

A Case of Subarachnoid Hemorrhage Due to Spinal Vascular Malformation

Jingyu Zhao¹, Yiwen Zu¹, Xiaoyi Chen², Ya Zhang², Hui Zhang³, Yanhong Dong^{4,*}

¹Department of Graduate School, North China University of Science and Technology, Tangshan, Hebei, China

²Department of Graduate School, Hebei North University, Zhangjiakou, Hebei, China

³Department of Graduate School, Hebei Medical University, Shijiazhuang, Hebei, China

⁴Department of Neurology, Hebei General Hospital, Shijiazhuang, Hebei, China

d_yanhongniu@163.com

*Corresponding author

Abstract: This article reports a case of spinal vascular malformation. The incidence of spinal vascular malformation is low, the onset of the disease is varied, and the early clinical symptoms are often atypical, making it easy to miss or misdiagnose the disease. In this case, the patient had a sudden onset of headache and was not examined for spinal cord at the beginning, which led to misdiagnosis of the disease at an early stage. This case report and review of the literature will deepen the understanding of spinal dural arteriovenous fistula. The case report and review of the literature are intended to enhance the understanding of spinal dural arteriovenous fistula and to improve the diagnosis and treatment of this disease.

Keywords: Spinal Vascular Malformation, Subarachnoid Hemorrhage, Case Report, Spinal Cord

1. Introduction

Spinal vascular malformation (SVM) has a low incidence, accounting for 2%-4% of spinal vascular disease, but can cause severe neurological symptoms [1]. Spinal subarachnoid hemorrhage (SSH) is very rare, accounting for 1% of subarachnoid hemorrhage disorders [2], and spinal subarachnoid hemorrhage caused by spinal vascular malformation is a rare type that has been rarely reported. We studied the clinical data of a patient with subarachnoid hemorrhage caused by spinal vascular malformation admitted to our department, and reviewed the relevant domestic and international literature to deepen our understanding of this disease, which is reported below.

2. Case report

Patient, female, 61 years old. She had dizziness for 5 days and left-sided limb weakness for 3 days. 5 days ago she had a hazy and swollen feeling in her head. 3 days ago she had difficulty in lifting the left limb, with numbness of the limb, difficulty in urinating, and pain in the back of the neck, with obvious accompanying headache. He had a transient confusion, double eye hanging (relieved for about 3 minutes), no obvious panic, shortness of breath, etc. He had been seen in an outside hospital, and no abnormality was seen in the cranial MRI; he was in good health in the past. The muscle strength of the left limb was grade 4, and the muscle strength of the right side was normal. Babinski's sign on the left side was positive, and the neck was tonic with four transverse fingers. Cephalothoracic CT: left frontal deep lacunar cerebral infarction, the rest did not show significant abnormalities. Blood cell analysis: C-reactive protein 68.97 mg/L, white blood cell count 14.06*10⁹/L, neutrophils 87.50%. The patient's condition was not significantly relieved by general symptomatic treatment. After lumbar puncture, hemorrhagic cerebrospinal fluid was detected. Cerebrospinal fluid biochemistry showed: chloride 101 mmol/L, total cerebrospinal fluid protein: 475.06 mg/dl, cerebrospinal fluid sugar: 57.73 mg/dl. The cytology of cerebrospinal fluid was examined. A full field of red blood cells was considered as subarachnoid hemorrhage. MRI of the cervical spine showed a small nodular spinal cord with high and low mixed signals in various sequences on the left side of the C6-7 intervertebral disc, which was considered a spinal vascular malformation. A spinal angiogram showed an abnormal vascular image of

the blood supply from the right metacervical trunk branch visible in the arterial phase, the patient's symptoms improved after symptomatic treatment, and no further consultation was performed.

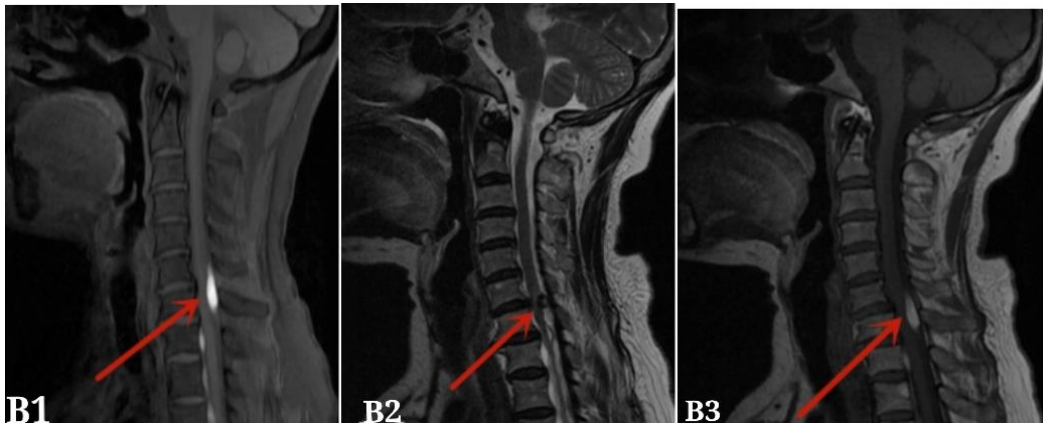


Figure 1: Arrow out-of-shape, arrow pointing to intramedullary high signal



Figure 2: Note: DSA examination the arrow indicates the location of the arteriovenous fistula

3. Discussion

SVM is generally considered to be a congenital abnormality of the spinal cord vasculature, manifesting as some abnormal vascular structures in or near the spinal cord. There are many types of SVM and various methods of classification, and there is no uniform standard for typing, mostly divided into four types: spinal arteriovenous malformation (SAVM), perimedullary arteriovenous fistula (PMAVF), dural arteriovenous fistula (SDAVF), and cavernous angioma (CA) [3]. The majority of the population with SVM is elderly, and the incidence of men and women is basically the same. Lesions are more common in the thoracic and lumbar segments and are often acute or chronic progressive spinal cord lesions [4]. Most patients present to neurosurgery after severe neurological deficits. Spinal vascular lesions account for approximately 3-4% of all intradural lesions of the spinal cord. They are pathologically similar to their intracranial counterparts in terms of vascular malformations, but their clinical impact tends to be relatively poor. Early, proper pathologic recognition is imperative to halt disease progression and reduce permanent spinal cord injury. The first clinical observation of SVM was published in 1890, but the first successful surgical treatment of spinal vascular malformations was not reported until 1914. The first clinical observation of SVM was published in 1890, but the first successful surgical treatment of spinal vascular malformations was not reported until 1914. In 1974, Aminoff and Logue showed that up to 48% of patients with spinal vascular malformations (SVM) were confined to a bed or wheelchair for 3 years after the onset of symptoms, and that chronic paraplegic complications were a direct cause of death cause.

The unique structural and vascular anatomy of the spinal cord leads to a diversity of clinical

presentations, with first symptoms generally insidious, difficult to diagnose and no specific clinical manifestations [5]. In particular, in chronic disease, pain can be the first symptom, repeatedly appearing during the course of the disease, or with different manifestations such as numbness, hemiparesis, sensory impairment or sphincter dysfunction. In acute disease, the hemorrhage is caused by rupture of a blood vessel and results in varying degrees of paraplegia, radicular or conduction bundle sensory deficits, and positive meningeal irritation signs. The mechanism of subarachnoid hemorrhage caused by SVM may be due to an increase in arteriovenous pressure, which increases when arterial blood flows into the valveless coronary plexus and radicular veins [6]. When the patient exercises heavily, the sudden increase in systemic arterial pressure further aggravates the venous pressure, leading to ruptured blood vessels and bleeding [7]. In the present case, the patient developed the disease after physical exercise. SAH is easily confused with cerebral subarachnoid hemorrhage, which is difficult to differentiate. The main differentiating points are: (1) the pain in the low back appears earlier and more intense than the headache; (2) the headache and other brain symptoms may subside quickly, but the symptoms of spinal cord involvement are difficult to relieve and keep getting worse; (3) the consciousness is clear; and (4) there are obvious neurogenic signs. The characteristics of cerebral SAH are: (1) early onset of severe headache and rare back pain; (2) long duration of headache, accompanied by nausea and vomiting; (3) some degree of confusion; and (4) positive signs of meningeal irritation.

There are no uniform diagnostic criteria for spinal vascular malformations, and they are easy to be missed and misdiagnosed, and the main tests for SVM are CTA, MRI and myelography [8]. With the development of imaging technology, MRI has the characteristics of non-invasive, simple operation and easy to popularize, and is used clinically for the screening and diagnosis of SVM. Different subtypes of spinal vascular malformations have different performance characteristics in MRI. Perimedullary venous fistulae mainly show intradural flow-void shadow and T2-weighted sequence intramedullary high signal in MRI [9]. Spinal vascular malformations are characterized by low signal T1- and T2-weighted images on MRI [10]. Dural arteriovenous fistulas have a slow onset and progressive worsening, and MRI mostly shows peri-medullary low signal on T2-weighted sequences and high signal on the central soft membrane surface of the spinal cord [11]. Spongiform hemangiomas are similar to cerebral spongiform hemangiomas on MRI, showing a mixture of well-defined peripheral low signal on T2-weighted sequences and central high signal of variable size [12]. In recent years, due to the development of CTA, the number of cases being used to diagnose spinal vascular malformations has gradually increased, and better clinical results have been achieved. CTA can be used as a screening tool for spinal vascular malformations, but CTA cannot easily detect small blood supply arteries and cannot accurately diagnose the type of spinal vascular malformations due to the limited scanning range [13]. Spinal angiography is still the gold standard, and it can clearly show the extent, size, type and relationship of the abnormal vessels to the spinal cord, which can help to clarify the next treatment plan. In this case, spinal angiography was not performed in time to determine the staging and treatment plan after the etiology by MRI.

Early diagnosis and treatment of SVM can help to restore neurological function and improve quality of life. The aim of SVM treatment is to block the arteriovenous malformation vascular shunt to ensure normal spinal cord blood supply and venous return, while protecting normal spinal cord tissue as much as possible to promote spinal cord function recovery [14]. At present, the main treatment means include microsurgery, vascular intervention, and microsurgery plus vascular intervention combined surgical treatment. Microsurgery is difficult to identify the extent of the vascular malformation or the location of the fistula, and accurate localization often requires the operator's accumulated experience and repeated fluoroscopic observation. Postoperative vascular malformation treatment is difficult to assess, and the resection of vascular malformations can be assessed only by visual or surgical experience after surgery, which increases the risk of surgical complications due to misjudgment [15]. Endovascular interventions can be performed in a single session, with minimal trauma and easy postoperative recovery, but the success rate of recanalization is low, while the recurrence rate is high, and there is a risk of misembolization of normal vessels causing impaired spinal cord function [16]. Currently, there is an increasing application of composite surgery treatment, which is the integration of microsurgery and endovascular interventional techniques using high-definition imaging equipment in the operating room to fill the respective shortcomings of the traditional operating room and interventional catheterization room, providing safe and precise treatment for spinal cord vascular malformations. Dai Wei [17] et al. studied the clinical data of 17 patients with spinal cord vascular disease treated by composite surgery, which resulted in successful composite surgery with no miscutting or residuals, and no recurrence in all patients.

Difficulty in diagnosis leading to delayed treatment remains a major problem in rare diseases. early stage of SVM is prone to misdiagnosis and underdiagnosis, complicated treatment, and high disability

rate. Early diagnosis and rational treatment planning are key to improve the prognosis and quality of survival of patients. Through the analysis of this case and review of the relevant literature, the clinical features

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