

# Dexmedetomidine in functional endoscopic sinus surgeries for rhino orbital mucormycosis in post covid patients.

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## Abstract

**Background:** Rhino-orbital mucormycosis is an angio-invasive fungal infection with high mortality rates. Management of mucormycosis is challenging for surgeon as well as for anesthesiologist. Dexmedetomidine, an  $\alpha_2$  agonist, has well-known anesthetic and analgesic-sparing effects, which provide an ideal oligemic surgical field.

**Aim:** To evaluate the effect of dexmedetomidine on intraoperative blood loss and quality of surgical field in FESS in post covid rhino orbital mucormycosis patients.

**Material and Method:** After obtaining approval from Institute ethics committee, medical records of post COVID19 positive patients that underwent resection for mucormycosis were retrospectively reviewed and divided into two groups (25 each), who received dexmedetomidine as group D and those who did not, as group C. SBP, DBP, HR, MAP were recorded intraoperatively, after induction and then at 15mins, 30mins, 60min, 90mins and at extubation. Satisfaction level of surgeon was based on LIKERT SCALE. Quality of surgical field by FROMME-BOEZAART SCALE. Emergence time was recorded. Patients were also monitored for complications during the surgery.

**Results:** There was statistically significant reduction in HR and MAP in group D ( $p < 0.005$ ) as compared with group C. The surgeon's satisfaction was higher, as bleeding rates was lower in group D. Emergence time was shorter in patient with control group than group D ( $13.033 \pm 1.5$  vs  $7.73 \pm 1.63$ ). During the surgery, one patient experienced bradycardia, shivering and dryness of mouth in group D and three patients experienced hypotension in group C.

**Conclusion:** Dexmedetomidine is an ideal hypotensive agent to provide an oligemic surgical field during endoscopic surgeries. Managing covid19 and additional mucormycosis can lead to increase mortality and morbidity. Surgeon had greater visibility of structures and are well satisfied.

**Key words:** Mucormycosis, Controlled hypotension, dexmedetomidine, FESS.

## Introduction

Corona virus disease is a highly infectious viral disease, which becomes a global pandemic. There have been many complications reported during and post covid infection ranging from mild to life threatening pneumonia associated with bacterial and fungal infections. The second wave of coronavirus disease was associated with a rise in cases of rhino – orbital mucormycosis.

Rhino-orbital mucormycosis is an angio-invasive fungal infection caused by saprophytic fungi that originates in the paranasal sinuses and subsequent

invasion of the orbit, eye and cerebral parenchyma<sup>[1]</sup>. It is predisposed mainly by immunodeficiency, diabetes mellitus, solid organ transplant, corticosteroid therapy, multiple trauma and immunocompromised patients<sup>[2]</sup>. Treatment requires multimodal approach with anti-fungal drugs and surgical debridement of involved tissues, which should be done on urgent basis as delay may cause further worsening of prognosis. So there is less time for optimization of patients co-morbid conditions and there should be a vigilant coordination between surgeon and anesthesiologist.

Functional Endoscopic Sinus Surgery (FESS) is done

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via endoscope and the area is richly supplied by blood vessels. During endoscopic surgeries, there is an extensive amount of bleeding which impairs visibility of structures and increase the operative time<sup>[3]</sup>.

Bleeding during surgery can cause damage to other structures as visibility is hampered and required frequent suctioning that will become difficult for the surgeon to operate. Post-operative bleeding also causes delay in discharge of the patient from the hospital<sup>[4]</sup>.

Hence, it is mandatory to minimize bleeding so as to provide clear endoscopic vision. Induced hypotension technique is used to overcome this problem and limits the blood loss and decrease the operative time and make favorable condition to operate<sup>[5]</sup>. Hypotensive anesthesia is a technique to control hypotension during the surgery that used to limit the intraoperative blood loss and is effective to provide the best possible field for surgery<sup>[6,7]</sup>.

The ideal agent used in controlled hypotension must have certain characteristics, such as ease of administration, a short onset time, disappears quickly when administration is discontinued, rapid elimination without toxic metabolites, negligible effects on vital organs, and predictable and dose-dependent effects<sup>[8]</sup>.

There are many agents used for controlled hypotension but Dexmedetomidine is one of the ideal agent. The central and sympathetic activity would reduce arterial blood pressure and heart rate and releases norepinephrine dose-dependent<sup>[9]</sup>. It is a potent selective alpha 2 adrenoreceptor agonist. It has sedation, anxiolysis, amnestic, hypnotic & analgesic properties with opioid sparing, not associated with respiratory depression<sup>[4]</sup>.

The present study aimed to evaluate the clinical efficacy and safety of dexmedetomidine in post covid patients and to assess intra operative blood loss and quality of surgical field for induced hypotension in endoscopic sinus surgeries.

## Materials and Methods

The present study is a retrospective observational study that evaluated hospital records of 50 post covid patients that underwent surgical resection for mucormycosis under general anesthesia. After obtaining approval from the Institute ethics committee, medical records of the post COVID 19 positive patients that underwent surgical resection for mucormycosis of ASA 2 and 3 of both sexes, aged 18-65 yrs attending the Department of ENT, Gandhi medical college and associated hamidia hospital, Bhopal between May 2021 to December 2021 were retrospectively reviewed.

From the hospital records, Patient were divided into two groups (25 each), who received dexmedetomidine and those who did not received.

Preoperative base line parameters, such as HR, SBP, DBP, MBP, SPO<sub>2</sub>, ECG were recorded after 5 min of settling in the operative room. Patients of group D(n=25) received a loading dose of dexmedetomidine 1 µg/kg in 10 ml of diluted 0.9% saline solution over 10 mins followed by an infusion at rate 0.4-0.7 µg / kg/hr. Patient of group C (n=25) do not received dexmedetomidine.

All patients were pre-medicated with IV glycopyrolate 0.01 mg/kg body weight, IV midazolam mg/kg body weight, IV fentanyl 0.5 µg /kg body weight and IV ondansetron 0.1 mg/kg body weight. After pre-oxygenation, anaesthesia was induced with Propofol (2mg/kg IV), wait upto 30 seconds and mask ventilation was confirmed. IV succinylcholine 2mg/kg was given to facilitate laryngoscopy and intubation. At the onset of apnea, using laryngoscope, intubation was done with a well lubricated appropriate size cuffed endotracheal tube and anaesthesia was maintained with oxygen, nitrous oxide, Isoflurane with intermittent use of IV Atracurium and controlled ventilation. All patients were placed in 15 degree reverse Trendelenberg position and their nasal cavities were packed with cotton pack soaked with epinephrine in a concentration of 1:10,000. SBP, DBP, HR and MAP were monitored and recorded Intraoperatively after induction and then at 15 mins, at 30mins, at 60min, 90 mins and at extubation.

1. Satisfaction level of surgeon was based on LIKERT SCALE <sup>[3]</sup>. (5 EXCELLENT, 4- GOOD, 3- SATISFACTORY, 2-POOR, 1-VERY POOR)

It was evaluated by one surgeon during surgery.

2. Quality of surgical field was assessed by the surgeon based on FROMME-BOEZAART SCALE<sup>[6]</sup>.

Score 0 - NO BLEEDING

Score 1 - Minimal bleeding, suctioning not required

Score 2 - Minimal bleeding, suctioning occasionally required

Score 3 - Minimal bleeding, repeated suctioning required

Score 4 - Moderate bleeding, repeated suctioning required, bleeding obscures surgical field

Score 5 - Severe bleeding, surgery not possible as bleeding, completely obscures the surgical field.

Ten minutes before the end of surgery infusion of the study drugs was discontinued. The residual neuromuscular blockade was reversed with IV neostigmine (0.05 mg/kg) and IV glycopyrolate (0.01 mg/kg), throat pack is removed. Patients were

extubated after serving adequate motor recovery and spontaneous breathing efforts.

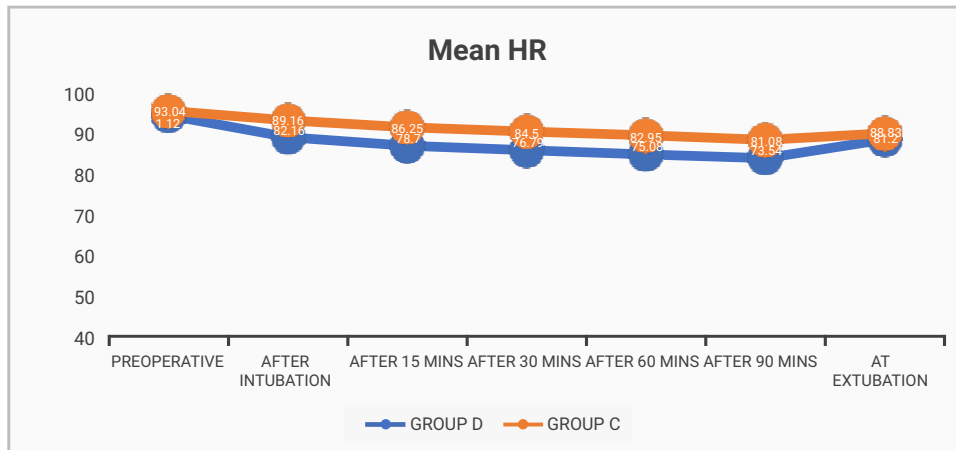
The interval between the discontinuation of anesthetics and response of verbal command, eye opening was recorded and noted as Emergence time. The patients were transferred to the post-anesthetic care unit after extubation and full recovery, where time to the first analgesic requirement was also recorded.

Postoperative recovery was evaluated using a modified Aldrete<sup>[10,11]</sup> Score (0-10) and time needed to achieve a score of greater than or equal to 9 were recorded.

**Statistical Analysis-** All the data were compiled and result were expressed as Mean and Standard deviation. The independent t-test was applied in both groups to compare the quantitative variables during the surgery. Significant  $p < 0.05$ , Not significant  $> 0.05$ , highly significant  $p < 0.001$ .

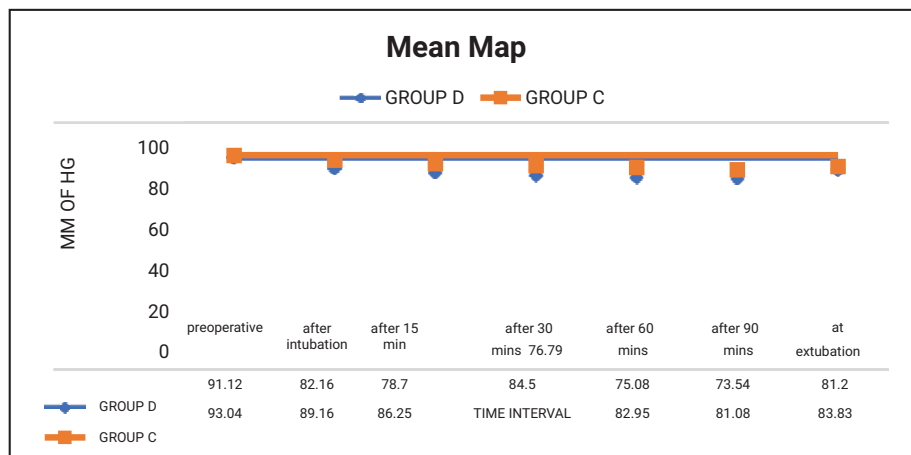
**Minutes**

**GRAPH 1:** Comparison of Mean HEART RATE between group D and group C.



Heart rate was compared between two groups (graph 1), baseline heart rate in both groups do not show much variation in intraoperative period, there was statistically significant reduction in heart rate compared with the baseline value of heart rate in group D ( $p < 0.005$ ).

**GRAPH 2:** Comparison of MEAN BP during surgery in both groups.



**Results**

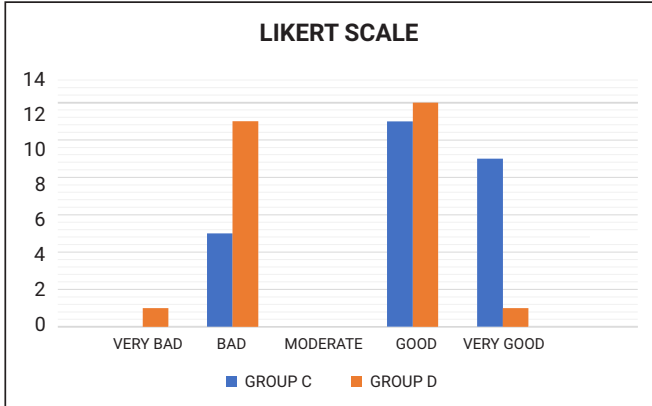
**Table 1: Demographic Characteristics.**

Parameters	Group D (N=25)	Group C (N=25)	P value
Age (YEARS)	38.2 ± 13.34	37.72 ± 11.0	0.89
Weight (Kgs)	58.52 ± 8.56	57.28 ± 9.11	0.62
Gender (M/F)	8/17	11/14	0.81
Asa status (2/3)	15/10	14/11	0.76
Duration of Surgery (min)	115.84 ± 11.2	121.28 ± 10.22	0.0793

Demographic characteristics of the patients in both the groups were comparable and was statistically insignificant. (Table 1) Mostly consist of females 31 (62%) with mean age of 40 years ( $38 \pm 2.66$  vs  $37 \pm 2.21$ ). The mean weight was 58 kgs. Most patients had ASA grade 2 (58%) and with grade 3 were 42%

**MM OF HG**

Mean blood pressure (MAP) was compared during surgery in two groups, it was found to be statistically significantly lower in group D than group C. It was highly significant  $p < 0.001$ , after intubation, 15 mins, 30 mins, 60 mins and 90 mins (GRAPH 2)



**Graph 3: Surgeon's satisfaction based on likert scale**

During FESS ,the patients receiving dexmedetomidine infusion has better surgical field as compared to control group. The surgeon's satisfaction was higher in group D than in group C. The difference in bleeding at surgical site was found to be statistically significant. In group D, 9 patients had very good score, 11 were good and 5 were moderate while in group C ,only 1 had very good score and 1 bad score. (Graph 3)

**Quality of surgical field was assessed by the surgeon based on FROMME-BOEZAART SCALE. (TABLE 2)**

**Table 2: Assessment of intraoperative bleeding (N = 50 pts, 25 each)**

Grades of surgical field Quality of the field 15 min after the start of surgery	Group D	Group C	P value
0	0	0	1
I	2	1	0.006
II	19	11	0.064
III	4	13	0.0005
IV and V	0	0	1
Quality of the field 30 min After the start of surgery			
0	1	0	1
I	3	1	0.004
II	16	11	0.058
III	5	13	0.0001
IV and V	0	0	1

Data are expressed as number of patients; \* $P < 0.05$  is statistically significant.

During FESS, surgeons experienced an ideal surgical site of grades 1 and 2 (minimum bleeding with sporadic suction) in 21 (84%) patients of group D, whereas no patients of the control group showed much reduction of bleeding at the surgical site despite a low systemic blood pressure. It was statistically significant between the two groups (Table 2).

**Table 3 :Emergence Time and Aldrete Score**

	GROUP D (N=25)	GROUP C (N=25)
Emergence Time(Min)	11.33 ± 1.58	7.73 ± 1.63
Aldrete's score (Time to achieve =/> 9) (min)	7.6± 2.90	9.5 ±4.48

The emergence time (11.33 ± 1.58 vs. 7.73 ± 1.63min) and time needed to achieve 9 or more of a modified Aldrete's score (7.6 ± 2.90 vs. 9.5±4.48min) were significantly shorter in patients of the control group. ( $P < 0.01$ ). (Table 3)

Respiratory rate and peripheral oxygen saturation (SpO2) were comparable with no episode of desaturation at any time.

**Table 4: Incidence of side effects.**

Side Effects	Group D	Group C	Total (%)
Hypotension	0	3	3 (12%)
Bradycardia	1	0	1 (4%)
Nausea/Vomiting	0	1	0 (4%)
Shivering	1	0	1 (4%)
Dryness of Mouth	1	0	1 (4%)

During surgery, one patient experienced bradycardia in group D and three patients experienced hypotension,1 patient had nausea vomiting in group C. One patient experienced shivering and dryness of mouth in group D and none of the patients were experienced nausea and vomiting. (table 4)

**Discussion**

Endoscopic surgery is a widely popular surgery and widely acceptable to patients and have a high success rates. Surgical debridement of mucormycosis is an aggressive procedure, hemodynamic instability and intraoperative bleeding during surgery makes difficult for the surgeon to perform surgery, therefore the role of anesthesiologist in improving condition of surgical intervention is extremely important.

In FESS, the highest risk of bleeding is due to capillary bleeding and capillary circulation could be decreased by decreasing arterial blood pressure. Some drugs and anesthetic agents help to decrease bleeding by hypotension, but controlled hypotension has a definitive role in FESS as it improves visibility of surgical field and reduce the operative time [12].



The dexmedetomidine as a dual phase and dose dependent response to blood pressure [13]. Several studies are carried out which shows the effectiveness of DEX in providing better visibility, lowering the bleeding amount and maintaining the blood pressure throughout [10,11].

### Hemodynamic Parameters

Present study was carried out with dexmedetomidine and control group. Baseline heart rate, DBP, SBP were almost same in both groups, there were no significant difference. The Mean HR & MAP in the DEX group were lower than that of control group at 15 min, 30 min, 60 min and 90 mins. The amount of bleeding in DEX group reduced significantly and there were no significant side effects seen with this drug as seen by studies Parvizi A et al [3], Fazel, M.R et al [9].

A study was conducted by C N Navya [7] in 2018 on 70 patients to compare the effect of DEX and labetalol for oligemic surgical field in ENT surgeries. DEX was found to significantly reduce intraoperative bleeding which improve operative field visibility and increased surgeon's satisfaction during surgery than labetalol.

Contrary to this study other studies like Eghbal, et al [14] reported different results for the effects of dexmedetomidine during FESS. Their results suggested that labetalol is superior to dexmedetomidine in concern to lower bleeding and extubation and recovery time. Hence labetalol controlled the bleeding better than the dexmedetomidine.

There are several scales and scores to grade surgical field, here we have used LIKERT scale and Fromme-Boezaart scale as it is easy to use and better understanding of surgical field by it. Surgeon satisfaction was higher with group D, Likert scale (V. Good=9 pts) than group C (V. Good=1 pt.)

Surgeons experienced an ideal surgical site of grades 1 and 2 (minimum bleeding with sporadic suction) in 21 (84%) patients of group D, whereas no patients of the control group showed much reduction of bleeding at the surgical site despite a low systemic blood pressure. It was statistically significant between the two groups.

Significant improvement in quality of the surgical field and an ideal surgical field was achieved in patients with group D with little bleeding but that does not interfere with the surgery were observed by kumkum gupta et al [15].

### Emergence & Aldrete Score

Results of current study shows that Dexmedetomidine was associated with significantly longer emergence time. Emergence time ( $11.33 \pm 1.58$  vs.  $7.73 \pm 1.63$  min) and time needed to achieve 9 or more of a

modified Aldrete's score ( $7.6 \pm 2.90$  vs.  $9.5 \pm 4.48$  min) were significantly shorter in patients of the control group.

Chhabra, saini et al 2020 [6]. found Mean recovery score comparable in both the groups but group D showed significantly longer time ( $22.64 \pm 4.47$ ) as compared with group M ( $10 \pm 6.5$ ) to achieve an Aldrete score of 9 or greater and to discharge the patients from the PACU.

Hyunzu kim et al 2015 [16]. conducted a study and their results suggesting the favorable recovery effects of dexmedetomidine, indicate that the peri-operative use of dexmedetomidine is a good option to guarantee the smooth emergence of high risk patients. This study supported our study as our patients are of post covid mucormycosis.

Most of studies demonstrated that the peri-operative use of dexmedetomidine can reduce the postoperative opioid consumption, pain intensity, and need for antiemetic therapy. In the present study, patients receiving dexmedetomidine had slower, smooth emergence and longer emergence time as compared with control group.

### Conclusion

Dexmedetomidine is an ideal hypotensive agent to provide an oligemic surgical field during endoscopic surgeries. Managing covid 19 on its own is difficult and additional mucormycosis can lead to increase mortality and morbidity. Surgeons are well satisfied with this drug and had no problem with the visibility of structures during surgery.

It is also associated with hemodynamic stability during the procedure and with longer and smooth recovery time from anaesthesia.

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**Recommendations:** Covid with Mucormycosis is most challenging for anesthesiologist as we have to maintain hemodynamics as well as satisfied surgical field. Dexmedetomidine is an excellent drug to use but it also has its disadvantages which causes significant bradycardia and hypotension, so to use it in a dose dependent manner is main concern.

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