A NOTE ON THE CEREBRO-SPINAL FLUID IN ACUTE POLIOMYELITIS.

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IN view of the existence of an erroneous idea that certain outbreaks of acute poliomyelitis are due to the action of the meningococcus, and on account of the difficulty which may occur in distinguishing acute cerebro-spinal meningitis from the meningeal type of poliomyelitis in certain cases, it may be of interest to state the results of the examination of 33 specimens of cerebro-spinal fluid withdrawn by lumbar puncture from 30 cases of poliomyelitis at the Hospital for Sick Children, Great Ormond-street. The interval between the onset of illness in these cases and the date of lumbar puncture varied from three days to six weeks.

In 24 specimens the fluid was quite clear and free from clot. In 8 traces of blood were present in varying amount, and clot formation occurred according to the degree of blood contamination. In one specimen, clear on withdrawal, a very fine web of clot formed on standing. The presence of albumin was recorded in 24 specimens, but its amount was not established by means of the albuminometer. The fluid, when boiled with a few drops of acetic acid, yielded the normal faint haze in 7 specimens, a definite cloud in 3, a fine precipitate in 5, and a heavy precipitate in 6. The amount of albumin, as a rule, varied with the duration of the illness, being usually, but not invariably, more marked, either as a fine or heavy precipitate, during the first two or three weeks of illness. In one case on the third or fourth day there was only a slight haze.

Every specimen tested for sugar showed the normal trace (0.05 per cent.).

Cytological examination of the centrifuged deposit showed usually the presence of lymphocytes slightly in excess of the normal (1-5 per c.mm.), but in six specimens there was a definite increase above the normal, and in another six no cells or only the normal very few cells were present. Very few polymorphonuclears were ever found except where blood traces occurred, when there was no evidence of leucocytosis, except in two specimens.

The relation between an increase in amount of albumin and the presence of lymphocytes in excess appears to be fairly constant, and may reasonably be taken as evidence of tissue reaction in the presence of the hitherto unrecognised virus—a reaction shown in sections, by the perivascular lymphocytic infiltration in the substance of the cord, and also seen in the spinal meninges.

Bacteriological examinations were made in nearly every case, both of film preparations of the centrifugation deposit and by culture. In no instance were organisms found in the stained films of the cells. In 23 specimens cultures proved sterile; a variety of media were tried in several—e.g., serum, serum agar, blood agar, glucose agar, glycerine agar, ordinary agar, and broth, inoculations being made both from the fluid and the centrifugation deposit, but all with negative result. In seven specimens obvious contaminations were present.

Post-mortem examinations were made of two fatal cases. In one, in which the cerebro-spinal fluid six weeks previously had been normal and sterile, a streptococcus was obtained from the spinal fluid, but films and cultures from the cord itself proved negative. In the other the cerebro-spinal fluid, which had been normal and sterile during life, yielded no growth. There was, however, early mitral valvulitis and a small infarct was found in the kidney. The heart's blood proved sterile. In these two cases there was, therefore, evidence of a secondary terminal infection.

In 10 cases Widal's serum reaction was applied to *B. typhosus* and *B. enteritidis* (Gärtner), but in all it proved negative. This was done in view of an article on "The Etiology of Poliomyelitis," by A. E. Vipond, who obtained a positive reaction in 6 out of 16 cases occurring in Montreal and attributed the disease to the action of *B. typhosus*.¹ Blood films have also been examined for the Dixon-Fox-Rucher organisms in several cases without success.²

Leucocyte counts in three cases gave 10,750, 11,000, and 12,000 per c.mm. respectively. Differential counts: Polymorphs, 56 per cent.; lymphocytes, 41 per cent.; and large mononuclears, 3 per cent.

There can be little doubt of the value of lumbar puncture as an aid to diagnosis between cases of acute cerebro-spinal meningitis and acute poliomyelitis of the meningeal type. In the former the fluid shows very unmistakeable characters, marked turbidity, frequently coarse, purulent clot formation, a great excess of albumin, absence of dextrose, a copious cell deposit of polymorphonuclears, and easy recognition of the meningococcus both in the film preparations and cultures on serum—characters which I have verified in some 200 examinations.

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RUPTURE OF THE POPLITEAL ARTERY AND VEIN; DIFFUSE HÆMATOMA.

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THE following is a brief account of the case, which I saw in consultation with Dr. L. de B. Christian of Hounslow on May 19th, 1911.

The patient, aged 28 years, was admitted to the Hounslow Hospital on April 25th, having been run over by a waggon, the wheel of which passed over the thigh just above the knee. There was a lacerated wound to the inner side of the patella, as well as considerable swelling around the knee, accompanied by much pain in the leg. The wound was cleansed and dressings were applied. On the sixteenth day after the injury the wound, which was granulating, was drawn together with a few sutures. At the end of three weeks the pain in the limb, which had persisted, became suddenly very severe and the swelling around the knee increased in size and œdema of the leg developed, but at no time had there been any coldness or cyanosis of the limb.

When I saw the patient for the first time on the twenty-fourth day after the injury he was very anæmic and was enduring very severe pain, which had to be relieved by morphia. The whole limb was greatly swollen, and below the knee there was marked œdema, which rendered it impossible to determine whether there was any pulsation in the tibial vessels. The region of the knee was enormously swollen, particularly posteriorly, where the swelling, which was hard, felt hot, the temperature being 101° F. No pulsation or thrill could be made out. It was quite clear that operative treatment was needed, as from the inflamed condition it was suggestive that the hæmatoma in the popliteal space had become infected, and the history was suggestive of rupture of the popliteal artery.

The operation was performed on May 21st. A tourniquet was applied to the groin and an incision about 10 inches in extent was made on the inner side of the knee and thigh. 1½ lb. of blood clot were turned out of the popliteal space, and after the cavity had been sponged clear of it the popliteal vein was seen hanging across the space as a thick thrombosed cord. The upper end of the artery was at once discovered as it emerged from Hunter's canal, where it had evidently been crushed against the shaft of the femur; at this spot it was found that the popliteal vein was also partially torn through. Some little difficulty was experienced in finding the lower end of the artery, which had retracted about 4 inches to the lower part of the space. Both ends were ligatured with fine thread without division of the coats, the upper end being drawn down before the ligature was applied, so that it might retract into Hunter's canal. The wound was closed and free drainage was provided. At the end of a week, as had been anticipated, some suppuration in the cavity occurred, possibly from infection spreading from the adjacent wound at the inner side of the patella, but things went well until June 11th—i.e., 21 days after the operation, when the temperature rose and the patient complained of severe pain in the knee-joint, which became very hot and swollen, and was evidently infected. The joint was freely laid open by lateral incisions and drained. A few days later, as the temperature still remained high, a tube was inserted into the joint from the posterior aspect; it was then discovered that the infection of the joint had arisen through

¹ Brit. Med. Jour., March 18th, 1911.

Brit. Med. Jour., Epitome, p. 44, March 18th, 1911.

sloughing of the posterior part of the capsule over the internal condyle of the femur. From this date the patient made steady progress towards recovery, and is now walking about with good but somewhat limited movement of the knee joint.

Apart from the comparative rarity of subcutaneous rupture of a main artery and vein, the case under consideration presents several points of interest. From the history it is clear that although a certain amount of bleeding into the tissues occurred at, or shortly after, the injury, yet the very severe hæmorrhage did not come on until three weeks later, as is evidenced by the sudden increase of the swelling and of the pain. It must, I think, be a very unusual occurrence for a clot to become displaced at so late a date while a patient is lying quietly in bed. Injury of this nature, particularly when the vessel affected is in the lower limb, is usually followed by threatened gangrene, and when it is the popliteal that is injured gangrene almost invariably follows. Schorong collected 45 cases of injuries of this nature to the main arteries. Of this number the popliteal was affected in 20, and in all of them gangrene supervened; in 11 the femoral was injured, and gangrene followed in 7; and in 2 the iliac, and both terminated in gangrene. The remaining 12 occurred in the arteries of the upper limb. It is difficult to offer any explanation why our patient was so fortunate as to escape, unless it was due to the absence of severe hæmorrhage into the tissues at the time of the accident. In this connexion it is interesting to note that there was not even coldness or cyanosis of the limb.

Doubtless the fact that the severe hæmorrhage did not occur until the end of three weeks, by which time the collateral circulation was well established, accounts for the fact that gangrene did not threaten after its occurrence. If it had been possible to diagnose the condition at the time of the accident one might have tried to restore the continuity of the artery by suture, but at the time of the operation it was clearly unnecessary, as the collateral circulation was well established. It is probable that the hæmorrhage came from the distal end of the artery, as the proximal end was found to contain a decolourised clot; the distal end was not examined as it lay in the depth of the wound, and was difficult to reach to apply the ligature.

Wimpole-street, W.

TWO RARE ABNORMALITIES OBSERVED IN THE COURSE OF OPERATIONS.

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CASE 1. *Operation for removal of the vermiform appendix; the colon all on one side.*—A woman, aged 43, who was admitted to the Samaritan Free Hospital, had suffered recently from an illness attributed to appendicitis and complained of persistent pain in the cæcal region. Chronic appendicitis was diagnosed, but when the abdomen was opened the cæcum was not in its usual place. On the supposition that it had not descended a second incision over the liver edge was made, and still neither cæcum nor colon was discovered. The gall-bladder and ducts were bound down to the stomach and liver by inflammatory adhesions, but no stone was felt and the bile could be squeezed out of the bladder, proving that the cystic duct was not occluded. Coils of small intestine, which were not adherent, filled the space where the colon should have been. The second portion of the duodenum was apparently normal. Its last part was provided with a mesentery and lay in the right hypochondriac region. A short omentum was seen attached to the stomach. By a further examination through the first-made incision the cæcum was found on the left side of the body, as low in the abdomen as usual, and so mobile that it could be brought well into view. The small intestine entered it from its right side and the appendix sprang from just below the ileo-cæcal valve. The appendix was bound to the cæcum by adhesions which did not appear to be recent. After removal of the appendix the sigmoid flexure was found to the left of the cæcum. Thus all the small intestine was to the right of all the colon. The conditions are diagrammatically represented in Fig. 1, but the height of the colon in the abdominal cavity was not determined. Sections of the appendix showed that its

mucous and submucous coats were inflamed, but it is not proposed to discuss the question whether inflammation of the appendix lying on the left side of the body or inflammation of the bile-ducts could have been the cause of the symptoms attributed to appendicitis. The patient was in good health for about 18 months after the operation, and then came back complaining of vague abdominal pains, which were relieved by simple remedies. A proposal to have the abdomen photographed by X rays after a bismuth meal was declined and she did not return. It is obvious that in this patient the half-twist of the alimentary

FIG. 1.

canal by which in the course of development the ascending colon passes over to the right side of the abdomen did not take place. I am not aware that this malformation has been described before.

CASE 2. *Gastro-jejunal anastomosis for secondary cancer involving the stomach; small intestine shut off from the general peritoneal cavity by a peritoneal membrane.*—In 1905 I removed the cancerous left mamma of a woman who was then 55 years of age, and she apparently made a complete recovery. About June, 1910, she began to suffer from pain in the back of the chest which extended towards the throat and was accompanied after a time by vomiting and a formation of two large swellings lying side by side in the upper two-thirds of the abdomen. These were resonant on percussion and varied in size with the food taken and the material ejected by vomiting. The patient was under the care of Mr. R. Capes of Denmark Hill, who kindly wrote to me about her, but she refused to see me again until February, 1911, when in consultation a diagnosis was made of secondary malignant growth involving and obstructing some portion or portions of the upper part of the alimentary canal. Surgical treatment was not thought desirable unless the conditions became intolerable, in which case it might be wise to attempt to short-circuit the intestine past the obstruction.

After a few days the patient was determined at all hazards to get any relief that was possible at once. Accordingly, on Feb. 15th Mr. Capes administered an anæsthetic, and I operated with the assistance of Dr. Andrew Elliot. Immediately before the patient was placed upon the table a large quantity of fluid was washed out of her stomach, so that this viscus when exposed was small and flaccid. It had a somewhat hour-glass shape, and the two swellings observed before the operation had been its distended right and left portions which had doubled down from the narrow part so as to make a valve-like division between them. Behind there was a diffuse new growth, apparently of retroperitoneal origin, which fixed the upper narrow part of the stomach to the posterior wall