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Mortality and Surgical Complications in Patients with Perioperative SARS CoV-2 Infection

Dr. Saurabh Shandil[1], Dr. Vishal Gautam[2], Dr. Charu Singh[3]

[1]M.S. (Surgery), RH Solan

[2]M.S. (Surgery), CH Tauni Devi, Hamirpur

[3]M.D. (DVL), JR2, Dr. RPGMC, Tanda, Kangra

Abstract: ***The Coronavirus (COVID-19) pandemic has resulted in over 4.5 million confirmed cases and over 300,000 deaths. The impact of COVID-19 on surgical practice is widespread, ranging from workforce and staffing issues, procedural prioritisation, viral transmission risk intraoperatively, changes to perioperative practice and ways of working alongside the impact on surgical education and training.[1]The aim of the study was to determine the effects of COVID-19 on surgical care. Objective: To outline the preoperative characteristics of coronavirus-infected individuals who underwent surgery and their postoperative results and to examine how symptoms affected outcomes and characterize how the coronavirus pandemic affected surgical treatment as a whole.***

Keywords: COVID-19, SARS CoV-2, ARDS, RT-PCR, TrueNat.

1. Introduction

Corona Virus Disease - 2019 (COVID-19) also known as Severe Acute Respiratory Syndrome Corona Virus-2 (SARS CoV-2) is caused by Novel Corona Virus which was declared as a pandemic by the World Health Organization (WHO) on March 11, 2020. The virus that causes this disease originated from animal trades in live animal market in Wuhan, China and was first identified in respiratory tract of patient with pneumonia in Wuhan, Hubei, China in December, 2019. SARS CoV-2 has lower pathogenicity as compared to SARS CoV, but has higher pandemic potential [2]. The epidemic of novel coronavirus disease 2019 (COVID-19) now has spread worldwide and turned into a global pandemic. The COVID-19 which belongs to the β coronavirus family. It is the seventh known coronavirus to infect humans; four of these coronaviruses (229E, NL63, OC43, and HKU1) only cause slight symptoms of the common cold. Conversely, the other three, SARS-CoV, MERS-CoV, and SARS-CoV-2, are able to cause severe symptoms and even death, with fatality rates of 10%, 37%, and 5%, respectively [3]. SARS CoV-2 is an enveloped, non-segmented, positive sense RNA virus that is broadly distributed in humans and other mammals. Its 2 diameter is about 65-125 nanometres (nm), containing single strands of RNA and provided with crown-like spikes on the outer surface. Structurally, SARS CoV-2 has four main structural proteins including Spike (S) glycoprotein, small Envelope (E) glycoprotein, Membrane (M) glycoprotein, and nucleocapsid (N) protein, and also several accessory proteins [4].

Patients who got infected with this virus not only experience respiratory problems such as dry cough, difficulty in breathing, pneumonia leading to Acute Respiratory Distress Syndrome (ARDS), but also experience disorders of heart, kidneys, and digestive tract[5]. Respiratory droplets, close contact transmission and aerosol transmission in a relatively close environment are the major routes of transmission. Epidemiological studies showed that patients with comorbidities including (Asthma, COPD, Tuberculosis, Pneumonia, ARDS, Diabetes Mellitus, Hypertension, Renal disease, Hepatic disease, and Cardiac disease), history of smoking or substance use, male gender and age more than 60 years were more likely to develop complications or have undesirable outcomes [6]. The Corona Virus Disease - 2019 (COVID-19) pandemic has a substantial effect on surgeons and patients who require surgical care. Operating on patients with either asymptomatic or symptomatic COVID-19 further increases the risk for perioperative morbidity and mortality due to pro-inflammatory cytokines, impaired cell mediated immunity and immunosuppressive response to surgery and mechanical ventilation. While many major factors contributed to increased post-operative mortality rate in COVID-19 patients, the mechanism is still remains unelucidated. The impact of SARS CoV-2 on post-operative outcome needs to be established in order to enable surgeons and patient to make evidence-based decision during pandemic [7]. In the present study, we evaluated the clinical outcome of patients who had surgery with perioperative SARS CoV-2 infection. Investigating perioperative outcomes of patients with COVID-19 undergoing a surgical procedure was very important to reduce patient mortality and morbidity.

2. Methods

This Prospective study was conducted in the Department of Surgery, Indira Gandhi Medical College, Shimla with involvement of 56 patients.

Testing Procedure: Laboratory testing for SARS CoV-2 was based on:

1) Viral RNA detection by quantitative RT-PCR.
2) SARS CoV-2 E gene detection by TrueNat.
3) Covid 19 antigen detection by rapid test kits.

The sensitivity of a single upper respiratory tract RT-PCR for COVID-19 was 82.2% (95% confidence interval 79.0-

85.1%). The sensitivity of two upper respiratory tract RT-PCR tests increased sensitivity to 90.6% (CI 88.0-92.7%)[8].

TrueNat test showed a sensitivity, specificity and diagnostic accuracy of (69.5- 90.9)[9].

The overall sensitivity of rapid antigen detection tests versus that of RT-PCR with oral, anterior nasal, and nasopharyngeal samples was 18.18% (95% confidence interval [CI] 8.19% to 32.71%), 63.04% (95% CI 47.55% to 76.79%), and 73.33% (95% CI 58.06% to 85.4%), respectively.[10]

Inclusion criteria:

- Patientdiagnosed with SARS CoV-2 infection 1 weekbefore or after surgery.

Exclusion criteria:

- Patients diagnosed with SARS CoV-2 infection beyond perioperative period of 1 week.
- Obstetric patients.
- Patients not consenting for study.

3. Results

This present study was undertaken on a group of patients presenting to the Department of General Surgery, Indira Gandhi Medical College, Shimla. The study group comprised of 56 patients of perioperative SARS CoV-2 infection after fulfilling the inclusion and exclusion criteria and were recruited into the study after taking the informed consent. A detailed history and examination record was maintained for each patient. Routine investigations like Haemoglobin, Total Leucocyte Count, Platelet Count, C-Reactive Protein, Lactate dehydrogenase, Chest X-Ray are recorded and analysed.

Age Distribution and Sex Ratio
The mean age of the patients was 48.87 ± 18.58 years and there were 33 (58.9%) male and 23 (41.1%) females in the present study.

Residence Locality:
Residence locality of patients was Bilaspur (3.6%), Chamba (5.4%), Hamirpur (1.8%), Kangra (5.4%), Kinnaur (3.6%), Kullu (10.7%), Lahaul (3.6%), Mandi (8.9%), Shimla (32.1%), Sirmaur (8.9%), Solan (14.3%), and Una (1.8%).

Occupation:
Occupation of patients were Businessman (5.4%), Farmer (30.4%), Govt. service (1.8%), Housewife (33.9%), Labourer (1.8%), Private job (5.4%), Retd. Govt. servant (3.6%), Shop keeper (8.9%), and Student in (8.9%).

Complaints:
Complaints revealed Blackish discoloration of lower limb present in 2 (3.5%), Dysphagia to liquid and solids in 3 (1.8%), Breast Lump in 3 (5.4%) , Non-passage of Flatus & Stool in 8 (14.3%), Pain epigastric region in 1(8.9%), Pain left Lumbar region in 1 (1.8%), Pain peri-umbilical region in 1(1.8%), Pain right Hypochondrium in 11 (19.6%), Pain right iliac fossa in 11 (19.6%), Pain right Inguinal region in 1(1.8%), Pain right Lumbar region in 1 (1.8%), Pain whole abdomen in 9 (16.1%), Recurrent vomiting in 1(1.8%), and Swelling Paraumbilical region present in 1(1.8%) patient.

Past History:
Past history of patients revealed E/L (Exploratory Laparotomy) with omental patch closure in 1(3.6%), History of Laparoscopic Cholecystectomy in 1(1.8%), History of Open Cholecystectomy was found in 5 (8.9%), and history of Pyelolithotomy observed in 1(1.8%), No past history was present in 47 (83.9%) patients.

Personal History:
History of alcohol intake was found in 2 (3.6%), History of smoking was present in 9 (17.9%), and both smoking and alcohol history was observed in 9 (16.1%). No history of addiction was observed in 35 (62.5%) patients.

Hemodynamic Parameters:
The mean Pulse rate was 92.64 ± 14.96, mean Systolic Blood Pressure was 119.78 ± 17.10, mean Diastolic Blood Pressure was 71.67 ± 8.72 and mean Saturation of Peripheral Oxygen (SPO2) was 93.55 ± 4.28.

Respiratory System:
Bilateral Vesicular Breath Sounds (VBS) was observed in 45 (80.4%) and Bilateral (B/L) crepts was present in 11 (19.6%) patients.

Abdominal Examination:
Abdominal examination of the patients revealed Raised bowel sound in 1(1.8%), distension in 4 (7.1%), T(Tenderness) in 6 (10.7%), T+G+RT (Tenderness + Guarding + Rebound Tenderness) in 9 (16.1%), and T+RT 9 (Tenderness + Rebound Tenderness) in (16.1%), No Abnormality Detected (NAD) in 27 (48.2%) patients.

Biochemical Parameters:
The mean Haemoglobin (Hb) was 12.85 ± 1.97, mean Platelet (PLT) was 311.87 ± 76.82, mean Total Leucocyte Count (TLC) was 11.29 ± 4.23, mean Erythrocyte Sedimentation Rate (ESR) was 20.71 ± 9.36, mean C-Reactive Protein (CRP) was 114.30 ± 46.74 and mean Lactate Dehydrogenase (LDH) was 332.41 ± 98.10.

Chest X-Ray Findings:
On chest x-ray, multiple ground glass opacities were observed in 22 (9.3%), multiple ground glass opacities + consolidation was observed in 13 (23.2%) and No Abnormality detected (NAD) reported in 21 (37.5%) patients.

Comorbidity:
Diabetes Mellitus (DM) was present in 7 (12.5%), Diabetes Mellitus+ Hypertension (DM+HTN) was present in 5 (8.9%) and Hypertension (HTN) was present in 5 (8.9%). No comorbidity was found in 39 (69.6%) patients.

Provisional Diagnosis:
Provisional diagnosis of patients revealed Absolute Dysphagia cause Carcinoma Esophagus in 1 (1.8%), Acute Appendicitis in 9 (17.9%), Acute Generalised Peritonitis in 7 (16.1%), Acute Intestinal Obstruction in 7 (12.5%), Acute Limb Ischaemia in 1(1.8%), Acute Perforated Appendix in

1(1.8%), Carcinoma Ascending Colon in1 (1.8%), Carcinoma Breast in 3 (5.4%), Carcinoma Caecum in 1(1.8%), Carcinoma Stomach with Mets in 3 (5.4%), Cholelithiasis with ERCP stent in situ in 1(1.8%), Empyema Gall Bladder(GB) in 1(1.8%), Follow up case of (F/U/C) Gall Stone Induced Pancreatitis(GSIP) in 2 (3.6%), Symptomatic Cholelithiasis in 6 (12.6%), Hydatid cyst Liver in 2 (3.6%), Renal Calculus in 1(1.8%), Non-functioning Kidney in 1(1.8%), Obstructed Epigastric Hernia in 1(1.8%), Para-Umbilical Hernia in 1(1.8%), Strangulated Inguinal Hernia in 1(1.8%), and Wet Gangrene in 1(1.8%) patient.

Surgery Performed:
Surgeries performed were Above Knee Amputation in 2 (3.6%), primary repair of traumatic Jejunal perforation in 1(1.8%), Distal Radical Gastrectomy(DRG) with loop Gastro-Jejunostomy(GJ) in 2 (3.6%), Exploratory Laparotomy(E/L) with Excision of Adhesive band between Omentum& Jejunum in 1(1.8%), Heineke-Mikulicz Stricturoplasty in 1(1.8%), Omental patch closure of Duodenal ulcer perforation in 6 (10.8%), Resection &anastomosis(R&A) of gangrene bearing segment of Ileum in 2 (3.6%), Appendicectomy in 12 (21.4%), Enucleation of Hydatid cyst liver in 1 (1.8%), Gastro-Jejunostomy in 2 (3.6%), Hartmann's procedure in 2 (3.6%), Pyelolithotomy with Double J (DJ) stenting in 1 (1.8%), Mayo's Repair in 1 (1.8%) , Modified Radical Mastectomy(MRM) in 3 (5.4%), Onlay Mesh Hernioplasty in 1 (1.8%), Open Cholecystectomy in 10 (17.9%), Partial Cysto-Peri Cystectomy in 1 (1.8%), Resection &Anastomosis(R&A) of Intussusceptum bearing segment of Jejunum in 1 (1.8%), Radical Nephrectomy in 1 (1.8%), Right Hemicolectomy in 2 (3.6%), Roux-en-Y Hepaticojejunostomy in 1 (1.8%), and Transverse Loop Colostomy in 2 (3.6%) patients.

Surgical Complications:
Pulmonary complications were found in 36 (64.28%), SSI was reported in 40 (71.42%) and no surgical complication was observed in 5 (8.92%) patients.

Outcomes:
Mortality was observed in 11 (19.6%), whereas 45 (80.4%) patients were successfully treated and discharged.

Hospital Stay:
The mean hospital stay was 14.87 ± 4.65 days.

4. Discussion

This study showed that individuals with perioperative SARS-CoV-2 infection had high rate of postoperative complications including pulmonary complications and surgical site infections. The risks of postponing surgery for certain individuals should be weighed against the increased risks associated with SARS-CoV-2 infection for better management of patient outcomes.

In the present study, the mean age of the patients was 48.87 ± 18.58 years with predominate males (58.9%). It has been reported that the male patients with age more than 70 years with the emergency or major elective surgery are particularly at higher risk of mortality. Patients with minor elective surgery were also found to have higher-than-usual mortality during covid pandemic[11]. Consideration should be given to delaying non-critical treatments and encouraging non-operative therapy during SARS-CoV-2 epidemics in order to postpone or prevent the need for surgeries. Surgery plus SARS-CoV-2 may have a synergistic impact, on increasing the death risk of SARS-CoV-2 positive individuals, especially in older age group who underwent surgery.

It has been reported that the postoperative mortality and pulmonary complications rates in SARS-CoV-2-infected patients are much higher than pre-pandemic baseline levels. The mean hospital stay in the present study was 14.87 ± 4.65 days and mortality were observed in 11 (19.6%) patients. Similar findings were revealed by a recent study reporting overall 30-day mortality of 23·8% [11]. Patients with SARS-CoV-2 infection who experienced surgical pulmonary complications have postoperative mortality rates that are similar to the critically ill COVID-19 patients who are hospitalised to critical care [12].

In present study, the pulmonary complications were present in 64.28% patients which is similar to the previous studies (41%–51%) in patients with perioperative SARS-CoV-2. However, in Dean et al. study, the rate of pulmonary complications in SARS-CoV-2 positive patients was 24%[13]. In the research by Inzunza et al., respiratory complications appeared in 30.8% of patients with COVID-19 infection while they did not in 1.4% of individuals without the infection [14].

The cause of this variability rate is unknown; however, it might be due to either under or over-reporting or to various individual factors. It ispossible that SARS-CoV-2 will cause pulmonary complications, which might be made worse by a surgery or general anaesthesia [11]. The increased postoperative thromboembolic events in SARS-CoV-2 are poorly understood. It has been proposed that a combination of localised pulmonary thrombotic microangiopathy and disseminated intravascular coagulation may be responsible for the coagulopathy linked to COVID-19. Thromboembolic incidents had already been identified as a significant risk factor for death in hospitalised SARS-CoV2 patients[15]. Future research with larger surgical patient cohorts is required to validate our findings and evaluate the relationship between thromboembolic events and postoperative mortality.

In the present study, the most common surgical complication was surgical site infection, observed in 71.42% patients. Similar to our study, the most common complications were bacterial surgical site infection in 3% cases in the study by Dean et al., followed by tendon rupture in 0.8% cases and fracture displacement in 0.6% cases [13]. The association with general anaesthesia is likely related to the more severe infections and the fact that more severe infections have a higher complication rate.

The continued presence of SARS-CoV-2 in the public is a threat to the security of patients, employees, and the effectiveness of perioperative treatment. However, there is compelling evidence and justification for not postponing urgent surgery for trauma and infection since doing so

would raise the incidence of surgical complications. Many tough choices must be made due to gaps in our understanding of SARS-CoV-2, including tradeoffs between immediate hazards from exposure to the virus and long-term risks from postponing appropriate planned surgical procedures for other illnesses. Additionally, when visiting a hospital, cross-infection between patients and personnel must be avoided. Pathways have been devised to reduce patients' risk of perioperative SARS-CoV-2 exposure in light of the significant mortality that has been documented in patients undergoing major surgery in the context of SARS-CoV-2 infection [13].

Patients with SARS-CoV-2 who experienced surgical pulmonary complications were more likely to die [11]. The pulmonary complication rate in the POPULAR multicentre, prospective, observational research of 211 hospitals from 28 European nations in 2014–15 was 8%, which is significantly higher than the pre-pandemic baseline[16]. In another study, ARDS had the highest mortality rate of the different complications (mortality 63·0%) [11]. The overall 30-day mortality was 0.09% and the 30-day mortality of day-care surgery was zero in the study by Dean et al. [13]. In the research by Pascal et al., the unmatched SARS-CoV-2 positive cohort's 30-day overall death rate was 16% compared to 4% in the surgical control group [12]. Patients with COVID-19 infection had a 30-day death rate of 12.8% in the research by Inzunza et al. [14]. An Italian study of 41 COVID-19-infected patients who underwent surgery reports a 19.5 percent overall death rate and a 59 percent respiratory morbidity rate [17]. The death rate for COVID-19 patients was reported to be 20%, while severe respiratory morbidity was reported to be 27% in retrospective research from Spain that examined morbidity and mortality in patients treated up until the pandemic's peak in that nation [18]. Similar to this, a Chinese study of 34 patients who underwent elective surgery and had a perioperative diagnosis of COVID-19 infection reveals a death rate of 20.5 percent, with 44.1 percent of patients required ICU care due to respiratory failure [19]. The incidence of mortality associated with pulmonary problems in SARS-CoV-2-infected individuals is disproportionately high, even when case-mix variations are taken into account.

Regarding surgical outcomes during the COVID-19 epidemic, Latin America has only a limited number of events to record. In a study published in Peru, Carpio Colmenares et al. compared 59 patients who received emergency abdominal laparoscopic surgery in 2020 to a control group of patients who underwent surgery in 2019. This study involved 59 individuals. Regarding age, sex, the length of symptoms, the severity of surgical sickness, and postoperative morbidity rate, they discovered no statistically significant variations. Only one patient got a perioperative COVID-19 infection among those who underwent surgery during the COVID-19 pandemic, although their postoperative stays were the longest. In the 2020 group, the postoperative morbidity rate was 45.7% [20]. Gonzalez-Calatayud et al. shared their observations from a tertiary care facility in Mexico, which included all surgical patients with a suspected or confirmed SARS-CoV-2 infection, despite including patients from a wide variety of surgical operations, such as C-sections, tracheostomies, and general surgery procedures, they claim a death rate of 42.8% [21].

It is currently unclear what the pathophysiological causes are for the higher death rate among SARS-CoV-2 positive individuals having surgery. A proinflammatory cytokine and immunosuppressive response may be elicited by mechanical breathing, anaesthetic, or tissue damage brought on by the procedure, all of which might exacerbate the symptoms of a pre or postoperative SARS-CoV infection. The risk of thrombotic effects in the pulmonary circulation, respiratory insufficiency, respiratory distress syndrome, and ultimately mortality may be further increased by surgery-related thromboembolic and pulmonary problems in addition to the underlying consequences of the SARS-CoV-2 infection [12].

5. Conclusion

People undergone surgery during the COVID-19 pandemic is more likely to experience pulmonary complications and mortality. Patients with SARS-CoV-2 infection found to have enhanced mortality rates and serious surgical complications including pulmonary complication and surgical site infection being most common complications. Our findings supported the substantial risk of death and adverse events among COVID19 surgical patients. In our opinion creating a multidisciplinary COVID-19 committee was crucial for the creation, application, and oversight of protocols meant to reduce the risk of in-hospital transmission between patients and medical personnel. Other measures included rotating preventative quarantines for health teams, ongoing training for employees, mandatory use of personal protective equipment, and visitation restrictions for patients.

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