



## Identifying and treating amiodarone-induced corneal deposits: When the heart saves and the cornea speaks

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## Abstract

Amiodarone remains a mainstay in the treatment of potentially life-threatening cardiac arrhythmias, yet its long-term use is well known to induce cornea verticillata, an epithelial alteration related to intracellular phospholipid accumulation. In most cases these deposits are clinically silent, but some patients may report glare, halos, blurred vision, or ocular discomfort, symptoms that can negatively affect visual quality and, in selected cases, influence treatment adherence, particularly in individuals with severe cardiovascular disease. This mini-review examines the current evidence on the pathophysiological basis, clinical manifestations, and diagnostic features of amiodarone-related corneal changes, with a focus on slit-lamp biomicroscopy and newer multimodal imaging approaches, including *in vivo* confocal microscopy. Management is considered within a multidisciplinary framework, where ophthalmic findings must be interpreted alongside the often-essential role of amiodarone in cardiac care. Special attention is given to ophthalmic follow-up, symptom-guided management, and patient counseling. By bringing together the perspectives of ophthalmology and cardiology, this review outlines practical strategies to maintain visual comfort without compromising the systemic benefits of antiarrhythmic therapy.

**Key Words:** Amiodarone; Cornea verticillata; Drug-induced keratopathy; *In vivo* confocal microscopy; Ocular surface disease; Multidisciplinary management

**Core Tip:** Amiodarone therapy is classically linked to cornea verticillata, a characteristic epithelial finding detected during routine ophthalmic examination. In many patients, these changes remain asymptomatic, but in some cases they may contribute to glare, halos, or more general visual discomfort, especially when pre-existing ocular surface disease is also present. Slit-lamp biomicroscopy remains the cornerstone of diagnosis, while anterior segment optical coherence tomography and, in selected cases, *in vivo* confocal microscopy may provide adjunctive structural documentation. Recognizing amiodarone-related corneal findings is clinically important, not only for accurate diagnosis, but also for appropriate patient counseling, symptom-oriented management, and rational follow-up planning.

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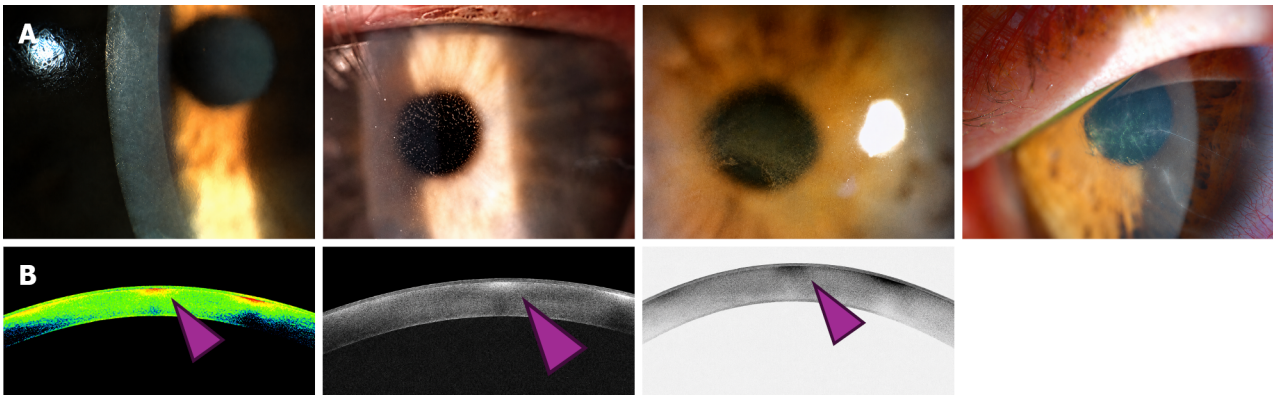
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## INTRODUCTION

Amiodarone remains one of the most effective antiarrhythmic agents for the management of life-threatening ventricular arrhythmias and for rhythm control in selected patients with atrial fibrillation. Its clinical use, however, is far from straightforward. Slow absorption, marked tissue accumulation, high lipid solubility, hepatic metabolism, and a long and highly variable elimination half-life all contribute to a complex pharmacokinetic profile. These same features help explain not only its therapeutic value but also its wide range of adverse effects. With prolonged use, both amiodarone and its active metabolite, N-desethylamiodarone, can accumulate in several tissues, including ocular structures. Among ocular adverse events, cornea verticillata, or vortex keratopathy, is the most frequent ophthalmic finding, whereas halos around lights and reduced vision are among the symptoms reported by symptomatic patients[1,2]. On slit-lamp examination, the deposits usually appear as bilateral whorl-like epithelial opacities, creating the classic pattern of cornea verticillata. Representative slit-lamp and anterior segment optical coherence tomography findings of amiodarone-induced cornea verticillata are shown in [Figure 1](#).

Ultrastructural studies have shown that these corneal changes reflect the presence of complex lipid deposits within lysosome-like intracytoplasmic inclusions in epithelial cells. Their development is generally linked to the cationic amphiphilic properties of amiodarone, which favor intralysosomal phospholipid accumulation and the formation of poorly degradable drug-lipid complexes, in keeping with a process of drug-induced phospholipidosis[3-8]. Both histopathologic findings and clinical observations suggest that keratopathy is related to dose and treatment duration, with more pronounced epithelial alterations occurring after greater cumulative exposure[4-6]. Even so, amiodarone-associated cornea verticillata has traditionally been regarded as a largely benign and reversible condition, since visual acuity is usually preserved and regression after drug withdrawal has been documented[1,4,7]. Still, preserved visual acuity does not necessarily mean absence of symptoms, and patients may complain of colored halos, blurred vision, glare, dryness, eyelid irritation, or photophobia[1,2,7].

*In vivo* confocal microscopy has added an important layer of detail to the assessment of amiodarone-induced keratopathy by enabling direct visualization of corneal microstructural changes *in vivo*. Hyperreflective intracellular inclusions have been described mainly in the corneal epithelium, especially in the basal layers, and in some cases as microdots within the stroma or endothelium[9,10]. Confocal imaging may also be useful in the differential diagnosis of cornea verticillata, particularly when Fabry disease is part of the clinical question, as slit-lamp examination alone may not



**Figure 1** Slit-lamp biomicroscopy and anterior segment optical coherence tomography in amiodarone-induced cornea verticillata. A: Slit-lamp photograph showing the typical whorl-like epithelial opacities radiating from the central to inferocentral cornea, consistent with amiodarone-related cornea verticillata; B: Anterior segment optical coherence tomography showing corresponding hyperreflective changes within the superficial corneal layers (arrowheads), consistent with epithelial drug-related deposition.

reliably separate the two conditions[11,12]. At the same time, recent reviews confirm that amiodarone-related cornea verticillata is generally associated with mild to moderate symptoms and little or no reduction in visual acuity, while also stressing that any decision to modify systemic therapy must be weighed carefully against the cardiovascular importance of the drug[13].

This point becomes especially relevant in older patients receiving long-term treatment, since aging itself is a major risk factor for tear dysfunction and meibomian gland disease, and concomitant medications or systemic comorbidities may further disrupt ocular surface homeostasis[14]. More broadly, tear-film instability and ocular surface damage are well known to cause fluctuating vision, blur, glare, and reduced visual quality even when best-corrected visual acuity remains relatively preserved[15]. In this setting, visual complaints in patients taking amiodarone may not be explained by epithelial deposits alone and may also reflect coexisting ocular surface abnormalities, although direct evidence supporting this association in amiodarone-treated populations remains limited. For this reason, a practical clinical assessment should move beyond the slit-lamp appearance of cornea verticillata and also take into account ocular surface status and patient-reported symptoms. On this basis, the present review summarizes the clinical spectrum of amiodarone-induced corneal deposits, the mechanisms underlying their development, the role of imaging in diagnosis and differential diagnosis, and the practical strategies that may help relieve ocular symptoms while preserving the systemic benefits of therapy.

## LITERATURE SEARCH

This article was conceived as a narrative minireview informed by a structured literature search. The search was conducted in April 2026 using PubMed/MEDLINE, the Cochrane Library, and ClinicalTrials.gov, and covered the period from database inception through April 2026. The search strategy combined the terms “amiodarone”, “cornea verticillata”, “vortex keratopathy”, “amiodarone keratopathy”, “drug-induced corneal deposits”, “*in vivo* confocal microscopy”, “ocular surface disease”, “dry eye”, and “visual quality”, using Boolean operators including “AND” and “OR”.

Eligible publications included English-language original articles, case reports, case series, review papers, and other clinically relevant publications addressing the pathophysiology, clinical features, imaging characteristics, differential diagnosis, ocular surface involvement, and management of amiodarone-induced corneal deposits. Articles not specifically addressing amiodarone-related corneal changes or lacking clinically meaningful ophthalmic content were excluded. The reference lists of selected studies were also screened manually to identify additional relevant reports.

Titles and abstracts were initially screened for relevance, and full texts were reviewed when potentially suitable for inclusion. As the purpose of this work was to provide a clinically oriented narrative synthesis rather than a formal systematic review, no PRISMA flow diagram, quantitative meta-analysis, or standardized risk-of-bias assessment was performed. The final narrative synthesis was based on the 50 publications considered most relevant to the aims of the review. Because this study did not involve prospective patient recruitment, experimental intervention, or the analysis of identifiable patient data, ethics committee approval was not required.

## LITERATURE ANALYSIS

The reviewed literature consistently shows that amiodarone-related corneal changes are common, predominantly epithelial, and variable in severity, ranging from the classic appearance of cornea verticillata to less common and more advanced forms. Early clinical and histopathologic studies were central in establishing this picture. In one of the earliest clinical series, Chew *et al*[16] documented typical keratopathy in 35 of 37 patients treated with amiodarone, and notably

none of these patients reported ocular symptoms. In the patient with severe keratopathy who underwent corneal biopsy, electron microscopy demonstrated membrane-bound lamellar bodies throughout the corneal epithelium, along with additional membrane-bound structures, predominantly granular in appearance, within stromal keratocytes. Building on these findings, Alnawaiseh *et al*[17] showed that Scheimpflug corneal densitometry may provide an objective approach to quantifying amiodarone keratopathy. Compared with healthy controls, patients receiving amiodarone showed significantly increased corneal light backscatter across all corneal layers. In that same study, N-desethylamiodarone levels correlated most strongly with densitometry values in the anterior cornea, whereas cumulative dose and treatment duration were more closely associated with densitometric values across the full corneal thickness.

Another recurring point in the literature is that these corneal findings are not necessarily fixed and may evolve over time. Rivera *et al*[18] reported grade IV amiodarone-induced keratopathy in a patient wearing soft contact lenses, noting that this was the first case of grade IV keratopathy identified among 686 amiodarone-treated patients followed at the Mayo Clinic. Frings and Schargus[19] described a case in which topical treatment with unpreserved phosphate-free 0.1% sodium hyaluronate containing heparin was associated, over a 3-month period, with a reduction in the area of cornea verticillata from 6 mm<sup>2</sup> to 2 mm<sup>2</sup> and an improvement from grade III to grade II in the treated eye, while the fellow eye treated with sodium hyaluronate alone showed no comparable change. Mehta *et al*[20] reported complete resolution of cornea verticillata during ongoing amiodarone therapy in a patient who had started rifampin; at that time, both serum amiodarone and desethylamiodarone levels were below the therapeutic range. After rifampin was discontinued, drug levels returned to the therapeutic range, and cornea verticillata reappeared four months later.

Beyond the classic whorl-like pattern, several reports have drawn attention to less typical morphologic presentations. In a patient with epithelial basement membrane dystrophy, Inoue *et al*[21] described bilateral amiodarone-related corneal opacities in which the usual vortex pattern coexisted with oval-shaped lesions. *In vivo* confocal microscopy showed highly reflective epithelial cell clusters consistent with amiodarone keratopathy, together with basement membrane abnormalities and epithelial microcysts typical of epithelial basement membrane dystrophy. Rogers *et al*[22] described amiodarone keratopathy in a grafted cornea in which the whorl-like pattern was oriented almost 90 degrees away from the usual direction. Bhatt and Ramaesh[23] reported an unusual unilateral case in a patient taking amiodarone whose fellow eye, fitted with an occlusive contact lens for many years, remained clear. Taken together, these reports broaden the recognized morphologic spectrum of amiodarone keratopathy[21-23].

Finally, some studies suggest that in selected cases amiodarone-related changes may extend beyond the superficial epithelium. Erdurmus *et al*[24] reported a patient with bilateral symmetric epithelial verticillata in whom confocal laser scanning microscopy also revealed reflective deposits around stromal keratocytes and diffuse bright microdeposits within endothelial cells, suggesting full-thickness corneal involvement. Meng *et al*[25] likewise described a patient who developed both corneal deposits and optic neuropathy during systemic amiodarone treatment. In their review, they emphasized that keratopathy is the most common ocular manifestation and is usually benign and potentially reversible, whereas amiodarone-associated optic neuropathy is rare but may lead to visual impairment ranging from mild deficits to severe permanent loss[25].

Overall, the available evidence indicates that amiodarone-related corneal deposits are usually readily recognizable and generally not vision-threatening, although their morphology and extent may vary according to the individual clinical context. Table 1 summarizes the principal studies included in this review[16-25].

## DISCUSSION

Amiodarone-related corneal deposits are usually easy to recognize and are often structurally benign, but their clinical relevance cannot be judged from slit-lamp appearance or preserved best-corrected visual acuity alone. Evidence from dry eye disease shows that tear-film instability and ocular surface damage may cause blur, glare, fluctuating vision, and reduced visual quality even when standard visual acuity remains relatively unaffected[15]. In patients receiving long-term amiodarone therapy, this provides a plausible framework for understanding why symptoms may sometimes seem disproportionate to the visible extent of epithelial deposition. However, direct evidence specifically demonstrating ocular surface dysfunction as a determinant of symptoms in amiodarone-treated populations remains limited, and this interpretation should therefore be regarded as hypothesis-generating rather than definitive. At the same time, the available evidence does not support the idea that ocular surface dysfunction is the only mechanism behind symptoms in amiodarone keratopathy. More realistically, it may be considered a clinically relevant contributing factor that can coexist with the corneal deposits themselves, rather than a proven primary driver of symptoms. This interpretation is in line with current diagnostic frameworks, which recommend integrating symptom evaluation with assessment of tear-film homeostasis and ocular surface findings[26]. It is also supported by the recognized role of meibomian gland dysfunction and aging in destabilizing the ocular surface[27,28], as well as by data linking dry eye to impaired optical quality[29]. Consistent with this broader perspective, a recent retrospective cohort of amiodarone-treated patients referred for visual disturbances described a heterogeneous range of complaints, including blurred vision, glare, halos, photophobia, and eye redness in association with verticillate keratopathy[30].

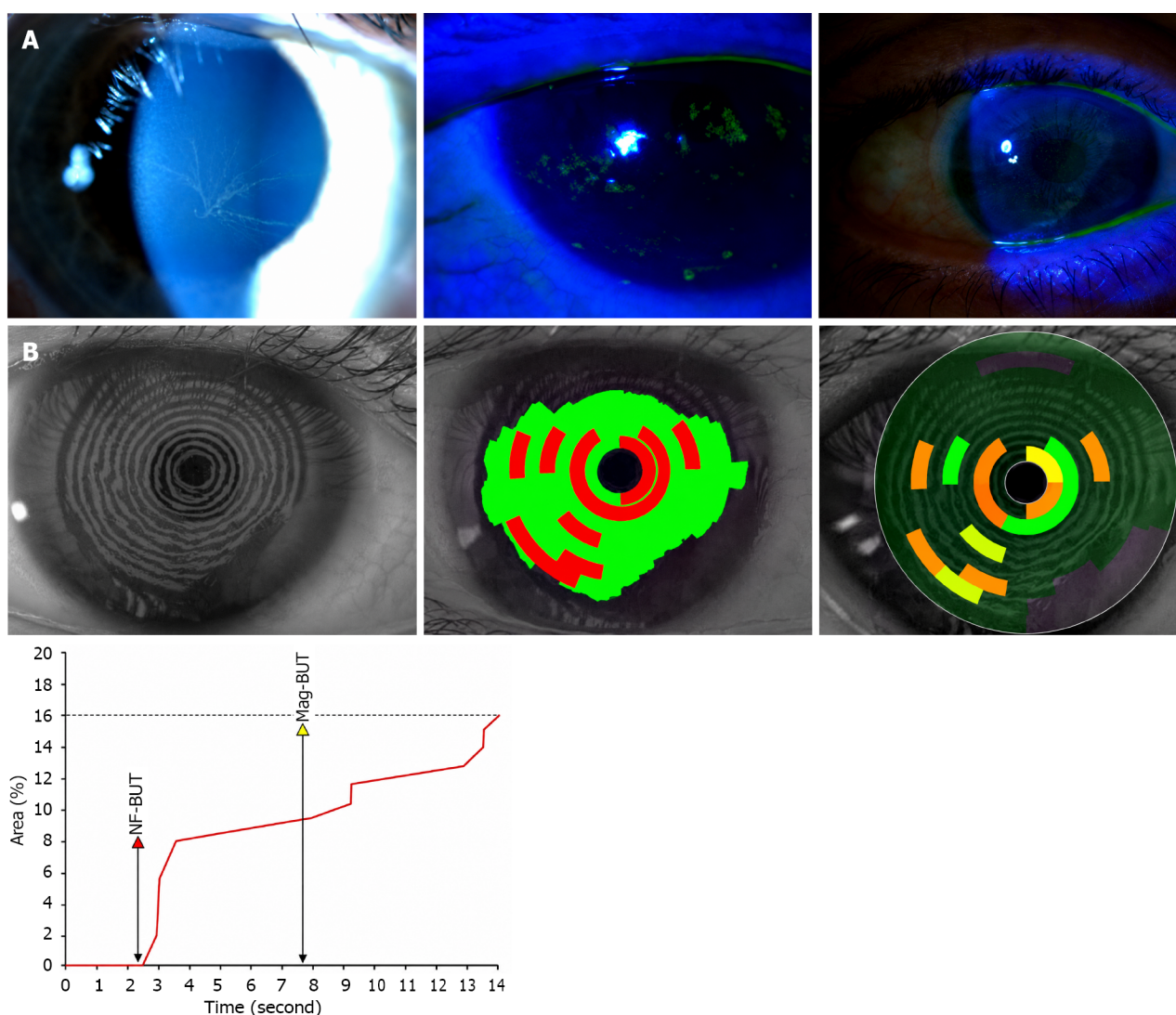
Current dry eye classifications also help place these symptoms within a more coherent clinical framework. Recent consensus documents emphasize that ocular surface disease is multifactorial and that visual disturbance may arise from interacting abnormalities involving tear-film homeostasis, inflammation, epithelial damage, eyelid disease, and neurosensory mechanisms[31-33]. For this reason, cornea verticillata should not automatically be assumed to explain every visual complaint in patients taking amiodarone. A more clinically useful approach is to interpret epithelial deposits together with symptom burden, ocular surface status, and the patient's visual needs. From a management perspective,

**Table 1** Key studies included in the literature review

| Ref.                         | Study design                      | Sample size                                                                         | Main findings reported in the literature                                                                                                                                                                                                                                                                                                                                                                    | Clinical relevance                                                                                                                                                       |
|------------------------------|-----------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chew <i>et al</i> [16]       | Clinical series                   | 37 patients                                                                         | In an early clinical series, typical amiodarone keratopathy was documented in 35 of 37 treated patients, although none reported ocular symptoms. In the patient who underwent corneal biopsy because of severe keratopathy, electron microscopy showed membrane-bound lamellar bodies throughout the corneal epithelium, along with predominantly granular membrane-bound structures in stromal keratocytes | This study supports the view that amiodarone keratopathy is common, often clinically silent, and ultrastructurally consistent with intracellular drug-related deposition |
| Alnawaiseh <i>et al</i> [17] | Comparative observational study   | 66 consecutively enrolled amiodarone-treated patients <i>vs</i> 66 healthy controls | Scheimpflug corneal densitometry demonstrated significantly higher corneal light backscatter in patients receiving amiodarone than in healthy controls. N-desethylamiodarone levels showed the strongest correlation with anterior corneal densitometry, whereas treatment duration and cumulative dose were associated with full-thickness densitometric changes                                           | These findings suggest that corneal densitometry may provide an objective tool for quantifying and monitoring corneal involvement during amiodarone therapy              |
| Rivera <i>et al</i> [18]     | Case report                       | 1 patient                                                                           | A grade IV amiodarone-induced keratopathy was described in a soft contact lens wearer. Among 686 amiodarone-treated patients followed at the Mayo Clinic, this was the first grade IV case identified                                                                                                                                                                                                       | This report indicates that advanced keratopathy can occur, but appears to be distinctly rare                                                                             |
| Frings and Schargus [19]     | Case report                       | 1 patient                                                                           | In a single case, topical treatment with unpreserved phosphate-free 0.1% sodium hyaluronate containing heparin was associated with a marked reduction in the area of cornea verticillata and with improvement in keratopathy grade over 3 months, whereas the fellow eye treated with sodium hyaluronate alone showed no comparable change                                                                  | This observation suggests that, at least in selected cases, corneal deposits may partially regress with topical treatment                                                |
| Mehta <i>et al</i> [20]      | Case report                       | 1 patient                                                                           | Complete disappearance of cornea verticillata was documented during ongoing amiodarone therapy after rifampin reduced serum amiodarone and desethylamiodarone concentrations to subtherapeutic levels. The deposits reappeared after rifampin discontinuation, once therapeutic drug levels were restored                                                                                                   | This case strongly supports the idea that corneal deposits reflect dynamic systemic exposure rather than fixed, irreversible corneal damage                              |
| Inoue <i>et al</i> [21]      | Case report                       | 1 patient                                                                           | In a patient with epithelial basement membrane dystrophy, typical vortex opacities coexisted with oval-shaped corneal lesions. <i>In vivo</i> confocal microscopy revealed highly reflective epithelial cell clusters, epithelial basement membrane abnormalities, and epithelial microcysts                                                                                                                | This report shows that amiodarone keratopathy may assume atypical morphologic features when the epithelial microenvironment is altered                                   |
| Rogers <i>et al</i> [22]     | Case report                       | 1 patient                                                                           | In a grafted cornea, the whorl-like pattern of amiodarone keratopathy was oriented almost 90 degrees from its usual direction                                                                                                                                                                                                                                                                               | This case suggests that local corneal architecture or epithelial migratory behavior may influence the visible orientation of vortex deposits                             |
| Bhatt and Ramaesh [23]       | Case report                       | 1 patient                                                                           | An unusual unilateral presentation was described in a patient taking amiodarone whose fellow eye, fitted with an occlusive contact lens, remained free of keratopathy. Reduced ultraviolet exposure was proposed as a possible explanation                                                                                                                                                                  | This observation highlights that asymmetrical or unilateral presentations may occur under specific local surface conditions                                              |
| Erdurmus <i>et al</i> [24]   | Case report                       | 1 patient                                                                           | Confocal laser scanning microscopy demonstrated not only epithelial verticillata, but also reflective deposits around stromal keratocytes and diffuse bright microdeposits within endothelial cells                                                                                                                                                                                                         | This case indicates that, although amiodarone keratopathy is usually considered an epithelial process, deeper corneal involvement may occasionally be present            |
| Meng <i>et al</i> [25]       | Case report and literature review | 1 patient                                                                           | A patient developed both corneal deposits and optic neuropathy during systemic amiodarone treatment. The accompanying review emphasized that keratopathy is generally benign and potentially reversible, whereas optic neuropathy is rare but may lead to permanent visual loss                                                                                                                             | This report reinforces the need to reconsider the diagnosis whenever visual loss appears disproportionate to the corneal findings alone                                  |

this supports an individualized, etiology-based strategy rather than a rigid algorithm, with treatment directed toward the main contributors to symptoms in each case [34].

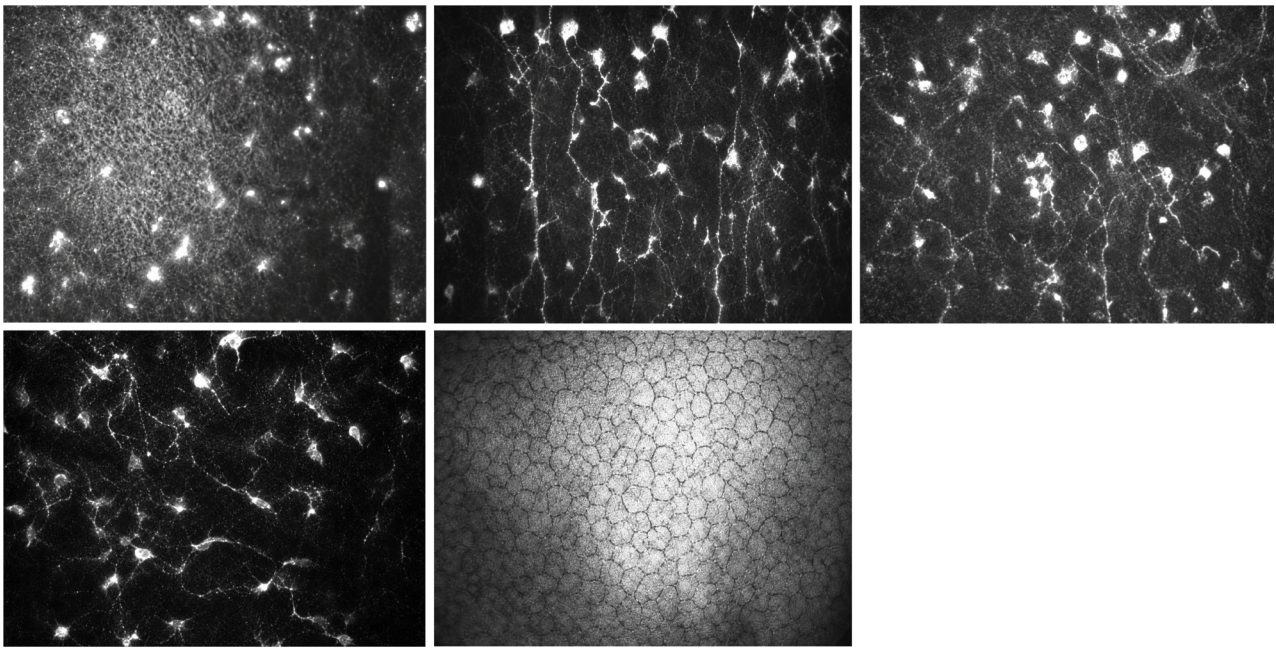
This perspective becomes particularly relevant when ocular symptoms arise in patients receiving amiodarone. In these cases, the ophthalmic evaluation should not end with documentation of corneal deposits, but should also explore potentially modifiable sources of ocular surface dysfunction. Representative ocular surface findings in a symptomatic patient on chronic amiodarone therapy are shown in **Figure 2**, including fluorescein staining and tear-film instability documented by non-invasive tear-film assessment. In dry eye associated with meibomian gland dysfunction, reduced meibum secretion and/or altered meibum composition destabilizes the lipid layer, increases evaporation, and promotes hyperosmolar stress, inflammation, and epithelial damage [35]. Age may further amplify this process, since older adults are more likely to have reduced tear production, chronic ocular surface inflammation, systemic comorbidities, and



**Figure 2** Ocular surface findings in a symptomatic patient receiving chronic amiodarone therapy. A: Fluorescein staining under cobalt blue illumination showing punctate epithelial staining, consistent with associated ocular surface compromise; B: Non-invasive tear film assessment showing irregular Placido ring reflections, color-coded tear film breakup maps, and breakup time analysis, supporting the presence of tear film instability.

polypharmacy[36]. In our view, symptomatic management of amiodarone keratopathy should therefore go beyond recognizing cornea verticillata itself and include identification and treatment of coexisting ocular surface abnormalities whenever present.

The literature on optical quality further reinforces this interpretation. In dry eye disease, objective optical assessments have shown increases in irregular astigmatism and higher-order aberrations, changes that are directly relevant to quality of vision[37]. This is biologically plausible, since the tear film is the first refractive surface encountered by incoming light, and any irregularity or instability at this interface can reduce retinal image quality and increase scatter[38]. Reviews focused on tear-film analysis and optical performance have also emphasized that conventional dry eye tests often correlate only weakly with symptoms, whereas dynamic assessment of tear behavior and optical quality may better reflect the patient's visual experience[39]. In practical terms, this helps explain why some patients with relatively limited structural corneal abnormalities may still report halos, blur, glare, or fluctuating visual quality. In this sense, the symptomatic expression of amiodarone keratopathy may be viewed as the result of a three-level interaction between systemic pharmacokinetics, epithelial microstructural change, and ocular surface optical instability. From an imaging standpoint, slit-lamp biomicroscopy remains the first-line and usually sufficient tool for recognizing the typical bilateral whorl-like epithelial pattern of amiodarone keratopathy. Anterior segment optical coherence tomography may serve as a practical non-invasive adjunct when structural documentation of superficial corneal involvement is desired, particularly for baseline recording or follow-up illustration, but it is not essential for diagnosis in most routine cases. By contrast, *in vivo* confocal microscopy should be regarded as a second-line technique reserved for selected situations, such as atypical presentations, uncertainty in the differential diagnosis, or cases in which detailed microstructural characterization may be clinically or academically useful. *In vivo* confocal laser-scanning microscopy has shown that cornea verticillata in both Fabry disease and amiodarone-induced keratopathy is characterized by hyperreflective deposits predominantly located in the basal epithelial cell layer[40].



**Figure 3** *In vivo* confocal microscopy findings in amiodarone-related keratopathy. Representative confocal images show numerous hyperreflective intracellular inclusions predominantly within the corneal epithelial layers, consistent with drug-induced phospholipid deposition. These images illustrate the microstructural substrate of cornea verticillata and support the role of confocal microscopy as an adjunctive tool for documenting epithelial involvement *in vivo*.

Representative *in vivo* confocal microscopy images illustrating the microstructural corneal changes of amiodarone-related keratopathy are shown in Figure 3. These findings support the value of confocal microscopy as an adjunctive tool for documenting epithelial involvement and atypical presentations, but not as a routine stand-alone test. Overall, amiodarone keratopathy is best understood as a usually non-vision-threatening corneal manifestation whose symptomatic relevance depends on the interplay between epithelial deposition, ocular surface status, and visual demands. This perspective may improve counseling and follow-up, while helping clinicians avoid two opposite errors: Attributing all symptoms to the corneal deposits alone or creating unnecessary alarm around a drug that often remains cardiologically indispensable.

Amiodarone-related ocular surface involvement may extend beyond the corneal epithelium itself. The drug accumulates in lacrimal gland cells due to its nature as a cationic amphiphilic drug and is secreted by the lacrimal gland into tears affecting the cornea and the conjunctiva alike. Electron microscopy showed complex lipid deposits within lysosome-like inclusions in the conjunctival epithelium. Experimental data suggest possible lacrimal gland changes[41], and earlier clinical observations demonstrated the presence of amiodarone in tears, supporting ocular surface exposure [5]. This is consistent with ultrastructural studies showing laminated lipid inclusions within bulbar conjunctival epithelial cells and other conjunctival elements[3,42].

Although this review focuses on corneal deposits, the ocular spectrum reported with amiodarone is broader. Lenticular changes have been mentioned in the earlier ophthalmic literature and anterior subcapsular cataract has been described in patients receiving moderate to high doses, but recent population-based data did not show an increased risk of cataract in amiodarone users compared with propafenone users[43]. More importantly, optic nerve involvement, although uncommon, deserves specific attention. Amiodarone-associated optic neuropathy has been supported by ultrastructural evidence showing lysosome-like membranous lamellar inclusions within large optic nerve axons, and by clinical and population-based studies reporting an association between amiodarone exposure and optic neuropathy. Clinically, the reported presentation is often insidious, slowly progressive, frequently bilateral, and accompanied by prolonged disc swelling, although the distinction from non-arteritic anterior ischemic optic neuropathy remains challenging in some cases[44-47]. More broadly, the recognized neurologic toxicity profile of amiodarone, including tremor, ataxia, dizziness, and peripheral neuropathy, is consistent with the drug's potential for multisite tissue toxicity during chronic exposure [48]. Rare orbitopathy with features resembling thyroid eye disease has also been reported, but the evidence remains limited to isolated case reports and small reviews, with some cases occurring with thyroid dysfunction and others without clear biochemical evidence of thyroid disease[49,50].

These observations reinforce the concept that ocular complaints in patients receiving amiodarone should be interpreted within a broader ophthalmic and neuro-ophthalmic context rather than being attributed automatically to cornea verticillata alone. From a therapeutic standpoint, reversal of corneal deposits appears possible in selected situations: Besides reduction in systemic exposure[20], a single case report described partial regression of amiodarone-induced cornea verticillata after topical sodium hyaluronate containing heparin, an interesting observation that remains hypothesis-generating rather than practice-changing[19]. A practical clinical approach based on the reviewed evidence is summarized in Table 2.

**Table 2 Practical clinical approach to ocular complaints in patients receiving amiodarone**

| Clinical scenario                                                                                                                                                              | Suggested approach                                                                                                                                                                                                                      | Clinical rationale                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Asymptomatic cornea verticillata identified during routine examination                                                                                                         | Reassure the patient, document the finding, and continue ophthalmic follow-up as clinically indicated                                                                                                                                   | Cornea verticillata is a frequent and generally benign finding and, in isolation, does not usually warrant discontinuation of amiodarone[1,13]                           |
| Mild visual symptoms in the presence of typical cornea verticillata and no concerning features                                                                                 | Evaluate the ocular surface and other potentially modifiable factors; offer symptom-directed treatment and appropriate follow-up                                                                                                        | Symptoms are not always explained by epithelial deposits alone and may reflect concurrent ocular surface disease or reduced optical quality[15,26-39]                    |
| Persistent or clinically meaningful visual complaints                                                                                                                          | Arrange ophthalmologic assessment if the patient is not already under specialist care; perform slit-lamp examination, visual acuity testing, and targeted ancillary investigations when appropriate                                     | A structured ophthalmic evaluation can help distinguish typical amiodarone keratopathy from other coexisting or alternative causes of symptoms[9-13,17,30,40]            |
| Visual loss that appears disproportionate to the corneal findings                                                                                                              | Perform prompt comprehensive ophthalmologic evaluation, including posterior segment examination and neuro-ophthalmic assessment                                                                                                         | Visual loss that exceeds what would be expected from cornea verticillata should not be attributed to corneal deposits alone without further evaluation[25,45-47]         |
| Red flags, including optic disc swelling, afferent pupillary defect, dyschromatopsia, visual field defects, progressive bilateral visual decline, or neuro-ophthalmic symptoms | Urgent specialist evaluation together with timely discussion with the treating cardiologist                                                                                                                                             | These findings raise concern for amiodarone-associated optic neuropathy or another serious cause of visual dysfunction [25,45-47]                                        |
| Consideration of amiodarone dose reduction, withdrawal, or replacement                                                                                                         | Do not base this decision on cornea verticillata alone; consider treatment modification only after multidisciplinary discussion, particularly when symptoms are severe, progressive, unexplained, or when optic neuropathy is suspected | Amiodarone is often clinically indispensable from a cardiologic standpoint, so ocular findings need to be interpreted within the broader systemic context[1,13,25,45-47] |

From a practical perspective, the available evidence supports a straightforward clinical approach. Ophthalmologic referral should be considered in patients receiving amiodarone who report persistent visual symptoms, especially blurred vision, glare, halos, photophobia, or ocular discomfort. Closer attention is needed when symptoms seem out of proportion to the degree of cornea verticillata observed at slit-lamp examination, when visual acuity is lower than expected, or when atypical findings suggest that the corneal changes may not fully explain the clinical picture. Red flags include progressive visual loss, optic disc swelling, visual field defects, dyschromatopsia, afferent pupillary defect, and other neuro-ophthalmic symptoms, since these findings should prompt assessment beyond the corneal surface and raise suspicion for amiodarone-associated optic neuropathy or other causes of visual dysfunction[25,45-47]. In contrast, cornea verticillata in isolation, when not accompanied by meaningful visual impairment or other concerning features, does not usually warrant discontinuation of amiodarone[1,13]. Decisions regarding dose reduction, drug withdrawal, or substitution should therefore be made on an individual basis and in close coordination with the treating cardiologist, particularly when amiodarone remains clinically essential[1,13].

## CONCLUSION

Amiodarone-induced corneal deposits remain one of the most recognizable ocular findings in patients receiving long-term antiarrhythmic therapy. In most cases, cornea verticillata is not vision-threatening and, on its own, does not warrant discontinuation of treatment. Still, its clinical importance should not be dismissed. Visual symptoms may emerge when epithelial deposits coexist with tear-film instability, meibomian gland dysfunction, age-related ocular surface changes, and the patient's specific visual demands, although the contribution of these ocular surface factors has not been directly established in amiodarone-treated populations. In this context, slit-lamp appearance alone may not adequately capture the true functional impact of the condition. A more meaningful clinical approach is therefore to recognize the characteristic corneal pattern while also assessing ocular surface status, symptom burden, and the broader therapeutic context. Multimodal imaging, including *in vivo* confocal microscopy in selected cases, may provide additional support for diagnosis and differential diagnosis, particularly when the presentation is atypical or when symptoms appear disproportionate to routine clinical findings. In practical terms, patients with typical asymptomatic cornea verticillata may often be managed conservatively, whereas visual loss disproportionate to corneal findings or signs suggestive of optic neuropathy should prompt urgent ophthalmologic assessment and multidisciplinary discussion regarding ongoing therapy. Overall, amiodarone keratopathy is best viewed as a usually benign but potentially symptomatic corneal manifestation that calls for balanced interpretation, conservative symptom-directed management, and close coordination between ophthalmologists and cardiologists, with the goal of preserving visual comfort without compromising the life-saving value of systemic therapy.

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## FOOTNOTES

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