Results with a small number of strains show a high correlation with the results of animal virulence tests in the case of *C. diphtheriae* and with clinical pathogenicity in the case of staphylococci.

The possibilities of wider application of the technique for both clinical and experimental purposes are discussed.

I wish to express my thanks to Dr. Theo. Crawford for his help in the preparation of this paper, and to Dr. J. E. McCartney for kindly providing some of the *C. diphtheriae* strains used and for carrying out the virulence tests. I wish also to thank Mr. T. W. Shaw for technical help.

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SPERANSKY'S METHOD OF SPINAL PUMPING IN RHEUMATOID ARTHRITIS

A REVIEW OF FOUR CASES

BY

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The recent interest shown in Speransky's method of treating rheumatic cases by means of "spinal pumping" make it worth while to report four cases of rheumatoid arthritis which were treated in this way and followed up for a year. Speransky (1935) gave reasons for his belief that the nervous system played an important part in acute and chronic disease. Ponomareff and Tchechkoff (1927) and Jowelew (1930) studied the passage of antibodies through the blood-stream barrier of the spinal cord in rabies and attempted by spinal pumping to break it down.

The operation, which consists in withdrawing and replacing 20 ml. of spinal fluid slowly twenty times, takes about an hour. The spinal fluid in each of our cases was sterile, and laboratory tests showed no abnormality. The only reactions were vomiting in one case and a transient rise of temperature in another. Spinal pumping is not an easy procedure to carry out in cases of active rheumatoid arthritis, for the patients find it difficult and painful to get into a suitable position for lumbar puncture.

Speransky claimed good results with this treatment in malaria and typhus, and also in the rheumatic diseases. He treated 100 cases of "polyarthritis" by spinal pumping, giving intensive salicylate therapy before and after, and found that of 52 patients with their first attack of rheumatic fever 70% appeared to show complete recovery. Of 15 cases of chronic arthritis, 4 were reported recovered, 9 improved, and 2 unchanged.

Later the Gillman brothers (1946) issued an account of their trials of spinal pumping, and interest was reawakened in the subject. They reported good results in 36 cases of subacute rheumatism following rheumatic fever and in 22 cases of chronic arthritis which had failed to respond to gold and physiotherapy. In 12 of these chronic cases there was great improvement, with a return of the sedimentation rate to normal in two weeks; in the remaining 10 the condition was unchanged. After the spinal pumping they noted severe sweating, a rise in skin temperature, and visible dilatation of the peripheral skin capillaries which lasted for 48 hours. Some unpleasant side-effects were encountered, such as severe headache and vomiting, and, in one case with hypertension, death due to multiple cerebral haemorrhages followed the third pumping. After publication of that report it was decided to try spinal pumping in the following cases of rheumatoid arthritis which had failed to respond to more rational methods.

Case 1

A hospital sister aged 54 had had arthritis for a year. It had spread rapidly to her hands, wrists, feet, knees, and elbows in the last six months. She was admitted on June 18, 1946, with clinical rheumatoid arthritis—afebrile. Radiographs revealed generalized decalcification with loss of joint space. A blood examination showed: red cells, 3,850,000; Hb, 70%; white cells, 5,500; differential count normal; W.R. negative; uric acid, 2.6 mg. per 100 ml.; sedimentation rate, 25 mm. in one hour (Westergren), which rose to 40 mm. in the next five weeks. Treatment with "myocrysin," salicylates, 1,000,000 units of penicillin, complete bed-rest, and plasters brought no improvement, and as she was rapidly becoming crippled it was decided to carry out spinal pumping. This was performed on Aug. 4 after a preliminary course of 10 g. of salicylate in 24 hours. The C.S.F. pressure at the onset was 180 mm., and at the end 70 mm. Salicylate, 10 g., was given during the next 24 hours. Five hours after pumping the patient complained of feeling "burning hot, especially in the forearms and feet," though there was no rise in general or skin temperature and no demonstrable capillary dilatation. This lasted for 12 hours. The joints then improved, and in a month the sedimentation rate had dropped to normal and the patient was up, walking, and free from pain. She proceeded to a convalescent home.

In February, 1947, the B.S.R. was 5 mm. In September, 1947, it was 8 mm., and she was doing light work, typing and playing the organ with some difficulty, and having to take three or four "veganin" tablets a week for pain in her wrists and ankles. There was a moderate degree of deformity and crippling, though it was no worse than in August, 1946. She had had no treatment since October, 1946. Radiographs showed no change from August, 1946.

Case 2

A Polish housewife aged 54 had suffered from intermittent arthritis in the knees, wrist, and hands for 20 years. It had been much worse in the last six years, since she had come to England. In spite of physiotherapy and gold injections at the B.R.C.S. Clinic, Peto Place, her condition had got worse. When admitted on Aug. 18, 1947, she was crippled with rheumatoid arthritis and had been unable to walk for two months. The

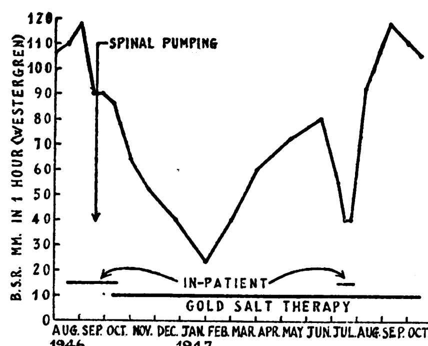

FIG. 1.—The blood sedimentation curve in Case 2.

B.S.R. was 110 mm. in one hour (Westergren); blood uric acid, 2.5 mg. per 100 ml.; Hb, 83%; white cells, 7,200.

Spinal pumping was carried out on Sept. 6. Salicylate was not given before or after. The C.S.F. pressure was 180 mm. After 10 withdrawals the pressure dropped to 35 mm. and the pumping was stopped. A reaction similar to that of Case 1 came on six hours afterwards, with a feeling of heat in forearms and legs lasting 12 hours. She had a general fever of 100° F. (37.8° C.), but no demonstrable capillary dilatation. During the next week the joint condition improved, and four weeks later she was discharged. Fig. 1 shows the course of

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her B.S.R. She has been treated as an out-patient with myocrisin. The patient was readmitted on July 7, 1947, for active rheumatoid arthritis. The B.S.R. was 55 mm. Further spinal pumping was tentatively suggested, but was refused. She still has an active rheumatoid arthritis, but is able to get about and do some housework.

Case 3

A housewife aged 48 was admitted on Aug. 30, 1946, for clinically active rheumatoid arthritis with effusions in the knee-joints. The history was o. rapid onset of arthritis involving the hands, wrists, elbows, and knees two months before. The temperature was 99° F. (37.2° C.), and the B.S.R. 45 mm. Radiographs of the hands revealed general decalcification and reduction in joint spaces. Blood examination showed: uric acid, 2.8 mg per 100 ml.: red cells, 4,350,000; Hb, 64%; white cells, 10,000. This patient refused gold treatment and requested to have spinal pumping, as Case 2, whom she knew, had improved so much.

Spinal pumping was carried out on Sept. 19, 1946, 10 g. of salicylate being given before and after. The C.S.F. pressure at the beginning was 180 mm. and at the end 160 mm. This patient had the same feeling of warmth at the periphery as Case 1, but with no demonstrable signs. Forty-eight hours later the joints were much improved, and a week later she had full movement and no pain, but the B.S.R. had risen to 85 mm. Twenty-five days later she was discharged, the B.S.R. being

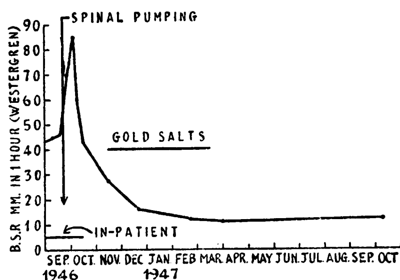

FIG. 2.—The blood sedimentation curve in Case 3.

45 mm. Fig. 2 shows her B.S.R. curve. She attended as an out-patient and had myocrisin till March, 1947, when the B.S.R. was 11 mm. On Oct. 10, 1947, she was doing full housework and had no pain or limitation of movement; the B.S.R. was 12 mm.

Case 4

An engineer aged 40 had for eight months been feeling ill and losing weight, with pain and swelling which started in the left great-toe joint and spread rapidly to the feet, right hip, knees, and right wrist. He had been treated elsewhere with injections of a local analgesic and manipulation of the right hip, but had steadily got worse. On March 21, 1946, he was pale and emaciated, with commencing ulnar deviation of the hands, limited movements of the hands and feet, and much muscle spasm. He had synovitis of the left knee and his ankles were swollen. The B.S.R. was 70/100 in one hour (Westergren); Hb, 73%; white cells, 11,600; blood uric acid, 2.6 mg. per 100 ml.

He was admitted to hospital, and for 10 weeks was treated with rest, plasters, gold, and blood transfusion. There was considerable improvement, but the rheumatoid arthritis was still active and the B.S.R. was 65 mm. As he was very anxious to get back to work he was offered spinal pumping in the hope that it would hasten the improvement. This was carried out on Oct. 1, 1946, after 10 g. of sodium salicylate had been given. Pressure at the beginning was 140 mm. and at the end 210 mm.

The patient was a trained scientist, and he kindly noted his reactions for us:—At operation: "No discomfort and no back-ache when it was over." First day: "Woke with violent headache and nausea and felt hot all over. Throughout the day experienced quite involuntary movements of the joints—i.e., sudden jerk of knee-joints or ankles or shoulders." Second day: "Still hot and having involuntary joint movements." Third day: "All reaction over." On discharge from hospital two weeks later: "On the whole no marked change." Some joints were less painful, others more so. There was no rise in temperature after the pumping and the B.S.R. was unchanged.

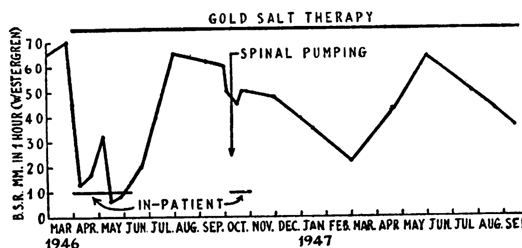

FIG. 3.—The blood sedimentation curve in Case 4.

The patient continued to have gold as an out-patient and steadily improved. He has gained 1 st. (6.35 kg.), is back at work, and is fit enough to swim, though he still has pain in one shoulder, elbow, and wrist. Fig. 3 shows his B.S.R. curve.

Comment

It may be of some interest to include the views of the patients themselves as to the efficacy of this treatment.

Case 1 slowly became quiescent after the pumping and has remained so. We were quite impressed with her improvement at the time, though it was not so dramatic as other writers had recorded, and the disease has remained quiescent. A year later the patient "does not believe the pumping had anything to do with it."

Case 2 still has very active rheumatoid arthritis. When readmitted to hospital a year later a further pumping was tentatively suggested, but she refused.

Case 3 requested this treatment and is convinced that it cured her. Certainly the disease is still inactive a year later, and the small amount of myocrysin (0.14 g.) which she had afterwards is not alone likely to have had this effect.

Case 4, whom we consider the most accurate observer, recorded "no marked change."

Discussion

No conclusions regarding the value of this treatment can be drawn from such a small number of cases. We saw no sign of dramatic improvement such as a return of the B.S.R. to normal in two weeks as recorded by the Gillmans in their 12 cases of chronic arthritis. All our patients described the same type of reaction as that noted by the Gillmans—that is, a subjective feeling of heat coming on a few hours after the operation and lasting up to 48 hours. In three it was most pronounced at the periphery. We were, however, unable to observe any objective sign of this, such as a rise in skin temperature or peripheral or orbital dilatation of vessels. Rheumatoid arthritis is an extremely difficult disease in which to assess the value of any particular treatment, because its natural history shows periods of remission and relapse.

All the cases were under the care of Dr. W. S. C. Copeman, and it is a pleasure to record my indebtedness to him for encouragement in carrying out the treatment and in writing this report.

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According to the October number of the British Red Cross Society's *News Survey*, an American in Washington before the war who acted as a blood donor for the Red Cross was subsequently wounded at Tarawa and was given a transfusion of plasma. On glancing up from his bed to look at the bottle he was astonished to see that its label showed the plasma was his own.

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