

Emergency Laparotomy in a COVID-19 patient with acute abdomen

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SUMMARY

We describe here the first laparotomy involving a COVID-19 patient in Malaysia. A 60-year-old man screened positive for SARS-CoV-2 in March 2020 and developed acute abdomen in the ward in Hospital Sultanah Bahiyah, Kedah. He underwent laparotomy and cholecystectomy for gangrenous cholecystitis. All personnel adhered to infectious control precautions, donning full personal protective equipment (PPE) throughout the surgery. Post-operatively, due to raised septic parameters, he was carefully diagnosed with and treated empirically for superimposed bacterial sepsis instead of cytokine release syndrome, with confirmed blood culture of *Klebsiella pneumoniae*. Patient was discharged well later. None of the staff involved in his care developed COVID-19 infection.

INTRODUCTION

COVID-19 disease was declared a pandemic on 11th March 2020 by the World Health Organisation (WHO) and the first case in Malaysia was reported on 25th January 2020. Subsequently, a new COVID-19 cluster was identified on 27th February, involving 4,942 attendees of *Tabligh* (religious) gathering at Sri Petaling, Malaysia.

Hospital Sultanah Bahiyah (HSB) is a 923-bedded referral centre of COVID-19 cases in the state of Kedah. The Department of Surgery has designated a separate team within the department who will scrub in for all COVID-19 surgical cases. Surgeries were carried out according to principles outlined in the Ministry of Health (MOH) guidelines on Management of Coronavirus Disease 2019 in Surgery, which included minimal staffing, adherence to infectious control precautions, donning of personal protective equipment (PPE) (N95 mask, goggles, disposable gowns, double gloves), pre-operative intubation and post-operative extubation in a negative pressure room at the intensive care unit (ICU). There is a reserved operation theatre (OT) with stand-alone air-conditioning system and modified air handling unit (AHU) to prevent return of air ventilating the theatre, which was located next to the emergency department (entry point of HSB) used for all COVID-19 surgeries in the hospital.

COVID-19 positive patients may be asymptomatic, pre-symptomatic (not yet develop signs and symptoms of

pneumonia upon positive swab) or symptomatic upon swab detection. Symptomatic COVID-19 patients develop lower respiratory tract infection which may progress to acute respiratory distress syndrome (ARDS) with severe hypoxaemia. A subgroup of COVID-19 patients may develop cytokine-release syndrome (CRS) which is the unregulated release of characteristic cytokines (interleukin (IL) 6), persistent fever, with organ and tissue damage, conferring high mortality rate to the host.

We describe here the multidisciplinary management of a 60 year-old, pre-symptomatic COVID-19 positive male who developed acute abdomen in ward requiring laparotomy, complicated with COVID-19 pneumonia, bacterial sepsis and multi-organ impairment post-op.

CASE REPORT

A 60-year-old Indian national man attended a religious gathering at Sri Petaling, Malaysia in March 2020. Following the outbreak of COVID-19 at that gathering, he tested positive (real-time reverse-transcriptase polymerase chain reaction (RT-PCR)) for SARS-CoV-2 in Kedah yet remained asymptomatic. Patient was subsequently admitted to the COVID-19 isolation ward at HSB. He has type II diabetes mellitus and hypertension. Five days after admission, he had persistent right hypochondriac pain, fever and vomiting. As abdominal pain could be the presenting symptoms of COVID-19 infection, oral Hydroxychloroquine was initiated. Two days later, he developed generalised peritonitis and was planned for laparotomy. Pre-operative chest X-ray (CXR) showed bilateral peripheral, ground-glass heterogeneous opacities thus suspension Lopinavir-Ritonavir (Kaletra®) was started prior to transfer to ICU.

Patient was transferred from the COVID-19 isolation ward to ICU for pre-operative intubation. He was then sent to the operation theatre (OT) dedicated for COVID-19 cases for surgery. The surgical team consisted of a consultant general surgeon, a general surgeon, a medical officer, two nurses and one consultant hepatopancreatobiliary surgeon (who was later called in to assess the necrotic-appearing cystic duct). All OT personnel donned and doffed full PPE, supervised by the infectious control team. The anaesthesiology team, consisting of a consultant anaesthetist and a medical officer, both wore powered air-purifying respirator (PAPR) suits, while the

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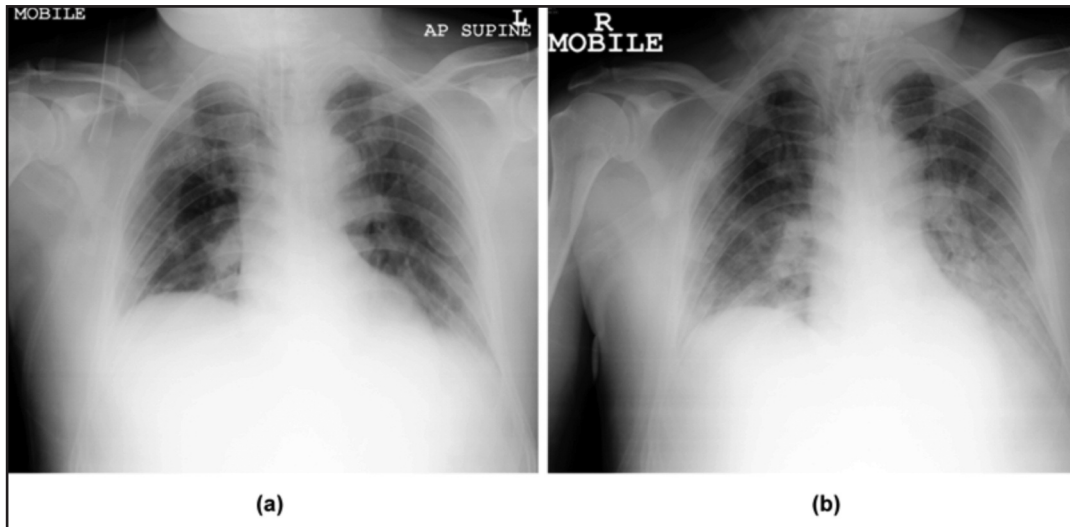


Fig. 1: (a) Chest X-ray (CXR) POD1, (b) CXR POD4.

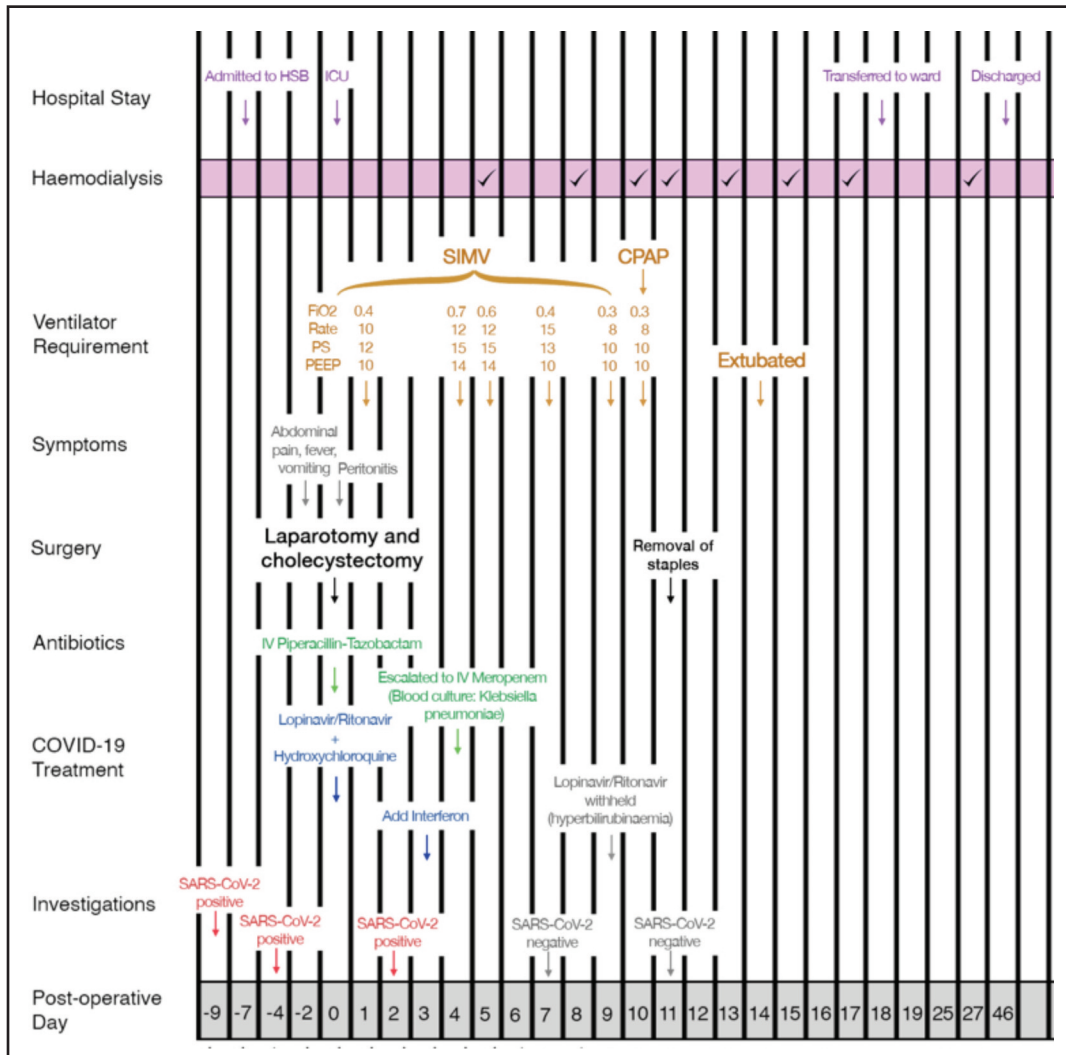


Fig. 2: Timeline of patient care.

anaesthesiology medical assistant donned full PPE. Disposable drapes and gowns were used for surgery. Laparotomy was undertaken, revealing a gangrenous gallbladder with a viable cystic duct, thus cholecystectomy was done. There was also a localised collection of 100ml bilious peritoneal fluid at the right upper quadrant with 40ml of dirty bile spillage during mobilisation of gallbladder, albeit no interloop collection was seen. Duration of the surgery was two hours.

Post-operatively, the patient was transferred to ICU. He required single inotropic support (IVI Noradrenaline 2ml/hr, 8mg/ml) and was started on IV Piperacillin-Tazobactam. Post-operative CXR revealed worsening bilateral ground-glass opacities at the periphery of lower zones (Fig. 1). On post-op day (POD) 3, patient was considered as critically-ill with multi-organ involvement and was started on subcutaneous injections of Interferon beta-1b 44mcg EOD for four doses.

On POD4, bile culture grew *Weissella (Lacto.) confusa* (gram positive bacilli) and tracheal aspirate culture grew *Klebsiella pneumoniae* (Extended spectrum beta-lactamase producing organism (ESBL)). Patient was febrile (Temperature: 39.7°C) with double inotropic support and leucocytosis (WCC 5.9 → 23.3 x10⁹/L). As the sepsis worsened, patient developed acute kidney injury (AKI) and underwent haemodialysis (HD) on POD5. In view of persistently high C-reactive protein (CRP) levels (>154mg/L), rising ferritin levels (1474 → 2849 → 3894ng/mL) and rising procalcitonin levels (3.53 → 4.76 → 79.37µg/L), he was treated for bacterial sepsis instead of CRS with IV Meropenem 1g TDS and IV Ampicillin-Sulbactam 9g TDS. Two days later, blood culture returned as *Klebsiella pneumoniae* (ESBL). His response to treatment is reflected in reducing levels of procalcitonin level (8.3µg/L on POD8) and CRP (36.07mg/L on POD12).

On POD9, patient's bilirubin and alanine transaminase (ALT) levels rose (Bilirubin: 20 → 59 → 129µmol/L, ALT 46 → 61 → 77U/L). Bedside abdominal ultrasound revealed no biliary tree obstruction. Patient was treated as drug-induced hyperbilirubinaemia and suspension Lopinavir/Ritonavir was withheld, following which bilirubin and ALT levels normalised.

Patient's wound healed well and the gallbladder histopathological examination (HPE) revealed acute on chronic cholecystitis. Throughout ICU admission, patient required 8 sessions of dialysis. His SARS-CoV-2 swab samples were negative from 4th sample onwards. He was extubated on POD13 and transferred to COVID-19 isolation ward on POD17 for rehabilitation and renal recovery. He was discharged well on POD46. None of the staff involved in his care developed COVID-19 infection.

DISCUSSION

In comparison with the single-centre, 8-patient COVID-19 positive cohort requiring abdominal surgery in Wuhan,¹ our patient was the first critically-ill COVID-19 patient who was discharged well post-emergency laparotomy.

The benefit of abdominal computed tomography (CT) scan in a COVID-19 patient with acute abdomen has to be weighed with risks of viral transmission to patients and staff at the Radiology department. As with regular patients, COVID-19 patients with generalised secondary peritonitis are indicated for laparotomy regardless of imaging^{2,3}. Similarly, all COVID-19 patients with acute abdomen - without secondary peritonitis - should not have the appropriate imaging study delayed if indicated, regardless of COVID-19 status. An elderly man from China⁴ underwent laparotomy for iatrogenic peptic ulcer perforation upon discovering pneumoperitoneum on CXR - which is an indication for surgery - thus he underwent early emergency surgery with minimal exposure of radiation required to treat his disease. Our patient was clinically diagnosed with secondary peritonitis, which was an indication for laparotomy, thus CT scan was not done before surgery. Similarly, DA Soesolo et al.⁵ subjected their patient for laparotomy upon discovering peritonism, although their patient died after surgery due to complications of bowel necrosis. Our patient was a good candidate for surgery as he was haemodynamically stable with no comorbidity prior to laparotomy.

Pre-operative imaging should be considered in patients who are haemodynamically stable with localised peritonitis² to assess the extent of containment of perforation for consideration of non-operative, percutaneous drainage of abscesses if present (i.e., percutaneous transhepatic cholecystostomy for gallbladder empyema or percutaneous pigtail drainage of localised diverticular abscess). Patients with peritonitis may have significant interloop collection which requires peritoneal washout with large amount of normal saline, thus we regard laparotomy as the more time-efficient procedure than laparoscopy to explore and definitively eliminate the surgical source of sepsis in COVID-19 patients.

Post-operatively, we monitored the progression and response to treatment of pneumonia using portable chest X-rays with machines reserved for COVID-19 patients in the ICU. Therefore, the pre- and post-operative CT Thorax changes of ground-glass appearance and pleural effusion seen in the Wuhan¹ cohort were not ascertained in our patient.

Culture from pus obtained intra-operatively grew *W.confusa*, a gram positive bacilli which is intrinsically resistant to Vancomycin. This organism is commonly found in fermented food and raw milk, which our patient consumes.

Our patient developed COVID-19 pneumonia with superimposed ESBL *K.pneumoniae* bacteraemia, complicated with multi-organ involvement. Surgical patients with COVID-19 who develop persistent temperature and worsening septic parameters must be carefully diagnosed with either CRS, bacterial sepsis or new-onset sepsis, as the treatment differs for each diagnosis; CRS is treated with tocilizumab (interleukin-6 receptor antagonist) and steroids as well as discontinuation of interferon, while sepsis is treated with antibiotics.

CONCLUSION

Emergency surgery for acute abdomen in COVID-19 patients should not be delayed by pre-operative CT scan if the indication for surgery is met. Post-operative COVID-19 patients with persistent fever and rising septic parameters should be promptly diagnosed and treated for either new-onset sepsis or CRS as treatment differs for each diagnosis. All surgical patients with COVID-19 pneumonia require close monitoring and early multidisciplinary team management where indicated.

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