Short Notes and Clinical Cases.

A STUDY OF A HUMAN MIDBRAIN PREPARATION.

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PHYSIOLOGISTS and clinicians are nowadays conversant with the various reflexes capable of production in decerebrate and midbrain preparations of animals. There are, however, but few records of the production of similar reflexes in decerebrate and midbrain conditions of man. It therefore seems reasonable to place on record the findings on clinical examination of a case which presented all the signs of having become a midbrain preparation.

PERSONAL CASE.

Mrs. E. R., age 60 years, was admitted to hospital on account of weakness of left arm and leg. On the evening of January 24, 1930, she went to bed in apparent good health. She rose the following morning and, while making a cup of tea, cried out. Her son, rushing to her aid, found her leaning over to the left and clasp ing her right hand in the region of her heart. To his questions she complained of weakness of the left hand, arm and leg, and of severe headache in the right frontal region. Within a few hours she was admitted to hospital.

On examination she presented the following signs. A left-handed woman, she was unable to speak freely, though apparently understood commands, such as "put out your tongue," "hold up your right hand." There was very marked weakness of the left side of the face; her eyes were turned to the right and she was unable to deviate them to the left. The pupils were small and equal, and reacted briskly to light. The left arm and leg were completely paralysed and flaccid. The tendon reflexes on the left side were brisker than those on the right; the left plantar response was extensor, while the right was flexor. The apex beat was level with the nipple line, and the heart sounds were pure. The blood pressure was 240 mm. Hg., systolic, and 100 mm. Hg., diastolic. The other systems were normal except for a trace of albumin in the urine.

Within 24 hours she rapidly became worse: her breathing became stertorous: her pulse rate increased, and her temperature rose to 100° F. She appeared unconscious of her surroundings, and in no way could be roused. Further examination elicited interesting reflex activities as well as new physical signs in the nervous system. No stimulus could arouse consciousness. Her pupils were small and quite inactive to light. Vestibular stimulation caused deviation of the eyes: the corneal reflexes were just present. Painful stimuli to the face did not appear, judging by facial expression, to cause conscious pain; her arms and legs were flaccid. The deep reflexes were all very brisk, and both plantar responses were extensor in type. She was sweating profusely all over the trunk and face.

It thus appeared that anatomically the lesion involved the pyramidal tracts, first on the right side of the cerebrum and later on the left side. The

fact that the light reflex disappeared, while stimulation of the vestibular nerves caused deviation of the eyes, suggested a lesion above the level of the third cranial nerve nucleus, but below the level of the external geniculate body.

PATHOLOGICAL REPORT.

At post-mortem the meninges were found to be normal ; the cerebrospinal fluid was tinged with blood. The gyri of the right cerebral hemisphere were flattened and broadened. Section of the brain revealed blood in both lateral ventricles, but none in the third ventricle, iter of Sylvius or fourth ventricle. The right centrum ovale was completely destroyed by a large hæmorrhage which extended down into the right cerebral peduncle as far as the anterior border of the substantia nigra and the red nucleus. The red nucleus itself appeared undamaged. The left hemisphere and peduncle showed no macroscopical lesion. The blood vessels of the circle of Willis were atheromatous.

From the clinical and pathological evidence the lesion appeared to be situated above the red nucleus ; therefore this case resembles mid-brain animal preparations.

MIDBRAIN REFLEXES.

The following interesting reflexes were obtained.

With the patient lying flat on her back and the arms by the side, rotation of the head to the left caused the right arm to flex at the elbow-joint, to adduct at the shoulder-joint, the forearm to pronate and the fingers to flex with the thumb opposed to the palm ; at the same time the right leg flexed slightly at the hip- and knee-joints, but no movement of the toes was observed. Synchronous with these movements the left arm extended at the elbow-joint and became slightly abducted at the shoulder-joint, while the left leg extended at the hip- and knee-joints. Rotation of the head to the right caused a complete reversal of the above state. These reflex movements were frequently elicited and were always of the same character.

Acute flexion of the head on the chest caused both arms to flex at the elbow-joints, and both forearms to pronate. Palpation of the legs revealed definite tension of the quadriceps muscles ; no movement of muscles was palpable below the knees.

Acute extension of the head, so that the occiput was in approximation to the region between the shoulders, resulted in rigid extension of both arms with pronation of the forearms ; no palpable movement was appreciated in the muscles of the legs.

When the patient was rolled on to her left side the right arm flexed slightly at the elbow-joint and swung forward from the shoulder, bringing the arm round in a circle. No movement was noted in the legs. When rolled on to her right side, the left arm performed a similar movement to that previously described in the right arm.

Stimulation of one or other ear with cold water caused conjugate deviation of the eyes to the side stimulated, but no obvious change in the posture or the tone of the muscles of the arms or legs. If she was first placed on her right side and then the left ear was stimulated with cold water, skew deviation of the eyes occurred; the left eye looked up and out while the right eye looked down and in. When she was on her left side, and the right ear was stimulated with cold water, the right eye looked up and out while the left eye looked down and in. Never at any time was a nystagmus produced.

In the act of stimulating the labyrinths with cold water, two reflexes constantly occurred. At the first gush of cold water into either ear, sudden rigid extension of both arms with some pronation of both forearms resulted, while palpation of the legs revealed a minimal contraction of the quadriceps muscles. If a piece of rubber tubing was inserted into the ear down to the drum, at the moment of contact with the drum a similar reflex response in the arms took place. It thus appeared that this reflex action was in some way connected with the ear-drum. It was further found, as the tube was being inserted into one or other ear, and before the drum was reached, that the patient invariably coughed; the coughing, however, was not associated with any movement of the limbs. Lastly, digital pressure on the under surface of the eyebrows, in the occipital region, or even simple pinching of the skin of the face, neck or shoulder, resulted in an immediate and simultaneous complete extensor movement of all four limbs with pronation of the forearms. This reflex action was repeatedly established, while every effort was made to cause no movement of the head on the trunk during stimulation.

On forcible plantar flexion of the toes on the right side, the right leg flexed, and if the left leg had been previously placed in a slightly flexed position, it extended at the hip- and knee-joints; no movement of the toes of the left foot was observed. If the toes of the left foot were plantar-flexed, then the left leg flexed and the right leg extended.

Pressure on the soles of the feet never at any time produced any movement of the flexors or extensors, irrespective of the position into which the leg had previously been put.

COMMENT.

This case exhibited in a remarkable way the reflexes associated with posture which have been so extensively studied in animals of recent years. The arm and leg movements following movement of the head on the trunk are similar to the tonic neck reflexes; the change in posture of the limbs when the body was rolled from one side to the other is analogous to the reflexes found in animals. The flexion-extension reflexes of the legs on painful stimulation of the toes are also demonstrable in animal preparations. Two reflexes found in this patient are rarely, if ever found in animal preparations: first, the coughing reflex on introducing an object into the ear, and, second, the multiple limb

extension response on painful stimulation of the skin of the head, neck and shoulders. The first, however, is commonly seen in the Ear Departments of large hospitals ; and the suggested pathway is supposed to be by Arnold's nerve, a branch of the tenth cranial nerve, which supplies the floor of the external auditory meatus. The multiple limb extension reflex from painful stimuli is difficult to explain ; the suggestion that it might be in the nature of a tonic neck reflex is difficult fully to comprehend, because stimulation of the face or back of the head or side of the neck produced similar results ; had it been a tonic neck reflex resulting from stretching of one or other group of muscles, one would have expected an alternating pattern of response dependent on the area stimulated, but this did not occur. Further, to produce the tonic reflex, forced rotation of the head had to be made, while the mere insertion of a soft rubber catheter in one or other ear was sufficient to produce the multiple extension response. One thus feels that there must be some other explanation of this phenomenon. Recourse to available literature, physiological and clinical, has failed to reveal any records of a similar disturbance having been recorded in either man or animals.

To Professor Fraser, of the Medical Unit, St. Bartholomew's Hospital, I owe my thanks for permission to publish these notes of a patient who was under his care.