

## Commentary: Fungal endophthalmitis – Newer insights into the diagnosis and management

There have been numerous advances in the diagnosis and management of fungal endophthalmitis with leading research publications from developing countries, especially India. In India, major academic centers have reported the incidence of fungal endophthalmitis (both exogenous and endogenous) to be quite high.<sup>[1-6]</sup> Ophthalmologists, microbiologists, and other clinician–scientists from these institutes have contributed greatly to reduce the disease burden and severity over the years. The All India Ophthalmology Society (AIOS) 2021 Sengamedu Srinivas Badrinath Endowment Lecture published in Indian Journal of Ophthalmology serves as a much-needed ready reckoner in the diagnosis and management of fungal endophthalmitis.<sup>[7]</sup>

With the COVID-19 pandemic, the general incidence of fungal infections has risen due to prolonged corticosteroid

use (especially among patients in intensive care units).<sup>[8,9]</sup> The prompt identification of endogenous fungal endophthalmitis has, therefore, assumed significant importance. In the AIOS lecture,<sup>[7]</sup> the authors have elegantly summarized the updated information of the epidemiology, pathological aspects of disease occurrence, advances in the molecular diagnosis including matrix-assisted laser desorption/ionization–time of flight, and peptide nucleic acid fluorescent *in situ* hybridization (PNA FISH). Next generation sequencing represents a novel area of research in determining newer fungal species causing infections (including hospital-acquired ones) and provides vital information on the ever-changing epidemiology of fungal infections.<sup>[7]</sup> The concept of mycobiome is relevant in ocular fluids, and the authors have done commendable work (unique and first of its kind) in determining the fungal genome in ocular flora (especially the conjunctival tissue).<sup>[10]</sup>

One of the relevant areas of research in fungal endophthalmitis besides laboratory evaluation is multimodal vitreoretinal imaging. Research using optical coherence tomography (OCT) has shown that endogenous candida infections can present in

two morphological forms – *intraretinal pattern* and *chorioretinal pattern*.<sup>[11]</sup> In the intraretinal form, the fungus causes intraretinal infection with accumulation of exudates in the inner retinal and subhyaloid region (*preretinal fungal aggregates*), with spill-over of cells in the vitreous cavity (“rain-cloud sign”). The choriocapillaris pattern consists of a large fungal lesion that can penetrate the retinal pigment epithelium and extends within the retinal layers. The choriocapillaris can be thickened and ischemic with diffuse choroidal thickening.<sup>[11]</sup> Zhuang *et al.*<sup>[12]</sup> demonstrated four patterns of endogenous candida endophthalmitis consisting of subretinal macular (type 1), inner retinal (type 2), full-thickness retina with macular edema (type 3), and subinternal limiting membrane (type 4).<sup>[12]</sup>

In contrast to candida endophthalmitis, aspergillus infections can present with dense *subretinal exudates* on OCT imaging with posterior hyaloid cells and diffusely thickened choroid.<sup>[13]</sup> Aspergillus species can cause the formation of a “retinal aspergilloma,” which may need surgical management with pars plana vitrectomy and histology for establishing the diagnosis.<sup>[14]</sup> Thus far, there are no studies comparing the OCT features of different fungal species in endogenous endophthalmitis. However, multimodal imaging along with advanced laboratory tools can be extremely helpful in diagnosing fungal disease and distinguishing them from other causes of necrotizing chorioretinal inflammations.

One of the most important steps in the management of fungal endophthalmitis (and suspected fungal endophthalmitis with diagnostic uncertainties) is performing pars plana vitrectomy.<sup>[7]</sup> In the large series published by Das *et al.*<sup>[15]</sup> with over 700 patients, it was observed that nearly all patients required vitrectomy with an average of two intravitreal injections of antifungal agents. Thus, the decision to perform vitreous surgery may be very critical in the management of fungal (or suspected fungal) endophthalmitis. If infections with fungi are suspected (especially in countries such as India with a high incidence), this justification is enough for *empirical treatment* with antifungal agents to improve outcomes.<sup>[15]</sup> However, care must be taken to obtain an adequate sample (vitreous fluid or chorioretinal biopsy) *prior* to the treatment.

There are several aspects where research is needed to improve patient outcomes with fungal endophthalmitis ranging from diagnostics to therapeutics. With the newer challenges posed by the COVID-19 pandemic, the relevance of managing invasive fungal infections is back to the table. The authors’ efforts in mitigating such challenges are noteworthy and laudable.<sup>[7]</sup>

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## References

- Mitra S, Agarwal T, Naik A, Padhi TR, Basu S, Behera UC. Post-traumatic endophthalmitis: Clinico-microbiological profile, antimicrobial susceptibility and prognostic factors at a tertiary eye care centre in Eastern India. *Semin Ophthalmol* 2021;36:742-50.
- Das S, Ramappa M, Mohamed A, Chaurasia S, Sharma S, Das T. Acute endophthalmitis after penetrating and endothelial keratoplasty at a tertiary eye care center over a 13-year period. *Indian J Ophthalmol* 2020;68:2445-50.
- Dave VP, Pathengay A, Panchal B, Jindal A, Datta A, Sharma S, *et al.* Clinical presentations, microbiology and management outcomes of culture-proven endogenous endophthalmitis in India. *Indian J Ophthalmol* 2020;68:834-9.
- Bhende M, Raman R, Jain M, Shah PK, Sharma T, Gopal L, *et al.* Incidence, microbiology, and outcomes of endophthalmitis after 111,876 pars plana vitrectomies at a single, tertiary eye care hospital. *PLoS One* 2018;13:e0191173.
- Satpathy G, Nayak N, Wadhvani M, Venkwatesh P, Kumar A, Sharma Y, *et al.* Clinicomicrobiological profile of endophthalmitis: A 10 year experience in a Tertiary Care Center in North India. *Indian J Pathol Microbiol* 2017;60:214-20.
- Chakrabarti A, Shivaprakash MR, Singh R, Tarai B, George VK, Fomda BA, *et al.* Fungal endophthalmitis: Fourteen years’ experience from a center in India. *Retina* 2008;28:1400-7.
- Das T, Joseph J, Jakati S, Sharma S, Velpandian T, Padhy SK, *et al.* Understanding the science of fungal endophthalmitis - AIOS 2021 Sengamedu Srinivas Badrinath Endowment Lecture. *Indian J Ophthalmol* 2022;70:768-77.
- Shroff D, Narula R, Atri N, Chakravarti A, Gandhi A, Sapra N, *et al.* Endogenous fungal endophthalmitis following intensive corticosteroid therapy in severe COVID-19 disease. *Indian J Ophthalmol* 2021;69:1909-14.
- Agarwal M, Sachdeva M, Pal S, Shah H, Kumar RM, Banker A. Endogenous endophthalmitis a complication of COVID-19 pandemic: A case series. *Ocul Immunol Inflamm* 2021;29:726-9.
- Shivaji S, Jayasudha R, Sai Prashanthi G, Kalyana Chakravarthy S, Sharma S. The human ocular surface fungal microbiome. *Invest Ophthalmol Vis Sci* 2019;60:451-9.
- Invernizzi A, Symes R, Miserocchi E, Cozzi M, Cereda M, Fogliato G, *et al.* Spectral domain optical coherence tomography findings in endogenous Candida endophthalmitis and their clinical relevance. *Retina* 2018;38:1011-8.
- Zhuang H, Ding X, Gao F, Zhang T, Ni Y, Chang Q, *et al.* Optical coherence tomography features of retinal lesions in Chinese patients with endogenous Candida endophthalmitis. *BMC Ophthalmol* 2020;20:52.
- Adam CR, Sigler EJ. Multimodal imaging findings in endogenous Aspergillus endophthalmitis. *Retina* 2014;34:1914-5.
- Kiang L, Pirouz A, Grant S, Adrean SD, Malihi M, Lin P. Aspergillus endophthalmitis resulting in development of retinal aspergilloma. *Ophthalmic Surg Lasers Imaging Retina* 2017;48:680-3.
- Das T, Agarwal M, Anand AR, Behera UC, Bhende M, Das AV, *et al.* Fungal endophthalmitis: Analysis of 730 consecutive eyes from seven tertiary eye care centers in India. *Ophthalmol Retina* 2021;S2468-6530(21)00289-X. doi: 10.1016/j.oret. 2021.09.006.

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