An Updated Retrospective Study on Clinical and Microbiological Profile, Management and Predictors of Poor Outcomes in Infectious Endophthalmitis

Estudo Retrospetivo Atualizado sobre o Perfil Clínico e Microbiológico, Abordagem Terapêutica e Preditores de Mau Prognóstico na Endoftalmite Infeciosa

Joana da Silva Rocha [1], Ana Rita Viana [1], Carla Teixeira [1], Sofia Justo [1], Catarina Francisco [1], Alexandre Reis da Silva [1], Rui Carvalho [1], Bruna Vieira [1], Tiago Maio [1], Sara Pereira [1]

[1] Ophthalmology Department, Hospital Pedro Hispano, Matosinhos, Portugal

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ABSTRACT

INTRODUCTION: Infectious endophthalmitis is a rare but vision-threatening intraocular infection, with a global incidence ranging from 0.021% to 0.32%. The most frequent exogenous causes are intravitreal injections and cataract surgery, while endogenous cases account for 5%–20%. Despite major advances in diagnosis and management, visual prognosis remains poor for many patients. This study updates a previous series from the same hospital, expanding the cohort and aiming to identify predictors of poor prognosis while evaluating the impact of protocol modifications introduced in recent years.

METHODS: A retrospective review was conducted of all patients diagnosed with infectious endophthalmitis between 2013 and 2025 at Pedro Hispano Hospital. Collected data included demographics, comorbidities, etiology, timing of presentation and treatment, microbiological isolates, and therapeutic approaches. Visual acuity (VA) was converted to the logarithm of the minimum angle of resolution (LogMAR) for statistical analysis.

RESULTS: Thirty-one patients were included (87.1% exogenous, 12.9% endogenous endophthalmitis). The main causes were intravitreal injections (29%) and cataract surgery (19.4%). Mean symptom-to-admission time was 1.94 ± 1.5 days. Most patients (90.3%) had ≥1 systemic comorbidity, most commonly hypertension (51.6%), dyslipidemia (45.2%), and diabetes (41.9%), and more comorbidities correlated with poorer final VA (ρ= 0.418; p=0.033). Median initial VA was 2.4 LogMAR (hand motion). Cultures were positive in 29%, with *Staphylococcus epidermidis* as the most frequent. Gram-negative infections were uncommon but led to severe outcomes. Vitrectomy (PPV) was performed in 80.6% of cases, significantly reducing complication rates (16.0% *vs* 83.3%; p=0.001). Early PPV (≤48 h) was associated with greater visual improvement compared with late PPV (>48 h) (ΔVA –1.58 *vs* –0.55; p=0.002).

CONCLUSION: This updated series confirms the predominance of exogenous endophthalmitis, particularly post-injection, and underscores the importance of early surgical intervention. Higher comorbidity burden and treatment delays were predictors of poor outcome, while early PPV significantly improved recovery and reduced complications. These findings support continuous refinement of preventive and therapeutic strategies to optimize prognosis in infectious endophthalmitis.

KEYWORDS: Endophthalmitis/diagnosis; Endophthalmitis/etiology; Endophthalmitis/therapy.

RESUMO

INTRODUÇÃO: A endoftalmite infecciosa é uma infeção rara e potencialmente devastadora, com uma incidência global estimada entre 0,021% e 0,32%. As causas exógenas mais frequentes são as injeções intravítreas e a cirurgia de catarata, enquanto os casos endógenos representam 5%–20%. Este estudo atualiza uma série previamente publicada pelo mesmo hospital, com amostra alargada, e procura identificar fatores preditores de mau prognóstico e avaliar o impacto das modificações recentes nos protocolos de assepsia implementadas.

MÉTODOS: Foi realizada uma análise retrospetiva de todos os doentes diagnosticados com endoftalmite infecciosa entre 2013 e 2025 no Hospital Pedro Hispano. Foram recolhidos dados demográficos, comorbilidades, etiologia, tempo entre o início dos sintomas e a instituição terapêutica, resultados microbiológicos e estratégias terapêuticas aplicadas. A acuidade visual (AV) foi convertida para a escala LogMAR (*logarithm of the minimum angle of resolution*) para análise estatística.

RESULTADOS: Foram incluídos 31 doentes (87,1% endoftalmites exógenas e 12,9% endógenas). As principais causas foram injeções intravítreas (29%) e cirurgia de catarata (19,4%). O tempo médio entre o início dos sintomas e a admissão foi de 1,94 ± 1,5 dias. A maioria dos doentes (90,3%) apresentava ≥1 comorbilidade sistémica, sendo as mais frequentes hipertensão arterial (51,6%), dislipidemia (45,2%) e diabetes *mellitus* (41,9%); verificou-se ainda uma correlação positiva entre maior carga de comorbilidades e pior acuidade visual final (ρ=0,418; p=0,033). A mediana da AV inicial foi 2,4 LogMAR (movimentos de mão). As culturas foram positivas em 29% dos casos, sendo o *Staphylococcus epidermidis* o agente mais frequente. Infeções por Gram-negativos apesar de raras, associaram-se a desfechos particularmente graves. A vitrectomia (VPP) foi realizada em 80,6% dos doentes, reduzindo significativamente as complicações (16,0% *vs* 83,3%; p=0,001). A realização de VPP precoce (≤48 h) associou-se a maior melhoria visual em comparação à tardia (>48 h) (ΔAV –1,58 *vs* –0,55; p=0,002).

CONCLUSÃO: Esta série confirma o predomínio das endoftalmites exógenas, sobretudo após injeções intravítreas, e reforça a importância da intervenção cirúrgica precoce. Atraso terapêutico e a presença de múltiplas comorbilidades foram preditores de mau prognóstico, reforçando a necessidade de estratégias preventivas eficazes e atuação rápida.

PALAVRAS-CHAVE: Endoftalmites/diagnóstico; Endoftalmites/etiologia; Endoftalmites/tratamento.

INTRODUCTION

Endophthalmitis is an ophthalmologic emergency requiring immediate intervention to prevent irreversible visual loss and remains a major challenge for ophthalmologists.[1-5] Endophthalmitis is an inflammation of the vitreous and/or aqueous humor, generally secondary to exogenous etiologies, namely ocular surgeries, intravitreal injections, trauma, or endogenous cases that result from hematogenous spread of systemic infections.[5-7]

Global incidence ranges between 0.021% and 0.32%.[3,6,8] The two most common causes correspond to the most frequent invasive ophthalmic procedures—intravitreal injections and cataract surgery—with the latter accounting for approximately 40–80% of documented cases.[3,6,8]

Periodic review of endophthalmitis cases, clinical evolution, prognostic factors, and aseptic protocols is crucial to reduce its incidence and improve outcomes. A prior study by Viana *et al*[2] conducted in our hospital included cases submitted to pars plana vitrectomy managed up to August 2023. Since then, a noticeable rise in endophthalmitis incidence lead to protocol revisions. This study updates that series, including all cases diagnosed between 2013 and August 2025, and aims to identify clinical and therapeutic predictors of poor prognosis.

METHODS

We performed a retrospective, single-center study including all patients clinically diagnosed with endophthalmitis at the Department of Ophthalmology of Hospital Pedro Hispano between September 2013 and August 2025. Thirty-one eyes from 31 patients were included from an institutional database. Diagnosis was based on clinical presentation and, when available, microbiological confirmation.

Patient data included demographic features, past medical history, cause of infection, date of admission and symptoms onset, visual acuity on admission and discharge, treatment modalities, as well as culture results when positive.

Best corrected visual acuities (BCVA) recorded in Snellen chart measures were converted into the logarithm of the minimum angle of resolution (LogMAR). Hand motion, light perception, and no light perception corresponded to 2.40, 2.70, and 3.00 logMAR, respectively, as per the Royal College of Ophthalmologists' database conversion.[9]

Statistical analysis was performed with IBM SPSS (v29.0). Normality was tested, and nonparametric methods were applied where appropriate. Correlations were evaluated with Spearman's or Pearson's coefficients, and significance was defined as p-value <0.05.

RESULTS

Thirty-one patients were included (58.1% male, mean age 69.8 ± 9.1 years) (Table 1). The left eye was affected in 61.3% of cases, and the mean follow-up was 15.7 ± 14.6 months.

Most endophthalmitis cases were exogenous (87.1%), predominantly following ocular surgery (61.3%). Early-onset endophthalmitis (≤6 weeks post-procedure) accounted for 17 cases, while 2 delayed-onset cases, both late complications of glaucoma surgery—one after nonpenetrating deep sclerectomy complicated by bleb leakage, and another after Ahmed valve implantation with tube exposure.

The most frequent causes were intravitreal injection (29%), followed by cataract surgery (19.4%), corneal ulcer complications (16.1%), and penetrating ocular trauma (6.4%) (Table 1). Four cases (12.9%) were endogenous, secondary to infective endocarditis (6.5%), prostatic abscess (3.2%), and meningitis (3.2%).

Between 2023 to 2024, there were 14 new cases, nearly doubling the cumulative count from the prior decade. Most of them were related to intravitreal injections or cataract surgery (Fig. 1).

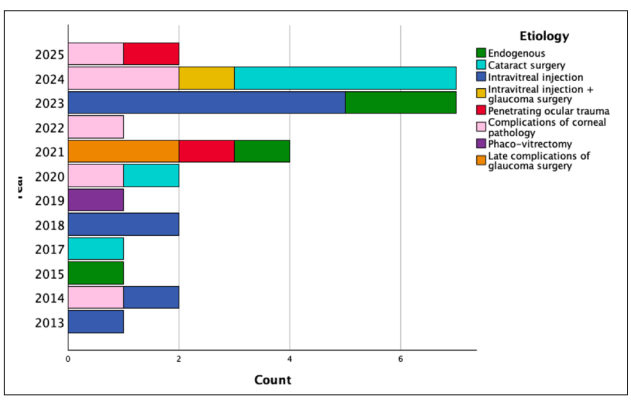

Figure 1. Distribution of number of endophthalmitis cases by year and etiology.

The mean interval between ocular intervention and symptoms onset was 8.7 ± 7.8 days (Table 1) and patients presented to the emergency department after 1.9 ± 1.5 days after symptom onset. Among exogenous cases, no significant correlation was found between symptom onset timing and visual outcomes.

Most patients (90.3%) had systemic comorbidities: es-

Table 1. Demographic and baseline characteristics.

Variables	
Number of patients, N	31
Number of eyes, N	31
Age (years), M±SD (range)	69.84 ± 9,09 [56-86]
Gender, N (%)	
Male	18 (58.1)
Female	13 (41.9)
Laterality, N (%)	
Left eye	19 (61.3)
Right eye	12 (38.7)
Lens status, N (%)	
Pseudophakic	17 (54.8)
Phakic	14 (45.2)
Endogenous *versus* exogenous endophthalmitis, N (%)	
Exogenous	27 (87.1)
Endogenous	4 (12.9)
Etiology, N (%)	
Intravitreal injection	9 (29)
Cataract surgery	6 (19.4)
Complicated corneal ulcer	5 (16.1)
Infectious endocarditis	2 (6.5)
Prostatic abscess	1 (3.2)
Meningitis complicated with otomastoiditis	1 (3.2)
Penetrating ocular trauma	2 (6.5)
Late complications of glaucoma surgery	2 (6.5)
Phaco-vitrectomy	1 (3.2)
Complicated descematocele	1 (3.2)
Intravitreal injection and glaucoma surgery	1 (3.2)
Microbiological sample collection N (%)	
No	6 (19.4)
Yes	25 (80.6)
Culture results, N (%)	
Negative	17 (54.8)
Positive	8 (25.8)
Time between eye insult and symptoms onset (days), M±SD(range) • Early postoperative cases	8.73 ± 7.8 (2–26) 9.64 ± 7.63 (2–25)
Systemic Comorbidities, N (%)	
Hypertension	16 (51.6)
Dislipidemia	14 (45.2)
Diabetes mellitus	13 (41.9)
Cardiac pathology - valvular heart disease	5 (16.1)
Infectious diseases - human immunodeficiency virus, virus hepatitis B, tuberculosis, meningitis	4 (12.9)
Oncological diseases	3 (9.7)
Liver disease - cirrhosis	1 (3.2)
Neurological diseases - dementia	1 (3.2)
Ocular Past Comorbidities, N (%)	
Glaucoma	4 (12.9)
Age-related macular degeneration (AMD)	4 (12.9)
Diabetic retinopathy • Non proliferative stage • Proliferative stage	 3 (9.7) 2 (6.4)
Previous retinal detachment	1 (3.2)
Branch retinal vein occlusion	1 (3.2)
Myopic choroidal neovascularization	1 (3.2)

AMD, age-related macular degeneration; IV, intravitreal; logMAR, logarithm of minimum angle of resolution; M, mean; N, absolute frequencies; PPV, pars plana vitrectomy; SD, standard deviation; %, relative frequencies.

sential hypertension (51.6%), dyslipidemia (45.2%), and type 2 diabetes mellitus (41.9%) being the most common (Table 2). A statistically significant correlation was found between number of systemic comorbidities and final VA (ϱ=0.418; *p*=0.033). No relationship existed between comorbidity count and VA variation (ΔVA). No association was found between the comorbidities count and type of etiology (*p*=0.312; Kruskal–Wallis test), but patients with complicated corneal pathologies (MR = 20.83), and endogenous causes (MR = 15.75) tended to present with a higher number of comorbidities. Ocular comorbidities included glaucoma (12.9%), age macular degeneration (AMD) (12.9%), and diabetic retinopathy (16.1%), without significant impact on visual prognosis.

Table 2. Clinical signs and treatments applied at presentation.

Signs at presentation, N (%)	
Cornea	
Edema	15 (48.4)
Ulcer	3 (9.7)
Perforation	1 (3.2)
Opacity	4 (12.9)
Anterior chamber	
1+ cells	1 (3.2)
2+ cells	2 (6.5)
3+ cells	3 (9.7)
Fibrin	9 (29)
Hypopyon	16 (51.6)
Presence of synechiae	
Yes	5 (16.1)
No	26 (83.9)
Lens status	
Phakic	14 (45.2)
Pseudophakic	17 (54.8)
Vitreous	
Not visible	13 (41.9)
Vitritis	17 (54.8)
Vitreous hemorrhage	1 (3.2)
Retina	
Normal	2 (6.5)
Not visible	24 (77.4)
Subretinal hemorrhages	3 (9.7)
Hemorrhages and cotton wool spots	2 (6.5)
Intraocular pressure (mmHg), M±SD	14.03 ± 8.68
Ocular ultrasound at presentation to study the posterior segment	
Yes	26 (83.9)
No	5 (16.1)
Treatments applied, N (%)	
Topical antibiotics (Topical ATB)	2 (6.5%)
Topical ATB + IV	4 (12.9%)
Topical ATB + oral + IV + PPV	8 (25.8%)
Topical ATB + IV + PPV	15 (48.4%)
IV ATB + PPV	2 (6.5%)

ATB, antibiotherapy; IV, intravitreal; M, mean; N, absolute frequencies; PPV, pars plana vitrectomy; SD, standard deviation, %, relative frequencies.

Median initial VA was 2.4 logMAR (corresponds to hand motion) (Fig. 2). The most frequent symptoms were decreased vision (90.3%), pain (80.6%), and red eye (80.6%). The number of presenting symptoms was not associated with visual outcomes. The principal clinical signs at presentation are stated in Table 3.

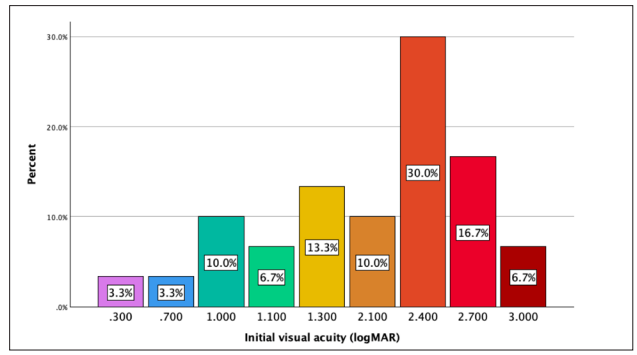

Figure 2. Initial best corrected visual acuity (BCVA) (logMAR, logarithm of minimum angle of resolution) in percentage (%).

Microbiological samples were collected in 80.6% of patients, predominantly vitreous samples (58.1%), followed by anterior chamber (12.9%). Cultures were positive in nine cases (29%), with *Staphylococcus epidermidis* as the most frequent (36.3%) (Table 4). Gram-negative isolations, though rare, were associated with poor outcomes and evisceration surgery. No significant correlation existed between culture positivity and visual outcomes. Most isolates were sensitive to aminoglycosides, vancomycin, piperacillin/tazobactam, fluoroquinolones, and third-generation cephalosporins, while four cases showed resistance to erythromycin, gentamicin, or flucloxacillin.

Most patients received both intravitreal (IV) and topical antibiotics (93.5%), except for two patients who refused intravitreal therapy. 29% of cases also received systemic antibiotic, mainly fluoroquinolones (n= 5), vancomycin (n= 2), and ceftriaxone (n= 1). Intravitreal vancomycin (1 mg/0.1 mL) and ceftazidime (2.25 mg/0.1 mL) were used, with an average of 5.8 injections. Topical fortified vancomycin and ceftazidime were used in 87% of cases according to institutional protocol. A minority of patients did not receive them due to poor treatment compliance. The mean duration of antibiotic therapy (considering topical, systemic and/or intravitreal routes) was 15.9 ± 12.8 days.

Medical treatment was initiated promptly (0.48 ± 0.85 days). Treatment delay was not significantly correlated with visual recovery in univariate analysis (r=0.286, *p*=0.176).

Vitrectomy (PPV) was performed in 80.6% of patients as early as feasible (2.8 ± 2.1 days after admission), depending on operating room availability and the patient's clinical stability, particularly in cases showing no improvement in inflammation or that showed clinical worsening after the first cycle of intravitreal antibiotics. Six patients did not undergo prompt PPV because surgery was deferred due to systemic contraindications, patient refusal, or anterior segment opacities with decreased visualization. These patients were treated with repeated intravitreal antibiotic injections and fortified topical antibiotics.

Patients were divided into early (≤48 hours; 56.5%) and delayed PPV groups (>48 hours; 43.5%) based on PPV timing, excluding two cases with surgery postponed beyond 15 days. Early PPV showed greater visual improvement (ΔVA = –1.58 ± 0.55 logMAR *vs* –0.55 ± 0.91; *p*=0.002) though final

Table 3. Isolation of each microbiological agent by etiology.

Etiology	Isolated agent, (N)							
	0	*S.anginosus*	*E. faecalis*	*S. epidermidis*	*E. coli*	*P. aeruginosa*	*P. mirabilis*	Total
Endogenous	1	1	1	1	-	-	-	4
Exogenous								
Cataract surgery	4	-	-	2	-	-	-	6
Intravitreal injection	7	-	-	1	1	-	-	9
Complicated corneal pathologies	4	-	-	-	-	1	1	6
Intravitreal injection + glaucoma surgery	1	-	-	-	-	-	-	1
Traumatic	2	-	-	-	-	-	-	2
Phaco-vitrectomy	1	-	-	-	-	-	-	1
Late complications of glaucoma surgery	2	-	-	-	-	-	-	2
TOTAL	22	1	1	4	1	1	1	31

N, absolute frequencies.

Table 4. Comparison of initial VA, final VA and variation in VA according with PPV timing.

Groups	Initial VA (logMar) M±SD MD ± IQR	Final VA (logMar) M±SD MD ± IQR	Variation VA (logMar) M±SD MD ± IQR
1 - PPV ≤ 48 hours	1.96 ± 0.54 2.10 ± 1.10	0.3 ± 0.28 0.3 ± 0.6	-1.57 ± 0.55 -1.70 ± 0.90
2 - PPV > 48 hours	1.97 ± 0.84 2.4 ± 1.625	1.31 ± 1.18 1.00 ± 2.38	-0.55 ± 0.907 -0.3 ± 1.13

IQR, interquartile range; logMAR, logarithm of minimum angle of resolution; M, mean; MD, median; SD, standard deviation.

VA did not differ significantly. Although ocular comorbidities may influence visual recovery, subgroup analysis was not feasible due to small sample sizes, overlapping comorbid conditions, and lack of reliable pre-endophthalmitis VA data. Most surgeries included anterior chamber washout (64.5%), lensectomy was performed only in phakic eyes when indicated, vitrectomy and removal of septic foci; five received silicone oil tamponade, and one received sulfur hexafluoride (SF_6) gas.

The overall complication rate was 29%, which included macular edema (n = 4), retinal detachment (n= 2), choroidal detachment (n= 1), hypotony (n= 1), ocular hypertension (n= 1), phthisis bulbi (n= 2), and need for evisceration (n= 4). Non-PPV patients had markedly higher complication rates (83.3%) than PPV patients (16.0%; p=0.001). Etiology was associated with complication risk (p=0.006); corneal pathology–related cases had the highest rates, followed by glaucoma-surgery–related cases and endogenous infections.

DISCUSSION

Most cases in this series were exogenous (87.1%), primarily postoperative (61.3%), consistent with international reports.[6] Endogenous cases represented 12.9%, within the 5%–20% range described.[6]

The mean interval between the inciting procedure and symptom onset matched previous studies from Portugal (mean 11.0 ± 2.9; median 4 days), Korea (mean 4.2 ± 7.9 days), and China (mean 9.7 ± 77.4 days).[10] Systemic comorbidities were common and correlated with poorer visual outcomes, similar to other series.[10]

Microbiological findings aligned with global patterns, with *S. epidermidis* predominating.[3,5] Gram-negative isolates (*Pseudomonas aeruginosa* and *Proteus mirabilis*), though rare, caused devastating outcomes that led to evisceration surgery.

Culture positivity (29%) was lower than reported (55%–75%),[3] likely due to earlier antibiotic administration, which may suppress bacterial growth. Strict antiseptic measures, particularly preoperative povidone-iodine, remain the most important measure for prevention.[3,5] Protocol re-adjustments - such as mandatory use of surgical mask by the patient during the administration of IV Injections; double application of preoperative 5% povidone-iodine instillation (the first applied 2 to 3 minutes prior entering the operating theatre; the second applied during surgical field preparation), and stricter sterile eye patch application (by the surgeon using sterile gloves) - contributed to subsequent stabilization.

Prompt treatment initiation is essential. Our PPV rate (80.6%) was comparable to Portuguese (73.5%) and Korean

(76.3%) studies and exceeded those in China (51.3%).[3,10] Despite the EVS trial's initial conclusion that vitrectomy offered limited benefit beyond light perception, advances in surgical techniques and instrumentation have shifted this paradigm.[3,6,11] Current ESCRS guidelines endorse complete PPV as the preferred treatment, especially in acute exogenous cases.[11] Our data support that early vitrectomy enhances relative visual recovery and mitigates irreversible retinal damage and inflammatory sequelae.

Complication rates were substantially lower in PPV-treated eyes. In contrast, 83% of non-PPV eyes developed severe complications such as evisceration or phthisis, aligning with the EVS.[12] The type of infection also influenced prognosis; cases secondary to corneal ulcers, glaucoma surgery, and endogenous infections had higher complication rates, consistent with Lu *et al*.[13]

CONCLUSION

This study provides a comprehensive characterization of infectious endophthalmitis cases managed at our center over 12 years. Most cases were exogenous, particularly following intravitreal injections and cataract surgery.

S. epidermidis remained the leading pathogen, while gram-negative infections, though infrequent, caused severe outcomes. Nearly all patients had systemic comorbidities, which correlated with poorer visual results.

Treatment followed international guidelines with prompt antibiotic administration and early PPV (<48h), which was associated with greater visual recovery and significantly fewer complications, reinforcing its role as a cornerstone of management. Poorer outcomes occurred in corneal and glaucoma-surgery–related infections, emphasizing the need for individualized strategies.

These findings underscore the importance of early recognition, rapid surgical intervention, and strict aseptic measures. Despite limitations inherent to retrospective single-center design, these results will be included in a large multicentric national database that hopefully will contribute to refining management protocols in our country.

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CONTRIBUTORSHIP STATEMENT / DECLARAÇÃO DE CONTRIBUIÇÃO

JSR: Data collection, data analysis and manuscript writing.

ARV, CT: Data collection, data analysis and review of the manuscript.

CF, SJ, AS: Data collection, review of the manuscript.

RC, BV, TM, SP: review of the manuscript.

All the authors approved the final version to be published.

JSR: Recolha de dados, análise de dados e redação do manuscrito.

ARV, CT: Recolha de dados, análise de dados e revisão do manuscrito.

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Todos os autores aprovaram a versão final a ser publicada.

RESPONSABILIDADES ÉTICAS

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Confidencialidade dos Dados: Os autores declaram ter seguido os protocolos da sua instituição acerca da publicação dos dados de doentes.

Proteção de Pessoas e Animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pela Comissão de Ética responsável e de acordo com a Declaração de Helsínquia revista em 2024 e da Associação Médica Mundial.

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Corresponding Author/
Autor Correspondente:

Joana da Silva Rocha
Ophthalmology Department, Hospital Pedro Hispano, Rua Dr. Eduardo Torres
4464-513 Senhora da Hora, Portugal
E-mail: joana.98rocha@gmail.com

ORCID: 0000-0001-5656-417X