



# Management of Allergic Fungal Rhinosinusitis Associated with Vision Loss During COVID-19 Era

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**Abstract** The ongoing COVID-19 pandemic has given rise to unique challenges related to healthcare management. The problems have arisen due to the direct effect of COVID 19 infection and treatment or as repercussions of administrative efforts being undertaken to check the rapid spread of the epidemic. The management of some of the diseases has been hampered with the implementation of the policies like lockdown and transportation difficulties. This paper presents a series of four patients (6 eyes with vision loss) of an otherwise benign entity, Allergic Fungal Rhinosinusitis (AFRS), causing visual deterioration, managed amid the pandemic. AFRS has been known to cause vision loss by pressure over the optic nerve or its blood supply; however, a timely surgical intervention in the form of functional endoscopic sinus surgery to remove the disease and decompress the optic nerve, results in favourable outcomes in most patients. A delay in diagnosis and treatment may result in irreparable damage with the resulting inability to salvage the vision. In our series, we observed that vision recovery could be achieved in 66.7% of the affected eyes (four out of six eyes), while a poor visual outcome was observed in two (33%). The poor visual outcome was observed for the eyes with a prolonged visual impairment (4–6 months) at the time of presentation. We would appeal to the physicians to be cognizant of the adverse outcomes associated with the delayed surgical intervention of AFRS in the current pandemic scenario.

**Keywords** Nasal polyp · Time-to-treatment · Optic neuritis · Blindness · COVID-19

## Introduction

COVID-19 pandemic has given rise to new challenges related to healthcare management, some of which are noticeable after the pandemic has plateaued. A rise in the incidence and severity of some diseases has been observed due to COVID-19 associated immunosuppression or medications like steroids used to treat it [1, 2]. A delay in treatment institution for routine and emergency surgical conditions has been observed because of the COVID-19 pandemic. The delay is a consequence of the avoidant healthcare-seeking behaviour of the patients, closure of healthcare facilities, and diversion of workforce and health resources away from routine, urgent, and emergency healthcare demanding conditions towards the care of COVID-19 patients.

Allergic fungal rhinosinusitis (AFRS) is a distinct subset of chronic rhinosinusitis with nasal polyposis (CRSwNP) usually encountered in immunocompetent individuals, which is associated with bony expansion and remodelling of the involved paranasal sinuses (PNS), resulting in proptosis and possible optic nerve compression [3]. The mechanical pressure over the optic nerve may lead to irreversible damage if not addressed promptly. During the COVID-19 pandemic, four such AFRS patients presented to us with vision impairment. Two patients had a bilateral involvement resulting in a total of six eyes with vision loss associated with AFRS in our series. The patients who sought surgical intervention in a delayed fashion (4–6 months) due to imposed travel restrictions to contain COVID spread sustained irreversible damage. We discuss

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**Table 1** Summary of the visual outcome of the patients detailed in the manuscript

SN	Age/sex	Duration of nasal symptoms	Visual symptoms		Visual outcome <sup>#</sup>
			Duration	Severity*	
1	25/F	Mild nasal stuffiness, off and on	Rt: 4 months Lt: 20 days	PL – HMCF +	No improvement 6/20 after 48 h
2	20/F	8 years	Rt: 6 months Lt: 1 month	HMCF + FCCF +	No improvement 6/9 immediate post op
3	16/M	1.5 years	Rt: 1.5 months	HMCF +	2/60 immediate post op
4	57/M	7–8 months	Lt: 5 days	PL +	6/18 after 72 h

SN Serial number; M Male; F-Female; Rt Right; Lt Left; PL perception of light; HMCF Hand movement close to face; FCCF Finger counting close to face

\*—Assessed at the time of presentation

#—Assessed in terms of visual acuity

the patient outcome and the various factors involved in managing these patients in the pandemic era.

## Case Presentations

### Case 1

A 20-year-old woman, a known case of AFRS, presented to our outpatient department (OPD) with a history of progressive diminution of vision in the right eye for the last six months and left eye for the last one month. The patient started having initial symptoms of nasal obstruction and discharge eight years back and had undergone functional endoscopic sinus surgery (FESS) thrice since then. The patient was asymptomatic for the next few years after the last surgery but started having symptoms again since last year, which gradually progressed. However, with the unfortunate onset of the COVID-19 pandemic, the strict lockdown regulations led to a significant delay in the timely visit to the hospital, and the desired treatment was delayed. At the time of presentation, the patient had telecanthus and bilateral proptosis (more on the right side), the visual acuity in the right eye had deteriorated to hand movements close to the face; while on the left side, she could count fingers close to face. The relative afferent pupillary defect was found on both sides. The external ocular movements were within normal limits, and the Fundus examination showed normal findings. Pale nasal polypi could be seen protruding out of the nasal vestibule on both sides. The patient had telecanthus and proptosis (more on the right side).

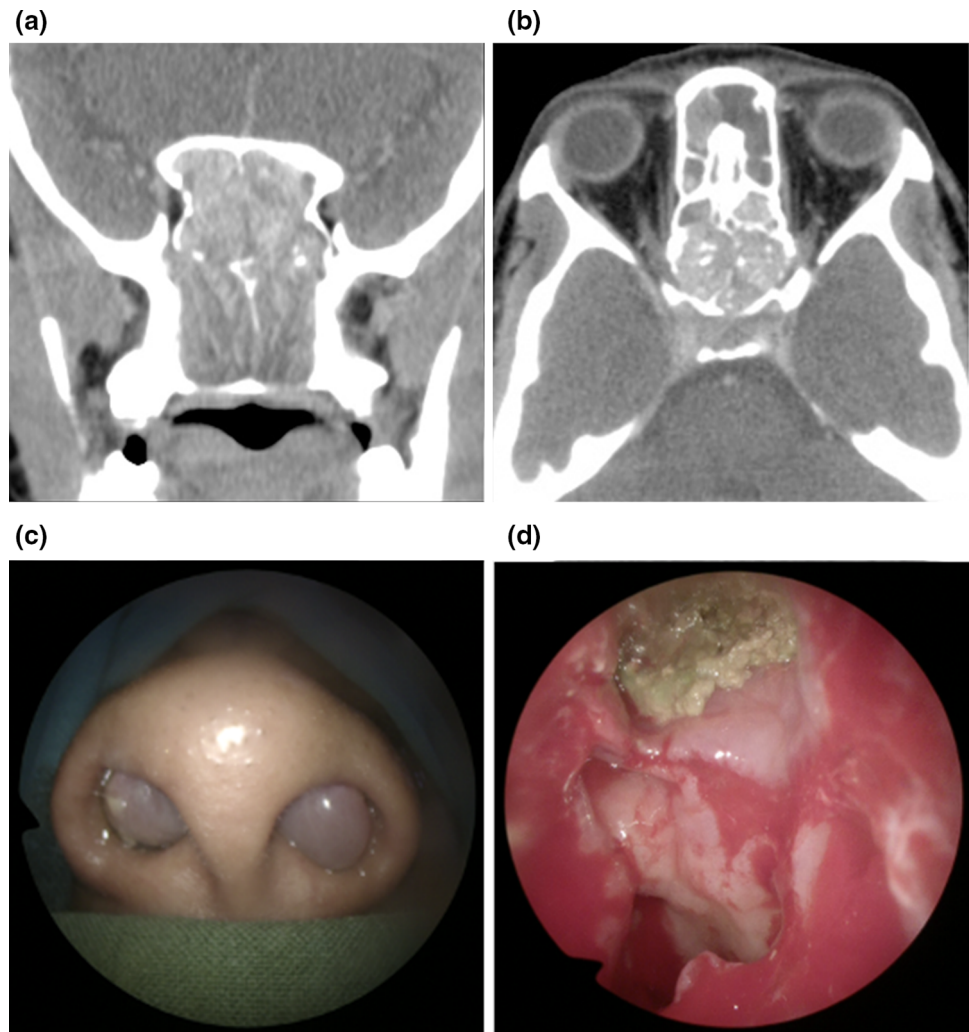
A CT scan of the paranasal sinuses was obtained, which showed expansile soft tissue with intermittent areas of hyperdensities, typical of AFRS, filling up all the paranasal sinuses, with severely thinned and ballooned out laminae

papyracea and cribriform plates on both the sides without intraorbital or intracranial extension. Onodi cells were present on both sides. The optic nerve was devoid of bony canal covering in the Onodi cells and sphenoid sinuses due to disease-associated bony erosion (Figs. 1a, 2b). Because of bilateral, progressive vision loss, the patient underwent urgent endoscopic sinus surgery in the emergency (Fig. 1d). One day after the surgical procedure, the visual acuity improved to 6/9 on the left side; however, the vision on the right side did not improve. At a follow-up of two months postoperatively, the visual acuity has remained the same, and Post FESS nasal cavity has recovered to Kupferberg stage (Vancouver modified) I-A.

### Case 2

A 25-year-old woman, 3-week postpartum, presented to us with occasional nasal stuffiness, bilateral proptosis, and bilateral visual impairment. While right-sided vision impairment was long-standing for the last four months, the left-sided vision impairment had a short history of the last 20 days. The patient could not visit the hospital because of the local administration's lockdown instructions and the fear of contracting the COVID infection during the hospital visit. As a part of work up to investigate the cause of proptosis, a contrast tomography (CT) and magnetic resonance imaging (MRI) was ordered. The CT scan showed expansile soft tissue density with classic foci of hyperattenuation involving bilateral maxillary, ethmoid and sphenoid sinuses. MRI showed the isointense lesion in T1 weighted images and widened sinuses with signal void corresponding to fungal debris in the involved sinuses (Fig. 2a, b). Optic nerves were seen exposed in the sphenoid sinuses on both sides, which had likely led to their compression and subsequent vision impairment. The right eye did not have the perception of light, and the left eye

**Fig. 1** Non-contrast CT scan **a** coronal, and **b** axial views showing heterogeneously hyperintense soft tissue density filling up the Onodi cells on both the sides with dehiscent optic nerve bilaterally (black arrows) **c** Showing bilateral pale polypi protruding into nasal vestibule. **d** The Optic nerve (\*) was found to be devoid of bony covering, and the recesses superior and inferior to it were packed with the fungal mucin (black arrow) causing nerve compression and inflammation



could perceive hand movements close to the face. She underwent endoscopic sinus surgery (Fig. 2c), and her vision on the left side improved to 6/12 within 48 h of surgery. Right side vision, however, has not shown any improvement.

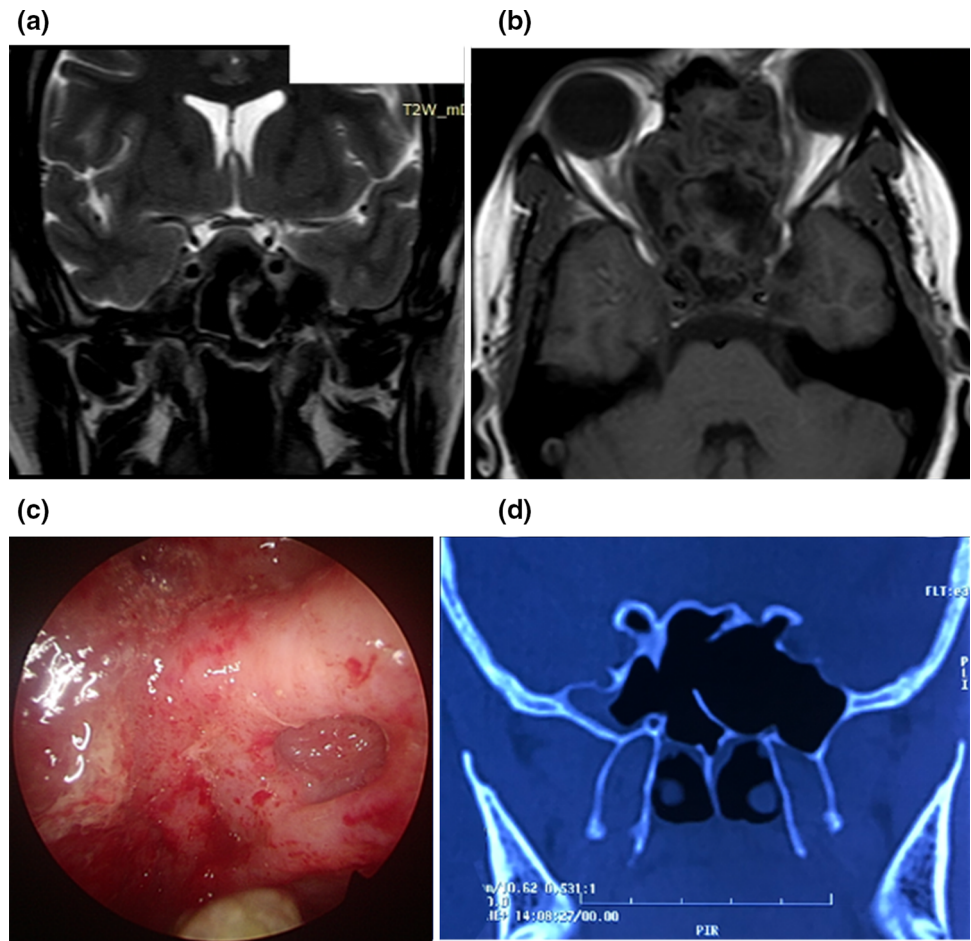
### Case 3

A 57 years' old male presented to the emergency department with a history of diplopia for last 20 days and bilateral visual compromise for last five days. The visual impairment was more severe on left side compared to the right. Further history revealed that the patient had been suffering from holocranial headaches for last 7–8 months and nasal obstruction and thick yellowish nasal discharge for last 7–8 months. There was no history of facial numbness, pain, loosening of teeth, nasal bleed, fever or vomiting. He was on treatment for type-II diabetes for last 10 years which was well controlled on oral hypoglycemic agents (glimepiride and teneligliptin), and hypertension

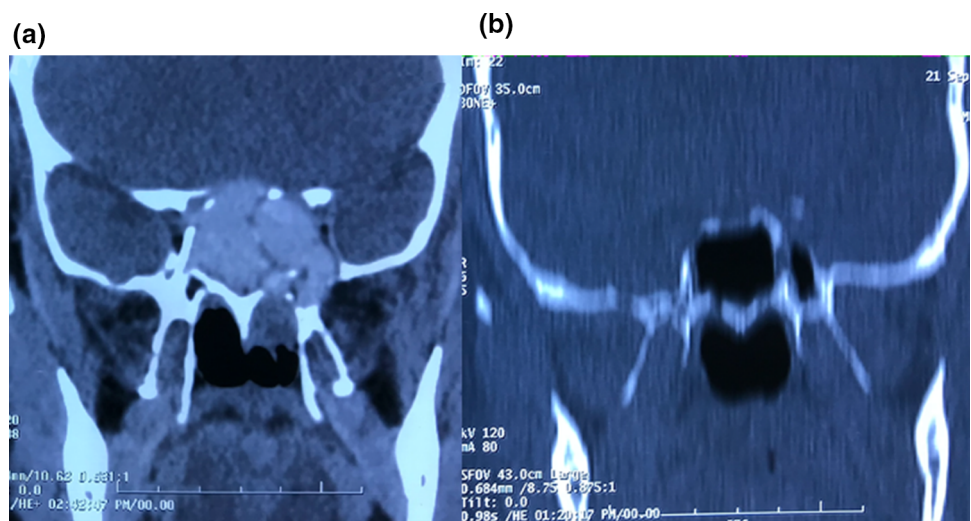
which was well controlled with amlodipine 5 mg daily. The examination showed subtle proptosis on left side with preserved external ocular movements. Visual acuity on right side was 6/12 while on the left side he had only perception of light. Pupillary reaction showed rapid afferent pupillary defect on left side. Nasal cavity showed pale polypi filling bilateral nasal cavity with thick yellowish nasal discharge. With a provisional diagnosis of nasal polyposis, a non-contrast CT scan was performed which showed features suggestive of AFRS (Fig. 3a).

The patient was taken up for FESS under general anesthesia. Intraoperatively, bilateral nasal cavity, ethmoid, sphenoid and right maxillary sinuses were filled up with pale polypi and fungal mucin. After debriding the diseased tissue, exploration of sphenoid sinuses showed deep optico-carotid recesses with dehiscent optic nerves on both the sides of the sphenoid sinuses. Post-operative course was uneventful and the vision improved to 6/18 on left side (from perception of light) and remained 6/12 on right side.

**Fig. 2** **a** T2W coronal, and **b** T1W axial MRI sequences showing the expansion of the involved sinuses (\*) with isointense soft tissue on T1 and signal void on T2 sequences corresponding to fungal debris filling up the sinuses. **c** Intraoperative photograph showing the dehiscent optic nerve on left side (\*) and granulation tissue filling up the lateral optico-carotid recess (arrow) after clearing of fungal mucin. **d** Post-operative CT scan showing well pneumatized sphenoid sinus free of disease



**Fig. 3** **a** Preop CT scan showing heterogeneously hyperintense soft tissue filling up the sphenoid sinus with dehiscent optic nerve bilaterally (arrows). **b** Post op CT Scan showing well pneumatized sphenoid sinus with no evidence of disease



#### Case 4

A 16-year-old boy who had nasal obstruction for the last one-and-a-half years presented a history of diminution of vision in the right eye for the last one-and-a-half months. Because of the inability to visit the hospital due to travel

restrictions to contain the spread of COVID, the patient had received teleconsultation previously and received tablet itraconazole with steroid nasal sprays as an interim bridging measure to surgery. The anterior rhinoscopy revealed pale nasal polypi bilaterally. Bilateral eye movements were within normal limits, and the CT scan showed



characteristic heterogeneous soft tissue densities present in the bilateral ethmoid and sphenoid sinuses. Visual acuity on the left side was normal; however, the patient could perceive only hand movements close to the face on the right side. The patient underwent endoscopic sinus surgery with removal of the fungal muck and debridement of polypi. Post-surgery, the vision improved to 2/60 on the right side; however, fundoscopy revealed sustained disc pallor on the right side as was present pre-operatively. Left eye vision remained 6/6 as pre-operatively. At a 3-month follow-up, the post-FESS cavity has healed well, and the patient has no ocular complaints.

## Discussion

AFRS is a subtype of CRSwNP involving a combination of type I and type III hypersensitivity reactions in immunocompetent individuals [3]. It is a slowly progressive disease known to cause expansion of paranasal sinuses, sometimes resulting in bony erosion of the lamina papyracea and skull base. The pressure on the optic nerve or its blood supply can also lead to partial or complete blindness [4, 5]. This holds true particularly for patients in whom the optic nerve passes through the pneumatized posterior ethmoid or sphenoid sinuses [6], especially when the bony covering of the nerve is dehiscent. The proposed mechanisms are venous congestion of the optic nerve, retinal artery occlusion, local immunological reaction to fungal antigen, and optic neuritis [5]. It is vital to make an early diagnosis of AFRS to allow timely initiation of treatment. All our patients showed characteristic hyperdensities surrounded by hypodense soft tissue on CT, which corroborated the diagnosis. FESS has been shown to relieve pressure over the optic nerve and restore vision in most cases. In our case series, out of a total of six eyes with visual impairment associated with AFRS, visual improvement was noted in four eyes (66.7%). Case 2 has been reported previously. [7] A favourable outcome was obtained in the patients presenting with recent onset partial vision loss; however, long-standing complete vision loss did not improve with surgery. Thakar et al. [4], in their series of 10 AFRS patients (13 eyes with compromised vision), showed similar results, where no improvement was seen post-surgery in cases of long-standing vision loss (> 6 months).

We explored the reasons behind treatment delay in our patients and the impact of delayed treatment on the visual outcomes. The patients' main reasons were the risk of contracting SARS CoV-2 infection due to hospital visits, severe curtailment of the transport facilities, shutdown of local health care services, and increased reliance on medical therapy for containment of the disease progression. The sinonasal symptoms related to AFRS overlap with the

upper respiratory symptoms associated with SARS CoV-2 infection. This resulted in further delay in diagnosis because of avoidance of nasal endoscopy in the OPDs and a shift of focus of the treating physician towards managing the presenting symptoms as SARS CoV-2 infection. A web-based survey of 5,412 participants revealed that ~ 41% of US adults avoided or delayed seeking medical care, including emergency (~ 12%) and routine (~ 32%) care during the pandemic [8]. Travel restrictions resulting from stay-at-home orders and curtailed transport facilities further discourage patients from obtaining the appropriate therapy on time. The perceived risk to life due to severe COVID infection makes patients disregard the non-COVID illness-associated symptoms. This avoidance and delay in instituting timely therapy can result in an increased incidence of disease progression-related complications with potentially irreversible sequelae of acute and chronic non-COVID illnesses, as is evident in our series of patients operated for AFRS. In the pandemic times, the patient and physician preference towards a conservative approach to surgical care offered via teleconsultation has been observed and may contribute to delayed detection and management of disease-related complications [9, 10].

We observed an apparent clustering of the AFRS cases complicated with vision loss within a short period of few months during the pandemic. This seeming rise in the number of these complicated cases can be attributed to our tertiary care centre being amongst the few operating centres offering emergency facilities to non-COVID patients during the pandemic. Once the strict travel restrictions were lifted and a tendency to co-exist with COVID-19 started getting instilled in the general population, the increased influx of the patients with complicated AFRS to our centre resulted in an apparent clustering of these patients. It is noteworthy that none of the patients in our series had tested positive for COVID-19 before or at the time of presentation to us.

Though the number of patients in our series is small, the presentation and management outcomes reported here for the uncommon complication of vision loss in AFRS patients stresses the fact that more stringent measures and guidelines need to be developed to streamline the surgical patients with otherwise benign and insidious diseases to prevent irrecoverable damage incurred by the avoidable complications.

## Conclusion

The logistic issues causing the delayed institution of surgical interventions for non-COVID diseases with a slowly progressive course can result in complicated presentations. AFRS is a surgical disease with an otherwise insidious

course. However, if left ignored, irreversible vision loss may result, as was observed with delayed (4–6 months) presentation in two of our patients (two eyes with impaired vision). The reasons for delayed hospital visits found in our study were the travel restrictions and avoidant patient behaviour in seeking surgical care because of fear of contracting COVID-19. We emphasize the need of patients and physicians to be aware of the importance of timely surgical intervention for these patients, especially in the current times of pandemics.

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#### Declarations

**Conflict of interest** The authors declare that they do not have any conflict of interest to declare.

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