Multiple brain abscesses with tetralogy of fallot (TOF): a case report

Lefi Mikaningtyas¹, Paulus Sugianto¹*, Mohammad Saiful Ardhi¹, Ardhi Tripriyanggara², Risqon Nafiah³

ABSTRACT

Introduction: Patients with multiple brain abscesses and a secondary diagnosis of tetralogy of fallot (TOF) rarely occur fatal complications. Brain abscess is a very uncommon but potentially fatal infection of the brain parenchyma that can affect 5%-18.7% of the CHD population. The degree of right-to-left shunt is responsible for brain tissue hypoxia, which can lead to cerebral infarction, which is a precursor to cerebral abscess. Therefore, this study aimed to report on a patient with several brain abscesses and TOF.

Case description: A 30-year-old cyanotic male with a chief complaint of gradually decreased consciousness since 2 weeks ago without a history of vomiting. The patient has a clubbing finger. The patient has a TOF history without a prior infection, such as toothache, ear discharge, paranasal infection, cough, or flu. Physical examination revealed the Glasgow Coma Scale of E4VxM6 (global aphasia), right hemiparesis, increased physiological reflexes and positive pathological reflexes in the right side of the body. Laboratory results showed slight leucocytosis and hyponatremia and elevated CRP. Head MRI spectroscopy was performed 3 days later, revealing multiple brain abscesses. The patient was given therapy antibiotics, namely ceftriaxone injection and metronidazole injection intravenously.

Conclusion: A brain abscess should be suspected in patients with TOF who arrive with a fever and an acute neurological condition. Besides antibiotics, patients should be encouraged to have corrective surgery as soon as possible to avoid future deadly consequences.

Keywords: brain abscess, tetralogy of fallot, cyanotic congenital heart disease.


INTRODUCTION

Brain abscess is a very uncommon but potentially fatal infection of the brain parenchyma that can affect 5%-18.7% of the CHD population. The primary risk factors include persistent hypoxia, which causes polycythemia, hyperviscosity, and inadequate host immunity.¹ The most common cyanotic congenital cardiac defect is tetralogy of fallot (TOF). It comprises four abnormalities: pulmonary stenosis or right ventricular outflow blockage, ventricular septal defect, overriding aorta, and right ventricular hypertrophy.² Tetralogy of fallot is one of the children’s most frequent cyanotic congenital heart disorders. It affects up to one-tenth of all congenital cardiac lesions and occurs in three out of every 10,000 live births. Cyanotic congenital heart disease patients are more likely to develop brain abscesses.³ Instead of passing via the pulmonary circulation and undergoing phagocytosis, the bacteria in the blood move from the right to the left heart via the shunt and obtain access to the cerebral circulation in individuals with TOF. If the patient has a cardiogenic abscess, then the prognosis will be worse than other types of brain abscesses, with fatality rates ranging from 27.5% to 71%.⁴

The brain and heart are the pivotal organs that regulate our body. It is known that the problem of both organs impairs the function of the heart-brain axis. Several investigations have indicated that neurological diseases and depressive disorders can produce autonomic nervous system dysfunction and arrhythmias. An improper shunting might result in a neurotransmitter production-inactivation imbalance (such as serotonin), contributing to the pathophysiology of brain illnesses. Several studies have suggested that specific variants may play a role in this link. Clinical research has revealed that the beginning of brain disorders associated with congenital cardiac defects occurs mostly in adults, significantly influencing their quality of life and work capability.⁵ The severity of the shunt is also determined by the degree of pulmonary stenosis. The degree of right-to-left shunting is responsible for brain tissue hypoxia, which can lead to cerebral infarction, which is a precursor to cerebral abscess.⁶ Therefore, prompt diagnosis and early treatment are essential for the patient. Thus, this study aimed to report a patient with multiple brain abscesses and TOF.

CASE DESCRIPTION

A 30-year-old cyanotic male came to our emergency room with a chief complaint of a gradual decrease of consciousness since
2 weeks ago without a history of vomiting. He can not communicate, but his eyes can open with pain stimuli. There has been a weakness in the right of the body about 3 weeks ago. There were no seizures or fever. The patient has a history of cavities but was never treated. There was no history of discharge from the ears, cough or flu. The patient complained of headaches 4 weeks ago but got relief by buying analgesic medicine alone.

The patient has had a history of TOF since he was young. Still, for the last 4 years, he did not take any medicine because of the early covid-19 pandemic, which made him not have routine control of the neurology outpatient clinic.

Physical examination revealed uniform central cyanosis with clubbing, and his vital signs were normal 120/65 mmHg, heart rate 61x/minutes, respiratory rate 20x/minutes, temperature 36.6 °C, SpO2 90% with nasal cannula 3 lpm. Neurological examination GCS was 4X6 (Global aphasia). He has clubbing of the fingers and toes with cyanosis of the lips and oral mucous membranes, as shown in Figure 1. We examined the cranial nerve and found a pupil round isochor of 3mm on both sides, light reflex and corneal reflex within the normal limit. Nuchal rigidity was negative. We found right facial palsy, upper motor neuron (UMN) type, and lingual palsy difficult to evaluate. From motoric function, we saw right hemiparesis, increasing physiological reflexes in the right side of the body, and pathological reflex (Babinski sign) was positive in the right side.

Because of the history of TOF, we performed transthoracic echocardiography. The result was Double Outlet Right Ventricle (DORV), VSD Subaortic bidirectional shunt, severe PS valvular, small ASD different diagnosis with Patent Foramen Ovale (PFO), prolapse tricuspid with moderate-severe TR, suspect major aortopulmonary collateral arteries (MAPCA), as shown in Figure 2.

The laboratory result showed slight leucocytosis 10.720, elevated CRP 0.77 and hyponatremia (132). The patient has cardiomegaly from thorax AP X-ray, as shown in Figure 3. The patient has performed Head CT with contras at
a previous hospital, which presented multiple brain abscesses followed by massive brain edema, as shown in Figure 4. We suspect him of numerous brain abscesses with different diagnoses. Three days after admission, we performed an MRI spectroscopy to confirm the diagnosis, and the result showed multiple brain abscesses with transverse sinus thrombosis, as shown in Figure 5.

After conducting anamnesis, a physical examination, laboratory tests and cerebral imaging, it was concluded that patients with multiple brain abscesses with TOF as an aggravating factor. Upon admission, therapy was administered with a normal saline infusion of 1000cc per 24 hours, metamizole injection every 8 hours, omeprazole injection every 12 hours, ceftriaxone injection 2 grams every 12 hours, metronidazole injection 500mg every 6 hours, dexamethasone injection every 8 hours. We plan to give the patient antibiotics for 6-8 weeks, then evaluate the patient’s clinical manifestation and imaging. If there are improvements, we should consider surgery for this patient. For oral medication, we gave the patient propranolol 10mg every 12 hours and ramipril 2.5mg every 12 hours with a diet high-calorie high protein 2100kka/day per sonde.

DISCUSSION

This case report explained a man with TOF who reported to the emergency room with neurological symptoms of a cerebral abscess and was found to have several brain abscesses. A brain abscess is a recognized dangerous consequence in uncorrected cyanotic CHD but can also happen in uncorrected cyanotic CHD. Another similar report showed a one-year-old boy diagnosed with a cerebral abscess and a history of TOF. The patient never underwent any medical or surgical treatment. Equal treatment was given in this patient, such as propranolol 2 mg 3 times daily and ceftriaxone 500 mg IV twice daily, metronidazole 150 mg IV 3 times daily, amikacin 50 mg twice daily, and phenytoin 35 mg IV twice daily. Unfortunately, after four weeks of treatment, the patient died due to septic shock.  

Many factors are responsible for brain...
Brain abscesses in Cyanotic Congenital Heart Defect (CCHD) patients. Normal alveolar phagocytes do not filter the blood in these patients by bypassing the pulmonary circulation. This enhances the potential of pathogenic germs to enter the brain’s circulation directly. This, along with the possibility that the brain is hypoperfused due to severe hypoxemia and metabolic acidosis caused by secondary polycythemia, permits infections to seed such under-perfused areas. Multiple brain abscesses are commonly associated with hematogenous dissemination from a distant source. In this study, the patient had confirmed that there was no previous infection, such as a paranasal sinus infection, an otogenic infection, an odontogenic infection, or a heart infection. He has no history of immunosuppressive diseases, HIV, or history of organ transplants.

Clinical manifestations in patients with cerebral abscesses are a classic triad of fever, headache, and focal neurological defects that might be accompanied by seizure. The diagnosis can be confirmed by imaging examinations such as head CT and MRI scans. Head MRI is a gold standard for diagnosing cerebral abscesses, and it can show soft tissue better than a head CT scan. In cerebral abscesses associated with cyanotic heart disease, first-line antibiotics are penicillin and cefotaxime, chloramphenicol, or metronidazole and/or ceftriaxone therapy, with treatment duration between 4-6 weeks or depending on the organism involved and response to treatment. Patients also could be administered phenytoin, dexamethasone, or mannitol to reduce intracranial pressure. Indications surgery on cerebral abscess is an abscess size that does not shrink with antibiotics for 4 weeks, mass effect and significant neurological deficits, multiple lesions in locations covered by surgery, multiloculated lesions, lesions in the posterior fossa, and the diameter of the abscess is more than 2.5 cm.

The delay in diagnosing and treating brain abscesses in CCHD patients keeps the underlying illness untreated for an extended time, complicating the disease process. Untreated individuals have a mortality rate ranging from 27.5% to 71%. Larger or deeper-seated abscesses should be aspirated as soon as possible and frequently. Following aspiration, the patient should begin antibiotic medication directed at the organism detected in the culture. Empirical medical therapy is reserved for patients whose abscess is less than 2 cm in diameter, the patient is neurologically stable, and recurrent CT scans evaluate the patient. Other types of treatment, such as craniotomy and excision, have poor outcomes in terms of mortality, which can be as high as 71%, and are therefore reserved for progressively worsening abscesses where usual treatment has proved futile.

The limitation of this study was that the culture results were unavailable, so the patient was treated with empirical antibiotics for the time being, and we were unable to report the type of bacteria that infected the patient in this study.

CONCLUSION
A brain abscess caused by cyanotic congenital heart disease (CCHD) is unusual. The degree of right-to-left shunting is responsible for brain tissue hypoxia, which can lead to cerebral infarction, a precursor to brain abscess clinicians need to be aware of any suspicion of CCHD to avoid unnecessary delays in diagnosis and treatment.

ACKNOWLEDGMENT
The author would like to thank all lecturers, family, and friends who have taught and supported us.

AUTHOR CONTRIBUTION
All of the authors participated in preparing the manuscript.

CONSENT STATEMENT
Written informed consent for the publication of this case report was obtained from a patient’s relative.

CONFLICT OF INTEREST
None

FUNDING
The author(s) declared that no grants supported this work.

REFERENCE