Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/14138
DOI URL: http://dx.doi.org/10.21474/IJAR01/14138

RESEARCH ARTICLE

CEREBRAL ABSCESS AND MYCOTIC ANEURYSM AS A CONSEQUENCE OF INFECTIVE ENDOCARDITIS: A CASE REPORT

Achraf Machraa, Zineb Fassi Fehri, Cyrille Mbida, Shihab Abu Baker, Achraf Zaimi, Najat Mouine and Aatif Benyass

Cardiology Center, Mohammed V Military Instruction Hospital of Rabat, Mohammed V University, Morocco.

Manuscript Info

Manuscript History
Received: 30 November 2021
Final Accepted: 31 December 2021
Published: January 2022

Key words:-
Neurological Complications, Infective Endocarditis, Mycotic Aneurysm, Brain Abscess, Case Report

Abstract

Background: Neurological complications of infective endocarditis are common and can cause significant morbidity and mortality. A broad spectrum of neurological manifestations may be observed. This case is used to show an approach towards the management of neurological complication of bacterial endocarditis based on a review of the published work.

Case Presentation: A 26-year-old male patient was admitted to our department with sudden onset of left side weakness associated with aphasia and an intense headache. Clinical assessment showed an infective endocarditis with two mobile vegetations attached to the mitral valve complicated by an intracranial mycotic aneurysm and a brain abscess. The patient was managed only with antibiotic therapy on the decision of a multidisciplinary team, with an excellent clinical outcome.

Conclusions: The management of neurologic complications of infective endocarditis remains challenging given the lack of prospective, controlled studies. Therefore, the decision process requires the participating of a multidisciplinary team.

Introduction:-

Neurologic complications as a consequence of infective endocarditis (IE) are frequent and remain a major cause of morbi-mortality regardless of recent progress in diagnostic methods, antimicrobial and surgical interventions. During the active course of IE, approximately 25% of patients with IE experience at least one neurological event **[1]**.

A broad spectrum of neurological manifestations may be observed, that can be grouped as cerebrovascular (ischemic stroke, cerebral hemorrhage, mycotic aneurysm), infectious (brain abscess, meningitis, spondylodiscitis and spinal cord abscess), and systemic (encephalopathy, seizures) **[2]**.

Large vegetation, left-sided lesions on the mitral valve increases the risk of developing neurologic complication from IE, and this is more presumably to happen before or few weeks after initiating antimicrobial therapy.

We herein present a case of a patient who had an intracranial mycotic aneurysm and brain abscess attributed to infective endocarditis which was managed conservatively with antibiotic therapy.

Corresponding Author:- Achraf Machraa
Address:- Cardiology Center, Mohammed V Military Instruction Hospital of Rabat, Mohammed V University, Morocco.

Timeline:-

7 months before admission	The patient described intermittent fever and a progressive deterioration of general condition (Fatigue and weight loss)
Admission	Patient presented a sudden onset left side weakness with expressive aphasia and intense throbbing headache A computed tomography scan revealed an acute cerebral ischemic stroke in the territory of the right middle cerebral artery
Day 2	A transthoracic and a transoesophageal echocardiography showed two mobile vegetations attached to the atrial side of the mitral valve with a mild mitral regurgitation and a restrictive subaortic ventricular septal defect of 8mm with a left-right shunt. White blood cell count at 13900/mm3, a C-reactive protein (CRP) was at 136mg/l, Repeated blood cultures were negative. I.V antibiotics (Vancomycin, gentamycin) were started
Day 5	A brain magnetic resonance imaging showed a cerebral abscess in the right parietal lobe, and a intracranial mycotic aneurysm of the M1 segment of the right MCA measuring 7mm I.V Metronidazole was added
Two weeks after admission	A multidisciplinary team recommended continuing with the antibiotic therapy for 6weeks
Three weeks after admission	Follow up transoesophageal echocardiography revealed a reduction in vegetation size
Six weeks after admission	A brain CT showed a decrease in the size of the cerebral abscess with persistence of the mycotic aneurysm
Day of discharge (7weeks after admission)	almost complete resolution of the neurological deficit. His CRP and white blood cell count were normal
Follow-up (4weeks after discharge)	No recurrence of symptoms, inflammatory markers were normal, and follow up TOE showed no residual vegetation

Case presentation:-

A 26-year-old man presented to our hospital with sudden onset of left side weakness with expressive aphasia followed by an intense throbbing headache localizing in both sides. On additional questioning he stated not feeling well for the past 7 months and described fatigue, intermittent fever, and 15kg weight loss. He had no prior history of chronic medical illness.

On physical examination, his temperature was 37,1°C, heart rate of 60/min, and blood pressure of 105/60mmHg, A loud, harsh, holosystolic murmur at the lower left sternal border was detected on auscultation. Neurological examination was notable for a left hemiplegia, with a positive Babinski sign on the left side, cranial nerve evaluation found a central facial palsy.

A computed tomography (CT) scan revealed an acute cerebral ischemic stroke with signs of hemorrhagic transformation in the territory of the right middle cerebral artery (MCA) without mass effect **(Figure 1)**.

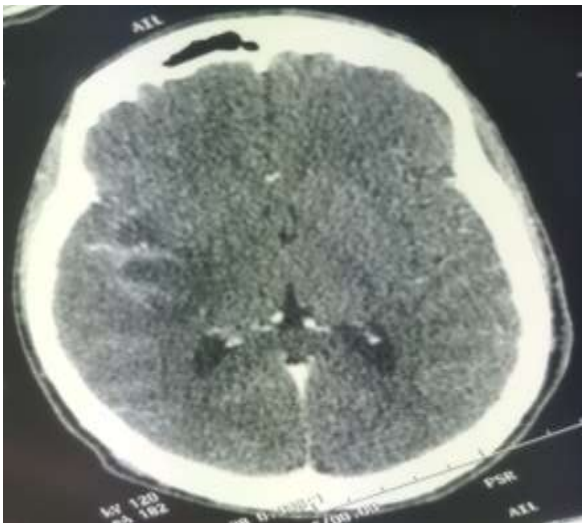

Figure 1: CT scan showing an acute ischemic stroke with signs of hemorrhagic transformation in the deep territory of the right middle cerebral artery (MCA).

A transthoracic and a transoesophageal echocardiography showed two mobile vegetations attached to the atrial side of the mitral valve (A2 and P2) measuring 5 and 6mm respectively with a mild mitral regurgitation **(Figure 2AB)**, restrictive subaortic ventricular septal defect of 8mm with a left-right shunt, moderate pulmonary hypertension (47mmHg).

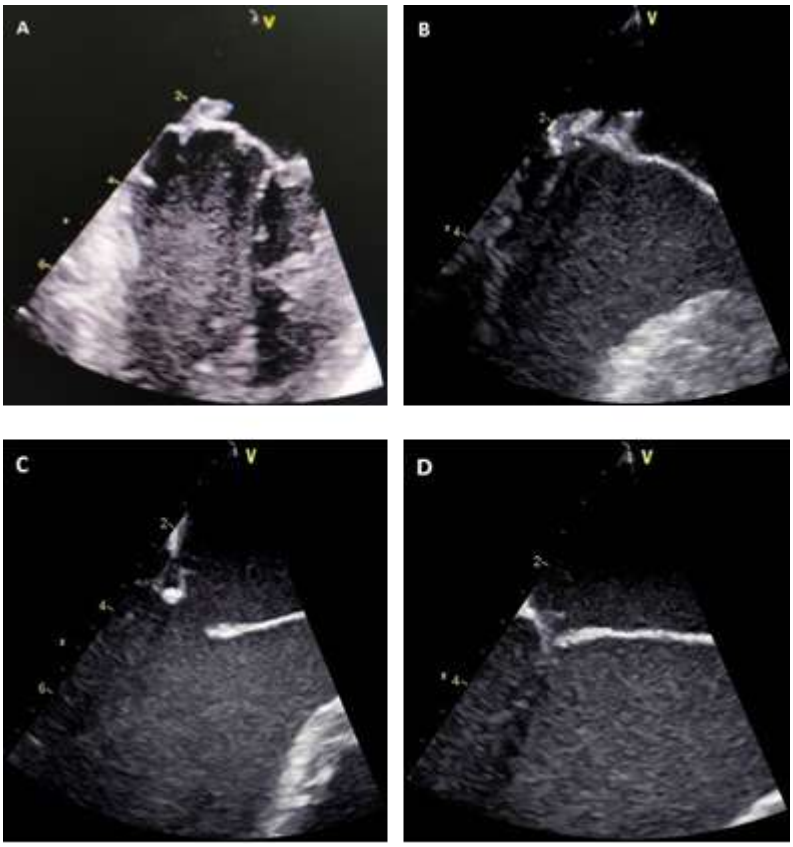

Figure 2:- A and B: Transoesophageal echocardiography showing two mobile vegetations attached to the atrial side of both mitral leaflet (A2 and P2) measuring 5 and 6mm respectively
C and D: Follow up transoesophageal echocardiography showing a reduction in vegetation size

Laboratory test was notable for leukocytosis with a white blood cell count of 13900/mm3 and a hemoglobin level of 10,4g/dl, C-reactive protein (CRP) was at 136mg/l, and his biochemistry panel was unremarkable. Repeated blood cultures were negative.

A brain magnetic resonance imaging (MRI) was performed, revealing multiple subcortical sharply defined lesions, with the largest lesion measuring (35mm x 20mm x 24mm), in the right parietal lobe with a ring enhancement suggesting the diagnosis of a cerebral abscess, and a intracranial mycotic aneurysm of the M1 segment of the right MCA measuring 7mm **(Figure 3)**.

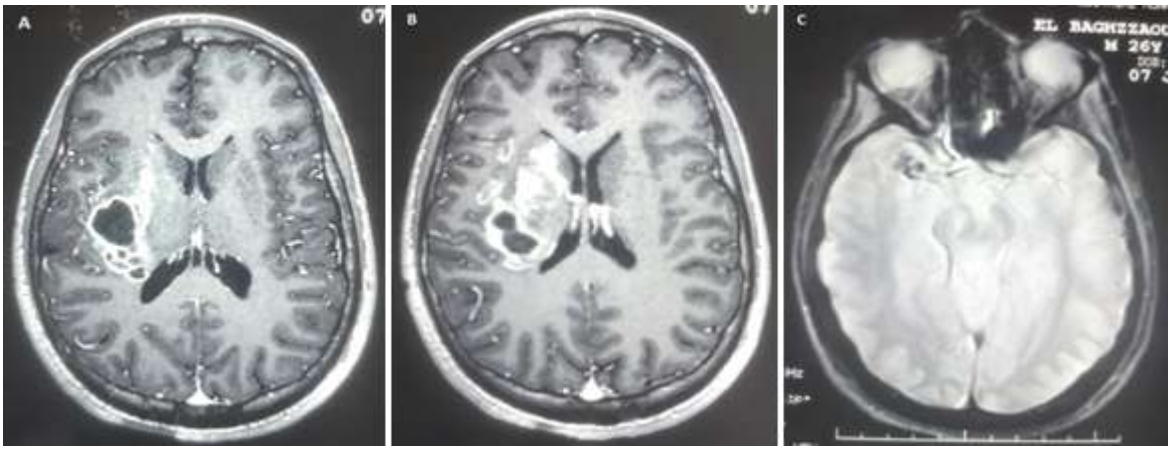

Figure 3:- A and B: MRI showing multiple ring-enhancing lesions of various sizes in the right parietal lobe
C: MRI showing hypointensity in the right lateral fissure, suggesting a mycotic aneurysm of the M1 segment of the right MCA

Taking the whole clinical picture into account, the diagnosis of infective endocarditis was made. The patient was started on Vancomycin (2g/day), Gentamicin (160mg/day), and Metronidazole (500mg/08h) for 6 weeks after consulting an infectious disease specialist. A full body CT was obtained to look for other sources of infection or other septic emboli, it came back normal.

A multidisciplinary team meeting, including cardiologists, cardiothoracic surgeons, and neurosurgeons was conducted to decide upon patient management, the team recommended continuing with the antibiotic therapy as the best therapeutic choice to adopt for this case with follow up echocardiogram and brain imaging.
The patient had an excellent clinical outcome with almost complete resolution of the neurological deficit. His CRP and white blood cell count gradually reduced. Follow up transoesophageal echocardiography revealed a reduction in vegetation size **(Figure 2CD)**.

A brain CT was performed at the end of antibiotic therapy showing a decrease in the size of the cerebral abscess with persistence of the mycotic aneurysm in the right sylvian valley **(Figure 4)**.

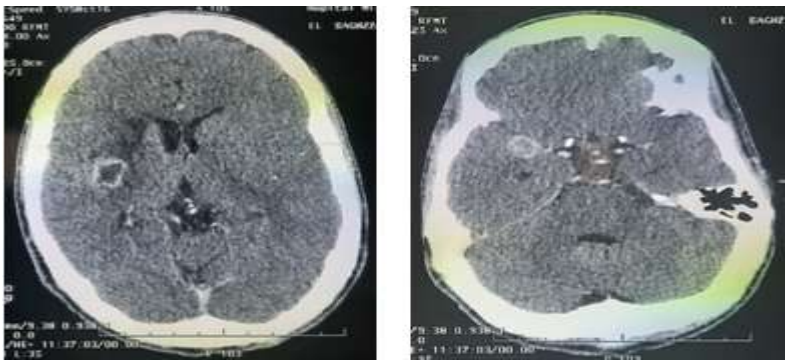

Figure 4:- Follow CT scan showing a decrease in the size of the cerebral abscess with persistance of the right mycotic aneurysm.

He was discharged after the end of the antibiotic therapy. On his recent follow up, he was doing well with no recurrence of symptoms, inflammatory markers were normal, and follow up TOE showed no residual vegetation.

Discussion:-

Neurological complications of IE originate from central nervous system embolization of valvular vegetation and are an indication of left-sided IE. One or more of the following disorders can be seen in the same patient:

- Mycotic aneurysms
- Brain abscess
- Ischemic stroke
- Cerebral hemorrhage

Risk factors for embolization include vegetation size and mobility **[1]**, staphylococcus aureus infection and mitral valve involvement **[3]**.

Infectious intracranial aneurysm

Mycotic aneurysms are rare inflammatory neurovascular lesions, detected in only 2% to 4% of patients with IE and in 5% to 12% of patients having IE with neurological symptoms **[4, 5]**. Although, the real incidence is probably greater, as they are usually asymptomatic unless they rupture causing intracranial or subarachnoid hemorrhages. IE is the most common underlying etiology of CMA.

The mycotic aneurysms occur secondary to either septic microemboli or bacterial escape from a septic embolus that has obstructed a vessel. The acute inflammation leads to neutrophils infiltration followed by degradation of the media and adventitia, fragmentation of the internal elastic membrane and proliferation of the intima. The weakened vessel wall in combination with the pulsatile pressure in the vasculature leads to an aneurysm formation and consequential growth **[6]**.

Mycotic aneurysms in the setting of bacterial endocarditis are usually fusiform shaped, thin walled, multiple, and are most commonly form in the distal branches of the cerebral circulation and frequently occur in the middle cerebral artery territories. They usually have a wide and absent neck making the therapeutic approach very challenging, both for surgical as well as endovascular techniques.

CT angiography and MR angiography are the commonly used imaging techniques despite the low sensitivity (45,5%) for detecting mycotic aneurysm **[7]**. Cerebral angiography remains the “gold standard” for the diasgnosis of mycotic aneurysm. Since it is not systematically performed, mycotic aneurysms are likely underdiagnosed. However, CT or MRI has a high negative predictive value for mycotic aneurysm detection in the absence of intracranial hemorrhage. Therefore, intracranial bleeding seems to be the best predictor for the presence of mycotic aneurysm in the setting of IE. Some studies suggest that angiography should be reserved for patients with intracranial hemorrhage on CT or MRI, focal neurological deficits, or altered mental status **[4]**.

The management of mycotic aneurysms depends on size, location, local expertise, and whether they have ruptured.

Ruptured aneurysms are managed by either open surgery or endovascular. Clipping may be challenging, as the aneurysm tend to be large with poorly defined necks and friable thin wall. The sacrifice of the parent artery is often necessary in the clipping procedure. Important neurological morbidity may result from these interventions **[8]**.

Endovascular techniques may be safer and more appropriate in patients who are at high risk for surgery due to cardiac disease, providing high occlusion and lower procedure-related complication rates. Aneurysmal coiling can be achieved securely, preserving the patency of the vessel even in distal aneurysms or in those with complex morphology **[8]**.

There is more controversy regarding unruptured aneurysms. The data are limited by small sample sizes, lack of randomization, selection biases, and failure to include measures of morbidity in addition to mortality outcomes. A conservative approach with antibimicrobial therapy guided by serial CT or MR angiography follow-up is an appropriate option. Endovascular or surgical approach should be considered if the aneurysm has a large size, or fails to reduce in size regardless of appropriate antibiotic therapy.

Brain Abscess

Bacterial brain abscess is a rare neurological complication of endocarditis and may affect between 1% to 7% of patients with IE **[3]**. They result from septic embolism and are most commonly seen in Staphylococcus aureus IE **[1]**. On MRI, brain abscess are seen as multiple ring-enhancing lesions at the gray-white matter junction which can cause hemorrhage, edema, or mass effect.

Antibiotic therapy, including methicillin resistant S aureus coverage if the organism is not known, is the first line treatment for brain abscess. Surgical approach should be considered for large abscesses with significant mass effect and risk of herniation or hydrocephalus, or in case of antibiotic failure **[5]**.

The duration of IV antibiotics is 6 to 8 weeks for those who have been medically managed and at least 4 weeks for those surgically managed, monitoring by serial imaging to assess the size and diffusion restriction of the abscess is needed to guide the treatment.

Optimal timing for cardiac surgery

Cerebral complications influence both the timing and indication of surgery and the risk of cardiac surgery must be weighed against the embolic risk. The use of anticoagulation during cardiopulmonary bypass might increase the risk of cerebral hemorrhage; recurrent hypotensive events during surgery may also worsen cerebral infarct.

As stated in the European Society of Cardiology guidelines, after a stroke or subclinical cerebral emboli in IE patients, cardiac surgery, if appropriate, should be performed without delay if intracranial hemorrhage has been excluded, unless neurological damage are severe (such as coma and brain herniation) **[9]**.

On the other hand, the AHA, ESC and Society of Thoracic surgeons (STS) recommend postponing cardiac surgery for a minimum of 4weeks in cases of major ischemic stroke or intracranial hemorrhage **[9, 10]**.

There is lack of data concerning the outcomes of valve surgery in patients with mycotic aneurysm. The Japanese Circulation Society recommends in case of ruptured mycotic aneurysm, neurosurgery should be performed first and cardiac surgery should follow after 2-3 weeks **[11]**.

Conclusions:-

Cerebral complications of infective endocarditis are frequent and often life threatening. The value of combined diagnostic strategies using multimodality imaging is progressing. The prediction and management of neurologic complications of IE are not easily approached and remains challenging, given the lack of prospective, controlled studies, and may need both medical and surgical treatments. Therefore, the decision process requires the participating of a multidisciplinary team.

List of abbreviations

IE: Infective endocarditis, CT: Computed tomography, MCA: Middle cerebral artery, CRP: C-reactive protein, MRI: Magnetic resonance imaging, AHA: American Heart Association, ESC: European Society of Cardiology, STS: Society of Thoracic surgeons.

Declarations

Ethics approval and consent to participate :

Not applicable.

Consent for publication :

The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient.

Availability of data and materials :

The data is available for sharing

Competing interests :

All the authors declare that they have no competing interests.

Funding :
The authors declare that this work was not supported by any grants or funding support.

Authors' contributions :
AM, ZF, CM, SA were involved in the collection of the data, drafting, literature review, and editing of the manuscript. AZ, NM, and AB were responsible for literature review and revising the manuscript for important intellectuel content. All authors have read and approved the final manuscript.

Acknowledgements:-

The authors would like to thank the medical and paramedical staff of the Cardiology Center in the Mohammed V Military Instruction Hospital of Rabat who took part in the management of this patient.

References:-

1. **García-Cabrera E, Fernández-Hidalgo N, Almirante B, IvanovaGeorgieva R, Noureddine M, Plata A, et al.** Neurological complications of infective endocarditis risk factors, outcome, and impact of cardiac surgery: a multicenter observational study. Circulation. 2013;127(23):2272–84.
2. **E. Novy, R. Sonneville, M. Mazighi, et al.**Neurological complications of infective endocarditis: new breakthroughs in diagnosis and management, Medecine et Maladies Infectieuses 43 (11–12) (2013) 443–450.
3. **Sonneville R, Mirabel M, Hajage D, et al.** Neurologic complications and outcomes of infective endocarditis in critically ill patients: the ENDOcardite en REAnimation prospective multicenter study. Crit Care Med. 2011;39(6):1474-1481.
4. **Hui FK, Bain M, Obuchowski NA, Gordon S, Spiotta AM, Moskowitz S, et al.** Mycotic aneurysm detection rates with cerebral angiography in patients with infective endocarditis. J Neurointerv Surg. 2015;7(6):449–52. 24.
5. **Morris NA, Matiello M, Lyons JL, Samuels MA.** Neurologic complications in infective endocarditis: identification, management, and impact on cardiac surgery. Neurohospitalist. 2014;4(4):213–22.
6. **A.F. Ducruet, Z.L. Hickman, B.E. Zacharia, et al.** Intracranial infectious aneurysms: a comprehensive review, Neurosurgical Review 33 (1) (2010) 37–46.
7. **Walkoff L, Brinjikji W, Rouchaud A, Caroff J, Kallmes DF.** Comparing magnetic resonance angiography (MRA) and computed tomography angiography (CTA) with conventional angiography in the detection of distal territory cerebral mycotic and oncotic aneurysms. Interv Neuroradiol. 2016;22(5):524–8.
8. **Champeaux C, Walker N, Derwin J, Grivas A.** Successful delayed coiling of a ruptured growing distal posterior cerebral artery mycotic aneurysm. Neurochirurgie. 2017;63(1):17–20
9. **Derex L, Bonnefoy E, Delahaye F**. Impact ofstroke on therapeutic decision making in infective endocarditis. J Neurol 2010;257(3):315–21
10. **Baddour LM, Wilson WR, Bayer AS, Fowler VG, Tleyjeh IM, RybakMJ, et al.** Infective endocarditis in adults: diagnosis, antimicrobial therapy, and management of complications: a scientific statement for healthcare professionals from the American Heart Association. Circulation. 2015;132:1435–86.
11. **Satoshi Nakatani; Takahiro Ohara; Kyomi Ashihara, et al. JCS 2017 Guideline on Prevention and Treatment of Infective Endocarditis**. Circ J. 2019 Jul 25;83(8):1767-1809.