

## Case Report

# Post COVID-19 invasive mucormycosis and actinomycosis co-infection: a case report

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## ABSTRACT

Actinomyces are commensals of human oropharynx and actinomycosis is considered mainly as an endogenous infection that is triggered by a mucosal lesion. Typically, the disease presents as a slowly progressive painless indurated mass evolving into multiple abscesses with draining sinus tracts sometimes expressing a typical yellow exudate with characteristic sulfur granules. The gold standard of diagnosis is histological examination and bacterial culture of the tissue. Most isolates are susceptible to beta lactams and they are the treatment of choice along with surgical management with drainage of abscesses and excision of recalcitrant fibrotic lesions and debridement of necrotic bone tissue. Here we present a case of 37-year-old male patient who has developed severe COVID-19 infection following which he developed invasive mucormycosis followed by actinomycosis. We postulate that the lymphopenia and the use of immunosuppressants used in treatment of COVID-19 lead to mucormycosis and aggressive debridement used as a strategy in treatment of mucormycosis led to colonization of actinomyces leading to cervicofacial actinomycosis.

**Keywords:** COVID-19, Mucormycosis, Actinomycosis, Immunosuppression, Functional endoscopic sinus surgery

## INTRODUCTION

Actinomyces species are filamentous gram-positive bacilli, mainly belonging to the human commensal flora of the oropharynx, gastrointestinal tract and urogenital tract. It is considered mainly as an endogenous infection that is triggered by a mucosal lesion.<sup>1</sup> Typically the disease presents as a slowly progressive painless indurated mass evolving into multiple abscesses with draining sinus tracts sometimes expressing a typical yellow exudate with the characteristic sulfur granules.<sup>5</sup> The gold standard of diagnosis is histological examination and bacterial culture of the tissue.<sup>4</sup> Here we present a case of 37 year old male patient who has developed severe COVID-19 infection following which he developed invasive mucormycosis followed by the actinomycosis.

## CASE REPORT

A 37-year-old male with no known co-morbidities had developed high grade fever with cough and breathlessness in August 2020. On investigation he was found to be positive for COVID-19 disease. He was admitted to intensive care unit for 7 days duration on account of his high oxygen requirement and was discharged after 19 days duration. He received full course of inj. remdesivir, inj. tocilizumab and total aggregate of 240 mg of dexamethasone.

After 2 months he developed pain around eyes and over the face associated with bleeding from nose and gums of 20 days duration. On examination he was found to have crusts in bilateral nasal cavities with paranasal sinus tenderness. Oral cavity examination showed gingivitis

with and small 1x0.5 cm ulcer on the hard palate. CT PNS and MRI brain done showed signs of invasive fungal sinusitis with osteomyelitis. He underwent functional endoscopic sinus surgery (FESS) and samples were sent to histopathology and KOH mount. KOH mount revealed aseptate hyphae with no branching. Histopathological examination revealed necrotic tissue with broad aseptate fungal hyphae consistent with mucormycosis with signs of angioinvasion more prominent with GMS stain. He received inj. liposomal amphotericin B 250 mg daily for 6 weeks duration

He developed nasal perforation and large palatal defect during the course of treatment for which he underwent Repeat FESS and palatal defect closure. After finishing the course of amphotericin B, he was started on T. Posaconazole 300 mg once a day regimen. He was followed up regularly and after 4 weeks duration he developed fever of 5 duration high grade with watery discharge from nose. The histopathological examination of repeat FESS showed the presence of actinomycosis. He was started on inj. ampicillin 2 gm IV every 6<sup>th</sup> hourly for 2 weeks. He recovered gradually on treatment. Regular follow-up was done every 15 days and he recovered well.



**Figure 1: Intra-op image of yellowish sulfur granules suggestive of actinomycosis.**

## DISCUSSION

Actinomyces species are filamentous gram-positive bacilli, mainly belonging to the human commensal flora of the oropharynx, gastrointestinal tract and urogenital tract. *Actinomyces israelii* is the most prevalent species isolated in human infections and found in clinical forms of actinomycosis. *A. israelii* and *A. gerencseriae* are responsible for 70% of orofacial infections. As such, it is difficult to discriminate colonization of mucosa-contaminating samples and infection due to actinomyces except when the culture is pure and associated with the presence of polynuclear neutrophils.<sup>1</sup>

The bacteriological identification of actinomyces from a sterile site confirms the diagnosis. The most appropriate clinical specimens are tissue obtained from surgical biopsy or pus. A gram stain is usually more sensitive than culture.<sup>2</sup> Once actinomyces have invaded the tissues, they develop a chronic granulomatous infection characterized by formation of tiny clumps, called sulfur granules because of their yellow color. These formations composed of internal tangle of mycelial fragments and rosette of peripheral clubs of protein-polysaccharide complex provide a resistance mechanism to the host defenses inhibiting phagocytosis.<sup>3</sup>

Cervicofacial actinomycosis is the most frequent clinical form of actinomycosis and “lumpy jaw syndrome”. Pathophysiological pathways of cervicofacial actinomycosis explain that predisposing conditions include poor oral hygiene, oral mucosal trauma in the form of dental extraction, local tissue damage caused by neoplastic condition or irradiation and cervicofacial surgery. Other predisposing factors are male sex, diabetes mellitus, immunosuppression and malnutrition.<sup>2</sup>

Imaging findings are usually noncontributory. CT and MRI may show a non-specific involvement of skin and soft tissues but are useful to assess bone involvement. The gold standard of diagnosis is histological examination and bacterial culture of the suspected bone if osteomyelitis is suspected.<sup>2</sup> Most isolates are susceptible to beta lactams and they are the treatment of choice along with surgical management with drainage of abscesses and excision of recalcitrant fibrotic lesions and debridement of necrotic bone tissue.<sup>4</sup>

Mucormycosis is a life-threatening infection caused by zygomycetes in immunocompromised patients. Neutropenia, impaired phagocyte function, hyperglycemia, acidosis and corticosteroid treatment are the important risk factors. A hallmark of mucormycosis infection is the presence of extensive angioinvasion with resultant vessel thrombosis and tissue necrosis. Rhino cerebral mucormycosis is the most common form of mucormycosis presenting as facial or retro-orbital pain. The treatment consists of inj. amphotericin along with aggressive surgical debridement.<sup>6</sup>

COVID-19 is caused by non-segmented positive sense coronavirus particles. The viral inflammatory response impairs lymphopoiesis and increases lymphocyte apoptosis and profound lymphopenia. Collectively, endothelial barrier disruption, dysfunctional alveolar-capillary oxygen transmission, and impaired oxygen diffusion capacity are characteristic features of COVID-19. In severe COVID-19, fulminant activation of coagulation and consumption of clotting factors occur.<sup>5</sup>

Here we present a case of 37-year-old male, known case of severe covid disease who has developed invasive mucormycosis and actinomyces co-infection post COVID. On detailed analysis of the pathophysiology of

all the three diseases we found that there may a causal association between the three diseases. In COVID-19 there is severe lymphopenia and there is use high dose corticosteroids and immunosuppressants reduces the function of neutrophils, thereby helping in the colonization and invasion of mucor species. For invasive mucormycosis the mainstay of treatment is antifungal therapy and local surgical debridement. The immunosuppression caused as result of COVID-19 and its treatment helps in the colonization of actinomyces species, the break in mucosa caused as a result of tissue necrosis and its debridement due to mucormycosis can lead to further invasion and growth of actinomyces. The presence of necrotic tissue also aids in providing the anerobic environment required for the actinomyces species as the cellular exchange no longer takes place.

### CONCLUSION

We conclude that there is a positive causal association between the three diseases where COVID leads to mucormycosis and it leads to actinomycosis. There is an increase in incidence of invasive mucor mycosis cases post COVID infection requiring aggressive debridement. These patients have to be followed up regularly and should be looked for any signs of actinomyces infection as it is difficult disease to diagnose and early diagnosis and treatment has a very good prognosis.

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### REFERENCES

1. Wong VK, Weston VC. Actinomycosis. BMJ. 2011;343:6099.
2. Valour F, Senechal A, Dupleux C. Actinomycosis: Etiology, clinical features, diagnosis, treatment and management. Infect Drug Resist 2014;7:183-97.
3. Pulverer G, Schutt- Gerowitt H, Schaal KP. Human cervicofacial actinomycoses: microbiological data for 1997 cases. Clin Infect Dis. 2003;37(4):490-97.
4. Oostman O, Smego RA. Cervicofacial actinomycosis diagnosis and management. Curr Infect Dis Rep. 2005;7(3):170-74.
5. Wiersinga WJ, Rhodes A, Cheng AC. Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19)-A Review. JAMA. 2020;12839:E1-13.
6. Song G, Liang G, Liu W. Fungal co-infections Associated with Global COVID-19 Pandemic: A Clinical and diagnostic perspective from China. Mycopathologia. 2020;185:599-26.
7. Spelberg B, Edwards J. Novel perspectives on Mucormycosis: Pathophysiology, Presentation and Management. Clin Microbiological Reviews. 2005;556-69.

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