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DISEASE OF THE CEREBRAL VESSELS, WITH ITS PROBLEMS IN DIAGNOSIS.*

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Diseases of the arterial system in the brain often give rise to a misleading and confusing chain of clinical symptoms.

Not infrequently these symptoms are almost identical with those of well-known diseases, such as tumors, abscesses, cysts, and hemorrhages. The diagnosis is, therefore, empirical or impossible, particularly if no gross evidences of disease are found in accessible or palpable vessels.

Changes in the vessel wall may be dependent on a defective development of the media, which leads to aneurismal pouches, minute, moderate, or large. Atrophy, inflammation, or degeneration follows wasting disease. Acute arteritis from infective processes or intoxications, extensions of disease, septic or otherwise, from adjacent structures, and from external injuries, have been clearly demonstrated by bacteriologic and histologic investigations. Thromboarteritis, in which the brunt of the attack is sustained by the intima and media, may result in the organization of a thrombus and the partial or complete obliteration of the vessel lumen. Arteriosclerosis, a circumscribed or diffuse thickening of the arterial walls, especially of the intima, secondary to certain inflammatory or degenerative changes in the media, covers such a broad field and is so well appreciated that further description is unnecessary.

The following cases represent a form of vessel disease in which there are fairly well-defined focal manifestations, which might easily fall under the head of brain tumor or other gross disease, and yet not represent the ordinarily recognized forms of cerebral arteriosclerosis. These cases also illustrate disease of the arteries of the brain without other marked evidences of general vessel degeneration.

CASE 1.—L. W. R., male, aged 45, married, telegrapher.

Family History.—Father died of bronchitis at 48; mother died of old age at 77. One brother and one sister are living and well. One sister is dead; cause unknown. Two sons and a daughter are living and well, except that all are somewhat nervous.

Personal History.—General health is fair. He can not recall any severe illness. He had gonorrhea years ago; syphilis, he denied. He had been twice married; neither wife had any miscarriages. Twenty years ago, the patient fell, striking his

spine, and sustained some sort of injury, which necessitated his being kept in bed in a prone position for ten weeks. There was apparently a complete recovery.

Present Disease.—Ten years ago he began to have jerking in his legs at night with occasional cramps. This condition grew worse, and seven years ago his arms also began to jerk, but after a time he improved in this respect, and his upper extremities are no longer affected, though he still has slight jerking in his legs, both day and night. About ten years ago he also began to lose the power of hearing in the left ear, and at the end of two years the loss was complete. A few months later, hearing in the right ear became dull, but he was still able to continue his work as a telegrapher until one morning he woke to find himself absolutely deaf. From that time till two years ago, he did clerical work. Ever since his deafness appeared, he has had noises in his head. There is constantly present a sound as of singing insects, and, in addition, there is at times a roaring like the fall of water, sometimes near, again far away, and at times there is a noise like that of the intermittent tooting of an automobile horn, sometimes high and sometimes low in pitch. This latter sound occurs only when he is nervous or worried. Sexual power has been weak for six years, and for the last year wholly gone. Two years ago he lost control of his bowels and bladder. After a time, this was regained, but is now again lost. During the last five years he has had attacks of dizziness from time to time, possibly due to digestive disturbances. When he becomes dizzy, he is also nauseated unless he assumes a recumbent posture. If he lies down, the nausea goes away, and if he closes his eyes, the dizziness also disappears. During the week before consulting me he had been dizzy always when rising from a recumbent posture. Four years ago he began to shuffle his feet when walking, and of late his gait is decidedly staggering. He still writes fairly well, but at times his hand jerks and the pen drops. He is confined to the bed and a chair practically all the time.

Physical Examination.—He is a medium-sized man, fairly well developed and nourished; skin, healthy in appearance; muscles, small. Temperature, 98.6 F.; pulse, 64, regular and normal in volume. Examination of heart and lungs is entirely negative. Radial and temporal arteries are soft. Abdominal organs are normal except for a considerable amount of gas in the stomach and intestines.

Urine: Clear, dark amber, strongly acid; specific gravity, 1.028; trace of albumin; no sugar; cylindroids and considerable mucus.

He complains of vertigo when he first rises, and says this is not worse when it is dark. He has an occasional slight headache—never any that is severe; no tenderness about the head. The eyes are deep set. There is no conjunctivitis, ptosis, lagophthalmos, nystagmus, or strabismus. Vision is fair. Examination of the ears is negative, except that he is absolutely deaf. Taste and smell are normal. No disturbance of cutaneous sensibility for touch, pressure, pain, or temperature can be demonstrated. The patellar reflexes are both increased; no ankle clonus. Marked Romberg sign is present with moderate ataxia in the hands; no Babinski sign. The muscles are all small. Those of the upper extremities are soft and flabby; those of the lower limbs are spastic; no atrophies; no fibrillary twitchings. He walks with a distinctly spastic, staggering gait.

Mental Condition.—His expression is sad but intelligent, and he has no peculiarities of dress or attitude. He is oriented

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as to time, place, and surroundings, comprehends what is said to him and answers relevantly. His memory is good. He is evidently much depressed and worries a great deal because he is unable to get about. At times he is extremely irritable; no hallucinations or delusions.

Course of Disease.—Oct. 26, 1907: He has been failing since last note. He says that he is losing flesh and that the power in his right hand is failing, though examination does not confirm the latter statement. Suffers severely from constipation and passes a limited amount of urine. His feet and legs become cyanotic and swollen if held in a dependent position. Almost ever since the last note, he has had a free flow of saliva, which, if swallowed, causes vomiting. He has a bitter taste in his mouth and has a constant feeling of distention and slight pain in his stomach. Taking food relieves this for a short time, but afterward seems to make it worse. Teeth are not tender, and gums are perfectly normal. Right pupil is a little larger than the left; both react normally for distance but sluggishly for light. Patellar reflexes are increased; no ankle clonus. He thinks that his eyesight is worse, and he is sure that he does not see so well during the dizzy spells as at other times. He says that he suffers greatly from mental distress.

Nov. 14, 1907: Much of the time the patient is extremely irritable and depressed. He walks with increasing difficulty and thinks that his eyesight is failing. He has no headache. The flow of saliva decreased for a time, but is again excessive.

Nov. 18, 1907: Dr. William R. Murray examined his eyes to-day and reported: "Lids and external ocular muscles normal. Cornea normal. Iris normal; reacts to light and convergence. Crystalline lens normal. Optic discs normal (lamina cribrosa prominent). Retinal arteries slightly contracted and pale; otherwise normal. Fundi show no pathologic changes. Visual fields (roughly) appear normal. Vision (R. and L.) for distance good. Reads fine print at ten inches. Examination of eyes negative."

Dec. 13, 1907: The man constantly complains of being weak; can not sit up except for short periods; he scarcely ever suffers from vertigo now. He has no pain except an occasional slight headache. Expression is bright. Sensibility to pressure and pain are about normal in upper part of body, but distinctly impaired in the legs and lower abdomen. Deep reflexes in the upper extremities are about normal, but are much increased in the legs. There is more or less spasticity everywhere, but especially in the lower extremities. No ankle or patellar clonus. No fibrillary twitching is noted; no contractures. There is no atrophy of tongue. He is still spitting very freely.

May 27, 1908: The man is in practically the same condition except that his ataxia is greater.

CASE 2.—Male, aged 48, married, train dispatcher, was seen June 14, 1907.

Family History.—Father died at 66 of kidney trouble; he had been a heavy drinker. Mother is living at 76 and well. One brother died of dysentery, and one brother drinks to excess. The maternal grandfather died of paralysis. There is no other nervous or mental trouble in the family.

Personal History.—General health in early life was fair. He had typhoid in childhood and gonorrhea at 17. Syphilis was denied. He was very ill with mountain fever twenty-four years ago. At different times he had a number of abscesses. He drank some every day, but rarely to the extent of being intoxicated. He used tobacco to excess habitually, his cigar bill amounting to \$35 a month. He was married at 22. His wife has never been pregnant. He has never been injured.

Present Illness.—About twenty-four years ago, when excited over a little family trouble, he had an attack of jerking of all the muscles, lasting one-half hour. A second similar attack, only more severe, occurred seven years ago, and again during a family quarrel. It lasted one hour, and was not accompanied by unconsciousness. He did not fall, but was lying down at the time. For the last sixteen years he has been failing in health, and fourteen years ago he noticed some unsteadiness in gait. This latter has gradually grown worse since. Sixteen years ago he first complained of the wind and the pillows hurting his ears, and not long after that he began

to slowly lose his hearing. The explosion of a cannon-cracker is thought by the family to have hastened the latter. The trouble began in the right ear, and eight years ago the left also began to be affected. Eighteen months ago, the right ear had become absolutely deaf and eleven months ago he suddenly lost hearing completely in the left ear, the change occurring within a few hours. From the outset of his ear trouble, he was greatly bothered by noises in his ears, a constant roaring with intervals of the sound of blowing whistles and the tooting of engines. These have continued ever since. On one occasion, since he became deaf, his wife dropped her scissors and made considerable noise. He threw down the paper which he was reading, said he must have dropped his knife and began searching for it. He also said that at times, when holding his watch in hand, he could hear it ticking. His ataxia is now so great that he walks only with the assistance of a cane and, even then, with a distinctly staggering gait. His sexual power has been failing for sixteen years, and for one and one-half years he has been entirely impotent. He is much constipated and for several years has often gone from seven to ten days without a bowel movement. For the past year there has been some loss of bowel control. Four years ago his urine began to dribble at the end of urination, and for three years he has had no control whatever of his bladder. There has been a tremor of the hands for years, but not of such extent as to interfere with his writing until recently. About four years ago he had some attacks when his head would fall to one side or the other, and he would be unable to control it. These were of very short duration. He has had lumbar pain at times, but no headache. He always has vertigo if he moves suddenly, and frequently at other times also. He sleeps fairly well, but often talks in his sleep, and sometimes very loudly. He is a little more querulous and nervous of late, but there was no distinct mental change previously.

Physical Examination.—He is a rather large man, fairly well developed and well nourished. Muscles are of fair size but flabby. Temperature 98.4 F.; pulse 80 and of normal quality. Lung examination is entirely negative. He has no cough. Apex beat of heart is slightly outside the normal line; no murmurs. There is a moderate degree of thickening of the radial and temporal arteries. Abdominal organs are apparently healthy. Sexual apparatus is normal.

Urine: Clear, amber, acid; specific gravity, 1.024; no albumin; no sugar. Microscopic examination is negative.

He has an anxious, worried expression; does not complain of pain. Eyes are bright; both lids droop slightly and equally; there is moderate arcus senilis. There are no ocular palsies; no double vision; no nystagmus. Pupils are equal and react sluggishly to light, fairly well as to distance. Vision is good. Ophthalmoscopic examination is negative. He is absolutely deaf. Taste is normal, but smell is very much impaired, possibly on account of a prolonged condition of catarrh. There is no disturbance of sensibility to touch, pressure, or pain. The deep reflexes of the arms are increased, and of the legs very much increased; no ankle clonus. Babinski sign is uncertain. Abdominal and cremasteric reflexes are normal. There is a fairly well-marked tremor of the extended fingers; no paresis or paralysis of the face or extremities.

Course of Disease.—At the time of his examination he was advised to go to a hospital, but he declined to do so and remained for four days at a hotel. On July 8, while sitting at dinner, he suddenly became unusually dizzy. With assistance, he was able to get to his room where he lay down on the bed. Shortly after he began to scream loudly and continued this for some time, but when seen one hour later he was lying in bed in a stuporous condition. He was transferred to the hospital where his temperature was found to be 98.2 and his pulse 84. The next morning the following conditions were noted:

He is conscious, but has a dull, heavy look and responds slowly to whatever is said or done. Is distinctly emotional. When questioned as to his experience of the preceding day, he says that while seated at the table he experienced an unusual sensation in his head. This became gradually more pronounced and he feared that he would die. Says he screamed in order to obtain help. He can not describe the sensation in his head other than to say that it seemed like an "unusual commotion."

His temperature has ranged from 99.6 to 102.2 F., and his pulse from 100 to 110. There is some paresis of the left face, including a distinct drooping of the left lid. He appreciates touch in the left face but not the pricking of a pin. Tongue can be protruded straight. There is nystagmus of vestibular type with quick component upward and to left. Vision is very bad, probably on account of nystagmus. He has a constant sense of dizziness even in the recumbent posture. There is no ocular palsy. He can not swallow, and there is no movement of the throat on the left side. Deafness is complete. Apparently there is no disturbance of sensation in arms or body. There is possibly numbness in the right leg. Both knee jerks are exaggerated; double ankle clonus; no Babinski sign.

July 10, 1907: He has been failing since yesterday. Temperature dropped from 100 to 103.2 F., and pulse from 106 to 132. Nystagmus continues with some tendency to a rotary movement. He is very dizzy. Pupils react to accommodation and slightly to light. There are no ocular palsies. Left face is still numb and shows some motor impairment. He can not swallow and there is no movement of the left side of the throat. Left hand is very ataxic. No abdominal or cremasteric reflex is obtainable. Both knee jerks are exaggerated and right leg is rigid. Ankle clonus is present on the left side; no Babinski sign. He is unable to retain urine. He complains of no pain except slight backache. He died at fifteen minutes past midnight.

Autopsy.—The postmortem was made the next day at noon.

Macroscopic Appearance: There are some adhesions at the apex of the right lung. Both lungs are congested and edematous and the bronchi are full of mucopus. There is a beginning pneumonia in the left lower lobe. Heart is moderately enlarged. There is an old endocarditis and a moderate degree of atheroma of the aorta. Liver is normal. Spleen is soft. Left kidney is normal in appearance. The right kidney shows marked atrophy and hydronephrosis. The ureter also is enlarged, but shows no constriction at any point, and there is no indication of distension of the bladder. Prostate is normal. The calvarium is very thick, especially anteriorly. Dura is not adherent; the pia-arachnoid is thickened and opaque, especially along the larger vessels, but is not adherent. There is no atrophy of the brain substances. Ependyma is normal. All the large vessels at the base of the brain are very much diseased; they are increased in diameter; the walls, except in the region of the aneurismal dilatation, are much thickened and show many patches of distinct nodular sclerosis. The basilar artery is almost uniformly distended and measures a little over one cm. in diameter. Its walls are thin and almost translucent, except at a few small points. The left vertebral artery is moderately enlarged; the right is greatly enlarged, and at the point of junction with the left measures 0.8 cm. in diameter. The right inferior cerebellar artery has three distinct saccular aneurisms in its course, the largest measuring 0.7 cm. in diameter. The left inferior cerebellar artery has one small saccular aneurism and one rather fusiform aneurism, the latter measuring 1.5 cm. in its greatest diameter. This entire vessel and its branches for some distance are completely obstructed by blood clots. There is a well-marked extravasation of blood into the pia-arachnoid in the region of distribution of this vessel. The left anterior cerebellar is very small and not aneurismal; the right, also small, is not dilated. The right and left posterior cerebral arteries are very much sclerosed, the left having two small saccular aneurisms, and the right one aneurism. All the other vessels, at the best, are very much thickened, and at points show irregular dilatation, but none have any distinct aneurismal formation.

Microscopic Examination: On section and microscopic examination of the vessels the intima is found greatly thickened in places, with well-marked areas of degeneration. There is very little elastic tissue in the intima. The media in many places is thin, and this is particularly true in the region of the aneurisms where it is almost wholly absent. The elastic tissue of the media is much broken up, and there is also well-marked round-cell infiltration of this coat, as well as of the adventitia. The thrombus is infiltrated with leucocytes. Section of small vessels from the cortex shows the ordinary changes of arteriosclerosis rather well marked.

CASE 3.—Male, aged 48, married, farmer, referred to me by Drs. Kilbride and Kelly of Canby, Minn.; was seen Dec. 16, 1907.

Family History.—Father died at 75 of paralysis; he had been temperate. Mother is living and well at 78. One brother died of nephritis at 40; one sister of tuberculosis and one sister of tuberculosis and nephritis. Four brothers and two sisters are living and well. The patient is married and has had six children, one of whom died in infancy; the others are well. There is no nervous or mental trouble in the family.

Personal History.—He was sickly in infancy, but after that period his general health was very good. He can not recall any severe illness at any time in his life. He has had occasional light attacks of rheumatism. Venereal diseases he denied. He has been temperate in the use of alcohol. Fifteen years ago he had a fracture of the right leg, which healed readily.

Present Disease.—Apparently he was perfectly well up to six months ago. At that time was working in the field and struck his left hand, just above the knuckle of the forefinger, with a wrench. The injury was slight, causing a moderate flow of blood, but no great pain. He continued at his work for a time, but at noon, when washing away the blood from the hand, he noticed a twitching of the first two fingers. This was slight, but not under his control. For three weeks longer he continued at his farm work, and during this period the twitching spread slowly to other areas. It was always worse when he was excited, and at such times appeared in parts which were entirely quiet when he was calm. The movements involved the left arm, shoulder, and neck, in the order named. Then the left foot and leg became affected, and when seen, Dec. 16, 1907, six weeks after the onset, there was twitching of the whole body, but more pronounced on the left side. He walked with difficulty and could scarcely button his clothes, especially if at all excited. He said that he had had vertigo at times for the past year. He was easily confused and cried at times.

Physical Examination.—He is a medium-sized man, fairly well developed and nourished. Heart and lung examination is entirely negative, except that his pulse rate is 88. There is a moderate degree of thickening of the radial and temporal arteries. His bowels move regularly and are entirely under his control, but he can not hold his urine so long as he could formerly. Sexual power is somewhat impaired.

Urine analysis is negative.

He has a rather dull, heavy expression, and complains of being weak. He has frequent attacks of vertigo, but can not associate them with any special time or act. He says that he has no pain. There is moderate arcus senilis but no ptosis, lagophthalmos, nystagmus, or strabismus. Vision is good with the aid of glasses. Examination of eye-grounds is negative. There is no defect of hearing and he has no subjective sounds. Sensation for touch, pressure, pain, heat, and cold is normal in all parts of the body. The patellar and Achilles reflexes are increased on both sides, but more so on the left. Ankle clonus is present on left side, but not on the right. There is well-marked ataxia in both upper and lower extremities, more marked on left than on right. All the muscles on the left side are spastic; there are no vibrillary twitchings. There is a constant, well-marked, fine tremor in left arm and hand, and at times this is seen in all parts of the body. It is increased by excitement or movement and is always worse on the left side. There is some incontinence of urine; none of feces.

Mental Condition.—Expression is dull and heavy. He has no peculiarities of dress or attitude. He talks but little and then only in response to questions. Is fairly well oriented as to time, place, and persons. His memory is much impaired, and he is slow to comprehend what is said to him. Often even a simple question must be repeated two or three times. His answers are only fairly relevant. He realizes that he is ill, but has no real insight into his mental condition. There are no delusions, illusions or hallucinations.

Course of Disease.—He was sent to the hospital and placed in bed. The next day his movements seemed about the same as when first examined, but the spasticity on the left side had increased and at times was much worse than at others. Occa-

sionally he was restless and, in an aimless sort of way, kept trying to get out of bed. His temperature was normal, but the pulse ranged from 72 to 96. There was involuntary urination. Two days after admission he had two convulsive seizures, the first one lasting eight and the second five minutes. The movements involved the entire body, but the left side more than the right. The next day he had another seizure of the same sort. The rigidity of the body was constant and much greater than on any other previous occasion. The left hand was tightly clinched. He swallowed with difficulty and was much more stupid. Temperature in the evening was 99.6 F.

December 20: There was not much change except that he was worse mentally, but on the following day he became partially paralyzed on the left side, and the right side became more rigid. His temperature was normal, but the pulse was 108 and weak.

December 23: He was quite unable to swallow, his stupor had increased, the paralysis on the left side was complete and the rigidity on the right side was much worse.

December 25: The following notes were made on this date: His expression is very dull. He talks little and only in whispers. Eyes are open, no ptosis or strabismus. Pupils are equal and react normally for light and distance. Tongue is dry and coated, protrudes slightly to the right. Right arm is rigid and strongly flexed, the fingers being drawn firmly into the palm. Right leg is extended and spastic, but less so than the arm. Left arm and leg are slightly spastic and almost completely paralyzed. The twitching is marked in the right hand, leg and foot; very slight in left hand and foot and, in the hand, is confined almost entirely to the thumb and forefinger. At times there is slight twitching in the right upper lip. He can move the right arm and leg but slowly and with difficulty. On the left side there are ankle clonus and greatly increased patellar reflex. On the right side there is no clonus but the patellar reflex is increased. Achilles jerk is increased on both sides. The head is distinctly drawn to the right side, though the muscles on both sides of the neck are firm. The left pectoral muscle is moderately contracted; the right firmly so. The right rectus abdominis is very firm; left flat. No abdominal reflex can be obtained on either side. Cremasteric reflex is absent on the left and slight on the right. There is involuntary passage of urine and feces. On account of his mental condition, it is impossible to determine anything as to sensibility. Pulse is weak and in the neighborhood of 120.

December 26: He was unable to swallow and was fed by nasal tube. Pulse ranged from 120 to 128, and was very weak and irregular. The right side had also become paralyzed. He was constantly in a condition of stupor. He died December 27, apparently from progressive failure of heart and respiratory action.

Postmortem Findings.—Dura is not adherent and is normal in appearance. Pia-arachnoid is thickened and very edematous in many places, not adherent to the brain. All the pial vessels are much distended with blood. The arteries at the base are thickened but uniformly so, and there are no calcareous plates. The right vertebral artery, at about the level of the first cervical nerve, shows a well-marked fusiform aneurism, 0.75 cm. in length and about 0.33 cm. in breadth. Almost directly opposite there is a saccular aneurism of the left vertebral 0.4 cm. in diameter. There is a moderate degree of atrophy of the cerebral substance in the anterior part of the brain. Section shows nothing except a general condition of hyperemia. Ependyma is smooth. On microscopic examination of the vessels there is a thickening of the intima and of the media with considerable increase of the elastic tissue.

The literature covering these specific findings is not very satisfactory.

The brain-tumor symptom-complex of arteriosclerosis is mentioned here and there by various writers, but no one author has given it his undivided attention. The majority of writers describe conditions under a general head and designate all vessel changes as arteriosclerotic.

Practically all cases reported seem to have ended by rupture of the vessel, with the usual manifestations of

apoplexy. In Case 2 the patient died from obstruction of the circulation in the cerebellum and brain-stem. In Case 3 the patient died from rather uncertain causes. The most evident postmortem finding, other than the vessel changes, was edema.

Mummert¹ calls special attention to the rarity of cerebellar aneurisms.

Rindfleisch² speaks of the rarity of cases of aneurism of the basilar artery seen clinically, often symptomless until rupture occurs and then mistaken for ordinary apoplexy. If symptoms are present during life, a diagnosis of brain tumor is most commonly made.

Saathoff³ refers to the position of the basilar artery whereby it is frequently exposed to undue pressure from indirect injuries.

Grunwald⁴ gives considerable attention to the differential diagnosis of disease of the vessels at the base of the brain from other conditions with which it is likely to be confused.

Joseph Collins⁵ has written an exhaustive treatise on the different phases of cerebral arteriosclerosis, in which he refers to the brain-tumor symptom-complex.

Fisher and Brooks⁶ discuss the relation of arteriosclerosis to diseases of the nervous system, but do not refer to aneurisms or other gross lesions of the basal vessels.

Bramwell⁷ covers the field of intracranial aneurisms and reports cases with focal manifestations, but does not refer to cerebellar lesions or symptoms.

Barrett⁸ has contributed an excellent article on the histology of cerebral arteriosclerosis with its clinical signs.

DISCUSSION.

DR. H. A. TOMLINSON, St. Peter: I have the records of about two hundred and fifty cases among the insane, and about thirty others, with regard to the postmortem findings in the cerebral blood vessels. My attention has been called particularly to the significance of the interference with the egress of blood from the brain, and I find that but little attention has been paid to this aspect of the subject. In the average individual, after 35 years of age, there is some piadural adhesion at the vertex, interfering with the emptying of the pial veins. In the defective and the degenerate, the tendency is for these adhesions to extend forward, finally involving the drainage of the area of the frontal lobes particularly. On account of the peculiar arrangement of the outlet of the pial veins into the sinus, the narrowing of the lumen of this outlet is a cause of serious obstruction; while the piadural adhesions along the median fissure, and at the base, interfere with lymph drainage. Therefore, aside from the diminished blood supply, resulting from the arteriosclerosis, there are the factors of the retained waste products, and the mechanical effect of lymph accumulation in the arachnoid space.

I have been interested to note two apparently different types of degeneration in the cerebral vessels: the one the usual productive periarteritis or endarteritis; and the other the not so common atrophic form of degeneration, in which there is apparent atrophy, beginning in the intima and extending to the media. This is the usual senile change, and just to the extent that it is presenile, do we find the symptoms resulting from chronic cerebral anemia: the confusion in mental effort, loss of memory and progressive muscular weakness, which disappears after a period of rest and improved metabolism, only to reappear on the resumption of active life.

1. Beitrag zur Aetiologie der Blutungen in Pons und Kleinhirn, Diss., Greifswald, 1904.
2. Deutsch. Arch. f. klin. Med., lxxxvi, 183.
3. Deutsch. Arch. f. klin. Med., 1905, lxxxiv, 384.
4. Ueber Aneurysmen der Gehirnarterien, Diss., Greifswald, 1906.
5. New York Med. Jour., June 9, 1906.
6. Jour. Nerv. and Ment. Dis., May, 1905.
7. Clinical Lecture on Intracranial Aneurisms and Meningeal or Extracerebral Hemorrhage, Clinical Studies, 1905-6.
8. Jour. Nerv. and Ment. Dis., April, 1905.

I believe that there is, under certain conditions, an angio-neurotic edema, involving small areas of the cortex, which gives rise to focal symptoms that disappear as suddenly as they come; also, that in the so-called uremic palsies there is a local ischemia followed by hypostasis; because, in all the cases that I have had an opportunity to observe these conditions existed in other organs or parts, and particularly in the kidneys.

DR. C. EUGENE RIGGS, St. Paul: I find in all cases that the use of the manometer is a matter of much practical importance. I remember a case of arteriosclerosis which I saw about a year ago. The patient had had a slight hemorrhage evidently, recovered from it, but complained of a great deal of dizziness and vertigo and much general distress and the indefinite symptoms which arteriosclerotics describe. The blood pressure registered 275, and then the tubing of the manometer broke, so that I could not measure the pressure further. Treatment for the relief of pressure proved efficacious. The patient is living very comfortably, but of course is still arteriosclerotic. I have had a number of cases in which much benefit has been derived by the use of the well-known remedy which we are almost inclined to disregard because of our familiarity with it, calomel. Calomel has some influence on metabolism and probably thus affects arterial tension.

The clinical picture of arteriosclerosis is very confusing. There are undoubtedly many forms of pathologic manifestations included under this name. Whether or not arteriosclerosis is due to toxemia affecting the smaller vessels and the capillaries and thus increasing the tension and after a while causing the change in the vessels, is a matter of theory perhaps, but certain it is that in these cases if the patient is put to bed and rested, given calomel and put on a light diet, usually the blood pressure will come down, and the vertigo will be materially relieved; and it is a very common thing to find the patient going on for years without any material change. Dr. Clifford Allbutt speaks of a case which he observed for nineteen years in which there were various attacks of hyperpiesis which were relieved, after which the patient was comfortable.

DR. JULIUS GRINKER, Chicago: It is the cases which present focal symptoms which trouble us rather than the ones presenting general symptoms of arteriosclerosis. We are often confronted with these cases and are asked: "Is this a tumor, or is it cerebral arteriosclerosis?" Only recently I have been puzzled, as never before, by a case in which I was consulted as to whether or not there was a tumor of the cerebellum. The symptoms were very much like tumor symptoms, and resembled one of the cases which Dr. Jones so ably described—almost a sister case in every detail. It was very difficult to decide whether we had to deal with a tumor causing vertigo and incoordination of the cerebellar variety, a type of cerebellar arteriosclerosis. I believe that the only way we can learn something about these cases is by having as many postmortem reports as we are able to obtain, and then correlating the symptoms with the findings, because this subject needs revision and classification. The symptoms are rather vague; we are often unable to make a positive diagnosis, because cases presenting these symptoms may turn out to be neoplasm or internal hydrocephalus, or generalized arteriosclerosis or aneurismal dilatation of the arteries at the base of the brain.

DR. ARTHUR S. HAMILTON, Minneapolis: We have, of course, many cases of cerebral arteriosclerosis, but gross changes, such as were found in Dr. Jones' cases, and yet not including the well-known miliary aneurism, are, I think, not very common. There is a fair number of instances of aneurism of some one of the cerebral vessels on record, but they are rarely recognized until they are found postmortem. In most of the individuals a previous diagnosis of brain tumor has been made but, if no symptoms have been present during life, death, when it occurs, is usually assumed to be due to apoplexy from the ordinary causes. Very rarely, when the aneurism is large, an accurate diagnosis has been arrived at through the recognition of a bruit, but this is quite impossible when the aneurism is small. In at least one of Dr. Jones' patients the symptoms were evidently due, not to the size of the aneurism acting very much as a tumor, but to the disturbance of the circulation in important parts of the brain. Aneurism of the cere-

bellar vessels is particularly uncommon, probably because these vessels do not receive the full force of the blood pressure from the middle cerebrals, and because they are not often the seat of emboli which lodge and occasionally produce aneurisms behind them. Very recently I had an opportunity to examine the brain of a comparatively young woman, in whom, following the development of a very extensive vegetative endocarditis, an embolus had lodged in the right Sylvian artery and, directly below the point of lodgment, an aneurism, about the size of a pea, had developed.

DR. W. A. JONES, Minneapolis: I want to emphasize the varying degrees of disease of the vessels other than the generally accepted arteriosclerosis. It seems to me that these cases emphasize the necessity of differentiating between arteriosclerosis and other diseases of the vessels. I appreciate the very great difficulty there is in making a positive diagnosis in any of these cases. The blood pressure in these cases is not great—in fact, it is often either normal or below normal. I do not know whether it would be helpful or not to take the blood pressure. It may be that that was improperly omitted. The venous return to which Dr. Tomlinson refers is a very natural sequence of the condition of the blood vessels that we found in these cases; and the obliteration or the simple subsidence of what was formerly a vessel would of necessity give rise to great changes in the cerebral circulation.

CEREBRAL INHIBITION WITH RELATION TO MOTOR FUNCTION.*

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From time to time there have been cases under observation in the St. Peter State Hospital in which there was loss of capacity to coordinate muscular movements involved in prehension and locomotion. These cases could not be placed in any of the usual categories, because there was no evidence of organic disease in the general nervous system. In some of these cases the loss of control of muscular movement was so great that any voluntary action was impossible, while in others there was, apparently, complete palsy. We never have been able to determine the nature of the involvement of the central nervous system in these cases, because there has always been more or less complete recovery of functional capacity, and none of the cases has come to necropsy.

So long as these peculiar manifestations occurred in the ordinary course of brain degeneration, they were considered to be a part of the sequence to these degenerative changes, as I reported in two papers on the subject.¹ However, a number of cases have been under observation during the past three years, the course of which would indicate that extreme incoordination of voluntary movement, and even palsy, may result from simple cerebral inhibition.

The term inhibition is used here to define that function of the cerebrum which interferes between the afferent impulse and the direct motor response. During the progress of development, in the integration of the nervous system, this function has resided in the ganglia at the cephalic pole, and its development has been in a direct ratio with the growing complexity of the conditions in the environment of the animal; also *pari passu* with the multiplication of the specially organized areas

* Read in the Section on Nervous and Mental Diseases of the American Medical Association, at the Fifty-ninth Annual Session, held at Chicago, June, 1908.

1. Sensory and Sensory-Motor Disturbance Associated with Insanity, *Jour. Nerv. and Mental Dis.*, October, 1892; The History of Three Cases of Peculiar Motor Manifestations in the Insane, *Jour. Nerv. and Mental Dis.*, December, 1892.