keeping with previous titrations of this serum with other strains of psittacosis virus (Bedson and Western, 1930).[1] Thus proof is forthcoming that the two strains B. 157 and "Bangor" are immunologically identical, and that they are strains of psittacosis virus.

TABLE II

Virus	Treatment	Dilutions of Virus		
		1 in 100	1 in 1,000	1 in 10,000
B.157	Virus in saline (titration)	+	±	∓
	Virus with immune serum M.176, M.177, and M.178	−	−	
Bangor	Virus in saline (titration)	++	+	±
	Virus with immune serum M.176, M.177, and M.178	∓	−	

CONCLUSIONS

Certain points arise out of the consideration of these cases. First, psittacosis is still liable to occur in this country, and should be borne in mind when one or more patients in a household are found to be suffering from an influenzal type of illness, with early signs in the lungs and perhaps some typhoid-like symptoms, such as epistaxis, abdominal distension, vomiting, constipation, or diarrhoea. Especially should such a diagnosis suggest itself if influenza is not prevalent in the surrounding neighbourhood at the time. Secondly, parrots are not the only birds which cause psittacosis in man. In the report of the Ministry of Health,[2] lovebirds, thrushes, and canaries, among other birds, are stated to have been the cause of human illness. It is apparently not certain how many types of birds suffer from diseases communicable to man, so the fact that a patient keeps birds should probably always arouse suspicion in doubtful cases of human illness. Certainly all bird keepers should take care always to wash their hands after attending to the birds, and especially before taking food. Thirdly, an unusual factor in the cases described in this article is that three generations of human psittacosis followed from the original sick budgerigar. Cosman, quoted in the Ministry's report, mentions a woman who caught psittacosis from a patient she nursed and afterwards infected her own child, but such a sequence is sufficiently unusual to be worth noting. Fourthly, the infection of a trained nurse in the course of her ordinary duties shows the care required in dealing with psittacosis, and incidentally, therefore, the necessity of early diagnosis of the disease. The nurses attending on these patients were warned to treat them like cases of typhoid, and this is probably all that can be done. So far as is known, this is the first instance in this country of the infection of a hospital nurse with psittacosis by her patient, and, even so, two out of the three nurses in attendance escaped the disease.

REFERENCES

[1] Bedson, S. P., and Western, G. T.: *Brit. Journ. Exper. Path.*, 1930, ii, 502.
[2] *Public Health and Medical Subjects*, No. 61, H.M. Stationery Office.

A CASE OF CEREBELLAR ABSCESS

BY

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Cerebellar abscess is not a very rare condition, and recovery occurs after operation in a small percentage of cases. It is thought, however, that the following case may be of sufficient interest to report, on account of its dramatic course, and also because of important considerations of treatment that it raises.

CLINICAL HISTORY

On January 8th, 1931, Dr. A. Moscrop Walker of Wallasey asked me to see, in consultation, a girl, E. M. T., aged 13, who had acute middle-ear suppuration, with involvement of the mastoid. I was informed that the ear infection had set in suddenly at a boarding school a fortnight previously, and that there had been no antecedent ear trouble. The mastoid symptoms were only of a few days' duration. On examination I found the left ear discharging. There was also tenderness and swelling over the mastoid and above the ear. The pulse rate was 120, and the temperature 99.4° F. The patient was moved to the Wallasey Cottage Hospital, and an operation was performed the same night.

The entire mastoid was in a condition of acute osteitis, and there were numerous small collections of pus scattered throughout the mastoid cells. There was also pus in the mastoid antrum. The mastoid was widely opened, a large rubber tube being used for drainage.

The patient was more comfortable after the operation, and for the first five days appeared to be progressing satisfactorily. It was observed, however, that she was rather apathetic and disinclined for food, but no special misgiving was felt on that account. On January 14th she vomited twice and became more lethargic, but there was no headache, and the temperature and pulse were normal. Later in the day she refused food, and during the night passed rapidly into a semi-comatose condition, with occasional meningeal cries. On the following day the coma deepened and she responded to questions in monosyllables only, and after long delay. She lay curled up on the right side. Incontinence was present. The eyes were half open, fixed, and staring. The pupils were unequal, and the right one was a little irregular in outline. The right eye was very slightly deviated downwards and outwards. There was no nystagmus and no papilloedema. The mouth was open and the tongue dry and furred. The temperature was 97.5°, and the pulse rate 76.

The case appeared to be one of brain abscess, but whether in the cerebrum or cerebellum it was impossible to say. Under ether anaesthesia the temporo-sphenoidal lobe was explored, without pus being found. The more difficult exploration of the cerebellum was then commenced, but before the dura mater of the posterior fossa was exposed, the condition of the patient became so alarming that the operation had to be rapidly terminated.

On January 16th the coma was deeper and the patient could not be roused. Lumbar puncture was performed, and 10 c.cm. of clear cerebro-spinal fluid was withdrawn under pressure. It was decided to make a further attempt to explore the cerebellum. A general anaesthetic being out of the question, 1/6 of a grain of morphine was given hypodermically, and the operation of the previous day was resumed as the patient lay in bed. An area of dura mater, the size of a sixpence, in front of the lateral sinus, was at length exposed. The dura was incised and a knife inserted into the cerebellum to a depth of one inch in different directions, but without result. A Record syringe with a stout needle was then tried, and at a depth of one and a half inches one drachm of pus was withdrawn. A small rubber tube, the width of a slate pencil, was used for draining the brain abscess. It was stitched to the skin to prevent displacement.

The withdrawal of pus was immediately followed by deeper breathing. The coma lifted slowly and consciousness was not fully restored for two days. Incontinence continued for nearly a week. When the patient was sufficiently conscious to co-operate in the eye tests, the changes observed were as follows: (1) nystagmus, on movement of the eyes to the left; (2) conjugate deviation of both eyes to the right, in the normal resting position; (3) diplopia, the right eye was inclined downwards and outwards; (4) the eyes had a fixed, staring appearance, spontaneous movements were very limited, and the patient was unable to move the eyes together in different directions and hold them there. She did not experience any

vertigo, and there was no homolateral weakness of the limbs or muscular inco-ordination.

On January 18th the use of the tube was discontinued, the discharge having ceased. It was thought that the tube might be obstructing the sinus, and the latter was kept open by fine forceps during the next two days. Between January 20th and 29th, apart from a quick pulse and a moderate pyrexia, there were all the indications of excellent progress. The eye changes disappeared except the nystagmus, incontinence ceased, and the appetite was fully restored. The mind was clear and animated. On January 31st a sudden relapse occurred, and the patient became rapidly comatose again. The tube was reinserted, but for several days she remained in a moribund condition, and could not be induced to swallow more than an occasional teaspoonful of water. Hiccup was a prominent symptom at this stage.

After these critical days had passed rapid improvement set in. The pulse and temperature remained normal and progress was uninterrupted. The tube drained freely and was left in for a fortnight, until it could no longer be inserted.

During the whole of this period the tube was taken out for cleaning twice daily. It remained, however, stitched to the skin all the time, so that there was no uncertainty in reintroducing it to the proper depth. The girl was able to get up on February 19th and returned home on February 25th. Since then she has made unremitting progress. The nystagmus disappeared in a week or two. Now, at the end of April, she is in vigorous health and entirely free from any ill effects of her serious illness.

CONCLUSIONS

The conclusions to be drawn from this case are:

1. That brain abscess may develop insidiously, and that the first intimation may be incipient coma.

2. That a hypodermic syringe may discover pus when other means fail.

3. That drainage should be continued as long as possible; for this purpose a very small tube may be adequate, the pus escaping alongside it rather than through it.

THE TECHNIQUE OF SURGICAL DIATHERMY

DESCRIBING A NEW ELECTRODE

BY

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The electric current employed in diathermy treatment and for surgical operations is of the nature of a high-frequency current. D'Arsonval (1895) showed that an alternating electric current, making and breaking about 15 times per second, would produce clonic contraction of isolated muscle preparations when tested *in vitro*. When the frequency of the current was increased 20 to 30 times per second tonic spasm was observed. The severity of the muscular contraction was augmented as the frequency was increased up to 300 cycles per second. Beyond this optimum the response of such muscle preparations to electrical stimuli diminished, and at about 10,000 times per second muscular spasm ceased and heat was developed. Electric currents which oscillate at 10,000 times per second are known as high-frequency currents; they have an entirely separate physiological action on tissues, as they cause heating, in contrast to lower frequency currents, which cause muscular contraction.

HIGH-FREQUENCY CURRENTS IN DIATHERMY

High-frequency electrical currents which are employed in diathermy or for surgical operations are obtained by means of coils and condensers. The main alternating current supply of 100 to 250 volts, and frequency of 50 to 60 cycles per second, is connected to the primary coil of a transformer; by this means a high voltage alternating current is developed in the secondary coil, which is connected to a series of condensers storing up the electrical charge until the voltage is sufficiently high to cause discharge through a spark-gap. The condensers are immediately recharged, and the process is repeated. With modern diathermy apparatus these oscillations are continuously maintained. The oscillating high-frequency current is taken up by a resonance coil of low resistance, and a second circuit is connected to the patient, which, when properly applied, produces the effects of diathermy. In place of the spark-gap, thermionic valves, three-electrode valves, or grid valves may be employed; these give a smoother current, which is perfectly continuous, but have the disadvantage that they are fragile and costly; further, they cannot carry a very heavy load of current. By such methods it is possible to obtain a high-frequency current of 3,000,000 cycles per second. Currents of electricity travel at a constant speed of 300,000 kilometres per second, but the nature of the wave-length transmitted varies with the frequency. Thus, a wave-length of 300 metres corresponds to a frequency of 1,000,000 cycles per second. The nature of the vibration of an oscillating current may be similar to the motion of a vibrating violin string, or it may be a series of undulating waves of uniform magnitude. The former are called damped oscillations, and the latter undamped oscillations. The thermionic valve apparatus emits a continuous flow of undamped oscillations; the apparatus containing spark-gaps produces damped oscillations. Each type of high-frequency current, differing in wave-length, causes variable reactions when applied to living tissue. The biological action of high-frequency current depends upon: (1) the intensity or amperage; (2) the tension or voltage; (3) the frequency of wave-length; (4) the nature of the oscillations; (5) the size of the electrodes; and (6) the electrical conduction of the living tissue. The amperage, voltage, and frequency directly control the intensity and dissipation of electrical energy, and therefore regulate the quantity of energy in terms of electricity or heat. As the amperage is increased the voltage and frequency diminishes; and, as a result, a heavier diffused current is generated, which is suitable for coagulation of tissues, and has greater power of penetration.

SURGICAL DIATHERMY

As a rule two electrodes are necessary for surgical diathermy. A large indifferent electrode is attached to a big area of the skin of the limbs or abdomen, and allows a wide path for the current to be generated to the body. This is discharged at the point of contact with the second active electrode. The size of the electrodes are directly proportional to the conduction of heat. Therefore a pin-point electrode will cause a discharge of electrical energy over a small area and result in rapid destruction of tissues by coagulation; whereas a larger plate electrode will have a generally diffused temperature effect over a wide area, which will not be sufficient to destroy tissue, but will only generate heat. The latter is the principle involved in therapeutic uses of diathermy. In order to obtain a maximum effect of deep penetration, a long wave-length current is applied by generating electricity at a high amperage, low voltage, and low frequency of damped oscillations. The maximum warmth the patient will tolerate is carried to the site of application by two large lead plates, copper foil or mesh, which are employed as the active electrodes.