

## ARTERIOSCLEROSIS OF THE SPINAL CORD.<sup>1</sup>

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It is a well known fact that arteriosclerosis is a condition which may occur in many parts of the body; in the vessels of the muscular apparatus as well as in those of the internal organs. Heart, lungs, stomach, liver, kidneys, *etc.*, may become the principal seat of this affection, and many different types of the disease have been described accordingly.

The arteries of the central nervous system are not exempt from this affection, but may on the contrary form the starting point, or perhaps the only seat of the disease. Sclerosis of the cerebral arteries is a comparatively frequent occurrence, and its clinical manifestations, the physical and mental symptoms, are sufficiently known to lead as a rule to a correct diagnosis *intra vitam* without difficulty.

Arteriosclerosis of the spinal cord, however, is a condition which is only rarely diagnosed. The literature on this subject is extremely scanty; most textbooks not even mentioning it. Having been especially interested in this subject for several years past, I have collected a number of cases in which arteriosclerosis of the spinal cord formed the principal and sometimes the only feature of the disease.

As to the etiology of arteriosclerosis in general a great many conditions have been mentioned by various authors. Infectious diseases, chronic intoxications, abnormalities in metabolism, heredity, old age, *etc.*, were held responsible for the manifold types of arteriosclerosis. It is not my intention to discuss these various factors as to their relative value in the production of the disease. There is, however, one point which seems to me of special importance in connection with this subject. In spite of the many conditions which are considered of etiological significance, there remains a comparatively large number of cases in which arteriosclerosis can not be attributed to any real cause, so that we must assume a primary tendency on the part of the vascular apparatus

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to undergo degenerative changes. It is true, heredity has been found to play a certain rôle in this class of cases, but what else does that mean than that the individual is endowed with abnormal blood vessels *ab ovo*. In fact arteriosclerosis has been observed in infants only a few months old. I have seen sclerosis of the peripheral arteries and those of the heart in a number of young men between twenty and twenty-five years of age. While arteriosclerosis is extremely common in old age, we have to deal here with premature changes of the blood vessels, due to a congenital abnormality of the circulatory apparatus. This then accounts for the manifold idiopathic diseases of the internal organs and the central nervous system based on degenerative lesions of the arteries.

In order to obtain as pure a clinical picture as possible of arteriosclerosis of the spinal cord, I have carefully eliminated all those cases in which even a suspicion of syphilis had to be maintained. Most cases which I have collected belong therefore in that category of idiopathic abnormality of the blood vessels.

Considering the anatomical basis of the disease it is evident that a sharply defined clinical picture cannot be given. It goes without saying that any artery or any group of arteries may become the principal seat of the lesion, and that according to the localization and intensity of the affection the symptoms will vary. Just as the clinical picture of spinal syphilis is characterized by the atypical complex of symptoms, so is arteriosclerosis of the cord a disease which may offer a great variety of clinical manifestations. In spite of this, however, there are certain clinical phenomena which will enable us to recognize this morbid condition of the spinal cord during life, and to differentiate it from other diseases of this organ.

One characteristic feature of spinal arteriosclerosis is the fact that the cells of the anterior half of the cord are much more apt to become affected than those of the posterior part. This is probably due to the peculiarity of the blood supply of this organ. The anterior spinal arteries are much less numerous than the posterior ones, and while the anterior arteries anastomose in such a way as to form one longitudinal vessel running over the entire anterior surface of the cord, the anastomosis of the posterior arteries produces six longitudinal vessels running parallel all the way down from the upper part of the cord to the conus. This

abundant anastomosis of the blood vessels immediately before their entrance into the substance of the cord may afford a greater safeguard against an increased blood pressure, and in case of occlusion of one of the smaller arteries the anastomosis allows a ready blood supply from other sources. Of the anterior half of the cord it is again the lower part which becomes more frequently the seat of the disease than the upper part. The cause for this may lie in the fact that here the blood supply is still more direct than in the cervical and dorsal regions. The one artery which accompanies the sciatic plexus, the *arteria magna*, supplies the anterior gray matter of the entire lumbar and sacral cord, while in the upper part the spinal arteries are more numerous. The *arteria magna* has the largest caliber of all the spinal arteries, and the blood passes more directly from this vessel into the substance of the cord than at any other place. The arterioles of the anterior horns in the lumbar and sacral region have therefore less protection against an increased blood pressure than any other part of the spinal cord.

As a consequence of this condition we find in arteriosclerosis of the cord motor and trophic disturbances much more frequently than sensory symptoms, the latter in fact being rather rare in this affection. The existing manifestations again are more common and more marked in the lower than in the upper parts of the body.

The motor symptoms consist of gradually increasing weakness, characterized by fatigue after moderate exertion such as standing and walking, combined with a slight tremor of the head and of the upper and lower extremities. The gross muscular power gradually diminishes more and more, the gait becomes dragging and difficult, until finally, in the more severe cases, it ends in absolute inability to walk. There is, however, no atrophy as a rule, and the muscular tonus retains its normal condition up to a late period of the disease. The patellar reflexes may be exaggerated at first, then become sluggish, and may be lost entirely in the later stages. A slight tremor of the lower extremities may cause a moderate swaying of the body in the standing position, which, however, is different from the typical Romberg symptom. These may be the only symptoms of the disease for a long time; there are no sensory disturbances. Perception to outer stimuli remains unimpaired, and there is no pain. The reflexes of the bladder and rectum are normal. Sooner or later the other organs become affected in a sim-

ilar way, and the patient may die from a cerebral hemorrhage or an intercurrent disease. This clinical picture is so often found in old age that it has frequently been considered a normal condition of this period of life. Unsteadiness of upper and lower extremities and gradually increasing impairment of gait and muscular power seem so common in old people, that one is often inclined not to look upon these phenomena as a morbid condition at all. But there are undoubtedly a great many old people who do not manifest any of these symptoms, and on the other hand, we not infrequently meet with these symptoms at an early period of life, so that it seems hardly justifiable to consider this condition a physiological process even among the very old.

Trophic disturbances manifest themselves in malnutrition of the skin, and of the mucous membranes, bones and joints. Glossy skin is a frequent symptom in these cases; the nails may become brittle, or may offer the conditions of onychogryphosis or alopecia unguium. There may be a tendency on the part of the skin to undergo ulceration and gangrene. A certain percentage of those cases known as erythromelalgia and Raynaud's disease are undoubtedly due to lesions in the trophic centers of the cord. The long bones may suffer from malnutrition, and possess a tendency to undergo spontaneous fracture. Certain forms of joint disease arthropathia and hydrops articulorum intermittens are found in this condition.

It is true that it is very difficult and often impossible to decide in individual cases whether these trophic disturbances are really due to lesions of the cord or to morbid changes in the peripheral arteries, especially as both conditions may occur simultaneously. There is, however, a considerable number of cases in which the peripheral vessels were found in perfectly normal condition, and where the cause had necessarily to be attributed to morbid changes in the trophic centers.

The diagnosis of spinal arteriosclerosis may sometimes offer considerable difficulty, especially when it occurs in younger individuals, and when its clinical manifestations resemble those of the well known systemic diseases. Although, as mentioned before, sensory symptoms are comparatively rare in arteriosclerosis, they may nevertheless occur. In the first place they may be produced by complicating peripheral lesions, and secondly, it is

of course not impossible for the posterior part of the cord to be involved also. The clinical aspect of cases of this kind may closely resemble those of tabes. Here it is the history of the case, the absence of syphilis, arteriosclerosis in other parts of the body, and the condition of the pupils, which may be of value in the differential diagnosis. The Argyll-Robertson pupil does not belong to arteriosclerosis. If, on the other hand, the case is complicated by sclerosis of the cerebral arteries, we may have a difference in size of the pupils, or an atrophy of the optic nerve, leading to complete blindness. This latter condition, which is often considered one of so-called idiopathic optic atrophy, is by no means rare in cerebral arteriosclerosis, and can be explained by purely mechanical pressure. The optic nerve and the ophthalmic artery pass through the optic foramen in a common sheath. There are cases on record where the autopsy showed a marked thickening of the artery at this place, in consequence of which the nerves were compressed and caused to atrophy. If furthermore arteriosclerosis occurs at the posterior half of the lower part of the cord, it may through the production of proliferating interstitial tissue cause a secondary degeneration of the posterior columns, and in this way produce conditions, which even in anatomical respects, resemble those of tabes. It is possible that this fact accounts for those cases which are mentioned in all statistics as a small percentage of tabes without syphilis.

Progressive muscular atrophy, amyotrophic lateral sclerosis, and multiple sclerosis, will offer much less difficulty in their differentiation from arteriosclerosis. There is on the other hand spinal syphilis which may in its clinical features resemble arteriosclerosis so closely that the differential diagnosis becomes extremely difficult. Most cases of spinal syphilis take their starting point in the meninges, and as a consequence of this produce more general manifestations and especially root symptoms. If the gray substance becomes affected primarily the symptoms may resemble those of arteriosclerosis. Here it is the clinical course which may help us to differentiate between the two conditions. Syphilis is apt to produce acute attacks with sudden remissions and exacerbations. The clinical picture is apt to undergo manifold changes and fluctuations, while arteriosclerosis is a slowly but steadily pro-

gressing disease, without many changes or irregularities in its clinical course.

Arteriosclerosis hardly ever remains confined to one single organ any great length of time. It may do so at the beginning of the disease, or the symptoms of the one or the other organ may stand out more prominently during a longer period, but sooner or later it will become manifest that arteriosclerosis is a general disease, and that its confinement to one particular part of the body is seeming rather than real. Therefore arteriosclerosis of the spinal cord does not constitute a *morbus sui generis*, but forms a period of a general disease, of which it is true the spinal symptoms may for a long time stand in the foreground, or may even form the principal features throughout the disease.

In the following cases the diagnosis of arteriosclerosis was made purely from the spinal symptoms at a time when the other organs were in a fairly good condition. During the later course the symptoms became more general in most cases, other parts of the body, especially the brain, becoming affected. As mentioned before, only those cases were selected in which syphilis could be excluded with certainty, so that this disease would not come in consideration even as an etiological factor.

*Case 1.* Mr. G., fifty-two years old. Merchant. No heredity. No syphilis. Wife has four healthy children. No miscarriages. Use of alcohol and nicotine very moderate. No infectious disease except a few slight attacks of malaria during the last few years and scarlet fever in childhood. Patient consulted me for the first time in May, 1899. Complained about gradual loss of muscular power in his lower extremities. Since two years his gait had become more and more impaired. Besides this he complained of dizziness especially in bending down. Examination revealed perfectly normal condition of the cranial nerves. Pupillary reflexes and fundus normal. No atrophies. No change in muscular tonus. Sensation perfectly normal all over. Patellar reflexes both missing. Radial arteries very hard. Urine normal. Heart and other internal organs in good condition. Patient walks like a man of ninety years. The body is slightly bent forward, and the feet are slowly dragged, without lifting them from the floor. After walking for a few minutes in this manner he has to sit down on account of great fatigue. Standing for any length of time is equally difficult. There is a slight tremor of both upper and lower extremities. The mental condition is perfectly normal. Memory for the past as well as for recent events

excellent. Intelligence unimpaired. No morbid emotions; speech without any disturbance. Writing somewhat unsteady on account of the tremor. When asked to bend his head down and raise it suddenly he became so dizzy that he had to be supported in order to prevent him from falling. The diagnosis of arteriosclerosis of the spinal cord was made. Patient remained in this condition for about two years; then the symptoms became still more marked, so that he was hardly able to walk at all. Two months ago cerebral hemorrhage and death.

The absence of the patellar reflexes in this case combined with the impaired gait and the motor disturbances due to tremor and dizziness resembling, to a certain extent, a moderate degree of ataxia, had led to the diagnosis of tabes, which, however, I rejected positively.

*Case 2.* Mr. N., sixty-four years old. Merchant. Heredity, alcohol, nicotine, syphilis and other infectious diseases negative. I saw patient for the first time in October, 1899, in consultation with his family physician, from whom I obtained the following history. He was always a healthy man up to a few years ago when he noticed a slight weakness in his lower extremities coming on very gradually. About eight months previous to the time when I saw him, he fell in the street and sustained a fracture of the left femur, complicated by a complete tearing of the tendon of the quadriceps. Patient could not remember that he had slipped in the street nor that his fall was due to dizziness or vertigo. All he knew was that his limb gave way and that he fell. He was treated surgically and made a complete recovery, so that he could walk about as well as he did before the accident. The weakness of the lower extremities continued and increased gradually. About five months later he had another accident in the street in spite of his extreme care in walking. This time he fractured the tibia of the left leg. He was absolutely sure that he had not slipped, and that no disturbance of consciousness could account for his fall. The examination revealed an absence of both patellar and both tendo-Achillis reflexes. No other symptoms on the part of the nervous system. Both radial arteries were sclerotic and the second heart sound was very much accentuated. The arteries of the lower extremities as far as they could be examined showed no particular change. The diagnosis of spinal arteriosclerosis was made, and the patient treated accordingly. Since that time he has remained in good health with the exception of the slowly progressing weakness of his lower extremities. There was never any pain in any part of the body.

*Case 3.* Mrs. B., forty-eight years old. Father died of apoplexy when fifty years old. One brother has heart disease; one sister highly nervous. No syphilis. Scarlet fever and diphtheria in childhood. Patient came to my office in November, 1900, with

the following complaints: Since about a year she noticed a gradually increasing weakness of the lower extremities which manifested itself mostly in the standing position. Patient in fact claims to be unable to stand still. If not sitting she must move about. She experiences great difficulty in getting up from a chair and in climbing stairs. Walking produces fatigue very easily. She complains of a dull aching pain in the back and in the lower extremities, especially after any exertion. Occasional attacks of headache and vertigo. Patient is a very stout woman, weighing 212 pounds. Objective examination reveals no symptoms on the part of the nervous system, except patellar reflex on the right side missing, on the left side very much diminished. Tremor of upper and lower extremities. No atrophies. Radial and temporal arteries highly sclerotic. The right radial artery feels like a cord of iron. On both lower extremities large areas of varicose veins. On the anterior surface of the left leg an ulcer of the size of the palm of the hand is very sluggish in healing in spite of careful treatment. Systolic murmur of the heart and accentuated second sound. No enlargement. Internal organs otherwise normal. Urine contains no albumin nor sugar. Mental condition is in perfect order. The inability to stand is due to the combination of weakness and tremor of the lower extremities with the heavy weight of the body which makes walking easier than standing.

*Case 4.* M. C., forty-five years old. Tailor by occupation. Mother died from apoplexy. One brother has a spinal disease. Two sisters both nervous. No syphilis or other infectious diseases. Moderate use of alcohol and nicotine. Since several years weakness of lower extremities and pain on exertion. Nervous system shows no objective signs except absence of patellar reflexes. Sclerosis of radial and temporal arteries. Slight enlargement of the liver. No changes in the other organs. Urine normal.

*Case 5.* S. L., fifty-two years old. Peddler. Father died from brain disease. Three sisters and four brothers are all nervous. No syphilis or other infectious diseases. Admits considerable use of alcohol and nicotine. Patient complains about weakness and dull pain in upper and lower extremities. No shooting pains. Occasional headache and dizziness. Examination showed slight difference of pupils, the right being larger, than the left one. No other symptoms on the part of the cranial nerves. Pupillary reflexes normal. Patellar reflexes exaggerated. Marked tremor of the tongue, upper and lower extremities. Sensation normal. Gross muscular power very weak. No Romberg; no atrophies. Nails are brittle. Multiple ulcerations at the tips of the fingers. One ulcer on the sole of the foot of the size of a silver dollar, looking like a typical mal perforant. Radial and temporal arteries highly sclerotic. The right radial artery can be

felt as a hard string up to the middle of the forearm. Second heart sound accentuated. Other internal organs normal. No albumin; no sugar.

In all these cases the spinal symptoms stood in the foreground of the disease, although an arteriosclerosis could be demonstrated also in other parts of the body. In several instances the complex of symptoms resembled that of tabes just as cases of cerebral arteriosclerosis may resemble general paresis.

The following group represents a set of cases in which the spinal symptoms are combined with cerebral manifestations.

*Case 6.* Mr. H. S., sixty-five years old. Merchant. No heredity. No alcohol. No nicotine. Syphilis could be excluded with certainty. No other infectious diseases. I saw the patient at first in November, 1898, in consultation with his family physician, from whom I obtained the following history. He was always in perfect health up to two years ago, when the sight of the right eye began to fail. An oculist, who was consulted at that time, diagnosed a beginning atrophy of the optic nerve, for which no reason whatsoever could be detected, so that it was considered a case of so-called idiopathic atrophy. This process advanced slowly but steadily, and about half a year later the same condition took place in the other eye. At the same time the patient experienced some difficulty in walking, which also increased gradually. There was never any pain in the upper or lower extremities. When I saw the patient the atrophy of the optic nerves was advanced so far that he could only distinguish between light and dark. The pupils did not react even to the strongest stimuli of light. There were no symptoms on the part of the other cranial nerves. Patellar and tendo-Achillis reflexes were absent. No Babinski phenomenon. The muscular power of both upper and lower extremities was very weak and there was a fine tremor in hands and feet. Patient could walk only a few steps, and with great difficulty. Sensation was perfectly normal. The heart sounds were somewhat dull, but there was no murmur and no abnormality on percussion. The lungs were slightly emphysematous and the internal organs otherwise normal. No albumin nor sugar. Radial and temporal arteries showed no particular change. The mental condition was perfectly normal. I diagnosed the case as one of cerebrospinal arteriosclerosis, explaining the optic atrophy by the condition mentioned before, *i.e.*, by pressure of the enlarged and rigid ophthalmic artery on the nerve at its passage through the optic foramen. The weakness and the tremor of upper and lower extremities continued to increase gradually without being complicated by any sensory symptoms. During the following summer, while patient

was in the country, he developed suddenly very marked mental disturbances. When I saw him he was in a state of great excitement, screaming and scolding. He had delusions of persecution and hallucinations of sight and hearing. The mental condition during the following weeks offered the typical picture of a case of dysphrenia, which is mainly characterized by the changeability of symptoms and lucid intervals. At times he was wild with excitement and at other times perfectly quiet. Now he was deeply depressed and melancholy, and then again gay and jolly. Here and there he had isolated delusions and hallucinations. All these morbid conditions were interrupted now and then by lucid intervals, during which his mental condition appeared perfectly normal. This special form of psychosis was in accordance with the diagnosis of arteriosclerosis, the symptoms being those of dysphrenia arteriosclerotica.

During the following year the lower extremities grew so weak that the patient became entirely unable to stand or walk, although there were no true paralysis, atrophies, or contractures. The mental condition kept on changing according to the nature of the disease. During the summer of 1901 patient had a hemorrhage in the internal capsule of the left hemisphere with right-sided hemiplegia and aphasia, which, however, receded after a few weeks, so that the condition became about the same as it was before, except for an increased weakness of the right arm. During the winter of 1901-1902 he had several attacks of edema of the lungs, which he also survived. Recently he got an edema of the hands and feet, and is in an extremely weak condition. The urine never contained any albumin.

Here we have a case with loss of patellar and pupillar reflexes; blindness, inability to walk and mental disturbances. How closely this complex of symptoms resembles those of a case of tabes, combined with general paresis, and still how different are both conditions in their pathogenesis. If this patient were about fifteen years younger the diagnosis of general paresis might have been very tempting, and still there is no reason why this very condition should not occur in younger men. I have no doubt that a certain percentage of cases which are reported in statistics as tabes and general paresis belong in this category, and that this, as said before, may account for the tabes and paresis cases without syphilis.

*Case 7.* Mr. A. T., forty-four years old. Merchant. Mother died from brain disease. One other brother died from apoplexy. Two sisters both "very nervous." No alcohol. Very moderate smokers. No syphilis and no other infectious diseases. When

I saw patient in October, 1900, in consultation with his family physician, he complained of general weakness, especially in the lower extremities. While in earlier years he was a good sportsman, he was unable now to run or even walk for any length of time. Standing was especially difficult. After the least exertion he experienced extreme fatigue and dull pain in his back and extremities. This condition came on very gradually during the last few years. Of late he was also troubled with a number of mental disturbances. At times he was depressed and suffered from loss of ambition and energy. Besides this, he complained of certain morbid fears and impulses, and of imperative ideas. Whenever he boarded a train of the elevated railroad or a ferryboat he experienced the impulse to jump down, and often asked the conductor to prevent him from doing so. Since recently he did not dare to take the elevated, but preferred the surface car for this reason. For days he was annoyed by certain thoughts and ideas, which he recognized as utterly absurd, but of which he could not rid himself. There were no objective symptoms on the part of the nervous system, except very sluggishly reacting patellar reflexes and a fine tremor of upper and lower extremities. Both radial and temporal arteries were as hard as iron cords, and considerably twisted. There were extensive varicose veins on both lower extremities and the ophthalmoscopic examination revealed sclerotic arteries of the retina. The outlines of the heart were normal, and there was no murmur, but the sounds were extremely intense. The urine contained traces of albumin, and the other organs were normal. I made the diagnosis of arteriosclerosis of the central nervous system. Half a year later patient died suddenly from cerebral hemorrhage.

*Case 8.* A. W., fifty-two years old. Tailor. Father died from apoplexy. No alcohol. Moderate use of tobacco. No syphilis. Has seven healthy children. No other infectious diseases. Patient consulted me in September, 1900, on account of weakness of the back and lower extremities, and of dull pain in these parts after any kind of exertion. Besides this, he complained of headaches, dizziness and ringing in the ears. These symptoms had come on gradually during the last two years. Up to that time he had always enjoyed good health and strength. There were no objective symptoms on the part of the nervous system, except a fine tremor of the hands, slight unsteadiness of the lower extremities, and somewhat exaggerated knee-jerks. Radial and temporal arteries were very hard. The heart sounds were very much accentuated, but there was no murmur or enlargement. Other internal organs normal. No albumin nor sugar. There were very large extensive varicose veins on both lower extremities. Nails were brittle; skin dry and badly nourished. The diagnosis of ar-

teriosclerosis of the central nervous system with the complex of symptoms of *Menière's disease*, was made.

Patient's condition grew gradually worse; especially the spinal symptoms increased quite rapidly. After about six months patient was hardly able to walk. The patellar reflexes had become very slow and sluggish, but there was no atrophy and no pain except after exertion. After another six months patient developed mental symptoms consisting of depression and occasional maniacal outbursts. Now and then there were remissions in his psychical symptoms, lasting one or sometimes several days, so that the psychosis offered the clinical picture of a *dysphrenia*. Intelligence and memory remained unimpaired throughout the disease. In December, 1901, patient died from cerebral hemorrhage.

Autopsy: Edema of the brain. Pia can be removed from the brain without difficulty; extensive hemorrhage in the left internal capsule. Arteries of the brain and cord very sclerotic. Left Sylvian artery showed several white thickenings. Right Sylvian artery also considerably thickened throughout its course. Vertebral artery highly sclerotic. Brain and cord were hardened in five per cent. formalin. Sections were stained with Weigert, Nissl, Van Gieson and carmine. The anterior longitudinal artery of the cord was very much enlarged in diameter throughout its course; especially the adventitia seemed to be thickened considerably. The lumen of the vessel varied at the various levels. At some places it appeared somewhat contracted and packed with blood corpuscles, and at other places it was enlarged and irregularly shaped. The posterior longitudinal arteries showed similar conditions, with the exception that here the lumen of the vessels seemed not to be enlarged but rather diminished in size throughout. Both anterior and posterior spinal arteries showed considerable thickening of the walls. The arterioles of the gray matter of the cord appeared to be much thicker than normal. The lumen was often extremely small and sometimes seemed to be occluded entirely. At several places there were blood corpuscles on the outside of the vessel, and small groups in the substance of the gray matter, indicating minute hemorrhages. The motor cells in the anterior horns were normal in size and shape, but here and there the Nissl bodies appeared rather indistinct, and there was a very marked increase of pigment in the bodies of the cells. The cells of the posterior horns showed no morbid changes whatsoever, and the white substance was perfectly normal throughout the entire cord. The microscopical examination of the brain showed also general arteriosclerosis. A great many of the smaller arteries and arterioles were occluded, and several capillary hemorrhages had taken place into the substance of the brain.

All the foregoing cases represent the spinal type of arterio-

sclerosis sufficiently advanced to produce such anatomical changes in that organ that the diagnosis of an organic lesion could be made without difficulty. The question is now whether we would not be able to recognize this condition at an earlier period of the disease, at a time when no gross changes in the substance of the cord have yet taken place. There can be no doubt that every case of spinal arteriosclerosis must give some symptoms at such an early period, and that some cases may become stationary and never give evidence of an organic lesion. Naturally cases of this kind are as a rule put in the large indefinite category of neurasthenia. Although I do not claim to be able to lay down certain diagnostical rules, to separate these earlier or minor cases of spinal arteriosclerosis from purely functional nervous disorders, I want to point out a certain group of cases in which the diagnosis of beginning spinal arteriosclerosis at least suggests itself, considering the clinical manifestations of the well-marked cases described above.

The following case is only a representative of a frequent and well known form of disturbance :

*Case 9.* Mr. F. T., forty-three years old. Merchant. Father died from apoplexy. Mother and two brothers are nervous. No alcohol nor nicotine. No syphilis nor other infectious disease. Since a number of years patient complains about general fatigue, especially of the lower extremities, after the slightest exertion. His skin is dry and badly nourished. Nails are brittle. Circulation is sluggish. Patient complains constantly of cold feet. After a cold bath it takes him a long time to restore his circulation and to become warm. He suffers from sleeplessness. In the morning he feels extremely heavy and tired, and the eyes are bloodshot. The examination reveals no objective symptoms except rigid radial arteries.

This case represents, as said before, a type of patients who are generally classified among the neurasthenics, and who are by no means rare in the practice of any physician. If we compare his symptoms with those cases of well marked spinal arteriosclerosis, we must admit that a striking resemblance exists between them, and that at least the possibility of this case belonging in the same category cannot be denied. It is evident of what importance it would be, to recognize the real pathogenic origin of this class of

cases, for not only scientific but also for practical therapeutic purposes.

So much, I think, can be said today, that a special type of arteriosclerosis exists, which has to be located in the spinal cord. It must be left to future investigations to advance our knowledge of this somewhat obscure process still more, and especially to throw more light on the origin of this morbid affection of the vascular system.