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# Clipping of a ruptured middle cerebral artery aneurysm in a patient with coronavirus disease 2019 (COVID-19): A case report

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ABSTRACT

*Aim of the study:* The aim of this study is to present our suggestions for organization, personal protective equipment (PPE) use, work flow of the operating theater, and the treatment of patients with COVID-19 and co-existing neurological disease.

*Materials and methods:* We present the case of a 70-year-old male who was transferred to our Department because of subarachnoid hemorrhage with ruptured right middle cerebral artery aneurysm and SARS CoV-2 infection. The emergency clipping of the aneurysm and hematoma evacuation was performed. According to the therapeutic committee guidelines, chloroquine was started for COVID-19 treatment.

*Results:* Postoperatively, the patient is in good condition, with the Glasgow Coma Scale (GCS) score of 15, with mild, left hemiparesis, 4+/5 points on the Lovett scale, without symptoms of acute respiratory distress syndrome (ARDS). No one from the stuff was infected during the treatment.

*Conclusions:* Managing patients with infectious diseases such as COVID-19 presents many challenges and risks for healthcare personnel. Our experience suggests that by following strict safety protocols of PPE use, donning and doffing, and reducing operation time, the surgery may be safe for both the healthcare personnel and the patient.

## 1. Introduction

In late December 2019, a number of unexplained pneumonia cases began to be reported in Wuhan, China. A few days later, the causative agent of this mysterious pneumonia was identified as a novel coronavirus. This causative virus has been temporarily named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the relevant infectious disease has been named coronavirus disease 2019 (COVID-19) by the World Health Organization [1]. According to daily reports from the Coronavirus Resource Center of the Johns Hopkins University Hospital, there are currently in excess of one million confirmed cases of COVID-19 and over sixty thousand patient deaths have been attributed to the disease. Despite the sudden onset of the pandemic and the severity of many cases, other diseases affecting society continue to occur as they did prior to the pandemic. Consequently, practicing physicians may be required to treat patients with COVID-19 and other comorbidities.

We present a case of the clipping of a ruptured middle cerebral artery aneurysm in a patient with COVID-19. Based on this case, we present our suggestions for organization and work flow of the operating theater, and the treatment of patients with COVID-19 and co-existing severe central nervous system (CNS) diseases.

## 2. Materials and Methods

A 70-year-old male, with binocular glaucoma, was transferred to the Department of Neurosurgery from a referring hospital. The patient experienced a sudden severe headache with nausea, vomiting, left hemiparesis and loss of consciousness. On admission, a CT scan showed an intracerebral hemorrhage with dimensions of 35 × 45 × 35 mm in the right temporal lobe, with a subarachnoid and intraventricular hemorrhage (grade 4 on modified Fisher scale). CT angiography showed an aneurysm of the right middle cerebral artery with a diameter of 4 mm (Fig. 1.) During hospitalization in the Neurology Department of the referring hospital, the patient shared a room with a patient infected with COVID-19. The patient was transferred to the Department of Neurosurgery of the Central Clinical Hospital of the Ministry of Internal Affairs and Administration in Warsaw where a confirmatory test of COVID-19 was performed. Due to the presence of intracerebral hematoma and the location of the aneurysm, the patient was qualified for an emergency aneurysm clipping and intracerebral hematoma evacuation. On admission, the patient was alert and conscious, with the GCS score of 14/15 points, with left hemiparesis 4+/5 points on the Lovett scale, and meningeal signs (World Federation of Neurosurgical Societies grade 3). Blood pressure was 120/60 mmHg, heart rate was 66/min, respiratory rate was 16, temperature was normal. In the Modified Early Warning Score (MEWS) the result was 1, so it was decided to start chloroquine for COVID-19 treatment according to the therapeutic committee guidelines of the Central Clinical Hospital of the Ministry of Internal Affairs and Administration in Warsaw [3].

On March 27, 2020, the aneurysm clipping was performed using a slightly bent Yasargil type titanium clip by a right lateral supraorbital approach. Postoperatively, the patient is in good condition, with the GCS score of 15, with mild, left hemiparesis 4+/5 points on the Lovett

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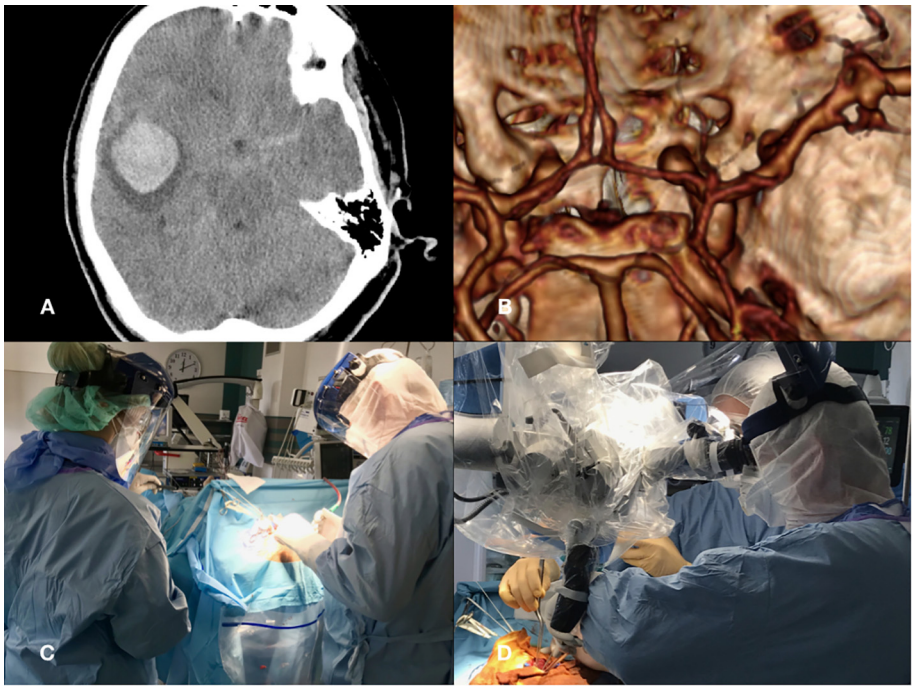


**Fig. 1.** A. CT scan. Intracerebral hemorrhage with dimensions of 35 × 45 × 35 mm in the right temporal lobe, with a subarachnoid and intraventricular hemorrhage (grade 4 on modified Fisher scale). B. CT angiography. Ruptured aneurysm of the right middle cerebral artery. C. Emergency aneurysm clipping and intracerebral hematoma evacuation. Medical staff secured with full PPE including a well-fitting respirator mask (FFP3, N95), goggles or face shield, two pairs of gloves, splash-resistant gown, and boot covers. D. During neurosurgical procedures, the main problem is the use of the operating microscope. It is impossible to look through the eyepiece of the microscope while wearing the protective face shield.

scale. Nimodipin was used for prevention of delayed ischemic neurologic deficit (DIND). Treatment with chloroquine for a period of seven days was performed in order to reduce the risk of exacerbation of respiratory failure in the course of COVID-19. Moreover, at the time of submission of this paper, none of the operating room team has exhibited any signs of COVID-19 infection (e.g. fever, pneumonia, etc.). The patient has consented to the submission of this short communication to the journal.

## 3. Discussion

COVID-19 is one of the fastest spreading pandemics in the history of medicine. It often affects people with other diseases and immunity deficiency. This also applies to patients with ischemic and hemorrhagic strokes. Practicing neurosurgeons can now face the challenge of treating a SARS CoV-2 infected patient. Surgical treatment of any common condition in such unusual circumstances can cause enormous logistical and organizational problems related to the proper protection of operating room (OR) employees and the organization of OR work.

We would like to share the protocol we use in our Department and our observations regarding the surgical treatment of patients presenting with COVID-19 complications in addition to their neurological diagnosis. First of all, the most important task is to confirm the diagnosis of SARS CoV-2 infection. In cases of emergency, when it is not possible, every patient with significant suspicion should be treated as if the patient is infected with SARS CoV-2.

An OR with a negative pressure environment should be used [2]. Before the start of each operation, the anesthesiologist puts all the drugs and equipment required for the procedure onto a tray to avoid handling of the anesthesia cart during the case [5].

Patient transport from the patient room to the operating theater should be carried out by a team secured with full PPE including a well-fitting respirator mask (FFP3, N95), goggles or face shield, two pairs of gloves, splash-resistant gown, and boot covers. For patients coming from the intensive care unit (ICU), a dedicated transport ventilator is used, and the transport utilizes a dedicated route. Recommended PPE for contact with critically ill patients with confirmed or suspected COVID-19 infection includes a fluid-resistant gown, gloves, eye protection, full face shield and fit-tested N95 respirators. Hair covers or hoods should also be worn. Longer-sleeved gloves are preferred (if available) to prevent exposure of the wrists with glove slippage. Alternately, vertical tape strips can be used to help keep gloves secured to the gown. Eye protection should include protection from side exposure with side shields or goggles. Full face shields can provide both eye protection and avoid facial and respirator contamination. Some disposable shoe covers may increase the risk of self-contamination during removal of protection clothing. Shoes worn should be impermeable to fluids and able to be decontaminated. Staff should wear OR scrub suits or full coveralls under the PPE. Coveralls with an integrated hood may simplify the underlayer worn in conjunction with PPE, however the choice of product should be assessed for ease of removal to avoid contamination during removal. Hand hygiene must be performed after removing PPE, and in the event of inadvertent contamination of the hands by touching dirty surfaces during PPE removal [4].

Intubation should be carried out by the most experienced team using techniques that minimize the amount of time required for the procedure (including video-laryngoscopy as indicated). During intubation, only an anesthesiologist and a nurse anesthetist are present in the room, while the operating team, secured with the proper PPE, prepares the operating set in a separate, isolated room [4].

After intubation of the patient, positioning of the patient for surgery is done by personnel also secured with PPE. The operating team performs surgery protected with a hooded suit, shoe protectors, face shield, goggles, a double cap, a double pair of gloves sealed around the wrists, over which we put a sterile gown and an additional sterile pair of gloves (Fig. 1). During neurosurgical procedures, the main problem is the use of the operating microscope. It is impossible to look through the eyepiece of the microscope while wearing the protective face shield. It is possible to use googles, but they restrict vision as well. It is worth considering the use of an exoscope for adequate visualization, which would allow full protection of the persons performing the procedure. According to the recommendations of the American Association of Neurological Surgeons (AANS), a minimal number of people should be present in the room during surgery. There is some evidence suggesting that this virus may be transmitted through aerosol [2]. This is the reason why we should avoid using ultrasonic knives that may cause aerolysis. It is recommended to use a smoke evacuator when

electrocautery is used.

The patient should remain intubated and transported to the ICU. We recommend handing the patient off to the minimum required number of transport personnel, who are waiting outside the OR. Personnel should wear PPE as recommended by the Centers for Disease Control and Prevention (CDC). PPE should not be the same as worn during the procedure (Supplementary Table 1).

After completing the procedure, we remove the PPE according to the recommendations of the CDC, and then ventilate the operating room for 30–60 min. Surface disinfection should be carried out using chlorine containing agents. Electronic equipment can be decontaminated using an alcohol-based disinfectant. Glasses and goggles should be washed with soap and water and sanitized with alcohol.

## 4. Conclusions

Managing patients with infectious diseases such as COVID-19 poses many challenges and risks for healthcare personnel. Performing surgeries may be hazardous for the OR team. Our experience suggests that, by following strict safety protocols of PPE use, donning and doffing, and reducing operation time, surgery may be safe for healthcare personnel and the patient.

## Author contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Kacper Kostyra, Błażej Nowak, Bogusław Kostkiewicz. The first draft of the manuscript was written by Kacper Kostyra and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.inat.2020.100849.

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