Late-Developing Cerebral Arteropathy After Pyogenic Meningitis

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Background: Although vasculopathy is a recognized complication during acute meningitis, to our knowledge, no previous reports have been published of this phenomenon developing months after successful treatment.

Objective: To report a unique case of a late-developing vasculopathy after pyogenic meningitis in an adult.

Report of a Case: A 51-year-old woman was seen with severe headache 2 months after treatment of *Haemophilus influenzae* type C meningitis. Initial arteriography showed no abnormality; a second arteriogram showed progressive multifocal intracranial stenosis affecting mainly the internal carotid arteries. Findings from pathologic examination disclosed diffuse collagenosis consistent with chronic vascular injury from meningitis. The arterial lesions stabilized, and the patient remained asymptomatic.

Conclusion: Progressive intracranial arterial stenosis can evolve months after meningitis and should be added to the list of recognized vascular complications.

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**OBSERVATION**

ARTERIAL INVOLVEMENT during the acute course of pyogenic meningitis is frequent and can lead to stroke. Long-term cerebrovascular complications, especially in adults, are less well characterized, owing in part to the coexistence of other confounders that may predispose to cerebral ischemia. We report a case of progressive cerebral arteropathy that began and evolved during the months after successful treatment of severe *Haemophilus influenzae* type C meningitis in an adult, resulting in a moyamoya pattern on cerebral arteriography.

REPORT OF A CASE

A 51-year-old healthy, left-handed woman with a history of chronic tobacco smoking and asthma developed confusion, fever, nausea, and vomiting that followed an earache that was treated with otic drops. On admission to the hospital a lumbar puncture showed a white blood cell count of 11.4 × 10^3/µL (11.4 × 10^9/L), with 95% neutrophils; a glucose level of 5 mg/dL (2.8 mmol/L); and a protein level of 643 mg/dL (6.43 g/L) all of which is consistent with pyogenic meningitis. *Haemophilus influenzae* type C grew from cultures of cerebrospinal fluid. She was treated with a combination of antibiotics and corticosteroids and required mechanical ventilation for 10 days, followed by gradual neurological improvement of her condition.

No regular medications were taken prior to hospitalization. A history of avascular hip necrosis and exacerbation of asthma by aspirin use was noted.

Six weeks later, the patient reported recurrent headaches and 2 brief episodes of left-sided numbness. An examination of the patient's cerebrospinal fluid showed a total white blood cell count of 0.13 × 10^3/µL (13.5 × 10^9/L), with 90% lymphocytes; a glucose level of 32 mg/dL (17.8 mmol/L); and a protein level of 195 mg/dL (1.95 g/L).

Two months after the initial hospitalization, persistent headache led to cerebral arteriography (Figure) that showed no abnormality, except for the presence of a 5-mm aneurysm of the left internal carotid artery near the ophthalmic artery origin, suspected to be a congenital “berry” aneurysm (Figure A and E). Cranial magnetic resonance imaging using radiolabeled gadolinium 64 showed meningeal enhancement and pansinusitis. She was treated with a combination of oral antibiotic agents.

Seven months after onset, although occurring daily, headaches had improved; she had returned to clerical work.

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She underwent a second cerebral arteriogram for endovascular treatment of the aneurysm, but the intervention was curtailed when multiple focal, constrictive, intracranial arterial stenoses were present involving the supraclinoid carotid arteries bilaterally, the proximal middle cerebral arteries bilaterally, the intracranial left vertebral artery, and the proximal right posterior cerebral artery (Figure B and F). Cranial magnetic resonance imaging showed no meningeal enhancement. A second cerebrospinal fluid examination showed normal opening pressure, a total white blood cell count of 0.02 × 10⁹/µL (all lymphocytes), a glucose level of 53 mg/dL (2.94 mmol/L), and a protein level of 108 mg/dL (1.08 g/L). Results from extensive serologic studies for underlying systemic disorders or vasculitis were unrevealing.

Two weeks after the second arteriogram, she experienced the sudden inability to read that lasted about 15 minutes. Combined treatment with clopidogrel, 75 mg/d, and prednisone, 100 mg/d, was initiated.

Nine months after onset and after 6 weeks of oral corticosteroids were received, a third cerebral arteriogram showed progression of focal areas of intracranial stenosis to 90% diameter stenosis with new development of abundant lenticulostriate collateral vessels and extracranial collaterals (Figure C and G). The cerebral aneurysm was unchanged. Subsequently, results from the evaluation of cerebral blood flow by acetazolamide-enhanced, single-positron emission computed tomographic imaging were normal. A cerebral biopsy specimen showed marked leptomeningeal collagenosis with...
periadventitial fibrosis of the small arteries, without inflammatory or atherosclerotic changes. Corticosteroid treatment was tapered; however, treatment with clopidogrel was continued.

Twenty-two months later, the patient was generally doing well, with infrequent headaches and no abnormal findings on neurological examination. Arteriography was undertaken to assess the cerebral aneurysm and showed subtle improvement in the degree of intracranial stenoses, persistence of extensive collateral vessels, and no change in the cerebral aneurysm (Figure D and H). The patient remains neurologically asymptomatic 36 months after having acute meningitis.

To our knowledge, no information about the natural history of this vasculopathy is available. This process would probably not have been identified in this patient because of its surprisingly benign clinical course, except for the incidental aneurysm that led to repeated arteriograms. Whether late-developing cerebrovascular complications are more related to H influenzae than to other organisms is uncertain. It is likely that late-developing intracranial arterial stenosis may be more frequent than appreciated following severe pyogenic meningitis and should be recognized as a potential vascular complication.

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REFERENCES


