



Case Report

Delayed definitive treatment of life-threatening neurosurgery patient with suspected coronavirus disease 2019 infection in the midst of pandemic: Report of two cases

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) pandemic has affected global health system; in the context of the COVID-19 pandemic, both surgeon and anesthesiologist often dealt with emergency situation, optimal timing of surgery and safety protocol in hospital setting must be implemented with many facets for both patients and health-care providers.

Case Description: We reported two cases. Case#1 - A 16-year-old male was referred to our hospital, due to a decreased of consciousness following a motor vehicle accident. Head CT scan revealed an epidural hemorrhage on the left temporoparietal. The patient was suspected for having COVID-19 from the reactivity of his serum against SARS-CoV-2 antigen. Procedures for the confirmation of COVID-19 and surgical preparation caused 12 h delayed from the admission. Nevertheless, the patient was deteriorated clinically before he was transported to the operating room and died after 6 cycles of cardiopulmonary resuscitation. Case#2 - A 25-year-old male was referred to RSHS, due to a decreased of consciousness, diagnosed as bilateral proximal shunt exposed with suspected COVID-19; delay occurred due to unavailability of negative pressure intensive unit for postoperative care. This caused 5760 h (4 days) delayed for bilateral shunt removal and temporary extraventricular drainage.

Conclusion: Optimal timing of surgery, a good safety, and health protocol during pandemic in emergency setting are an obligation to protect health providers and patients. A decision-making plan must be organized precisely to maintain alertness, achieve the highest possible standard of care, and outcome in emergency surgical cases. Lack of monitoring must be abated to avoid fatality for patient, especially in emergency surgery setting.

Keywords: Definitive treatment, Neurosurgery, Suspected Coronavirus disease 2019 patients

INTRODUCTION

Coronavirus disease 2019 (COVID-19) pandemic has affected global health-care system.^[5] Conducting surgery in the middle of pandemic era is challenging.^[11] Despite medical emergency, health and safety protocol in hospital setting must be implemented with many facets for health providers and patients.^[1] Health protocols were recommended and prepared from the emergency

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room, screening for COVID-19 is mandatory for patients, surgical team, and other assistances to minimize the effect of the pandemic during surgery.^[1] However, even in the time of pandemic, dealing with emergency cases and life-threatening conditions should not be postponed.^[13] In this report, we aim to describe the results of our screening system for suspected COVID-19 patients and to evaluate the response time to surgery (before COVID-19 era, the average 1–2 h); we reported two cases of delayed emergency surgical procedure due to a prolonged protocol in two patients whom were found to be reactive for rapid IgM SARS-CoV-2 antibody test and were proven to be fatal.

CASE PRESENTATION

Characteristics of patients with suspected COVID-19 in our emergency unit

The initial screening for potential COVID-19 infection was conducted by the emerging and reemerging infectious disease team (PINERE). Patients were screened for COVID-19 before surgery by PINERE using RSHS modified early warning score (RSHS EWS consists of standard questionnaire, laboratory, and radiology). Suspected COVID-19 was declared based on RSHS EWS values ≥ 5 . Between May 1, 2020, and June 31, 2020, 166 patients were consulted to our unit with indications for emergency surgical procedures, with 30 subjects (18.1%) who were declared as patients with suspected COVID-19. The median age was 35 years old (YO) [the youngest 15 YO and the oldest 64 YO]. Most cases were female ($n = 19$; 63.3%) with obstetric as the most common group ($n = 17$; 56.7%). Majority of subjects were referred from other cities ($n = 22$; 73.3%) and only 8 patients (26.7%) came from our city. We observed that more than a half of patients were came without *symptoms* of COVID-19 ($n = 17$; 56.7%); only 10 patients (33.3%) with fever, 5 patients (16.7%) with cough, and 3 patients (10%) with dyspnea. Radiological examination shown half of patients ($n = 15$; 50%) suspected pneumonia on their chest X-ray. RSHS EWS values ≥ 5 for COVID-19 were only 2 patients (6.7%). The mean value of leukocyte was $12,735.2 \pm 5033.9/\text{ul}$, absolute lymphocyte was $1690.8 \pm 982.8/\text{ul}$, lymphocyte was $15.96 \pm 10.9\%$, neutrophil was $76.56 \pm 12.2\%$, and neutrophil-lymphocyte ratio was 10.8 ± 18.1 . The average response time of suspected COVID-19 patients from arrival to surgery was 14 h 24 min \pm 4 h 1 min with the median response time which was 10 h (min 40 min and max 96 h) [Table 1]; unfortunately, there was two dead cases reported in this study.

Death case report #1: Medical history and physical examination

A 16 YO boy who was riding a motorcycle without helmet was hit by another motorcycle and suffered a moderate

traumatic brain injury (TBI), was found unconscious and admitted to our center. Primary survey shown a clear airway with C-spine control, body temperature of 37.3°C, heart rate 100×/m, respiratory rate 22×/m, blood pressure 120/80 mmHg, and Glasgow Coma Scale (GCS) of 10 (E₃M₅V₂). Cardiorespiratory examination showed no abnormalities. Pupils were round, isochoric with diameter of 3 mm on both eyes, normal pupillary reflex, and no motor weakness on both extremities. However, we found a hematoma on his left temporal.

Laboratory findings

We conducted routine laboratory examination and rapid antibody against SARS-CoV-2 for routine screening during pandemic. All hematology parameters were normal except for a slight leukocytosis (leukocyte 17,340/ μL). However, the patient was found to be reactive for SARS-CoV-2 antigen at 5 h from admission.

Diagnostic imaging

Patient's chest x-ray within normal limits [Figure 1]. The noncontrast head CT scan of the patient showed soft-tissue swelling on the left temporal [Figure 2a], compressed sulci, gyri, Sylvian fissure, ventricles, and a massive biconvex hyperdense mass on the left temporoparietal region (± 40 cc) with midline shift >5 mm [Figure 2b]. Diagnosis of moderate TBI and epidural hematoma (EDH) of the left temporoparietal were established.

Treatment

We planned an emergency craniotomy. However, surgery to evacuate EDH was delayed due to health and safety protocols for patients suspected with COVID-19. As soon as the



Figure 1: A preoperative chest X-ray radiograph on patient #1 showed within normal limits.

Table 1: Characteristics of patients with suspected COVID-19 presenting to emergency unit in a tertiary referral hospital in Indonesia.

| Characteristic | Patient (n=30); n (%) |
|------------------------------------|--|
| Age, median (in years) | 35 (min 15, max 64) |
| Gender | |
| Female | 19 (63.3) |
| Male | 11 (36.7) |
| Case origin | |
| Referred | 22 (73.3) |
| Local | 8 (26.7) |
| Symptoms | |
| None | 17 (56.7) |
| Fever | 10 (33.3) |
| Cough | 5 (16.7) |
| Dyspnea | 3 (10.0) |
| Radiological examination | |
| Within normal limit | 15 (50.0) |
| Suspected pneumonia on chest X-ray | 15 (50.0) |
| RSHS EWS COVID-19 score | |
| <5 | 28 (93.3) |
| >5 | 2 (6.7) |
| Type of surgery | |
| Obstetric and gynecological | 17 (56.7) |
| Digestive | 4 (13.3) |
| Neurosurgery | 3 (10.0) |
| Vascular | 2 (6.7) |
| Orthopedic | 2 (6.7) |
| Plastic | 1 (3.3) |
| Urology | 1 (3.3) |
| Laboratory results (Mean±SD) | |
| Leukocyte count (μL) | 12,735.2±5033.9 |
| Absolute lymphocyte count (/μL) | 1690.8±982.8 |
| Lymphocyte percentage (%) | 15.96±10.9 |
| Neutrophil percentage (%) | 76.56±12.2 |
| Neutrophil-lymphocyte ratio | 10.8±18.1 |
| Response time of suspect COVID-19 | |
| Average±SD (min) | 854.23±244 → (14 h, 24 min+4 h, 1 min) |
| Median (min) | 600 (min 40, max 5760)– (min 40 min, max 96 h) |

suspected COVID-19 diagnosis was established, the patient was moved to a separate COVID-19 isolation room with less neurological monitoring. There was no burr hole equipment in our emergency room for COVID-19 patients. Every patient suspected or confirmed with COVID-19 was consulted to PINERE team in infection and operating room (OR) needs more time to be prepared for an infectious patient. This caused 12 h delayed from the admission. Nevertheless, the patient was deteriorated clinically before he was transported to the OR and died after 6 cycles of cardiopulmonary resuscitation.

Dead case report #2: Medical history and physical examination

A 25 YO male, 3 days before admission, the patient looked drowsy and difficult to be awoken; the complaint preceded with cough, shortness of breath, and fever. His family complained of exposed shunt since a month ago. Primary survey was within normal limit, body temperature of 38.9°C, heart rate 118×/m, respiratory rate 26×/m, blood pressure 130/80 mmHg, and GCS of 7 with tracheostomy (E₂M₅Vtc); on respiratory examination, crackles were heard in both side of the lungs, but O₂ saturation was still within the range of 96–98%. Pupils were round, an isochore with 3/5 mm in diameter, absent of pupillary reflexes on the left side, and at bilateral Kocher point, the proximal part of the shunt was found exposed at both parietal regions.

Laboratory findings

We conducted laboratory examination and the antibody test against SARS-CoV-2 for screening. The result was found to be reactive for SARS-CoV-2 antigen after 1 day since the admission; hematology parameters were within normal limits.

Diagnostic imaging

The chest X-ray showed homogenous radio-opaque areas in bilateral lung fields suggestive as bilateral pneumonia [Figure 3]. We did not perform neuroimaging examination. Diagnosis of bilateral exposed shunt at proximal part due to postventriculoperitoneal (Vp) shunt due to postexternal ventricular drainage (EVD) due to the shunt malfunction due to postcraniectomy evacuation was established.

Treatment

As soon as the suspected COVID-19 diagnosis was established, the patient was treated in emergency COVID-19 isolation room. However, surgery to remove the both shunt tubes was delayed due to health and safety protocols. After consulted to PINERE team and OR ready for surgery, another delay occurred due to the full capacity of the COVID ICU for the postoperative care. This caused 5760 h or 4 days delayed from the admission administration to, in this case, bilateral shunt removal and temporary EVD.

DISCUSSION

A total of 30 patients (18.1%) from 166 patients were consulted to our emergency unit with consideration as a suspected COVID-19 patient (May–June 2020); only one patient had reverse transcription polymerase chain reaction (RT-PCR) (+). Most of the cases were female (63.3%) and needed emergency cesarean (SC) section. Female predominant for emergency surgery and suspected to have

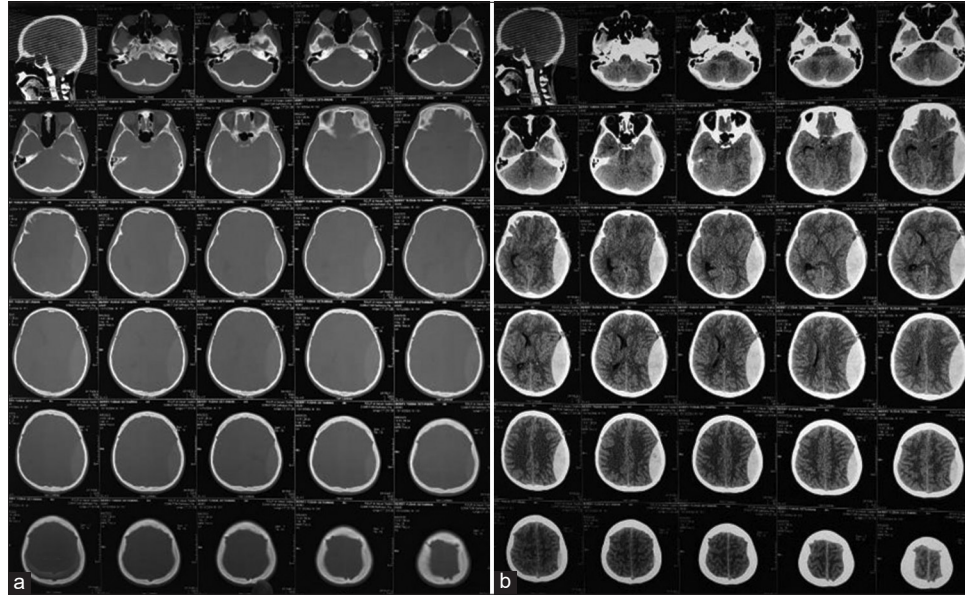


Figure 2: Following of the noncontrast head CT scan showed the presence soft-tissue swelling on the left temporal without bone fracture (a); compressed sulci, gyri, Sylvian fissure, and ventricles, then a massive biconvex hyperdense mass on the left temporoparietal region (± 40 cc) with midline shift >5 mm (b).



Figure 3: A preoperative chest X-ray radiograph on patient #2 showed the presence of homogenous radio-opaque areas in bilateral lung fields suggestive a bilateral pneumonia.

COVID-19 is similar to previous studies in the US and Italy, since SC is the most common surgery done in all countries including Indonesia.^[7,24] One confirmed COVID-19 patient presenting to our emergency unit had no COVID-19 symptoms. Reports from China and the World Health Organization, 1.2–10% of COVID-19 patients show typical symptoms.^[10]

Death case report #1

TBI is one of the leading cause of death in young people, especially in the Southeast Asia.^[6] EDH is one of the least

common types of TBI (about 1% of all types) and with proper management, both conservative and surgical, the outcome tends to be favorable and delayed treatment could lead to deteriorating effects causing morbidity and mortality.^[15,16] Surgery is indicated when there is more than 30 ml of hemorrhage regardless of the patient's GCS.^[3] In our case, the volume of the EDH was 40 ml, so surgical evacuation should have been done as soon as possible. Society of British Neurological Surgeons Guidelines suggested that emergency craniotomy for indicated TBI should be performed within 4 h since TBI.^[21] Slight delayed until ± 6 h was shown to be acceptable.^[4] However, delayed surgical treatment >12 h since the admission was associated with higher unfavorable outcome.^[18] In our case, there was a 12.5 h “transit time” in the emergency isolation room until the patient passed away before receiving a life-saving craniotomy.

There were several reasons for devastating outcome in this patient. First, during the early months of the pandemic, our hospital was not equipped with on-site PCR equipment with COVID-19 and since the previous studies have shown that COVID-19 has a typical pneumonia-like symptom without a specific clinical characteristic, it was difficult to diagnose. The only available kit for screening on that period was a rapid antibody test which on previous reports shows promising sensitivity and specificity for SARS-CoV-2 active infection although later studies rebutted those results; we used SD Biosensor SARS-CoV-2 antibodies kit for the rapid test and yielded results within 15 min.^[20] In Canada, routine COVID-19 screening before surgery was recommended, in this case, was PCR swab test.^[22] The consideration was first that

there would be increased risk of adverse outcome in patients who underwent surgery during COVID-19 incubation period.^[22] The next reason was for conducting appropriate planning and infection control to prevent infection spreading to health providers and other patients.^[22] In Alabama, the United States of America, emergency surgery, such as TBI used to proceed without COVID-19 screening test, but all teams are equipped with full personal protective equipment (PPE) in conducting the surgery.^[17] This was before there was a reliable PCR test which provided results within 1 h.^[17] In the United Kingdom, recommendation for patients planned for nonemergent surgery was through both the PCR and antibody test assay.^[2] Since the PCR test takes longer time for processing, one center in Ireland recommended the use of thorax CT scan or rapid test for COVID-19 screening before emergency surgery;^[12] since our hospital has now is equipped with an on-site PCR equipment as well as CT scan and rapid test antigen for COVID-19, it is interesting to see each superiority on future preoperative screening.

After the patient was transferred to isolation room for reactive result in COVID-19 antibody test, there was lack of neurological monitoring. Neurological monitoring was recommended to be performed at least once every hour.^[8] During the early pandemic, there is a limited supply of PPE and staff that was available on the emergency unit but with an increasing amount of suspected COVID-19 patient that entered our isolation emergency room. This unbalance of resource and patient burden reduces our hospital effectivity and unfortunately lack of monitoring becomes an identified issue. However, we totally understand that this should not become an excuse for not monitoring a patient with moderate TBI. The PINERE team policy for screening was at that point not catered for rapid decision time, especially for surgical patients; due to the technical problems, the need for more data to assess and confirmation of those patient whether as suspected/probable/confirmed COVID-19. A proper algorithm to deal with COVID-19 patients should have been well planned and implemented so that there would be no unnecessary delay;^[23] in our case, communication and coordination are the main key.

Moreover, there was no emergency burr hole equipment in the isolation room of the emergency unit prepared for COVID-19 patients, so the life-saving emergency procedure was not performed. Unfortunately, the patient died in the isolation room of our emergency ward after waiting for 12.5 h without definitive treatment, in this case, craniotomy.

Death case report #2

The Vp shunt exposure on the scalp is a serious complication; the common complications were exposure of the shunt 23.3% (13.3% exposed shunt reservoir and 10% exposed distal catheter).^[9] Given appropriate infection prevention, the reconstruction of the scalp is needed even requires

removing the shunt. Shunt-related complications requiring surgical revision are categorized as either “catheter related” (i.e., proximal or distal obstruction) or “scalp related” (i.e., wound dehiscence, infection, etc.).^[14,19] Unfortunately, for a shunt-dependent patient with severe hydrocephalus, as in our case, shunt exposure was a major setback. It necessitated an admission to the neurological intensive care unit with temporary EVD; in our case, intracranial pressure wound dehiscence and infection risk made surgery for both shunt removal and temporary EVD should have been done as soon as possible.

CONCLUSION

Optimal timing of surgery, a good safety, and health protocol during pandemic in emergency setting are an obligation to protect health providers and patients. A decision-making plan must be organized precisely to maintain alertness, achieve the highest possible standard of care, and outcome in emergency surgical cases. Hospital management and infectious disease team must make strategic protocol to balance staff safety, effective time management, especially in time-dependent neurosurgical patient, and ultimately best interest and outcome of the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

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