DIFFERENTIAL DIAGNOSIS OF COMMON PERIPHERAL VASCULAR DISEASES

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Due to advances in medical therapeutics there has been a definite increase in the life span of man, and thereby an increase in the incidence of degenerative diseases is seen.

The most common changes are those seen in general arteriosclerosis which may or may not be associated with diabetes mellitus. Arteriosclerotic changes may occur in any part of the vascular tree and quite frequently affect the smaller peripheral vessels. As the circulation is decreased, symptoms occur that frequently bring the patient to the physician.

Thrombo-angiitis obliterans, which is also known as Buerger's disease, is an inflammatory reaction that occurs in the arteries and veins of the extremities resulting in formation of thrombi and occlusion of these vessels.

Another disease in this group is clinically known as Raynaud's disease or symmetrical gangrene. In this entity intermittent spasm takes place in the digital arteries. This is associated with typical changes in color and in some instances the condition progresses to necrosis and local gangrene.

Arteriosclerosis, with or without diabetes mellitus, thrombo-angiitis obliterans, and Raynaud's disease constitute the greatest percentage of peripheral vascular disturbances seen by the physician.

ETIOLOGY

Even after extensive research and clinical investigation no definite causative agent can be named for arteriosclerosis. Prolonged and intensive activity may play a part, infectious diseases such as typhoid fever, and syphilis, diabetes, and prostatitis may be contributing factors.

The relationship between arteriosclerosis and diabetes is well recognized. A child with diabetes may show signs of arteriosclerosis. Essential hypertension also has a definite association with this process.

The etiology of thrombo-angiitis obliterans is still unknown. The frequent occurrence of migratory phlebitis makes it seem that it may be of an infectious nature. Tobacco has been looked upon as an etiologic agent and in many instances these patients use a great deal of tobacco; on the other hand, it also occurs in those who do not use tobacco. It has been thought that this disease has occurred mostly in Polish and Russian Jews, but today it is known that it may occur in any race.

In Raynaud's disease the etiology is also unknown, although it is now recognized that the occurrence of peripheral vasoconstriction which

may lead to gangrene and death of the extremity is a distinctly sympathetic affection or vasomotor imbalance.

Pathology

Arteriosclerosis is a general disease involving the large and small arteries in proliferative and degenerative processes. The pathology is much the same regardless of its appearance in the large or small vessels although in the smaller arteries it is apt to cause more diffuse proliferation in the intima. As the disease progresses, deposits of fat appear in the cells of the intima, new connective tissue cells form, and also new elastic tissue. While this process is going on there may be deposits of fat in the muscle cells of the media. As the process advances, the intima thickens and the fatty areas may break down and become necrotic. Thrombi may form over the necrotic areas of the intima and thus cause obstruction.

The end result of these changes is that the arteries lose their elasticity and become hard, rigid, and tortuous. With proliferation of the intima in the smaller vessels, narrowing of the lumen occurs and thus the circulation through the vessel is diminished or obliterated. After narrowing of the vessel, the final occlusion by secondary thrombosis gives rise to the senile and diabetic forms of gangrene.

It is recognized that a relationship exists between arteriosclerosis and diabetes mellitus. In spite of the marked advance in therapy of diabetes mellitus, the pathologic process in the vessels has not been arrested. McKittrick and Root[1] found that the chief difference between these two conditions lies in the relative amounts of intimal and medial change. In the diabetic limb with obliterative vascular disease, there exists an extensive amount of endothelial proliferation and fatty deposition in the intima, the lumen of the vessel being filled with lipoid packed cells, new connective tissue, and leukocytes. While a moderate degree of medial sclerosis with calcium deposition is a common finding, the striking feature is the change in the intima.

Buerger[2] described chronologically the pathological picture of thrombo-angiitis as follows: "An acute inflammatory lesion with occlusive thrombosis, the formation of miliary giant cell foci, the stage of organization or healing, with disappearance of miliary giant cell foci, the organization and canalization of the clot, the disappearance of inflammatory products, and the development of fibrotic tissue in the adventitia that binds together the artery, vein, and nerves."

Allen[3] believes that "the process is one of inflammation, producing early thrombosis which is localized and which often becomes canalized. The process becomes chronic and has tendencies to heal as it spreads to

other portions of the vessels or may become quiescent later to flare up again or even apparently remain healed in certain instances."

With vasoconstriction of the peripheral vessels in Raynaud's disease, asphyxia to tissues occurs. This may be of a temporary nature with slight pathological change. However, if sufficiently intense, changes occur in the arterioles, terminating in superficial gangrene or ulceration of the tips of the fingers or toes.

Diagnosis

In many instances these peripheral vascular diseases can be diagnosed without any great difficulty. This is especially true when all the classical symptoms appear; however, some will not be so simple and every diagnostic measure must be utilized.

A general and routine medical history and physical examination are essential when examining these patients. In the general history, special note is made of the findings of the cardiac system. In addition, we use a special form on which we record information and findings relative to the peripheral vascular disease. On the special form the following information is recorded: age, sex, occupation, birth place, and nationality.

When eliciting the present complaints, pain will be a prominent symptom. During the early stages pain may be entirely in the feet, and treatment may be concentrated there for fallen arches or some other foot difficulty. It may appear while the patient is walking or exercising only to disappear entirely after a period of rest. This type of pain is well known as intermittent claudication.

The patient may be unable to sleep or rest due to pain which is known as rest pain. The distress may be of a burning or aching nature in the digits, being produced by exposure to cold or some emotional upset. If this appears, vasospasm should be considered.

Inquiry should be made whether it is difficult to keep the extremities warm. The patient usually comments that the hands or feet are cold. Notation should be made of the presence of calluses, ulcerations, eczema, and the condition of the toenails. A brief summary of the onset and course should be obtained.

A family history of arteriosclerosis, diabetes mellitus, syphilis, nervous disorders, hypersensitiveness, or angina pectoris may be of importance. A personal history of injury, frost bite, chilblains, phlebitis, foci of infection, or use of ergot should be noted. The amount and form of tobacco used, such as cigarettes, pipe, and cigars, should be listed in detail. Changes in the color of the skin of the feet or hands may be noted by the patient.

The diagnosis of Raynaud's disease is practically made when, after exposure to cold or an emotional upset, the skin becomes dead white and then changes to a blue or purplish or bluish black. This reaction can be reproduced by immersing the hand in cold water.

Changes in color should be noted in the extremities because frequently early changes in the vessels can be diagnosed. Ischemia of the extremities is perhaps the most important diagnostic sign in the circulatory disturbances of the extremities. Plantar ischemia can be demonstrated by using Samuels[4] test. The patient lies on his back with the lower extremities elevated to an angle of 45 degrees or more. The patient then rapidly flexes and extends the feet, using the ankle joints as pivots. If the arterial circulation is intact, there will be no deviation from the normal pink tinge of the plantar surfaces even after prolonged ankle motion. In the presence of arterial occlusion, however, even of minimal extent, a decided pallor soon develops.

Rubor can best be demonstrated when the extremity is pendant. In advanced peripheral vascular changes the rubor appears following a few seconds of pendancy. If mild changes have occurred, only the fore part of the foot may be involved and in the more advanced cases it may involve the foot entirely and sometimes extend up the leg.

Cyanosis in an extremity is usually a sign of grave danger of gangrene, especially if it does not disappear on finger pressure.

Much information can be obtained by examining the peripheral pulses. In the upper extremity, the axillary brachial and radial pulses can be readily palpated and in the lower extremity the femoral, popliteal, posterior tibial, and dorsalis pedis arteries are easily palpated. In a small percentage of patients, the dorsalis pedis and posterior tibial may be absent. This, however, is not definite evidence of obstructive peripheral vascular disease unless other pathology can be demonstrated.

The blood pressure and blood counts should also be noted. The histamine test is of value in determining the superficial cutaneous circulation and is especially helpful when amputation of an extremity is being considered. This test may be done by one of two methods: (1) Place a drop of histamine acid phosphate on the cleansed area of the skin and then scratch with the point of a hypodermic needle as is done in a vaccination or, (2) inject the drop intradermally. The test can be made above the ankle, below the knee, above the knee, or on the upper part of the thigh.

If there is no involvement in the circulation, the reaction obtained will be a red spot succeeded by a wheal and this in turn will be surrounded by a flare. Such a reaction will develop within five minutes. If the

circulation is below normal the appearance of the wheal and flare will be much slower or may not appear at all.

Various tests have been utilized to determine the presence of vasospasm. In each test the principle is the same, that is, release of the constricting influence of the sympathetic nerves to the peripheral vessels will produce a dilatation of these vessels if they are capable of dilating. If the vessels dilate, an increased blood supply will result and thus elevate the temperature of the skin. To make such determinations, a skin thermometer is necessary. To make an accurate test for vasospasm, the patient is placed in a room with the temperature between 70° and 74° F. The extremities are exposed to the room temperature for one hour before the first readings are taken. One of the methods for removing the constricting influence is then used. The simplest of these was described by Landis and Gibbon[5]. After readings are made on the feet, the hands and forearms are immersed in a water bath with a temperature of approximately 110° F. for 35 minutes and readings are again taken. In normal reactions the temperature of the toes will be elevated to 90° or 92° F.

With the blanket test described by Coller and Maddock[6], the patient is exposed for one hour in a room at 70° F. and readings are made. The patient is then wrapped in three heavy blankets for one hour and readings are again taken.

Injection of the peripheral nerve or the use of spinal anesthesia are also used to study the skin temperature to rule out vasospasm. Novocain is injected into the posterior tibial nerve and plantar anesthesia of the foot results. The skin temperature of the ball of the great toe is taken before and after the injection. The difference in temperature will indicate the amount of peripheral dilatation obtained. Spinal anesthesia also removes the constricting influence in the extremities but this procedure carries with it some risk and requires hospitalization.

The oscillometer is an instrument used to determine the elasticity of the arteries of the extremities and takes the place of the palpating finger in the examination of the peripheral arterial pulsations. A needle swings along a graduated scale which gives quantitative information concerning the amplitude of the peripheral pulses. With this instrument, pulses that were not palpable to the examining finger can be demonstrated.

Roentgen studies of the extremities may be of value to demonstrate the presence of calcium deposits in the arteries. These pictures do not, however, give information as to the amount of obstruction in the vessels. They may be of value to help confirm the diagnosis of a marked arteriosclerosis.

Differential Diagnosis

The differentiation of thrombo-angiitis obliterans and arteriosclerosis will at times present a difficult problem. In both instances the symptoms are produced by the occluding process in the vessels. Intermittent claudication, pain, ischemia, rubor, decreased or absent arterial pulsations, and gangrene are common in both diseases.

Thrombo-angiitis obliterans usually occurs in males between the ages of 20 and 45 years. A history of excessive smoking of cigarettes is generally obtained. In about 40 per cent of the patients, the presence of or a history of a migrating phlebitis is noted. Migrating phlebitis may particularly involve the external and internal saphenous veins and may be preceded by the appearance of subcuticular red spots or nodules on the leg which are tender and hard upon palpation. Although any race may be affected, it is predominant in the Russian and Polish Jews.

Arteriosclerosis generally occurs in patients in the older age group, the changes usually not being apparent until the age of 50 is reached. If diabetes is present, the symptoms appear at an earlier age and calcification of the peripheral arteries is much more intense than in the uncomplicated arteriosclerosis.

Silbert[7] suggests the following outline for differentiation of the two diseases:

Thrombo-angiitis obliterans	Arteriosclerosis
Appears younger than his age	Appears older than his age
Hair normally pigmented	Hair usually gray
No arcus senilis	Arcus senilis frequently present
Retinal arteries normal	Retinal arteries usually sclerotic
Blood pressure usually low	Blood pressure often high
Radial and temporal vessels soft	Radial and temporal vessels thickened and hard
Upper extremities frequently involved	Upper extremities seldom involved
Femoral arteries frequently closed	Femoral arteries seldom closed
No calcification of vessels on X-ray	Calcification of vessels on X-ray frequently seen
Blood volume usually diminished	Blood volume usually normal
Symptoms of coronary artery sclerosis rare	Symptoms of coronary artery sclerosis frequent
Aorta appears normal on X-ray	Aorta sometimes appears elongated on X-ray
Albuminuria rare	Albuminuria not uncommon
History of migrating phlebitis frequent	History of migrating phlebitis rare

Raynaud's disease belongs in the vasospastic group. It is characterized usually by a symmetrical vasospastic disturbance of all extremities and sometimes the tips of the nose and ears. The disease shows a pre-

dilection for women between 18 and 40 years of age. It predominates in young, thin women who are unusually sensitive to cold. The onset is usually sudden with blanching, commonly of one or more fingers or toes. Due to the local syncope there is severe pain or paresthesia and the member will have a "dead" feeling. The appearance is that of marble-like pallor and coldness. It may last from a few minutes to hours and disappear. The color may change to a blue or purplish or bluish-black (cyanosis). Following this reaction blebs may develop which may last for months. If the bleb proceeds to gangrene it breaks down, leaving an ulcerated area which finally cicatrizes, or a dark scab may develop and become detached. After a series of attacks, the fingers are seen to be very thin, hard and tapering, and the nails present trophic disturbance.

Gangrene of the fingers and toes is frequently seen in polycythemia vera. A local thrombosis occurs in the arteries due to the high viscosity of the blood.

The appearance of the patient is usually quite striking. The face and ears exhibit a peculiar dusky redness seen in no other disease. When the patient is exposed to cold temperatures cyanosis is very marked in the hands and face. The excessive blood volume may cause dyspnea, palpitation or a sense of cardiac oppression. Weakness or easy fatigability may be present. Examination of the eye grounds reveals engorged and tortuous arteries. The red blood cells and blood volume is greatly increased.

Usually marked pallor can be demonstrated on elevation of an affected extremity and when pendant, marked engorgement occurs. If gangrene is produced it is usually in the toes and fingers and is definitely demarcated.

References

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