Central nervous system involvement of polyarteritis nodosa: a case report

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Polyarteritis nodosa (PAN) is a necrotizing vasculitis involving small and medium-sized arteries and it affects multiple organ systems in the body Central nervous system (CNS) involvement appears less frequently, and usually develops after the disease is established. Although aneurysms are common in visceral arteries in PAN, intracranial aneurysms are uncommon and have been documented rarely. This case is reported to raise awareness among radiologists as it has characteristic and rare, if not specific, imaging findings of CNS involvement of PAN.

Key words: polyarteritis nodosa, aneurysms, hematoma, central nervous system.

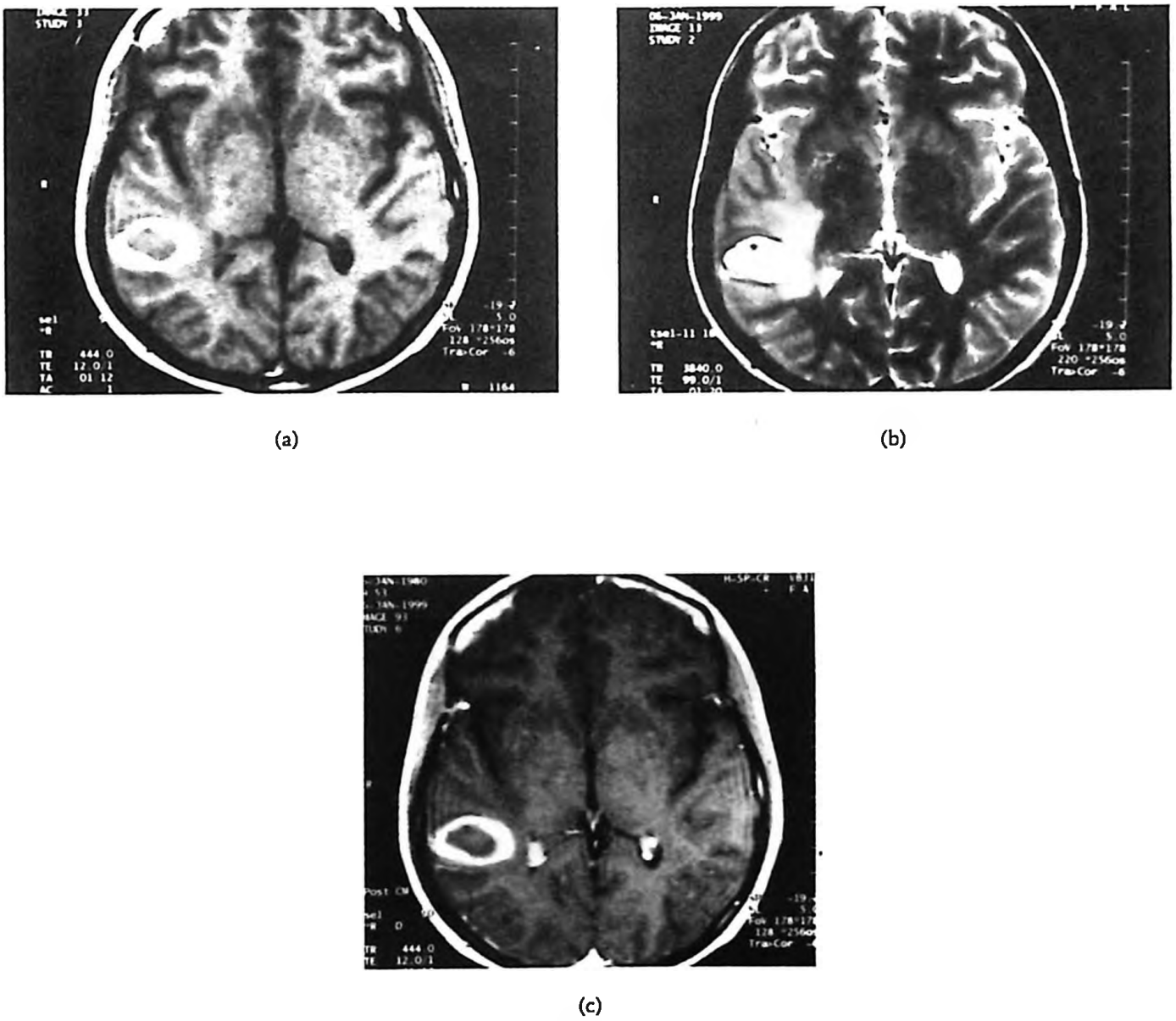
Polyarteritis nodosa (PAN) is a necrotizing vasculitis involving small and medium-sized arteries, and it affects multiple organ systems in the body, except for the lungs and spleen[1-4]. Central nervous system (CNS) involvement appears less frequently, and usually develops after the disease is established. The most common neuroradiological findings in PAN are nonspecific focal ischemic areas followed by intracranial hemorrhage. Although aneurysms are common in visceral arteries in PAN, intracranial aneurysms are uncommon and have been documented rarely[4-6]. In this paper, the central nervous system involvement of PAN in a young male patient with intracranial aneurysms and intracerebral hemorrhage is reported.

Case Report

An 18-year-old male patient presented with a three-week history of abdominal pain, headache, high blood pressure of 200/120 mm Hg, weakness in legs and weight loss of 5 kg. He also had fever, disseminated skin rash on arms in the form of livedo reticularis and cyanosis of the hands. He had suffered from abdominal pain for 10 years for which he had an operation for suspected perforation. A renal angiogram performed previously because of his recurrent hypertension was normal.

Laboratory examination showed a high erythrocyte sedimentation rate and C-reactive protein. ANA, anti-DNA, and RF antibodies were negative. Thyroid hormones were in normal range. Abdominal ultrasound and computed tomography scans were normal. He had signs of pericarditis on echocardiography. Although medication was started with antihypertensive drugs and steroids, the patient had left hemiparesis, left hemihypoesthesia and nystagmus during his stay at the hospital. Magnetic resonance imaging (MRI) revealed a subacute hematoma localized in grey and subcortical white matter of the right temporoparietal region. The lesion was hypointense and had a hyperintense rim in T1 W images (Fig. 1a), and was hyperintense in T2 W scans with moderate peripheral edema (Fig. 1b). After gadolinium injection, there was no contrast enhancement (Fig. 1c). As a ruptured aneurysm was suggested in differential diagnosis, a cerebral angiogram was performed. In his cerebral angiography, there were multiple aneursmal dilatations in peripheral segments of the left middle cerebral artery (Fig. 2a). There were several aneurysms in occipital, internal maxillary (Fig. 2b) and superficial temporal branches of the right external carotid artery (Fig. 2c). The diagnosis of PAN was made on

the basis of the American College of Rheumatology criteria for the classification of polyarteritis nodosa[2]. The patient was treated with cytotoxic agents, but 10 days later he developed spinal shock. In his thoracic spinal MRI study (scans unavailable), the spinal cord intensity was diffusely increased in T2 W images suggesting occlusion of Adamkiewicz's artery (anterior spinal artery). The patient died four days later.



(a) (b)

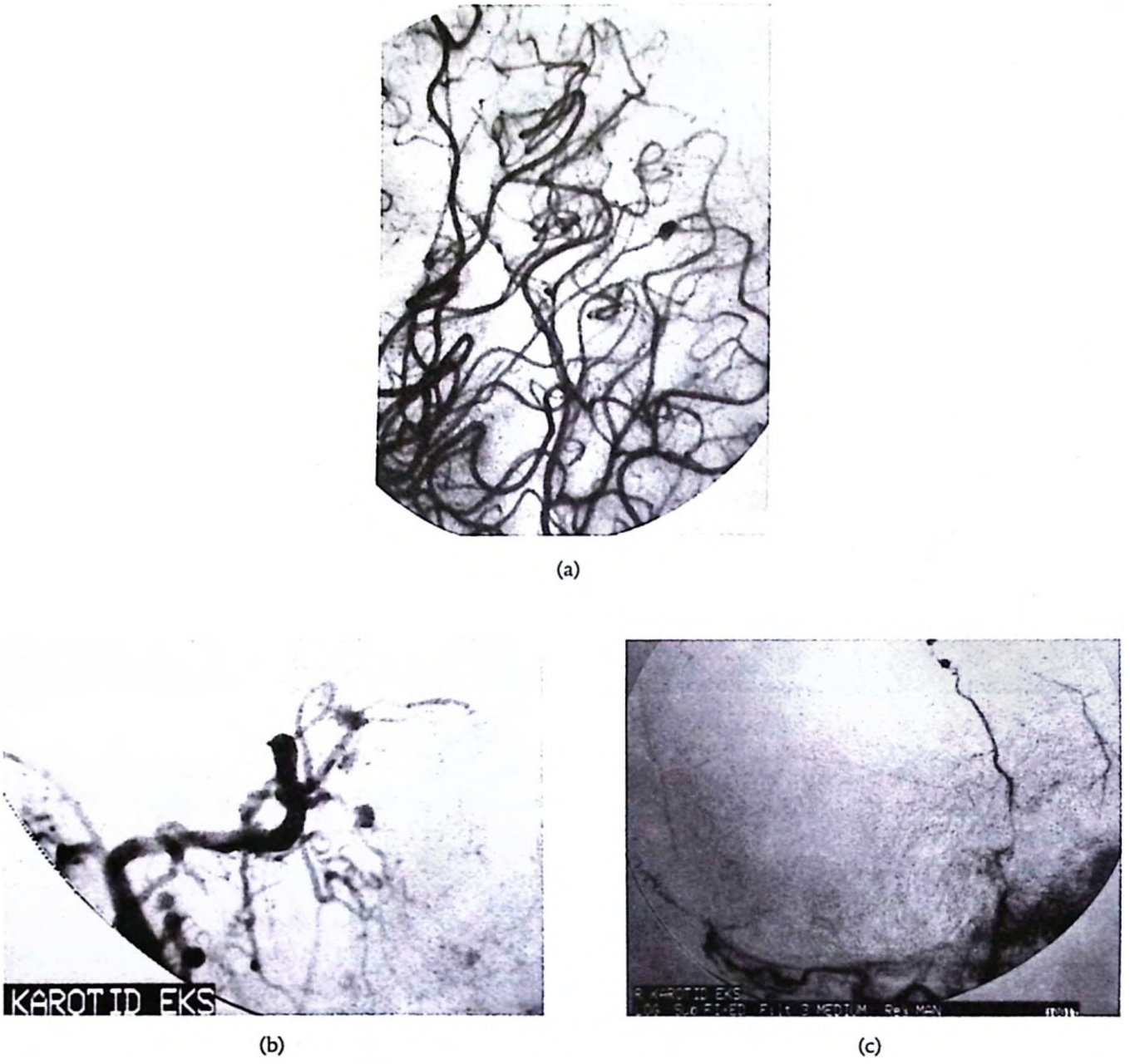
(c)

Fig. 1. a, b, c: Magnetic resonance imaging (MRI) findings of an 18-year-old-man with central nervous system (CNS) involvement of polyarteritis nodosa (PAN).

a) Transverse T1 W scan reveals a isointense lesion that has a peripheral hyperintense rim consistent with subacute hematoma localized in grey and subcortical white matter of the right temporoparietal region.

b) The lesion is hyperintense in T2 W scan and there is peripheral edema.

c) There is no contrast enhancement after gadolinium injection.



(a)

(b)

(c)

Fig. 2. a, b, c: Cerebral angiogram of the same patient.

a) Multiple aneurysmal dilatations in peripheral segments of left middle cerebral artery in left common carotid artery injection.

b) More aneurysms in occipital, internal maxillary.

c) Superficial temporal branches of the right external carotid artery.

Discussion

Polyarteritis nodosa is a systemic necrotizing vasculitis involving small and medium-sized arteries, believed to be initiated by immune complex deposition[6]. Multiple organ systems are involved including skin, joints, heart, kidneys, gastrointestinal system (GIS), and peripheral and central nervous system. The kidneys are involved in up to 80 percent of cases in the form of renal failure and hypertension, and GIS vasculitis is present in up to 50 percent of the patients, in the form of abdominal pain due to visceral infarction. Cardiac manifestations are congestive heart failure, myocardial infarction, hypertension related changes and, as seen in our patient, pericarditis. Fever and weight loss accompany the symptoms[2].

In PAN, neurological involvement is the leading cause of morbidity in 65 percent of the patients[2]. It is usually manifested as mononeuropathy multiplex, paresthesia, pain, weakness and sensory loss. The central nervous system is

affected in 20-40 percent of the patients in the form of hypertensive encephalopathy and hemorrhagic and ischemic infarcts in the brain and spinal cord[4]. There are reports that suggest that CNS involvement is likely to develop in patients who have renal and mesenteric involvement[7], but recent publications report that CNS findings may well be early disease manifestations[6].

The symptoms and findings in PAN are not specific, nor are there especific serologic tests for diagnosis[2]. Usually, laboratory findings vary with the degree of inflammation and vascular damage in specific organs. Angiographic studies may be extremely helpful in suggesting the diagnosis by demonstrating stenosis, occlusion or aneurysmal dilatations in the vasculitic vessels, but none of these abnormalities is pathognomonic[6]. Although aneurysms are common in renal and splanchnic circulation, they are rarely encountered in intracranial circulation in patients with PAN[4-6]. Definitive diagnosis is made by arterial wall biopsy and by confirming the presence of granulocytes and mononuclear leukocytes in the arterial wall[2].

Our patient had six out of 10 classification criteria of PAN defined by the American College of Rheumatology (Table I): weight loss, livedo reticularis, myalgia, mononeuropathy multiplex, hypertension and aneurysmal dilatations in cerebral angiography. It is stated that the presence of three or more of these 10 criteria is associated with a sensitivity of 82.2 percent and specificity of 86.6 percent[2].

In the differential diagnosis of PAN, it is advised to exclude systemic lupus erythematosus, rheumatoid arthritis and Wegener's granulomatosis prior to submitting a patient to the tests required by the PAN criteria. It is stated that the diagnosis of PAN should not be excluded until angiograms and relevant vessel biopsies are performed[2].

The MRI findings in our case were nonspecific, and a set of differential diagnoses such as hypertensive hemorrhage and rupture of aneurysm had to be considered. On the basis of imaging findings alone, with hemorrhagic lesions on MRI and aneurysms in cranial angiography, primary angiitis of the CNS would be the first on a differential diagnosis list. Primary angiitis of the CNS presents with ischemic lesions or hemorrhage caused by stenosis and vascular wall fragility[3]. Hemorrhage from ruptured aneurysms resulting from angiitis has ben reported in previous cases. The patients present with headaches and multifocal neurological deficits. On cerebral angiography, several areas of segmental arterial narrowing are demonstrated. A leptomeningeal or parenchymal biopsy specimen should demonstrate granulomatous changes with chronic polynuclear lymphocytes and multinucleated giant cells with focal fibroid necrosis. This well-defined characteristic distinguishes it as a different clinicopathological entity from other vasculitides affecting the CNS, such as collagen disease, Takayasu's disease, and rheumatoid arteritis. As our patient had symptoms related to other organ systems,

Table I. 1990 Criteria for the Classification of Polyarteritis Nodosa (Traditional Format)

Criterion	Definition
1. Weight loss > 4 kg	Loss of 4 kg or more of body weight since illness began, not due to dieting or other factors
2. Livedo reticularis	Mottledd reticular pattern over the skin of portions of the extremities or torso
3. Testicular pain or tenderness	Pain or tenderness of the testicles not due to infection, trauma or other sources
4. Myalgias, weakness or leg tenderness	Diffuse myalgias (excluding shoulder and hip girdle) or weakness of muscles or leg tenderness
5. Mononeuropathy or polyneuropathy	Development of mononeuropathy, multiple mononeuropathies or polyneuropathy
6. Diastolic BP > 90 mm Hg	Development of hypertension with the diastolic blood pressure higher than 90 mm Hg
7. Elevated BUN or creatinine	Elevation of BUN > 40 mg/dl or creatinine > 1.5 mg/dl, not due to dehydration or obstruction
8. Hepatitis B virus	Presence of hepatitis B antigen or antibody in serum
9. Arteriographic abnormality	Arteriogram showing aneurysms or occlusions of the visceral arteries, not due to arteriosclerosis, fibromuscular dysplasia, or other noninflammatory causes
10. Biopsy of small or medium-sized artery containing PMN	Histological changes showing the presence of granulocytes or granulocytes and mononuclear leukocytes in the artery wall

(*) For classification purposes, a patient shall be said to have polyarteritis nodosa if at least three of these 10 criteria are present. The peresence of any three or more criteria yields a sensitivity of 82.2 percent and a specificity of 86.6 percent.

BP: blood pressure; BUN: blood urea nitrogen; PMN: polymorphonuclear neutrophils.

primary angiitis of the CNS was excluded from the differential diagnosis list. Many of the patients misclassified as PAN actually have syndromes such as giant cell (temporal) arteritis, Wegener's granulomatosis and Churg-Strauss syndrome. The facts that the patient lacked classical findings of granulomatous histopathology (giant cell arteritis) and necrotizing upper airways disease (Wegener's granulomatosis) and had no long history of atopia and eosinophilia (Churg-Strauss) helped us to make the definitive diagnosis of PAN.

Since the vasculitides comprise a diverse group of diseases and there is a great variability among individual cases in the same type of vasculitis, it is imperative to use a universally accepted classification system[8]. Our patient' signs and symptoms fullfilled seven out of 10 minor diagnostic criteria for PAN proposed by Özen et al[9]. Renal involvement and musculoskeletal findings, which were defined as major criterion, were absent in our patient. The presence of five criteria, including at least one major finding, correlated with the histopathologic diagnosis of PAN in at least 97 percent of their patients[9].

In conclusion, among several vasculitis syndromes, PAN remains one of the most difficult to classify[2]. The definitive diagnosis requires angiograms or vessel biopsies. This case is reported to raise awareness among radiologists as it has characteristic and rare, if not specific, imaging findings of CNS involvement of PAN. Contrary to common belief, CNS involvement may present early in the course of the disease, as in our patient.

REFERENCES

1. Lightfoot RW, Michel BA, Bloch DA, et al. The American College of Rheumatology 1990 criteria for the classification of polyarterits nodosa. Arthritis Rheum 1990; 33: 1088-1093.
2. Andreoli TE, Carpenter CC, Plum F, Smith LH. Cecil Essentials of Medicine (2nd ed). Philadelphia: WB Saunders; 1990: 655.
3. Nishikawa M, Sakamoto H, Katsuyama J, Hakuba A, Nishimura S. Multiple appearing and vanishing aneurysms: primary angiitis of the nervous system. Case report. J Neurosurg 1998; 88: 133-137.
4. Hurst RW, Grossman RI. Neuroradiology of the central nervous system vasculitis. Semin Neurol 1994; 14: 320-340.
5. Oran I, Memiş A, Parıldar M, Yunten N. Multiple intracranial aneurysms in polyarteritis nodosa: MRI and angiography. Neuroradiology 1999; 41: 436-439.
6. Provenzale JM, Allen NB. Neuroradiologic findings in polyarteritis nodosa. AJNR 1996; 17: 1119-1126.
7. Ewald EA, Griffin D, McCune WJ. Correlation of angiographic abnormalities with disease manifestations and disease severity in polyarteritis nodosa. J Rheumatol 1987; 14: 952-956.
8. Hunder GG, Arend WP, Bloch DA, et al. The American College of Rheumatology 1990 criteria for the classification of vasculitis. Arthritis Rheum 1990; 33: 1065-1067.
9. Özen S, Besbas N, Saatçi Ü, et al. Diagnostic criteria for polyarteritis nodosa in childhood. J Pediatr 1992; 120: 206-209.