

Restarting Elective Surgeries during COVID-19 Pandemic: Innovations and Anaesthesiologist's Perspective

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ABSTRACT

Introduction: Lockdown imposed due to Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) caused by coronavirus led to disruption of all aspects of life across the world with serious consequences in delivering of routine surgical services to the patients. Anaesthesiologists and surgeons in the study Institute devised clinical assessment based protocols for preanaesthesia assessment {not including routine preoperative Coronavirus Disease 2019 (COVID-19) Testing} to ensure timely conduct of elective surgeries as soon as patients started reporting to hospital.

Aim: To evaluate the efficacy of various measures taken by anaesthesiologists and operation theatre team to impart surgical care during COVID-19 pandemic without increasing the risk of transmission of COVID-19 disease.

Materials and Methods: A retrospective observational study was carried out with the idea of comparing the surgical workload of year 2020 (January to December 2020) with the previous year 2019 (January to December 2019). The study was conducted in the month of March 2021, in a 627-bedded secondary care multispeciality hospital in northern India. The data on total number of patients undergoing surgeries in year 2020 was compared with that of year 2019 on the basis of elective surgeries, emergency surgeries and different modalities of anaesthesia used to conduct all those surgeries. These variables from both the years were compared using chi-square

tests and Statistical Package for Social Sciences (SPSS) trial version 23.0.

Results: The total numbers of surgeries had reduced in year 2020 (3923 in 2019 vs 2500 in 2020) with highest reduction in the months of April and May 2020 (83.08 and 74.75%, respectively). However, with implementation of clinical assessment based protocols and targeted changes in anaesthesia practice, the decrease in elective surgeries came to statistically non significant levels by the month of September 2020. The difference in percentage of cases carried out under regional anaesthesia (4.23% in 2019 vs 3.24% in 2020) was statistically not significant (p -value=0.051). The emergency surgeries in 2019 were 805 vs 742 in 2020, percentage change from 2019 base data was -7.83. The incidence of COVID-19 infection during postoperative period was nil in the Institute. The incidence of COVID-19 infection among the staff was found to be similar to the patients reported to the hospital despite of handling elective surgical cases.

Conclusion: Regular surgical care can be safely provided after thorough clinical assessment of the patients in this ongoing pandemic. This did not lead to increase in incidence of COVID-19 infection in healthcare workers as shown in our data. Hence, preoperative COVID-19 testing should be performed only when indicated by clinical history and examination. However, more studies with multiple centres are required to validate these protocols and hence facilitate the formation of even more refined ones.

Keywords: Coronavirus disease 2019, Lockdown, Protocols, Severe acute respiratory syndrome coronavirus-2

INTRODUCTION

The later part of year 2019 witnessed rise in cases presenting with influenza like illness progressing to severe respiratory distress in Chinese city of Wuhan. Soon, it was deduced that these cases were caused by a novel coronavirus which was named as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) and World Health Organisation (WHO) declared it as Coronavirus Disease 2019 (COVID-19) disease [1]. The Government of India imposed a strict nationwide lockdown to contain the spread of infection on 24th March 2020 [2].

Various mathematical models were followed to predict transmission and rise in number of COVID-19 cases. The concept of reproduction number (R_0), where we calculate the average number of cases of an infectious disease arising by transmission from single infected patient in a population that has previously not encountered the disease, became imperative. The R_0 for coronavirus was calculated to be as high as 5.7 [3]. One of the main limitations of mathematical models for transmission of infectious diseases is that the transmission rates are fixed as constants and do not take into account the prevalence of local environmental factors [4]. These static models led to formulation of guidelines across the world where special emphasis was laid towards stocking up of various health care facilities to deal with tides of patients in future.

It was advised to preserve skilled man power and avoid exposure at all costs. Cancelling everything became a norm leading to stoppage of routine surgical care across the country with the idea of redirecting the resources for management of critically ill COVID-19 patients [5]. The anaesthesiologists and anaesthesia assistants became an indispensable part of teams managing severe COVID-19 cases, thus creating shortages of staff inside operation theatre required for providing safe surgical care in perioperative period.

Mathematical models, though an important tool in public health for policy making, must be cross checked with actual burden of COVID-19 disease in every district. The underlying objective of writing this article is to highlight the fact that general guidelines issued at the central/federal level alone cannot suffice the health requirements of entire population. The facts pertaining to local burden of COVID-19 in the community, awareness about subsequent waves, local testing ability, availability of resources in terms of Personal Protective Equipment (PPE), Intensive Care Unit (ICU) beds, skilled manpower, medical oxygen supply to the hospital etc should be taken into consideration [6].

Blanket guidelines issued at times by authorities have led to cancellation of surgeries by as high as 91% in comparison to the previous year, as reported by a preprint study [7]. During peak of lockdown, even time sensitive surgeries like oncological surgeries

were cancelled at various Institutes. These authorities have totally ignored the fact that elective surgeries are not optional surgeries. These are proposed to the patients as a solution to an underlying pathology. Deferring these procedures has caused unimaginable impacts on the lives of these patients in terms of increase in morbidity, deterioration in prognosis over due course of time, loss of finances due to inability to work efficiently etc., [8].

The study hospital is an important secondary care centre in 100 km radius providing healthcare services to a large population. Closing down this centre would have led to devastating effects on the general health of public in our catchment area. Hence, local intra-hospital protocols pertaining to perioperative period were prepared by anaesthesiologists to accommodate the requirements of pandemic without compromising routine surgical care to our patients. The intention of these protocols is to ensure that surgical services should not come to a standstill in case of ongoing pandemic. So the aim of the study was to evaluate the efficacy of various measures taken by anaesthesiologists and operation theatre team to impart surgical care during COVID-19 pandemic without increasing the risk of transmission of COVID-19 disease.

MATERIALS AND METHODS

A retrospective observational study was carried out with the idea of comparing the surgical workload of year 2020 (January 2020 to December 2020) with the previous year 2019 (January 2019 to December 2019). The study was conducted in the month of March 2021, in a 627-bedded secondary care multispecialty hospital catering to service personnel, dependants and ex-servicemen from armed forces. Data was collected from the hospital records after obtaining due permissions from Ethical Committee and administration vide letter number 02/EC/IRB/2021 dated 01 March 2021.

Local intra-hospital perioperative protocols were devised by anaesthesiologists for imparting anaesthesia care to the patients coming for elective surgeries without compromising the safety of patients as well as healthcare workers. Special emphasis was given to the clinical judgment over generalised guidelines while evaluating and screening every patient for COVID-19 disease. All the surgical specialties resumed functioning based on these protocols by June 2020.

Various intra-hospital protocols put in place were as follows:

- Establishment of COVID-19 suspect and COVID-19 confirmed ward.
- Establishment of COVID-19 operation theatre with stand alone air conditioning system [9].
- Establishment of cough clinic to screen the patients with influenza like symptoms, contact with COVID-19 positive case or history of travel to endemic areas. These clinics were equipped with thermometers and x-ray machines to facilitate early decision making for course of treatment inside the hospital. Patients with history or findings suggestive of COVID-19 disease were admitted as COVID-19 suspect and followed-up by Reverse Transcription-Polymerase Chain Reaction (RT-PCR) test. Patients with no history, symptoms or signs suggestive of COVID-19 were referred to main hospital complex for routine care for which he/she reported to the hospital. Routine RT-PCR test for patients reporting for elective surgeries was not followed in our hospital.
- Routine use of PPE was encouraged at various levels as per the risk assessment of health care provider. For aerosol generating procedures, it was encouraged to use a normal surgical mask over a N95 mask as it further reduced exposure to viral particles [10]. Healthcare workers were encouraged to maintain hydration due to excessive high temperatures [11].

- Hand hygiene with alcohol based hand sanitisers.
- Patients coming for elective surgeries were again screened for signs and symptoms suggestive of COVID-19 at preanaesthesia checkup clinic. Patients were also explained the remote possibility of contacting COVID-19 during hospital stay despite of all the precautions and their willingness for surgery was documented [12].
- Whenever possible, preference to be given to regional and spinal anaesthesia over general anaesthesia [12].
- 'No visitor' policy: No attendants/visitors were allowed along with patients for entire stay inside the hospital except for those who are bed bound, to avoid overcrowding inside hospital.
- Admission policy: A seven-day admission policy was drafted for patients coming for elective surgery to monitor symptoms of COVID-19 [13].
- Patients were encouraged to wear three ply masks throughout their stay [12].
- Patients were again screened for signs and symptoms of COVID-19 before entry to operation theatre by help of self assessment forms which contained questions pertaining to symptoms of influenza like illness, contact with covid positive case prior to admission or history of travel. These forms were assessed by anaesthesiologists prior to starting the case [13].

Changes in anaesthesia management:

- All cases requiring general anaesthesia with endotracheal intubation were intubated using succinylcholine. This led to decrease in duration of bag and mask ventilation thus decreasing aerosol formation [10].
- No cases were planned under general anaesthesia with face mask technique. All cases were planned under total intravenous (i.v.) anaesthesia [14].
- Pneumoperitoneum was drained indirectly through suction thereby avoiding direct release in operation theatre environment [15].
- Use of face shields in addition to PPE's specifically during aerosol generating procedures [10,12].
- Use of two heat moisture exchanger viral filters on anaesthesia circuits to prevent contamination of anaesthesia workstations [10].

STATISTICAL ANALYSIS

Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) trial version 23.0 software and Chi-square test was applied for testing statistical significance (p-value <0.05).

RESULTS

Total number of surgeries that took place in year 2020 was 2500 against 3923 in year 2019 (p-value <0.05). The data collected shows that the span of age group was similar in both years ranging from period of infancy to more than 75 years of age. There was no difference in male to female patient trends in both years [Table/Fig-1]. There was a deliberate reduction in general anaesthesia with endotracheal tube and face mask categories to reduce aerosolisation in operation theatre. This marks 48.53% and 56.64% decrease respectively from the original practice. Total i.v. anaesthesia constituted 11.04% of the total workload in 2020 versus 5.81% in 2019. This increase was statistically significant (p-value <0.05). Regional and spinal anaesthesia were preferred techniques of safe anaesthesia practice. There was a statistically significant increase in percentage of cases carried out under spinal anaesthesia in year 2020 (37.44%, p-value <0.05). Even though the number of cases were less in 2020, the difference in percentage of cases carried out under regional anaesthesia (4.23% in 2019 vs 3.24% in 2020) was statistically not significant (p-value=0.051) [Table/Fig-2].

Variables	2019	2020	p-value (Chi-square test)
Age groups (years)	Number (Percentage %)	Number (Percentage %)	
<1	22 (0.561)	33 (1.32)	<0.05
1 to 10	294 (7.494)	179 (7.16)	
11 to 60	3300 (84.119)	2129 (85.16)	
61 to 75	292 (7.443)	136 (5.44)	
>75	15 (0.382)	23 (0.92)	
Total	3923 (100)	2500 (100)	
Gender			
Male	1535 (39.13)	825 (33)	<0.05
Female	2388 (60.87)	1675 (67)	
M:F	0.64:1	0.49:1	

[Table/Fig-1]: Comparison of demography.
p-value <0.05 was statistical significance

Types of anaesthesia	2019	2020	Change from 2019 base data (%)	p-value (Chi-square test)
	Number (Percentage %)	Number (Percentage %)		
GA-ett	579 (14.76)	298 (11.92)	-48.53	0.001
GA-IGEL	90 (2.29)	93 (3.72)	3.33	0.001
GA-FM	143 (3.65)	62 (2.48)	-56.64	0.012
Spinal	1270 (32.37)	936 (37.44)	-26.30	<0.05
Regional	166 (4.23)	81 (3.24)	-51.20	0.051
TIVA	228 (5.81)	276 (11.04)	21.05	<0.05
MAC	1447 (36.89)	754 (30.16)	-47.89	<0.05
Total	3923 (100)	2500 (100)	-36.27	

[Table/Fig-2]: Number of surgeries vs types of anaesthesia.
GA-ett: General anaesthesia with endotracheal tube; GA-IGEL: General anaesthesia with IGEL as supraglottic device; GA-FM: General anaesthesia with face mask; Spinal: Spinal anaesthesia; Regional: Regional anaesthesia; TIVA: Total intravenous anaesthesia; MAC: Monitored anaesthesia care

There was a noteworthy reduction in elective surgical workload from the month of April 2020 to August 2020 (p-value <0.05). However, with streamlining of the above mentioned protocols, the elective surgical workload from September to December in year 2020 showed no statistically significant difference when compared to similar months in year 2019. On the contrary, the months October and December 2020 show statistically significant increase in percentage of total elective cases with p-values of 0.027 and <0.05, respectively [Table/Fig-3]. The decrease in emergency surgeries in the month of March 2020 was statistically significant when compared to March 2019 (p-value=0.03). Fear of catching COVID-19 from hospital environment led to decreased footfall and contributed

Month	2019	2020	Change from 2019 base data (%)	p-value (Chi-square test)
	Number (Percentage %)	Number (Percentage %)		
January	305 (9.782)	205 (11.48)	-32.78	0.67
February	310 (9.942)	228 (12.77)	-26.45	0.003
March	271 (8.691)	234 (13.10)	-13.65	<0.05
April	272 (8.724)	46 (2.57)	-83.08	<0.05
May	301 (9.654)	76 (4.25)	-74.75	<0.05
June	218 (6.992)	111 (6.21)	-49.08	0.326
July	317 (10.167)	121 (6.77)	-61.82	<0.05
August	252 (8.082)	75 (4.20)	-70.23	<0.05
September	243 (7.793)	146 (8.17)	-39.91	0.67
October	212 (6.799)	153 (8.57)	-27.83	0.027
November	251 (8.050)	178 (9.97)	-29.08	0.25
December	166 (5.324)	185 (10.36)	11.44	<0.05
Total	3118 (100)	1785 (100)	-42.75	

[Table/Fig-3]: Elective surgeries vs months.

to this finding. The difference in emergency surgeries conducted from April to December 2020 was statistically not significant when compared with similar months in 2019 [Table/Fig-4]. Patients and health care workers who were found to have symptoms suggestive of COVID-19 illness were tested with RT-PCR. There was no statistical difference in incidence of covid 19 illness between the two groups despite allowing all elective surgeries. (p=0.821). All these tests were conducted preoperatively. Since these patients had symptoms suggestive of COVID-19 illness, they were treated for the same in covid ward rather than sending them for elective surgery in the main hospital complex [Table/Fig-5].

Month	2019	2020	Change from 2019 base data %	p-value (Chi-square test)
	Number (Percentage %)	Number (Percentage %)		
January	56 (6.96)	74 (9.97)	32.14	0.041
February	43 (5.34)	52 (7.01)	20.93	0.28
March	80 (9.94)	50 (6.74)	-37.50	0.03
April	64 (7.95)	48 (6.47)	-25.00	0.35
May	45 (5.59)	51 (6.87)	13.33	0.35
June	49 (6.09)	48 (6.47)	-2.04	0.83
July	62 (7.70)	59 (7.95)	-4.84	0.93
August	72 (8.94)	67 (9.03)	-6.94	0.97
September	86 (10.68)	72 (9.70)	-16.28	0.58
October	71 (8.82)	87 (11.73)	22.54	0.072
November	89 (11.06)	63 (8.49)	-29.21	0.11
December	88 (10.93)	71 (9.57)	-19.32	0.43
Total	805 (100.00)	742 (100.00)	-7.83	

[Table/Fig-4]: Emergency surgeries vs months.

Category	Total tests	Positive	Negative	p-value (Chi-square test)
Patients excluding healthcare worker	229	135	94	0.821
Healthcare worker	23	13	10	

[Table/Fig-5]: COVID-19 RT-PCR testing data.

DISCUSSION

In this retrospective observational study, the impact of the COVID-19 pandemic was studied on the practice during the lockdown, as well as post lockdown period for the entire year of 2020 and compared with a similar time in the preceding year. It was also aimed to study the outcome of various intra-hospital protocols that were designed to resume elective surgeries. This is in contrast to various studies that focus on the impact of pandemic only in the lockdown period [7,16,17].

Anaesthesiologists played a key role in helping the hospital administration to resume elective surgical workload. Innovations in patient assessment protocols and use of personal protective equipment at various levels followed by targeted changes in anaesthesia practice to reduce aerosolisation, not only helped surgical specialties to get back on road but also ensured safe anaesthesia practices amidst COVID-19 pandemic. Routine testing for COVID-19 was never a part of protocols at the study hospital. Despite that, the incidence of COVID-19 did not increase in our staff even after conducting all sorts of surgeries. Moreover, none of the patient admitted for elective surgery developed COVID-19 disease in the postoperative period.

The reduction in elective surgical workload was maximum in the months of April and May 2020, immediately after the announcement of lockdown. Even the emergency surgeries in the year 2020 saw significant decline in our hospital in the months of March 2020. This can be explained not only by the presence of strict curfews during that period but also by the fearful environment created by the media sensationalism. The number of emergency surgeries gradually reached previous year values as people eventually started reporting

to the hospital. The increase in elective surgical workload during December 2020 in comparison to December 2019 emphasises authors efforts to clear the backlog.

In the study conducted by Gadgil A et al., they concluded that as many as 54% of emergency and 91% of elective surgeries were cancelled across India [7]. Grippaudo FR et al., conducted a study in a plastic surgery hospital in Italy where they reported 62.9% reduction in elective surgery, 90% in ambulatory surgery and 87.65% in day care surgeries in the month of March 2020, which was the peak of lockdown in their cities [16]. In the index hospital also, the reduction in elective workload was 83.08% and 74.75% in the months of April and May respectively when compared to same months of previous years. Pavić AK et al., reported significant decrease in semi emergency/ time sensitive surgeries also [17]. The statistically significant reduction in emergency surgeries in the present institute was only 37.5% in March 2020. The restrictions continued in India till the end of the year. While most of the centres resumed only emergency and time sensitive surgeries [18,19] our hospital carried out 2500 surgeries by the end of December 2020 out of which 1785 surgeries were purely elective in nature. Overall there was 42.75% reduction in elective surgeries. The survey conducted by Goel M et al., shows 75-90% reduction in elective surgical workload in ophthalmology even during post lockdown period [20]. But we managed to restart most of the surgeries in our hospital by following the protocols discussed above.

In early 1980's, many healthcare Institutions cancelled services to many AIDS patients in order to protect their own staff [21]. But today, we have come a long way in terms of managing HIV patients. Taking the COVID-19 pandemic in similar light, we need to innovate and develop techniques and protocols to restart the routine healthcare services to our clientele along with ensuring adequate safety of healthcare workers.

Limitation(s)

The data was analysed from a relatively small secondary care hospital. This model should be tested in various other centers also to prove its validity. Routine use of succinylcholine may be contraindicated in certain patients thus warranting the use of other muscle relaxants requiring bag and mask ventilation thereby causing aerosolisation. Hospitalisation for longer periods reduced patient turnover rates and might have contributed to overall reduced elective surgeries in year 2020.

CONCLUSION(S)

The COVID-19 pandemic has caused significant disturbance in providing routine surgical care to patients all across the world. But cancelling everything for a long period will have detrimental effect on the health of our patients. Local leadership and doctors should be involved in developing protocols and innovative techniques to ensure the continuation of routine healthcare services along with management of pandemic. Anaesthesiologists are going to play an important role in designing these protocols to bring the surgical healthcare back on track.

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