Infective endocarditis complicated by brain embolism: a case report

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SÚHRN

Symptomatické neurologické komplikácie sa vyskytujú u 15–30 % pacientov s infekčnou endokarditídou. Zároveň sa u 35–60 % pacientov vyskytujú klinicky nemé mozgové embólie. *Staphylococcus aureus* je patogén, ktorý najčastejšie spôsobuje postihnutie nervového systému. Uvádzame prípad 67-ročného muža s infekčnou endokarditídou po stomatologickom výkone, ktorý sa prejavil ako spondylodiscitída a mnohopočetná embolizácia do mozgu, vrátane mozgového abscesu, ktorý si vyžiadal neurochirurgickú drenáž. Po 6 týždňoch liečby širokospektrálnymi antibiotikami a komplexnej podpornej terapii sme pacienta prepustili v uspokojivom somatickom a psychickom stave. Pokračuje príprava pacienta na kardiochirurgický výkon.

ABSTRACT

Symptomatic neurological complications occur in 15–30% of patients with infective endocarditis. At the same time, other clinically silent cerebral embolisms occur in 35–60% of patients. *Staphylococcus aureus* is the pathogen that causes nervous system involvement most frequently. We report a case of a 67-year-old man with infective endocarditis following a dental procedure that manifested as spondylodiscitis and multiple brain embolization, including a brain abscess that required drainage. After six weeks of treatment with broad-spectrum antibiotics and complex supportive therapy, we discharged the patient in a satisfactory mental and somatic condition. The preparation of the patient for cardiac surgery is ongoing.

Introduction

Symptomatic neurological complications occur in 15–30% of patients with infective endocarditis (IE). At the same time, clinically silent cerebral embolism occurs in 35–60% of patients with IE.[1] Neurological complications include meningitis, brain abscess, ischemic stroke, and fungal aneurysm.[2] Although neurological impairment is the most common extracardiac manifestation of IE, brain abscesses are uncommon.[3] Moreover, the mortality of IE is negatively affected by neurological complications.[4] Septic embolization is the most common cause of these complications, which mainly manifest as neural infections.[5] *Staphylococcus aureus* is the pathogen causing neurological complications most frequently.[1] We present a case of IE and brain abscess as a non-cardiac complication of IE caused by multiple septic emboli.

Case report

A 67-year-old man with a previous right-sided nephrectomy for renal cancer in 2014 and a previous laminectomy with the evacuation of a thoracic spine abscess in 2018 was examined in our echocardiography laboratory to assess the severity of a known mitral regurgitation. He was treated for arterial hypertension and was otherwise in a favorable biological state. Transesophageal echocardiography revealed severe mitral regurgitation based on the P2 prolapse of the posterior mitral valve leaflet (Fig. 1).

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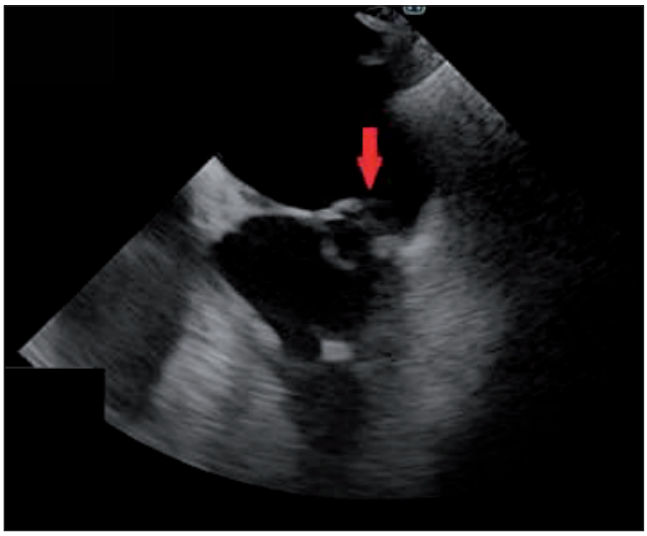

Fig. 1 – Transesophageal echocardiography – 4-chamber view. The red arrow shows the prolapse of the P2 mitral leaflet.

Subsequently, the patient was prepared for a surgical replacement and referred to a dentist to exclude dental infectious foci. The dentist found a focal infection of one tooth and treated it by extraction. The patient was given antibiotic treatment by amoxicillin-clavulanate orally for 48 hours. Shortly afterwards, we admitted the patient to our hospital for MRI-verified thoracic and lumbar vertebral spondylodiscitis (SD) (Fig. 2). The patient complained of 2-week-long low back pain, chills, general weakness, and twitching in both lower limbs. At the initial examination, a qualitative combined disorder of consciousness was observed, the patient was asleep, confused, with right-sided facial nerve dysfunction, and a light paraparesis of lower limbs was present. Computer tomography (CT) of the brain did not reveal intracerebral pathology. However, subsequent magnetic resonance imaging (MRI) was performed, and this examination confirmed minor ischemic foci in several vascular territories – a finding highly indicative of cardioembolic etiology (Fig. 3). A transesophageal echocardiography documented infective endocarditis of the mitral valve. A small vegetation (6 mm in length) was present on the anterior leaflet of the mitral valve. At the same time, a rupture of the mitral valve's suspension apparatus and a posterior leaflet flail led to a severe mitral regurgitation (Figs 4–6). The patient was transferred to a cardiological intensive care unit to treat complicated IE. We collected multiple blood cultures and extended the antimicrobial treatment – intravenous vancomycin and gentamicin were added, and meropenem (which was started as the initial treatment for SD) was continued. Ear, nose, and throat examination

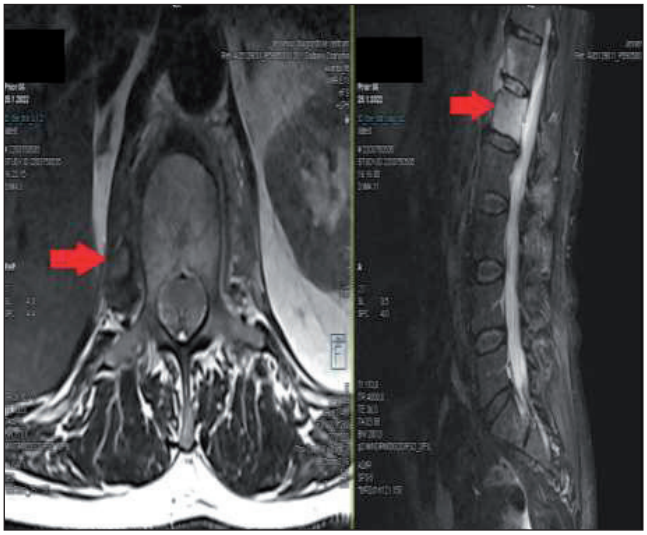

Fig. 2 – The MR of the spine. The axial projection is shown on the left side, and the arrow points to the paravertebral abscess. On the right side, sagittal projection is shown, and the arrow shows an increased signal in the lumbar vertebra and the surrounding tissue (due to inflammation).

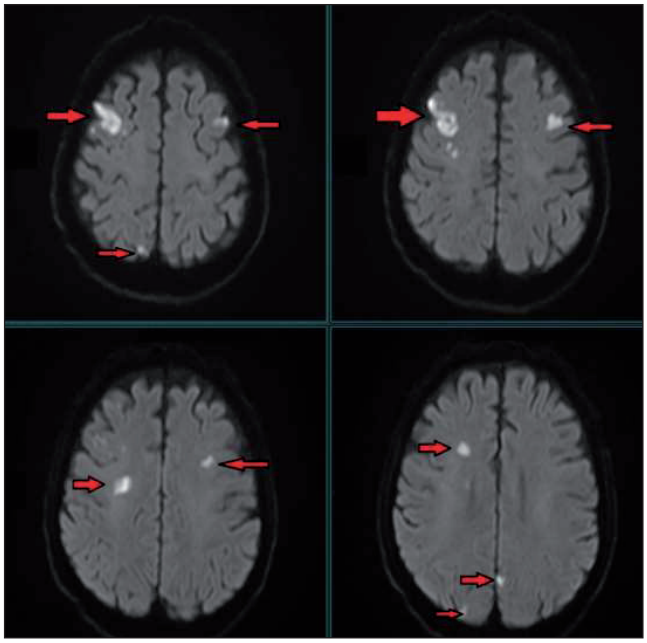

Fig. 3 – MR imaging of the brain – diffuse weight imaging. Arrows show hyper signal foci in several vascular territories – a finding typical for septic embolization.

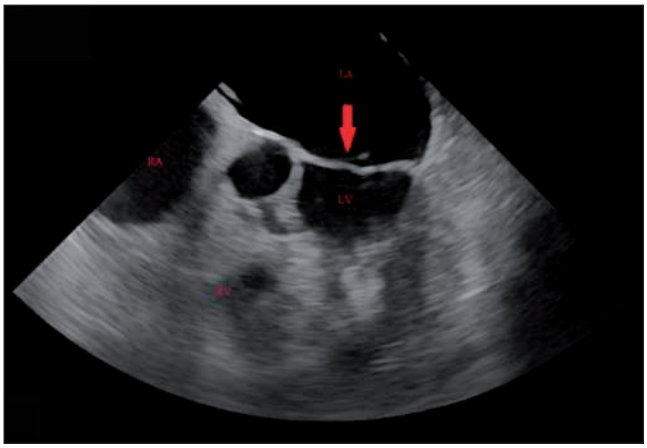

Fig. 4 – TOE modified 4-chamber view also with LV outflow tract. The red arrow shows small fluttering vegetation on the anterior leaflet of the mitral valve. LA – left atrium; LV – left ventricle; RA – right atrium; RV – right ventricle.

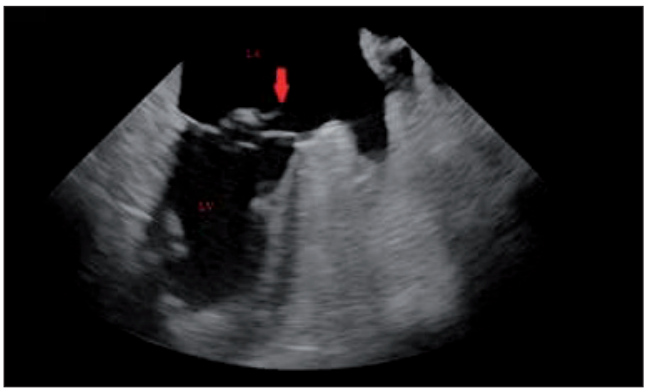

Fig. 5 – Transesophageal echocardiography 2-chamber view. The arrow shows the flail of the posterior leaflet of the mitral valve caused by the rupture of the suspensory apparatus.

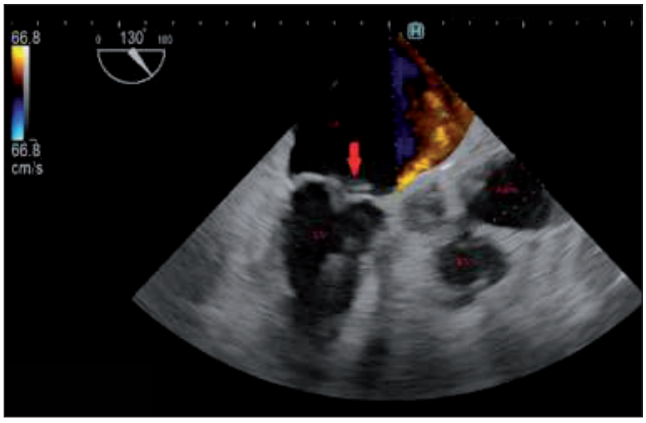

Fig. 6 – Transesophageal echocardiography 3-chamber view. The arrow shows a flail of the posterior leaflet of the mitral valve. Also, signs of severe mitral regurgitation can be seen.

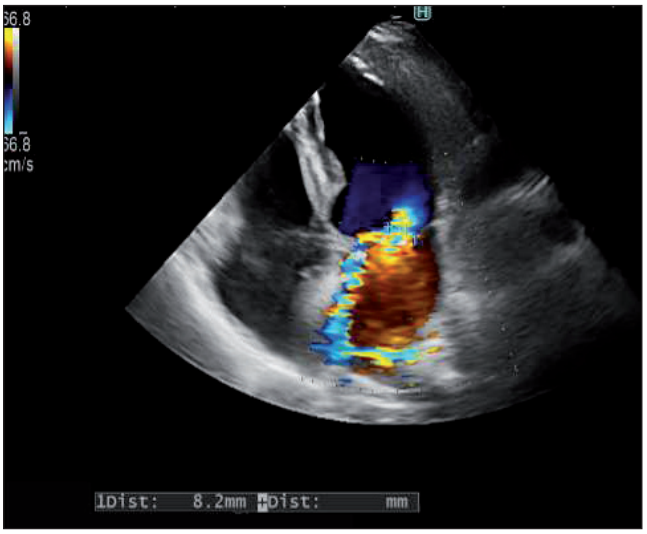

Fig. 7 – Transthoracic echocardiography showing semiquantitative assessment of mitral regurgitation by measurement of the vena contracta.

and a repeated dental examination excluded focal infection in the orofacial region. Blood culture samples taken before and during the hospital stay did not detect any pathogen. Antibiotic therapy was adjusted according to therapeutic drug monitoring, with good tolerance and

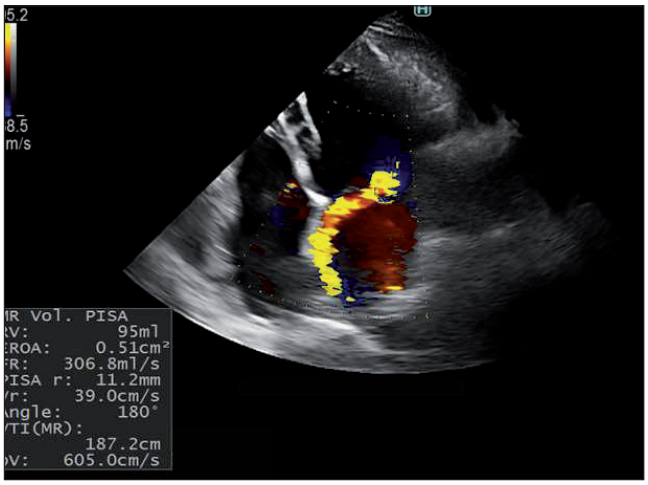

Fig. 8 – Transthoracic echocardiography showing the use of quantitative assessment of mitral regurgitation by proximal isovelocity surface area (PISA) method.

no additional side effects. Control transthoracic echocardiography confirmed the persistence of severe mitral regurgitation (Figs 7 and 8).

A control CT scan of the brain was performed to exclude fungal aneurysms, which were not confirmed, but a small deposit frontally on the right side was detected. This focus was highly suspicious of a brain abscess (Fig. 9). After a comprehensive multidisciplinary evaluation and consideration of current laboratory markers (decrease of inflammatory markers to almost negative values and improvement of the overall clinical condition), we continued the antibiotic therapy and performed an MRI scan. The MRI documented a lesion with a character of an abscess with hemorrhage on the periphery. A neurosurgeon was consulted, and an indication for aspiration of the abscess lesion was made.

During the procedure, samples were taken for microbiological and histological examination. The histology showed an abscess but without finding any pathogen (Fig. 10). A control brain MRI revealed the progression of perifocal edema and bleeding after the procedure (Fig. 11). Another MRI of the spine documented a complete regression of the inflammatory changes. The multidisciplinary team decided to terminate the antibiotic treat-

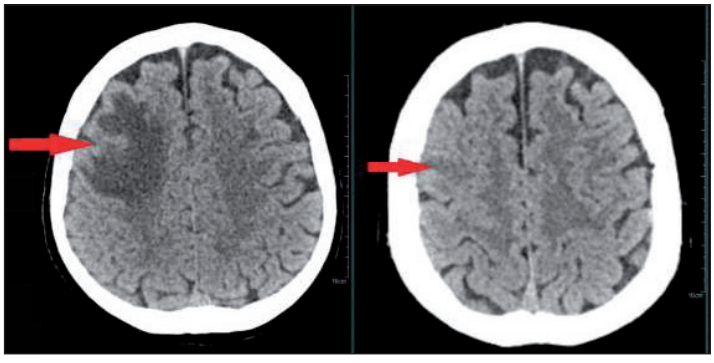

Fig. 9 – The native CT scan. The arrow on the left picture shows a typical finding of an abscess. The image on the right is an older CT scan for comparison, and the arrow shows a small ischemic lesion in the frontal region.

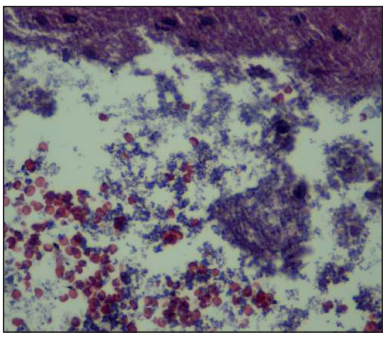

Fig. 10 – The histological finding of the brain abscess.

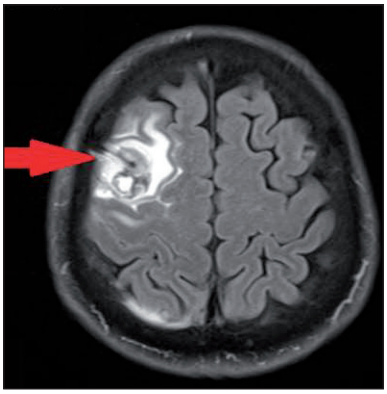

Fig. 11 – The control MRI scan of the brain after the neurosurgical intervention. The arrow shows an increased signal in the right frontal area with a surrounding hemorrhagic rim.

ment. We discharged the patient and scheduled him for a control MRI of the brain, which confirmed a significant regression of the lesion frontally to the right later on. The patient was consulted with a cardiac surgeon for the persistence of severe mitral regurgitation associated with signs of heart failure. Based on a comprehensive examination of the patient, a cardiosurgical procedure on the mitral valve was indicated. To definitively rule out a residual inflammatory focus, a PET CT scan was performed, which found no remaining foci of pathologically increased metabolism of glucose.

Discussion

The guidelines of the European Society of Cardiology (ESC) aimed at IE prophylaxis are based on changes in the pathophysiological concept of IE. This change in concept resulted in the restriction of antibiotic prophylaxis to the highest-risk patients – patients with the highest incidence of IE and the highest risk of adverse consequences of IE.[1] Several studies have looked at the incidence of viridans group streptococcal IE (VGS-IE) following guideline changes in the United States and the United Kingdom implemented in 2007 and 2008. Desimone et al. found no increase in the incidence of VGS-IE in a localized area of Minnesota. IE incidence rates (per 100,000 person-years) during 1999–2002, 2003–2006, 2007–2010, and 2011–2013 were 3.6, 2.7, 0.7, and 1.5, respectively.[6] According to ESC guidelines from 2015, our patient was not indicated for antibiotic prophylaxis during a dental procedure. Nonetheless, the dentist indicated amoxicillin-clavulanate as a short-duration treatment for the purulent infection, as mentioned earlier. The subsequent sequelae of adverse events in our patient suggest the need for a more individual approach to antibiotic prophylaxis and treatment in certain situations.

The case report we present deals with a case of IE complicated by SD and a brain abscess. Early diagnosis of IE is essential for initiating adequate antibiotic therapy and identifying patients who may benefit from extended monitoring of cardiac function and early surgical intervention. Behmanesh et al. performed a retrospective analysis of the coexistence of IE and SD. Over ten years, 110 out of 255 patients with SD underwent transesophageal echocardiography to detect IE. The IE detection rates between patients who underwent and did not undergo echocardiography were 33% and 3%, respectively ($p < 0.0001$).[7] Chronic renal failure, heart failure, septic condition on admission, and a preexisting cardiac condition were significantly associated with coexisting IE.[7,8] Mortality in patients with IE was significantly higher than in patients without IE (22% vs. 3%, $p = 0.002$).[7] Based on these data, routine use of transesophageal echocardiography in some patients with SD could be advocated. Viezens et al. conducted a database analysis of 328 patients diagnosed with spontaneous SD using statistical analysis with propensity score matching. They found significantly more positive blood cultures in patients with the coincidence of IE and SD. The most frequently affected valves were the aortic and mitral valves. More patients were treated surgically in their patient group, as the study was performed at a tertiary center where patients to whom a conservative treatment for SD failed were referred. The coincidence of SD and IE fundamentally affects the duration of antimicrobial treatment and the length of hospitalization compared to patients who are only diagnosed with SD.[9]

IE complicated by a central nervous system event is associated with a significantly higher mortality. Septic embolism is a significant cause of poor prognosis and relates to increased IE-related mortality.[4] Notably, the symptoms of most neurological complications are evident on admission or develop during the first days of hospitalization.[10]

Furthermore, neurological complications of IE are among the most common ones.[3] Garcia et al. retrospectively analyzed data from consecutive patients with left-sided IE (1345 in total) obtained from 8 centers in Spain. Of these patients, 340 experienced neurological complications, 192 patients (14%) had ischemic events, 86 (6%) had encephalopathy or meningitis, 60 (4%) had hemorrhagic complications, and 2 (1%) had brain abscesses. Their analysis showed that the most common independent risk factors for neurological complications were vegetation size above 3 cm, mitral valve involvement, *Staphylococcus aureus* infection, and anticoagulation therapy.[11] Preceding mitral regurgitation was a predisposing factor in our patient. Due to the negativity of blood cultures, we cannot confirm that IE was caused by *Staphylococcus aureus* as the most common cause of neurological infections. We also do not know the original size of the vegetation on the mitral valve as, at the time of the first transesophageal echocardiography, the patient had already suffered from an embolic event. Due to the initial extensive intracerebral involvement (septic embolism in several vascular territories), we believe that initially, the vegetation was of larger size. Rodríguez-Montolio et al. retrospectively analyzed 222 patients treated for IE and

found a high prevalence of neurological complications (21%), with ischemic events accounting for 74.5% and intracerebral hemorrhage for 23.4% of cases.[12] Although neurological complications frequently occur in patients with infectious endocarditis, bacterial brain abscess is a rare complication of endocarditis. It affected 1–7% of patients with IE and was mainly associated with a methicillin-resistant *Staphylococcus aureus* (MRSA) infection. MRI usually detects these abscesses as multiple lesions highlighting the margin in the gray-white junction, which can cause significant edema, bleeding, and a mass effect.[5]

Many patients require a combination of drug and surgical treatment to manage IE successfully. In patients with neurological complications of IE, the indication for cardiac surgery remains or is enhanced, and it must be in balance with perioperative risk and postoperative prognosis. In these cases, one must proceed individually, as there are no data from randomized studies (in the case of neurological complications), and cohort studies suffer from bias, which can only be partially compensated by statistical methods.[1] Early cardiac surgery of a patient with concomitant SD is conflicting since inflammation in the spinal region is an infectious focus increasing the risk of early prosthetic IE.

Conclusion

Summarizing, neurological complications of IE are among the most common,[13] and IE complicated by a central nervous system event is associated with significantly higher mortality.[4] Early diagnosis of IE is vital for adequate antibiotic therapy. The length and the combination of antibiotic treatment of IE complicated by neurological infection are governed by the recommendations for the management of IE. An essential issue for consideration is the passing of antibiotics through the blood-brain barrier. In the case of surgical treatment of IE complicated by neurological infection, one must proceed individually, as randomized studies are lacking, and cohort studies suffer from bias.

References

1. Habib G, Lancellotti P, Antunes MJ, et al. 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC). Eur Heart J 2015;36:3075–3128.
2. Taj S, Arshad M, Khan H, et al. Infective Endocarditis Leading to Intracranial Abscess: A Case Report and Literature Review. Cureus 2021;13:12660.
3. Daoud H, Abugroun A, Olanipekun O, et al. Infective endocarditis and brain abscess secondary to *Aggregatibacter aphrophilus*. ID Cases 2019;17:00561.
4. Yu ZJ, Dou Z, Li J, et al. Nomogram for Predicting In-hospital Mortality in Infective Endocarditis Based on Early Clinical Features and Treatment Options. Front Cardiovasc Med 2022;9:882869.
5. Morris NA, Matiello M, Lyons JL, Samuels MA. Neurologic complications in infective endocarditis: identification, management, and impact on cardiac surgery. Neurohospitalist 2014;4:213–222.
6. Ibrahim AM, Siddique MS. Subacute Bacterial Endocarditis Prophylaxis. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2022 Jan. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532983/, date of last access: 2022 July 15.
7. Behmanesh B, Gessler F, Schnoes K, et al. Infective endocarditis in patients with pyogenic spondylodiscitis: implications for diagnosis and therapy. Neurosurg Focus 2019;46:1–5.
8. Viezens L, Dreimann M, Strahl A, et al. Spontaneous spondylodiscitis and endocarditis: interdisciplinary experience from a tertiary institutional case series and proposal of a treatment algorithm. Neurosurg Rev 2022;45:1335–1342.
9. Chaudhary G, Lee JD. Neurologic Complications of Infective Endocarditis. Curr Neurol Neurosci Rep 2013;13:380.
10. García-Cabrera E, Fernández-Hidalgo N, Almirante B, et al. Neurological complications of infective endocarditis: risk factors, outcome, and impact of cardiac surgery: a multicenter observational study. Circulation 2013;127:2272–2284.
11. Rodríguez-Montolio J, Meseguer-Gonzalez D, Almeida-Zurita M, et al. Prevalence of neurological complications in infective endocarditis. Neurologia (Engl Ed) 2023;S2173-5808(23)00013-5.
12. Ibrahim AM, Siddique MS. Subacute Bacterial Endocarditis Prophylaxis. StatPearls. Treasure Island (FL): StatPearls Publishing; 2022 Jan.