symptoms also point to an injury in the region of the internal capsule. The paralysis, at first almost confined to the face and arm, would indicate, according to Horsley and Beevor's experiments on the monkey, that the anterior fibres of the motor tract were injured, and the absence of hemianopia and of any left-sided sensory symptoms show that the posterior end of the capsule was uninjured. On taking a skull and passing the original feeder spout in the direction above described, it was found to plunge into the brain and to injure the capsule near the genu, as we suppose it to have done in the present case.

Note on Mental Condition.—The loss of memory for events occurring hours or days before an accident involving injury to the head has been frequently observed, and two extremely interesting papers have been published by Mr. Joseph Bell¹ and Sir William Savory.² We are unaware, however, of any case in which there has been so prolonged a period sponged out from recollection as in this case. The symptom does not appear to have any localising value.

With regard to the other mental symptoms, the inability to fix in his memory and to recall visual images of things presented to him now, and his impulsive acting on this imperfect representation of facts would suggest some defect in an interruption of free communication between the higher sensory and motor centres of the man's brain. In the absence of a necropsy to confirm our localisation of the lesion, and to exclude other unsuspected ones, it is impossible to make more than a guess at the physical cause for the psychical condition. The injury we have seen reason to believe was about at the genu of the internal capsule, and would doubtless become more extensive from inflammatory softening during the first few days, so as to encroach on the anterior limb of the internal capsule, of whose functions little is known. Its size increases in animals as we ascend the scale of cerebral development, and it has been proved by Flechsig and others to contain fibres uniting the frontal lobe with the opposite cerebellar hemisphere. Many of the other fibres have been traced back to the grey matter of the pons, but their ultimate destination is unknown. This case would seem to suggest that they form a connection between the anterior and posterior parts of the brain in which motor and sensory processes are probably predominantly represented. The failure to recognise objects (imperception) has for twenty years been held by Dr. Hughlings Jackson to be specially characteristic of lesions in the right occipital lobe; may not the symptoms in our case be due to a cutting off of this connection between this sensory storehouse and the centres for initiating volitional motor which are almost certainly in the anterior part of the brain?

A CASE OF IDIOPATHIC PERNICIOUS ANÆMIA IN WHICH ARSENICAL PALSY HAD BEEN INDUCED TREATED BY BONE MARROW.

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THE following case of pernicious anæmia, although the only one in which bone marrow has been given under my personal observation, seems to me to be worthy of record at the present moment because it illustrates amongst other things how, in pernicious anæmia, arsenic, though given till arsenical palsy is induced, may fail entirely to affect the blood state, and how the blood state may be entirely removed and perchance cured by the administration of a hæmopoietic tissue, namely, bone marrow.

For arsenic in efficient doses to fail to influence, to some extent at least, the course of pernicious idiopathic anæmia is, in my experience, quite exceptional. As a rule, its administration results in marked improvement if not actual cure for the time being, to be followed very soon by relapse, in which, strange to say, the drug frequently fails to be of

the smallest benefit, and the patient ultimately succumbs to his disorder. This curious behaviour of arsenic seems to me to be quite characteristic of the disease; its failure in relapses is frequently as signal as its success in the first period of the disorder, in which, as I have said, it seems to effect a complete cure.

The patient whose case is narrated below was, when admitted to the infirmary, to all appearances at the point of death. It was consequently thought desirable to push the administration of arsenic, in spite of the constant vomiting which was such a marked feature of the case in its early stages, until large doses had been reached. This was done, until in a month, although the anæmia had not advanced, well-marked palsy was induced. Nervous manifestations are known to occur in pernicious anæmia.¹ I have myself seen a case in which the knee-jerk was absent, and returned under treatment by arsenic, the patient making a complete recovery, only to relapse and die in a few months. There can be no doubt, I think, that the distribution and character of the palsy in the present case point clearly to the arsenic administered as its cause.

This case is the second I have seen in which arsenic given in medicinal doses has produced profound and long-standing palsy. The first will be found very briefly recorded in the *BRITISH MEDICAL JOURNAL* for 1893, vol. i, p. 239. The boy whose case is there given has not yet recovered the proper use of his limbs, and it is now fully two years since the arsenic was given which produced his paralysis. Such disastrous results, although occurring with very great infrequency, must give us pause, and make us ever watchful for the earliest signs of arsenicism in cases in which large and increasing doses of the drug are being used.

In my own cases no warning of impending danger was given by the occurrence of gastro-intestinal irritation. The arsenic seemed to go direct to the nerves without affecting the stomach or intestine, much in the same way as alcohol will get to them without affecting the liver. I have now made it a rule to watch carefully the knee-jerk in all cases in which arsenic is being administered, as I believe the failure of this reflex to be a sure index of its deleterious effects upon the nervous system.

The administration of bone marrow in cases of anæmia was first suggested in this country by Dr. Dixon Mann.² He used a glycerine extract of marrow, and gave it (1) to a boy suffering from hæmophilia, (2) a girl suffering from long-standing anæmia (chlorosis), and (3) a man the subject of profuse hæmatemesis, and in all with good results. But it was not till Professor Fraser published his case in June of last year,³ that any example of idiopathic pernicious anæmia successfully treated by bone marrow had been recorded.

In what manner bone marrow or its extract after undergoing the process of digestion proceeds to effect the marked changes in the blood which are shown to have been effected in the cases recorded by Professor Fraser and myself, I am at a loss to explain, unless it be by assisting in the effort which the marrow, according to some recent observations of Dr. Muir,⁴ seem to make in pernicious anæmia to supply the deficiency of hæmocytes. I ought to mention that in October last I saw, with Mr. Kershaw, of Pudsey, a case of pernicious anæmia in which bone marrow failed to do good; and in November last Dr. Honeyburne, of Idle, asked me to see with him a patient suffering from profound idiopathic anæmia in which the marrow could not be taken. In the latter case the nature of the anæmia was not at all clear, the case being much complicated by a great enlargement of the liver and some enlargement of the spleen without leucocytosis.

W. R., aged 43, a miner, was admitted on April 21st, 1894, and is still (November 6th, 1894) in the infirmary. He was admitted with extreme pallor, feebleness, restlessness, insomnia, and at times much delirium. He presented no malarial or syphilitic taint, and there was no evidence of plumbism or other acquired toxæmia. During the twelve months before admission he had been unable to work through increasing feebleness, great shortness of breath on even quite trivial exertion, and vomiting. He stated that he had lost flesh, though he was still fairly stout, even to corpulency. He had never lost any blood. He was a short thick-set man, well nourished, the subcutaneous fat being abundant.

¹ On the Association of Disease of the Spinal Cord with Pernicious Anæmia, by H. M. Bowman, M.D., *Brain*, Part lxxvi, 1894, p. 198.

² *Lancet*, March 10th, 1894, p. 599.

³ *BRITISH MEDICAL JOURNAL*, June 2nd, 1894, p. 1172.

⁴ *Journal of Pathology and Bacteriology*, February, 1894, p. 354

¹ *Edin. Med. Journ.*, 1883.

² *Lancet*, vol. ii, 1882.

He looked profoundly ill. There was intense pallor of the whole surface, the colour of the skin being that of old wax. There was no jaundice. The mucous membranes were almost devoid of their natural blood tint. There was some oedema of the legs. The bones and joints presented no peculiarities. He was very restless, partly from great shortness of breath, and partly from mental disturbance. He was at times dull, stupid, and apathetic; at others fretful, querulous, incoherent, and delirious. He was breathing 36 in the minute, and the smallest exertion, such as turning in bed, increased the rate. The respiratory system was normal on physical examination. The pulse was 128, regular, small, easily compressible, and very feeble. There was visible pulsation in the neck. The cardiac impulse was very faint and quick. The apex beat was in the fifth interspace, 4 inches from the middle line; at the same point a well-marked systolic thrill could be felt. The cardiac dulness was not increased. A soft, systolic, blowing murmur was heard at the apex, base, and over the vessels of the neck, but not at the angle of the left scapula. Blood drawn from the finger looked pale to the naked eye. The red corpuscles were reduced to 18 per cent. There was marked poikilocytosis with a few megalocytes. The pupils were normal and active, and vision good. The discs were very pale. The remains of an extensive hæmorrhage were seen in the right fundus, and of a much smaller one in the left. He made no complaint of headache, but his mental state was so dull and confused that it was very difficult to ascertain his subjective condition. The knee-jerk was present. The tongue was pale and dry. There was great thirst, and appetite was bad. The breath was foul. He was quite unable to take food on account of almost constant vomiting. There was no hæmatemesis. The vomited matters contained free hydrochloric acid. There was obstinate constipation, and the abdomen was rather full. Nothing abnormal was found by physical examination. The urine was of a bright sherry colour (not dark) and clear, specific gravity 1018; it contained no albumen, no sugar, and no blood. He was at once ordered liquor arsenicalis, m 10, t.d.s.; milk, champagne, and ice, and such other food as he could take.

The intention was to give arsenic in increasing doses, until a maximum dose, to be determined by his inability to take it, was reached. In this way the drug was administered till May 25th (34 days), so far as vomiting would allow. The largest dose ever reached was one of 19 minims, and the largest quantity taken in any 24 hours was 75 minims. For 24 or 48 hours it would occasionally be impossible to give any arsenic whatever. It may be taken that the amount of arsenic given was always the largest his condition would permit.

In spite of these large doses, the drug made no very obvious effect upon his disease. From April 21st to May 25th, during which time, as before said, he was taking arsenic with more or less regularity, there were periodic remissions of vomiting and delirium, but beyond this there was no amelioration in his fundamental condition. The blood count showed no material change, and his aspect and shortness of breath were in no degree improved. Delirium and restlessness were more or less constantly present.

On May 22nd it was observed that he was almost completely helpless in his legs, and that the knee-jerk was gone. About this time a marked change was noticed in the colour of the skin, especially of the hands and feet. In addition to his original pallor, there was to be observed a very striking pigmentation of the skin, with small blackish-brown spots, not raised above the general level and quite smooth, except on the soles of the feet, where the pigmentation was associated with much horny thickening of the surface affected. (He presented, in fact a very good example of hyperkeratosis and pigmentation due to arsenicism.)

On May 25th the weakness of limbs was much more marked, and he was quite unable to feed himself, and standing was an impossibility. His colour had improved a little, and there had been no vomiting for three days; 75 minims of liquor arsenicalis were being taken in twenty-four hours. On ophthalmoscopic examination, the hæmorrhages seen on April 21st, 1894, had disappeared; the discs were very pale. A blood count was made, and the red cells found to be reduced to 18 per cent. of normal. The lower extremities were oedematous and the knee-jerks still absent. He complained of rather severe pains in the hands and feet, and there was some blunting of the tactile sense in the ends of the toes. The administration of arsenic was abandoned on this date, it being quite evident that multiple peripheral neuritis had been induced by it.

On June 4th the weakness was still extreme, and he was unable to sit up in bed on account of the uselessness of the trunk muscles. There had been no vomiting since May 24th. He was ordered to take three ounces of fresh bone marrow daily.

On June 11th his appearance was much improved. The former dirty waxy colour of the skin had largely disappeared, and the mucous membranes had a distinct blood tinge in

place of their former white colour. His mental colour was also more satisfactory.

The weakness of the limbs was unaltered, and the knee-jerk was still absent. There was marked wasting of the intrinsic muscles of the hands, with characteristic wrist and foot drop. Sensation was unimpaired, but he still complained of numbness and tingling in the fingers, and the calf and forearm muscles were very tender on squeezing. The pulse was 104; there was much beating in the neck, and the systolic murmur was still audible at the apex but not in the back. The blood examined on this date showed an increase of the red corpuscles to 30 per cent., and marked poikilocytosis.

On June 15th he described himself as feeling half as well again as he did on admission (April 21st), and he certainly looked much better, owing mainly to marked increase in natural colour of the skin and mucous membranes. There was still pain in the limbs, and the paralytic condition was but little improved. The blood cells were found to have increased to 40 per cent., and the hæmoglobin stood at 45 per cent.

On June 20th the general condition was still further improved, but the paralysis had not changed, and the knee-jerks were still absent. The blood count showed 56 per cent. of red corpuscles.

On June 27th the blood count showed 70 per cent. of red corpuscles. He had taken bone marrow daily without inconvenience and without impairing his appetite for ordinary food, which he was taking in abundance.

On July 4th there was still no improvement in the paralysis; the knee-jerks were still absent, and there was some pain in the limbs. The blood corpuscles had increased to 80 per cent.

On July 25th he was still taking the bone marrow. There was some improvement to be noticed in the condition of the limbs, and he could use his hands to feed himself for almost the first time since the end of May, though the hands were still "dropped," and the fingers flexed and crowded together; the knee-jerks were still absent; the blood count showed red corpuscles 95 per cent. of normal number.

On August 10th the blood showed a normal (100 per cent.) number of red corpuscles; the poikilocytosis had entirely disappeared, and for the first time the corpuscles formed good rouleaux. The arsenical pigmentation had almost disappeared, but there was no material improvement in the paralysis.

On August 27th all the muscles of the arms reacted to faradism, but the muscles of the legs did not react. With

galvanism K. C. C. was more marked than A. C. C. in all the muscles of legs. The systolic *bruit* had disappeared and the blood count was quite normal.

On September 11th the patient was using his fingers much better than he had done, and they looked much less helpless. The knee-jerks were still absent. He could feed himself a little better, but was still quite unable to stand. The feet were still pointed, but the wrist drop had almost gone.

To-day (November 16th, 1894) he is still quite helpless in his legs, the feet are pointed and the knee-jerks absent. The hands are more useful than they were, but they are still very weak and wasted. His aspect in all other respects is that of a robust healthy man, except that his rosy complexion is just a little childlike in character. The blood examined to-day looks perfectly natural, forms good rouleaux, and shows a normal number of red corpuscles of natural shape and colour. The photographs here reproduced show very well the condition of his limbs on November 16th, 1894. He is still taking the bone marrow.

The following is the method by which the marrow is prepared. Three ounces of fresh bone marrow (as much red as possible) are made up into a paste, with port wine 1 ounce, glycerine 1 ounce, and gelatine 5 drachms. A little care is required in making the paste, to keep the gelatine and the marrow sufficiently fluid for them to be thoroughly mixed. The gelatine should be soaked in sufficient water to soften it, and then should be melted with the glycerine, the mixture being kept in a mortar previously made hot with boiling water, while in another mortar, made hot in a similar manner, the marrow and wine are mixed. Then the contents of the two mortars should be thoroughly incorporated and allowed to set. The hospital butcher seems to have no difficulty in supplying the marrow free from bone spicules.

I wish to express my thanks to my house-physician, Mr. W. W. Stoney, M.B.(Vict.), and to Messrs. Crawshaw and

Dearden (clinical clerks), for their great assistance in keeping the clinical records of the case from which the above narrative has been abstracted.

REMARKS ON THE RELATIONSHIP OF INFLUENZA AND EPIDEMIC PNEUMONIA.

Read at the Autumn Meeting of the Northern Counties of Scotland Branch of the British Medical Association.

By BRODIE CRUICKSHANK, M.A., M.D.

NAIRNSHIRE was first invaded by influenza in the autumn of 1891. Whole households were prostrated by a disease with which we were unfamiliar. Most of the cases recovered slowly, but many developed pneumonia. After a period of great activity for three months the disease disappeared, leaving a legacy of debilities of various kinds, chiefly phthisis and neurasthenia.

During the following May and June we had a recrudescence of the epidemic. The cases were few in number, but severe, and a large proportion was complicated with pneumonia.

The winter of 1892-93, and the summer of 1893, passed without an outbreak; but in the middle of October, 1893, the disease started afresh in a most violent manner, and continued for nearly six months. I shall direct your attention, in some detail, to this last outbreak, as it was marked by a large number of cases of pneumonia, and forcibly impressed my mind with the contagiousness of that disease.

Isolated cases occurred all over the county, but in one particular valley, and on one side of that valley, almost every house had one or more victims. The infected district was on the right bank of the River Nairn, all along the level valley, and the slopes of the hillsides facing the north. The area extends, for about four miles from north to south, and for about one mile from east to west, and contains the village of Cawdor, with about 200 inhabitants, and two small hamlets, besides farmhouses and cottages occupied by crofters and labourers. The district is purely agricultural, and the people are fairly well off, and, as a rule, comfortably housed; its sanitary condition, if not perfect, compares favourably with that of neighbouring districts, while the bracing air and general salubrity of Nairnshire are everywhere well known.

The disease for the first three months attacked chiefly aged persons and adults; then the children suffered most, so much so that the public school at Cawdor had to be closed, as the attendance had diminished to less than half the average. During the epidemic I was called upon to treat 64 cases of pneumonia, single or double, and of these 15 proved fatal. The mortality was chiefly amongst aged persons, although 3 strong healthy adults died of double pneumonia. In one authority I find hemiplegia mentioned as a rare complication of pneumonia. Curiously enough I met with three cases of this complication, and all the patients died. Two of them were aged men, but the third was a robust man who had actually passed the crisis, and seemed in a fair way to recovery before paralysis supervened.

Pleurisy was not met with in many cases. Empyema followed in one of the pleuritic patients, who, after operation and a tedious convalescence, made a complete recovery.

Notes were kept of the ages of the patients, but nothing seems deducible therefrom, as the cases were pretty evenly distributed over the different decades. As might be expected, the mortality was greatest in advanced life. About two-thirds of the cases were males.

The evidence of the contagious nature of the disease was most convincing. In many instances two or more members of one family were attacked, not simultaneously, but one after the other. One man sickened with pneumonia (double), and died on the eighth day. He was nursed by his wife, who showed symptoms of the disease two days before his death, and also fell a victim. Another man died of double pneumonia; three weeks afterwards five of his children showed the usual signs and symptoms—dulness, tubular breathing, gelatinous sputa, etc. They all recovered. In one family, consisting of an aged father, two daughters, and two sons,