



# Brain Abscess - A Rare Complication of Catheter - Associated Infection in Patients on Hemodialysis

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## SUMMARY

**Introduction:** Vascular approach is one of the main risk factors that causes infections in patients that are treated by hemodialyses. Brain abscess is one of the rarer metastatic complications of dialytic catheter sepsis. Metastatic infections contribute to the increase of morbidity and mortality rates in hemodialytic patients.

**Case report:** A 38 year-old male patient with the case history of hypertension and a rapid progressive glomerulonephritis treated by hemodialyses who developed brain abscess caused by catheter related complication in the region where he had left-sided parenteral ischemic brain stroke. The admitted patient had no subjective symptoms and neurological deficiency, elevated inflammation parameters. No microorganisms were found after the necessary laboratory analyses, puncture point and catheter tip swab tests. Two weeks after hospital admission the patient's condition deteriorated in terms of an increased number of abscess lesions diagnosed by MRI of endocardium, without clinical impairment and increase of inflammation parameters, so the right choice and duration of parenteral antibiotic administration caused brain abscess regression.

**Conclusions:** Albeit brain abscess is a rare complication of the septic state, physicians should have in mind previous brain lesions, especially in immunosuppressed patients.

**Keywords:** brain abscess, catheter-related infections, hemodialysis

## INTRODUCTION

Previous studies have shown that vascular approach is the main risk factor that causes infections in patients treated by hemodialyses. It has been concluded that there is less risk of infections in patients with arteriovenous fistula (AVF) and arteriovenous graft, and that the risk is higher in patients with temporary or permanent catheters [1]. Metastatic infections are present in 5 to 10% of the patients with

catheter sepsis and they appear as osteomyelitis, endocarditis, septic arthritis and epidural abscess [2]. A series of case histories of hemodialytic who complications of catheter-related infections was shown in several papers [3-5]. Other complications, including endophthalmitis, brain abscess, septic pulmonary embolism and mycotic aneurism were less common [6].

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## CASE REPORT

A 38 year-old male patient with the case history of longtime hypertension and rapidly progressive glomerulonephritis since 2007 was treated with cyclophosphamide pulses according to the Ponticelli regimen (intravenous corticosteroid puls 1000 mg, cyclophosphamide pulses 1000 mg once a month during the first six months, then once every three months at the same dose to two years), then Azathioprine along with low-dose corticosteroid therapy. In the course of 2012, the patient had Fournier gangrene due to which Azathioprine therapy was cancelled and corticosteroid therapy was introduced. A year later, chronic kidney disease progressed to end-stage renal disease, so hemodialysis was introduced through a created arteriovenous fistula (AVF) of the right arm with short-term functionality. The patient was dialyzed through a double volume catheter that was replaced nine times with the last access from January to March, 2015, but four days after admission to the Clinic for Nephrology and Clinical Immunology it was replaced into the left femoral vein due to right arm access dysfunction. The patient was hospitalized without subjective symptoms in order to be prepared for cadaver kidney transplant. After hospital admission, due to recurrent dysfunction of the existing catheter, the catheter was replaced in the right femoral vein since other vascular approaches were exhausted. Since the patient had an acute ischemic brain stroke of the left parietal region, a neurologist was consulted who ruled out neurological deficiency and indicated an endocranial contrast CT scan which was followed by MRI of endocranium that proved the abscess of the same region (figure 1). Laboratory tests showed progressed sedimentation (120/mm), a mild C-reactive protein (CRP) increase (15.1 mg/l), white cell count within reference values ( $8.79 \times 10^9$ ) and progressed anemia (Hb 79.7 g/l). Blood cultures, the tip and swab of the exit point of the catheter were negative. An infectologist and a neurosurgeon were consulted, which led to the implementation of empiric antibiotic therapy (ceftriaxone (Longaceph®) 1g i.v. after each dialysis treatment, metronidazole (Metronidazol) 500 mg/8h, vancomycin (Vancomycine) 20 mg/kg initial dose during the last hour of dialysis treatment and then 500 mg during the last 30 minutes of each subsequent dialysis treatment for a period of three weeks) and

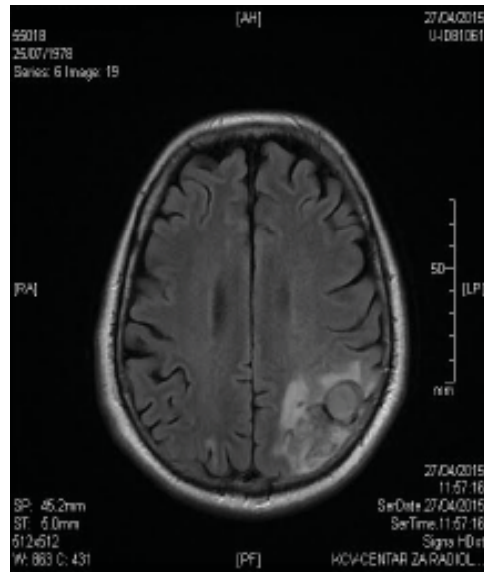


Figure 1. MRI of endocranium [T2 FLAIR, axial plane] - left sided brain abscess in parietal region with chronic hemorrhage area and perifocal edema

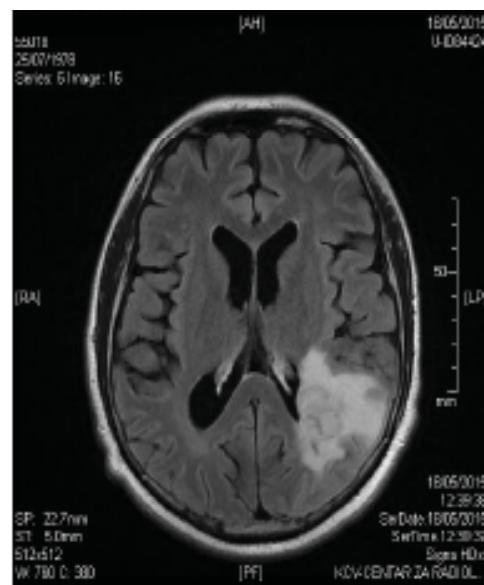
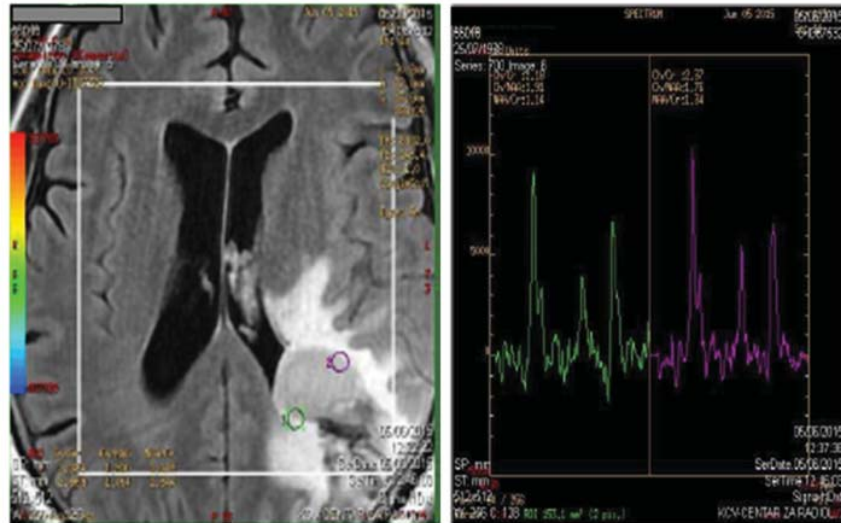


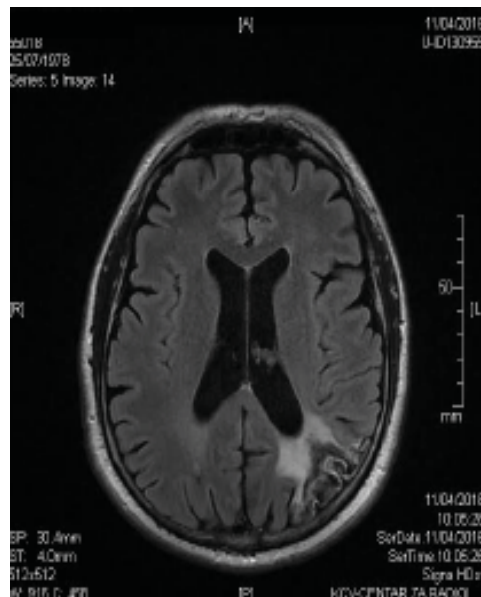
Figure 2. MRI of endocranium [T2 FLAIR, axial plane] - increase in number of abscess lesions and the size of perifocal edema

the need for surgical treatment was excluded. Two weeks afterwards, another MRI of endocranium was done where an increase in numbers of abscess lesions was monitored (figure 2), and due to suspected antimycotic infection (fluconazole (Diflucan®) 200 mg after each dialysis during the ten days) and antiedematous therapy were introduced. The examination was completed by other analyses such as (Anti-HIV, Elisa Toxoplasma Gondii Test, Cysticercosis, Echinococcus, Galactomannan test as well as oncological markers), echocardiograph, chest and abdomen CT scan as well as MR spectroscopy of endocranium (figure 3) to rule out etiology of infections and malignant diseases. The patient was transferred to Clinic for Infec-

**Figure 3.** MRI spectroscopy of endocranium - lesions are of inflammatory origin



**Figure 4.** MRI of endocranium [T2 FLAIR, axial plane] - regression of abscess lesion with consequent gliosis and smaller perifocal edema, without mass effect



tious Diseases where a two-months therapy of antibiotics (ceftriaxone (Longaceph®), vancomycin (Vancomycine) and metronidazole (Metronidazol) in same doses 23 days of administration, linezolid (Zenix) 600 mg/12h and meropenem (Meronem) 500 mg/12h i.v. 15 days of administration, amoxicillin (Amoksicilin) 500mg/8h orally 15 days, clindamycin (Klindamicin) 150 mg/6h orally 8 days of administration) along with same dose antimycotic therapy. A distal creation of AVF of the left arm was attempted which caused oedema of the arm, so anticoagulant therapy was introduced. Doppler ultrasonography and multisliced computer phlebography of upper limbs detected a filiform flow on brachiocephalic line (v. anonima), so a vascular surgeon suggested a proximal AVF since there were no conditions

for endovascular treatment. Right before hospital release, and 3 and 9 months afterwards, MRI of endocranium showed a gradual regression of the previous symptoms. Almost three years after the release from Clinic for Infectious Diseases, The patient has been dialyzed through a proximal AVF of the right hand and is feeling physically well for almost three years after the hospital release.

## DISCUSSION

The incidence of brain abscess in general population of Western countries is 8%, while in developing countries it is 1-2%, without any data on the incidence in dialytic patients [7]. Brain abscess is usually the result of brain trauma, previous neurosurgical procedures, infection spreading per continuitatem or a hematogenous spreading of systemic infection as the second identified mechanism creating around 25% of brain abscess cases [8,9]. However, metastatic infections are present in 5 to 10% of the patients with catheter sepsis in the form of osteomyelitis, endocarditis, septic arthritis and epidural abscess, while other infections such as brain abscess are much less common [10]. There are only cases published on the patients who survived brain abscess caused by a mycotic infection of the central venous catheter and one case of a deceased patient whose brain abscess was the consequence of AVF Staphylococcus aureus bacteriemia [11-13]. Our hemodialytic patient developed brain abscess due to infection of dialytic catheter placed in the right femoral vein. It should be mentioned that a great majority of bacteriemiae do not cause brain abscess or any other infection of

the central nervous system, if there is no predisposition [8]. It is well-known that areas of ischemia, infarction and brain contusion can be a good soil for inoculation of parasites that cause brain abscess, so our immunocompromised patient developed abscess of the left parieto-occipital region on the very place of the previously hyper-perfused region [13].

A classic clinical triad of fever, headache and focal neurological deficiency indicates a brain abscess, but recent data indicate this constellation occurs in only 2%-34% of the cases. Our patient had no subjective symptoms or significant bio-chemical parameters, apart from inflammatory activity and characteristic anemia. Laboratory analyses of the blood have no diagnostic significance, because leukocytosis and accelerated sedimentation of erythrocytes are quite common, but the absence of their growth does not exclude the diagnosis. A great majority of septic infections is caused by gram positive microorganisms (87.3%), proven by most studies, although the incidence ranges from 33% to 72.8% [14-16]. *Staphylococcus aureus*, *Streptococcus viridans* and *Klebsiella pneumoniae* are the most common microorganisms isolated in brain abscesses developed due to hematogenous dissemination, although in 14% to 34% of the cases, cultures stay negative. Analysis of cerebrospinal fluid can detect pleocytosis, elevated proteins and lowered glucosidase, but in 0% to 43% of the cases cytochemical examination is negative [17]. Hemoculture, the culture from the dialytic catheter tip and its exit point swab, cytochemical and microbiological examinations of the liquor along with appropriate additional laboratory analyses, excluded infectious (specific and non-specific) etiology. We are of the opinion that the most common risk factors for catheter sepsis are frequent hospitalizations due to catheter replacing, maneuvering and duration of catheter in the right femoral vein as well as expressed anemia [2]. Inability to identify the culprit can be explained by administration of antibiotics prior blood analyses or limited proliferation of microorganisms in conventional hemocultures or special means to detect isolated microorganisms.

In most patients with non-specific and unclear symptoms, it is necessary to consider the possibility of brain abscess diagnosis and its treatment as early as possible, especially if headaches become more intense, if there is an elevated intracranial pressure or neurologi-

cal deficiency. In the patients that are prone to immunosuppression, brain abscess is to be suspected and diagnosed sooner [17]. MRI is a diagnostic method of the first choice in diagnosing brain abscess, because it is more precise than CT and it offers significant advantages in detecting cerebritis, inflammation spreading on chambers and subarachnoid region as well as detecting satellite lesions [18]. MRI detected and monitored the brain abscess of our patient, and MRI spectroscopy of endocranium excluded malignant etiology since this diagnostic procedure is able to differ abscess from cystic tumors [19].

A retrospective analysis based on prospectively designed protocol determined that a combination of Cephalotaxine and Metronidazole can be a safe and efficient treatment of empiric therapy implemented in treating this patient. Parenteral antibiotics are to administered at least 6 to 8 weeks, which is to be followed by 2 to 3 months of orally taken antibiotics [20]. Parenteral antibiotic therapy of brain abscess longer than six weeks is necessary in necrotic and/or encapsulated abscesses with tissue necrosis, multiocular abscesses, abscesses of vital intracranial localizations and in immunocompromised patients, which was the case with this patient [21]. An active abscess growth, clinical deterioration or the absence of radiological improvement in terms of the size of the abscess, requires a prompt surgical treatment [22]. Although, an impairment in terms of an elevated number of abscess lesions was diagnosed after two weeks of conservative treatment, without clinical deterioration and the growth of inflammation parameters, a decision by a multidisciplinary team was made on an adequate choice and duration of parenteral antibiotic therapy.

Our patient was coincidentally diagnosed with brain abscess a month after a treated acute ischemic brain stroke, after three weeks of temporary dialytic catheter in the right femoral vein. We strongly believe that the replacement of the catheter and an early administration of empiric antibiotics prior microbiological results, as well as the appropriate duration of the therapy, all contributed to a successful treatment. According to most papers, mortality rate is usually less than 15% without the data on the mortality rate of dialytic patients [23]. Brain abscess prognosis has significantly improved in the past couple of years, but patient monitoring is necessary



considering potential long-term consequences and the risk of recidivism. In the present case there are some limitations because it is not clearly established clear causal link between the dialysis catheter and abscess (patient had expressed inflammatory syndrome, is not an isolated cause and there was only morphological MRI and CT diagnosis which is not differentiated whether the collection on the site of infarction abscess or cavity formed extinction of brain tissue).

## CONCLUSION

Although brain abscess is a rare complication of the state of sepsis, physicians should have in mind a previous brain lesion notably in immunosuppressed patients.

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## Apsces mozga - retka komplikacija kateter-vezanih infekcija kod bolesnika na hemodijalizi

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### KRATAK SADRŽAJ

**Uvod:** Vaskularni pristup je glavni faktor rizika za nastanak infekcija kod bolesnika koji se leče hroničnim hemodijalizama. Apsces mozga je jedna od ređih metastatskih komplikacija sepse dijaliznih katetera. Metastatske infekcije doprinose povećanju morbiditeta i mortaliteta kod bolesnika na hemodijalizi.

**Prikaz bolesnika:** Prikazali smo slučaj 38-godišnjeg muškaraca sa anamnezom hipertenzije i rapidno progresivnog glomerulonefritisa lečenog hroničnim hemodijalizama koji je na terenu preležanog ishemijskog akutnog moždanog udara levostrane parijetalne regije razvio apsces mozga, komplikaciju kateter-vezane infekcije. Bolesnik je po prijemu bio bez subjektivnih tegoba i neurološkog deficita, povišenih parametara inflamacije. Sprovedenim odgovarajućim laboratorijskim analizama, brisom izlaznog mesta i vrha katetera nije izolovan uzročnik. Dve nedelje od prijema usledilo je pogoršanje u vidu povećanja broja apscernih lezija verifikovano magnetnom rezonancom endokranijuma, bez kliničkog pogoršanja i porasta parametara inflamacije, te je odgovarajućim izborom i dužinom trajanja parenteralnih antibiotika došlo do regresije apscesa mozga.

**Zaključak:** Iako je apsces mozga retka komplikacija septičnog stanja, uvek treba razmišljati o tome kada postoji prethodna lezija mozga, naročito kod imunokompromitovanih bolesnika.

**Ključne reči:** apsces mozga, kateter-vezane infekcije, hemodijaliza

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