modia by those who still maintain that there is but one species of plasmodium.

In view of my belief that the estivo-autumnal fevers are due to two distinct parasites, a view held by many other investigators who have studied malaria in the tropics, and as, to my knowledge, the quotidian plasmodium has never received a specific name, I propose for that organism the name "*Plasmodium falciparum quotidianum*," regarding it as a sub-species of *Plasmodium falciparum*, which is concerned in the etiology of tertian estivo-autumnal malaria. The latter organism is undoubtedly typical of the estivo-autumnal plasmodia, and for that reason I regard it as the type, and the quotidian plasmodium as a sub-species. The classification of the malarial plasmodia proposed would then be as follows:

Division. Protozoa.

Class. Sporozoa.

Order. Hemosporidia.

Genus. *Plasmodium*.

Species:

1. *Plasmodium malariae*, Marchia et Celli. Quartan malarial plasmodium.

2. *Plasmodium vivax*, Grassi et Feletti. Tertian malarial plasmodium.

3. *Plasmodium falciparum*, Blanchard. Estivo-autumnal plasmodium, tertian type.

Sub-species:

4. *Plasmodium falciparum quotidianum*, Craig, 1909. The quotidian estivo-autumnal plasmodium.

Clinical Department.

A CASE OF SEROUS AMICROBIC MENINGITIS. OPERATION. RECOVERY.*

BY CHANNING C. SIMMONS, M.D.,

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THE following case is of interest as regards the diagnosis and the condition found at operation. There has been considerable interest in recent years in cerebral injuries and intracranial surgery. Formerly injuries to the head other than fracture of the skull and middle meningeal hemorrhage were classed as concussion or contusion and the treatment was what might be termed expectant, — rest, lowering of blood pressure by drugs and depletion, ice to the head, etc. Now, however, certain of the cases have been recognized as conditions which may best be relieved by surgical interference, but even at present there is considerable difference of opinion among neurologists as to the value of an operation in a given case. Cushing, in this country, is a strong advocate of decompression if the condition is at all doubtful, as it can be done rapidly and with comparatively little shock. In the following case there was considerable difference of opinion as to the advisability of operation among the neurologists, and although it is im-

* The author wishes to express his thanks to Dr. W. A. Brooks for the opportunity to operate upon and report this case.

possible to say what the outcome would have been without operation, it seems improbable that recovery would have been as rapid.

R. P., fourteen years of age, was brought to the accident room of the Massachusetts General Hospital on Sept. 25, 1908, with the following history.

On Sept. 9 he went to the county fair. That night the family heard a noise and thought nothing of it, but made an investigation an hour later and found the patient in his night clothes, unconscious, at the foot of a flight of stairs. Examination at that time by Dr. Willard showed no bleeding from the ears or nose. The breathing was quiet and the pulse slow. There was a swelling in the left temporo-parietal region, and ecchymosis over the right eyebrow. The jaws were set in spasm. There was flaccid paralysis on the right arm, but the other extremities were moved when the patient was disturbed. The pupils were equal and reacted to light.

For six days the patient remained in practically the same condition, unconscious most of the time, with periods of violence. The bowels were moved by enemas, and feeding accomplished by rectum. He had incontinence of urine and lay always on the left side. Paresis of the right leg was noticed.

A week after the injury there was some improvement in his condition. The movements were more purposive, and he took a small amount of nourishment by mouth, but he would not answer questions; the paralysis remained the same and there was still incontinence. There was no improvement for four days before admission to the hospital.

Previous history. — Always well and considered a bright boy. Headache at times for the past three months. No vomiting, convulsions or other brain symptoms.

Physical examination. — Well-developed boy; semi-conscious, lying on left side. When turned patient protests and rolls back. Makes no response to questions.

Cranium negative. No bleeding from ears or nose. Pupils equal and react; examination of fundus shows no choked disk. Slight right facial paralysis. Lungs negative. Heart slow, sounds loud, no murmurs. Pulse 40 and of high tension; temperature 97° by rectum. All extremities cold and bluish, especially the right arm, which shows complete muscular paralysis. Abdominal and cremasteric reflexes more marked on left than right. Patellar, Achilles and plantar reflexes normal; Koenig's sign present on both sides. No rigidity of neck.

The patient was seen in consultation with Dr. Waterman, who advised a decompression operation, without opening the dura, for possible hemorrhage, or, more probably, laceration of the cortex.

The patient was kept under observation for twenty-four hours. During this time he was semi-conscious, with periods of restlessness and extreme violence. There was incontinence of urine. The pulse varied between 28 and 44, averaging about 40, and was of high tension, but unfortunately the blood pressure was not taken.

Operation Sept. 26. A curved incision was made with the convexity upwards, beginning at the border of the hairy scalp over the external canthus, and ending over the auditory meatus. Flap dissected back and fibers of temporal muscle separated, exposing the skull. Button removed with trephine over the lower end of the Rolandic area, that is, somewhat higher than the usual opening for hemorrhage from the anterior branch of the meningeal artery. There was no evidence of meningeal hemorrhage. The presenting dura bulged into the opening, was pale and did not

pulsate. The trephine opening was enlarged upwards with rongeur forceps, where the bulging was much more marked, and the dura was incised, with the escape of several drams of clear, straw-colored fluid, which squirted up as the incision was made, nearly an inch. The dura was then carefully elevated with a blunt dissector, and an ounce or more of the fluid, which seemed to lie in a more or less circumscribed cavity, evacuated. After this there was less bulging, and the brain pulsated normally. A small drain of gutta-percha tissue was introduced to the opening in the dura, and the wound closed in the usual manner. The patient stood the operation well, and the pulse, which was 40 at the beginning of the anesthesia, was 84 when the patient was returned to the ward.

During the night following operation he was extremely restless, and there was a profuse serous discharge from the wound. The pulse remained above 70, and was of good quality. Temperature 100° (rectal).

The subsequent history is as follows:

Sept. 28. No discharge from wound. Pulse 50. Answers questions slowly but rationally. Some movement in right upper arm.

Sept. 30. Wick out.

Oct. 1. Continued improvement in motions of arm and in the mental condition. Asks for food, bedpan, etc.

Oct. 2. Pulse 60 and thready. Blood pressure 95.

Oct. 5. Marked improvement. Blood pressure 102. Stitches all out; wound healed by first intention.

Oct. 10. Circulation good. Pulse 72. Mental condition normal. No headache. Almost perfect use of right arm, but still considerable impairment in strength. Up in wheel chair.

Oct. 12. Blood pressure 132.

Oct. 14. Up and about ward.

Oct. 22. Discharged well.

A letter received on March 22, 1909, from Dr. R. F. Willard, the patient's physician, from Coventry, Vt., stated that he had attended school all winter and was in good condition. His mind was a little slow, and he had not received quite as good marks as formerly. There had been no headaches, nausea, attacks of vertigo or other brain symptoms. The trephine opening was in good condition.

The interesting points in the case are those of diagnosis and the proper treatment, whether operative or expectant.

The diagnosis first made was concussion, but as there was comparatively little improvement in eleven days following the injury, his physician sent him to the hospital feeling sure some serious lesion was present.

Hartwell, in the *Annals of Surgery*, for July, 1908, writing on the question of operation in non-penetrating cranial injuries, divides them into three classes:

1. Slight symptoms with certain recovery.
2. Severe symptoms with certain death.
3. Border-line cases.

He reports two cases under the third heading and considers an absolute diagnosis impossible, but decompression indicated. He speaks of them as cases of acute traumatic edema, and says that protruding eye-balls and choked disk are usual, due to increased intracranial pressure. Neither symptom, however, was present in this

case. Another feature of the above case was that the fluid seemed to be localized, forming practically a cyst.

Cushing, in speaking of similar cases, terms them serous amicrobic meningitis, or acute edema, and mentions a case in which the symptoms did not become marked until two weeks after injury.

The indications are, of course, to relieve the cerebral pressure, which may be done by bleeding, lumbar puncture or a decompression operation. Cushing, Ballard and other observers favor decompression as the safest procedure. Bleeding is uncertain, and the increase in tension is really a conservative act, equalizing the pressure and preventing the intracranial tension due to the exudate from causing death from pressure on the medulla. Lumbar puncture in certain cases gives marked relief, but cases of sudden death during the operation have been reported, due to pressure on the medulla, caused by its being forced into the occipital foramen by the sudden relief of pressure below. Decompression is a comparatively simple operation, and permanent brain hernia is not to be expected unless there is some irreparable, deep-seated damage which will keep up the pressure.

As regards cysts, Cushing divides them into two classes, parasitic and traumatic, which increase in size and cause pressure symptoms. They are to be differentiated from the parencephalic cysts due to hemorrhage, which cause paralytic symptoms and not those of pressure.

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POISONING BY ILLUMINATING GAS. REPORT OF SIX CASES.

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UNTIL very recently the usual treatment of cases of gas poisoning consisted in the use of oxygen inhalations and the administration of strychnia hypodermically.

Crile¹ has used transfusions in some experimental cases of this sort, in dogs, with success, and scattered cases are to be found in the literature and elsewhere of the treatment of clinical cases by the use of transfusion, by infusion of defibrinated blood, by venesection or by intravenous injection of a saline solution. At the time of the introduction of "normal" or physiological salt solution, and since then, records of cases are to be found in considerable number which were treated by its use. Most of the cases so treated died. So far as I can find, the solution used was apparently a true "normal" saline, containing sodium chloride 0.6% only, and was used as a subcutaneous infusion. Jones² reports the successful use of intravenous saline infusion clinically.

The method used in the series of cases reported