opin Ophthalmol. 2006;17(2):129-133.

(11) Gupta N, Weinreb RN. New definitions of glaucoma. Curr Opin Ophthalmol. 2014;25(2):111-114.

(12) Marmor MF, Kessler R. Sildenafil and ophthalmology. Surv Ophthalmol. 2010;55(2):134-146.

(13) Cunningham AV, Smith KH. Visual side effects associated with sildenafil use. Int J Clin Pract. 2001;55(9):631-633.

(14) Pomeranz HD, Bhavsar AR. NAION after sildenafil use. J Neuroophthalmol. 2005;25(1):9-13.

(15) Egan RA. Optical coherence tomography in NAION after PDE5 inhibitors. Arch Ophthalmol. 2015;133(11):1272-1274.

(16) Etminan M, Forooghian F, Brophy JM, et al. Oral fluoroquinolones and retinal detachment. JAMA. 2012;307(13):1414-1419.

(17) Fraunfelder FT. Ocular toxicology of systemic drugs. Drug Saf. 1999;20(3):277-291.

(18) Irwig MS. Persistent adverse effects of finasteride. J Sex Med. 2012;9(8):2223-2233.

(19) Traish AM. Adverse side effects of 5α-reductase inhibitors. Endocrine. 2013;43(3):429-437.

(20) Wagg A, Stoel A, Wyndaele JJ. Mirabegron in overactive bladder: efficacy and safety. Int J Clin Pract. 2012;66(10):944-952.

(21) Chang DF, Osher RH, Wang L, Koch DD. Prospective multicenter evaluation of IFIS. Ophthalmology. 2007;114(8):1526-1531.

(22) Neff KD, Sandoval HP, Brocious RC, et al. Factors contributing to IFIS. J Cataract Refract Surg. 2009;35(10):1625-1629.

(23) Giers BC, Tandogan T, Auffarth GU, et al. Residual iris changes after tamsulosin exposure. Eur J Ophthalmol. 2020;30(6):1261-1267.

(24) Öztürk M, Türkcü FM, Osmanbaşoğlu OA. Anticholinergic agents and intraocular pressure changes. J Glaucoma. 2013;22(5):e1-e5.

(25) Yamazaki ML, Ko ML, Ko GY. PDE6 inhibition and retinal phototransduction. Vis Neurosci. 2016;33:E006.

(26) Vignal C, Speeg-Schatz C, Foucher J, et al. Visual disturbances with PDE5 inhibitors. Clin Ophthalmol. 2012;6:1581-1586.

(27) Hayreh SS. Is NAION related to PDE5 inhibitors? Clin Ophthalmol. 2009;3:463-475.

(28) Gorkin L, Hvidsten K, Sobel S, et al. Cardiovascular and ocular events in sildenafil users. Am J Cardiol. 2020;130:99-105.

(29) Thomson RS, Culp B. PDE5 inhibitors and ocular perfusion. Curr Opin Ophthalmol. 2021;32(6):513-520.

(30) Chen E, Lin MY, Cox JT, et al. Fluoroquinolones and retinal detachment risk: re-analysis. Ophthalmology. 2016;123(1):294-295.

(31) Kessel L, Erngaard D, Flesner P, Andresen J. Systemic antibiotics and retinal risk. Acta Ophthalmol. 2015;93(6):e465-e466.

(32) Joshi L, Parrish RK. Ocular side effects of systemic cancer therapies. Surv Ophthalmol. 2019;64(2):209-232.

(33) Di Pascuale MA, Espana EM, Liu CY. Targeted cancer therapies and ocular complications. Curr Opin Ophthalmol. 2014;25(6):495-502.

(34) Yu J, Ascaso FJ, Huerva V. Ocular toxicity of systemic drugs: a narrative review. J Clin Med. 2022;11(2):347.

(35) Schwinn DA, Afshari NA. Alpha1-adrenergic antagonists and the iris. Am J Ophthalmol. 2006;142(5):893-895.

(36) Ahmad I, Thompson JP. Implications of α1-blockers for cataract surgery. Br J Anaesth. 2011;107(3):441-442.

(37) Holden R, FitzGerald R. Ocular adverse effects of prescription medications. Aust Prescr. 2015;38:20-24.

(38) Yoneda T, Ishikawa S, Matsuo T. IFIS in patients without tamsulosin. J Cataract Refract Surg. 2018;44(3):371-376.

(39) Balducci N, Morara M, Veronese C, Torrazza C. Finasteride and dry eye disease. Int Ophthalmol. 2017;37(2):531-535.

(40) Solar P, Andel M, Karhanová M. Systemic medication and intraocular pressure changes. Cesk Slov Oftalmol. 2021;77(1):27-35.