

rectus muscle and fascia one-fourth the size of the aorta was passed through the midpoint transversely. No stitches were necessary. A good pulse with a thrill was present over and below the insert. Closure was done. August 3 to 10 there was a good femoral pulse.

August 11, nine days after operation, under ether, the abdomen was opened and a good pulse over and distal to the insert was verified. When the aorta was slit open, no clot was found. The insert measured 6 by 2 by 2 mm., and was the same color and appearance as the intima. It reduced the lumen of the aorta by fully two-thirds its volume.

EXPERIMENT 9.—July 17, 1918, a large female mongrel was anesthetized with ether, the aorta was exposed, a slit 0.5 cm. long was made longitudinally through both walls, and a piece of external rectus sheath and muscle equal to the diameter of the aorta was passed through. There was no bleeding around the insert. There was a pulse, distal to the insert, with a thrill. Closure was done. There was a good femoral pulse. July 18, the dog was active; a full femoral pulse was present. The condition continued the same till July 31 (fourteen days after operation). Under ether anesthesia the abdomen was opened. A good pulse was felt in the aorta immediately distal to the insert and at the site of the insert, where the vessel was felt thickened and a moderate mass of adhesions was present.

Necropsy.—The aorta was slit longitudinally through the insert, and the insert was accidentally cut. The insert was 6 mm. in diameter, the aorta, 1 cm. in diameter. No clot whatever was present.

EXPERIMENT 10.—July 16, 1918, a small fox terrier was anesthetized with ether, the aorta was exposed, the circulation was controlled as above, a slit 1 cm. long was made through both walls laterally, and a piece of anterior rectus muscle and fascia equal to the size of the aorta was passed through the aorta. Four stitches at the ends of the slits were necessary to control the bleeding. A faint pulse was felt distal to the insert. Closure was made. A very faint femoral pulse was present. From July 16 to July 24, no femoral pulse could be felt. July 25, a faint femoral pulse reappeared. July 25 to August 8, the femoral pulse increased to normal volume. August 8, the animal strangled herself on her tie rope; she had been very well and active.

Necropsy.—Twenty-three days after operation, a section of the aorta, including the iliacs, was excised. The aorta was slit open; no clot was present. The insert was found; it measured 3 by 3 mm.; it was firm, was closely adherent to the anterior wall of the aorta and had a gray, glistening appearance indistinguishable from the intima. It reduced the aortic lumen by two thirds.

EXPERIMENT 11.—July 7, 1918, the same animal as in experiment 4 was anesthetized with ether, the right carotid was exposed, and with a fine knife the anterior half of the vessel wall was excised for 1.5 cm. A piece of external rectus muscle and fascia 3 mm. thick was removed and sutured as a patch over the carotid defect with the muscle surface projecting into the lumen.

July 28, the wound was clean. August 11, twenty-four days after operation, under ether anesthesia, the carotid was reexposed and found to have a full pulse throughout its extent. A small sacculated aneurysm was present, with an opening 4 by 4 mm., a depth of 2 mm., and its cavity 5 mm. at the widest point, occupying the position of the musculofascial patch. The carotid was removed and slit open. There was no clot whatever present. The patch had held firmly but had bulged out to a depth of 2 mm. It contained no clot. The inference from this case is that such a patch, if applied in man, would give rise to an aneurysm. The fate of transplanted tissue is well known, and the resulting scar tissue in this case must be very firm and strong in order to withstand arterial pressure. It looks as though intra-arterial or intra-aneurysmal transplants would be of greater value in the treatment of aneurysm.

A complete report on the foregoing work, with photographs of the specimens and histologic examinations of the tissues will be made later. The exigencies of active military service render such studies difficult. The following conclusions seem fair, and I regret that

lack of time will not permit a discussion of the many points of value that have been observed.

SUMMARY AND CONCLUSIONS

1. Strips of rectus fascia with muscle attached of varying size up to three-fourths that of the aorta of dogs may be placed through a dog's aorta or carotid without causing permanent clot or thrombosis. In certain cases no clot at all is formed.

2. In over half the experiments, the contraction of the aortic walls about the inserts and of the inserts against the slits in the aorta entirely controlled hemorrhage. In the remaining cases, from one to four simple sutures controlled bleeding from the corners.

3. These inserts diminished the lumens of the aortas to approximately one-third to three-fourths their former volume.

4. Such inserts may be used to diminish the volume of a large artery, to diminish the orifice of a sacculated aneurysm, to favor thrombosis of the aneurysmal sac by being placed through it, or to limit the size of a fusiform aneurysm by being placed so as to exclude certain sectors from the current.

5. In no cases have symptoms of embolism been noted. The only pathologic observations to exclude such an occurrence were: (a) In two cases examined at necropsy within six days, no clot was formed at all. (b) In four cases examined at necropsy later than six days, no clot was present. (c) In all cases but one, when a clot was formed it took a uniform, blunt tipped icicle shape, was quite firm, and would not easily break off.

6. A patch of fascia or muscle may be sutured to an arterial defect with perfect functional results.

7. The sac of an aneurysm or the vessel proximal to it may be lessened in volume by such inserts.

8. An arterial patch of muscle and fascia in a dog is consistent with perfect function of the artery.

CHRONIC ARSENIC POISONING ON A FARM

REPORT OF A CASE

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History.—A woman, aged 22, seen by Dr. Samuel Ayres of Kansas City, Mo., to whom she was referred by her local physician in Summers, Ark., complained of sore mouth, indigestion, weakness and general tenderness. She had been married two and one-half years; she had had no children nor miscarriages. She had had mumps, measles, whooping cough and scarlet fever during childhood; there had been no operations. Previous to her present illness she had been entirely well. She had had a well-balanced diet. She lived on a farm and had no other occupation aside from her household duties. Prior to five years before she had been employed in a fruit drying factory for three years, where she said that she was exposed to sulphur vapor. She also spent a great deal of time spraying fruit orchards, and said that she ate fruit which had recently been sprayed. The spray, she thought, contained arsenic. This immediately preceded her present illness, which began five years before. On questioning, she was quite sure that she had not been exposed to arsenic during the past five years. She had moved away from the fruit orchard. There was no family history of tuberculosis. A year and a half before, the patient's brother, who was then 22 years old, was operated on for appendicitis, following several intermittent attacks of severe abdominal cramps. The operation gave no relief, and the attacks of cramps had per-

sisted up to the present time. The brother had a papular skin eruption on his face and back. A sister also had had trouble with her skin for some months.

Present Illness.—Skin: Five years before, in May, a papular eruption appeared on the forehead and chin, which spread to the body, chest, back and shoulders, scalp and face. This was diagnosed by a local physician as eczema, and treated by local applications which, instead of giving relief, only made matters worse. The eruption consisted of papules and pustules which bled when opened. Some were as large as the little finger nail, and often ruptured spontaneously, bleeding profusely and soiling the clothing. The condition of the skin had been variable, sometimes better, sometimes worse. For the past year or more there had been a more permanent brownish pigmentation of the face. Heat or wind caused the face to burn and sting.

Sensation: About a year later, or four years before being seen, a burning sensation of the mouth, tongue and lips was noticed. The patient said that her tongue was red, and that the lips were blistered and peeled. The burning sensation later spread to the chest and epigastrium, and at times a sense of burning and tenderness was general over the entire body so that merely touching her caused pain. The patient said that sometimes her hands felt as if they were three times their normal size. They often felt numb, or tingling, and she had frequently cut or burned herself without feeling any pain. About two years before, her eyes began to cause trouble. After looking at objects for even a short time, her eyes would become tired and the vision blurred. At times the patient had lost her sense of smell and taste. For the past three weeks water had tasted bitter.

Digestive Tract: The appetite had been variable; there was no vomiting; the patient was not often nauseated. During the past two years there had been discomfort after eating. From fifteen to thirty minutes after a meal, a heavy feeling was noticed in the stomach, which frequently caused the heart to beat rapidly. Often there was a bitter taste in the mouth soon after eating. Because of these symptoms, and on account of the sore mouth, the patient had eaten but little. For periods of a week or two at a time, the patient had been troubled with an excessive flow of saliva. The bowels were constipated, moving once in two or three days. There had never been any diarrhea. The rectum was sore and burned.

Cardiovascular: At times the heart beat so rapidly that it was quite uncomfortable. This was brought on usually by eating or by overexertion. There was no dyspnea.

General Condition: The patient felt weak. She had lost both strength and weight. Her best weight three years before was 123 pounds; the present weight, three weeks before, 99½ pounds.

Genito-Urinary: Menstruation had been irregular during the past three years, with considerably more pain. Often there had been intervals of from six to eight weeks between periods; one interval lasted five months. The last period was three weeks before. Sometimes there was burning after urination and burning in the vagina. There was no history of vaginal discharge. One and a half years before, after urinating, the patient was seized with a sharp, knifelike pain in the right loin when she attempted to stand up. The pain began in front and radiated to the back. It was so severe that she fell to the floor. Following this attack, she was in bed for eight or nine weeks, and during this time was unable to move on account of the pain, which no longer was related to urination. Ever since then the patient had felt in danger of pain, sometimes with very acute attacks. During the intervals of comparative freedom she was able to bend forward and to move her trunk in any direction. During the past ten days, the pain had been severe, especially if the right arm was raised above the head, or if the right side was pulled or twisted. The pain was in the right side and back, but did not cross to the left of the spine. Frequently there was a dull ache in the spine, back of the head and chest which was unrelated to the pain in the lower back. This ache was worse in damp weather.

Periodicity: The patient had not been entirely well during the past five years. She always felt better in the autumn.

Her symptoms all became most noticeable about December. During the past two years, she had been confined to bed during the late winter and spring, on account of the severe pain and general tenderness.

Physical Examination.—The patient was well developed and fairly nourished, conscious and rational, and lay quietly in bed with the eyes closed. The hair was abundant and of fair texture, but short, being only about 10 inches in length; the ends were broken off abruptly. The patient said that her hair used to be of finer texture and about 40 inches long. The skin was rather dry. On the face, most marked on the cheeks, there was a brownish-red pigmentation which was not sharply demarcated, but faded off gradually. There were many punctate papules; to the touch the cheeks felt like a nutmeg grater. On the back between the shoulders, there were small acneiform papules and pustules. There was a wart on the back of the left hand and on the palm of the right, which, the patient said, had been present for only a few weeks. The skin was otherwise negative. The conjunctivae were reddened and the patient kept her eyes closed most of the time because the light caused discomfort. The pupils were regular, equal, and reacted to light. The teeth were fair, the throat negative; the buccal mucous membrane was normal; the tongue was normal, except that the fungiform papillae at the back seemed unusually large and red. The lymph glands were not enlarged. The heart and lungs were normal. There was a slight general tenderness of the abdomen, most marked in the lower right quadrant. No masses were felt. There was no fluid. The patient had difficulty in turning over; the act seemed to be painful. There was no local tenderness in the back. There was no tremor of the hands. There was slight edema of the ankles on pressure. The knee jerks were very sluggish; the plantar reflexes also were sluggish. There was no Babinski reflex. The hand grasp was equal but weak. There was no Romberg sign. The finger-to-nose test was negative. The temperature was normal. The pulse was about 100. Pelvic examination was negative.

Summary.—A farmer's wife, aged 22, had been intermittently ill during the past five years, worse in the late winter and early spring. The outstanding symptoms were dermatitis with pigmentation of the face, muscular weakness, loss of weight, sore mouth, gastric discomfort, constipation, disturbances in taste, smell and cutaneous sensations, photophobia, menstrual irregularities, tachycardia, and many indefinite pains, aches and burning sensations. She had been unsuccessfully treated by many physicians and had tried all remedies that had been recommended by both physicians and friends.

Before the laboratory findings were considered, four conditions offered themselves as reasonable possibilities in the differential diagnosis. They all fairly adequately accounted for the symptoms as summarized.

1. Neurasthenia or psychoneurosis.
2. Pellagra.
3. Addison's disease.
4. Chronic arsenic poisoning.

Other conditions were thought of, such as renal stone and tuberculosis of the spine, but each accounted for only a part of the syndrome.

With a highly strung and unstable nervous system as a background, any chronic, unsuccessfully treated dermatitis may readily develop into an attack of neurasthenia with a varied host of symptoms similar to those described.¹

Pellagra must be seriously considered, for it also is characterized by periodicity, weakness, neuritis, gastroenteritis, stomatitis and dermatitis. In the case under discussion, the chief point against pellagra is the character of the dermatitis. In pellagra, the backs of the hands and wrists are usually involved, and whatever region is involved shows a sharply demar-

1. Osler: The Principles and Practice of Medicine, Ed. 8, pp. 1106-1116.

cated area of pigmentation. Here the pigmentation is limited to the face, is diffuse, and is rather more finely papular than one would expect with pellagra.

Addison's disease usually shows a more generalized pigmentation and frequently a pigmentation of the buccal mucosa.

According to the history as it was obtained after careful questioning on several occasions, the only known exposure to arsenic occurred five years before when the patient used arsenic sprays in fruit orchards. For the past three years, she had lived in a different place where there were no fruit trees, and she had not used any spraying mixtures. It is possible that some of her many remedies contained arsenic, but no single medicine had been used longer than a few weeks. Her brother's supposed appendicitis, which had been unrelieved by operation, and her sister's skin eruption suggest that the whole family had been exposed to arsenic.

Laboratory Examination.—Blood: 1. The systolic blood pressure was 120 and the diastolic, 85. This evidence points strongly against Addison's disease.

2. The Wassermann reaction was negative.

3. Microscopic examination revealed: white cells, 12,900; red cells, 4,500,000; hemoglobin, 95 per cent.; the red cells were normal; there were no malarial parasites.

Roentgen-Ray Studies: The teeth, spine, lungs and heart were all normal. There seemed to be some adhesions between the duodenum and gallbladder, but the stomach was otherwise negative; there was no filling defect, and the emptying time was normal.

Gastric Analysis: An Ewald test meal was given. After one hour, 100 c.c. of gastric contents were withdrawn. The odor was normal, there was no retained food, and microscopic examination was negative. Total acidity was 83; free hydrochloric acid, 51. There was no lactic acid nor blood.

Ophthalmoscopic Examination: This revealed dilated retinal veins and contracted arteries. These findings were regarded as unimportant and indicating merely vasomotor changes.

Stool: Macroscopically the stools were of a claylike consistency and rather gray. Microscopically there was bile-stained mucus, and no parasites or parasitic ova.

Urine: The urine was acid; the specific gravity was 1.017; there was slight trace of albumin; there were a few pus cells, red cells, occasional epithelial cells, hyaline casts and coarsely granular casts. A specimen submitted to the Kansas City Testing Laboratory for an analysis of metals was reported as containing: lead, 0; arsenic, 0.000329 per cent. Following this line of inquiry, a sample of wall paper and of well water from the patient's home were also tested for arsenic. The wall paper was found to contain arsenic (As_2O_3), 0.00307 per cent.; the well water was found to contain arsenic (As_2O_3), 0.00044 per cent.

DIAGNOSIS AND TREATMENT

The finding of arsenic in the urine, together with the typical symptoms of chronic arsenic poisoning make the diagnosis practically certain. The patient was once more questioned concerning a more recent exposure to arsenic. The husband then recalled that for the past two years he had used a Paris green mixture in spraying his potato plants. The patient remembered now that this mixture had been kept in a box in the kitchen, and to the best of her knowledge was still there. The fact that Paris green was kept in the house, and also the fact that the wall paper contained arsenic explains the winter exacerbations of all symptoms. At this time the patient spent more time indoors, and the windows were more likely to be closed; hence the greater opportunity to absorb arsenic vapors.

Undoubtedly the patient became thoroughly poisoned with arsenic five years before when she sprayed fruit orchards, and her illness had been prolonged by the subsequent absorption of small amounts of arsenic either from the box of Paris green or from the wall paper or from both. It is well known that in the presence of warmth and moisture, certain molds growing on arsenic wall paper liberate a poisonous volatile compound that is probably an organic derivative of arsenic pentoxid. According to Putnam,² "there is nothing more striking in the clinical history of this matter than the fact that a person who has once been poisoned, or who is naturally susceptible, is sometimes affected by exposures that seem absurdly insignificant." Putnam³ also calls attention to the diffuse brownish pigmentation of the face, painful micturition, and distinctly periodic symptoms (winter and early spring) in addition to the commonly observed gastro-intestinal and nervous disorders.

The treatment consisted essentially in removing the source of poisoning and treating the gastro-intestinal disturbances symptomatically, with daily colonic irrigations of sterile water and a light diet of cooked food. According to latest reports a month later, the patient had improved markedly. The prognosis in this case is good because the peripheral neuritis has not progressed to an irreparable state.

CONCLUSIONS

This is a well marked case of chronic arsenic poisoning with an adequate etiology, and a definite finding of arsenic in the urine. The syndrome as developed here is remarkable for its multiformity. This patient showed loss of weight, muscular weakness, disturbances of the tactile and other special senses, digestive disorders, sore mouth and tongue with salivation, menstrual disorders, especially periods of amenorrhea, painful conjunctivitis, dry and defective hair, painful urination, tachycardia, loss of appetite, headache, diffuse pain and tenderness, and dermatitis which had been general, but at the time of examination was limited to the face and consisted of a roughening with diffuse brownish pigmentation. All of the symptoms were worse in the winter or early spring. When confronted with such a syndrome, one which is not typical of any well recognized disease, one should always think of chronic arsenic poisoning, and have the urine examined for arsenic by a competent laboratory, or by any one of several tests which are described in detail in textbooks on toxicology or industrial medicine.

2. Putnam, J. J.: Boston Med. and Surg. Jour., 1890, **122**, pp. 421-424.

3. Putnam, J. J.: Boston Med. and Surg. Jour., 1889, **120**, 255.

Increased Importance of Venereal Prophylaxis.—The end of actual fighting in the world war does not lessen the necessity for the campaign against venereal diseases. Rather, it becomes a greater emergency measure than ever. Cessation of hostilities centers attention on the return of the victorious American forces. On entering the service the men became subject to Army and Navy discipline, which, in the control of venereal diseases within the ranks, is rigid. Prior to demobilization the intense fighting morale of the forces is bound to relax. The men will be buoyant in spirit and eager to celebrate. When mustered out they will return to conditions in civilian life which have been responsible for venereal disease. Many of them will contract it as a result. Unless all cases of venereal disease have proper treatment during the period of reconstruction, the scourge will reach alarming proportions. The time from now on is the most critical of all.—*Public Health Reports*.