SYMPATHECTOMY IN TREATMENT OF THE CRYOPATHIES

BY

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The cryopathies include conditions such as frostbite, immersion foot and hand, trench and shelter foot. The inclusion of these lesions in one group is justified by the fact that their pathology is identical; they differ only in the degree of damage. While exposure to cold is no doubt the main factor, prolonged immersion must play an important part. Webster (1942) reports a series of cases, some of them gangrenous, which resulted from prolonged immersion in sea-water at 60 to 70° F.

The literature is already considerable. The subject has been fully discussed in recent important papers by Ungley (1942, 1943) and Greene (1942). These and other writers insist strongly that in the treatment of these patients the temperature of the damaged parts must be raised with extreme slowness and caution. A too rapid return to normal will be disastrous, especially if it be accelerated by any form of heat. Others have advocated sympathectomy in the immediate treatment. Against this suggestion is the fact that after rescue the chilled areas become notably hyperaemic, and it is in this stage that the local damage appears to increase or at least to become more obvious. It is not easy to see how a sympathectomy is going to act in tissues where so much damage to nerves is already present, and if it did act it could hardly be good practice to increase and prolong the stage of harmful hyperaemia. An analogy can be drawn from plant life. The gardener who has had the misfortune to have a delicate plant frosted would never dream of treating it by exposure to sun or raised temperature or by flooding with tepid water. He knows that his only chance is to withhold water and to maintain the plant under cool conditions, allowing the temperature to rise only with infinite slowness and patience.

The Sequelae and their Treatment

Although the majority of cases appear to make a good recovery with no, or at the worst trivial, loss of tissue, others continue to suffer from symptoms which are due to a combination of sclerosis and deficient blood supply. The after-troubles most often found are pain of a burning or tingling type increased by warmth and exertion, persistent indurated swelling, chronic and very painful ulcers of pulps or extremities of digital stumps, loss of movement of fingers and toes, and occasionally a sensitization to cold which results in the Raynaud phenomenon. Hyperhidrosis may also be troublesome. These end-results are in fact those of vascular occlusion, and resemble closely those found in the more chronic types of thrombo-angiitis obliterans.

It seems reasonable, therefore, to hope that for these later troubles a sympathectomy may offer some prospect of relief. I have during the last five years had the opportunity of treating the later consequences of trauma from cold by preganglionic sympathectomy in five patients. In each of these cases a very gratifying relief of symptoms has been obtained. The patients were all men, of whom four were victims of frostbite—one in the hands and three in the feet—while the fifth was a negro seaman with grave damage to both feet from immersion. Brief notes of two of these cases are as follows.

Notes on Two Cases

Case 1.—A farm labourer aged 40 had the fingers of both hands frostbitten at his work. They recovered without loss of tissue, but at the end of eighteen months he was quite unable to work owing to chronic and very painful ulcers, together with a most troublesome Raynaud phenomenon. When seen in August, 1938, he could do no outdoor work because of the cyanotic attacks, and was suffering pain and loss of sleep from chronic ulceration of the right index and left ring fingers. A bilateral preganglionic section of the cervico-dorsal chain was done in Sept., 1938. The result was immediately satisfactory. The circulation in the fingers improved and the ulcers healed. The Raynaud phenomenon, though not entirely abolished, was much reduced in frequency and severity. He has since been seen on many occasions, and remains well and in full work.

Case 2.—A negro seaman aged 24 was adrift in an open boat in the North Atlantic during ten days in Nov., 1941. He was landed and was treated for six months in hospital in Newfoundland. In June, 1942, he was seen in this clinic, complaining of pain, ulceration, and inability to walk. Both feet were swollen, hard to the touch, and completely stiff. Tenderness and excessive sweating were noted. All the toes of both feet had been partially shed, and their stumps bore small chronic ulcers; the left fifth toe was gangrenous. He complained of constant burning pain, increased by warmth and attempts to walk. A bilateral lumbar-cord ganglionectomy was done by my colleague Miss Liebert in June, 1942, and resulted in immediate relief of pain, with rapid healing of the ulcers. The gangrenous toe did not improve, and was subsequently amputated, the wound healing readily. He has since continued well and gets about without pain.

These results would seem to indicate that sympathectomy is worth while in the chronic and painful sequelae of the cryopathies.

Conclusion

In the endeavour to estimate what benefit may result from the operation in any given case recourse may be had to preliminary tests of vascular efficiency—e.g., nerve block or foreign protein. In my experience the best method for the lower extremities is to use a thermo-couple thermometer provided with 8 or 10 leads, each carrying a point for application to the skin. These points are fixed on the areas selected for observation, and a movable plug allows the current from any one point to be recorded by the reflecting galvanometer. The temperatures are recorded with the patient on the theatre table, and at the end of half an hour's observation of temperature a spinal anaesthetic is given and the temperatures again recorded. The normal rise in the feet in a young healthy adult is of the order of 8 to 10° C., but in cases such as those under discussion a rise of 1° C. would justify sympathectomy, which can be carried out forthwith. In the upper limb a general vasodilator may be employed, although it may be that, where all fingers appear equally affected, a simple block of the ulnar nerve at the elbow will give sufficient evidence.

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MISUSE OF INTRAVENOUS N.A.B. FOR VINCENT'S INFECTION

BY

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Ever since Ehrlich (1910) first reported the use of intravenous arsenic in the treatment of Vincent's angina arsenicals have continued to be advocated for this purpose. To-day, when both the available supply and the cost of such things deserve special consideration, it is worth while questioning the value of N.A.B. and its allies, particularly when given intravenously, in the treatment of this infection.

The disease, termed "trench mouth" in the last war, is a common accompaniment of wartime conditions, and there still seems to be a fairly widespread impression that in severe cases intravenous N.A.B. is the most potent method of treatment. Since N.A.B., in direct contact with the organisms, has a high spirochaeticidal power, it is at least logical to apply it locally to the lesions in the mouth. But Vincent's infection, unlike syphilis, is a purely local condition, and attempts to isolate fusospirochaetal organisms from the blood stream of infected patients have never been successful. Occasional case reports of Vincent's infection occurring in patients undergoing antisyphilitic treatment have cast further doubt on the efficacy of intramuscular or intravenous arsenic in dealing with the lesions in the mouth.

Vincent's Angina after Intravenous Arsenicals

Thus, Sutton (1924) reported the case of a syphilitic woman who first developed Vincent's angina eleven days after starting intramuscular injections of sulpharsphenamine. She had many carious teeth, and direct smears obtained from typical lesions

in her mouth showed numerous spirochaetes and fusiform bacilli. After regular cleansing of the mouth with hydrogen peroxide and local application of arsphenamine solution, the condition healed in a few days and the treatment for syphilis was continued. Hillsman and Driscoll (1925) similarly reported the case of a syphilitic woman who developed Vincent's infection nine days after arsphenamine injections. Local applications of arsphenamine alone gave no relief, though the condition subsequently healed satisfactorily. Williams (1929) described the case of another woman who developed Vincent's angina for the first time while undergoing antisyphilitic treatment with intravenous neoarsphenamine. Local treatment with sodium biborate was followed by rapid clinical recovery and disappearance of organisms. Donson (1933) described the development of Vincent's infection in a man, with considerable sepsis, who was having a course of intravenous injections of neosalvarsan and bismuth tartrate. Spirochaetes and fusiform bacilli were found in profusion in smears, and there were no symptoms suggestive of arsenic or bismuth poisoning. Again the condition responded immediately to local treatment. Reichmann (1926) has referred to a group of cases having had treatment for syphilis (neoarsphenamine intravenously and mercury intramuscularly) for at least two weeks previous to the first appearance of Vincent's infection. Successful relief of pain and healing occurred in a few days with local neoarsphenamine applications once a day and hydrogen peroxide mouth-washes every two hours.

Farrell and McNichols (1937) also state that they have had six patients who were receiving arsenical treatment for syphilis and who developed Vincent's infection. Goodridge (1942) has lately described a case of chronic Vincent's infection in a patient undergoing antisyphilitic treatment. Careful local treatment, including the application of 10% chromic acid, brought about rapid recovery, and smears for Vincent's organisms became negative.

Two Recent Illustrations

I have recently seen two airmen whose cases relate to this matter.

Case 1.—This patient (aged 26), whom I saw by courtesy of Squadron Leader J. V. MacGregor, was under treatment for syphilis. He had recently had a bad cold, and after his ninth intravenous injection of N.A.B. (when a total of some 5 g. had been given) he developed painful tender gums, which bled. Swallowing or chewing became very painful, and ulceration developed around the lower left molars and inner side of the left cheek. Vincent's organisms were found in a direct smear. He had a partially erupted lower left third molar with a tender gum-flap, and there was some cervical adenitis and mild fever. He was put to bed and treated with applications of 10% chromic acid followed by hydrogen peroxide (10 vols.). He also received two-hourly mouth-washes of hydrogen peroxide and 300 mg. of nicotinic acid daily. The pain disappeared within 48 hours of starting local treatment and his improvement was rapid. The ulceration healed, and the partially erupted tooth was in due course removed. Vincent's organisms were no longer found in smears, and his antisyphilitic course was able to be continued.

Case 2.—The second patient (aged 22) was admitted to an R.A.F. hospital on account of malaise and jaundice which had developed during antisyphilitic treatment. He had completed a first course of intravenous N.A.B. (total 5.55 g.) in Aug., 1942. He started a second course two months later, and had received a further 4.65 g., his last injection being given on Nov. 12. On Nov. 14 he felt unwell, and on Nov. 16 was seen to be jaundiced. He was apyrexial at this time, had no sore throat, and there were no lesions in the mouth or any adenitis. On Nov. 20 a van den Bergh test showed 16 units of serum bilirubin. On Dec. 2 his temperature rose to 100.2°, and an acute ulcerative stomatitis, localized to the right side of the mouth, was present. There was an irregularly erupted lower right third molar, and some pocketing of the gums in this area was noted. The right submaxillary gland was enlarged and tender. A direct smear showed very numerous Vincent's organisms; there were no haemolytic streptococci on culture. He received local treatment with 10% chromic acid and hydrogen peroxide, as had the preceding case. Nicotinic acid was not given. The condition responded rapidly, and in two days the temperature was normal and the ulcerations were healing well. The tooth was removed on Dec. 10, and a smear taken on Dec. 18 showed no Vincent's organisms.

The interest of this case lies in the fact that a patient having had so much intravenous N.A.B. as to become jaundiced is

still able to harbour Vincent's organisms in his mouth and to develop ulcerative stomatitis. If the drug is so valueless prophylactically, scepticism as to the value of giving a single intravenous injection in the treatment of Vincent's angina becomes thereby even more justified.

Animal experiments lend further support to this view. Thus Rosebury and Foley (1939) produced local lesions in the groins of guinea-pigs by subcutaneous injections of material obtained from the mouths of patients with Vincent's angina. They state that "although intravenous administration of neoarsphenamine, under the conditions of these experiments, was ineffective in altering the course or character of experimental Vincent's infection, when the same drug was applied in direct contact with the flora there was a distinct ameliorative effect." In animals treated by the local method the exudate from the lesions became less and, microscopically, showed marked diminution in the number of organisms. On the other hand, the exudate from the lesions of animals treated intravenously showed no such decrease in its amount or in its content of Vincent's organisms; it in fact presented the characteristic picture obtained from untreated controls.

Methods of Treatment

It is a commonplace that fusiform bacilli and spirochaetes can be found in the mouths of many healthy people, and the causal relationship of these organisms to Vincent's angina has therefore been questioned. These and other anaerobes, however, are found in greater profusion in cases of poor oral hygiene, undernutrition, and chronic toxic or debilitating conditions. The so-called Vincent's organisms have therefore been aptly described as "opportunists" rather than primary pathogens.

Treatment of the disease calls primarily for treatment of the underlying condition, whether it be local or general. Nutritional deficiencies must also be remedied. Healing of the lesions in the mouth seems to be best accomplished by use of daily local applications of 10% chromic acid, followed immediately by hydrogen peroxide (10 vols.), and subsequent two-hourly mouth-washes of peroxide. In a recent series of investigations King (1943) has produced further evidence of the value of this form of local therapy, in combination with 150 mg. of nicotinic acid daily by mouth. This use of oxygen-liberating agents is a logical means of checking the growth of anaerobic organisms, and the rapid relief from discomfort is striking.

Periodontal treatment, including the cleansing of subgingival pockets, careful scaling, and removing of dental irregularities or sepsis at the appropriate time, is an important part of the treatment. It is said that Vincent's ulceration never occurs in edentulous mouths. The use of arsphenamine or allied compounds locally is at least a logical procedure, directed against the spirochaetes, although there seems to be little evidence that it is any more effective than the somewhat simpler and cheaper use of substances such as hydrogen peroxide.

Whatever form of treatment is given, however, it is to be hoped that the employment of intravenous arsenical compounds for this condition will be recognized as useless and wasteful. Hirschfield (1942) has recently referred to two instances in America "in which almost the entire hospital staff, including nurses and attendants, were subjected to a series of intravenous injections only because of 'positive' bacteriologic findings when they were examined after the appearance of a Vincent's infection in a nurse or one of the patients." Such a practice, quite apart from its prophylactic and therapeutic uselessness, is not without risk on account of possible idiosyncrasies to arsenic. Minor unpleasant effects are well known, but a very rare and severe form of reaction is an acute haemorrhagic encephalitis (or "encephalopathy"). Recent examples in syphilitics under treatment with arsenic have been reported by Nelson *et al.* (1943) and Halcrow (1943). Some 200 cases in all have been described, and the fatality rate is high. Smith and Newbill (1939) reported the case of a young man who was treated with intravenous neoarsphenamine and sulpharsphenamine for Vincent's angina. He developed severe reactions after both injections, became comatose, and died of arsenical myelo-encephalitis. It is said that 50% of these types of severe reactions occur after a second injection and that they

are more likely to occur in the presence of some active infection—of which Vincent's angina constitutes an example.

Conclusions

Vincent's infection sometimes develops in patients undergoing antisyphilitic treatment with intravenous arsenicals.

The use of intravenous arsenicals in the treatment of Vincent's infection is unsound, both on theoretical and on clinical grounds, particularly since the condition responds readily to other less expensive and less dangerous drugs.

I am indebted to Flight Lieut. S. C. Holms, R.A.F.V.R. (Dental Branch), for his help and advice.

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A PHYSIOLOGICAL FACTOR IN HAEMOGLOBINOMETRY

BY

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The recent Report to the Traumatic Shock Committee of the Medical Research Council on haemoglobin estimation (1943) fulfils its purpose admirably as a survey of methods including an analysis of technical limitations and suggestions for improvement. There is, however, a physiological factor in haemoglobinometry—namely, the diurnal variation—which merits the consideration of the physician. The blood haemoglobin may vary from increase or decrease of the total blood volume due to interchange of water with the tissues or to the withdrawal or addition of erythrocytes. Dreyer, Bazett, and Pierce (1920), on the basis of hourly or bi-hourly colorimetric haemoglobin estimations, assert that the haemoglobin may vary as much as 20 to 30% of the average throughout the day. Short (1934-5), using a colorimetric method, reported a variation of 17%. Price-Jones (1931) made 100 observations with a Haldane haemoglobinometer on blood obtained from his finger in the mornings and afternoons of successive days, and stated that there was no significant difference between afternoon and evening values. Rabinowitch (1923-4) used the oxygen-capacity method on 20 subjects, and reported a maximum variation of 26%. Photometric methods may be affected by the variation of substances in the blood other than haemoglobin, such as lipids, and the gasometric apparatus used by Rabinowitch was an early and not very accurate type.

Diurnal Variations in Hb Concentration

Some years ago, in an attempt to settle this question, I took part with Dr. van Slyke (1939) in an investigation of the diurnal variation in the blood of 18 normal men. Blood was obtained by venepuncture, with precautions to avoid stasis, at intervals of from two to three-hours during the day. Haemoglobin was estimated by the CO-capacity method of van Slyke and Hiller (1928), which is superior to the oxygen-capacity measurement for reasons stated in the Medical Research Council report (1943). The mean difference between duplicate analyses of our samples was 0.06 vol. %, or 0.3% on the Haldane scale. The greatest range between highest and lowest values in an individual in the day was 2.3 vols. % CO (or O₂) capacity—i.e., about 12% on the Haldane scale. The average range was 1.3 vols. %, or 7% on the Haldane scale. Observations were repeated on each of five subjects on two separate days about a week apart, and there seemed to be a tendency for the blood of each subject to follow a course characteristic for that individual. It is difficult to make any generalization concerning the direction of the change apart from the statement

that there seems to be a tendency for the haemoglobin concentration to diminish during the day; but a subject who showed this change on one day gave the opposite result on another.

I have no reason to doubt that these findings represent real changes in the haemoglobin concentration of the blood. It seems that data of similar accuracy are not available for the alterations in women and children. The diurnal variations recorded in health may be greater in abnormal conditions. Moreover, the fact that the variations recorded by most of the earlier workers on blood samples obtained by pricking the skin are higher than those obtained by us inclines one to the belief that this difference may be due to local alterations in the concentration of haemoglobin, to the interference of lipids or other substances with the photometric technique, or, more simply, to sampling errors. Price-Jones (1931) found excellent agreement between gasometric measurements and colorimetric Haldane estimations in the blood of 20 subjects. It is not clear, however, from his paper whether the colorimetric estimations were made on separate samples obtained by skin puncture or on the same samples used for gas analysis which were obtained by venepuncture.

Conclusions

Haemoglobin in the blood of normal men is subject to a diurnal variation which is less than that described by Rabinowitch and other workers but higher than that reported by Price-Jones. The average range is 7% in terms of the Haldane haemoglobinometer scale. The range of any diurnal variation which may occur in the haemoglobin of normal women and children appears to merit careful investigation.

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Medical Memoranda

Arteriosclerotic Aneurysm of Abdominal Aorta with Perforation into Upper Jejunum

In contrast to aneurysm of the thoracic aorta, aneurysm of the abdominal aorta is comparatively rare, and its diagnosis might easily be missed for years, as in the case reported below. A few days before admission the patient was seen by a consultant, who thought of a growth in the sigmoid, but after the negative x-ray evidence, considered that a small polyp in the colon might explain the rectal haemorrhages. The long-standing rectal and vaginal pain was very likely due to the aneurysm. Very often in cases of abdominal aneurysm there is pain in the upper abdomen due to pressure on the coeliac plexus. Here there was a history of "fibrositis" of the upper abdomen, but her main and more permanent complaint was of the rectal and vaginal pain. The explanation of the difference from the more usual upper abdominal pain may be that the situation of an aneurysm of the abdominal aorta is usually subdiaphragmatic, whereas in this case it extended down to the bifurcation. It might therefore be expected to exert pressure on the inferior mesenteric ganglion and so cause the pain referred to rectum and vulva. While the usual cause of thoracic aneurysm is syphilitic disease of the aorta, aneurysms of the abdominal aorta, at least in this country, are mostly due to arteriosclerosis, as it was in this case.

CLINICAL CASE RECORD

On Jan. 20, 1943, a lady aged 79 was admitted to the County Hospital, Otley. She had a long history of suffering. Seven years ago she was in bed for 6 months, and some form of heart disease was diagnosed. While in bed she developed a thrombophlebitis, followed by neuralgic pains in the vulva and rectum. Nothing local was found that would explain this latter condition and no discharge or haemorrhage of any kind. A diagnosis of "vulvitis and rectal neuralgia" was made. These pains had persisted and increased up to the time of admission, and finally invalided her to such an extent that she had to spend the last two years in bed. The pains were very severe and were only relieved by morphine. Four years ago she had had a short attack of "fibrositis" in the upper half of the abdomen and in the lumbar region. Fourteen days before admission she had an unheralded rectal haemorrhage. At first she passed blood mixed with faeces and then pure blood-clots. She lost a fair