emphasized the utility of combined treatments for trypanosomiasis, as, for instance, atoxyl and trypanoth. Soon after Moore, Nierenstein, and Todd published the results of their important investigations on the treatment of experimental trypanosomiasis by various combined treatments. They state that Thomas and Breinl's atoxyl treatment was not sufficient to prevent recurrences in a number of cases, and from their experiments on *T. brucei* they came to the conclusion that Thomas and Breinl's treatment should be followed by a mercury treatment. According to them atoxyl acts on the ordinary adult stage of the trypanosome as found in the peripheral circulation, but not on the developmental forms of the parasite, which are not seen in the general circulation.

The combined treatment I have tried is quinine cacodylate and mercury perchloride. The experiments were made on monkeys inoculated with the same strain of trypanosome as those on which the quinine cacodylate alone and the mercury treatments had been tried.

Three monkeys were treated with quinine cacodylate (0.10 gram per injection) and perchloride of mercury (0.005 gram per intravenous injection), contemporarily; that is to say, they received one injection of cacodylate in the morning and the mercury in the evening. The treatment lasted forty days. Three other monkeys received quinine cacodylate for twenty days and then perchloride of mercury for twenty more days. Three more monkeys received a daily intravenous injection of perchloride of mercury for twenty days, and for twenty days more a daily subcutaneous injection (0.10 gram) of quinine cacodylate.

The treatment, therefore, lasted in all the three groups of monkeys forty days. The trypanosome disappeared from the general circulation about the same time in the first two groups (between the fifteenth and nineteenth day); in the monkeys of the third group the trypanosome did not disappear completely during the mercury treatment; it disappeared between the twenty-second and thirtieth day.

At the present time, two months after the combined treatments were discontinued, the monkeys of the first and second groups are apparently free from the trypano-

some; as regards the third group, a recurrence has taken place in one of the monkeys, though the trypanosome is present in very small numbers.

CONCLUSIONS.

1. Quinine cacodylate shows a well-marked trypanocidal action in monkeys experimentally inoculated with a strain of trypanosome closely resembling *T. evansi*.

2. Mercury perchloride improves the general condition of the inoculated monkeys, and frequently causes the temperature to subside to normal. Given alone, however, its trypanocidal action is not very marked. In patients affected with sleeping sickness, it would seem from the experiments made by Low and myself in 1903 that mercury perchloride given by intravenous injection induces a fall in the temperature, but the improvement is only temporary.

3. I suggest that quinine cacodylate alone, or, better, in combination with intravenous injections of perchloride of mercury, should be tried in sleeping sickness, using large doses. If it should be found that quinine cacodylate has a marked trypanocidal action also on *T. gambiense*, the advantage of this drug over other preparations would be its powerful action on the malaria parasites. This would be an appreciable advantage, as in the experience of many observers, among whom Low and myself, a large number of sleeping sickness patients are suffering also from chronic malaria.

4. Quinine cacodylate besides its trypanocidal properties and its action on Laveran's parasites, has apparently some action on other protozoa, as, in my experience, its use is beneficial in kala-azar and yaws.

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AN UNUSUAL DEFORMITY OF THE FOOT.

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THE following abnormality of both feet recently came under my notice, and its rarity and biological interest make the case worth reporting.

It occurred in a boy, aged 12 years, who consulted me for some minor ailment. There was nothing like it in the family record, as far as the parents could remember, and the family history was unimportant.

The abnormality consisted in an extremely short first metatarsal bone, the head not reaching within an inch of that of the second metatarsal.

When a young child the great toe projected slightly inwards away from the foot, but now, probably from long wearing of a boot, it lies parallel with the others.

The skilagram, taken by Mr. Fryett, shows the bones of the foot, the condition being bilateral. There is little power of abduction, but adduction of the toe is unusually powerful, though it cannot be brought in apposition with the outer members.

The absence of the usual support given by the head of

the first metatarsal causes the boy to bear most of his weight on the outer side of the foot, and the parents volunteered the statement that his boots always wore out on this side. He is not so active in running and walking as his brothers.

There is a marked flexion of the first phalanx at the metatarso-phalangeal joint, so that on standing the head of the phalanx is touching the ground. This explains the apparently very short length of that phalanx in the

skilagram, as it is taken almost end on. Actually the bone is of normal size. I regard this flexion at the joint as a secondary occurrence, the object being to allow part of the body-weight to be transmitted to the ground through the first phalanx.

It is obvious that the disability does not lend itself to treatment, but the interest lies in the fact that it closely resembles the condition normally present in

the anthropoid apes. In them the foot is a grasping organ, and the big toe is somewhat like the thumb, being shorter than the other toes and appposable.

The great toe is still appposable in the human fetus, and is much more movable in childhood than in adult life.

The resemblance to the skeleton of the ape would be still closer if the great toe did not lie parallel with the

others, a condition probably due to wearing boots. Comparing the skiagram with that of a normal foot, there is seen to be a distinct, though slight, bowing of the metatarsal bones, the convexity being outwards, and this is very marked in the toes, especially the fourth and fifth. A still more exaggerated degree of this is seen in the skeleton of the chimpanzee and gorilla. Its object is to facilitate apposition to the great toe and the grasping of objects in climbing.

The apes, too, walk entirely on the outer side of the sole of the foot, and are not very agile in running. The deformity, which, as far as I know, is unique, is easily explained by comparative anatomy, and is a reversion towards the condition met with among the higher apes.

A NOTE ON

DR. MILLIGAN'S PAPER, "THE TREATMENT OF CHRONIC SUPPURATION OF THE MIDDLE EAR WITHOUT RESORT TO RADICAL MASTOID OPERATION."

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DR. MILLIGAN, in his paper in the *BRITISH MEDICAL JOURNAL* of October 12th, 1907, has brought forward many new points regarding the treatment of middle-ear disease which have their basis on the pathological findings of the exudate. The soundest treatment of medical and surgical cases has to-day its foundation on the pathological nature of the lesion, and, this being definitely determined, the physician's or surgeon's procedure is governed accordingly.

Dr. Milligan points out that the otologist must differentiate, before treatment is begun, the different stages of inflammations of the middle ear, and, further, the causative agent of the lesion must be ascertained. On the result of these findings depends the treatment of the case, and by this means unnecessary radical operations can be avoided and the prognosis can be given more accurately.

It is beyond my domain to discuss the different operative procedures, but there are some points in the conclusions that can be drawn from the examination of the inflammatory exudate which I wish to discuss.

I have had an opportunity, through the kindness of Dr. Birkett, of examining the exudates in middle-ear diseases. These cases were fairly representative of the class that is met with in hospital practice. I would point out that in our experience the cases coming to the outdoor department of the Royal Victoria Hospital, Montreal, suffering from otitis media usually present a condition more chronic than those of the better classes met with in private practice; the latter class usually seek aid for middle-ear trouble earlier than the poorer classes. I have had the opportunity of examining material from cases in all stages of the disease.

Dr. Milligan points out that the inflammatory exudate varies with the stage of the disease, and that the exudates from these various stages have distinct cellular characters, which may be recognized with the microscope. In the early acute stage there is "shedding of the superficial columnar epithelial elements of the mucosa," with leucocytes and red blood cells, and, "as chronicity is established, the type of epithelium becomes changed to a more flattened and squamous variety, while leucocytes tend to be gradually replaced by lymphocytes and myelocytes." He lays great stress on the cellular character of the exudate, and adds:

Provided the cytological examination reveals an extensive leucocytosis, with, in addition, degenerated columnar epithelial cells and but few lymphocytes, the conclusion to be come to is that the process is superficial, exudative, limited to the mucosa, and capable of arrest by means of efficient local treatment. On the other hand, the presence of a number of lymphocytes is indicative of granulomatous changes in the mucosa, changes which suggest an extension of the inflammatory process into the deeper layers of the mucosa, and changes which are unlikely to be arrested by any form of purely local medication.

Were we able to follow the course of an inflammatory process by the microscopical findings, particularly as

regards the cellular contents of the exudate, the possibilities of Dr. Milligan's findings would be indeed great.

It must be extremely rare to meet with such cases in which the epithelial elements of the exudate can be recognized and differentiated. As these middle-ear diseases are infective processes, where the invading agent attacks the tissues from within the ear cavities, the superficial mucosal cells are the first to be desquamated and destroyed. Not alone do the epithelial cells become shed, but, in consequence of the infecting agent, they become swollen, granular, and frequently entirely broken up. To distinguish these cells from others, all will admit is indeed difficult, but to distinguish the various types of the epithelial elements among themselves is still more difficult.

In the exudates that I have had the opportunity of examining, and even among those in the early stage of middle-ear disease, I have not found the presence of recognizable epithelial cells in the stained preparations to be of definite significance. Where a purulent inflammatory exudate already exists, the superficial epithelial elements of the area involved in the ear must have been shed long before, and only those epithelial elements are likely to be involved which border the inflamed area. In these conditions, therefore, were it possible to distinguish the different kinds of epithelium, we would meet with both kinds of these epithelial cells, regardless of the stage or chronicity of the lesion.

Dr. Milligan also points out the variation in the leucocytes of the acute and chronic cases. In the former the polymorphonuclear leucocytes are the more numerous, while in the latter the lymphocytes are in the majority. This differentiation is probably possible where the chronic type refers to lesions advancing to healing, but in those cases in which there is a long-standing greater or less exudate, which clinically represents chronicity, the exudate contains polymorphonuclear leucocytes in greatest number. This is true whether the inflammation involves the soft tissues or even the bone. As Dr. Milligan further adds, the chronic cases are to a great extent mixed infections. This being so, these cases exhibit not infrequent recurrent exacerbations of the disease as new infection is received. Moreover, in the so-called chronic cases it is but rarely seen that the entire lesion exhibits in all parts the same stage of the disease. We must therefore recognize that while healing is going on in one area an acute or chronic inflammation may exist at another, and have associated with it the acute inflammatory leucocytes of the polymorphonuclear variety.

He diagnoses tuberculous disease of the temporal bone by the presence of lymphocytes, epithelioid cells, myelocytes, and giant cells in the exudate. Epithelioid cells, as they appear in the tubercles in the tissues, are not to be encountered in the exudate. Their form is entirely altered, and it would be difficult to distinguish them from the wandering cells or fibroblasts seen in any healing wound. The most probable giant cells found in bone destruction of whatever origin are the osteoclasts. When we recall the great number of sputum analyses that are made, and the infrequency with which giant cells are found in those exudates from tuberculous infections, the evidence contributed by the presence or absence of these elements in exudate from the middle ear has but little value.

He also lays stress on the qualitative bacterial analyses, and in this we must agree. I believe that our best evidence of the nature of middle-ear disease lies in determining the kinds of organisms producing the lesions. In our experience, the *Micrococcus catarrhalis* should not be included among the virulent infections of the ear. The commonest dangerous organism is the streptococcus, while among the infrequent severe infectious agents are the meningococci. I have not met with the gonococcus infection of the middle ear. Following this, in order of virulence and frequency, are the pneumococcus, staphylococcus, *B. influenzae*, *B. coli*, *B. typhi*, *B. pyocyaneus*, and a number of other organisms more rarely met with.

From my experience, I would conclude that much reliance cannot be placed on cytological characters of the exudate, and that we must still look to the bacteriological examinations for our evidence as to the nature of the disease and its probable consequence.