Obliterative Brachiocephalic Arteritis
Pulseless Disease of Takayasu

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Although a newcomer to American medical literature, this strange vascular disease of young adult women has been recognized abroad for many years. The etiology is obscure, but the pathologic findings are fairly well documented and the clinical picture is unusually consistent. An obliterative arteritis of the branches of the aortic arch results in severe ocular and cerebral damage. The disease process is relentlessly progressive and the prognosis for sight and life is poor. The present case was treated with corticosteroids and anticoagulants with apparent benefit. This disease should be considered when cataracts are encountered in young people and when arterial pressures and pulses in the upper extremities are absent.

The ocular manifestations of a rare vascular disease afflicting branches of the aortic arch were first described in 1908 by Takayasu, a Japanese physician. The disease was not recognized in this country until 1952, when Caccamise and Whitman\(^1\) reported a 19-year-old girl with characteristic clinical findings. However, 3 patients who may represent instances of obliterative brachiocephalic arteritis had been reported earlier under other diagnoses\(^2-4\) and 3 probable cases have since been described.\(^5-7\) In contrast, 68 cases are recorded in Japan,\(^6\) and European authors have added 26 others.

Description

Confined almost exclusively to young adult women, obliterative brachiocephalic arteritis presents a remarkably well-defined clinical picture and a discouragingly progressive course leading to loss of visual and cerebral faculties and, ultimately, to blindness and death. The etiology is unknown. Ask-Upmark\(^8\) has reviewed the cases occurring outside of Japan, Currier and associates,\(^6\) have delineated the neurologic manifestations of pulseless diseases, and Caccamise and Okuda\(^9\) have described the ocular findings. The differential diagnosis of this and other aortic arch syndromes has been well covered by Ross and McKusick.\(^4\)

The basic fault is a loss of normal circulation to the head and upper extremities with symptoms and signs due to ischemia of the brain, eyes, head, and arms; hypersensitivity of the carotid sinus mechanism; and development of a collateral circulation.

The primary pathology is a chronic progressive arteritis involving all layers of the proximal segments of vessels arising from the aortic arch with eventual effacement of the lumen of the innominate, common carotid, and subclavian arteries. The iliac arteries can be involved and the ostia of the visceral branches of the aorta are occasionally included in the obliterative process. Classically, however, the arteritis is limited to the branches of the aortic arch. Microscopic examination of an affected artery discloses an inflammatory reaction involving all layers of the vessel wall reminiscent of the changes seen in smaller arteries with polyarteritis nodosa or temporal arteritis. The lumen of the artery is decreased in caliber or completely occluded. Thrombus formation contributes to the obliteration of the artery and attempts at recanalization may be seen.

A variety of etiologic agents has been considered, including syphilis and tuberculosis. However, Treponema have not been demonstrated in the lesions and the patients have invariably had negative serologic tests for syphilis. The occasional appearance of giant cells and granulomatous reaction in the vessel...
wall has suggested tuberculosis but acid-fast organisms have not been recovered from or demonstrated in the diseased vascular tissue. Rheumatic or other types of preceding infectious processes have been noted in the anamnesis of many cases, particularly those reviewed by Ask-Upmark, who pointed out that a large percentage of European cases are from countries bordering the North Sea, an area in which rheumatic infections are prevalent. The unusual frequency of this vascular disease in young women has led to interesting speculation but, unfortunately, has failed to illuminate the problem of etiology. Many believe that brachiocephalic arteritis is best considered a collagen disease.

Claudication occurs in the arms and jaw. Collateral circulatory routes develop largely from the intercostal arteries and supply the arms with sufficient blood to maintain nutrition of the tissues. As a result, gangrene of fingers does not occur. However, atrophy of nasal mucosa and perforation of the nasal septum have been described, as well as atrophy of the alveolar processes with loss of teeth. Focal areas of tissue necrosis may occur in the ears.

Early symptoms from the eyes have been termed "visual claudication" and consist of transient dimness of vision and diplopia. Pathologic alterations occurring in the eye secondary to ischemia include atrophy of the uveal tract, corneal opacities, cataract formation, and peripapillary looping of new vessels. A few instances of glaucoma have been observed. Permanent visual impairment and blindness can result.

Cerebral symptoms also tend to be transient at first but distressingly recurrent with sensations of dizziness, paresis, or convulsions. The brain eventually becomes completely dependent upon the vertebral arteries for its supply of blood, and cerebral thrombosis is a common late development. Syncopeal attacks can occur and have been attributed to a demonstrably hypersensitive carotid sinus mechanism, which may result from involvement of the sinus walls by the arteritis or from the lowered blood pressure in the carotid sinuses distal to the areas of arterial obliteration. Some patients with Takayasu's disease complain of tachycardia but other cardiac symptoms are seldom paramount although an occasional patient may progress to congestive heart failure on the basis of hypertension. In patients with iliac artery involvement, claudication has been present in the lower extremities as well.

Classically, arterial pulses and pressures are absent in the upper extremities but normal in the legs. Carotid artery pulsations may be absent or very faint and auscultation in the supraclavicular and carotid areas of the neck frequently discloses a continuous bruit with systolic accentuation. This vascular murmur probably arises in the diseased vessel itself as a result of a constant pressure gradient across the narrowed area. Weak pulsations are at times palpable in the radial vessels, and an abnormally low arterial pressure with small pulse pressure may be detected in one or both arms. With involvement of the vessels to the legs, arterial pulses and pressures will be abnormal or absent in one or both extremities. Hypertension is occasionally recorded in the legs. Examination of the posterior thorax may disclose bruits or palpable dilated intercostal arteries serving as collateral channels.

Laboratory studies show few abnormalities. The erythrocyte sedimentation rate is generally accelerated. Serologic tests for syphilis are negative. Blood counts and chemical tests and the urine are normal. The electrocardiogram is normal in most cases. Electroencephalograms have seldom been described and are not specific. Fluoroscopic study gives no sign of the disease unless notching of the lower rib borders due to dilated intercostal vessels is observed. Angiograms fail to demonstrate the proximal segments of the aortic branches although the more distal portion of these vessels may be visualized and appear normal.

The present case demonstrates most of the characteristic symptoms and signs of the disease and is the first to be treated with corticosteroids and anticoagulants. The response to this therapy has been encouraging.

**Case Report**

Mrs. S. S., a 42-year-old white woman was admitted to the Virginia Mason Hospital in June 1956 for study of low blood pressure and pains in the left leg and right arm.* In 1951 she developed

* We are indebted to Dr. William V. King of Burlington, Washington, for referring this patient.
a deep aching in the region of the left shoulder and left side of the neck that lasted several days. Relief would be obtained only when the arm was placed completely at rest. Since 1951 she had 6 or 7 attacks of this nature involving the left shoulder, the left groin, and the right shoulder.

Fifteen months prior to entering the hospital, while walking on marshy ground wearing hip boots, the patient first noted cramping pains in the left calf relieved by rest. The right calf felt tired but was not painful. The left leg remained tender for 2 or 3 days after this walk and the slightest use caused pain. Since then, walking at a normal pace brought on claudication in the calf and, if she persisted, the claudication would spread into the left anterior thigh muscles. Resting gave relief and hurrying made it worse, as did walking up an incline.

For 9 months she had noticed that the left hand would become numb when carrying her lunch pail. The more shirts and jackets worn, the faster the hand would go numb. This symptom persisted and 4 months prior to hospitalization she first developed cerebral and ocular symptoms, which occurred in attacks coming on as frequently as twice a day or as infrequently as twice each week. The initial symptom of these attacks was a feeling of weakness in the eyes “as if they would cross.” Then a sensation of slow gyrations in the head and partial loss of balance would develop. If she tried to walk during these spells, she weaved. Lying down shortened their duration. Each spell lasted from 4 to 10 minutes and was followed by nausea. One month after the appearance of these symptoms her blood pressure was found to be low, at 70/60 mm. Hg in the arm.

Within a month of coming here she first noticed claudication in the right arm involving the deltoid and biceps muscles that was brought on by repetitive motions of the arm such as raking the lawn or painting walls. About the same time jaw claudication first appeared with aching in the masseter muscles and in the neck when chewing meat or other fibrous foods. This aching discomfort in the jaw and neck would stop when she ceased chewing.

Past History. The patient was born in 1914 in Canada. At age 5 she fell and fractured the right clavicle but there was no other history of injury. She had the usual childhood diseases without complication. The menarche was at age 12 and menses were regular. At age 29 both Fallopian tubes and one ovary were removed, apparently because of cysts and dysmenorrhea. She had never been pregnant. There was no history of venereal infection. The teeth were replaced many years ago by dentures. For 3 years she had been treated elsewhere for a mild glaucoma. She smoked 1 package of cigarettes each day. Review of systems was negative.

Family History. The patient is the eighth of 10 children. Her father, of English descent, is 80 years old, active, and well. Her mother, of French and German extraction, died at age 76 after a fractured hip; she was a mild diabetic for the last 5 years of her life. No member of the patient's family has been afflicted with an illness similar to hers.

Physical Examination. She was a normally developed, adequately nourished woman, 5'3" tall, weighing 135 pounds, and edentulous. The nasal mucous membranes were atrophic but there was no perforation of the septum. The ears were normal. Ophthalmoscopic examination disclosed slight glaucomatous cupping but no evidence of cataracts, corneal opacities, or vascular looping in the region of the optic disks. Carotid pulsations were barely perceptible, and in the left carotid triangle of the neck a continuous bruit was clearly audible. There was systolic accentuation of the murmur but it persisted throughout diastole. Neither axillary artery was pulsatile to palpation. A very weak right brachial artery pulsation was present. Both radial arteries were weakly palpable at times but ulnar pulses were absent. The lungs were normal to examination and the heart was not enlarged on percussion. There were no palpable thrills or audible cardiac murmurs, and the heart tones were regular and of good quality without accentuation or muffling. The liver, spleen, and kidneys were not enlarged, nor was there any abdominal mass, fluid, or localized tenderness. The abdominal aorta was normally pulsatile, and pulsations were strong in the right femoral artery but weak in the left. Auscultation disclosed a systolic bruit over the left femoral vessel. The right popliteal and dorsalis pedis pulses were normal but the left popliteal and dorsalis pedis arteries and both posterior tibial vessels were nonpulsatile. Pelvic and rectal examinations were negative and the deep tendon reflexes and sensory perception were normal. There was no pain or tenderness on palpation of any of the muscle groups or with movement of any of the joints, all of which had a free and normal range of motion.

Blood pressure was determined with great difficulty in the arms. With the patient supine the systolic pressure in both arms was around 75 to 80 mm. Hg, both on palpation and auscultation. By auscultation, diastolic pressure was estimated to be around 70 mm. Hg. With the patient sitting up or standing, an arterial pressure could not be detected in either arm. At times a satisfactory reading was unobtainable in any position. Blood pressure in the legs, obtained with a 14-cm. cuff on the lower thigh, was 145/80 mm. Hg on the right and 90/80 mm. Hg on the left. By palpation with the cuff on the calf the systolic blood pressure in the right dorsalis pedis artery was measured at 120 mm. Hg. An intra-arterial blood pressure of 120/80 mm. Hg was recorded from the right femoral artery. Intra-arterial pressures were not taken in any of the involved extremities because of the small risk of further compromising the circulation to these parts.

Laboratory studies were all normal and included hemoglobin, total and differential leukocyte counts,
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sedimentation rate, serologic test for syphilis, urinalysis, blood cholesterol and calcium, serum sodium and chloride, postural blood sugar, and a Robinson-Kepler-Power test. The electrocardiogram was normal. A chest film disclosed a heart shadow normal in size and contour, clear lung fields, and no rib notching. Fluoroscopy showed no evidence of aneurysm or other abnormality of the aorta or heart. A film of the abdomen was negative for calcification in the adrenal glands or vessels. Venous pressure in the right antecubital vein was 118 mm. of water, with the reference level 10 cm. from the back. Circulation time arm-to-tongue employing Decholin was 11 seconds. An electroencephalogram, 8-electrode bipolar localizing type, disclosed nondescript changes of low voltage, rapid variety type from all areas. A rare 10 to 12 per second alpha wave appeared in the posterior derivations. No high voltage slow activity was noted at any time during the recording and no paroxysmal dysrhythmias. There were no focal artifacts. The tracing was classified abnormally rapid, not specifically diagnostic.

Hospital Course. The patient remained afebrile and ambulatory. Prednisone, 10 mg. was administered orally every 6 hours. Dicumarol was employed to maintain the prothrombin concentration between 10 and 20 per cent of the control. The patient was discharged after 10 days to continue the same medications.

Results of Treatment. After 6 weeks of therapy the patient returned for reevaluation. There were signs of mild steroid effect with early mooning of the face. She reported a gradual subjective improvement, having been free of jaw and arm claudication since leaving the hospital and she also noted an increased capacity for walking before the appearance of claudication in the left calf. She had not been bothered with further cerebral symptoms but continued to have occasional transient blurring of vision and sensation as though the eyes were about to cross. Pulsations seemed stronger in the common carotids and the left femoral vessel. The radial pulses were still very weak and the ulnar pulsations remained absent. The left dorsalis pedis pulse was at times thought to be present; however, blood pressure determinations in arms and legs were not appreciably altered.

At this juncture further studies were carried out which, unfortunately, had not been done before treatment was begun. The platelet count was 180,000 and 200,000 on 2 occasions. An angiogram was performed with 40 ml. of 70 per cent Neo-Iopax. The first portion of the innominate artery, the entire left subclavian artery, and the proximal segment of the left common carotid artery were not visualized. The right subclavian artery could be faintly traced at its junction with the right common carotid but not distal to this point. However, the axillary arteries and the distal portions of the carotid arteries, including their bifurcations, were clearly seen and appeared normal. The failure of the dye to outline the proximal segments of the branches of the aortic arch was considered in keeping with the presumed presence of arteritis in these vessels with narrowing of the lumen. The arch itself was well opacified in several of the exposures and appeared entirely normal without evidence of aneurysm or congenital malformation. Visualization of the more distal segments of the carotid vessels and of the axillary arteries showed that none of the involved arteries had been completely occluded. Collateral vessels were not seen.

Discussion

A positive diagnosis of obliterative brachiocephalic arteritis on clinical grounds alone is not possible at this time. Ross and McKusick's comprehensive discussion of the various entities that may present as the aortic arch syndrome emphasizes the difficulties of the differential diagnosis. Given a young woman without evidence of aneurysm, congenital anomaly, or trauma, the likelihood of Takayasu's disease is very good.

The symptoms and signs of the aortic arch syndrome presented by our patient prior to the institution of steroid and anticoagulant therapy would be difficult to explain on any basis other than an obliterative brachiocephalic arteritis. Except for the fractured clavicle in childhood there was no history of trauma and no evidence of aortic aneurysm or dissection or syphilitic infection. The aortic arch appeared entirely normal on angiography. The presence of degenerative atherosclerosis with thrombotic occlusion of the innominate, carotid, and left iliac vessels remains a possibility but would seem unlikely in a woman of her age free of diabetes, hypertension, or evidence of deranged lipid metabolism or arteriosclerosis anywhere. This patient did vary from the typical case of brachiocephalic arteritis in 3 respects: there was no objective evidence of organic damage to the eyes beyond glaucoma, she did not have carotid sinus syncopal attacks, and she apparently did have involvement of the left iliac artery. However, all these variations have been described in patients with Takayasu's disease.

The prognosis of patients with obliterative brachiocephalic arteritis is poor. The duration of symptoms in reported cases ranged from 6
months to 14 years. The average time from onset of symptoms to the time of reporting or to death was 5.1 years for the 26 cases reviewed by Ask-Upmark.\(^8\) Blindness and cerebral thrombosis are the greatest threats to the patient with pulseless disease.

A variety of therapeutic measures have been attempted but no one has reported favorable results except for apparent improvement in 1 probable case treated with penicillin.\(^6\) Cortisone or allied steroids have not been employed except briefly in 1 of Ask-Upmark's patients.\(^8\) Because that patient's cataracts appeared to worsen, the drug was discontinued after only 1 week of therapy. We decided to try prednisone in the present case in an attempt to control, or even reverse, a presumed inflammatory arteritis. We were pleased to note improvement of the patient's symptoms. Although the response to this therapy was judged on subjective grounds, the patient was confident that her exercise tolerance for walking was increased and insisted that her cerebral symptoms had cleared as had jaw and arm claudication. Even considering the known euphoria and sense of well being often associated with use of these steroids, we believe that an actual improvement may well have taken place. As previously described, some of the arterial pulses seemed stronger to the examiners although blood pressure levels had not changed appreciably.

At the present time the patient is being maintained on 15 mg. of prednisone per day and sufficient Dicumarol to provide a desired degree of hypoprothrombinemia. We intend to reevaluate the patient's status at frequent intervals, watching particularly for the appearance of organic changes in the eyes. If visual or cerebral symptoms become worse, arteriography will be repeated and the feasibility of vascular grafting or prosthetic replacement of the diseased vessel segments appraised.

**Summary**

An apparent instance of a rare vascular disease, obliterative brachiocephalic arteritis, occurring in a 42-year-old woman is described. Prednisone and Dicumarol were employed therapeutically with encouraging results. Although the present case is but the third example of this disease to be reported in this country, 5 probable cases have been described under other diagnoses. In contrast, nearly 100 cases have been recognized elsewhere in the world, chiefly in Japan and Europe.

**Summario in Interlingua**

Es describite un caso apparente del rar morbo vascular, arteritis brachiocephalic obliterative. Le patiente esseva un femina de 42 annos de etate. Prednisona e Dicumarol esseva usate con incoragiantse resultatos therapeutic. Ben que le presente caso representa solmente le terti exemplo de iste morbo reportate in le Statos Unite, 5 casos probabil se esseva describite sub altre diagnoses. Per contrasto con isto, quasi 100 casos ha esseite recognoscite in altre partes del mundo, principalmente in Japone e Europa.

**REFERENCES**

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