gravity plays a negligible part in the emptying of the organ.

3. Acute dilatation of the stomach is a paralytic condition analogous to retention of urine and requiring treatment on similar lines.

4. Acute paralytic dilatation may come on idiosyncratically, but more usually as a post-operative complication—at times of gastro-enterostomy or partial gastrectomy.

5. There is reason to believe that the cure of peptic ulcer after gastro-enterostomy is due to the continuous neutralization of the gastric acidity which the operation ensures.

6. In many cases treatment of ulcer by diet and alkalis is likely to fail because the patient either cannot or will not submit to a sufficiently prolonged and thorough course of treatment.

7. Of a hospital series of stomach operations, 25 per cent. were for ulcer perforations; most of these patients had had medical treatment.

8. If a diseased appendix is present along with an ulcer there is little likelihood of the ulcer being cured by medical treatment alone.

9. Many cases of chronic gastric ulcer fail to be diagnosed because the symptoms are apt to be both variable and ill defined; *x*-ray examination is desirable in most cases of chronic dyspepsia.

10. Sudden loss of appetite in a patient whose digestion has previously been normal is highly suggestive of stomach growth; an *x*-ray examination should be advised without delay in such cases.

MUSCLE EXTRACT TREATMENT OF SOME GRAVE VASCULAR DISEASES

BY

M. S. SCHWARTZMAN, M.B.

A suggestion was made by me in two previous papers^{1,2} to apply in "intermittent claudication" a new method of treatment with injections of muscle extract, the therapeutic value of which in angina pectoris was discovered by Professor J. S. Schwartzman (Odessa)^{3,4} and confirmed by a number of authors on the Continent.⁵ The object of the present paper is to give a short account of the results obtained in a larger number of cases of vascular diseases of various types. On account of space I shall confine myself to a brief description of three illustrative cases and a summary of the results obtained in forty-two other cases, reserving the details for future publication. The two cases first described were demonstrated before the Clinical Section of the Royal Society of Medicine on February 13th, 1931.

THROMBO-ANGIITIS OBLITERANS WITH ADVANCED GANGRENE

History.—A mechanic, aged 42, with no history of venereal disease, but who had been smoking ten cigarettes a day, complained that since 1924 he had felt pain in his calves on walking. Trophic disorders appeared on the toes and dorsum of the right foot in 1926. Gangrene developed in 1929, when his right leg was amputated, first below the knee (Mr. C. Price Thomas at Westminster Hospital), and soon after above the knee (Mr. Tudor Edwards). At the operation the right popliteal artery was found to be thrombosed. In December, 1929, gangrenous changes appeared on the left big toe. In January, 1930, a periarterial sympathectomy of both left femoral and anterior tibial arteries was performed (Mr. E. Rock Carling). After a short period of

relief the condition became gradually worse, and the patient was readmitted to the Westminster Hospital in July, 1930.

Examination.—The left leg, foot, and toes were stone cold, deeply blue, and oedematous. The soft tissues of the big toe were black, sloughing, and hanging in shreds. There was a very offensive discharge from underneath the slough. A black area extended alongside the bases of the toes; no inflammatory reaction was noticeable. The patient suffered such excruciating pain that he threatened to commit suicide. The dorsalis pedis and posterior tibial arteries were pulseless. The angle of circulatory sufficiency was about 70 degrees. The amputation stump of the right thigh ulcerated over a large area. The Wassermann reaction was negative; blood pressure was 135/90.

Treatment.—Treatment with daily injections of muscle extract was started by me on July 5th, and continued till August 9th at the Westminster Hospital (under Mr. E. Rock Carling), and later at the London Jewish Hospital (under Mr. S. I. Levy) till the middle of October. At first the soft tissues of the big toe and at a later date the distal 1½ phalanges separated. The pain and swelling disappeared, the discharge stopped, the leg and foot became normally warm, and the wounds healed up. Neither elevation nor dependent position caused any pain. Return of colour was prompt at horizontal position. Blood pressure fell to 125/70. The arteries were pulseless as before treatment, and no change in oscillometric index could be detected.

The case terminated in spontaneous amputation of a part of the big toe, instead of a high amputation above the knee, which was thought to be indicated before the commencement of this treatment.

COMBINED THROMBO-ANGIITIS OBLITERANS AND RAYNAUD'S DISEASE

History.—A miner, aged 43, with no history of venereal disease, complained that for nine years he had had pain in his legs after walking a distance of about a hundred yards. A few months later he developed attacks of blanching of all his fingers and toes, followed each time by an intensely blue colour and associated with a severe burning sensation. The affected parts became persistently swollen, cold, and cyanotic, and within a few months the tips of eight fingers, and all the toes except one, fell off. The burning sensation became unbearable in December, 1929, when black offensive discharging ulcers appeared on the stumps of the self-amputated parts. The patient slept badly and was almost cachectic in appearance. He was admitted to the Guest Hospital at Dudley on June 11th, 1930 (Dr. G. Walker).

Examination.—The posterior tibial and dorsalis pedis arteries were imperceptible on both sides. The right radial artery could be felt, but not the left. Postural colour changes were very slight. The blood pressure was 130/100. *X*-ray examination revealed necrotic changes at the terminal phalanges of fingers and toes. No calcification of arteries was seen.

Treatment.—Treatment with muscle extract was begun on June 15th. Four days later the patient stated that the pain was less severe, and that he could sleep better. After twenty injections the patient slept without hypnotics. A second course was started on July 5th, and continued daily for a month.

The following is an abstract from the hospital notes sent to me by the house-surgeon, Dr. Browne, on August 10th: "All pain is gone except occasional spasms at the bases of the great toes, which are not quite healed. The feet and hands are normal in colour and sensation. The face is rosy and fattened, and the patient is better than he has been for years."

The patient is under my observation at present at the London Jewish Hospital. The pain has never recurred, the gangrenous patches have been replaced by healthy granulations, there is no discharge, and skin is growing over the wounds from the edges. The blood pressure fell to 110/60.

Of two other cases of thrombo-angiitis obliterans with advanced gangrene, the treatment in one resulted

in cessation of pain and complete healing up of the gangrenous patches; in the other further development of gangrene was arrested, but the pain did not stop in spite of three months' treatment, and the patient was admitted to a hospital with a view to amputation.

Of nineteen cases where there were no gangrenous changes, but where intermittent claudication was the chief complaint, five of them being due to thrombo-angiitis obliterans and fourteen to arterio-sclerotic occlusion, the results were satisfactory in sixteen. The ability to walk without pain or tiredness in the legs increased in some of them from a distance of twenty to thirty yards to two miles; in others from one hundred to two hundred yards to a mile and over. Some of the patients have been under observation for another six months, the improvement being still maintained; only in three cases, of which two had treatment for a short period, was no improvement noticed. On the whole, cases of thrombo-angiitis obliterans responded more quickly than those of arterio-sclerotic occlusion. On analysing the results the conclusion reached was that the rapidity of the response to treatment was proportionate to the amount and severity of the vasomotor phenomena. The more prominent the spastic factor in a given case, the quicker and more striking are the results of this treatment.

DIABETIC GANGRENE

Taking into consideration that diabetic gangrene is primarily due to impoverished nutrition resulting from athero-arterio-sclerotic obliteration, I felt justified in trying the same treatment in diabetic gangrene. The following is a brief description of one of three cases treated.

History.—A woman, aged 66, was admitted to the London Jewish Hospital on July 3rd, 1930, with a history of diabetes diagnosed two years previously, and with gangrene of the left fourth toe of three months' duration.

Examination.—The heart was enlarged; the second aortic sound was markedly accentuated; there were emphysematous changes in the lungs; the abdomen was negative. Both feet were cold and bluish. Posterior tibial and dorsalis pedis arteries were pulseless on both sides. The left fourth toe was persistently cyanotic. A discharging sinus was seen at its base. This appeared about three months before admission. Urine was acid, having a specific gravity of 1030; albumin was nil; sugar was present; acetone was nil. Blood sugar on fasting stomach was 306 mg. per cent. Wassermann reaction was negative. Radiograms of both legs showed calcified arteries. Blood pressure was 175/110. Local treatment, radiant heat, and rest for two months had no effect.

Treatment.—Daily injections of muscle extract were started on July 5th, 1930, and continued for about a month. On the eighth day the feet became warmer, the colour improved, and the pain disappeared. On the twelfth day the sinus stopped discharging. In three weeks after the commencement of treatment the sinus healed up. The feet were almost of normal colour and temperature. Blood pressure fell to 140/90. The patient was discharged from the hospital, but treatment was continued for another two months three times a week. No insulin or any other treatment was given. At the hospital the patient received the same diet as she had before admission.

In two other cases the results were equally satisfactory, insulin being simultaneously administered in one of them.

ANGINA PECTORIS

Apart from thrombo-angiitis obliterans, arterio-sclerotic obliteration, Raynaud's disease, chronic asphyxia, and diabetic gangrene, treatment with muscle extract was applied by me in nineteen cases of angina pectoris, in eleven of which there was a history of coronary throm-

bosis and evidence of myocardial disease. Nine patients showed striking improvement, which manifested itself in complete cessation of pain or sensation of constriction on exertion. Some of the patients have been under observation for over a year. No recurrence has been noticed. In three cases the pain recurred, but a few more injections sufficed to ameliorate the condition. In four cases the treatment resulted in a definite improvement, but the patients still complained of occasional pain on walking after meals. In one case of great severity in which cervical sympathectomy had failed, the treatment was followed by a considerable improvement at first, but this was maintained only for three weeks, after which the previous condition recurred, and there was no response to further treatment. In two cases the treatment failed altogether.

REMARKS

A great deal of research has still to be done to elucidate the rationale of this method and the nature of the active principle. It is clinically evident, and confirmed by the physiological experiment, that the extract acts as a powerful depressor. It is most probably by overcoming the vascular spasm, which seems to be an important additional factor even in organic vascular diseases, that the extract partly produces its therapeutic results. The same depressor effect may account to a great extent for its beneficial action in angina pectoris. In our experiments both alcoholic and aqueous protein-free extracts of skeletal muscle of young animals (calves) were used.

There are no doubt present, particularly in an active muscle, some substances (? metabolites) which are partly responsible for the increased blood supply required for exercise. It is likely that these substances form the active principle of the muscle extract. Not much can be said yet about their chemical nature. The extract contains but very little histamine, if any. The substances are not identical with choline, and the depressor action is not counteracted by atropine. They may contain adenosine, as was recently suggested,⁶ but physiological experiments indicate that they are not likely to be identical with it.

Apart from their central vaso-dilator action they seem to have also a local vaso-dilator effect, as some of my clinical experiments tend to show. On this observation and on a technique of treatment of peripheral vascular diseases based on it, I hope to be able to report in the near future.

The investigation has been carried out chiefly with the original extract kindly supplied by Professor J. S. Schwartzman (myol 111). In a few cases an extract prepared by G. Henning of Berlin (myoston) was used. Experiments are being conducted with a view to standardizing the preparation, increasing its potency, and elucidating some problems, such as method of sterilization, concentration, etc., which are still unsettled.

I wish to express my gratitude to Professor J. S. Schwartzman of Odessa, of whose original discovery this research is a further development, and to Sir James Purves-Stewart for the encouragement he has given me. The work has been chiefly carried out at the Westminster and London Jewish Hospitals, and I am greatly indebted to Mr. E. Rock Carling, Mr. G. T. Mullally, Dr. A. Abrahams, Mr. S. I. Levy, Dr. D. Krestin, Dr. G. Konstam, and Dr. N. Pines, for allowing me to treat some of their patients.

REFERENCES

- ¹ Schwartzman, M. S.: *British Medical Journal*, May 10th, 1930.
- ² Idem: *Munch. med. Woch.*, 1930, xviii.
- ³ Schwartzman, J. S.: *Zeit. f. Kreislaufforschung*, 1928, vii.
- ⁴ Idem: *Munch. med. Woch.*, 1929, xxxii, xliii; 1930, xviii.
- ⁵ Fahrenkamp, K., and Schneider, H.: *Med. Klin.*, 1930, ii.
- ⁶ Drury, A. N.: *British Medical Journal*, June 1st, 1930.
- ⁷ Rothman, H.: *Arch. f. exper. Path. u. Pharmacol.*, 1930, xv, 155.