

# Impact of COVID-19 in Emergency Digestive Surgery

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**Abstract:** *Introduction:* The COVID-19 pandemic caused a global shift in health care management strategies. Emergency surgery remained a priority regardless of the patient's CoViD status. However, the balance between the delay in surgical management and this unprecedented pandemic situation posed a problem regarding the postoperative prognosis of patients. The main objective of our study was to investigate the outcome of patients with COVID-19 undergoing emergency digestive surgery. *Patients and Method:* In a prospective, cross-sectional, observational study, over a period of three months (from April 1, 2021 to July 1, 2021) in the surgical resuscitation and visceral surgery departments of the Joseph Ravoahangy Andrianavalona Hospital, patients "data" who underwent emergency digestive surgery with or without COVID-19. The CoViD-19 was diagnosed by a positive PCR (Polymerase Chain Reaction) result, the presence of anti-SARS-Cov-2 antibodies (IgM positive), and a chest CT scan in favor of COVID-19 pneumopathy. The Chi2 or Fisher test was used to measure the association of the different variables. *Results:* Of the 322 patients hospitalized, thirty-two patients had undergone emergency digestive surgery, twenty-two of whom stayed in the Surgical Intensive Care Unit. The median age was 40 [19-95] years. Twelve patients were infected with COVID-19. Traumatic indications occupied the first place. The time to surgery as well as the duration of surgery were significantly associated with COVID-19 infection ( $p=0.039$ ;  $p=0.05$  respectively). Ten patients died, half of them within the first 48 hours. *Conclusion:* COVID-19 was associated with a longer time to surgery and a longer hospital stay. High mortality was recorded. An update of the patients' vaccination status would be recommended to improve the postoperative prognosis.

**Keywords:** COVID-19, Digestive Surgery, Emergency Treatment, Madagascar, Mortality, SARS-CoV-2

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## 1. Introduction

The COVID-19 pandemic had disrupted health care strategies worldwide [1, 2]. The surgical sector was not spared in 2021. Indeed, although the recommendations suggested postponing scheduled surgeries, emergency surgery remained a priority regardless of the COVID-19 status of patients in order to preserve their vital prognosis [3-

5]. The recommendations were often too pragmatic and "provisional" with a low level of evidence. Each public institution had to adopt its own strategy to manage surgical indications that could not be shifted [6, 7]. The benefit-risk ratio depended on the surgical indication and the severity of the COVID-19 infection. However, weighing the delay in surgical management against this unprecedented epidemic situation, the postoperative prognosis of the patients was

problematic [8-10].

The main aim objective of this study was to assess the relationship between CoViD status and the postoperative outcome of urgent digestive surgery.

## 2. Patients and Method

This is a prospective, cross-sectional, observational study during the second wave of the COVID-19 pandemic in 2021 that lasted three months (from April 1, 2021 to July 1, 2021) in the surgical resuscitation and visceral surgery departments of the Joseph Ravoahangy Andrianavalona Hospital. The study was monocentric (Joseph Ravoahangy Andrianavalona University Hospital). It focused on patients who underwent emergency digestive surgery during the pandemic. The immune status was determined preoperatively or postoperatively. Patients with a positive Polymerase Chain Reaction (PCR) result and/or a positive IgM antibody and/or a chest scan in favor of COVID-19 pneumonia were reported as CoViD patients. Recruitment was complete. Digestive emergencies included life-threatening emergencies requiring absolute surgical intervention (penetrating abdominal wound, peritonitis...), delayed emergencies (appendicitis, feeding stomies...) and carcinological emergencies (such as colectomy, gastrectomy on tumor).

The variables studied were: age, gender, neoplasia history, ASA classification (American Society of Anesthesiologists) from I to VI, nutritional grade (from 1 to 4), performans status index (from 0 to 4), indication of the surgery, pulmonary involvement, associated procedures (digestive resection), Clavien-Dindo complications (I to V), biological variable (CRP, D-Dimers), surgical approach, time and duration of the procedure, admission and stay in Surgical Intensive Care Unit (SICU), length of stay, cause of death.

Continuous variables are expressed as median with their extremes, categorical variables as frequency or percentage. The Chi<sup>2</sup> test or the Fisher test was used to measure the associations between the length of the operation, the length of stay, the surgical approach and the early recovery. Statistical analysis was performed with Epi-info® software version 3.5.4. The significance level was below 0.05.

## 3. Results

Of the 322 patients hospitalized, 32 had undergone emergency digestive surgery, 22 of whom stayed in the ICU. Twelve patients were infected with COVID-19. The median age was 40 [19-95] years. The population was predominantly male with a sex ratio of 2.83. All patients with COVID-19 had presented with an SPI greater than 2. The ASA score was greater than or equal to III (having unbalanced morbidity (ASA = III (n=2), ASA = IV (n=2), ASA V (n=1) in the case group in 55% (n=5). The delay to management was greater than 12 hours in 60% (n=14) for patients with COVID-19 versus 44% (n=4) for patients without COVID-19. Procedure times were greater than 60 minutes in 55% (n=15) of CoViD-free patients versus 44% (n=4) of CoViD patients. For procedure duration of more than two hours, two non-CoViD patients and two CoViD patients died.

The clinical characteristics of the patients are represented in Table 1.

**Table 1.** Clinical and hospitalization characteristics of the study population.

Variables		Number (percent) (n [%])
Gender	Male	23 [72%]
	Female	9 [28%]
Age (years)	[18-30]	9 [28%]
	[40-50]	5 [16%]
	[50-60]	7 [22%]
	More than 60 years	6 [18%]

Variables		Number (percent) (n [%])
Score ASA	I	11 [34%]
	≥ II	21 [66%]
Indications	Infectious	14 [44%]
	Carcinological	8 [26%]
	Traumatic	10 [31%]
Anesthesia	General anesthesia	32 [100%]
Surgical approach	Median	27 [84%]
	Elective	5 [16%]

Inflammatory workup was marked in all patients with CRP > 5 and D- Dimers > 500 IU in 60.8% (n = 14). Undernutrition was more marked in patients infected with COVID-19 (Table 2).

**Table 2.** Profile of COVID-19 and non-COVID-19 patients undergoing emergency GI surgery.

	Variables	CoViD (n [%])	No CoViD (n [%])	p
IPS	< 2	3 [25%]	8 [40%]	0,141
	≥ 3	9 [75%]	12 [60%]	
Nutritional State	I, II	4 [33%]	18 [90%]	
	III, IV	8 [67%]	2 [10%]	

Time to intervention was not significantly associated with COVID-19 coinfection (Table 3).

**Table 3.** Perioperative characteristics of patients with and without COVID-19.

		CoViD (N [%])	No CoViD (N [%])	P
Time of the intervention (hours)	[6-12]	6 (50%)	8 (40%)	0,039
	[12-24]	3 (25%)	7 (35%)	
	≥ 24	3 (25%)	5 (25%)	
Duration of the intervention (minutes)	< 60	2 [17%]	7 (35%)	0,05
	[60 – 120]	9 [75%]	10 (50%)	
	≥ 120	1 [8%]	3 (15%)	

		CoViD (N [%])	No CoViD (N [%])	P
Clavien- Dindo score	I			
	> II	2 [17%]	8 [40%]	0,092
	< 3	2 [17%]	8 [40%]	
Stay at the SICU (days)	[3- 5]	8 [67%]	4 [20%]	< 0,001
	≥ 5	2 [17%]	8 [40%]	
	< 3	2 [17%]	2 [10%]	
Stay at the unit (days)	[3- 5]	6 [51%]	12 [60%]	0,006
	≥ 5	4 [34%]	9 [45%]	
Death		4 [34%]	6 [30%]	0,379
Delay of the death	< 48 hours	1 [8,5%]	4 [20%]	
	≥ 2 days	1 [8,5%]	4 [20%]	
Causes of the death	Sepsis	1 [8,5%]	6 [30%]	
	Respiratory distress	1 [8,5%]	2 [10%]	

Surgical approach was not significantly related to COVID-19 co-infection  $p = 0.379$ . Early lifting and COVID-19 infection were not associated  $p = 0.284$ . Time to surgery as well as duration of surgery were significantly

associated with COVID-19 infection ( $p=0.039$ ;  $p=0.05$ ). COVID-19 patients were more likely to be admitted to the ICU. Pulmonary involvement was moderate in half of the cases (Table 4).

**Table 4.** Table representing the pulmonary involvement of patients infected with Sars-Cov-2.

Affected parenchymal involvement	Less than 25%	25 - 50%	50 - 75%	More than 75%
on the thoracic scanner				
Number	3	7	2	-
Rate	25%	59%	16%	-

Ten patients died. Serious lung damage related to CoViD-19 was found in two cases (Table 5).

**Table 5.** Table comparing pulmonary involvement of deceased vs. non-die patients.

	Less than 25%	25 - 50%	50 - 75%	More than 75%
Death	2	1	1	1
No death	4	3	-	-

Traumatic indications had longer hospital stays (Table 6).

**Table 6.** Table comparing length of hospital stay by surgical indication.

	Less than 5 days	5-10 days	More than 10 days
Infectious	-	1	-
Carcinological	-	2	2
Traumatic	1	2	3
Other	1	-	-

## 4. Discussion

In general, a decrease in surgical activities in its entirety had been observed whether scheduled surgeries had been suspended as well as emergency surgeries in the present study with thirty-five surgeries only in three months (from April 1, 2021 to July 1, 2021) within the Surgical Intensive Care and the visceral surgery of the Joseph Ravoahangy Andrianavalona Hospital Center during the second wave.

The Global Surgery collaborative study in 2020 assessed the worldwide surgical activity during the pandemic over a period of 07 days [2]. At the national level, 27 procedures were performed in six hospitals in Madagascar [2]. On a global scale, 137104 patients with COVID-19 were operated on in a cohort of 140231 patients in 116 countries [2, 3].

CoViD patients to be operated on should not stop in the anesthesia room, recovery room, or any place other than the dedicated COVID operating room. They should be taken

directly to a designated operating room, which should be adequately marked with clearly visible door signs. In the event that surgery does not require general anesthesia and if the clinical situation permits, patients should continue to wear a protective mask throughout the procedure.

However, COVID-19 patients were more likely to be admitted to the ICU.

The procedures in the present study were mainly for post-traumatic hollow organ perforation peritonitis. The number of emergency surgeries did not change during the pandemic, although scheduled surgeries decreased by 25% at the beginning of the wave in Europe until the total cessation of elective surgical activities [4]. The delay of these surgeries had to be as short as possible [5]; these pathologies were considered to be at risk of sepsis in case of delayed surgery, which increased the prognosis in addition to that of SARS-CoV-2 infection [5]. However, during the COVID-19 pandemic, US reviews recommended that surgeons cool simple acute appendicitis with antibiotic therapy based on

amoxicillin and clavulanic acid in order to delay surgery [4, 6]. Life-threatening emergencies could not be deferred. Oncological emergencies were also prioritized between chemotherapy sessions according to TNCD (Thesarius National Cancerology Digestive) recommendations [7, 8]. The choice between the practice and these concepts depended on the patient's condition and disease progression.

The delay of the interventions in the present study ranged from 2 hours to 4 days depending on the degree of urgency of the indications (varying from a penetrating abdominal wound to an acute intestinal obstruction refractory to drug treatments). Yet the estimated time needed to perform scheduled surgery after a person tested positive for CoViD was seven weeks in the literature [9, 10]. The risk of mortality is still increased when patients undergo surgery within 6 weeks after contracting the disease [11]. The risk of death was 4% within two weeks of diagnosis, 3.6% after 5 to 6 weeks [6, 7]. It drops to 1.5% if the wait is 7 to 8 weeks [5]. Obviously, this delay is an indicative average and could not be adopted in our study given the degree of urgency of

our interventions, hence the higher morbidity and mortality..

This theory is reinforced by the fact that mortality is disproportionately high in all surgeries of COVID-19 patients, including elective (18.9%), emergency (25.6%), minor surgeries such as appendectomy or hernia repair (16.3%), and major surgeries such as hip surgery or colon cancer surgery (26.9%) [5, 6]. Cardiopulmonary status and the risk of venous thromboembolism are particularly relevant considerations in this patient population. The long-term cardiopulmonary effects of COVID-19 indicate a lasting physiological change. Pulmonary diffusing capacity at six months of diagnosis is still impaired for patients with severe infection [5, 6].

Cardiac abnormalities have also been noted during the recovery phase. Two to three months after infection, left ventricular ejection fraction is lower and left ventricular volume is higher than healthy patients. The majority also show persistent inflammation on cardiac MRI [6].

Surgical emergencies included mainly intestinal obstructions, peritonitis due to hollow organ perforation and acute appendicitis (Table 7).

**Table 7.** Multicenter study at three hospital sites of emergency digestive surgery over a 28-day period during the COVID-19 pandemic.

Indications	Antananarivo (CHUJRA)	Rahantaso et al [2]	Toamasina (CHU Analankininina)	Razafindraibe et al [2]
	COVID -	COVID +	COVID -	COVID +
Acute intestinal obstruction	6 (26,08%)		6 (18,75%)	-
Acute peritonitis	6 (26,08%)	3 (60%)	3 (9,38%)	2 (50%)
Abdominal trauma	2 (8,69%)	1 (20%)	3 (9,38%)	-
Appendicitis	5 (21,73%)	1 (20%)	6 (18,75%)	2 (50%)
Deep abscess	1 (4,34%)	-	3 (9,38%)	-
Haemorrhoid	-	-	3 (9,38%)	-
Others*	3 (13,04%)	-	8 (25%)	-
	23 (100%)	5 (100%)	32 (100%)	4 (100%)

(\* Infected hematoma, Cholecystectomy ...).

In our results, the inflammatory syndrome was marked. This "inflammatory storm" of COVID-19 is thought to be exacerbated by the inflammation caused by surgery, which dramatically increases the risk of postoperative complications and mortality [2]. For example, while the average mortality rate after surgery is normally less than 1%, it jumps to nearly 24% in cases of COVID-19 [6]. In May 2020, the international collaborative group "COVIDSurg" found alarming results from a recent study of 1,128 patients: a mortality rate of 23.8% and a postoperative pulmonary complication rate of 51.2% in patients with COVID-19 perioperatively (seven days before or four weeks after their surgery) [2].

Ten patients were malnourished in our study, eight of whom were infected with COVID-19.

Underlying malnutrition impairs the immune system, which can make people more vulnerable to infections such as COVID-19 and impact recovery.

The European Society for Parenteral and Enteral Nutrition (ESPEN) recommends that patients infected with COVID-19 receive nutritional supports that provide at least 400 kcal/day and  $\geq 30$  g of protein/day when oral intake is insufficient to meet estimated nutritional requirements [11].

Nutritional rehabilitation plays an important role in the rehabilitation of patients with COVID-19, especially for those

who have spent some time in intensive care. Preoperative undernutrition remains an independent risk factor for postoperative complications in digestive surgery. In addition, the French Society of Anesthesia and Intensive Care (SFAR) [Société Française d'Anesthésie et de Réanimation]) and the French Society of Clinical Nutrition and Metabolism (SFNEP) [Société Française Nutrition Clinique et Métabolisme]) recommend peri-operative nutritional management in order to reduce the operative risks due to undernutrition by means of peri-operative pharmaco-nutrients [4].

Early postoperative refeeding is also recommended, depending on the patient's tolerance, unless surgically contraindicated [11].

The mortality rate of patients with COVID-19 was 33%. In our study, age and gender were not significantly associated with death. Zheng et al [2] had identified that mortality was higher in males (28.4%) than in females (18.2%) and in patients aged 70 years or older (33.7%) compared with those aged less than 70 years (13.9%) in patients with COVID-19 [5].

Indeed, the study confirms that age is a major risk factor for severe COVID-19 or death from this disease. Men were at higher risk with a risk of hospitalization of 1.4 and death of 2.1 [4]. The X chromosome and sex hormones play a protective role by participating in innate and adaptive

immunity according to Zheng et al [5].

In the literature, age and gender, factors associated with postoperative death included cancer surgery, major procedures and emergency surgery [5].

The most vulnerable pathologies also included: trisomy 21, mental retardation, cystic fibrosis, lung transplantation, kidney transplantation, chronic end-stage renal disease on dialysis, active lung cancer in COVID-19 [7, 8]. A risk of severe form for the following pathologies were found: diabetes, obesity, arterial hypertension, cardiovascular diseases, chronic respiratory diseases including chronic obstructive pulmonary disease and tuberculosis, active cancers, neurodegenerative diseases) [1].

Chest scan is significantly more sensitive than PCR for detecting COVID-19 infection. It also allows to evaluate the severity of the pulmonary involvement. In our study, lung involvement was more than 75 percent in 2/3 of the patients who died from COVID-19 infection.

According to the National Digestive Cancer Thesaurus, the risk of 30-day mortality was twice as high if a patient was infected with SARS-CoV-2 [2]. Cancer pathology is associated with a five-fold increased risk of developing a severe form if a cancer patient with COVID-19 had undergone surgery [2].

According to a survey of surgeons in Europe on thoughts about future changes in surgical activity, 72% of surgeons had demonstrated a new relevance of surgical indications in COVID-19 patients. Approximately 74% insisted on effective collaboration between anesthesiologists and surgeons for delay indications and postponements of procedures [4].

During an active epidemic, given the large number of healthy carriers, it must be emphasized that protective measures must be used by the entire team. Almost all (96%) private or public facilities have separate management circuits for Covid + patients. The simplest strategy would have been to transfer patients to hospitals (public or private) that would not be under pressure from COVID-19. Alternatively, structures and medical teams would be separated for COVID-19 and non-COVID-19 patients [1].

Containment had delayed emergency consultations, but urgent surgery requires diligent care. If it can be performed under safe conditions, nonsurgical treatment should be considered only in cases where it is justified by strong evidence. and COVID-19 patients [1].

The strength of our study lies in its analytical nature, emphasizing the extrapolation in our results. Its limitations were mainly statistical in nature due to its low statistical power.

## 5. Conclusion

Mortality was high in patients infected with the coronavirus. This specific morbidity was more related to postoperative pulmonary complications from severe COVID-19 infection and episodes of respiratory distress than to the

surgery itself. However, the presence of sepsis worsened the prognosis of patients.

Deferring surgery was recommended in cases of severe pulmonary involvement as long as an alternative treatment was available. The complexity of certain digestive surgery procedures and possible secondary postoperative complications justify a multidisciplinary approach to the patients for nutritional assistance.

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