



SURGERY DURING EARLY COVID- 19 PANDEMIC – CHALLENGES FACED AND OUTCOMES

Medicine

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ABSTRACT

Aims: To study the challenges faced for conducting surgeries and assess the outcome during early Covid - 19 Pandemic; **Materials and Methods:** All patients scheduled for non-urgent but essential surgeries during the pandemic were subjected to preoperative RT-PCR test 24-96 hours before surgery and for emergency surgeries RAT testing as per the algorithm. Surgical patients being managed conservatively in the wards but showing Covid suspected symptoms were also subjected to RAT testing; **Results:** A total of 3725 surgeries were done from March 2020 to January 2021 during the pandemic out of which 636 cases were on elective basis. Almost 7% cases scheduled for surgeries tested positive and were managed as per the protocol. Positivity rate for RAT testing was found to be 5.0 % and for RT-PCR it was 7.9 percent; the mean post-operative hospital stay was 4.09 days. There were 224 minor, 76 major complications. **Conclusion:** Adherence to updated guidelines, Standard Operative Procedures should always be followed. Role of Administrative machinery acts as an adjunct to tide over a disaster like Public health crisis as experienced during this pandemic. Use of Preoperative RT-PCR for elective surgeries and RAT testing for emergency surgeries was found to be effective in decreasing the exposure to the health care givers but potential for infectivity during incubation period was always a concern. RAT testing had low positivity rate but was effective in detecting confirmed cases among surgical patients being managed conservatively in the wards and helped in increasing contact tracing. Overall, it was possible to start selective non-urgent but essential surgeries initially with acceptable surgical outcomes and the spectrum of surgeries expanded as the magnitude of pandemic decreased in the region.

KEYWORDS

Surgery, Covid-19, Pandemic, Outcome, Challenges

INTRODUCTION

Every nation of the world whether developed or developing has been tested by the fury of Mother Nature in a tiny form termed as SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) manifested as COVID-19 pandemic and India was no exception¹. As an emerging economy, in spite of world's skeptical views about our existing vulnerable Health Care System country managed to sail through the worst impact of pandemic not only by increasing the infrastructure at every level but also by becoming self-reliant in it in the shortest possible time. This was possible by timely assessment of the ever-changing dynamics of the disease and regional variations and release of guidelines and SOPs (Standard Operative Procedures) guided by the information available from the already worst affected nations, Central and regional administrative agencies, medical and paramedical institutions around the globe. This can be gauged by the fact that India was among the first countries to develop multiple indigenous corona vaccines and also started with the world's largest vaccination program against corona.^{2,3}

Our institution being one of the premier tertiary care centers of the region adhered to these proposed SOPs and guidelines and it's time to time updating as guided by Ministry of Health and Family Welfare, Government of India (GoI) on its official website. The first case of SARS-CoV-2 in India was detected on 31st January 2020 and first such case in Kashmir valley was confirmed on March 18th 2020. As per the instructions of GoI, Kashmir valley too went into complete lockdown along with the whole country on 23rd March 2020. There was a visible amount of fear in the society – the fear of unknown as little was known about the pattern of this viral disease. Whole administrative machinery was thrust into bringing the containment of the spread. All markets, vehicular traffic, industrial joints, financial establishments, government offices barring essential services were closed.⁴

Hospitals were designated as Covid committed hospitals and Chest disease branch of our institute was one such dedicated Covid Hospital. Fifty percent of the surgical wards were converted into Covid wards and almost 25 % of surgical staff was posted to Medicine department to tackle the sudden surge of patients and to increase the surge capacity. All teaching classes, outdoors, Minor and Elective procedures were

postponed indefinitely till further orders. Only life-threatening emergency procedures were allowed. The balance for most of the diseases was tilted towards conservative management. During lockdown it was also observed that number of referrals from peripheral health institutions was drastically reduced maybe due to lack of vehicular movement and fear factor.

But the period of complete lockdown (approximately 03 months) led to piling up of large number of non-urgent but essential cases which included many cases of malignancies requiring surgical intervention post neo-adjuvant chemo/chemo-radiation. By the time country eased out its strict lockdown policy by creating containment zones with color coding, country became self-reliant in manufacturing universal precaution kits and materials, sanitization equipment, increased its testing capacity and had access to lot of available information about the dynamics of the pandemic and the virus especially from the worst hit nations as updated from time to time on World Health Organization's website⁵ and Ministry of Health and Family Welfare Government of India. The information helped in formulating policies anticipating the future events.

MATERIALS AND METHODS

AIMS AND OBJECTIVES: To study the challenges faced for conducting surgeries during Covid Pandemic and assess the outcome of restarting surgeries during early Covid 19 Pandemic.

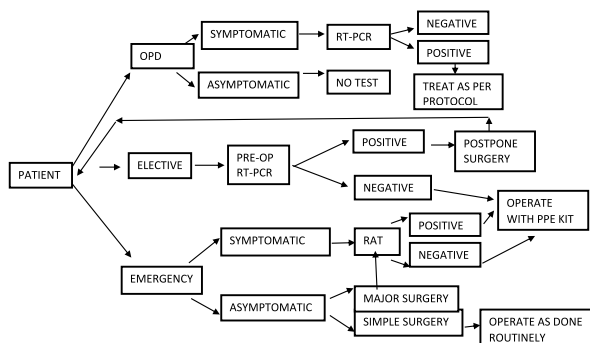
The study was conducted in retrospective manner in the Department of Surgery, Government Medical College Srinagar. The data from March 2020 to January 2021 was studied. The data elements extracted for this study included all the official orders passed by Hospital administration in liaison with Ministry of Health & Family Welfare Government of India, Health & Medical Education Department, Government of Union Territory of Jammu and Kashmir. All the emergency and elective operative records of department of Surgery were studied and analyzed. All Covid testing data of Department of Surgery was studied for the period of study and following assessments were made.

A. Quantum of the problem in restarting surgeries were identified as: Problems related to Virus dynamics⁶, related to the Hospital

infrastructure and other material required for virus containment and related to societal behavior towards pandemic.

B. Possible Solutions were created by creating: Central control Machinery (Central, State, and Regional Administrative machinery), Implementing strict measures for Infection control within hospital premises, adhering to universal precautions updated regularly⁷, enhancing testing capabilities by way of increasing number of testing laboratories, VTM's (Viral Transport Medium) for swabs, making available different types of testing kits (RAT- Rapid Antigen Testing, RT-PCR – Reverse Transcriptase Polymerized Chain Reaction) testing at least 24-96 hours pre-operatively was mandatory⁸ and training staff for sampling. Initially samplings was being done by staff from department of microbiology but after training surgical residents were deputed to collect samples.

Algorithm used for testing in patients pre-operatively



SOPs and guidelines: were followed as updated on Ministry of Health and Family Welfare Government of India website [https:// www.mohfw.gov.in](https://www.mohfw.gov.in)⁴

All the data regarding patient's profile, preoperative testing done, surgical intervention conducted, hospital stay, short term complications were documented. In addition data regarding health care givers from Department of Surgery like random Covid testing, positivity rate, family's positivity rate were documented. All the data collected and recorded as Microsoft Excel Sheet was analyzed. The statistics was applied wherever indicated using Statistical Package for the Social Sciences for Windows, version 12.0 (SPSS Inc., Chicago, IL, USA).

RESULTS AND OBSERVATIONS

From March 2020 to January 2021 a total of 3725 surgeries were conducted by the Department of Surgery out of which 1976 were males and 1749 were females. A total of 3089 were done as emergency procedures (1737 males and 1352 females) and 636 elective surgeries were conducted including 239 males and 397 females (Table No. 1).

Table No. 1: Age, Gender distribution of surgical cases operated during Pandemic

S. No.	Age group	Emergency		Elective		Total		
		M	F	M	F	M	F	Both
1	0 – 14	265	172	38	17	303	189	492
2	15 – 40	712	547	93	194	805	741	1546
3	41 – 60	494	369	64	137	558	506	1064
4	> 60	266	264	44	49	310	313	623
	TOTAL	1737	1352	239	397	1976	1749	3725

Among emergency surgeries intervention for acute appendicitis was the commonest major procedure done under GA accounting for 20% followed by exploration laparotomy for perforation peritonitis, bowel obstruction, solid organ injury accounting for 7.7%, 3.5%, and 3.26% each. Among minor procedures done under Local Anesthesia Post-traumatic laceration suturing was the commonest entity tackled accounting for 27% followed by tube-thoracoscopy (13.8%), excision for infected subcutaneous lesions (7.3%), and incision drainage of abscesses (6.9%) (Table No. 2).

Table No. 2: Disease wise distribution of Emergency surgical cases operated during Pandemic (From March 2020 to January 2021)

S. no.	Procedure	Diagnosis	Total
1.	Exploratory laparotomy	Perforation peritonitis	238

		Solid organ trauma	101
		Intestinal obstruction	109
		Other causes	13
2.	Appendectomy	Acute appendicitis	618
		Appendicular abscess	10
3.	Tube thoracoscopy	Hemo / Pneumothorax	429
4.	Incision & drainage	Breast abscess	83
		Perineal abscess	61
		Other types of abscesses	72
5.	Supra-pubic cystostomy	Urinary retention	53
		Urethral trauma	41
6.	Post trauma lacerations	Suturing under LA	836
7.	Excision	Infected s/c cysts, lesions	227
8.	Repair	Penile fracture	31
		Para-phimosis	10
9.	Miscellaneous	Various conditions	157
	total under GA / SA / LA		1261/109/1719
	Grand total		3089

A total of 636 major non-urgent but essential (elective) procedures were conducted as per the testing algorithm and preference was given to malignancies. Fifty five percent were laparoscopic cholecystectomies, 9% each for Endo-urolological procedures and laparoscopic repair of Hernias, 8.6% were pediatric cases and 7.3% cases comprised of malignancies done by both laparoscopic and open approaches. (Table no. 3).

Table No. 3: Disease wise distribution of Non-urgent but essential (Elective) surgical cases operated during Pandemic. (From March 2020 to January 2021)

S. No.	Procedure	Total	Percentage
1.	Hepato-biliary Surgeries	362	55 %
2.	Gastro-intestinal Surgeries	63	10 %
3.	Genito-Urinary Surgeries	122	19 %
4.	Onco-Surgeries	19	3 %
5.	General Surgeries	62	9.7 %
6.	Endocrine Surgeries	03	0.5 %
8.	Other Laparoscopic Procedures	05	0.8 %
	Total	636	100 %

Pre-operatively 810 RT-PCR were done (positivity rate 7.9 %) and 516 RAT tests were done (positivity rate 5.0 percent). Majority of the RT-PCR test (85%) were done within 48-96 hours pre-operatively. All 132 patients who were being managed conservatively in the ward and underwent RAT testing were also subjected to RT-PCR and positivity rate increased from 6.8% to 12.8 percent. Overall, 30 patients showed radiological lesions suspicious of Covid 19 (Table No. 4).

Table No. 4: Type of Pre-operative/ Routine Covid testing done, its timing before surgery and post testing and/or post procedure positivity rate, percentage of patients with radiological changes.

S. No.	Timing Before Surgery	RT-PCR	RAT	Positive RT-PCR RAT	%	Skiagram Changes
1	24 Hours	-	384	- 17	4.42	11
2	48 Hours	137	-	07 -	5.10	1
3	72 Hours	227	-	21 -	9.25	3
4	96 Hours	314	-	19 -	6.05	2
5	Non-Operative Patients	132	132	17 9 p Value 0.13 (NS)	12.8/6.8	13
	Total	810	516	64 26	7.9/5.0	30

NS – Not Significant

Overall, the mean hospital stay was 4.09 days. For elective laparoscopic surgeries it was 1.77 days. The mean hospital stay for elective open surgeries was 3.12 days whereas mean hospital stay for open emergency cases was 4.53 days. When compared to hospital stay for pre-Covid previous year it was 5.34 days for 8084 surgeries. There were 17 road traffic accident patients brought dead to the casualty testing status of whom was not known. There were total of 224 minor complications and 76 major complications making a total of 300.

When compared to complications for pre-Covid previous year it was 617/8084 surgeries (Table No. 5).

Table No. 5: Disease wise hospital stay and complication rates of surgical cases operated during Pandemic (Mean)

S. No.			Cases	Days Mean	Complications Minor Major	%
1	Laparoscopic	Elective	552	1.77	25	5.79
2	Open	A). Emergency	3089	4.53	187	8.19
		B). Elective	84	3.12	12	17.8
Total			3725	4.09	224(6%) 76(2%)	8.05
March 2019-January 2020 (10 Months)			8083	5.34	617	p Value 0.46
March 2020 - January 2021 (10 Months)			3725	4.09	300	(NS)
			p Value 0.00001 (Sig)			

NS – Not Significant; Sig - Significant

Out of total strength of 504 in the department of surgery which included 101 surgeons, 393 paramedics and 10 ministerial staff 81 tested positive for SARS-CoV-2 during the line of duty which included 33 surgeons, 45 paramedics and 3 office staff members (Table No. 6).

Table No. 6: Positivity rate among surgical staff.

S. No.	Group	Strength	Covid positive	% positive	Tests Done
1	Surgeons	101	33	32.5 %	155
3	Paramedics	393	45	11.4 %	475
4	Office Staff	10	3	30%	13
5	Total	504	81	16.1%	643

DISCUSSION

The current pandemic called Corona virus disease (COVID-19), that occurs as a result of infection with the highly contagious single stranded mRNA virus having an incubation period of 5 to 14 days, which primarily spreads by respiratory secretions, mostly (80%) runs a mild course, while few (14%) needing hospitalization and oxygen therapy, and only 5% needing critical care management. Rapidly evolving and updating of conflicting information about the dynamics of virus behaviour even by the most trusted institutions around the globe and its impact and outcomes on a spectrum of clinical profiles of confirmed patients provided little aid in further management.⁹⁻¹¹

The pandemic affected delivery of surgical services to the needy patients. We first assessed the quantum of ever evolving problems for restarting surgeries during pandemic and devised possible solutions based on the assessment.

A. Problems faced in restarting surgeries:

1. Related to Virus dynamics: To restart elective surgeries, it required restarting of regular Out Patient Department which further created concerns regarding overcrowding of the patients and exposing Health Care Workers but had to balance with the concerns like possibility of increased morbidity due to delay in performing surgeries for malignancies post chemo-radiation and patients with co-morbidities.¹²
2. Related to the Hospital infrastructure: Lack of space and critical care available to surgical patients, lack of adequate manpower, complications due to wearing PPE Kits for prolonged periods, lack of Testing Kits, Universal Precaution Kits for surgical department as majority attention was directed towards symptomatic / critical Covid positive patients and finally, financial constraints and fewer resources were a major factor stressing hospital infrastructure.
3. Related to societal behavior: Fear of the unknown among people was a significant factor. It led to tense situations often in the hospital premises requiring hospital security intervention. Internet search by the patients and visitors often led to confusions and affected proper delivery of available health services.

B. Solutions created:

1. Central control Machinery was involved for smooth functioning

of health institutions during the pandemic crisis and it included MoHFW GoI – Ministry of Health and Family Welfare Government of India, State Executive Committee – Section of Disaster Management Act 2006, DDMA - District Disaster Management Authority, Divisional Commissioner, Deputy Commissioners, Senior Superintendent of Police, Principal Government Medical College Srinagar, Nodal Officer State Laboratories, Departments of Medicine, ENT, Anesthesia, Pulmonary Medicine, Hospital Infection Control Committee (HICC), Infection Prevention and Control Activities (IPC), Committee of Doctors for CPT (Convalescent Plasma Therapy)

2. Infection control within hospital premises by training of HCG by HICC, isolated wards for Covid positive, segregation of corridors leading to Covid wards, sampling restricted between 10 AM – 2 PM only at Respiratory clinic for non-admitted patients, reduction in number of visitors, thermal scanning at all entry points, use of masks, sanitizers, frequent hand washing, installation of sanitization tunnels at prominent entry points and proper referral of covid patients from peripheral health institutions, shifting of critical and symptomatic Covid positives to covid designated area of the Hospital, proper disposal of the Covid positive dead bodies as per protocol, frequent surprise checks by Hospital authorities to see for the adequate functioning and sticking to the norms laid by the authorities.
3. Universal precautions: *For Healthcare giver:* The HCG were divided into High risk and low risk^{13,14} based on their type of duties and exposure and were advised to follow the SOP's and guidelines updated from time to time appropriate for their risk profile as recommended by MoHFW guidelines. Further a buddy system was allowed for breach in the protocols. Asymptomatic HCG was adequately quarantined (14 days) in case of exposure and was allowed only after negative testing with RT-PCR. Symptomatic HCG was treated as per the protocol. Chemoprophylaxis by administering Hydroxy-chloroquine was given to all HCG.⁷ *For Peri-operative and Operation Theatre Precautions:* Strict instructions were issued for pre-operative, intra-operative and post-operative. *Pre-operative:* Pre-Anesthesia checkup and pre-operative Covid testing with RT-PCR was made mandatory for elective surgeries. *Intra-operative:* Adequate care was taken to minimize exposure by limiting the number of functional OT Rooms to 50 percent, proper handling of the instruments, donning and doffing of the PPE Kits, limited necessary communication while performing surgery among surgical and anesthesia team, restricted number of people per OT room and restricted movement within OT complex. OT complex was daily sprayed with Sodium hypochlorite solution by hospital fumigation team and OT complex was twice weekly disinfected using Bacillocid Extra (Dimethanol + Glutaldehyde) by the Theater team. *Post-operative:* Directly shifting the patients to the wards, limiting the number of visitors, preferably early discharge from the hospital and further follow up was preferred telephonically in order to decrease exposure. *For Visitors:* Restricted numbers and restricted movement of visitors in the hospital. Visitors were advised adherence to all Universal precautions. Any deviation from the rules was strictly monitored and addressed to. Frequent rounds of wards and other hospital premises were done by Hospital Security personnel helped by paramilitary forces as and when need arises for maintaining rules and laws. Social Media curbs were instituted by administration to avoid rumor mongering.
4. *Testing laboratory, tests performed and testing staff:* Availability of VTM's (Viral Transport Medium) for swabs was started at VDRL Laboratory, Department of Microbiology. In addition, there were laboratories set up at two other regional tertiary care institutes. Preoperative RT-PCR testing at least 24-96 hours was mandatory.⁸ For covid symptomatic patients planned for emergency surgery and covid asymptomatic but planned for Major exploration, RAT Testing was mandatory (The corresponding author is a designated Nodal Officer from Department of Surgery for RAT testing). Initially samples were being collected by trained staff of department of microbiology but anticipating surge in cases as per the global trends staff from all the departments including department of Surgery were given few days training for sample collection (Nasopharyngeal, oral swabs) and use of VTM. All samples from surgical patients were collected and transported by surgical residents.

From March 2020 to January 2021 a total of 3725 surgeries were

conducted by the Department of Surgery. Among emergency surgeries intervention for acute appendicitis was the commonest major procedure done under general anesthesia accounting for 20% followed by exploration laparotomy done for perforation peritonitis, bowel obstruction, solid organ injury accounting for 7.7%, 3.5%, and 3.26% each. Elective surgeries were started late during the pandemic. A total of 636 major elective procedures were conducted as per the testing algorithm and preference was given to non-postpone conditions like malignancies. The testing for detecting SARS-CoV-2 Virus by RT-PCR and RAT has been a cornerstone in tackling the pandemic¹⁵ irrespective of a possibility of a false negative results¹⁶ and it has helped in restarting not only elective surgeries but also led to the judicial use of universal precautions for performing emergency procedures in low resourceful countries. The timing of preoperative testing was also considered keeping in view the infectivity during the incubation period.^{9, 17} Some less resourceful countries further limited the testing to patients only with clinical symptoms of Covid 19 or patients undergoing high risk surgeries like transplant, lung surgeries or asymptomatic patients in high prevalence areas.^{18,19}

"Surgeons have long been stalwart advocates for their patients and, now more than ever, we must navigate a path that carefully weighs benefits with new risks. Indeed, the consequences of performing operations on patients with subclinical Covid-19 infection can be dire, with a mortality rate as high as 20%."²⁰ In our department in coherence with the national guidelines we charted an algorithm in which RT-PCR was recommended pre-operatively for all elective surgeries and positive cases were postponed till the patient turned negative. In case of emergency surgeries after July 2020 RAT testing was started as the kits were made available and in case of positive cases and major surgeries irrespective of the test results all universal precautions were taken. There was a total of 810 RT-PCR done pre-operatively with a positivity rate of 7.9% and 516 RAT tests done with a positivity rate of 5.0 percent. Majority of the RT-PCR test (85%) were done within 48-96 hours pre-operatively. When compared with global trends for positivity rate of pre-operative RT-PCR testing it was > 1 percent. This may be due to large study group almost touching half a lakh patient.²¹ All 132 patients who were being managed conservatively in the ward and underwent RAT testing were also subjected to RT-PCR and positivity rate increased from 6.8% to 12.8 percent but was found to be statistically insignificant (p value 0.13).

COVID-19 is a new nosological entity, there is not enough data during first half of year 2020 that would enable the determination of standards for the interpretation of a diagnostic test.²² but later studies found that rapid assay for SARS-CoV-2 antigen detection (Standard™ Q COVID-19 Ag kit) showed comparable sensitivity (98.33%; 95% CI, 91.06–99.96%) and specificity (98.73%; 95% CI, 97.06–99.59%) with real-time RT-PCR assay and can be used as a screening assay, especially in a high prevalence area.²³ Overall, 30 patients showed radiological lesions suspicious of Covid 19 during pre-anesthesia check-up or during management in the wards and were treated as per the protocol.

The mean hospital stay for elective laparoscopic surgeries, elective open surgeries and for open emergency cases was less (4.09 days). when compared to the previous year 2019 with same duration (8083 surgeries, 5.34 days) and was found to be statistically significant (p value < 0.0001). This may be due to early discharge of the cases during pandemic and further treatment telephonically. There were 17 road traffic accident patients brought dead to the casualty testing status of whom was not known but proper disposal of the bodies was done as per the protocol. There were total of 224 (6%) minor complications and 76 (2%) major complications. When compared to the complication rates during the previous year before corona pandemic (8083 total surgeries, 159 major and 458 minor complications) rate of complications was found to be statistically insignificant (p value 0.46). The result from the Italian multicenter study show the surgery-related complications and mortality rates in SARS-CoV-2 infected patients was slightly lower than in the literature. The post operative outcomes should be reinterpreted on the basis of the preoperative conditions of the patients and the type of surgery rather than the positivity status.²⁴ One of the limitations of our study was to assess the pulmonary complications related to SARS-CoV-2 in post-operative surgical patients especially managed on emergency basis as all such patients were shifted to designated wards for Covid and it was difficult to ascertain the cause of mortality to Covid or the surgical disease. A study by Perilli et al indicated that emergency surgery is generally associated with a higher risk of pulmonary complications compared to elective surgery.^{25,26}

The frontline workers including the health care givers faced tough times delivering their services as little was known about the pathophysiology of the virus. When compared to the positivity rate of testing in patients, the HCG positivity rate was more than the double which strengthened the belief that in spite of taking all the precautions and following guidelines the HCG were more at risk of contracting the virus. The global positivity rate among the HCG was approximately 20% with good numbers succumbing to the virus.²⁷ It was around 16.1 % in our study with no mortality. The positive HCG was treated as per the protocols laid and 33 % were hospitalized till recovery. It appeared that promptly acting on timely advice by National guidelines based on data from worst affected nations helped regional institutions like ours to be able to protect our HCG in an efficient way.

CONCLUSIONS:

Diligently following of regularly updated guidelines and Standard Operative Procedures is helpful and should always be adhered to. Role of Administrative machinery acts as an adjunct to tide over a massive disaster like public health crisis as experienced during Covid-19 pandemic. Use of Preoperative RT-PCR testing for elective surgeries and RAT testing for emergency surgeries was found to be effective in decreasing the exposure to the treating theatre staff and other health care givers but potential for infectivity during incubation period was always a concern which can be mitigated by adhering to universal precautions and a strict OT complex behavior approach. RAT testing had low positivity rate but was effective in detecting confirmed cases among surgical patients being managed conservatively in the wards and helped in increasing contact tracing. The outcome assessed by hospital stay was found to less compare to pre-Covid times without increase in the rate of complications but almost 16 % of HCG from Department of Surgery tested positive and 33 % among them were hospitalized. Overall, it was possible to start selective elective surgeries in a graded manner initially and the spectrum of surgeries expanded as the magnitude of pandemic decreased in the region.

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