

Blebitis Management: A National Survey and Literature Review

Abordagem de Blebitis: Questionário Nacional e Revisão da Literatura

 Inês Mendo ¹, Mariana Vaz ¹, João Vaz ¹, Tomás Loureiro ¹, Paula Telles ¹, Pedro Simões ¹, Nuno Campos ¹

¹ Ophthalmology Integrated Responsibility Center, Unidade Local de Saúde Almada-Seixal, Almada, Portugal

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ABSTRACT

INTRODUCTION: Filtering surgeries remain a cornerstone in the management of glaucoma. Although rare, blebitis represents a potentially severe complication that can compromise both surgical success and visual prognosis if not recognized and treated promptly. Management strategies vary widely, and no formal guidelines currently exist to direct therapy. In this context, the present study combines a brief literature review with a national survey to provide an updated overview of blebitis and to evaluate current trends in its management among glaucoma specialists in Portugal.

METHODS: An anonymous online survey consisting of 12 questions regarding the diagnosis and management of blebitis was distributed to glaucoma specialists in Portugal. The questionnaire addressed hospital admission, microbiological sampling, topical and systemic antibiotic use, corticosteroid and cycloplegic prescription, as well as criteria for addressing these cases as endophthalmitis. Responses were analyzed descriptively to identify patterns of practice and heterogeneity in management approaches. In parallel, a narrative review of the literature was conducted to summarize current evidence on incidence, risk factors, and therapeutic strategies.

RESULTS: A total of 33 responses were collected. Only 15.2% of glaucoma specialists reported admitting patients with isolated blebitis for inpatient treatment. Regarding antibiotic therapy, all specialists initiated topical treatment, with 72.7% preferring fortified eye drops containing cef-tazidime and vancomycin. A minority opted for additional routes of antibiotic administration: intravitreal in 12.1%, subconjunctival in 9.1%, and intravenous in 6.1% of cases. Most specialists prescribed topical cycloplegics (75.8%) and topical corticosteroids (90.9%), although only 16.7% initiated corticosteroids at the time of diagnosis. Among respondents, 39.4% reported that they would only consider treating blebitis as endophthalmitis in the presence of vitreous involvement.

CONCLUSION: This combined literature review and national survey highlight significant variability in the management of blebitis among Portuguese glaucoma specialists, reflecting the absence of standardized guidelines. The findings underscore the need for consensus-based recommendations that may harmonize management strategies, improve patient safety, and optimize visual outcomes in this rare but sight-threatening complication.

KEYWORDS: Eye Infections, Bacterial/drug therapy; Eye Infections, Bacterial/etiology; Glaucoma/surgery; Postoperative Complications; Trabeculectomy/adverse effects.

RESUMO

INTRODUÇÃO: As cirurgias filtrantes mantêm-se como um dos pilares fundamentais no tratamento do glaucoma. Embora rara, a blebite representa uma complicação potencialmente grave, capaz de comprometer tanto o sucesso cirúrgico como o prognóstico visual, caso não seja reconhecida e tratada precocemente. As estratégias de tratamento variam amplamente e não existem, até ao momento, recomendações formais que orientem a terapêutica. Neste contexto, o presente estudo combina uma breve revisão da literatura com um inquérito nacional, com o objetivo de fornecer uma atualização sobre a blebite e avaliar as tendências atuais na sua abordagem entre especialistas de glaucoma em Portugal.

MÉTODOS: Um questionário online anónimo foi enviado aos especialistas de glaucoma em Portugal. O questionário, composto por 12 questões, abordou a necessidade de internamento, colheita para análise microbiológica, utilização de antibióticos tópicos e sistémicos, prescrição de corticoterapia e cicloplegia, e critérios para abordar estes casos como endoftalmite. As respostas foram analisadas para identificar padrões de prática clínica e heterogeneidade nas abordagens terapêuticas. Paralelamente, foi realizada uma revisão narrativa da literatura para resumir a evidência atual relativa à incidência, fatores de risco e estratégias de tratamento da blebite.

RESULTADOS: Foram obtidas 33 respostas. Apenas 15,2% dos especialistas optam por internar doentes com blebite isolada. Todos iniciam antibioterapia tópica, sendo que 72,7% preferem colírios fortificados de ceftazidima e vancomicina. Uma minoria utilizou vias adicionais de administração de antibiótico: intravítrea em 12,1% dos inquiridos, subconjuntival em 9,1% e endovenosa em 6,1%. A maioria opta pela prescrição de cicloplégicos (75,8%) e corticosteroides tópicos (90,9%), embora apenas 16,7% os iniciem no momento do diagnóstico. Entre os inquiridos, 39,4% optam por abordar como endoftalmite apenas na presença de envolvimento vítreo.

CONCLUSÃO: Esta revisão da literatura e o questionário nacional realizado evidenciam uma variabilidade significativa na abordagem da blebite entre especialistas, refletindo a ausência de orientações terapêuticas padronizadas. Os resultados reforçam a necessidade de desenvolver recomendações baseadas em consensos que permitam harmonizar as estratégias de tratamento, melhorar a segurança dos doentes e otimizar os resultados visuais nesta complicação rara, mas potencialmente ameaçadora da visão.

PALAVRAS-CHAVE: Complicações Pós-Operatórias; Glaucoma/cirurgia; Infecções Oculares Bacterianas/etiologia; Infecções Oculares Bacterianas/tratamento farmacológico; Trabeculectomia/efeitos adversos.

INTRODUCTION

Glaucoma is a highly prevalent condition worldwide, affecting approximately 2%–3% of individuals over the age of 40 years-old.¹ Even though surgical options for the management of glaucoma have expanded over the years, classical filtering procedures, particularly trabeculectomy, continue to play an essential and irreplaceable role in the management of this disease.² As with any surgical intervention, complications may occur, but bleb-forming filtering procedures carry the additional risk of developing a bleb-related infection, commonly referred to as blebitis.³⁻⁵

Blebitis is defined as an infection of the filtering bleb following glaucoma surgery, such as trabeculectomy.³⁻⁵ Its reported prevalence varies among studies but remains relatively low, with recent data indicating a rate below 1.5%.⁶ Nevertheless, despite standardized therapeutic measures, bleb infections may still occur years after surgery and can result in severe visual loss if not promptly recognized and managed.^{7,8}

Several studies have identified risk factors associated with the development of blebitis, including the use of anti-metabolites (mitomycin-C or 5-fluorouracil), the presence of thin, avascular or leaking blebs, younger patient age, inferior bleb location, and postoperative wound manipulation.⁹⁻¹¹

Given its rarity, the management of blebitis is not yet standardized, and no universally accepted clinical guidelines exist. In fact, a national survey conducted in the United Kingdom highlighted significant variations in clinical practice regarding the management of blebitis.¹²

Therefore, the present survey aims to characterize current clinical practices in Portugal regarding the diagnosis and management of blebitis and review the recent literature on its epidemiology, risk factors, and therapeutic approaches.

MATERIAL AND METHODS

Blebitis Management National Survey: A survey consisting of 12 questions was distributed among glaucoma specialists in Portugal through the *Google Forms* platform, with

the collaboration of Sociedade Portuguesa de Oftalmologia (SPO). Responses were collected between June and September 2025 and remained anonymous and confidential.

The questionnaire was divided into sections covering different aspects of diagnosis and management of blebitis (not bleb-related endophthalmitis), including initial assessment and criteria for hospital admission, collection of microbiological samples, choice of topical and systemic antibiotic therapy, use of corticosteroids and cycloplegic agents, as well as criteria for addressing these cases as endophthalmitis. Questions were presented in the form of multiple-choice and open-ended items to allow for both quantitative and qualitative analysis. The full questionnaire can be found in [Appendix A](#).

The primary outcome of the survey was to characterize current clinical practices among portuguese glaucoma specialists regarding the diagnosis and management of blebitis.

Literature Review: A narrative literature review was conducted to complement the survey findings and provide updated evidence on blebitis management. The search was performed in PubMed/MEDLINE using combinations of the keywords “blebitis”, “bleb-related infection”, “glaucoma filtering surgery”, and “trabeculectomy”. The search included English-written articles published from January 1985 to September 2025.

RESULTS

A total of 33 responses were collected. Only 15.2% of glaucoma specialists reported admitting patients with isolated blebitis for inpatient treatment. Most specialists prescribed topical cycloplegics (75.8%) and topical corticosteroids (90.9%), although only 16.7% initiated corticosteroids at the time of diagnosis. Among respondents, 39.4% reported that they would only consider treating blebitis as endophthalmitis in the presence of vitreous involvement. The majority (75.8%) also reported obtaining a conjunctival swab for microbiological analysis at presentation ([Table 1](#)).

Regarding antibiotic treatment, all specialists prescribed topical therapy, mostly fortified ceftazidime and vancomycin (72.7%). The majority (63.6%) combined topical and oral antibiotics - most commonly ciprofloxacin (64%), followed by moxifloxacin (28%). Topical therapy alone was preferred by 15.2% of respondents. A smaller proportion combined topical with subconjunctival antibiotics (9.1%), mainly vancomycin, while 12.1% combined topical and oral therapy with intravitreal injections, in which all selected vancomycin plus ceftazidime ([Fig. 1](#)).

DISCUSSION

BLEBITIS MANAGEMENT QUESTIONNAIRE

The present national survey provides the first insight into how blebitis is currently managed by glaucoma specialists in Portugal. Although the condition remains uncommon, our findings reveal substantial heterogeneity in diagnostic and therapeutic approaches, mirroring the ab-

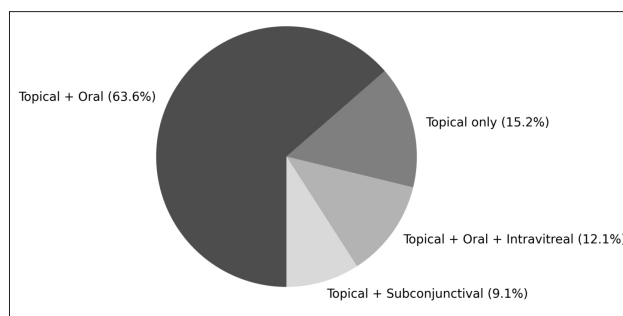


Figure 1. Antibiotic Strategies in Isolated Blebitis.

Distribution of responses regarding antibiotic administration in isolated blebitis among portuguese glaucoma specialists. Combined topical and oral therapy was the most frequently selected option (21 responses, 63.6%), followed by topical therapy alone (5 responses, 15.2%), topical combined with oral and intravitreal therapy (4 responses, 12.1%), and topical combined with subconjunctival therapy (3 responses, 9.1%).

sence of standardized clinical guidelines.

Most portuguese specialists reported initiating topical fortified antibiotics (predominantly ceftazidime and vancomycin) and combining them with oral therapy, while the use of intravitreal or subconjunctival routes was less frequent. The decision to hospitalize patients with isolated blebitis was uncommon, and corticosteroids were generally introduced after initial antibiotic coverage.

When compared with previously published surveys, similar variability in management practices can be observed. In the United Kingdom survey by Chiam *et al* (2012),¹² which gathered responses from 120 ophthalmologists, 94% initiated topical fortified antibiotics, most commonly gentamicin and ceftazidime, and only 9% routinely admitted patients for inpatient treatment. Likewise, corticosteroids were prescribed by approximately 80% of respondents, but initiation timing varied considerably. These results are broadly consistent with our findings, suggesting a persistent lack of consensus even across different health-care systems.

Earlier, in the American Glaucoma Society survey by Reynolds *et al* (2001),¹³ practice patterns were comparable. In that study, all ophthalmologists reported using topical fortified antibiotics, while 54% also administered subconjunctival injections and 35% admitted patients for intravenous therapy. Compared to these data, Portuguese specialists appear to adopt a more conservative approach, with fewer invasive interventions and less frequent hospitalization.

BLEBITIS DEFINITION AND CLINICAL PRESENTATION

Most authors define blebitis as an infection confined to the filtering bleb and adjacent conjunctiva after bleb-forming glaucoma surgery, without clinical evidence of vitreous involvement. When vitreous is involved, the entity is termed bleb-related endophthalmitis.³⁻⁵ Hence, isolated blebitis often presents with localized bleb/conjunctival injection, mucopurulent discharge or focal “pus cap” over the bleb, tenderness, pain, photophobia, and anterior chamber cells without vitritis.³⁻⁵ Bleb-related infections (BRI) occur

Table 1. Blebitis Management Questionnaire's Responses.

	N (%)
1. Do you usually admit a patient with isolated blebitis for treatment?	
Yes	5 (15.2%)
No	28 (84.8%)
2. Do you usually collect a conjunctival swab (for culture)?	
Yes	25 (75.8%)
No	8 (24.2%)
3. Do you routinely apply 5% povidone-iodine to the ocular surface at the time of diagnosis?	
Yes	9 (27.3%)
No	24 (72.7%)
4. Which topical antibiotic regimen do you usually use?	
Ofloxacin or levofloxacin only	3 (9.1%)
Moxifloxacin only	4 (12.1%)
Ceftazidime and vancomycin	24 (72.7%)
Gentamicin and vancomycin	2 (6.1%)
5. Do you usually start oral antibiotic therapy?	
Yes	25 (75.8%)
No	8 (24.2%)
5.1 If you start oral antibiotics, which is your usual choice?	
Ciprofloxacin only	16 (64%)
Moxifloxacin only	7 (28%)
Ciprofloxacin + Metronidazole	2 (8%)
6. Do you usually administer subconjunctival antibiotics?	
Yes	3 (9.1%)
No	30 (90.9%)
6.1 If you do, which subconjunctival antibiotic(s) do you usually use?	
Vancomycin	3 (100%)
7. Do you usually administer intravitreal antibiotics?	
Yes	4 (12.1%)
No	29 (87.9%)
7.1 If yes, which intravitreal antibiotics do you usually administer?	
Vancomycin and ceftazidime	4 (100%)
8. Do you usually start intravenous antibiotic therapy?	
Yes	2 (6.1%)
No	31 (93.9%)
8.1 If yes, which intravenous antibiotic(s) do you usually prescribe?	
Vancomycin and cefuroxime / ceftriaxone	2 (100%)
9. Do you usually start topical corticosteroid therapy?	
Yes	30 (90.9%)
No	3 (9.1%)
9.1 If yes, when do you start topical corticosteroids?	
At the time of diagnosis	5 (16.7%)
After 24–48 hours of antibiotic coverage	13 (43.3%)
After 72 hours of antibiotic coverage	12 (40%)
10. Do you usually prescribe a topical cycloplegic agent?	
Yes	25 (75.8%)
No	8 (24.2%)
11. How frequently do you re-evaluate a patient with isolated blebitis?	
Twice daily	10 (30.3%)
Daily	23 (69.7%)
12. What would make you manage the case as endophthalmitis?	
Presence of mild to moderate anterior chamber reaction	7 (21.2%)
Presence of significant anterior chamber activity with associated hypopyon	11 (33.3%)
Only in the presence of vitreous involvement	13 (39.4%)
I always treat it as endophthalmitis	2 (6.1%)

predominantly after trabeculectomy, but other bleb-forming filtration procedures that create a subconjunctival reservoir can be associated with this complication.⁵

Although early cases may occur, late-onset presentations are the most common. Yassin *et al*⁴ emphasize that BRI may develop several years after surgery and Sharan *et al*⁸ reported a 0.96% infection rate over a mean 5.3-year follow-up in a late-onset cohort, underscoring how risk persists long-term. Visual prognosis is mainly driven by whether infection progresses to vitreous involvement: past studies show that eyes with isolated blebitis (no vitritis) tend to maintain their previous visual acuity, whereas those with endophthalmitis have far worse visual outcomes.⁶

RISK FACTORS FOR BLEBITIS

Several studies have investigated the risk factors associated with the development of bleb-related infection (BRI). In their landmark multicenter analyses, Soltan *et al*⁹ identified the use of antimetabolites, the presence of a thin, avascular, or leaking bleb, inferior bleb location and younger patient age as major independent risk factors for infection. Poulsen *et al*¹⁰ confirmed these findings, further highlighting that late-onset infections are strongly associated with avascular blebs and bleb leaks. Sharan *et al*¹¹ further emphasized the long-term nature of this entity, with most infections occurring several years after trabeculectomy, and identified postoperative bleb manipulation as an additional significant risk factor. Collectively, these studies established the conceptual framework for understanding blebitis as a late, wound-healing-related complication of filtration surgery.

Among the factors identified, the use of intraoperative antimetabolites, namely mitomycin-C (MMC) and 5-fluorouracil (5-FU), has been consistently associated with a higher risk and incidence of bleb infections.^{9,10} MMC, introduced to enhance long-term surgical success, acts by inhibiting fibroblast proliferation, thereby reducing subconjunctival scarring and improving filtration. However, this pharmacologic benefit often results in the formation of thin, avascular, and cystic blebs that are more permeable and susceptible to leakage, providing a direct pathway for microbial invasion.¹⁴⁻¹⁶

Hence, while MMC increases long-term success rates of trabeculectomy, it also predisposes to delayed bleb-related complications.¹⁴⁻¹⁷ Moreover, higher intraoperative doses or longer exposure times to MMC have been linked to an even greater risk of late-onset bleb leaks and subsequent infection, as demonstrated by Robin *et al*.¹⁴

Comparable findings have been reported with 5-FU, though the risk profile appears less pronounced than with MMC. Ticho *et al*¹⁸ and the Fluorouracil Filtering Surgery Study Group¹⁹ both noted that adjunctive 5-FU is associated with late-onset bleb leaks and avascular blebs, particularly with repeated postoperative subconjunctival injections performed in the past. Long-term data from Uchida *et al*²⁰ confirmed that eyes treated with 5-FU face a persistent risk of bleb-related infection, reinforcing that excessive inhibition of wound healing (whether via MMC or 5-FU) can

compromise bleb integrity and overall safety over time.

Taken together, these findings suggest that the same pharmacologic mechanisms that enhance surgical efficacy by limiting fibrosis also increase susceptibility to infection by creating avascular, thin-walled, and leak-prone blebs. Consequently, meticulous long-term surveillance of antimetabolite-augmented blebs and early management of leaks remain critical to reducing the risk of blebitis.

POVIDONE-IODINE SOLUTION

The use of povidone-iodine (PI) as an adjunctive antiseptic measure in the management of blebitis is mainly supported by laboratory and clinical evidence. Gocke *et al*²¹ demonstrated that PI solutions have broad-spectrum antimicrobial activity against common ocular pathogens, including *Staphylococcus*, *Streptococcus*, and *Pseudomonas* species, achieving rapid bactericidal effects even at low concentrations. In vivo studies have confirmed its efficacy in reducing conjunctival and perilimbal flora: Boes *et al*²² showed that chemical preparation with 5% PI followed by saline irrigation significantly decreased bacterial colony counts on the ocular surface. Furthermore, Gregori *et al*,²³ in a randomized clinical trial, demonstrated that topical PI pretreatment reduced the microbial load in infectious keratitis, supporting its safety and antimicrobial effectiveness in active ocular infection.

In the context of bleb-related infection, PI is commonly applied to the ocular surface at presentation or during sampling for culture, aiming to decontaminate the bleb surface and periocular tissues. Both Kandarakis *et al*³ and Yassin *et al*⁴ include its use as part of the initial management of suspected blebitis, particularly before the administration of fortified antibiotics. Although controlled data in blebitis are limited, its low cost, rapid onset of action, and broad antimicrobial spectrum make povidone-iodine a rational and widely adopted adjunctive measure in clinical practice.

BLEBITIS STRATIFICATION AND MANAGEMENT

Regarding the overall management of blebitis, recent studies have been consistent in advocating disease stratification as the key determinant of therapeutic approach. Bleb-related infection is now understood as a spectrum of clinical manifestations, in which the extent of intraocular involvement dictates both prognosis and treatment. As highlighted by Kandarakis *et al*,³ this entity encompasses a spectrum ranging from localized blebitis, confined to the filtering bleb and adjacent conjunctiva, to advanced bleb-related endophthalmitis involving the vitreous cavity. Management should therefore be guided by the initial clinical presentation and its subsequent evolution under therapy.

To provide a structured framework, the Collaborative Bleb-related Infection Incidence and Treatment Study (CBI-ITS) by Shoji *et al*⁷ proposed a three-stage clinical classification: Stage I: Blebitis - infection limited to the bleb, with anterior chamber inflammation but no vitreous reaction; Stage II: Bleb-associated endophthalmitis: early vitreous involvement with mild vitritis; and Stage III: Bleb-related en-

dophthalmitis: severe vitritis and marked decreased visual acuity. This staging system serves as the foundation for a graduated treatment algorithm, in which therapy escalates according to disease severity. In the CBIITS protocol, Stage I infections were managed primarily with topical fortified antibiotics and close monitoring. Stage II cases required additional subconjunctival or systemic antibiotic administration, while Stage III were treated with intravitreal antibiotics, sometimes combined with pars plana vitrectomy. The study demonstrated that this stratified approach was associated with improved visual outcomes and reduced complications compared to non-standardized management.⁷

MICROBIOLOGICAL SAMPLING

Microbiological confirmation is recommended whenever feasible, as it guides therapy and provides epidemiological understanding. Recent reviews support obtaining a conjunctival/bleb swab at presentation (before or immediately after starting antibiotics), especially when exudate or a “pus cap” is present. If progression is suspected, anterior chamber (AC) tap should be performed and, if vitritis is present, vitreous sampling is advised.^{3,4} The CBIITS framework incorporated sampling within its stage-based algorithms - surface sampling in Stage I and escalation to AC/vitreous sampling for Stages II–III - aligning specimen depth with intraocular involvement.⁷ When sampling the surface, brief povidone-iodine preparation is once again recommended, as it reduces periocular contamination without reducing culture positivity.²¹⁻²³

Although reported culture positivity rates for conjunctival, aqueous, and vitreous samples are heterogeneous and not consistently quantified across studies, microbiological sampling remains clinically relevant, particularly in a condition with potential for rapid progression and irreversible visual loss. Notably, in our survey, approximately 25% of specialists reported not routinely obtaining cultures in cases of isolated blebitis, despite this potential clinical utility.

RATIONALE FOR ANTIBIOTIC SELECTION

Empiric therapy should cover the organisms most often isolated in bleb-related infection while permitting rapid adjustment to culture results. While blebitis with anterior chamber involvement are most often associated with *Staphylococcus* and *Streptococcus* isolates,²⁴ bleb-associated endophthalmitis can be associated with *Streptococcus* species, Gram-negative organisms (especially *Moraxella catarrhalis*, *Haemophilus influenzae* and *Serratia* spp.), and *Enterococcus faecalis*.²⁵⁻²⁸ Accordingly, reviews and risk-factor studies consistently support initial broad Gram-positive (including MRSA) plus Gram-negative coverage (hence the common use of fortified vancomycin + ceftazidime in moderate to severe presentations).^{3-5,9-11} When analysing the questionnaire’s responses, Gram-positive and Gram-negative coverage was mainly achieved with fortified therapy. Even though no specific agent is formally recommended at this point, it is important to highlight that some of the reported options did not follow this principle.

The pharmacologic rationale should mirror local susceptibility patterns. Coagulase-negative *Staphylococcus* shows high vancomycin susceptibility and variable fluoroquinolone susceptibility. In a dedicated series of *Staphylococcus epidermidis* endophthalmitis, clinical outcomes were acceptable when therapy covered resistant strains, underscoring the importance of reliable coverage of Gram-positive strains.²⁹ Where *Streptococci* and *Haemophilus* are concerns (earlier presentations), keeping third-generation cephalosporins in the empiric regimen remains prudent.³⁻⁵ On the other hand, fluoroquinolones provide practical broad-spectrum topical coverage and excellent tissue penetration, being a reliable option for both Gram-positive and Gram-negative coverage; in vitro data demonstrate good activity against many ocular isolates, supporting their use in milder disease or as adjuncts, while recognizing regional resistance variability.³⁰

In summary, culture-directed therapy is ideal, but until results arrive, a stage-guided empiric regimen that reliably covers Gram-positive cocci and Gram-negative agents, and escalates route and intensity with intraocular involvement, is the strategy most consistently supported across reviews, surveys, and treatment frameworks.^{3-5,7,12,13}

The route of antibiotic administration represents another area of marked variability in the management of blebitis. In the CBIITS study, Shoji *et al* proposed a stage-based therapeutic algorithm in which topical antibiotics were recommended for Stage I disease, while subconjunctival or systemic therapy was reserved for more advanced stages.⁷ In our survey, most specialists reported combining topical treatment with oral antibiotics, while a smaller proportion escalated to subconjunctival or intravitreal administration, even in the absence of vitreous involvement.

To date, no studies have directly compared different routes of antibiotic administration in blebitis or demonstrated a clear clinical benefit of systemic or subconjunctival therapy over intensive topical treatment in isolated disease. Nevertheless, available studies are largely concordant in reserving non-topical routes of administration as a form of therapeutic escalation in more severe presentations, and this empiric, severity-driven approach continues to guide clinical practice in the absence of comparative evidence.^{4,7,28,31}

TOPICAL CORTICOSTEROIDS AND CYCLOPLEGIC AGENTS

Adjunctive anti-inflammatory therapy plays an important role in the management of blebitis once adequate antimicrobial coverage has been initiated. Even though there is no robust clinical evidence demonstrating a direct impact of topical corticosteroids on infection resolution or visual outcomes in blebitis, both Kandarakis *et al*³ and Yassin *et al*⁴ highlight that topical corticosteroids may be beneficial in controlling anterior-segment inflammation and reducing the risk of synechiae and scarring of the filtering bleb. Nevertheless, their use should be delayed until initial clinical improvement under antibiotics is observed, as premature steroid administration could potentially suppress local im-

mune response and favor bacterial proliferation.³⁻⁵

The relevance of these measures is also reflected in major clinical surveys. In the United Kingdom survey,¹² 82% of ophthalmologists reported prescribing topical corticosteroids during treatment of blebitis, although most delayed their introduction for 24 to 72 hours after starting antibiotics. Similarly, in the American Glaucoma Society survey,¹³ 62% of specialists used topical corticosteroids, typically as adjunct therapy after bacterial control was achieved.

Cycloplegic agents are commonly prescribed in parallel to relieve ciliary spasm, photophobia, to prevent posterior synechiae formation and to provide comfort and stabilization of the anterior chamber during the acute inflammatory phase.^{3,4,12,13}

BLEBITIS BEYOND TRABECULECTOMY

With the continuous evolution of surgical strategies for glaucoma, bleb-related infections are no longer confined to classical trabeculectomy. Recent reports have documented the occurrence of blebitis following newer bleb-forming procedures, underscoring the need for ongoing clinical vigilance. Brown *et al*³² described a series of bleb complications after *XEN Gel Stent* implantation, where the use of MMC was implicated as a contributing factor, leading to late-onset bleb leaks and infection. Similarly, Kudsieh *et al*³³ reported a case of blebitis following *Preserflo MicroShunt* implantation, highlighting that even minimally invasive subconjunctival devices can create a filtration bleb vulnerable to infection.

These emerging observations indicate that blebitis should be recognized as a potential complication across all bleb-forming glaucoma surgeries, regardless of device size or surgical invasiveness. As the use of antimetabolite-augmented MIGS expands, ophthalmologists must remain alert to early signs of bleb infection, regardless of the surgical technique employed.

LIMITATIONS

This study has some limitations that should be acknowledged. Firstly, the small number of responses to the questionnaire limits the ability to identify significant treatment patterns. In addition, the questionnaire did not collect detailed demographic or professional data, such as age, years of experience, or institutional affiliation of the respondents. As a result, potential variations in management practices according to clinician profile or practice setting could not be explored. Secondly, the voluntary and self-reported nature of the questionnaire may introduce selection and reporting bias, as clinicians with greater interest and experience in bleb-related infections may have been more likely to respond. Finally, this survey-based design does not allow correlation between management strategies and clinical outcomes, which would require prospective or multicenter observational studies.

CONCLUSION

The national survey conducted highlights the heterogeneity of current clinical practice in the management of ble-

bitis among portuguese glaucoma specialists, particularly regarding hospitalization criteria, antibiotic regimens, and adjunctive therapy. These findings mirror international data, reinforcing the absence of standardized guidelines and the need for evidence-based consensus to optimize care.

Recent literature supports viewing bleb-related infection as a spectrum of disease severity, in which timely recognition and stratified management are crucial to preserving visual outcomes. Treatment should be guided by clinical presentation and therapeutic response, escalating appropriately from topical to systemic and intravitreal therapy as required.

Ultimately, bleb-related infection should be recognized as a potential complication across a range of contemporary glaucoma surgeries, underscoring the need for sustained clinical awareness and standardized preventive strategies.

CONTRIBUTORSHIP STATEMENT / DECLARAÇÃO DE CONTRIBUIÇÃO

IM: Drafting of the article, revision.

MV, JV, and NC: Data collection.

TL and PT: Revision.

PS: Data collection, revision.

All authors approved the final version for publication.

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**Corresponding Author/
Autor Correspondente:**

Inês Mendo

Centro de Responsabilidade Integrada de
Oftalmologia, ULS Almada-Seixal,
Av. Torrado da Silva,
2805-267 Almada
E-mail: ines.smendo@gmail.com



ORCID: 0009-0007-6514-8267

Appendix A. Blebitis Questionnaire.

Blebitis Management Survey Questionnaire

1. Opta por internar o doente com blebite isolada para tratamento?
 - Sim
 - Não
2. Costuma realizar colheita de exsudado ocular?
 - Sim
 - Não
3. Costuma aplicar iodopovidona 5% na superfície ocular no momento do diagnóstico?
 - Sim
 - Não
4. Que antibioterapia tópica costuma utilizar?
 - Ofloxacina ou levofloxacina apenas
 - Moxifloxacina apenas
 - Cefuroxima e ofloxacina
 - Ceftazidima e vancomicina
 - Gentamicina e vancomicina
 - Outra
5. Costuma iniciar antibioterapia oral?
 - Sim
 - Não
- 5.1 Se inicia antibioterapia oral, qual a sua opção?
 - Ciprofloxacina apenas
 - Moxifloxacina apenas
 - Outra
6. Opta por aplicar antibiótico subconjuntival?
 - Sim
 - Não
- 6.1 Se costuma aplicar antibiótico subconjuntival, qual a sua opção?
 - Cefuroxima apenas
 - Ceftazidima apenas
 - Cefuroxima e gentamicina
 - Vancomicina
 - Outra
7. Opta por administrar antibióticos intravítreos?
 - Sim
 - Não
- 7.1 Se sim, quais os antibióticos intravítreos que costuma administrar?
 - Vancomicina e amicacina
 - Vancomicina e ceftazidima
 - Outra
8. Costuma iniciar antibioterapia endovenosa?
 - Sim
 - Não
- 8.1 Se sim, qual o antibiótico endovenoso que opta por prescrever?
 - Ciprofloxacina apenas

Appendix A. Blebitis Questionnaire. (cont.)

Cefuroxima/Ceftriaxona apenas
Vancomicina apenas
Vancomicina e cefuroxima/ceftriaxona
Outra

9. Costuma iniciar corticoide tópico?

Sim
Não

9.1 Se sim, quando inicia o corticoide tópico?

No momento do diagnóstico
Após 24-48h de cobertura antibiótica
Após 72h de cobertura antibiótica
Outra

10. Costuma prescrever cicloplégico tópico?

Sim
Não

11. Com que frequência reavalia o doente com blebite isolada?

Duas vezes por dia
Diariamente
A cada dois dias

12. O que o levaria a tratar o caso como endoftalmite?

A presença de atividade ligeira-moderada na câmara anterior
A presença de atividade significativa na câmara anterior, com hipopion associado
Apenas na presença de envolvimento vítreo
Trato sempre como endoftalmite