

have retained to the full this property during the last three years.

Further Tests.

Three series of experiments to test for the direct development of the property of dulcitate fermentation and motility by culture of the strain in mice were made. The culture of the blood of the first mouse sown direct into dulcitate peptone water produced no change, that of the second mouse (first passage) gave similar results, but that of the third mouse (second passage) produced an acid change in 24 hours and a trace of gas also in 48 hours. No motility of the strain was obtained.

Michaelis acid agglutination test gave a negative result.

Morphologically this strain since isolation and on all the media employed for its growth has been relatively longer by half than a typical *B. paratyphosus B* grown under the same conditions. When inoculated into man it produced antibodies specific for typical strains of the *B. paratyphosus B* group, as also for itself. These have been recorded in detail (Strain *B. paratyphosus B* "M").¹

The virulence for the mouse when injected subcutaneously corresponded to that of typical strains and gave rise to a generalised septicæmia. 0.25 c.cm. of broth culture always killed in 24 hours. Given orally the results were negative.

Of some hundreds of strains of *B. paratyphosus B* isolated and tested by my colleagues or self in France, Malta, or Italy, no other strain of the group of *B. paratyphosus B*, or of the groups *B. Aertrycke* and *B. Gaertner B*, has failed to produce readily acid and gas in dulcitate media from its original culture, and all have shown motility, and these characters have persisted when any later subcultures were tested.

I beg to thank Lieutenant-Colonel J. W. West, C.M.G., R.A.M.C., for permission to publish this article.

A CASE OF

MEDULLARY SYMPTOM-COMPLEX

DEPENDENT ON A LESION (? HÆMORRHAGIC) OF THE LEFT POSTERIOR INFERIOR CEREBELLAR ARTERY.

By SYDNEY A. OWEN, M.D. CANTAB., M.R.C.P. LOND., ASSISTANT PHYSICIAN, WEST LONDON HOSPITAL, ETC.;

AND

PATRICK ALEX. LEIGHTON, M.D. EDIN., SURGEON, ELTHAM COTTAGE HOSPITAL, ETC.

THE following is a summary of the condition of the patient, a female, aged 47, laundress, single, after she had been taken ill on August 25th, 1916, and transferred to Eltham Cottage Hospital a few days later.

Left-sided occipital headache the only premonitory symptom. Acute onset, without loss of consciousness or convulsion, but with vomiting (once), persistent uncontrollable hiccough, tinnitus (left ear), and intense giddiness; forced movements towards left, left-sided cerebellar hypotonia and ataxia (slight), with nystagmus on looking to left; inability to swallow, with paralysis of left vocal cord, dysarthria and paralysis of palate (R. and L.); left pseudo-ptosis, enophthalmos and small pupil; paresis of left sterno-mastoid and trapezius; analgesia and thermo-anæsthesia right side of body and face, and left face. Tactile sensibility, joint sense, vibration sense, all normal. Hypertrophied heart; high systolic and diastolic blood pressure, no albuminuria; Wassermann reaction negative.

The onset is best described in her own words:—

"I was getting into bed and suddenly felt very queer. Something seemed to click in my head and I felt myself suddenly being pushed violently towards the left and almost thrown on to the bed, which seemed to rise up and meet me. I was unable to stand up. There was a loud buzzing in my left ear. I became breathless. I could not see. I thought I was paralysed down my left side and found I could not swallow. I could not speak."

At our examination on August 30th a tentative diagnosis, lesion of the left posterior inferior cerebellar artery, was made. A second, more detailed examination on Sept. 7th, confirmed this diagnosis, when the following notes were made. General condition slightly improved, no fever throughout. Headache slight, only severe as premonitory

symptom. Hiccough, very distressing symptom at onset, now ceased. No return of vomiting. Oral sepsis marked. Tongue clean, protruding normally, neither tremulous nor atrophied, symmetrically disposed in floor of mouth. Now prefers to feed herself with œsophageal tube. Any voluntary attempt to swallow, fluids or solids, still quite impossible. Ocular movements full. No diplopia. Coarse slow nystagmoid jerks on looking to left. Left lid much drooped (= pseudo-ptosis), left palpebral fissure smaller than right. Left pupil now larger than previously, reaction to light now sluggish, outline irregular, cornea steamy, iris muddy, ocular conjunctiva still intensely injected. Low grade of iritis now present. Condition quite painless; douching eye painless; visual acuity, R. = good; L., previously good, now impaired. R. fundus (dilated pupil) normal; imperfect view of left obtained now, previously normal. Owing to iritis no attempt made to test skin pupil reflex. Voice less husky, but speech, though trifle "thick," quite intelligible to a stranger. Complete paralysis of left vocal cord persists. Palatal reflex (R. and L.) not obtained. On phonation R. palate only moves slightly. Left sterno-mastoid and trapezius (upper part) definitely flabby and paresed, though not to same extent as previously.

Patient still feels she must lie with head turned towards left side of pillow; cannot sit up alone and still tends to incline heavily to left when propped into sitting posture. Has made no attempt to stand. Is no longer giddy when attempts to sit up with assistance. Limbs now seem natural to her. Movements of left arm and leg slightly incoördinate as at previous examination. Nose finger test on left imperfectly executed. No static or intention tremor. No involuntary movements or dysidiadocokinesia. No gross evidence of cerebellar asynergia or dysmetria can be elicited. No motor deficiency. ? Slight hypotonia of left upper persists. No muscular wasting. No return of tinnitus. Can hear a watch well, better on left (history of right ear discharge some years previously). Muscles supplied by motor. V. normal. No facial paralysis or paresis.

Reflexes deep and superficial, normal, except slight relative diminution, at onset, of left knee-jerk and sluggish abdominal reflexes throughout. Lack of perspiration on affected side of face, symptom not infrequently seen in this type of case, not present. No attempt made to produce reflex sweatings. Salivary secretion appears normal. Vigorous pin-pricks on analgesic parts (skin) at no time produced bleeding. Comparison of temperature in right and left axilla not tested. No trophic or vaso-motor changes noted. Sphincters normal.

The sensory side.—Subjectively: Patient states left side of my face "burns" sometimes; on other occasions it feels "numb like menthol." This sensation increased by rubbing part with handkerchief. No abnormal subjective sensations on right side. Objectively: Tactile sensibility (tested with camel's hair brush). Beyond definite blunting on left cornea and conjunctiva, tactile impressions appreciated normally, in all areas tested on both sides. Light touch on tongue, palate, and pharynx normal. Light touch, with cotton-wool, seemed just as "tickly" on either side of face and in either nostril. Tactile discrimination: Compass points appreciated normally on face; localisation of tactile stimuli normal on all parts. Joint sense and muscle sense: Normal everywhere. Tuning-fork: Vibrations of tuning-fork were appreciated quite well on both sides of body (limbs, face, and head).

Cutaneous pain (tested with sharp pin).—Right side of body (face, neck, and limbs) completely analgesic to pin-point, whatever degree of stimulus. Right tongue, palate, and pharynx also appear analgesic; except on trunk at level of fourth cartilage and on abdomen at level of umbilicus the analgesic area is bounded by middle line. At these areas mid-line was encroached upon to $\frac{1}{2}$ in. Each stimulus felt as a touch and accurately localised. On left side of face (peripheral trigeminal area) and on ear pin-point caused no sensation of pain. Response to pin-point over left posterior end of lower jaw, neck, limbs, and trunk normal. Left tongue, inner cheek, pharynx, and palate analgesic. Pulled hairs (right and left) on forehead, caused no pain. "She can just feel it."

Pressure pain (tested with blunt, rounded end of whale-bone knee-jerk hammer).—Some conflicting results. Very firm pressure, even to extent of producing pitting of skin, on any part of body, face, forehead, and limbs, did not give

¹ Paratyphoid Inoculations, THE LANCET, 1914, ii., 743.

rise to painful sensation. Tested with same pressure on ourselves, it was certainly associated with sensation of discomfort and even pain. Pinching of calf muscles (right and left) and tendo Achillis forcibly also appeared to be tolerated in an abnormally insensitive way. Pinching tongue on either side, even forcibly with dressing forceps, not associated with any unpleasant degree of pain. A rubber tourniquet applied to right upper arm for bleeding gave rise to no discomfort at all. When the blood pressure was being tested pressure of inflated armlet was appreciated normally on left; on right side patient was obviously less intolerant, and on cross-examination she said: "I feel it less."

Cold (tested with lumps of ice in test-tube).—Right side: On whole of right side of body, with exception of small patch on right forehead and on cheek just below right eye, ice-cold is not appreciated normally. "It all feels ordinary" or "not at all cold." Left side: On left side of face (peripheral trigeminal area) same result as on right half of body. On excepted areas cold was referred to as "tepid," and though imperfectly described gave rise definitely to a different sensation from that produced on other parts of the right face, body, and limbs. On left neck, left trunk, and left limbs ice-cold gave rise to a normal sensation.

Hot (tested with water at 110° F. in test-tube).—On left face (peripheral trigeminal area), on right face, except just above and below eye, neck, trunk, arm, and leg, water at this temperature was referred to as "only tepid." On excepted area, water at 110° was referred to as "not so hot as on left arm" (standard of normal). On left neck, trunk, arm, and leg, sensation of heat was clearly differentiated in normal manner. On abnormal areas stimulation with ice-cold water or water at 110° did not provoke any sensation other than that referred to—e.g., burning, numbness, or pain. In a similar manner, pinching or rubbing skin, except on limited area on face in the manner already mentioned, did not give rise to any other sensation.

Sense of taste (on carefully dried and protruded tongue).—On left half vinegar and salt-water were not correctly interpreted as such. On right side of tongue they were correctly interpreted, but, it must be confessed, with considerable hesitation. With sugared water (right and left half) patient could make no correct response at all.

Sense of form.—With the eyes closed, and when a safety-pin, hair-pin, and half-a-crown were placed in right palm, very definite hesitation in the correct interpretation of them was present. The same objects placed in left palm were quickly and correctly named. We are not prepared to interpret this result; the sense of form is usually not affected in this type of case.

Mentality.—Throughout a long examination patient experienced no mental fatigue. Most intelligent, and, for most part, very discriminating answers were given. Mental concentration and memory appeared quite intact. On testing sensory side of nervous system no delay between application of stimulus and response was seen at any time.

Additional Notes.

A thin frail woman, slightly cyanosed; condition of heart, noted on first occasion, was confirmed—viz., apex-beat in sixth space (five inches from middle line) with heaving impulse, action regular. Heart sounds clear. Since admission no respiratory distress or tachycardia, average pulse-rate 84; T. 97° to 98°. Lungs normal; abdomen normal. Urine still shows no albumin. No polyuria.

Blood pressure.—Right, blood pressure = 170 (systolic), 120 (diastolic). Left, blood pressure = 178 (systolic), 120 (diastolic) (taken immediately afterwards).

Diagnosis.

(a) *Ætiological*.—The absolutely abrupt onset is strongly in favour of a vascular lesion (e.g., a hæmorrhage). In the majority of cases published thrombosis appears to have been the diagnosis most favoured where an autopsy was not obtained. In our case the high systolic blood pressure must have an important bearing on causation, and it seems to us improbable, especially with such a high diastolic pressure, that thrombosis should occur. The lesion, too, would appear to have a wider (vertical) spread than is usual, and we assume that involvement of XI. cranial nerve can be explained in this way. As a rule this nerve or its nucleus is spared. The initial premonitory headache and the subsequent vomiting are in keeping with this

diagnosis. In our opinion, then, the rupture of a small aneurysm, on the course of one of the main lateral end branches of this vessel, interfering with the parts usually supplied by it, appears to us to best explain the clinical picture in this particular case. An extra-medullary leak, the blood being extravasated by the side of the medulla, might be an explanation of partial involvement of muscles supplied by XI. nerve. There is, however, one anatomical objection to this—the hypoglossal roots which are situated also in this region would have been involved, in all probability, were this the case. On the other hand, if the main lesion is one of the left vertebral artery itself rather than its branch the nuclei which lie on the ventricular floor, including that of the XII. and mesial structures and the pyramidal tract, would have been involved as well. Embolism: In the absence of a definite focus for the origin of the embolus it seems to us this ætiological factor may be dismissed. Basal meningitis, tumour, or abscess can be excluded with confidence. Syphilis, it would seem, can be excluded by the history and negative Wassermann reaction.

(b) *Anatomical*.—The signs and symptoms are so characteristic of lesion in this part of the medulla that it seems useless to discuss the possibility of the lesion being placed elsewhere.

Comment.

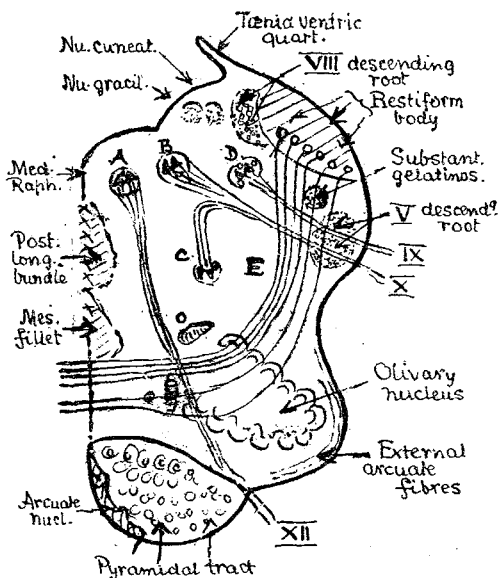
The type of case under consideration is by no means rare, and has been very fully described by Dr. S. A. K. Wilson. The case recorded by him corresponds in a remarkable manner with the one here described. We cannot attempt to analyse the details of our case with the wealth of knowledge and experience he brings to bear upon his own. The ætiological factor in Dr. Wilson's patient was a thrombotic one, the patient being a male aged 42. In our case hæmorrhage appears to us to be a more likely cause, for the reasons stated above. The character of the onset, however, and the initial symptoms are strikingly similar. In Dr. Wilson's patient the accessory nerve appears to have escaped. In our case partial paralysis of the sterno-mastoid and trapezius on the side of the lesion was present. We have already attempted to explain this point. The more persistent character of the symptoms seen in our case could be explained by assuming the presence of the hæmorrhage rather than a thrombosis. In his case the sensory changes on the right side of the face differed in certain respects from those seen in this patient. The subjective sensations in his patient were especially instructive. Those who are interested in the physiology of the lesion and its bearings on the question of epicritic and protopathic sensation must consult his able description in the paper referred to above.

The *anatomy* of the lesion, by comparison, is simple. (a) *Vascular*: The posterior inferior cerebellar artery is the vessel responsible. This vessel is clearly one of the most important branches of the vertebral (usually), but receives scant attention in anatomical text-books:—

"It rises a short distance below the pons and passes obliquely backwards round the medulla oblongata, at first between the filæ of the hypoglossal nerve and then between the filæ of the accessory and vagus nerves, into the vallecula of the cerebellum, where it divides into lateral and medial terminal branches. The trunk of the artery gives branches to the medulla oblongata, and choroid plexus of the fourth ventricle. The medial terminal branch runs backwards between the inferior vermis and the lateral lobe of the cerebellum. It supplies, principally, the former structure and anastomoses with its fellow of the opposite side. The lateral branch passes laterally on the lower surface of the hemisphere and anastomoses with the superior cerebellar artery." (Cunningham's Anatomy.)

(b) *Neurological*: An analysis of the symptoms and signs will be made clear by reference to the accompanying figure, and can be summarised as follows: 1. The sympathetic phenomena (small pupil, pseudo-ptosis and enophthalmos, anidrosis and alterations in salivary secretion when present) are dependent on a lesion of the cervical sympathetic system, which extends upwards in the formatio reticularis of this part of the medulla. 2. The forced movements, giddiness, instability, nystagmus, and tinnitus are due to interference with the connexions of Deiters's nucleus and descending nucleus of VIII. nerve. The cerebellar symptoms, hypotonia, and ataxia are due to interference with the numerous afferent cerebellar systems, from spinal cord, olivary system, and other tracts passing towards restiform body. 3. A lesion of the descending root of V. nerve, its cells, and connexions (homo- and contra-lateral) will account for the dissociate

sensory changes on the right and left sides of the face, mucous membranes of the mouth and cheek. 4. Interference with the central connexions of the vago-glosso-pharyngeal and accessory nuclei, nucleus ambiguus, tractus solitarius, their nuclei and cells, motor and sensory, will account for the weakness of the palate, loss of taste, paralysis of the vocal cord, weakness of the sterno-mastoid and trapezius, and visceral signs, such as tachycardia, hiccup, dyspnoea, &c. 5. It will be noted that the functions of



Composite diagram of the medulla to show the structures involved and those which escape in a lesion of the posterior inferior cerebellar artery. A, Hypoglossal nucleus. B, Vagus nucleus. C, Nucleus ambiguus. D, Tractus solitarius. E, Reticular formation.

the XII. nerve (tongue muscles), the motor portions of V. nerve (movements of jaw), VII. nerve (movements of the face), the cochlear portions of the VIII. (hearing), and ocular nuclei escape. The lesion is extra-pyramidal, the pyramidal fibres being internal and ventral. 6 In this region the medium fillet (mainly concerned with the conduction of impulses from muscles and joints) coming from the spinal cord, with the paths for cutaneous touch, vibration sense and pressure pain, escape. These lie nearer the middle line, and this explains the absence of anaesthesia, &c. On the other hand, the paths for temperature (hot and cold) and cutaneous pain, which lie nearer the periphery, in the reticular formation, are characteristically involved.

In conclusion, it may be said that a lesion of this vessel produces one of the most characteristic crossed paralyses and dissociate anaesthesia which occur in clinical medicine, and although a previous case has never been seen, can be recognised immediately and diagnosed with confidence.

References.—1. Wilson, S. A. K.: Proc. Roy. Soc. Med., vol. ii, part ii., 1909, pp. 52-75. This paper contains the most important references bearing directly or indirectly on this subject. 2. Occlusion of the Posterior Inferior Cerebellar Artery, Andrew G. Gillis, Journ. Amer. Med. Assoc., 1914, lxxiii., Oct. 31st, p. 1550. 3. Occlusion of the Posterior Inferior Cerebellar Artery, Herman Gordinier, Albany Medical Annals, October, 1911, p. 585. 4. Occlusion of the Posterior Inferior Cerebellar Artery (Report of Case), G. W. Robinson, Journ. Amer. Med. Assoc., 1913, lxi., July 19th, p. 179. 5. A Case of Thrombosis of the Vertebral and Posterior Inferior Cerebellar Arteries, A. Salmon, Lo Spertimentale, 1913, lxvi., p. 442.

THE ELIZABETH GARRETT ANDERSON HOSPITAL APPEAL.—Some £6000 are still required to complete the £50,000 asked for in the appeal inaugurated by Lady Hall, of Dunglass, in 1916 for the endowment of this hospital as a memorial to the founder. As the committee are anxious to close the fund in the autumn an urgent appeal has been issued for subscriptions, which should be sent to the hospital, Euston-road, and will be acknowledged by Lady Hall.

BONUS TO NURSES IN SOUTH AFRICA.—The Kimberley Hospital Board, not having been permitted to grant a bonus to their nursing staff in recognition of exceptional services rendered by them during the recent influenza epidemic, a public fund was opened, and a sum of £700 raised by the people of Kimberley. This money was distributed on Wednesday, May 7th, among nearly 70 sisters and nurses, the presentation being accompanied by the payment of high tributes to the work of the hospital nurses during the influenza crisis.

Clinical Notes :

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

A CASE OF

PERFORATING WOUND OF THE HEART.

BY F. C. PYBUS, M.S. DURH., F.R.C.S. ENG.,
MAJOR, R.A.M.C.(T.).

IN addition to many medico-legal points this case presents features of general surgical interest, and seems worthy of record. The patient was stabbed in the neck and back and four times in the thorax. Pneumothorax was produced on each side. Three of the four thoracic wounds were over the heart; one of these produced pneumothorax, opened the pericardium, and penetrated the left ventricle, which was sutured about two hours later. Nevertheless the patient survived for five days, then dying from septic infection of the pleura and pericardium.

Notes of Case.

Leading Seaman H., aged 28, was admitted to the 1st Northern General Hospital about 2 A.M. on June 21st, 1917. He, with some companions, had been dancing and drinking in a house. A quarrel arose, during which a knife was used. His companions left, and on returning with the police the patient was found lying on his face in the yard of the house. He was unconscious and had several stab wounds about him.

On admission he was conscious, but collapsed. A rapid survey in the receiving room revealed several wounds, from one of which, over the heart region, air and blood was escaping. Two sutures were placed in the wound. On removal to the theatre the following wounds were found: 1. A punctured wound in left side of neck behind the sterno-mastoid muscle which was bleeding slightly. 2. An incised wound over inner part of left sixth interspace $1\frac{1}{2}$ in. long and internal to the nipple. 3. A small punctured wound just below left nipple. 4. A small punctured wound over ninth rib in left nipple line. 5. A wound 2 in. long over eighth rib in right mid-axillary line from which blood and air escaped. 6. A wound 2 in. long over erector spinæ muscle in the left lumbar region.

Wound 2 appeared the most serious and a heart injury was suspected. As the whole of this region was emphysematous no exact knowledge of the size of the pericardial sac could be obtained.

Operation.—Open ether was administered and the whole chest was cleaned. When the sutures in Wound 2 were removed blood and air escaped. On separating the edges the sixth costal cartilage was found cut across, as also were the soft structures adjoining. The pericardium was visible, as was also the lung, which was partly collapsed and surrounded by blood. Wounds 2 and 3 were joined by an incision, which was also prolonged upwards, downwards, and outwards, making a large flap. The soft structures of the flap were separated from the ribs, and the sixth costal cartilage was divided near its junction with the rib. The fifth costal cartilage was also divided near the sternum and the whole flap turned outwards.

A hole 1 in. long was found in the pericardium from which frothy blood escaped. No heart wound could be seen through this opening, so it was enlarged. This revealed a wound on the front of the left ventricle $\frac{1}{2}$ in. long adjacent to the coronary artery running in the inter-ventricular groove. This wound was bleeding slightly; it appeared to be non-penetrating, and it was thought that the blood might be coming from a cut branch of the coronary artery. The heart was steadied and two catgut sutures inserted in the ventricle which closed the wound and controlled the hæmorrhage. The pericardium was now cleaned of blood and the wound in it closed. As much blood as possible was mopped from the left pleura and some saline introduced into the pleural cavity. The flap of chest wall was replaced and sutured in position, making the left pleura air-tight.

The neck wound was then cleaned and sutured. The wound of the right side of the chest was found to open the pleura, and the diaphragm could be felt through the puncture. There was a partial collapse of this lung, with pneumothorax. The bleeding appeared to come from the wound margin, which was then sutured.

Wound 6 passed through the erector spinæ and entered the right perinephric tissue, but no further damage appeared to have been done. Morphia was given and saline by the rectum, and the patient was put to bed in fairly good condition.