



# Spontaneous Surgical Intracranial Haemorrhages Associated with SARS-Cov-2 Infection: Case Report

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## Abstract

Spontaneous surgical acute and chronic intracranial haemorrhage in patients with SARS-Cov-2 infection is a theoretical possibility. We report two cases of SARS-CoV-2 infection that was associated with spontaneous surgical acute and chronic intracranial haemorrhage. The two patients had successful surgical intervention. Surgical haemorrhages should be considered in patients with SARS-COV-2 infection especially if there is an associated altered sensorium.

**Keywords** Coronavirus disease 2019 (COVID-19) · Intracerebral haemorrhage · SARS-CoV-2 · Subdural haematoma

## Case Report

### Case 1

A 58-year-old man presented with a day history of altered sensorium. He had been on admission at a COVID-19 isolation centre for 10 days on account of COVID-19 until he started having altered level of consciousness and desaturating. The patient is a known hypertensive and diabetic. There was no history of use of antiplatelet or anticoagulant medication. On admission, his vital signs were a respiratory rate of 26 breaths/min with oxygen saturation of 94% on the air room, heart rate of 67 beats/min, blood pressure of 152/88 mmHg, and temperature of 37.8 °C. Brain computerised tomographic (CT) scan revealed a large right-sided occipital lobe haemorrhage with perilesional oedema, effacement of the posterior horn of the lateral ventricle, and subfalcine herniation with 9 mm midline shift (Fig. 1A). Chest CT revealed bilateral patchy ground-glass infiltration which was in keeping with SARS-CoV-2 infection. Repeat nasopharyngeal COVID-19 polymerase chain reaction

(PCR) test still returned as positive. His laboratory tests were remarkable for neutrophils of 83.7% (white count of  $7.3 \times 10^3/\mu\text{L}$ ), lymphocytes of 10%, platelets count was  $102 \times 10^3/\mu\text{L}$ , haematocrit of 33%, D-dimer was elevated (3.02 ug/mL) and unremarkable for prothrombin time (PT) of 14.7 s, activated partial thromboplastin time (aPTT) of 26.1 s (control-32.1 s), and an international normalised ratio (INR) of 1.08. He was intubated (on account of his Glasgow coma scale score dropping from 15 to 7) and had insertion of arterial and central venous lines. Remdesivir, Azithromycin, and Dexamethasone were commenced in addition to Phenytoin while the patient was scheduled for an emergent craniotomy. The patient had an uneventful evacuation of the haematoma via a right occipital craniotomy approach and primary duraplasty (Fig. 1B). After the surgery, the patient was admitted to the intensive care unit until he was fit for extubation (3 weeks after intubation). The patient gradually improved, and by the 3rd-month follow-up, the patient was self-ambulant and cares for himself.

### Case 2

A 72-year-old right-handed woman presented with a 6-day history of headaches and a 2-day history of loss of consciousness. She has been on treatment for COVID-19 (confirmed by nasopharyngeal swab test for SARS-CoV-2 PCR) a month prior to presentation with persistent post-SARS-CoV-2 infection symptoms of easy fatigability and cough. There was no history of antecedent history of head trauma or use of anticoagulant. She is a known hypertensive

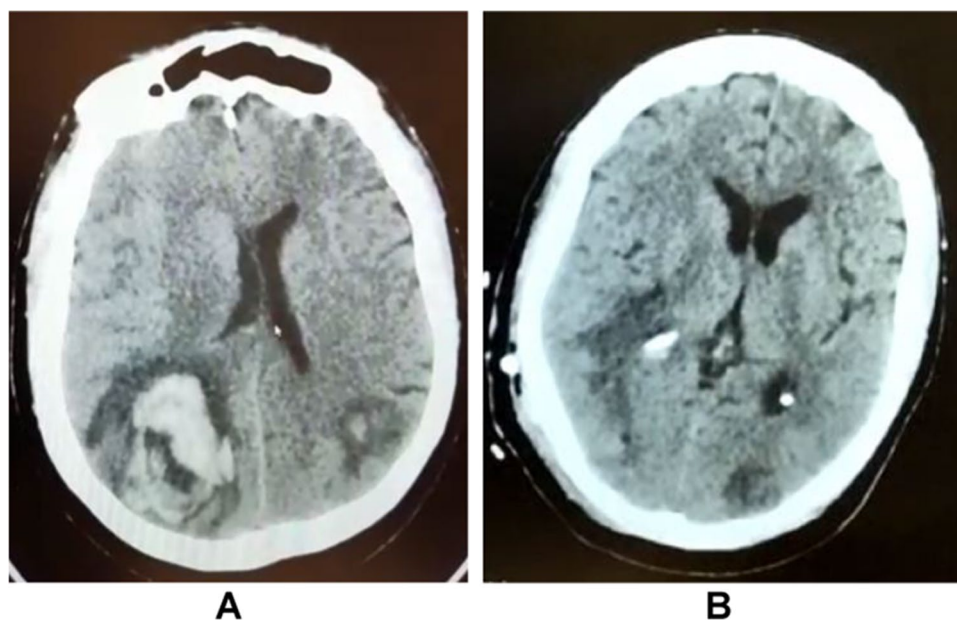
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**Fig. 1** Computerized tomographic scan images of the brain pre (A) and post-operation (B) of the patient with haemorrhagic stroke



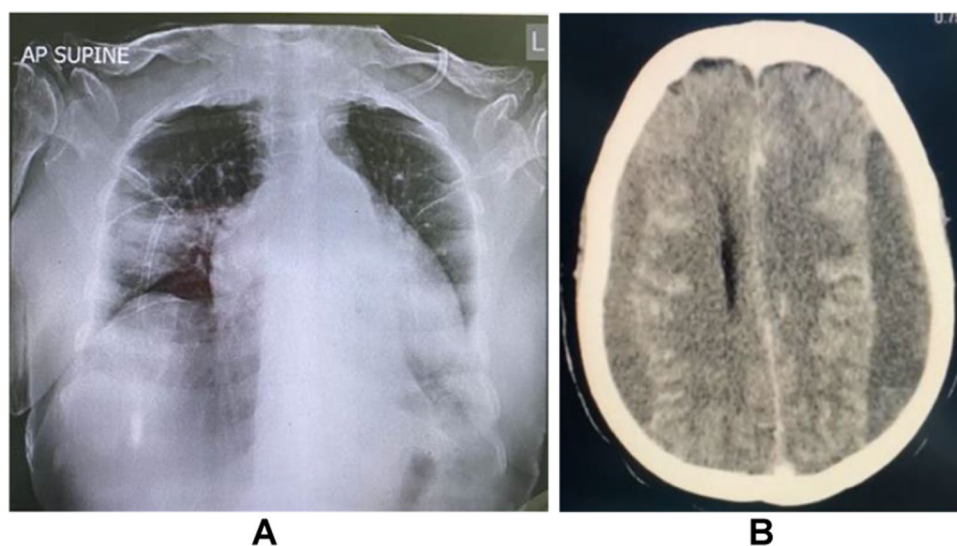
controlled with amlodipine and moduretic. Examination revealed an unconscious woman with a respiratory rate of 22 cycles per minute, blood pressure of 170/102 mmHg, pulse of 64 beats/min, temperature of 37.9 °C, and oxygen saturation was 94% in room air. Her Glasgow coma scale score was 5. CT of the chest showed cardiomegaly of left ventricular configuration with a cardiothoracic ratio of 0.61 and right lung middle lobe ground-glass opacities (Fig. 2A). Cranial CT scan showed bilateral frontal frontotemporoparietal curvilinear hypodense subdural collection measuring  $10.7 \times 17.7$  mm and  $11.3 \times 20.5$  mm on the right and left, respectively (Fig. 2B). Nasopharyngeal COVID-19 PCR test returned positive. She had an uneventful emergency evacuation of the haematoma via bilateral parietal burr hole craniostomy approach with subperiosteal wound drain. The

patient regained full consciousness within 2 days and was discharged 12 days after the surgery in a state of ability to care for herself.

## Discussion

The SARS-CoV-2 virus has neurotropic and neuroinvasive properties [1, 2]. It gains entry into the human body mainly via the angiotensin-converting enzyme 2 (ACE-2) receptor [3, 4]. This receptor is expressed in several organs in the body, the brain parenchyma inclusive. When these receptors are inhibited by the SARS-CoV-2 virus, vascular autoregulation and cerebral blood flow become compromised [4].

**Fig. 2** Chest X-ray (A) and computerized tomographic scan (B) images of the patient with subdural haematoma



Most patients presenting with COVID-19-associated stroke are not surgical and have baseline cardiovascular risk conditions such as hypertension, diabetes mellitus, hyperlipidemia, smoking, or previous stroke history.

Numerous factors that make COVID-19 patients prone to intracranial haemorrhage include low platelets, hyperfibrinolytic state, consumption coagulopathy, use of antiplatelets and or anticoagulant medications, prolonged hypoxia of endothelial cells, and pro-inflammatory state due to cytokine storm [5, 6].

In a study, among 5227 individuals with COVID-19, 35 (0.7%) were found to have haemorrhage of some kind and 17 (0.3%) were due to acute SDH. Twelve (70.6%) of the patients with SDH had a head trauma before the haemorrhage, and five were on anticoagulant drugs [7]. Our index patient had chronic SDH with a prior history of use of aspirin but no antecedent history of head trauma. The fact that SARS-CoV-2 binds to ACE2 receptors and associated thrombocytopenia may explain the increased risk of a cerebral haemorrhage. Viraemia and ensuing endothelial injury may make the bridging veins of traversing the subdural space more at risk to haemorrhage after a minor trauma from sneezing, coughing, or a Valsalva manoeuvre [8].

## Conclusion

Surgical acute and chronic intracranial haemorrhagic complications should be considered in diabetics and hypertensive patients with SARS-COV-2 infection who have altered level of consciousness. This highlights the need for early neuroimaging in this group of patients.

**Authors' Contribution** JO Idowu: Conception, data acquisition, analysis, and revising

OE Idowu: Conception, work design, data acquisition, analysis, and interpretation

AS Adeniran: Data interpretation, work drafting, and revising

**Data Availability** Available on request.

**Code Availability** Not applicable.

## Declarations

**Ethics Approval** Lagos State University Teaching Hospital (LASUTH) Health Research and Ethics Committee, Ikeja, Lagos, Nigeria, LREC/06/10/1826.

\*LASUTH Health Research and Ethics Committee is affiliated with the Lagos State University Teaching Hospital (LASUTH), Ikeja, Lagos, Nigeria.

**Consent to Participate** Not applicable. Retrospective review of de-identified hospital data with ethical approval obtained.

**Consent for Publication** Not applicable. Retrospective review of de-identified hospital data with ethical approval obtained. All the authors agree to the final revised article.

**Conflict of Interest** The authors declare no competing interests.

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