**Case Report**

Emergency endoscopic variceal band ligation in a COVID-19 patient presented with hematemesis while on mechanical ventilation

Mohamed El Kassas,1 Ahmad Al Shafie,1 Abo Seif Abdel Hameed2 and Mamdouh Mahdi3

1Endemic Medicine Department, 2Anesthesia and ICU Department and 3Internal Medicine Department, Faculty of Medicine, Helwan University, Cairo, Egypt

COVID-19, caused by severe acute respiratory syndrome coronavirus (SARS-CoV-2), is now a global pandemic with serious health consequences. Currently, many strict control measures are applied in health care settings, including endoscopy units, in order to limit virus spread. Several recommendations called to limit endoscopic procedures to emergent endoscopies; however, several uncertainties still exist concerning patient safety, protective measures, and infection control methods in emergency endoscopic settings. In this case report, we present a case of successful endoscopic band ligation for bleeding esophageal varices in man with COVID-19 disease who presented with an acute attack of hematemesis while on mechanical ventilation (MV). Esophago-gastroduodenoscopy was performed in the ICU room after preparing the setting, and revealed large, risky esophageal varices. Endoscopic band ligation was done with successful control of bleeding. Third-level measures of medical protection were applied for the participating medical personnel, and patient monitoring was maintained all through the procedure. After the procedure, the bleeding stopped, and the patient was vitally stable and conscious. We conclude that emergency endoscopic interventions could be performed safely with appropriate arrangements in patients with confirmed COVID-19 on MV.

**Key words:** band ligation, COVID-19, endoscopic intervention, hematemesis, mechanical ventilation

**INTRODUCTION**

A **NOVEL CORONAVIRUS** named COVID-19 that was initially reported in Wuhan, China1 has been diagnosed in more than one million people worldwide, according to the World Health Organization (WHO) up to the submission date.2 COVID-19 is currently the world’s most clamoring public health threat owing to its significant impact on individuals and health care systems. Transmission usually occurs through small droplets from normal breathing, coughing and sneezing, and by aerosols or infected secretions and discharge.3,4 Additionally, some reports have confirmed the virus’s existence in gastrointestinal epithelial cells, raising the possibility of feco-oral transmission.5 Endoscopy units are currently challenged with many restrictions during this outbreak. To date, several reports and technical guidance have been issued by different academic bodies to advocate practices in endoscopic procedures.5 Specific standards are currently implemented in the majority of endoscopy units worldwide; most of the applied rules are derived from our previous experiences with severe acute respiratory syndrome in addition to the currently known facts regarding COVID-19. The most important regarding these recommendations are the necessity to limit the endoscopies to the emergency procedures like gastrointestinal bleeding, impacted foreign bodies, and biliary obstruction.7 It is also mandatory to assess the patient risk according to case definitions established by WHO and local health authorities. According to this risk stratification, patients are considered as either low risk or high risk based on fever, presence of respiratory symptoms, diarrhea, and history of contact with a case.8 The minimum requirements for personal protective equipment for health care workers in endoscopy units are the use of gloves, hairnet, protective eyewear (either goggles or face shield), waterproof gowns, and respiratory protective equipment, modified on the basis of risk stratification. Another important issue is the health education for personnel regarding the infection control measures and needed precautions for suspect and probable COVID-19 patients.9 However; numerous uncertainties are still present concerning patient safety, methods for...
protection of health care providers, and how to avoid nosocomial infection in emergency endoscopic settings.

CASE REPORT

Here, we report a case of successful endoscopic band ligation for bleeding esophageal varices in a man with COVID-19 disease who presented with an acute attack of hematemesis while on mechanical ventilation (MV). On 24 March, 2020, a 59-year-old man with history of hepatitis C virus (HCV)-related chronic liver disease, was referred to the 15 May COVID-19 quarantine hospital for admission with confirmed COVID-19 that was diagnosed a day before in another chest hospital by a positive sample of oropharyngeal swabs by RT-PCR assay. Chest CT revealed multiple bilateral patchy lung consolidations and ground-glass opacities, likely the typical radiologic picture of COVID-19 (Fig. 1). The patient is hypertensive on amlodipine and atenolol, and diabetic on sitagliptin/metformin combination. He gave a history of HCV-related liver cirrhosis with antiviral treatment ineligibility because of advanced cirrhosis, and no previous endoscopy was done before. The patient was fully conscious and vitally stable upon admission with mild dyspnea and cough. The patient started treatment according to the established COVID-19 protocol with oseltamivir, levofloxacin, and meropenem. Two days later, he developed pulmonary edema because of uncontrolled hypertension (200/120), and was admitted to ICU and started glyceryl trinitrate infusion. On 29 March 2020, the patient was intubated, and MV was started because of conscious level disturbance (GCS 9/15). Oxygen saturation was 98% at this time. Two days later, an acute attack of hematemesis occurred, which was initially treated through intravenous fluids, plasma transfusion, pantoprazole, and octreotide infusion. Over the next 12 h, these measures were not sufficient to stop bleeding. Esophagogastroduodenoscopy (OGD) was arranged for the patient inside the ICU room by mobilizing the endoscopy station to the ICU and preparing the setting for conducting the procedure. The medical team who attended the procedure was composed of the operator doctor, the anesthesiologist, and an endoscopy trained nurse. The endoscopy tower and medical staff were all located on the left side of the patient’s bed. The layout of the endoscopy setting prepared in the ICU room is shown in Figure 2a, and an image for the settings of the procedure and performed banding are shown in Figure 2b. OGD was done using a 9 mm gastroscope (2.8 mm working channel) and revealed three large columns of risky esophageal varices with overlying nipple sign and stigmata of active bleeding. The stomach was full of blood with a picture of mild

Figure 1 Layout of the endoscopy setting prepared in the ICU unit.

Figure 2 (a) Chest CT revealing multiple bilateral patchy lung consolidations and ground-glass opacities, (b) The settings of the procedure and the endoscopy image.
portal hypertensive gastropathy. Endoscopic band ligation was performed with successful control of bleeding. Third-level measures of medical protection were applied in the ICU room, including handwashing, using the protective medical standard mask (N95), disposable surgical cap, face protective shield, goggles, disposable long sleeve water-resistant gown, two pairs of gloves, long boots, and disposable shoe covers.10 Peri-procedural monitoring included peripheral venous catheterization, ECG, pulse oximetry, noninvasive BP, in addition to MV monitoring. Laboratory findings of the patient over the admission period are detailed in Table 1, and peri-procedural findings are shown in Table 2. The patient was put in the supine position, and based on the symptoms of COVID-19 and the associated liver condition, propofol injection was used for anesthesia with an induction dose of 80 mg, followed by 120 mg maintenance during the duration of the procedure (30 min). No visible or definite exposure to any body fluids from the patient was recorded during the operation. Two cycles of disinfection in the automated endoscopy washing machine was done using activated dialdehyde; each cycle lasted for 20 min. After the procedure, the bleeding stopped; the patient was vitally stable, conscious and was kept in ICU for further follow up. Ceftriaxone 2 g daily was added to the patient list of medications for 3 days. The patient was removed from MV 2 days after the procedure, and his nasopharyngeal swab tested negative for COVID-19. After the procedure, none of the staff who attended the endoscopy acknowledged the occurrence of fever or any other symptom suggestive of infection. The first nasopharyngeal swab checks

Table 1 Laboratory findings of the patient before and after the endoscopy

| Date  | 28/3 | 30/3 | 31/3 | 1/4 | 2/4 |
|-------|------|------|------|-----|-----|
| TLC   | 13.9 | 7    | 6.2  | 13.2| 12.8|
| Lymphocyte | 3   | 1.2  | 1.1  | 1.6 | 1.6 |
| Granulocyte | 10.1 | 5.4  | 4.8  | 10.2| 10.7|
| Hb    | 11.8 | 10.3 | 9.9  | 7.9 | 8.7 |
| Ptt   | 126  | 72   | 62   | 58  | 89  |
| Urea  | 94   | 75   | 53   | 80  | 100 |
| Creatinine | 1.1 | 0.3  | 0.73 | 1.1 | 0.68|
| Na    | 113  | 123  | 118  | 120 | 120 |
| K     | 5    | 4.5  | 4.8  | 4.7 | 4.4 |
| AST   | 99.5 | 43   | 36   | 1350| 945 |
| ALT   | 71   | 41   | 33   | 1060| 810 |
| Albumin | 2.6 | 2.63 | 2.47 | 3.1 | 3   |
| T. Bilirubin | 1.02 | 1.04 | 0.95 | 1.04| 1.4 |
| D. Bilirubin | 0.66 | 0.67 | 0.54 | 0.69| 0.73|
| PC %  | 45%  | 32%  | 38%  | 42% | 42% |
| CRP   | 65   | 48   | 48   | 52  | 55  |
| ESR   | 60   | 60   | 50   | 55  | 60  |

ALT, alanine transaminase; AST, aspartate transaminase; CRP, c-reactive protein; ESR, erythrocyte sedimentation rate; Hb, hemoglobin; K, potassium; Na, sodium; PC%, prothrombin concentration; Ptt, platelet count; TLC, total leucocytic count.

Table 2 Peri-procedure data of the patient

| Before procedure | During procedure | At the end of the procedure |
|------------------|-----------------|-----------------------------|
| BP 100/60       | 90/50           | 95/65                       |
| HR 120          | 123             | 119                         |
| O₂ sat. 99%     | 99%             | 99%                         |
| MV setting      | SIMV 60%        | SIMV 100%                   |
| Conscious level | Conscious       | Sedated                     |
| GCS E4 VT M6 (10 T) | Sinus tachycardia | Sinus tachycardia     |
| ECG             | Sinus tachycardia| propofol                    |
| Drug            | Pantoprazole infusion | Octreotide, pantoprazole infusion |

BP, blood pressure; ECG, electrocardiogram; CS, Glasgow Coma Scale; HR, heart rate; MV, mechanical ventilator; O₂ sat., oxygen saturation; SIMV, synchronized intermittent mandatory ventilation.
for the whole team were negative, and are scheduled to be repeated after a week.

**DISCUSSION**

The COVID-19 virus pandemic has challenged the medical care infrastructure and called for new restrictions and recommendations in various health care settings, including endoscopy units. Due to difficulty in predicting an end for such an outbreak, and the expectancy of having future epidemics of the virus, efforts should be made to explore and settle appropriate tools and limitations for dealing with everyday medical emergencies until this epidemic is controlled. To our knowledge, this is the first report describing an endoscopic intervention in a critically ill patient with COVID-19 on MV. The situation of having the patient on MV with endo-tracheal intubation could add a privilege for this case as it helped to protect airways from aspiration with the continuous active bleeding during the maneuver. Moreover, such a protection for the airway with the resulting closed respiratory circuit could reduce the possibility for COVID-19 infection transmission. Despite the technical difficulties, fears of infection transmission, and the proven extraordinary risk in dealing with a lethal respiratory virus, it was possible to conduct a life-saving endoscopic procedure.

In conclusion, emergency endoscopic interventions could be performed safely with appropriate arrangements in patients with confirmed COVID-19 on MV. However, more evidence and a large number of cases are required to confirm our findings.

**ETHICAL CONSIDERATIONS**

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. An informed consent was obtained from the legal representative of the participant included in the study.

**ACKNOWLEDGMENT**

Authors acknowledge the great effort and sacrifice of the medical staff and nurses working in COVID-19 quarantine hospitals all over the world.

**CONFLICT OF INTEREST**

Authors declare no conflict of interests for this article.

**FUNDING INFORMATION**

No funding was received to accomplish this work.

**REFERENCES**

1. Wu F, Zhao S, Yu B et al. A new coronavirus associated with human respiratory disease in China. Nature 2020; 579: 265–9.
2. WHO. Novel Corona virus situation report. [Cited 2 April 2020]. Available from URL: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports.
3. Jiang F, Deng L, Zhang L, Cai Y, Cheung CW, Xia Z. Review of the clinical characteristics of coronavirus disease 2019 (COVID-19). J Gen Intern Med 2020; 35: 1545–9. https://doi.org/10.1007/s11606-020-05762-w
4. Ye Q, Wang B, Mao J et al. Epidemiological analysis of COVID-19 and practical experience from China [published online ahead of print, 2020 the 1st of April]. J Med Virol 2020. https://doi.org/10.1002/jmv.25813
5. Tian Y, Rong L, Nian W, He Y. Review article: gastrointestinal features in COVID-19 and the possibility of faecal transmission. Aliment Pharmacol Ther 2020; 51: 843–51. https://doi.org/10.1111/apt.15731
6. Lui RN, Wong SH, Sánchez-Luna SA et al. Overview of guidance for endoscopy during the coronavirus disease 2019 (COVID-19) pandemic. J Gastroenterol Hepatol 2020; 35: 749–59. https://doi.org/10.1111/jgh.15053
7. Endoscopy activity and COVID-19: BSG and JAG guidance – update 6.04.20. [Cited 6 April 2020]. Available from URL: https://www.bsg.org.uk/covid-19-advice/endoscopy-activity-and-covid-19-bsg-and-jag-guidance/.
8. Zhang Y, Zhang X, Liu L, Wang H, Zhao Q. Suggestions for infection prevention and control in digestive endoscopy during current 2019-nCoV pneumonia outbreak in Wuhan, Hubei province, China. Endoscopy 2020; 52: 312–4.
9. Musa S. Hepatic and gastrointestinal involvement in coronavirus disease 2019 (COVID-19): What do we know till now? Arab J Gastroenterol 2020; 21: 3–8. https://doi.org/10.1016/j.ajg.2020.03.002
10. Chen X, Shang Y, Yao S, Liu R, Liu H. Perioperative care provider’s considerations in managing patients with the COVID-19 infections. Transl Perioper & Pain Med 2020; 7: 216–24. https://doi.org/10.31480/2330-4871/116