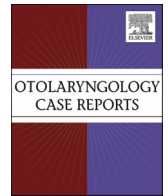




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# Pediatric COVID-19 associated acute rhinosinusitis and periorbital abscess: A case report

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## ABSTRACT

Complications of acute rhinosinusitis (ARS) in the pediatric population can include intra- and extracranial involvement from spread of infection. Though these infections are most commonly preceded by a URI, infection with Sars-CoV-2 (COVID-19) as the inciting event for complicated ARS has rarely been described in the pediatric population. Furthermore, decision making surrounding surgical management of acutely infected patients with COVID-19 remains complicated. This case demonstrates complicated ARS in an otherwise healthy 10-year-old patient with an orbital abscess following COVID-19 infection, ultimately requiring both internal and external surgical approaches for adequate management.

## 1. Introduction

Complications of acute rhinosinusitis in the pediatric population can include intra- and extracranial involvement from spread of infection. Orbital complications have been classified by Chandler et al. [1], based on anatomic involvement, ranging from isolated pre-septal involvement (group 1) to cavernous sinus thrombosis (group 5). Viral upper respiratory tract infection (URI) commonly precedes acute sinusitis in children [2], and the management of some complicated infections may be successful with conservative medical management, but others may require surgical intervention [3,4]. Infection with Sars-CoV-2 (COVID-19) as an inciting event for the development of complicated sinusitis in the pediatric patient has rarely been described [5,6] and presents unique challenges and considerations in the setting of acute infection.

## 2. Materials and methods

### 2.1. Case presentation

The patient is a 10-year-old male, fully vaccinated but not COVID-19 vaccinated, with a past medical history remarkable only for mild seasonal allergies who presented as a transfer from a community hospital after 3 days of fever and left-sided frontotemporal headaches, progressive periorbital edema and ipsilateral pain with upward gaze. A contrast CT scan of the orbits was obtained demonstrating bilateral pansinusitis

in addition to a left superolateral subperiosteal orbital abscess measuring approximately 2.6cm in the largest dimension at which time the patient was started on IV vancomycin and ampicillin/sulbactam.

The patient's father tested positive for COVID-19 the week prior to admission and had been isolating in the home with the patient. The patient had been intermittently febrile with a mild, unproductive cough in the days prior to admission and was found to be COVID-19 positive on presentation. Ophthalmology evaluation was performed and revealed: visual acuity of 20/20 OU, no afferent pupillary defect (APD) OU; tonometry 15 OD 18 OS, and extraocular movement full OU with pain on upgaze OS. Significant upper lid edema OS with injected chemosis. Given the location and size of the orbital infection, along with lack of improvement with medical therapy, the decision was made to treat with endoscopic sinus surgery and orbitotomy for drainage. Standard institutional COVID-19 operating room precautions were used. Of note, operating room staff and personnel used N-95 masks (no PAPR devices) and powered microdebrider instrumentation was used during sinus drainage. Microbiology cultures of the abscess contents ultimately grew *S. pneumoniae*. The patient was discharged to home on postoperative day four on a course of amoxicillin/clavulanic acid. He was seen 2 weeks after discharge with nearly resolved clinical infection.

### 2.2. imaging studies

Fig. 1: 11/26/21 CT Orbits with contrast:

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### 3. Discussion

Previous studies have linked viral upper respiratory infections as a preceding event to the development of acute bacterial sinusitis among the pediatric population [2,7]. In this case presentation, the patient developed symptoms consistent with progressive acute bacterial sinusitis following known isolation with his father who tested positive for COVID-19 a week prior to the patient's hospital admission. Although the specific pathophysiologic manifestations of COVID-19 in pediatric patients have yet to be fully understood, local inflammation disrupting the mucosal lining of the nasopharynx and inhibiting mucociliary clearance may likely have contributed to this patient's development of complicated acute bacterial sinusitis.

According to the 2013 American Academy of Pediatrics Clinical Practice Guidelines, management of complicated acute bacterial sinusitis consisting of orbital and/or intracranial involvement relies on medical management with oral antibiotics with possible escalation of therapy to include intravenous antimicrobial therapy and surgical intervention [7]. Progressive symptoms including orbital involvement with change in vision acuity, ophthalmoplegia, elevated intraocular pressure, as well as intracranial involvement with headache, vomiting, or altered mental status warrant surgical intervention. Superolateral location of the abscess (as in this case) has been shown to be less responsive to medical therapy and transnasal endoscopic drainage and is typically addressed with an external approach [8,9]. Given the patient's subperiosteal abscess with associated progressive symptoms, and minimal improvement with intravenous antibiotics, our team consisting of both otolaryngology head and neck surgery and ophthalmology proceeded with surgical intervention. Opinions concerning surgical practice for pediatric patients with complicated acute sinusitis with concurrent COVID-19 infection recommended initial trial course of medical management for at least 48–72 hours prior to surgical intervention [10]. However, given known clinical factors for medical therapy failure for this clinical pathology, this may place some children at risk for adverse events if surgical therapy is delayed. Additional recommendations suggested limiting use of drills and microdebrider instruments to minimize dissemination of aerosolized viral particles as well as to employ use of PPE, preferentially PAPR use for sinonasal surgery [10]. Although a powered microdebrider instrument was used during this case, the surgical attending and senior resident donned N95s and appropriate PPE, no COVID-19 infection in the surgical team was contact traced back to this case. The current level of safe PPE is unknown for use in this type of management, but our experience seems to suggest that consideration be given to N95 respirators as an option over PAPR device. Furthermore, institutional COVID-19 vaccination requirements were in place prior to this patient's presentation and though this policy is not universally deployed it all institutions, it may be another factor to consider.

Current literature regarding pediatric COVID-19 acute sinusitis surgical and medical management remains scarce. However, Blanco and colleagues document two cases of pediatric complicated acute sinusitis

with concurrent COVID-19 infection requiring surgical intervention with one patient requiring postoperative admission to pediatric intensive care unit for management of hypoxia but soon improved following bilevel positive airway pressure (BiPAP) and medical therapy [5]. At this time, it is difficult to ascertain if the clinical course of COVID-19 associated acute rhinosinusitis with orbital complications poses a risk factor for poorer clinical outcomes. The patient in our case report remained hospitalized for a total of four days and was discharged home with a two-week course of oral antibiotics. Our case report appears to suggest that the clinical course may be similar to that of cases involving complicated acute rhinosinusitis without concurrent COVID-19 infection. Ultimately, further research remains critical to elucidate associated complications and comorbidities with COVID-19 infection. Consideration for appropriate resource utilization and PPE should also be re-evaluated, as N95 respirators may provide sufficient protection for the surgical treatment team.

### 4. Conclusion

Though complicated acute rhinosinusitis may be managed with conservative medical management, close attention must be given to evaluate for more severe or progressing infections to avoid rare, but devastating, life- or sight-threatening complications. The role of SARS-CoV-2 (COVID-19) in these infections is not well understood and requires additional investigation to elucidate concomitant comorbidities and/or complications. Current surgical treatment strategies, along with COVID-19 institutional protocols, can allow for safe, timely, and effective management.

### Author statement

**William Reed:** Conceptualization, Writing-Original draft preparation, review, editing. **Somtochi Okafor:** Writing-Original draft preparation, investigation. **Jeffrey Cheng:** Conceptualization, Writing-Review, editing, Supervision.

### Ethical statement

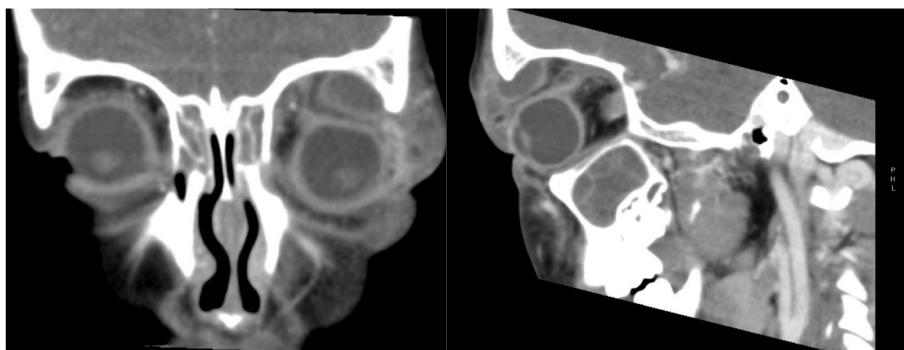
The article was reviewed by the Duke University Health System (DUHS) Institutional Review Board (IRB). The DUHS IRB has determined that the following activity does not meet the definition of research as described in 45 CFR 46.102(d), 21 CFR 50.3(c) and 21 CFR 56.10(c) and satisfies the Privacy Rule as described in 45 CFR 164.514.

**Protocol ID:** Pro00110259.

**Reference ID:** Pro00110259-INIT-1.0.

**Protocol Title:** Pediatric COVID-19 Associated Acute Rhinosinusitis and Periorbital Abscess: A Case Report. **Principal Investigator:** Jeffrey Cheng.

This IRB declaration is in effect from January 24, 2022 and does not expire. However, please be advised that any change to the proposed



**Fig. 1.** Caption: Post-contrast CT scan images demonstrating acute sinusitis as well as left sided, subperiosteal superolateral orbital abscess.

research will require re-review by the IRB.

#### Declaration of competing interest

None of the authors have any conflicts of interest to disclose.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.xocr.2022.100461>.

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