SUBDURAL HEMATOMA CAUSED BY DURAL ARTERIOVENOUS FISTULA: REPORT OF A RARE MANIFESTATION

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ABSTRACT

Dural arteriovenous fistula (dAVF) presenting with acute subdural hematoma, which is not related to head injury, is rare. Dural arteriovenous fistula is the second most common type of cerebrovascular malformation that exhibits as arteriovenous shunting. We report a case of dural AVF presenting with acute subdural hematoma (ASDH) and provide a review of the literature. A 21-year-old man presented with headache on the left side, the only symptom that drove him to the hospital. Computed tomography demonstrated a small right ASDH. Cerebral angiography showed a dural AVF at bilateral temporal regions with the feeders from bilateral meningeal and temporal arteries draining into the cortical veins.

Keywords*: subdural hematoma, dural arteriovenous fistula (dAVF)*

I. INTRODUCTION

Subdural hematoma is an intracranial lesion that can be life-threatening and progress to lethal outcomes for the patients. The major causes of subdural hematomas are acute or chronic injuries. However, there are some rare causes. A small amount of non-injury subdural hematomas is often missed due to lack of equipment to find out the etiology. One of the known rare causes is dural arteriovenous fistula. Finding the fistula and treating this pathology require the experience and most advanced, modern equipment.

II. CASE PRESENTATION

In July 2021, a 21-year-old male patient was admitted to Emergency Department of Can Tho University hospital with persistent headaches on his left side for about one week. Medications did not relieve his pain. He had no previous history of injury. Two days before the admission, the pain became worse and was associated with vomitting. This occurred several times. Furthermore, the patient had no other neurological deficits. Upon clinical assessment, he had intracranial hypertension syndrome and suspicious intracranial lesions. A CT scan revealed a subdural hematoma of 3mm thickness in the left cerebral hemisphere without midline shift. The hematoma was consistent with the patient's symptoms.

The patient was then admitted to Neurology Department for further examination and planned for treatment. The clinical doctor evaluated the non-traumatic subdural hematoma such as blood clotting disorders, vascular malformations and so on. Additional tests were carried out to supported the diagnosis. The patient was also administered medications for intracranial hypertension. One day later, the patient got a magnetic resonance imaging (MRI) scan of the brain. The result showed a vessel-like lesion likely dAVF on the left hemisphere with venous drainage ectasia into subarachnoid vein which confirm the diagnosis.

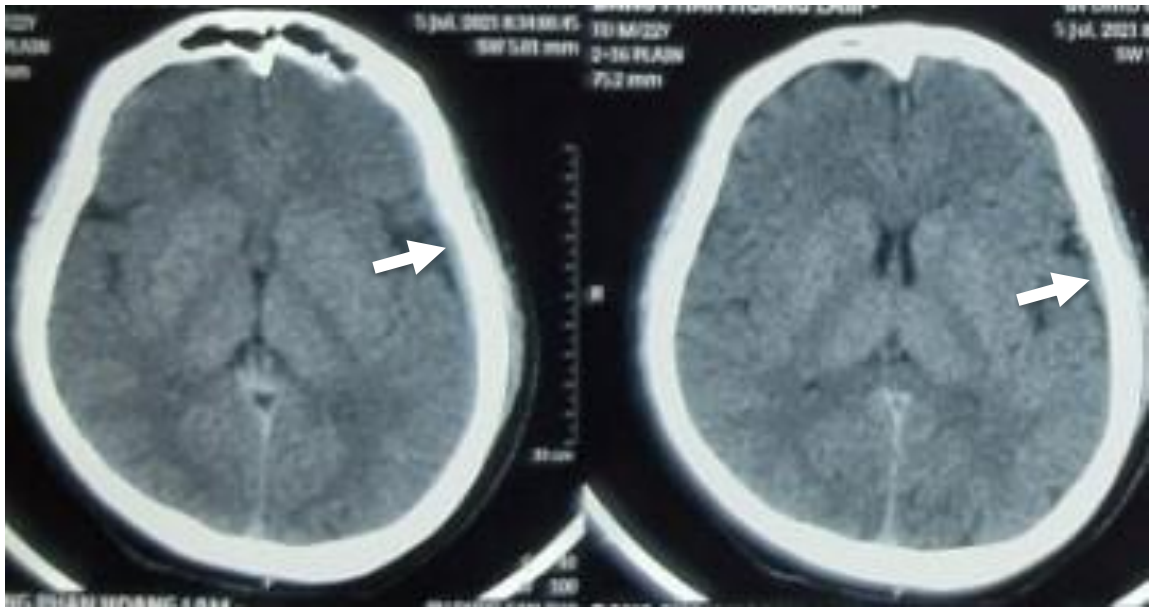

Figure 1. The left subdural hematoma on the brain CT scan

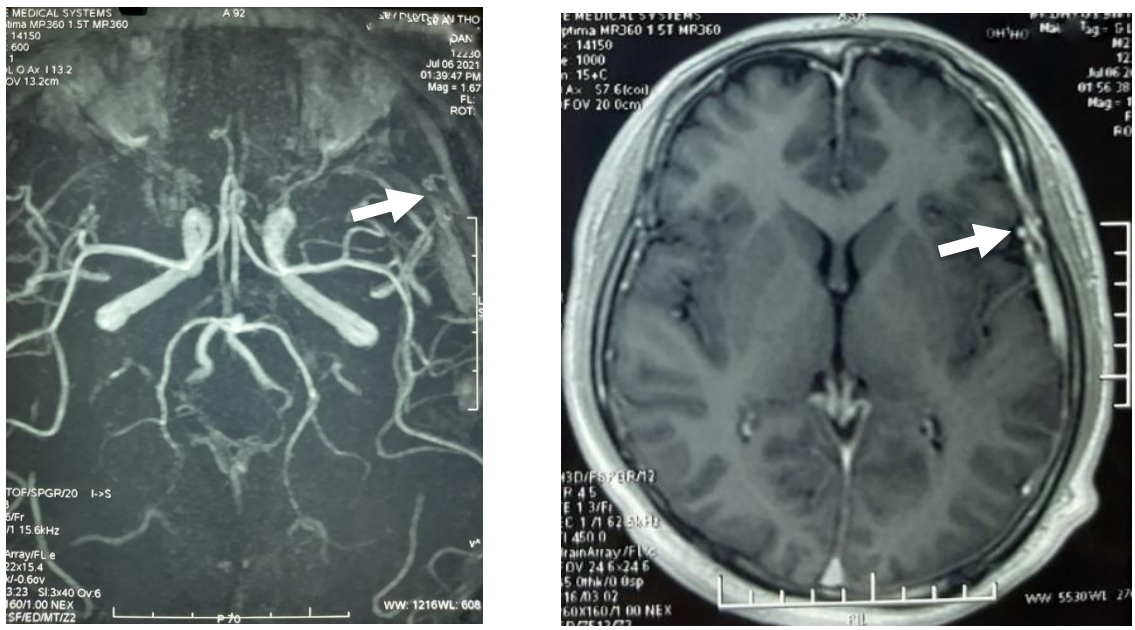

Figure 2. Axial TOF3D and Axial T1W CE MRI: dural arteriovenous fistula (arrow)

Intracranial dural arteriovenous fistula is characterized by pathological anastomoses between meningeal arteries and dural venous sinuses, meningeal veins, or cortical veins. The disease usually has diversity of clinical symptoms such as headache, tinnitus, vision loss, bulge of the eyes. It can cause complications such as inracranial hemorrhage, intracranial hypertension, which can be life-threatening. However clinically, this patient had only extremely subtle symptom of headache which was explained by the hematoma. The condition was resolved under interventional endovascular embolization. The endovascular intervention was conducted under the digital subtraction angiography (DSA) system for

about 2 hours to check and embolize the fistula with Lipiodol. The interventional results were completely blocked of the feeding branches, the middle meningeal arteries at the sites of the fistula.

The patient's condition after the intervention was completely stable. He was monitored for another 2 days before discharge. On clinical re-examination one month later, his symptoms of persistent headache had been resolved. He was doing very well afterward and was scheduled for an angiogram after 6 months.

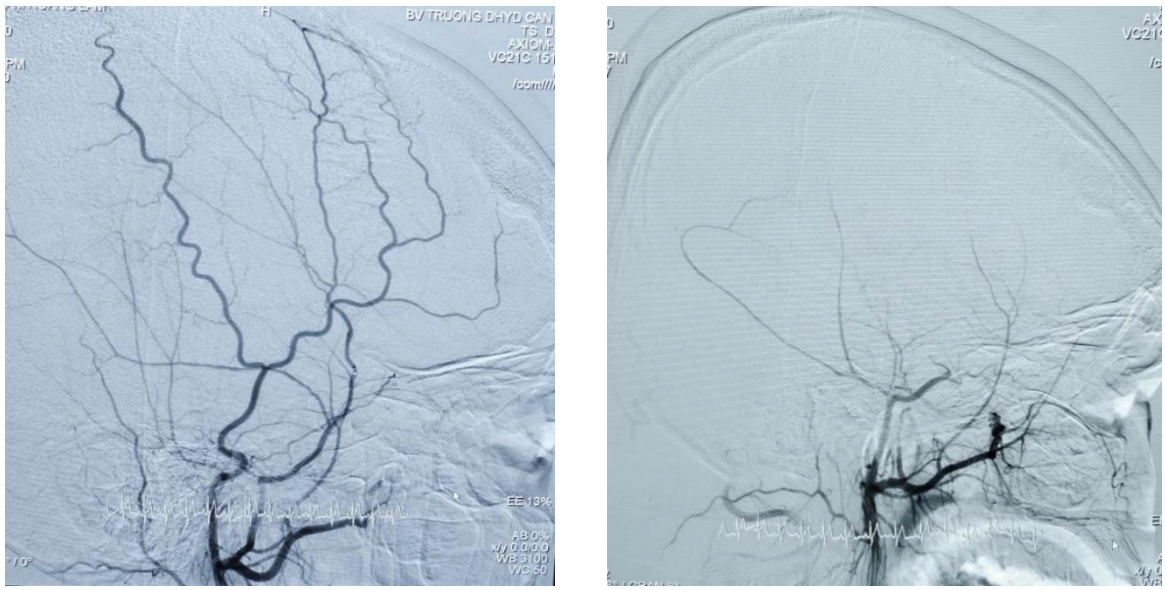

Figure 3. Middle meningeal artery before and after embolization

III. DISCUSSION

It is admitted that diagnosing dural arteriovenous fistula is often difficult due to very variable clinical symptoms. Just as being presented in our case, headache was the most common complaint. However, many case reports showed progressive cognitive impairment, ataxia, and myoclonus with dAVF. The clinical symptoms were explained by venous hypertension in the deep venous system, producing bilateral basal ganglia/thalamic dysfunction, without involvement of deep white matter [6]. Besides, dAVF cases with infrequent neurological manifestations, such as gait ataxia, parkinsonism, and myoclonus, have also been reported. Occasionally, patients with dAVF could present focal neurologic deficits, a dementia-like syndrome, hemorrhage, or ischemic infarction. As a result of its rarity, hardly could we ever detect dAVF causes an SDH. In which SDH case is not caused by trauma, we should consider focusing on imaging and laboratory tests to look for other hemorrhagic causes such as dAVF. The modalities of diagnostic imaging that should be indicated are Doppler ultrasound, computed tomography, magnetic resonance imaging. MRI is the modality of choice with the best accuracy, a non-invasive diagnostic method for the assessment of cerebral parenchyma and cerebral vascular diseases. Digital subtraction angiogram is the gold standard for diagnosing and treating cerebral vascular disease.

Multiple different classification systems for dAVF have been suggested. In general, these lesions account for 10-15% of all intracranial vascular malformation. The Borden and

Cognard classification systems are the most widely used. Both systems are based on the pattern of venous drainage from the fistula.

Table 1. The Borden classification systems

Borden classification	
Type	**Fistula location/venous drainage**
I	Venous sinus or meningeal vein(s)/antegrade in sinus(es) only
II	Venous sinus or meningeal vein/retrograde in cortical vein(s)
III	Cortical vein/retrograde in cortical vein(s)

Table 2. The Cognard classification systems

Cognard classification	
Type	**Fistula location/venous drainage**
I	Venous sinus/antegrade in sinus(es)
IIa	Venous sinus/retrograde in sinus(es)
IIb	Venous sinus/retrograde in cortical vein(s)
IIa+b	Venous sinus/retrograde in both sinus(es) and cortical vein(s)
III	Cortical vein (without venous ectasia)/retrograde in cortical vein(s)
IV	Cortical vein (with venous ectasia)/retrograde in cortical vein(s)
V	Cortical vein/retrograde in spinal perimedullary vein(s)

The severity of dAVF depends on the venous drainage, and 12–29% bleed. Hemorrhages are one of the most serious clinical issues, appearing with loss of consciousness, motor defects, and can even cause death [1]. In a published meta-analysis, 20 studies involving 2513 patients were reported: 269 patients (11%) received symptomatic treatment with a follow-up period between 1 and 210 months; 3.3% had intracranial hemorrhages and 2.6% died [4]. Most cases have retrograded leptomeningeal venous drainage, often combined with venous ectasia. They are usually classified as Cognard types IIb, III and IV [5], [6]. In our case, it was Cognard type IV.

There are 3 approaches to treatment: endovascular embolization, surgery, radiation. Embolization is the first choice because of its high efficiency and minimal invasive. Treatment of intervention is usually conducted by arterial tract. Micro-catheter is selectively threaded into the arterial stem all the way to the venous fistula to pump the embolism [9].

Among the reports of dAVF with ASDH, some underwent surgical treatment. Craniotomy for treating both SDH and dAVF was performed at a single stage. Other patients underwent endovascular treatment for dAVF and received medication only for SDH. In addition, craniotomy for SDH and endovascular treatment for DAVF sometimes were performed in combination [2], [3], [6]. Because the severity of SDH is a crucial factor for prognosis, the treatment strategy depends on its severity [8]. If intracranial hypertension is not manageable with conservative treatment, then an urgent surgery of the SDH is the first option [6].

IV. CONCLUSION

DAVF is a rare clinical entity, given wide spectrum of symptoms and non-special imaging features; it is a great challenge for doctors to diagnose dAVF accurately and timely. Subdural hematoma is a rare finding of dAVF and miss diagnosis in clinical practice. Prompt identification of these clinical and radiographic features, especially MRI remains

critical for minimizing the morbidity and mortality of lesions. Endovascular intervention is the most effective treatment for dAVF.

Declaration of patient consent

Patient's consent not required as patients' identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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