

Case Report

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Brain strokes related to aortic aneurysma – the analysis of three cases

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Abstract: Brain stroke connected with aortic blood flow disturbances is a rare disease and its incidence is difficult to assume. Nevertheless, 10-50% of patients with aortic dissection may not experience any pain. In case of 18-30% patients with aortic dissection neurological signs are first disease presentation and among them ischemic stroke is the most common. The most popular aortic dissection classification is with use of Stanford system. Type A involves the ascending aorta and type B is occurring distal to the subclavian artery. Aortic dissection risk factors include hypertension, cystic medionecrosis, bicuspid aortic valve and Marfan's or Ehlers-Danlos syndrome.

Keywords: Aortic dissection; Aneurysm; Brain stroke

1 Introduction

Stroke can be defined as brain tissue damage caused by poor blood flow in brain vessels. It occurs in two forms: ischemic and hemorrhagic [1, 2]. The latter comprises only 13% of strokes with bleeding in the brain or in space surrounding it, due to hypertension, atrial fibrillation and

obesity, diabetes mellitus, dislipidemia, tobacco smoking and brain aneurysms [3, 4]. Brain strokes with aortic blood flow disturbances seem to be rare conditions with incidence rates that have been difficult to enumerate. From 10 to 50% of aortic dissection takes place without pain. Neurological disorders, most commonly stroke, may be the first symptom of the disease in 18-30% of patients. Stratford division seems to be the most commonly used classification of stratification types. Type A dissections include cases in which the disease process involves the ascending aorta, and type B the distal section below the origin of the subclavian artery. Risk factors for aortic dissection include hypertension, faulty development of the wall of the aorta, bicuspid aortic valve, Marfan syndrome and Ehlers - Danlos' syndrome. Being widely available in emergency departments, radiographic examination of the chest leads to incorrect diagnoses for 80% of patients with aortic dissection. The most common defects include the expansion of the mediastinum and abnormal aorta. Echocardiography may confirm the diagnosis, but computed tomography has shown to be more reliable as it distinguishes stratification derived from the pathology of carotid arteries from the initial one comprising the aorta. The mortality rate in patients with correctly-diagnosed aortic dissection is as high as 50% within the first few days. Contradictory as it might seem, due to the high morbidity in patients with type A form of the disease, timely surgery appears to be the main treatment. This present study is an analysis of three patients with aortic blood flow disturbances and brain stroke. The first two cases describe painless ascending aorta dissection and the third describes post traumatic thoracic aorta aneurysm.

2 First case

A 58-year-old male was admitted to the Neurology Department of Hospital Name due to left limbs paresis lasting for three days. The patient had been diagnosed with diabetes, hypertension, hyperlipidemia and obesity a few years

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earlier. Internal examination revealed no abnormalities. Neurologically, dysarthria, mild left limbs paresis with Babiński sign were reported. Computer Tomography (CT) of the brain revealed multifocal vascular lesions and leukoariosis in both the right and left hemispheres. During hospitalization, intermittent disturbances of consciousness were observed, although electroencephalography (EEG) remained normal. Ultrasonography revealed slow, biphasic blood flow in the right internal (ICA) and external (ECA) carotid artery. Due to those abnormalities, computer angiography tomography was performed, showing obstructed blood flow in the right ICA and normal flow of blood in the left ICA. Persistent elevation of C-reactive protein (CRP) level and leukocytosis with no reaction for antibiotics resulted in a chest X-ray examination but no abnormalities were detected. Urinalysis and other blood tests were also normal. Echocardiography (ECHO) was performed on the fourth day, revealing a dissecting aneurysm of the ascending aorta (70 mm width with the features of tunica intima exfoliation). The patient was operated on the next day in the Department of Cardiac Surgery. The open-heart operation with stent-graft fixation was performed; however the right ICA was not revascularized during that operation. The patient died after two weeks due to cardiac and respiratory insufficiency.

3 Second case

An 82-year-old male was admitted to the Neurology Department because of aphasia and severe right limbs paresis that had developed over the previous hour. During internal examination no abnormalities were found. The patient had been suffering from anemia for many years, and was taking supplements containing iron. A CT scan revealed old multifocal vascular lesions in both hemispheres of the brain. The patient was given thrombolytic treatment. Initially, the patient's neurological status improved. However, after 30 minutes of rtPA infusion, the patient started to complain of chest pain, lost consciousness, and went into cardiac arrest. Resuscitation was initiated with simultaneous echocardiography, which revealed a dissecting aneurysm of the ascending aorta and cardiac tamponade. The patient died 40 minutes later.

4 Third case

A 28-year-old male was admitted to the Neurology Department due to aphasia and right limb paresis. A CT scan

revealed a hyperdense left middle brain artery. The symptoms had begun during the previous night. Four years earlier the patient had undergone open-heart surgery for a posttraumatic thoracic aorta aneurysm, and required surgery again two years later due to problems with the stent-graft fixation to the artery wall. He also suffered from hypertension, dyslipidemia and recurrent blockage of the internal iliac artery, which were restored surgically a few times. The patient was treated with a vitamin K antagonist (acenokumarol), although of its use in treatment of recurrent thrombosis and iliac arteries has been considered to be controversial. However, without any doctor's consultation, he had discontinued taking the medicine due to nasal hemorrhage five days before the stroke. Control CT showed an ischemic lesion in the frontal and temporal lobes of the left hemisphere of the brain. USG revealed no blood flow in the left common carotid artery (CCA) and diverted flow in left vertebral artery. Angiography CT revealed an aorta with a stent-graft without features of new dissection and the blood thrombus in the CCA which confirmed the embolic nature of the stroke, possibly linked to discontinuation of the anticoagulants. ECHO was normal except for postoperative changes in aorta. During hospitalization the patient was treated with heparin and after a week he was given a vitamin K antagonist. After rehabilitation, the patient's neurological status improved.

Establishing a diagnosis of aortic dissection in patients with only neurological symptoms is challenging, as it requires special attention to subtle signs including chest discomfort, carotid bruits or asymmetric radial pulsation in patients with stroke especially before the thrombolytic treatment [5]. Aortic dissection risk factors include hypertension, cystic medionecrosis, bicuspid aortic valve and Marfan's or Ehlers-Danlos syndrome [6]. Aortic dissection is widely categorized according to the Stanford system. Type A involves the ascending aorta and type B occurs distal to the subclavian artery [7]. Nevertheless, 10-50% of patients with aortic dissection may not experience any pain. In 18-30% of patients with aortic dissection, neurological signs often present as the onset of disease and ischemic stroke [5, 8, 9]. About 80% of patients with aortic dissection experience loss of consciousness and that symptom in patients with a brain stroke should turn doctors to further diagnosis [10]. Upper extremity pulse discrepancies may occur in up to 30% of aortic dissection [11]. Cardiac murmur caused by aortic regurgitation is present in 60-70% of patients with type A dissection [12].

A number of mechanisms may be responsible for the ischemic stroke occurring in patients with aortic dissection, including the extension of the dissection into the common carotid arteries, thromboembolism, or cerebral

hypoperfusion [13]. In the first case presented, the right internal carotid artery was blocked by a thrombus connected to the ascending aortic dissection, while in the second case the aortic dissection extended to the left ICA, causing cardiac tamponade. Neither patient complained of chest pain at the moment when neurological symptoms occurred. The second patient started to complain of chest pain during rtPA infusion. The last case involved a posttraumatic thoracic aortic aneurysm. That patient was operated on many times with the recommendation of using vitamin K antagonists to prevent thrombosis complications. Unfortunately, he had interrupted treatment due to nasal hemorrhage without a prior consultation with a doctor.

A study by Mendes, 2011, described the case of a patient with aortic dissection presenting as an ischemic stroke. Successful treatment included an infusion with recombinant tissue plasminogen activator followed by surgery. She also claimed that there were only 19 cases of stroke secondary to aortic dissection admitted to hospital within the short treatable time window, only three of which obtained rtPA [14]. Nakagawara (2007) described 10 deaths after the alteplase treatment in patients with aortic dissection reported in Japan before July 2007 [15].

The exclusion of aortic dissection seems to be vital in patients with brain stroke especially before the thrombolytic treatment. Undiagnosed patients with aortic dissection given rtPA may experience the extension of the dissection, hemothorax, or hemopericardium [16, 17]. Chest X-rays are widely available in the Emergency Department, often showing abnormality in 80% of patients with aortic dissection as well as revealing mediastinal widening and abnormal aortic contour [18]. Echocardiography is also an easy and noninvasive examination that can be performed quickly in the Emergency Department. It can reveal a subintimal dissection with a false lumen [19]. The D-dimer test can be useful in both the exclusion of dissection and the elevation in many infectious diseases [20]. Despite the fact that echocardiography may also confirm diagnosis, aortic CT scans ought to be a gold standard and in this study it is possible to differentiate dissection extending into the cervical arteries from a primary cervical arterial dissection [21]. A study by Huang suggested that cerebral CT angiography should be performed in acute ischemic stroke patients, particularly in those with watershed CT perfusion deficits [5].

Surgery appears to be the gold standard treatment. Unfortunately, the morbidity in these patients is high, and mortality reaches nearly fifty percent. Patients with type A dissections should be operated on as soon as possible,

and it is important to note that stroke is not a contradiction to surgery [6, 14]. In this present study, the first patient was operated on for a brain stroke in the first week but died a few days after surgery. Also, the second patient also underwent surgery but required several follow-up operations due to ongoing complications.

Establishing the diagnosis of aortic dissection in patients presenting only with neurological symptoms is thus challenging and complicated by many factors. On the other hand, it is vital to reconsider the issue of an aortic aneurysm in patients potentially prone to thrombolytic treatment. Doctors must pay attention for subtle signs of aortic dissection such as mild dyspnea, chest discomfort and carotid bruits, cheek peripheral pulses and blood pressure on both arms before rt-PA administration.

Ethical approval: The research related to human use has been complied with all the relevant national regulations, institutional policies and in accordance the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or equivalent committee.

Informed consent: Informed consent has been obtained from all individuals included in this study.

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