

Challenges of Anaesthetic Management in Endoscopic Sinus Surgery in Post COVID Rhino Orbital Cerebral Mucormycosis Patients

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ABSTRACT

Introduction

Mucormycosis is a potentially lethal opportunistic, angioinvasive fungal infection with rapid progression and high mortality and predisposed by diabetes mellitus, corticosteroid other immunosuppressive drugs, haematological malignancies, haematological stem cell transplantation, solid organ transplantation and iron overdose. The aim of our study is to consider the challenge in providing anaesthesia in endoscopic sinus surgery for rhino orbital cerebral mucormycosis in post COVID patient.

Materials and Methods

A total of 20 patients after being COVID negative, posted for endoscopic debridement of paranasal sinuses and also of orbital contents were analysed with respect to outcome after surgery considering the comorbidities of the patients and toxic effect of antifungal drug. Patients' comorbidities were optimised through preoperative evaluation prior to surgery. Adequate monitoring of haemodynamic status during intraoperative period and optimum anaesthetic management was provided in endoscopic sinus surgery. The patients were managed in recovery room in post operative period and their outcome was reviewed.

Results

Our patients posed 3 challenges: a) difficult airway in view of palatal perforation b) long standing diabetes mellitus with associated metabolic complications c) administration of amphotericin B could interact with anaesthetic agents and produced adverse outcome. After surgery mortality was experienced in 10% of cases.

Conclusion

Awareness of warning symptoms and signs, a high index of suspicion, early diagnosis and initiation of full dose of liposomal Amphotericin B and meticulous surgical management may help to optimise the outcome of ROCM in the setting of COVID 19 infection.

Keywords

Diabetes Mellitus; Rhino Orbital Cerebral Mucormycosis; COVID-19; Anaesthetic Management

Mucormycosis is a fulminant opportunistic fungal infection most commonly seen in diabetics and immune-compromised individual.¹ It is highly lethal, locally invasive and propensity to involve multiple organs. Mucor causes severe tissue destruction by endothelial invasion.¹ Mucor is acquired primarily via inhalation of environmental sporangiospore (3-11 microns in size) in immune compromised host or direct entry during trauma and affect these host with severe metabolic

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condition.² Six clinical types² of mucormycoses are:

- 1) Rhino-orbital cerebral mucormycoses (ROCM)
- 2) Cutaneous and soft tissue
- 3) Pulmonary
- 4) Gastrointestinal
- 5) Mucor of bones and joints
- 6) Disseminated.

Corona disease 2019 (COVID 19) caused by severe acute respiratory syndrome corona virus 2(SARS-Cov-2) extended globally and associated with variety of bacterial and fungal coinfection particularly in those with diabetes, immune compromised and severely ill patient.³ They have higher probability of suffering from invasive fungal infection and associated with poor outcome during endoscopic surgical debridement of ROCM cases.^{3,4}

Treatment of possible or proven ROCM include urgent surgical debridement, strict glycaemic control and medical management with antifungal drug, most commonly injection (inj) Amphotericin B deoxycholate or inj liposomal Amphotericin B.^{5,6} Hypokalaemia, hypomagnesemia, fever, chills, hypotension are common side effects of Amphotericin B.⁶ Allergic reaction, seizure, anaemia, thrombocytopenia and impairment of renal function less likely to occur.⁶ Transnasal endoscopic sinus surgery allows local control of disease with better post operative outcome.⁵ In ROCM cases necessary precaution should be taken from our side for difficult airway caused by palatal perforation, fungal debris in oropharyngeal region and supraglottic oedema.⁶ Post operative care in Intensive Care Unit(ICU) is important due to comorbidities in post COVID patients and fungal infection with high mortality.⁶ Control of glycaemic status with regular insulin, optimisation of comorbidities, effect of medication like steroid during COVID treatment, restoration of health condition ,minimisation of toxic effect of Amphotericin B like hypokalaemia, nephrotoxicity, pallor- all these factor affect outcome of the patient after surgery.^{5,6} Proper post operative management in ICU/HDU(high dependency unit) is important factor for predicting outcome in these patients due to co-morbidities and great invasiveness of fungal infection in post COVID patients.⁶

Materials and Methods

This is prospective observational study in which 20 patients who were confirmed COVID positive by RTPCR test⁴ (reverse transcriptase polymerase chain reaction) in recent past or vaccinated with single dose few days back, presently tested COVID negative and were diagnosed as ROCM during course of treatment attending tertiary care hospital during months of May to July 2021 were included in our study.

Patients were diagnosed by characteristic clinical manifestation—periorbital swelling, visual disturbance, blocked nose etc and histopathological examination or culture of the sinonasal specimen.²

We evaluated the patient's demographic details, clinical presentation, laboratory and imaging finding, medical management and toxic effect of antifungal drug. Written informed consent was taken from every patient. The study was approved by institutional Ethics and Research Board (MC/KOL/IEC/NON-SPON/1143/06/2021 dated 17.6.2021)

Pre-anaesthetic evaluation revealed co-existing illness of these patients like type 2 diabetes mellitus (DM), hypertension, ischaemic heart disease and any other condition suggestive of immune suppression like haematological malignancy, medication with immune suppressive drug, steroid. Warning signs and symptoms of ROCM like nasal stuffiness, black tinged or blackish discharge from nose, fever, periorbital or facial oedema, proptosis, loss of vision, facial pain, headache were reported during pre-anaesthetic check up. History regarding COVID status, time of active COVID infection, duration of illness, use of steroid (its dose and duration), oxygen therapy, medicine Tocilizumab⁴ during COVID treatment was taken during pre anaesthetic checkup (PAC). Idea about patient's cardiopulmonary status, airway and general condition was obtained from pre anaesthetic check up. Advice was given for optimisation of patient's status prior to surgery.

After getting PAC fitness 20 patients of ASA (American Society of Anaesthesiology-Physical Status) grade I to III of either sex were put up for endoscopic

sinus surgery under general anaesthesia (GA) with informed high risk consent.

Before operation patient's vital were optimised and even before histopathological confirmation of diagnosis, medical management with antifungal drug i.e., Amphotericin B were started under supervision of Medicine Faculty and toxic effect of antifungal drug was treated. While providing general anaesthesia to a patient with ROCM, difficult airway was experienced during mask ventilation and endotracheal intubation as a result of peri orbital swelling and supraglottic oedema associated with fungal debris. So, preparation for anticipated difficult airway was taken. Ryle's tube insertion, urinary catheterisation and gauze packing of oral cavity was performed.

After attaching the principal monitors that is ECG (Electrocardiogram), NIBP (Non invasive blood pressure), SPO₂ (pulse oximetry), ETCO₂ (end tidal carbon di oxide) the patients were preoxygenated with 100% oxygen@ 10 lit/min for 3 minutes. Intravenous (IV) line was established in both hands in diabetic patient. In one hand IV fluid was Ringer's solution infusion and in another hand, IV fluid was 5% Dextrose with 10 unit(U) insulin and 10 meq of KCL (Potassium chloride) at a rate of 100ml/hour was continued.

Premedication was done with IV injection Glycopyrrolate (.01mg/kg), inj Ondasetron (0.1mg/kg) IV, inj Fentanyl(1-2mcg/kg) IV, inj Midazolam(0.05mg/kg) IV. For induction inj Propofol (2mg/kg) IV was given slowly. Orotracheal intubation with 7.5-8 mm size PVC (Polyvinyl Chloride) cuffed endotracheal tube was facilitated following IV injection (inj) of short acting muscle relaxant Succinyl choline (1.5mg/kg). Maintenance of anaesthesia was done by giving inhalational agent Isoflurane 1.5 volume% and intermittent inj of Atracurium (loading dose .5mg/kg) IV then is followed by top up dose 0.2mg/kg along with Nitrous Oxide.

Patients were monitored by following parameters that is pulse, NIBP, SPO₂, ECG, ETCO₂, respiratory rate, temperature, urine output. At the end of surgical procedure, the patients were reversed by using inj Neostigmine IV (0.06 mg/kg) and inj Glycopyrrolate (0.01mg/kg). After extubation patients were shifted to recovery room (HDU/CCU) and were observed for haemodynamic status at frequent interval. State of sensorium, pulse, BP, SPO₂, respiratory rate, temperature, CBG (capillary blood glucose), urine output were monitored and managed accordingly. For pain management paracetamol infusion was continued thrice daily.

Table I : Co-morbidities in patients

	NUMBER OF PATIENTS (%)	NUMBER OF PATIENTS (%)
Patients having comorbidities	16 (80%)	Diabetes mellitus-10 IHD, hypertension-03 Hypothyroid-03
No obvious comorbidity	04 (20%)	
Total number of patients	20	

Table II : Stage of Rhino orbital cerebral mucormycosis (ROCM)

ASA –PS	STATUS I	STATUS II	STATUS III
No. of patients	07	10	03
Percentage	35%	50%	15%

Table III: Number of patients received Amphotericin B in treatment

AMPHOTERICIN B IN TREATMENT	RECEIVED	NOT RECEIVED
No. of patient	13	07
Percentage	65%	35%

Table IV : Outcome of patients after surgery

STATUS	DISCHARGED IN STABLE CONDITION	PERI OPERATIVE COMPLICATION OF CARDIAC ARREST	PROLONGED HOSPITAL STAY	EXPIRED
No. of patient	13	01 (treated in ICU)	03	03
Percentage	65%	05%	15%	15%

Results

The study evaluated 20 patients of either sex of ASA Physical status I-III, who underwent endoscopic sinus debridement for ROCM under G.A. Demographic characteristics, coexisting illness, medication used during COVID treatment, haemodynamic parameters, staging of disease, extent of surgery, hospital records, mortality rate were reviewed for each patient. Most common comorbidity was diabetes mellitus (n = 20) followed by hypertension, ischaemic heart disease in six patients. (Table I) Sixteen patients were reported COVID positive (Table II), prior to appearance of symptom of mucormycosis and 10 patients received inj steroid for COVID. Out of 20 patients 7 patients had stage 1 ROCM (involvement of paranasal sinus) and 10 patients have stage 2 ROCM (involvement of orbit) and 3 patients had disease stage 3 (involvement of cranium). (Table II) Thirteen patients received medical treatment with antifungal drug, i.e., Amphotericin B prior to surgery. (Table III) Among 13 patients who were exposed to

Amphotericin B, five patients experienced severe anaemia prior to surgery and received packed RBC transfusion for correction of anaemia. Among 20 patients 3 patient expired within 7 days of surgery and 1 patient suffered from cardiac arrest after extubation (Table IV). However that patient was revived after cardiopulmonary resuscitation and managed in ICU and ultimately recovered. Thirteen patients were discharged after operation and completed the course of inj Amphotericin B with resolution of clinical and histopathological finding within 3 weeks. Three patients stayed in hospital longer, who underwent surgery for further debridement and medical treatment. (Table IV) In perioperative period four patients had more than anticipated blood loss during dissection and PRBC transfusion was done and five patients developed hyperglycemia—treated with GKI (glucose-potassium-insulin) infusion⁷. In 2 patients having anticipated difficult airway with palatal perforation, anatomical distortion due to upper airway oedema, smooth endotracheal intubation after direct laryngoscopy was done taking all precaution.

Discussion

Mucormycosis is an opportunistic fungal infection caused by group of mould known as Zygomycetes with mortality rate 35%-90% depending upon the site and extent of the disease.¹

The classic feature of mucormycosis is angioinvasion, thrombosis, infection and necrosis.^{1,8} Treatment includes extensive surgical debridement, high dose of systemic Amphotericin B, control of underlying disease, and other supportive measures.⁹ Our patients had long standing history of diabetes mellitus, haemodynamic instability, immunosuppression associated with use of steroid for treatment of COVID infection, while some of the patients had required urgent surgery. Usually mucor does not pose a major threat to those with healthy immune system.

As early diagnosis and immediate surgical debridement is pivotal in the management of mucor mycosis,⁹ The anaesthesia team had actively participated in pre anaesthetic checking for optimisation of patient's comorbidities prior to surgery and provided proper perioperative care for haemodynamic stability and avoiding renal insult and also made plan for airway management in patients with anticipated difficult airway. Considering poor outcome of surgery in patients with history of recent COVID infection^{9,10}, many comorbidities and side effects of inj Amphotericin B used for treatment of invasive fungal infection—post operative management of these patients in critical care unit was required.

So, mucor is opportunistic fungal infection in immune compromised patient with history of comorbidities like diabetes mellitus and history of use of immunosuppressant drug like steroid mainly to control respiratory symptom in pandemic corona virus infection involving nose, paranasal sinus, orbit and also cranium.¹⁰ As early surgical debridement is essential to arrest the disease, proper anaesthetic management for surgical debridement of ROCM in post COVID patient with comorbidities is very important to improve outcome of these patients.

Management of mucor patient should be multi-disciplinary approach. All mucormycosis cases should be admitted in separate ward having critical care unit

(CCU), high dependency unit (HDU) and general ward. But in our setting this arrangement was lacking. So proper communication among different disciplines e.g., Internal Medicine, Ophthalmology, Otolaryngology, Neurosurgery, Microbiology and Pharmacology for early recognition of complications, quick access to laboratory diagnosis, coordinating medical and surgical treatment were difficult—this was the limitation of our study.

Conclusion

Awareness of and due attention to warning symptoms and signs and a high index of suspicion, early diagnosis by diagnostic nasal endoscopy and direct microscopy of the high nasal swab or an endoscopically guided nasal swab, supported by contrast-enhanced MRI or CT scan, initiation of full dose of liposomal Amphotericin B while awaiting the results of culture and histopathology, identification of indication for paranasal sinus surgery and orbital exenteration and meticulous post-surgical management and continued step down oral antifungal until clinical and radiologically monitored resolution may help to optimise the outcome of ROCM in the setting of COVID 19 infection.

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