fixed, and the patient accommodated to the beam. This is perhaps one of the most vital indictments of the million-volt appliance.

Though we cannot lightly set aside the requirement of a bigger percentage depth dose, there are other ways in which it can be realized without resort to these very high voltage plants. Apart from the use of radium in large units a greater percentage depth dose can be obtained by increasing the focal skin distance when using x rays at 200 kV. This latter has become a practical policy with the advent of newer types of tube, which give a larger yield of x rays.

One important consideration in depth doses is that it is extremely easy to pay too much attention to the expression "percentage depth dose." The vital thing is what doses may be given to the carcinoma cells at various depths in the body, and the percentage dose calculated in terms of a single exposure of x rays may well give the impression that the figure resulting is rather absolute in character. This is far from the case, for if we begin to think of total depth doses we see that the total dose which can be given to a group of cells at a depth in the body not only depends upon the number of ports of entry, but also upon the actual intensity of the radiation employed. This arises from the fact that the reaction of the skin (the bogy of the therapist) is a function of the intensity of the radiation employed, of the time intervals, as well as the total dose. It is many years since experiments showed that it was possible to reach a limiting, though useful, intensity of radiation which the skin could more or less indefinitely support. It has been left to the genius of Coutard, making use of this condition in x -ray practice, to show that he can give a large cumulative dose to groups of malignant cells at a depth in the body without even a severe skin reaction by giving daily small doses of radiation.

Future Organization

The present time is one which finds many institutions installing new x -ray apparatus and discussing the administrative needs of therapy departments. The decisions reached are very important ones, for they will influence the treatment and prospects of life of thousands of patients. The radiologist has to decide between treating his patients with x rays at 200 kV and adopting prolonged treatment, and alternatively making the hazardous jump to half a million volts or more, knowing beforehand something of the technical difficulties involved, the limitations and hindrances inevitably associated with a beam whose direction or inclination may have to remain unchangeable, and that such experimentation is very costly.

It is evident that the general tendency of the more successful centres of radiotherapy is to increase the period over which treatment is given, and this extension of the time may well cause very big changes in the way in which this kind of work should be organized. If patients are to be under daily treatment for periods ranging from sixty to ninety days, it is questionable whether the organization of general hospitals, with the exception of those with special interests in cancer, is particularly fitted for such an exacting demand. It looks as though x -ray treatment in the future may have to be organized on the lines of sanatorium treatment.

In any case the problem is evidently becoming so big, so complicated, and so full of essential but intricate detail that the organization of this service for the country requires well-considered schemes, so that advantage can be taken of existing knowledge, and large sums of money and individual toil shall not be wasted in unproductive effort.

FATAL CASE OF JAUNDICE

BY

R. M. LITTLEDALE, M.R.C.S., L.R.C.P.

After reading the article on leptospiral jaundice in the *Journal* of March 30th I am prompted to publish this case. Here also the aetiological problem was very difficult; in actual fact it was never solved. The case occurred on a small poultry farm in the country, consequently the facilities for bacteriological and other examinations were not such as one would get in a general hospital. Such tests as were carried out were done by Dr. Ponder and his staff at the Maidstone laboratory, and I should like to take this opportunity of thanking them for the help and advice which they gave me in this case.

Case Record

The patient, a strong, well-built man of 44, was first taken ill on February 24th, 1935. He then complained of joint pains and a sore throat; he went to bed, but did not send for me till the 26th. When I first saw him he was complaining of pains in his back and in the larger joints, a general feeling of lassitude, and a sore throat. Headache was present, though not severe.

On examination his throat and tongue gave the appearance of a scarlatinal infection. Examination of the chest and abdomen revealed no abnormality, and no rash was discernible. Temperature was 102.4° F. Urine was clear and contained no albumin or sugar.

On the 27th, after the patient had passed a very restless night, the clinical picture was much the same. A few rales appeared at the base of the right lung; the temperature fell to 99.2°, and respirations increased to 30. On the 28th, after a slightly more restful night, the patient became markedly jaundiced. (Here it may be of interest to add that he was jaundiced—diagnosed at the time as catarrhal—in 1921.) Examination of the abdomen revealed slight tenderness over the gall-bladder area, but neither liver nor gall-bladder was palpable. Rectal examination showed no abnormality.

The right lung base presented impairment of resonance and tubular breathing. Temperature was 100.4°, and respirations 32. Stools were dark brown and of a normal consistency. Urine contained bile, but no albumin or sugar.

On March 1st the condition remained much the same; the temperature dropped to 98°, and respirations to 24. On March 2nd the patient said he felt better. Jaundice had increased. The apex beat now became very irregular—about seven or eight normal beats followed by a period of auricular fibrillation and then back to normal rhythm again, and so on. Signs of pneumonic consolidation for about two inches above the diaphragm on the right side were now fairly well established. Temperature was 97.6°, and respirations 24. On March 3rd, after a night of delirium, the patient was very euphoric. The jaundice had now become an intense bronze, and the mouth was exceedingly sore and dry. The condition of the heart had improved slightly—digitaline cristallisée, 1/240 grain, was given four-hourly—but was still irregular. The consolidation was spreading across to the base of the left lung. Still there was no physical abnormality detected in the abdomen, beyond a slight resistance of the upper right rectus. The stools were black, but this was undoubtedly due to the administration of an iron mixture at the onset of the illness. Temperature was 98.2°, and respirations 28.

On March 4th no sleep was obtained with medinal; the pulse became feeble, but less irregular. Cardiazol 1 c.cm. was

injected subcutaneously. The lung signs remained unaltered. Later in the day the pulse became more forcible. Flatulence was now a marked and troublesome feature, but was relieved by enemata. The urine contained bile and chlorides, but no albumin or sugar. Temperature had now fallen to 97°.

On March 5th the pulse was considerably improved, and had become full and regular. Flatulence was still marked. An interesting feature from now until his death was the excessive amount of urine passed by the patient, as much as 104 oz. being passed in the twenty-four hours on two or three occasions. There was little change in the physical signs in the lungs. Temperature was 97.6°, respirations 26, pulse 98.

On March 6th nausea became evident. Flatulence was still pronounced, and hiccup occurred in the morning. The mouth was by now exceedingly raw and painful, and, for the first time, the stools appeared putty-coloured. The chest signs seemed less marked. Gardenal was given at night.

On March 7th, after the patient had passed a delirious night, the jaundice seemed to be a little less pronounced. The abdomen was very distended, and enemata only gave temporary relief. Hiccup was not so obvious as on the previous day. The stools were soft and had the appearance of "silver fish." Examination of the chest now revealed an increase of sounds at the right base. Temperature was 98.4°, pulse 106, and respirations 28.

By March 8th the patient was very distressed, flatulence causing considerable discomfort. A faint, slightly raised, morbilliform eruption was now just discernible through the jaundice all over the body. The heart sounds were feeble, but with a regular pulse and apex beat. The abdomen had become a little more tender over the gall-bladder area, but no intra-abdominal viscus was palpable. Stools were still loose, with the "silver fish" appearance. Urine passed late at night was cloudy, and microscopical examination disclosed red blood corpuscles and epithelial debris. Temperature was 99.8°, and respirations 40. The temperature rose to 101° just before midnight. Gardenal was taken at night.

On March 9th, the last day of the illness, after a very delirious night, the patient appeared more rational. Respirations increased to 50. At about 5 p.m. respirations had further increased to 56 and the pulse became progressively feebler. At 7 p.m. the patient passed about two ounces of brown faeces streaked with blood. At 9.15 p.m. a large, soft, "silver fish" stool was passed. Urine was now loaded with red blood corpuscles and epithelial debris. At 11 p.m. the patient was in a state of collapse, and the pulse was barely perceptible. Respirations increased to 60. Cardiazol 1 c.cm. was again taken. Oxygen was administered throughout the day, but with no beneficial effect. Just before death, which occurred at 11.30 p.m., the patient passed a putty-coloured stool and about two ounces of bright red blood per rectum.

Necropsy

Post mortem, intense jaundice was the outstanding feature. All the internal organs examined were markedly bile-stained. There was no evidence of new growth and no pus to be found anywhere. The liver was slightly enlarged, but the gall-bladder was normal in size and contained inspissated bile. The kidneys were both enlarged. Nothing abnormal was found in the stomach, beyond bile-staining. Both lung bases were consolidated, but no pus was discovered. The pleurae covering the lung bases were loosely adherent to the diaphragm. There was no evidence of any endocardial lesion in the heart or of myocardial degeneration visible to the naked eye.

Histological and other Examinations

The wall of the gall-bladder was congested, and section revealed acute inflammation of the mucous membrane. Both kidneys showed cloudy swelling. There was round-celled infiltration about the portal canals, otherwise the liver was normal. The spleen was markedly congested.

A throat swab taken on February 26th was negative for diphtheria. Blood Wassermann reaction was negative. Culture from blood taken on the seventh day of the illness remained sterile after forty-eight hours' incubation. Culture from throat swab taken on the seventh day of the illness yielded a pneumococcus. White cell count

taken on the sixth day of the illness showed 11,700 per c.mm.—polymorphs, 86 per cent. ; lymphocytes, 7 per cent. ; hyaline, 3 per cent. ; myelocytes, 4 per cent. ; and abnormal leucocytes.

Discussion

The aetiology of this case presented great difficulties throughout, and, unfortunately, it will never be discovered whether or no it was a case of leptospiral infection. This man, who spent his days among chickens and the usual mud and filth associated with them, may quite easily have picked up such an infection. He also, strangely enough, had a sore place on his heel about a week before the onset of his illness, but not much importance was attached to this finding at the time or afterwards. A haemolytic streptococcal infection was a possible explanation, but the intense degree of jaundice and the sterile blood culture would hardly fit in with such a diagnosis. The sudden onset of the jaundice rather suggested the sudden flaring-up of a malignant condition in the liver as the result of an acute inflammatory condition inflicting an already damaged organ ; post-mortem examination completely negated this theory. A liver abscess was considered as a possibility until a white cell count was done ; this disclosed a leucocytosis, which was not even equal to the degree usually associated with pneumonia.

The feature which struck one above anything else was the intense bronze jaundice ; within twenty-four hours of its onset it was of a greater severity than anything I have seen before. I can only conclude by saying that the patient was clearly being poisoned by some extremely toxic process, and that his resistance, as shown by the steady fall in the temperature, was not strong enough to combat it.

CEPHALIC TETANUS OCCURRING IN CIVIL PRACTICE

BY

RALPH SHACKMAN, M.B., B.S.

LATE SENIOR HOUSE-SURGEON, METROPOLITAN HOSPITAL, E.

The infrequency of cephalic tetanus—even amongst war injuries—prompts me to record the following case, together with a few notes on the subject.

The patient, a man aged 71, was seen in the casualty department of the Metropolitan Hospital on February 4th, 1935. He gave a history of having fallen down and cut his right forehead while defaecating in an outside garden lavatory. A laceration was present over the right frontal region, and was 1 inch long and about a 1/4 inch deep. It was treated with a flavine and paraffin dressing. On February 6th the patient was seen in the out-patient department and appeared well. The next day he was again seen in the out-patient department, and still appeared well. On February 9th, five days after the accident, weakness of the right side of the face was noted ; it was only slight, the patient being able to whistle. On February 11th, seven days after the injury, a bilateral facial weakness was noted, and the patient was admitted to hospital.

Closer examination during the evening of the same day showed, in addition to the bilateral facial weakness, a degree of stiffness in the muscles of the face: the eyes could not be closed, but if the lids were held down and the patient told to open his eyes, the upper lids moved up weakly. The tongue, when protruded, deviated to the right. The next day (eight days after the injury) a degree of trismus was noted. The jaws were not tightly clenched, but the mouth could not be opened forcibly, and the patient took up an attitude whereby he held his lips apart with his fingers. Nasal breathing was absent, there being a long-standing history of nasal obstruction, so that there was some degree of dyspnoea. The abdominal and the arm and leg reflexes were normal. The wound was suppurating. During the same evening the