

A rational approach to manage surgical procedures in COVID Era – A perspective based on experience in a private referral hospital

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Abstract

Background and Aims: COVID-19 disease has imposed challenges in caring for non-Covid elective surgical patients. As elective surgeries become essential, we propose to evaluate our approach and outcomes of surgical procedures performed during the initial period of COVID-19 pandemic so as to provide a road-map for safer approach.

Material and Methods: We retrospectively evaluated outcomes in patients who underwent essential elective and emergency surgeries during the 5-week period between April 18, 2020 and May 28, 2020. All patients were screened at the front desk on their arrival to identify possible exposure to SARS-CoV-2. Nasopharyngeal swab of patients requiring hospital admission was tested for COVID-19 by quantitative RT-PCR. Patients needing essential elective surgery were taken up for surgery if they tested negative for COVID-19. Emergency procedures were undertaken in a demarcated theatre for COVID after taking level-3 protection without delay. The clinical data was reviewed and analysed.

Results: A total of 764 surgical procedures were conducted, of which 70.7% were elective essential surgeries, with 95.4% of these patients being discharged in stable healthy condition. Approximately 23% of the elective and 26% of the emergency surgeries was categorised in the surgical difficulty category III and majority of these were performed under general anesthesia. Postoperative mortality was 1.04%, but the overall mortality rate was approximately 2.5%. Only two patients (0.3%) tested positive for COVID-19 in our series.

Conclusion: A robust preoperative screening and testing can enable safe scheduling of essential elective surgeries.

Keywords: COVID-19, elective surgical procedure, preoperative RT PCR testing

Introduction

The World Health Organization (WHO) had declared coronavirus disease 2019 (COVID-19), as a public health emergency of international concern on Jan 30, 2020.^[1,2] COVID-19 poses an extraordinary challenge to healthcare professionals as guidelines and protocols keep changing at an overwhelming pace. As a result, there has been inattention

towards non-COVID-19 patients, who require definitive essential elective and emergency surgical care. Many hospitals are currently reducing or postponing elective surgeries, mainly to conserve scarce medical resources needed to manage the surge of COVID-19 cases, in accordance with the government of India (GOI) advisory released on March 20, 2020, and this was to be reviewed “as per evolving situation”.^[3-6] Though the upsurge of COVID-19 shows no signs of waning, however the

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overall positivity rate hovers around 5.5% out of the total sample tested, as per ICMR statement issued dated June 12, 2020.^[7]

Resuming elective surgeries is critical, as delay could lead to a worsening of pre-existing diseases and their associated complications. Indeed, the term “elective” misleads one to believe that surgery is not a definitive therapy. On the contrary, the term “elective” refers to the fact that the acuity of the underlying clinical condition still offers a time frame for scheduling. Hence many authors have renamed it as medically necessary, time-sensitive (MeNTS) procedures.^[8] The main apprehension of resuming elective surgeries has been the reported higher perioperative mortality rate (upto 20%) in surgical patients who were asymptomatic but COVID-19 positive during the conduct of surgery and anesthesia.

Preoperative testing has the potential to diminish the perioperative morbidity and mortality secondary to COVID-19. The objective of this article is to evaluate the outcomes in patients undergoing various surgical procedures in a private tertiary care referral teaching hospital, retrospectively. Additionally, a rational model is proposed for the hospitals to schedule elective MeNTS surgeries.

Material and Methods

After approval from Institutional Ethics Committee (Ref No. DMCH/R&D/2020/90 dated 1/7/2020), perioperative data of all surgeries conducted between April 2020 and May 2020 was retrieved. In view of challenges posed by the pandemic, a high level committee comprising of members from hospital administration, heads of various departments and management members unanimously decided to subject all preoperative patients including parturients to COVID-19 testing.

All patients were screened at the front desk on their arrival to identify patients with possible exposure to SARS-CoV-2 or those with Influenza like illness (ILI- fever, dry cough, sore throat, headache, loss of taste/smell), while maintaining social distancing and adopting standard precautions. Patients presenting with ILI/SARI were directed to the flu corner, for further evaluation and medical management. Nasopharyngeal swab of all patients coming to the hospital for indoor admission were collected and immediately transported to the microbiology laboratory for quantitative RT-PCR Covid-19 test. Reports were made available within 24 hrs. However, patients with urgent surgical conditions were subjected to COVID-19 testing, using True-NAT RT-PCR, the results of which were available within 2 hours. As per ICMR guidance dated 19/4/2020, a negative test result by the TrueNat will be deemed as final, whereas a positive test results by the TrueNat will be considered as provisional which needs to be confirmed by real time RT-PCR test results.^[9]

Awaiting this report, these patients were managed conservatively, taking requisite standard precautions, in a designated isolation waiting area where no visitors were allowed. If the patients tested negative for COVID-19, they were shifted to their respective preoperative area for pre-anesthesia checkup (PAC) and underwent the surgical procedure with level 2 protection for HCWs. Patients who tested positive for COVID-19 were shifted to the isolation ward (COVID-19 Unit) and were cared for as per the policies laid down by ICMR. However, patients requiring emergency surgery in the absence of COVID-19 report or a positive COVID-19 report, were shifted to the predesignated Covid-operation theatre, where the procedure was undertaken without delay, with level-3 protection for HCWs.

Clinical records of all the operative patients in terms of demographics, comorbidities, nature of elective essential MeNTS vs. emergent surgeries, level of surgical difficulty, type of anesthesia, duration of stay in hospital, ICU admission and final outcomes and their Covid-19 status (RT-PCR) were reviewed. We also attempted to correlate type of anesthesia, difficulty level of surgery, duration of stay, COVID-19 positivity rate, and ICU admission with outcomes like discharge in stable healthy condition (DISH), discharge against medical advice (DAMA) and death.

Level of surgical difficulty was categorised on the basis of degree of complexity, and risks according to the measures for the hierarchical management of surgical procedures published by the National Health Commission of China.^[10]

Detection of the virus is achieved by identifying the viral RNA through nucleic acid amplification, usually using a real time polymerase chain reaction (RT-PCR). The most commonly tested sample was nasopharyngeal swab. The specimen was collected in a viral transport media and transported to Microbiology lab in a triple packaging as per ICMR guidelines. Viral RNA is extracted from the specimen and subsequently amplified using reverse transcription-PCR.^[4] The real time RT-PCR assay was performed using a 2019-nCoV nucleic acid detection kit according to the manufacturer’s protocol (Altona). A cycle threshold value (Ct-value) less than 37 was defined as a positive test result, and a Ct-value of 40 or more was defined as a negative test. At a Ct-value of 37 to less than 40, retesting was recommended for confirmation.^[11,12]

Statistical analysis

Data were described in terms of range; mean \pm standard deviation (\pm SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using

ANOVA. For comparing categorical data, Chi square (χ^2) test was performed and exact test was used when the expected frequency is less than 5. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS 21 (Statistical Package for the Social Science) version statistical program.

Results

In the present study, out of the total 764 patients admitted for surgery, 540 (70.7%) patients underwent elective/MeNTS surgeries, whereas 224 (29.3%) patients had emergency surgery in the 5 week period from April 18, 2020 to May 25, 2020. Elective surgical procedures were more in number than emergency procedures in all the specialties except neurosurgery and plastic surgery [Table 1]. Categorization according to surgical difficulty for all surgeries in various specialties is also depicted in Table 1. A comparable number of patients underwent elective/MeNTS surgeries in each surgical difficulty level, however a greater number of emergency procedures (31%) belonged to surgical difficulty level III.

Good outcomes with DISH was observed in 729/764 (95.4%) patients. Eight patients (1.04%) died postoperatively and the number of deaths were equally distributed in all the surgical difficulty categories (2 in each category). Another 22 (2.9%) patients went DAMA [Table 2]. However, 11 of them (50%) were critically ill with poor prognosis at the time of DAMA [Table 3].

Eighty one of 764 patients required ICU admission during their stay in the hospital. Fifteen (68.2%) patients who went DAMA and 7 out of 8 expired patients in this study required ICU care [Table 3]. The length of hospital stay (LOS) was longest in level –III surgical procedures, followed by level –IV, level –II and level –I procedures. However, when a comparison made between the final outcome and average LOS, it was observed that the stay was prolonged in patients who did not survive, followed by the patients who went DAMA [Table 3].

General anesthesia was administered to higher number of patients (46%) as maximum number of these patients fell in surgical level III [Figure 1]. We also found that type of anesthesia (GA) and longer duration of stay (LOS) significantly contributed to poor outcomes ($p < 0.05$; CI -95%) [Table 2].

The mean age of the expired patients was 60.3 ± 18.6 years which was significantly more than the age of patients who were discharged in stable healthy condition (DISH). We could not elucidate a significant contribution of duration of surgery and gender to outcomes. The most common comorbidities encountered in our study were diabetes, hypertension and malignancy. The presence of comorbidities

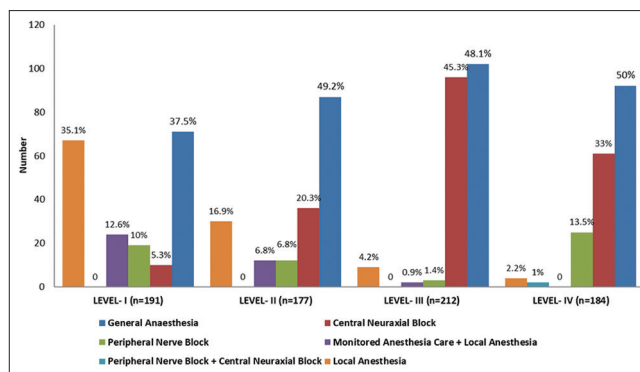


Figure 1: Distribution of surgical procedures (Category) according to the type of anesthesia given to the patient

was significantly ($p < 0.01$) associated with poor outcome [Table 3]. Detailed relook at patient files revealed that all eight patients who expired belonged to ASA status III and IV. Among these six died due to postoperative sepsis with multi-organ failure, one due to severe persistent hemorrhagic shock, while the other due to severe brain trauma.

Only two out of the total of 764 patients tested positive for SARS COV-2 by quantitative RT-PCR. One of the them was posted for an emergency procedure and the report was available in the postoperative period. High-risk contact HCWs including anesthesiologist and chief surgeon were isolated and tested negative for SARS COV-2. The other patient was posted for elective neurosurgery and report was available prior to surgery. The surgery was delayed till the time patient reported negative for COVID-19. Both the patients were managed according to the ICMR guidelines for asymptomatic SARS COV-2 patients. None of our anesthesiologists, surgery, nursing and ancillary staff exhibited any symptoms of SARS COV-2 or ILI.

Discussion

The COVID-19 pandemic has disrupted routine hospital services globally. A global expert-response study conducted to elicit projections for the proportion of elective surgery, has estimated that 28.4 million operations would be cancelled or postponed during the peak 12 weeks (2.4 million/week) of disruption due to COVID-19. If all the 190 countries included in this study increase their normal surgical volume by 20% post-pandemic, it would take a median 45 weeks to clear the backlog of operations resulting from COVID-19 disruption. In India alone, estimated number of these surgeries is 48,728 per week or about 585,000 over 12 weeks.^[4]

There are few studies published on continuation of surgical procedures during the ongoing COVID-19 pandemic. This is due to heightened risk of postoperative complications and mortality in patient undergoing major surgeries as both SARS-Cov-2

Table 1: Distribution of Elective/Emergency Surgical Procedures in Various Specialties According to the Surgical Category (n=764)

CATEGORY → SPECIALITY ↓	LEVEL- IV		LEVEL- III		LEVEL- II		LEVEL- I		Total	
	Number	% age	Number	% age	Number	% age	Number	% age	Number	% age
Elective Surgeries										
ENT	0	-	3	2.1	1	0.8	30	20.1	34	6.3
General/Gastro Surgery	14	11.2	34	23.8	43	35.0	7	4.7	98	18.1
Neuro Surgery	8	6.4	2	1.4	2	1.6	1	0.7	13	2.4
Obstetric & Gynecology	47	37.6	41	28.7	42	34.1	27	18.1	157	29.1
Onco Surgery	7	5.6	18	12.6	7	5.7	47	31.5	79	14.6
Ophthalmic Surgery	16	12.8	0	-	0	-	4	2.7	20	3.7
Orthopedic Surgery	22	17.6	29	20.3	9	7.3	15	10.1	75	13.9
Pediatric Surgery	1	0.8	1	0.7	0	-	0	-	2	0.4
Plastic Surgery	2	1.6	3	2.1	7	5.7	4	2.7	16	3.0
Urology	8	6.4	10	7.0	12	9.8	14	9.4	44	8.1
Others	0	-	2	1.4	0	-	0	-	2	0.4
Total (n=540)	125	23.1	143	26.4	123	22.7	149	27.6	540	100
Emergency Surgeries										
ENT	2	3.4	2	2.9	1	1.8	0	-	5	2.2
General/Gastro Surgery	8	13.6	18	26.1	11	20.4	3	7.1	40	17.8
Neuro Surgery	11	18.6	5	7.3	7	13.0	7	16.7	30	13.4
Obstetric & Gynecology	8	13.6	6	8.7	8	14.8	8	19.0	30	13.4
Onco Surgery	0	-	0	-	2	3.7	3	7.1	5	2.2
Ophthalmic Surgery	12	20.3	0	-	0	-	8	19.0	20	8.9
Orthopedic Surgery	8	13.6	14	20.3	6	11.1	2	4.8	30	13.4
Pediatric Surgery	2	3.4	5	7.3	1	1.8	0	-	8	3.6
Plastic Surgery	5	8.5	9	13.0	13	24.1	8	19.0	35	17.2
Urology	3	5.1	2	2.9	5	9.3	3	7.1	13	5.8
Others	0	-	8	11.6	0	-	0	-	8	3.6
Total (n=224)	59	26.3	69	30.8	54	24.1	42	18.8	224	100
Grand Total (n=764)	184		212		177		191		764	

Table 2: Distribution of surgical procedures, average hospital stay and final outcome

Surgical category ↓	No. of patients	Avg. Stay (days)	Outcome							
			DISH		DAMA		DOR		EXP	
			No.	Avg Stay (days)	No.	Avg Stay (days)	No.	Avg Stay (days)	No.	Avg Stay (days)
LEVEL- IV	184	9.02	176	9.06	4	8.00	2	6.50	2	10.00
LEVEL- III	212	9.43	199	8.60	10	25.00	1	3.00	2	15.50
LEVEL- II	177	8.09	167	7.92	6	9.83	2	7.00	2	18.50
LEVEL- I	191	4.08	187	3.73	2	14.50	nil		2	24.50
Total*	764	7.7±8.9	729	7.3±8.4	22	16.8±15.4	5	6.0±4.3	8	17.1±15.4

*F (ANOVA) -10.826; P -0.0001 (Outcome Vs average hospital stay); F (ANOVA) -14.8, P -0.001, (Surgical category Vs Outcome). DISH- Discharged in a stable and healthy condition; DAMA- Discharged against Medical advice; DOR - Discharged on request; Exp-Expired

infection and major surgery induce significant inflammatory stress and deregulation of immunity,^[13] hence current guidelines recommend postponing all elective surgeries.^[14-16] However, these non-urgent elective surgeries have the propensity to convert to urgent clinical situations at any point in time making these patients vulnerable to corona virus infection as well.^[6] Therefore, elective essential or MeNTS surgeries must be carried out as early as possible to cope with the huge amount of backlog.^[6,8,17]

We conducted 764 surgical procedures of which 70.7% were essential elective/MeNTS surgeries with majority (95.4%) of patients being discharged in stable healthy condition (DISH).

Both elective and emergency surgeries belonged to all the four surgically difficult categories. These surgeries would have not been possible without the safeguard of preoperative COVID-19 testing using RT-PCR. The overall mortality rate calculated as a sum of expired patients and 50% of patients who went DAMA was approximately 2.5%. This mortality rate cautions us that essential elective surgeries should be scheduled based on an objective scoring using preferably MeNTS scoring^[8] after ensuring availability of ICU beds and other relevant medical resources.

General endotracheal anesthesia, higher age, multiple co-morbidities and longer LOS significantly contributed

Table 3: Comparison of various characteristics of Discharged against medical advice (DAMA), Discharged in stable and healthy condition (DISH) and Expired patients

	DAMA (n=22)	Expired (n=8)	DISH (n=729)	Statistical analysis
Age	45±18.5	60.4±18.9	41.9±17.6	F (ANOVA): 4.641 P: 0.009
Sex Male:Female	15 (77.3%) 7 (22.7%)	4 (50%) 4 (50%)	414 (56.8%) 315 (41.2%)	χ^2 : 1.295 P - 0.523
Comorbidities	Chronic Alcoholic, Drug Addiction, Hypertension, Liver Cirrhosis, Diabetes, Malignancy, Prolonged Use of Steroid 11/22 (50%)	Hypertension, Diabetes, Malignancy, Hypothyroidism 5/8 (62.5%)	Hypertension, Malignancy, Diabetes Cardio- Vascular Disease, Chronic Kidney Disease, Chronic Liver Disease, Chronic Lung Disease, Prolonged Use of Steroid 192/729 (26.3%)	χ^2 : 11.01 P: 0.004
Type of anaesthesia	GA - 17 (77.3%) PNB - 3 (13.6%) LA+MAC -2 (9.1%)	GA - 7 (87.5%) LA - 1 (12.5%)	GA - 327 (44.8%) CNB - 199 (27.2%) PNB - 56 (7.7%) LA+MAC - 36 (4.9%) PNB+CNB - 2 (0.3%) LA - 109 (14.9%)	χ^2 : 22.159 P: 0.014
Surgical Category				χ^2 : 2.3 P: 0.5
Level IV	4 (18.2%)	2 (25%)	176 (24.2%)	
Level III	10 (45.5%)	2 (25%)	199 (27.3%)	
Level II	6 (27.3%)	2 (25%)	167 (22.9%)	
Level I	2 (9.1%)	2 (25%)	180 (25.7%)	
Duration of surgery (H)	2.8±2.0	2.8±2.1 hrs	1.8±2.5	F (ANOVA): 2.87 P: 0.5
ICU stay (No of Patients=81)	15 (68.2%)	7 (87.5%)	57 (7.8%)	χ^2 : 134.9 P: 0.001
Condition at the time of discharge	50% - critical/poor prognosis	N/A	Stable and Healthy	-

to poor outcomes and need for ICU stay in our series. Anesthesiologist have a vital role to play in reducing the morbidity and mortality burden by ensuring preoperative optimization of underlying comorbidities and modifiable risk factors. In addition, preferentially employing regional anesthesia techniques wherever feasible has been shown to reduce the pro-inflammatory responses and improve outcomes. This would also contribute to a reduction in the aerosolization risks to HCWs.

Only two asymptomatic patients (0.3%) tested positive for COVID-19 in our series of 764 surgical patients with none of the HCWs exhibiting any symptoms of SARS COV ILI like illness. Both the patients were treated according to the ICMR guidelines for asymptomatic SARS COV-2 patients. The similar strategy has also been reported in another study for the management and testing of patients pre-operatively.^[18]

All the patients were tested for COVID 19 using RT-PCR test (Altona diagnostic, Germany), which has an efficiency of >96% and Limit of detection (LOD) is 3.8 RNA copies/ml of the specimen for both the genes (E-gene and S-gene), which is lowest in comparison to the other kits available in the market.^[12] However, falsely negative results may occur due to incorrect sampling,^[19] which was addressed by training and education of health care staff.

Absence of COVID-19 testing pre-operatively would have escalated use of level 3 PPE by all HCWs thereby creating a financial strain on already beleaguered health care systems of private self-funded hospitals. Further, knowing the COVID-19 status of any surgical candidate assists in shared decision making for safely scheduling the surgery thereby ensuring reduction in postoperative complications and prevention of potential transmission of the novel coronavirus from the patient to health care worker or to other patients.^[20-23] Being aggressive with testing while carrying out surgical services could avert disastrous consequences and can also help mitigating the pandemic suppression campaign, especially in the absence of therapeutics or vaccines.^[19] The Society of Gynecologic Oncology (SGO) and the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), recommend that all preoperative patients should be tested for COVID-19, regardless of their symptoms or exposure.^[15,24]

Our series has many limitations. We did not categorically employ an objective score to schedule true MeNTS surgeries across all specialties. Future strategies should employ this scoring to justify utilization of resources amidst an escalating pandemic. An exit RT PCR test should be offered to all elective/emergency surgical patients and their high-risk contacts both, at 5-7th postoperative day and prior to their discharge from hospital. Though the strategy proposed by us is based

on the observations from our tertiary care referral single centre which has level 3 Covid care facilities as well, it cannot be extrapolated to different category of hospitals especially government hospitals; however, it does provide us with a general road map to safely conduct MeNTS surgeries in future.

In conclusion, our small series of essential elective surgeries facilitated with preoperative testing offers a glimmer of hope for continuation of safe care for surgical patients and HCWs. We need to formulate a balanced strategy that ensures timely availability of MeNTS elective surgeries with optimal utilization of scarce hospital resources. This would provide more benefits whilst concomitantly reducing the risks of poor outcome for the patient and treating HCWs. We need a larger series of surgical patient data with long-term follow-up data to validate further our recommendations of preoperative and postoperative testing into future policies.

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Conflicts of interest

There are no conflicts of interest.

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