

Vertebrobasilar Artery Dissection Stroke- Case Report and Literature Review

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Abstract

Vertebrobasilar dissection is an uncommon cause of stroke and persistent vertebrobasilar insufficiency, and its image documentation *in vivo* is reported since 1978. Etiology investigation in many cases is frustrating. Trauma, artery dysplasia, cardiovascular risk factors and efforts are cited as possible causes. Presentation as a subarachnoid hemorrhage or an ischemic stroke, with potential life-threatening complications, are the main clinical and image findings. Treatment can be conservative, endovascular, or open surgical. We describe a 35-year-old woman, who presented to emergency room with occipital headache, transitory loss of consciousness, and generalized seizures, with hemiparesis and nystagmus. Magnetic resonance showed cerebellar and pontine infarction, vertebral artery dissection, with stenosis of basilar artery. In-hospital evolution was concerning, with tetraparesis and coma state, so she needed critical care and was conducted with anticoagulation, physiotherapy and contingency measures. Six-month outcome is considered excellent. We also present a literature review of this condition.

Keywords: Stroke; Cerebellar; Pontine; Vertebrobasilar; Artery Dissection

Abbreviations

VBI: Vertebrobasilar Insufficiency; VBAD: Vertebrobasilar Artery Dissection; MR: Magnetic Resonance; CT: Computerized Tomography

Introduction

Stroke is a common diagnostic in emergency care, but etiological diagnosis of stroke, however, can be a hard work. Sometimes etiological diagnosis becomes easier when it is present with older age, known heart disease, diabetes, cumulative risk factors, known atherosclerosis or atrial fibrillation [1]. Stroke in younger patients without any risk factor, however, turns on a challenge for clinicians and neurologists, because there are many rare diseases that could lead to a stroke in this subpopulation [2]. One of these is VBAD [3], linked to 6% of posterior cerebral territory strokes [4]. Although VBI was reported in 1946, by Kubik and Adams [5], VBAD have only been recognized

antemortem in the studies of Fisher, Ojemann and Roberson in 1978 [6]. Occurrence has been described, in different studies, as 1:100000 [7] cases to 1:400000 [8], so it is very uncommon. The dissection etiology is found in a minority of cases [9,10]. Angiographic evidence of dysplasia is present only in 10 - 15% of patients and suggests genetic mediated weakness of artery wall with or without aneurysms [11]. Extra-cranial factors, such as hypertension, trauma, or efforts, may eventually be related with the development of dissection [11,12].

Main symptoms are headache, transient loss of consciousness and a persistent VBI, with dizziness, ataxia, coordination disturbances, diplopia and dysarthria [3], but it could evolve with seizures, tetraparesis, coma and death [13]. Nowadays, neuroimage, especially MR, have central role in diagnostic. Two kinds of cerebral damage are seen: a subarachnoid hemorrhage or an ischemic stroke [7,11]. MR can also be useful showing vascular acquired or congenital abnormalities and the dissection itself. Clinical and image findings should guide the treatment [8].

Materials and Methods

We report a case of a 35-year-old woman, who was treated in 2020 August, in São Vicente Charity Hospital, in Guarapuava, Paraná, Brazil. Informed consent by patient herself was obtained. We conducted a review on this issue on following databases: PubMed, Medline, Scielo and Cochrane, with keywords: vertebral, basilar and dissection. Articles were selected if they had search on dissection at vertebrobasilar system. Other neck dissections, as carotid dissection, were excluded. Mixed articles, with carotid and vertebrobasilar dissections, were considered if it was possible to detach data on vertebrobasilar dissections. Reviews of stroke, articles on vertebrobasilar insufficiency and physiotherapy concepts, as well as historical articles, were used when applicable. We choose describing the case simultaneously to review presentation.

Case Report and Discussion

A 35-year-old woman went to emergency room in 2020, August, presenting severe, oppressive headache, more intense in the occipital region. Pain had begun 5 - 7 days before, but there was significant worsening and associating with other symptoms, such as transitory loss of consciousness, nausea and vomiting. In the emergency room, she presented generalized seizures. A family member reported that the patient was previously healthy, had never been pregnant, did not use any medication and had no personal or family history of stroke. There was no personal history of hypertension, diabetes, or cardiovascular disease. Two years before attendance, she had been victimized on a car crash, with mild head and neck blunt trauma, and no health service was sought at that time. At initial physical exam, patient had normal vital signs, presented sopor, with a Glasgow Coma Scale (GCS) of 10 points (opening eye to the call, emitting incomprehensible words, locating pain stimulus). There was no pupillary abnormality. Initial neurological exam was prejudicated by lack of collaboration, but a horizontal nystagmus of fast component to the right and right hemiparesis was observed. She was initially treated with phenytoin and general measures. Admission red and white cell count, glucose, creatinine, sodium, potassium, urea, liver function, covid19 antigen test and coagulation tests were all normal. A CT scan with vessel contrasting did not show any abnormality.

Our patient had 35-year-old, out of main age group for stroke, but similar with Ruecker, *et al.* [8] basilar artery dissection case series (mean \pm SD = 40 \pm 5,9 years; n = 12). Kim, *et al.* [13] presented a 53-years average (n = 21), like Nakagawa, *et al.* [14], with 55,2-years (n = 17). In most case series of our review, male sex was predominant (Table 1). Symptoms at hospital arrive had a higher severity degree when compared with most literature reports, in which the reduced mental status and seizures are found in a minority of cases (Table 1). Headache, nausea, and vomiting are seen in majority of cases in literature, but seizures are not so frequently described [8,14]. The acute, unilateral, headache, neck pain with or without vertigo as very initial symptoms should be red flags even in the absence of specific neurologic findings [15]. Nystagmus, present in our case, is described in about 20% of literature VBAD cases [3,11]. In the Kim, *et al.* [13] series, only 1 of 21 cases had a defined etiology and this was trauma; different of Saeed, *et al.* [16] and Dziewas, *et al.* [17], who reported trauma in 15 and 27% of cases, respectively. Our patient had a head and neck trauma two years before hospital seek, we think that is so much

time from trauma to stroke. Trauma, including surgical and chiropractic manipulations, is one of the findable etiologies in these cases [13,16,17]. Some case series had reported traditional cardiovascular risk factors present in VDAB cases [8,20,21]. Some sports in which head is rapidly moved were reported in one series [20]. Artery dysplasia, aneurisms, and wall frailty have been also described [8,16,17]. CT was normal, and it is consistent with Ruecker, *et al.* [8] description, in which CT was useful in cases of subarachnoid hemorrhage or cerebral edema. In table 1, we present main epidemiological, symptoms and risk factors in some case series about VBAD.

Author, year	n	Male (%)	Female (%)	Mean Age (y)	Symptoms and signs (%)	Risk Factors (%)
Kitanaka, <i>et al.</i> 1994 [23]	24	-	-	50	Neck pain (60)	-
Plaza, <i>et al.</i> 1996 [24]	7	86	14	27	Head or neck pain (100)	Dysplasia (71)
Nakagawa, <i>et al.</i> 2000 [14]	17	77	23	55	Headache (100) Vertigo (100) Cranial nerve signs (88)	-
Saaed, <i>et al.</i> 2000 [16]	26	50	50	48	Head or neck pain (88) Vertigo (57) Nausea/vomiting (53)	Cardiovascular (46) Trauma (27) Sports (15) Chiropractic (12)
Dziewas, <i>et al.</i> 2003 [17]	46	59	41	43	Cranial nerve signs (96) Neck pain (72) Headache (50)	Cardiovascular (65) Chiropractic (30) Trauma (15) Dysplasia (2)
Kim, <i>et al.</i> 2008 [13]	21	57	43	53	-	None (95) Trauma (5)
Ruecker, <i>et al.</i> 2010 [8]	12	75	25	40	Headache (92) Hemiparesis (42) Nausea/vomiting (33) Dysarthria (33)	Cardiovascular (50) Dysplasia (42)
Albuquerque, <i>et al.</i> 2011 [25]	13	38	62	44	Headache (15) Neck pain (30) Cranial nerve signs (30) Vertigo (38) Nausea/vomiting (30) Sopor (30)	Chiropractic (100%)

Table 1: Reviewed VDAB case series findings on sex, age, symptoms, and risk factors.

At second in-hospital day, patient had new worsening of consciousness level and more seizures, with flaccid tetraparesis and bilateral cutaneous-plantar reflex. She was submitted to orotracheal intubation and mechanic ventilation. MR was performed and showed an area of recent ischemic infarction with left pontine (Figure 1.1) and cerebellar hemisphere (Figure 1.2) commitment, and findings suggestive of dissection of the left vertebral artery and stenosis in the left basilar artery, "string sign", as described by Fisher, Ojemann and Robertson (1978) (Figure 1.3). Full anticoagulation with enoxaparin 60 mg twice a day and critical care measures were delivered. New routine exams, including thrombophilia search, were all negative.

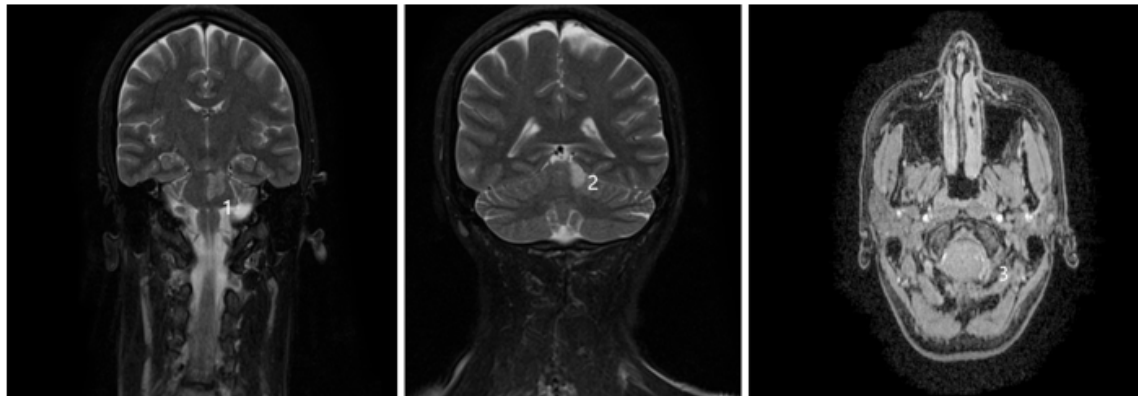


Figure 1: Diagnosis RM: T2 images showing ischemic area in left pontine (1) and cerebellar hemisphere (2), and TOF image showing vertebral artery dissection and basilar artery stenosis, “string sign” (3).

Worsening of consciousness levels suggests extension of infarction, cerebral edema, or subarachnoid hemorrhage. MR is an essential exam in this scenario. In almost all VDAB cases described in literature, MR has been the cornerstone of diagnosis [8,12-19]. Ruecker, *et al.* [8] had found 7 in 12 cases that used transcranial doppler, which demonstrate basilar stenosis or flow restriction in 5 of them. These literature findings, and the evolution of our case, strongly suggests that, in suspected VBAD, MR should be performed as soon as possible, while CT scan or transcranial doppler are less useful strategies. Ischemic findings, as seen in our case, are the most likely presentation in literature case series, with 52 to 58% in comparison with subarachnoid hemorrhage [8,13]. Our patient was treated with subcutaneous enoxaparin and no invasive strategy was done. The use of anticoagulants is a well-established measure in non-hemorrhagic cases [8,12,13,25]. Stenting or embolizing strategies were minority in most case reports, about 9 - 16% of non-hemorrhagic VDAB [8,13]. Open surgical approach is an exception strategy for these cases nowadays [8]. If there is no subarachnoid hemorrhage, most of studies report a good prognosis. In table 2, we summarize main diagnosis, treatment and prognosis data in reviewed case series.

Author, year	n	Main diagnosis method	Main Treatment (% if disponible)	Long term outcome (% if disponible)
Kitanaka, <i>et al.</i> 1994 [23]	24	Angiography	Surgical (79)	Majority favorable
Plaza, <i>et al.</i> 1996 [24]	7	Angiography, CT, MR	AP/AC	Majority favorable
Nakagawa, <i>et al.</i> 2000 [14]	17	Angiography, MR	Endovascular	Good or excellent (88)
Saaed, <i>et al.</i> 2000 [16]	26	Angiography, MR	Endovascular (12) Surgical (0) Thrombolysis (7) AP/AC (80)	Favorable (83) Recurrence (7)
Dziewas, <i>et al.</i> 2003 [17]	46	Angiography, MR	Thrombolysis (4) AC (96)	Good (70) Moderate (22) Bad (8)

Kim., <i>et al.</i> 2008 [13]	21 (10: SAH; 11: Non SAH)	Angiography, CT, MR	All: Endovascular (48) AP/AC (52) Non SAH: Endovascular (18) AP/AC: 72%	All: Death (14) Non-SAH: Death (0)
Ruecker., <i>et al.</i> 2010 [8]	12	MR (83) Transcranial Doppler (75) Angiography (33) CT (25)	Endovascular (8) None, AP/AC (92)	Good or excellent (67) Death (8)
Albuquerque., <i>et al.</i> 2011 [25]	13	MR (100) Angiography (100)	Endovascular (38) AP/AC (46) Surgical (23)	Total recovery (69) Death (8)

Table 2: Main diagnosis, treatment, and prognosis data in reviewed VBAD case series. CT: Computerized Tomography; MR: Magnetic Resonance; AP: Anti-Platelets Agents; AC: Anticoagulant Therapy. SAH: Subarachnoid Hemorrhage.

Patient evolved with ventilator associated pneumonia and sepsis, successfully treated, and she left the ventilator with oxygen supply by a tracheostomy. After that, she presented flaccid tetraplegia, voluntarily moving of eyes, face, and neck muscles. Over three weeks of bed physiotherapy, she had improvement of motor deficit, initially with involuntary movements of the right side, later with voluntary movements. At discharge, she received only oral Dabigatran 150 mg twice a day [26] and was referred to a home follow up by a specialized team. Hynes., *et al.* [27], in recent systematic review, support antithrombotic therapy without invasive strategies in cases of VBAD, stating that there are no controlled studies about this issue.

The patient maintained a rehabilitation program with motor physiotherapy, speech therapy and psychotherapy. Six months after hospital discharge, the patient presented remarkable recovery of motor functions, with mild pseudobulbar dysarthria, mild cerebellar dysplasia and ataxia, walking with orthoses help, even playing basketball. The six-month follow-up RM showed pontine gliosis (Figure 2.1) and mild stenosis in the left vertebral artery (Figure 2.2) Her latest neurologic exam had observed discrete dysarthria, ataxia and dysdiadochokinesia. She was leaving orthosis and initiating free walking. In the early stages, rehabilitation focused on multimodal sensory stimulation closely coordinated with early mobility in the ICU was performed, so she could wake up from a comatose state to an infirmity patient. Prolonged motor physiotherapy transitioned her from wheelchair to return home reconquering independence for activities of daily life [28].

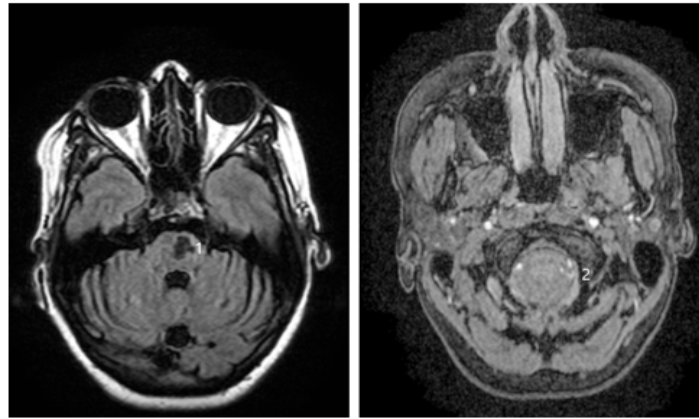


Figure 2: Six-month follow-up RM: T2 image: pontine gliosis (1) and TOF image: mild vertebral artery stenosis (2).

Conclusion

We presented this case of a 35-year-old woman with a stroke caused by a dissection in the vertebrobasilar artery system. Her signs and symptoms and image findings should serve as a warning to emergentists and intensive care professionals. A sudden, intense, occipital headache could be a clue for this diagnosis, once cranial nerve signs or paresis may not be present in initial examination. Magnetic resonance is a useful tool for these cases and should be performed as soon as possible. Treatment in most cases is clinical with antiplatelets or anticoagulant agents. Endovascular or surgical treatment are reserved to special cases. As we showed, some cases may have many in-hospital complications. Fortunately, most of cases, like ours, have a satisfactory evolution. An interdisciplinary teamwork helps to return patient to daily tasks.

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