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A M O E B I A S I S.

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INTRODUCTION.

Amoebiasis is the general term applied to infection of man by Entamoeba Histolytica, the cause of amoebic dysentery.

This infection may occur without clinical symptoms, or it may be characterised by diarrhoeal or dysenteric attacks, or by any other symptoms connected with the nervous or gastro-intestinal systems. The symptom complex known as amoebic dysentery is but one phase of Amoebiasis, and dysentery occurs in but a small proportion of infections with Entamoeba Histolytica.

Although the condition is world-wide in distribution, the most severe symptoms and complications are most frequently observed in the Tropics. Durban, the town in which I reside, is situated on the south-east coast of the Union of South Africa. Its climate is humid, it has a native and Indian population of 150,000 most of whom live in the surrounding districts and whose personal hygiene and ideas of general sanitation are primitive in the extreme. A large proportion of this native community depend solely for a livelihood on market gardening, their produce being sold in the Borough Market. Another large proportion are domestic servants in homes and hotels. It is thus not surprising that the condition is the most wide spread disease encountered in Natal.

As Honorary Physician at the King Edward VIII Hospital, with 120 beds in my charge, I have had exceptional opportunities of studying the disease and its many complications. In the last three years 382 cases have been treated in my wards.

In the present thesis, I propose to summarise the important work done on this subject, and to give an account of my observations, especially with regard to the treatment of the conditions amongst the natives in Natal.

HISTORICAL.

Entamoeba Histolytica was first described by Loesch in 1875, who found it in the foeces of a Russian peasant in Petrograd. The man died and a postmortem examination was performed and the records of the finding are a description of the protozoan known as Entamoeba Histolytica today.

In those days Shiga had not discovered his Bacillus, and any amoeba found in the stools was regarded as the cause of dysentery, as the existence of more than one species of amoeba in man was not yet recognised.

The parasite belongs to the protozoa class Rhizopoda and as a cause of dysentery was first definitely described by Councilman and Lafleur in 1891 (Reference "A"), who called it Amoebic Dysentery.

In 1903 Schaudinn first clearly differentiated Entamoeba Histolytica from a harmless species occurring in the human intestine which he called Entamoeba Coli, giving the name Entamoeba Histolytica to the pathogenic species.

In 1913 Walker and Sellards (Reference "B") by experimenting upon human volunteers, proved that Entamoeba Histolytica is the cause of amoebic dysentery, and Entamoeba Coli is a harmless commensal living in the human intestine.

Culter in 1918 and Boek and Drbohlav in 1929 succeeded in culturing Entamoeba Histolytica.

In 1909 Elmassian described the first precystic stage of Entamoeba Histolytica, considering it a distinct species and naming it Entamoeba Minuta, as distinguished from Entamoeba Histolytica, the larger form.

In 1912 Prowazek called these small cysts Entamoeba Hartmanni.

In 1917 Wenyon and O'Connor (Reference "C") stated that cysts of Entamoeba Histolytica

varied/

varied in size from 7 - 19 m. in diameter.

In 1917 Dobell and Jepps (Reference "D") in their study of the diverse races of Entamoeba Histolytica found that cysts vary from 5-20 m. in diameter. They found that different races of Entamoeba Histolytica may coexist in the same patient.

Brug (Reference "E") in 1917 found variations in the size of the cyst from 7-20 m. Dobell and O'Connor in 1921 (Reference "F") gave a very careful description of Entamoeba Histolytica and discuss the various races.

Brumpt (Reference "G") in 1927 considered the small cysts which he speaks of as Entamoeba Minuta as non-pathogenic.

Craig (Reference "H") reviews the literature on the subject and quotes the work of Dobell and Jepps who have described five races differentiated by the size of the cysts produced. He also quotes Boeck (Reference "I") who described three groups.

It is now recognised that Entamoeba Histolytica is a collective species composed of distinct strains differentiated by the size of cysts.

Wenyon and O'Connor stated that cysts vary greatly in size. Cases infected with the small strains passed small cysts regularly, at any rate for some weeks with no tendency for the small cysts to be replaced by large ones.

It is now recognised mainly as the result of the work of Schaudinn, Hartmann, Wenyon and Dobell that several distinct amoebae occur in the intestinal canal of man, one of which, Entamoeba Histolytica, is pathogenic whilst others - Entamoeba Coli, Endolimax Nana, Iodamoeba Butschlii and Dientamoeba Fragilis - are harmless saphrophytic species.

CYTOLOGY.

It may be well to cite the essential characteristics of the Entamoeba Histolytica.

TROPHOZOITES. Cytologically the trophozoites of Entamoeba Histolytica have clear hyaline, refractile glasslike ectoplasm and finely granular endoplasm. The ectoplasm is best seen in the mobile amoebae. The motility is usually in a straight line by means of a single bladelike pseudopodium which moves rapidly and explosively. Usually the nucleus flows into the pseudopodium first, the red blood cells, if present, and finely granular matter follow it. In fresh bloody mucous stools from acute cases of amoebic dysentery, the motility is very rapid. In old stools the organisms are sluggish. The pseudopodia are more commonly blunt.

In stained preparations (iron hematoxylin) the nuclear membrane appears thin and delicate, upon the inner surface of which is a ring of minute chromatin granules. In the centre of the nucleus or less commonly slightly eccentrically is a small black dot of chromatin, the karyosome, which is about .5 m. in diameter. The karyosome is surrounded by a clear achromatic network. In degenerating amoebae, however, there may be masses of chromatin in this network.

PRECYSTIC STAGE. Before encystment the active forms leave the tissues, enter the lumen of the gut, where they undergo one or two divisions, diminish in size, lose motility, rid themselves of red blood cells, become spherical or oval in shape, and thus become precysts.

In the living unstained condition the precystic Entamoeba Histolytica appear colourless, hyaline or finely granular, round or slightly oval, measuring 6 - 20 m. or more in diameter. The distinction between ectoplasm and endoplasm is less apparent than in the trophozoite. Progressive motility is absent, although blunt pseudopodia may be sent out, but the organisms commonly remain stationary. The nuclear structure is the same as

the/

the trophozoite and the nucleus is usually more clearly visible. The precyst secretes a delicate wall and encysts.

CYSTIC STAGE. In living unstained preparations the cysts appear as colourless, hyaline bodies, usually round but they may be oval. The cyst wall is refractile, fairly thin and has a double contour. The nuclei appear as refractile bodies.

The chromatoid bodies appear as refractile bars, or rods, with blunt ends. The cytoplasm is free from inclusions and appears clear.

In iodine preparations (5% aqueous potassium iodide saturated with iodine and diluted with equal parts of distilled water for use) the cyst and nucleur walls appear dark brown, and the karyosome appears as a refractile dot. In iron hematoxylin preparations the cytoplasm appears bluish gray, the chromatoid bodies as black rods with blunt ends, the karyosomes and nucleur walls black. The glycogen and chromatoid bodies are usually absent.

In cysts with one or two nuclei the nuclear membrane is usually the same as in the trophozoite, but in the four nuclear stage the nuclei are smaller and the membrane finer.

DIFFERENTIAL CHARACTERISTICS OF THE INTESTINAL AMOEBAE OF MAN.

The main criterion upon which the differences are based is largely the nuclear structure which involves the thickness of the nuclear membrane, size, type and position of the karyosome, linin network (delicately stained fibrils in spaces between the karyosome and the nuclear wall), and chromatin granules. In addition to the nuclear structure, various other features are important - the number and type of nuclei, the type of chromatoid bodies, and the glycogen.

(A). ENTAMOEBA HISTOLYTICA.

Trophozoite: Cytologically the trophozoites have clear, glass-like etcoplasm and finely granular endoplasm. The motility is usually in a straight line by means of a single large blade-like pseudopodium which moves rapidly and explosively. Usually the nucleus flows into the pseudopodium first, the red blood cells and the finely granular material follow the nucleus into the pseudopodium. In fresh bloody mucous stools (from acute cases of amoebic dysentery) the motility is very rapid. In old stools the motility is more sluggish and the pseudopodia are blunt and blade-like.

Precysts: Before encystment, the organism becomes round or slightly oval, hyaline (by ridding itself of ingested material), smaller in size, and loses motility completely or it may continue to send out very blunt pseudopodia. The nucleus consists of a delicate wall lined internally with a ring of small refractile chromatin granules. In the centre of the nucleus is a small karyosome. The precyst secretes a delicate wall and encysts.

CYSTIC STAGE: Size 5-20 m. (small variety, 5-12 m. large variety 12-20 m.) The cysts contain 1-4 nuclei, although as many as 8 have been described. The nuclei have characteristic structures - thin nuclear membrane composed of

fine/

fine granules of chromatin and a very small centrally placed karyosome.

Young cysts have typical chromatoid bodies - rods with blunt ends. These show up best in moist preparations. In iodine stained preparations, brown staining glycogen may be seen. Both the chromatoid bodies and the glycogen disappear when the cysts are old.

(B). ENTAMOEBA COLI.

Trophozoite: The trophozoites vary in size from 15-50 m. the average size being about 20-25 m. As a rule there is no differentiation between the ectoplasm and the endoplasm. There are many food vacuoles containing ingested material - bacteria, crystals, starch, grains, pus cells, yeast cells, flaggellates and Entamoeba Histolytica cysts. The organism moves sluggishly in one direction for a short distance, halts, produces a pseudopodium from another portion of the body, and moves in another direction, chiefly by changing its shape. Occasionally one encounters very motile Entamoeba Coli which may be confused with Entamoeba Histolytica. In such an event careful examination will reveal ingested debris, bacteria etc. which does not usually happen with Entamoeba Histolytica. In case of doubt, stained preparations should be made, using the iron-hematoxylin method and the nuclei should be studied carefully. Repeated direct stool examinations should be made, as well as cultures.

Cytologically, the organism contains a visible nucleus surrounded by a thick membrane composed of coarse chromatin granules. The karyosome is fairly large and usually to one side of the centre. Chromatin granules are present in the clear zone between the karyosome and the nuclear membrane.

Precystic Stage: 15-30 m. In this stage it is frequently difficult to differentiate Entamoeba Histolytica from Entamoeba Coli. As a rule, however, Entamoeba Coli has a thicker wall, the cytoplasm is more granular, and the chromatin granules are coarser.

Cystic/

Cystic Stage: 10-30 m. (average size 14-20 m.) The cysts of Entamoeba Coli have fairly thick walls. There are 1-8 nuclei (16-32 have been described). The karyosome is usually large and eccentric. The chromatoid bodies are needle or splinter-like, with sharply pointed ends. Glycogen is present in young cysts. In the single nuclear stage the nucleus is large, becoming progressively smaller with the increase in the number of nuclei.

(C) ENDOLIMAX NANA.

Trophozoite: 8-15 m. The cytoplasm is granular, containing food vacuoles filled with bacteria, yeasts and debris. The motility is by means of short, blunt, hyaline pseudopodia, which are thrown out and withdraw slowly. In fresh material or in cultures the motility may be by means of slender, finger-like pseudopodia. The nucleus has an indistinct wall without chromatin granules. The karyosome is large and irregular.

Precystic Stage: 5-12 m. In unstained preparations the cysts appear as refractile, colourless round or oval. The cytoplasm is free from vacuoles, bacteria and debris.

Cystic Stage: 5-12 m. In unstained preparations the cysts appear as refractile, colourless, round or oval bodies containing 1-4 nuclei. In stained preparations the characteristics stand out plainly - there are 1-4 nuclei with faint nuclear membranes and no chromatin granules. There is a large central or eccentric karyosome in each nucleus. Glycogen is rarely seen.

(D) IODAMOEBA BUTSCHLII.

Trophozoite: 5-20 m. or larger (average 10-15 m.) It is a small amoeba moving sluggishly, as a rule, by means of broad, round and hyaline pseudopodia. In living trophozoites the nucleus is frequently invisible. In well stained preparations, however, the small nucleus with its large central karyosome, shows up well. The nuclear membrane is usually achromatic. Between the

karyosome/

karyosome and the nuclear membrane is a zone filled with granules. When the preparation is well stained the linin network (between the karyosome and the nuclear membrane) shows up. The cytoplasm is homogeneous and finely granular, containing food vacuoles filled with bacteria, crystals and various debris.

Precystic Stage: In this stage the organism is free from food vacuoles; it appears clear, glassy white and contains a large nucleus. It rounds up, secretes a cyst wall and encysts.

Cystic Stage: 6-20 m. (average 9 - 12 m.) There is a great variation in shape of the cysts; round, oval, rhomboidal etc. There are one or more glycogen masses staining from pale to mahogany brown with iodine. Usually there is only one nucleus, rarely two. The nucleus differs in that the granules are massed at one pole and the karyosome is pressed toward the wall, producing a "signet ring" appearance.

(E) DIENTAMOEBA FRAGILIS.

Trophozoite: Usually described as being small, about 12 m., but they may be quite large, as large as Entamoeba Histolytica. The organism moves rapidly by means of flattened, leaflike, hyaline pseudopodia. There is differentiation between ecto and endoplasm. The cytoplasm may be finely or coarsely granular, containing food vacuoles filled with bacteria, yeast cells, starch grains etc. The most important diagnostic feature is the presence of two nuclei. On dividing, the organism results in two uninucleate individuals, the nuclei of which divide, resulting in binucleate organisms. The nuclei are bounded by fine membranes. The karyosome is usually in the centre, but may be at one side of the nucleus. The karyosome is composed of granules, usually only four large, deeply stained chromatin granules.

LIFE HISTORY.

SUMMARY OF LIFE HISTORY OF ENTAMOEBA HISTOLYTICA.

The active vegetative entamoebae live on the tissues of the gut wall where they ingest blood corpuscles and multiply by division.

In the earliest amoebic lesions the amoebae make their way into the follicles of the large intestine where they multiply and partly by pressure, partly by the secretion of a cytolysin make their way into the interglandular tissue and produce a small amoebic abscess of the mucosa. In time this abscess bursts and becomes an ulcer. A certain proportion of amoebae leave the ulcers they produce, enter the lumen of the bowel, encyst, and pass out with the foeces.

The precystic individuals free from protoplasmic inclusions, are smaller than the ordinary forms which continue to multiply in the tissues. The typical cysts, smaller than the precystic forms, are quadrinucleate when mature. When swallowed by any human host they pass into the small intestine, where they hatch into amoebulae, which in turn attack and invade the tissues.

A characteristic feature of amoebic infection of the intestine is the periodic variation in intensity of infection, which may either be connected with resistance on the part of the tissues of the host, or possibly may be a feature in the development of the parasite.

Occasionally, however, vegetative amoebae may migrate from their site of election in the bowel wall, and as tissue invading forms enter the venous system and be transported to the liver, exceptionally to the spleen, brain or lung, but by so doing they become unable to complete the cycle of development as observed outside the body, for precystic individuals and cysts never develop in these circumstances. Amoebic infection of the skin round the sinus of a discharging liver abscess has been reported.

ENTAMOEBA HISTOLYTICA CARRIERS.

The healthy carrier of Entamoeba Histolytica is an individual who has not suffered and is not suffering from dysenteric symptoms, but passes Histolytica cysts though otherwise in perfect health. Such cyst passers must have active Entamoebae living in their tissues.

The cyst carriers may now be divided into two classes - firstly the contact who has never suffered from amoebic dysentery, and secondly the convalescent who has recovered from such an attack. It is now known that for every abnormal person who is suffering from amoebic dysentery with the passage of vegetative forms which are non-infective to others, there are large numbers of healthy persons who continue to pass Entamoeba Histolytica cysts, and thus constitute a perennial source of infection.

Vegetative Entamoebae must in either case live at the expense of the tissues of the host. I have found on several occasions on postmortem examination, extensive bowel ulceration without visible symptoms of dysentery having been present during life, and it is a matter of common experience that liver abscess may occur in these circumstances. Lesions of the mucosa may even be of miscropic proportions. Cytolosis and necrosis of the superficial epithelium takes place and is followed in the majority of instances by rapid regeneration of the epithelium, so that the probability is that only a small percentage of those infected actually show clinical evidence of amoebic dysentery.

The experiments of Walker and Sellards upon man showed that out of 20 men fed with Entamoeba Histolytica, 18 became parasitized, but only 4 developed dysenteric symptoms, though the remainder continued to pass typical cysts in their stools.

By intrarectal and intracaecal injection of foeces containing cysts, into cats and puppies,

ulceration/

ulceration of the bowel wall has been produced, but although the foeces may be swarming with active vegetative forms, no cyst-formation has ever been observed in these animals. Small lesions can be produced in kittens by intrarectal injection of artificial cultures of Entamoeba Histolytica.

Loesch in 1875, is said to have infected a dog, but the cat is the animal most readily infected, e.g. Dale and Dobell in 1917 (Reference 13) and Wenyon and O'Connor in the same year (Reference 14)

Macfee (Reference 15) states that cysts of Entamoeba Histolytica have been found to be carried by cockroachs.

The infection in passers of Entamoeba Histolytica is remarkably persistent, and in all probability unless anti-amoebic treatment is instituted these persons continue to pass cysts for the remainder of their lives. I firmly believe that everyone who harbours the cysts of Entamoeba Histolytica is a candidate for some more serious lesions due to the parasite, and that therefore every carrier should at once receive adequate treatment.

Walker's (Reference "B") classical experiments in Manila, in which Entamoeba Histolytica was fed to human beings, are of more than passing interest. Of 20 men who ingested Entamoeba Histolytica, 17 became parasitized following the first feeding, and one required three successive feedings, although all had been prepared with magnesium oxide as a neutralizing agent against the acidity of the gastric secretions. It is doubtful if parasitization would have occurred had they not been so treated. The lapse of time from ingestion of infectious material to the appearance of entamoeba in the stools varied from 1-44 days, with an average of 9 days.

Of great importance is the fact that of the 18 men experimentally parasitized, only 4 developed dysentery, and these were infected with

cysts/

cysts from healthy carriers. The incubation periods were 20, 57, 87, and 95 days. This latency is characteristic of the disease, and such latent infections may follow adjuvant causes such as fatigue, alcoholic excess, chilling etc., but may be entirely due to the chronocity of the ulcerative process.

Walker concludes that the chief, if not the exclusive, sources of infection lie in the chronic latent cases or carriers, because of their relative prevalence. Added difficulties arise in the fact that the condition exists indefinitely, the parasitization is unsuspected for years, and the carriers shed continuously or intermittently, enormous numbers of cysts.

The difference in the Pathogenicity between different strains of amoebae was made the purpose of an investigation by Frye and Meleney (Reference 19) working in the Department of Preventive Medicine and Public Health of the Vanderbilt University, which shows that various strains of amoebae may vary in virulence.

They studied five strains of Entamoeba Histolytica, two from a community of the hill country of Middle Tennessee, one being a symptomless carrier and the other a case of chronic dysentery. Two additional strains were obtained from acute cases in Western Tennessee, and the 5th was from another symptomless carrier.

The investigators concluded that bacteria, or their products, or some other substances in the culture of Entamoeba Histolytica, apparently do sometimes play a part in the production of lesions in the kittens' intestine, the trial animal in these studies, but that they are not an important factor in the differences in pathogenicity between different strains. This difference is probably due to a difference in the pathogenic activity of the amoebae themselves.

TRANSMISSION/

TRANSMISSION.

It is generally conceded that the most important methods of transmission of Amoebiasis are through a polluted water supply; by means of infected food handlers; through vegetables contaminated by polluted water or sewage; and by the droppings of flies or other insects that have fed upon material containing the cysts of this organism. Of these methods it is certain that the most important are transmission by polluted water and by infected food handlers.

Spector and Buky in 1934 (Reference 16) found that cysts of Entamoeba Histolytica perished within 10 minutes when dried upon the hands of volunteers, which had been grossly soiled with foeces containing them, and these investigators conclude that the result of their experiments demonstrate that transmission by food handlers is not a very important source of infection.

However, it should be remembered that even so short a period as 10 minutes, is amply sufficient for a food handler to contaminate food if it is handled directly after the carrier leaves the toilet, as very frequently happens, and Andrews in 1934 (Reference 17) has demonstrated that the cysts of this amoeba may remain in the finger nails of unwashed hands in a viable condition for periods varying from 5 to 45 minutes, and concludes that "the short survival period of Entamoeba Histolytica cysts on the surface of fingers is no serious impediment to the acceptance of the proposition that food handlers may play a role of considerable importance in the dissemination of Amoebiasis".

Spector, Foster and Glover (Reference 18) in 1935 examined the hands of 74 carriers of Entamoeba Histolytica immediately after passing their foeces in the usual manner, and found that five of them were positive for the cysts of this parasite. The fact that as many as five did show contamination is sufficient proof of the importance of the infected food handler in the transmission of the disease.

Water polluted with material containing Entamoeba Histolytica has been recognised as an

important/

important method of transmission ever since the discovery of the etiological relationship of the parasite to amoebic dysentery. Almost every writer and investigator has called attention to polluted water as a common method of transmission where the disposal of foecal matter was not under sanitary control, so that the mere fact that water may transmit this infection was well known before the discovery of the relationship of the cysts of Entamoeba Histolytica to transmission. After the discovery of cysts it was demonstrated by several investigators that these may live in water for a period varying from days to weeks, depending upon the amount of foecal pollution and conditions of temperature.

Craig's experience in the Philippines during the Philippine insurrection is an example. During that time the troops were engaged in active operation in the field, amoebic dysentery was very prevalent, occurring in veritable epidemics, and it was the consensus of all who studied these outbreaks that they were due to the drinking of polluted water from wells, springs and local tanks, for when the troops returned to their permanent camps where there was a carefully guarded water supply and sanitary precautions regarding food handling were enforced, amoebic dysentery soon ceased to be a factor of importance in the health records.

That these local epidemics were not due to bacillary dysentery was conclusively demonstrated by laboratory observation, for bacillary dysentery was also prevalent among the troops in certain regions, and the distinction between the two forms was insisted upon by the Authorities and made in the army laboratories.

The Chicago epidemic of 1934, and still later outbreaks in that city, caused by drinking polluted water, described by Bundsen (Reference 19) are merely the most recent examples of the epidemic occurrence of amoebic dysentery when conditions are favourable.

There can be no doubt that where cross-connections exist between a domestic water supply and one unfit for domestic use because of sewage pollution, or cross-connections between a domestic supply and a sewer, there is always present a potential danger of infection, and that mass infection, severe in type, may occur in this manner.

Amongst /

Amongst the natives in Natal, who live in primitive huts, and whose ideas of sanatory hygiene are non existent, a nearby well or stream usually provides the only source of drinking water for the community. As the rainy season lasts for six months in the year and thousands of natives rely on the fertile soil of the valleys for their produce, it is not surprising that Amoebiasis is rife amongst them.

Amongst those natives who depend solely on rain water for their drinking supply, the incidence of Amoebiasis is not very much less and I attribute this to the family habit of eating all food by hand from a communal pot.

The incidence of Amoebiasis in the European population of Durban has been proved to be very much greater in the families who buy from the Indians and native gardeners, than in those who grow their own vegetables and salads. This is easily accounted for by the fact that the natives and Indians often use their own excreta for the purpose of fertilizing the soil.

INCIDENCE OF CARRIERS.

Mention must be made of surveys made in various parts of the United States to determine the incidence of carriers.

One is the paper by Naus and Salinger (Reference 20). These investigators examined 800 patients, two thirds of whom came from the Gastro-Intestinal Service of the Cornell Pay Clinic.

In most cases material was obtained from single protoscopic examinations. Only a single specimen was examined. None of these patients gave a history of diarrhoea. In this group were 222 food handlers. In the entire group 5.4% were positive for Entamoeba Histolytica.

Craig in his book on Amoebiasis has discussed in detail the incidence of this disease in various parts of the world. He refers to 18 surveys covering 49,000 persons made in various

parts/

parts of the United States. In these surveys 11.6% of those examined were found to be positive.

In 1937, 100 consecutive admissions into the Fracture Ward at the King Edward Hospital were investigated by me for the presence of amoebic infection. Three stools on consecutive days were examined in each case. In 19 cases, cyst forms of Amoebiasis were found, and in 5 active trophozoites were present. Of these five, only one complained of diarrhoea.

PATHOLOGY.

The earliest lesion of amoebic dysentery consist of minute yellow hemispherical elevations of the mucosa, which mark the site of a deeper lying zone of necrosis. By growing in size and breaking down, they form flask-shaped ulcers, the bases of which lie in the submucosa. These lesions are scattered throughout the large intestine, and rarely extend above the ileocoecal valve.

Although I have never met with the condition, amoebic ulceration of the ileum is said to occur. Two cases have been reported by Biggam; both were acute and rapidly fatal cases, and in neither instance were amoebae found in the stools, but by scraping the lesions themselves.

The ulcers may not be larger than a pin head, or may enlarge to an inch or more in diameter, and as the disease progresses may become even larger. In this case the margins are rolled, the edges are undermined and the bases generally formed by the fibres of the muscular coat. The lesions themselves are usually capped by yellowish, greenish or even black sloughs, which may be of considerable thickness, and may project into the lumen of the bowel. The lesions, as a rule, begin in the caecum, and are scattered throughout the transverse and sigmoid colon and the rectal canal, though the intervening mucous membrane remains healthy.

As a general rule amoebic lesions extend throughout the large bowel as far down as the

Internal/

internal sphincter.

Thrombosis of the blood vessels, in which the entamoebae are often found, occurs at the bases of the lesions, and often by a process of erosion, the arteriole may be opened and severe haemorrhage result; perforation by ulcers and even massive gangrene of the gut may occur occasionally especially in the neighbourhood of the caecum and lead to fatal peritonites. (Case 8 is an example.)

In the healed or healing gut cicatricial pigmented scars mark the sites of the lesions. Adhesions may form between proximal coils of intestine. These may be matted together or adherent to the liver and spleen. The intestines themselves are very friable and tear readily when handled.

INVOLVEMENT OF APPENDIX.

It is an interesting and curious fact that inflammation of the appendix amongst the natives of Natal is a comparatively rare occurrence, and a big proportion of such cases have been proved from the scrapings of the lumen of the removed appendices to be of amoebic origin.

An amoebic inflammation of the caecum and ascending colon is not by any means rare and many such cases are sent into hospital, usually with a diagnosis of appendicitis or appendix abscess. Cases 13 & 15 are examples of this condition, which responded promptly to treatment of emetine. Case 17 is the record of such an amoebic infection of the caecum in which laparotomy was performed with a subsequent fistula formation and very prolonged convalescence.

Lenz in 1910 reported one case of appendicitis in amoebic dysentery. The appendix was removed, but as far as the report shows was not examined to determine whether or not amoebae were present.

Le Roy/

Le Roy des Barres, in 1912, reported three cases of appendicitis occurring in conjunction with or following amoebic dysentery.

Vives in 1918 stated that true appendicitis may occur in acute dysentery, ulceration of the appendix giving rise to the clinical symptoms of appendicitis.

Lund and Ingram in 1933 (Reference 21) reported four cases, one of which had typical symptoms and laboratory findings of acute appendicitis, in which diarrhoea was not present until the day following operation. Postmortem microscopic examination of the ulcers of the bowel revealed Entamoeba Histolytica infection. In one case exploratory laparotomy and appendectomy were performed. At autopsy the large intestine was found to be greatly distended with granulomatous masses at the caecum, transverse colon and rectum, all of which were the sites of extensive ulceration.

Weinberger (Reference 22) in 1934, reported a case of appendicitis with typical symptoms of acute attack. The appendix was removed promptly and the following day the patient developed diarrhoea. On stool culture bacillus dysenteriae was found more than 10 days later, and about 30 days after the initial attack Entamoeba Histolytica were found in the stools.

Asher and Kraemer (Reference 23) in 1934 in reporting five cases of Entamoeba Histolytica infection observed in private practice in New Jersey, found that appendectomy had been performed on two of them without relief of symptoms.

GRANULOMATA.

When the inflammatory process is a chronic one, there is a considerable compensatory hypertrophy of the bowel wall. Granulomata are formed whose physical signs are often suggestive of carcinomata.

Recently I was asked to be present at the operation of a patient of a colleague. This

patient/

patient had been diagnosed as a case of carcinoma of the ascending colon and a laparotomy had taken place five weeks earlier, at which this diagnosis was formed. A large hard mass was seen to be encircling the bowel. An ilio transverse colostomy was performed and the abdomen closed, as it was the intention of the surgeon to resect at a later date the portion of ascending colon involved. At the second operation, at which I was present, on exposing the ascending colon, to the great consternation of the surgeon, the large hard mass previously examined had disappeared, and there was in its place a soft area of thickening of the bowel wall with what appeared to be a cicatricial constriction at its distal end. This area of bowel was removed, ulcers were present in the mucous membrane and on examination of the scrapings of these ulcers active amoebae were found. Anti-amoebic treatment was instituted immediately after the second operation, and the patient recovered. Microscopic examination of sections of the bowel proved that the condition was purely inflammatory.

Gunn and Howard in 1931 (Reference 24) reported three cases of granuloma of the large bowel caused by Entamoeba Histolytica infection, and called attention to the similarity of amoebic granulomata to malignant tumours of the large bowel, and that the symptoms, physical signs and radiologic appearances in such cases may be identical to those produced by carcinomata. Diagnosis of carcinomata was made in these three cases. They have seen several instances in which Amoebiasis and carcinomata were present at the same time.

Kartulis reported a case of Entamoeba Histolytica infection in which the wall of the large bowel reached the thickness of 22 cm.

Rogers (Reference 25) refers to two cases of supposed carcinoma in which amoebae were found, and in which recovery was complete after treatment by emetine.

Reed and Anderson (Reference 26) state that amoebic tumours tend to disappear with medical treatment, but their failure to do so

does not rule out an amoebic lesion.

POLYPOSIS.

In chronic Amoebiasis, polypoid, and, it may be, gangenous tags, hang into the lumen of the gut, the intestinal contents may be composed of dark almost black haemorrhagic foecal matter, possessing a characteristic penetrating odour.

Hines (Reference 27) has described a case of polyposis of the colon in which "the colon mucosa presented no gross sign of ulceration, but was the site of multiple confluent polypoid masses". He describes the frequent formation of polypoid masses at the margins of healing dysenteric lesions.

Reed and Anderson (Reference 26) suggest that this is a possible method for the development of cancer from an amoebic lesion through the transitional stage of polyposis or small adenoma.

AMOEBIC HEPATITIS AND LIVER ABSCESS.

In the early stages of liver involvement there is a general congestion and enlargement, the result of massive portal infection with amoebae, a portal pyaemia in fact. It appears probable that the great majority of these organisms become destroyed by the resulting tissue reaction. Those that survive multiply and cause necrosis of the surrounding liver cells and the starting point of a liver abscess.

Cytolysis of the tissue cells is brought about by the action of the rapidly multiplying amoebae, but there comes a time when the amoebae themselves are destroyed by the products of their own activity. Sterile amoebic

abscesses/

abscesses at this stage are naturally liable to become secondarily infected with pyogenic organisms as occasionally happens.

As originally pointed out by Councilman and La Fleur, the primary lesion is a central necrosis of the liver lobule. This may or may not be a prelude to abscess formation. This statement was confirmed by Manson-Bahr in Fiji. Those cells in the immediate vicinity of the portal vessels are the least affected by the necrotic process, while those at the periphery are undergoing vacuolization.

In some instances this condition may be more or less confined to one lobe or even part of a lobe. Later, as we know from observations in cases that have died from their attendant dysentery, one or more grayish ill-defined anaemic circular patches are formed, ½ - 1 inch or more in diameter, in which the lobular structure of the gland cannot be made out. These gray spots are very evident on section of the organ - a drop or two of a reddish greenish pus may be expressed from the necrotic patches, for such they are.

Still later the centres of these patches liquify, and distinct but ragged abscess cavities are formed. An abscess thus commenced extends partly by molecular breaking down, partly by more massive necrosis of portions of its wall, partly by the formation of additional foci of softening in the neighbourhood, and subsequent breaking down of the intervening septa.

The walls of such an abscess have a ragged and rotten appearance. As the abscess enlarges so the zone of necrotic tissue becomes narrow. The character of the contained pus also changes during the evolution of the abscess and it occasionally becomes secondarily infected with streptococci and other organisms, when it may assume a brownish or greenish colour.

Liver abscesses may be single or multiple. When single the abscess sometimes

attains/

attains a great size. Frequently it is as large as a coconut or even larger. It has happened that the entire liver with the exception of a narrow zone of hepatic tissue has been converted into a huge abscess sac. When multiple the individual abscesses are generally smaller, ranging from the size of a filbert to that of an orange.

I was present at the postmortem examination of a native who died as the result of unrecognised hepatic Amoebiasis. There were seven distinct abscess cavities - three of which were inter-communicating. Most of them were about the size of golf balls and were full of creamy coloured pus. One cavity, however, was larger than the rest, being the size of an orange, and contained pus of a typical chocolate appearance.

From his symptoms as related to me, he appeared to have been suffering from pain for about six months, and was being treated by a native witch-doctor. He was extremely emaciated, and I formed the opinion that the creamy coloured abscess had been present for months and the large chocolate abscess was probably of more recent development.

As might be expected from consideration of the relative size, single abscess is much more common in the right than in the left lobe. What might be termed the seat of election is the upper part of the right lobe. Adhesions to surrounding organs are frequently, though not invariably, formed as the abscess approaches the surface of the liver. In this way the danger of intra-peritoneal extravasation is often averted. In case 9, at operation, adhesions were found but in this case they did not prevent intraperitoneal rupture.

Pulmonary inflammation and abscess from escape of liver pus into the lungs is an occasional complication of liver abscess. Case 17 is an example of this condition.

Generally the pulmonary abscess communicates with the mother abscess in the liver

by/

by a small opening in the diaphragm, the pleural sac usually, though not invariably, being shut off by adhesions.

The naked eye appearance of liver pus is peculiar and almost characteristic. When newly evacuated it is usually chocolate coloured and streaked or mixed with larger or smaller clots or streaks of blood, and here and there with streaks of clear mucoid, or yellowish material. It is so thick and viscid that it will hardly soak into the dressings. It lies on the surface of gauze like treacle or bread, spreading out between the skin and the dressing and finding its way past the edge of the latter rather than penetrating it.

When quite fresh, here and there little islands of what may be described as laudable pus may be made out in the brown mass. Sometimes it contains considerable pieces of necrotic tissue. Occasionally from a mixture of bile, the abscess contents are green tinged. They are rarely offensive unless the abscess lies near the colon, in which case it may have a foecal odour. Under the microscope many blood corpuscles are discoverable, besides much broken down liver tissue, large granular pigmented spherical cells, leucocytes, debris, oil globules, haematoidin crystals, and occasionally Charcot-leyden crystals, and Entamoebae. When secondarily infected with organisms, streptococci or B. Coli are found.

CLINICAL TYPES.

It is readily understood that any clinical classification is difficult because of the tendency of the symptoms to merge from one class into another. Conveniently there are five classes :-

(1) Dysentery with acute malignant onset and course: Fever and prostration are often present and the frequent bowel movements are attended by severe colic and bleeding.

(2) Amoebic diarrhoea and dysentery with sub-acute onset and course: This is the common

type/

type of amoebic bowel disturbance. It tends to become chronic or to show irregular exacerbations.

(3) Chronic uncomplicated intestinal Amoebiasis: This includes the so-called carrier state and the condition of recurrent or mildly persistent symptoms.

(4) Extra-Intestinal Amoebiasis: which for practical purposes consists chiefly of hepatitis and liver and lung abscess. Abscesses of other organs are extremely rare.

(5) Sequelae of Amoebiasis include various types of chronic bacterial colitis, spru, cancer, polyposis, cirrhotic liver changes and fibrotic lung changes, and mechanical defects such as stricture or scarring of the colon.

SYMPTOMOTOLOGY.

The great majority of cases of amoebic dysentery run achronic course with frequent intermissions and relapses. In fact, the capacity for latency is one of the most striking and characteristic features of the disease. The onset is generally insidious and the patient may complain more of diarrhoea than of dysenteric symptoms. Perforation of the bowel, leading to fatal peritonitis has been known to occur in a patient who, judged by clinical data, was not considered to be suffering from dysentery at all. In mild cases of amoebiasis, the patient generally complains of sudden attacks of diarrhoea.

Abdominal tenderness is as a rule much less acute than in bacillary dysentery and often has a definite distribution over the caecum, transverse colon or sigmoid colon. When ulceration occurs, in the rectum, tenesmus and straining may be present. The stools are larger than those of bacillary dysentery and may not number more than three or four in the twenty-four hours. As a rule they contain much dark and altered blood, which imparts a penetrating and foetid odour. In consistence and appearance they have been compared

to/

to anchovy sauce. When mucus is passed, it is streaked with blood and occurs as flecks scattered throughout the foecal mass. Occasionally however, the motions may be formed and only streaked with blood and mucus. Gangrenous sloughs may be passed. Unless the case is complicated by hepatitis, when the liver is painful and enlarged, there is often little fever and no toxic manifestations.

Acute cases of amoebic dysentery with urgent painful and severe clinical manifestations are less commonly met with. The patient as a rule becomes progressively emaciated but some subjects remain in remarkably good condition although suffering from repeated relapses.

As a general rule, in uncomplicated amoebic dysentery there is no pyrexia. Irregular fever sometimes observed is due to septic absorption from the bowel. A moderate leucocytosis of from 10,000 to 12,000 leucocytis is usual.

Intestinal amoebiasis is not always associated with dysentery or diarrhoea. It may occasionally be marked by obstinate constipation and by the association of intestinal pains or disturbances. Such symptoms as nausea, distension of the abdomen after meals, capricious appetite, attacks of urticaria, inability to concentrate and impairment of memory, headache, sallow complexion and loss of weight are frequently present.

INCUBATION PERIOD.

Walker and Sellards experimented with 20 men who volunteered. Seventeen became parasitized, but only four men developed symptoms of acute dysentery; the average duration before these symptoms appeared was 34 days. In the recent Chicago epidemic, the incubation period was very short, in most cases as early as four days after exposure (Reference 28). Such a short period is rarely observed in those with dysentric symptoms. It is inferred from these periods of incubation that there must be enormous doses of cysts ingested by the exposed individuals.

SYMPTOMS /

SYMPTOMS OF LIVER ABSCESS.

The common early symptoms of liver involvement are a sense of weight and fullness in the right hypochondrium followed by sharp stabbing pains over the hepatic area, with perhaps a dry cough which makes the pain more apparent.

In a considerable proportion of cases a sense of uneasiness, or actual pain, rheumatic in character, is felt around the right shoulder joint, especially at night time. Usually the pain and tenderness are in the skin around the acromial region. It is reflex in character due to the irritation of the phrenic nerve, is reflected through the fourth cervical route, from which the supra-acromial and supra-clavicular cutaneous nerves arise in the cervical plexus, and is the same pain as is encountered in inflammatory conditions of the lung and pleura, and caused by diaphragmatic pleurisy.

In left lobe abscess the pain is referred to the left shoulder joint. Fever soon follows, particularly towards evening and a few short rigors may occur. There is loss of weight and the complexion assumes a curious muddy, yellow tinge. The quotidian rise of temperature becomes a regular feature, the evening temperature often reaching 102° and sinking below normal in the morning. The pyrexial bouts are accompanied by most profuse sweats, necessitating frequent changing of clothing during the night. The patient becomes emaciated and his tongue furred, the extremities cold and clammy, the breathing is shallow and mainly thoracic, sometimes an actual fullness in the epigastrium may be observed.

Considerable discomfort, and it may be deep seated pain are produced by palpation and heavy percussion over the right hypochondrium. In the majority of cases the lower border of the liver is found to be enlarged below the costal margin. Often it extends upwards for an inch or more above the normal limit. It may be further observed that the line of dullness is arched along its upper border and that it is altered by change of position, the upper line

descending/

descending when the patient lies on his left side, or when he stands up. Deep inspiration may give rise to acute pain. Sometimes one or two tender spots may be discovered in the lower intercostal spaces; the spleen is not enlarged. On auscultation a pleuritic rub may be detected at the base of the right lung, or signs of compression such as inspiratory crepitation, decreased breath sounds, and a dimunition of vocal fremitus may be noted at the right base. Pains are usually relieved by lying on the affected side.

In abscess of the left lobe, a tumour of variable outline, sometimes resembling in shape and position that of an enlarged spleen, may be present in the hypogastrium, and there is usually some involvement of the base of the left lung, but it must be remembered that a tumour which may be taken for an abscess in the left lobe of the liver may in reality be due to compensatory hypertrophy of the undamaged left lobe.

As the case progresses the patient becomes more emaciated, hectic fever with drenching nocturnal sweats continue, the liver dullness or pain may increase or the general enlargement may somewhat subside and percussion may reveal a local bulging. If the abscess which has now formed is not relieved by operation, the patient after months of illness will die from exhaustion, or the abscess, which has attained enormous dimensions, may burst into the right lung or pleura or elsewhere and be discharged, and either recovery or death from continued hectic fever or exhaustion or from some intercurrent complication, ensue. The blood shows a well marked polymorphonuclear leucocytosis of 15,000 to 35,000 per c.mm., though in some rare cases no rise of the leucocytes occurs.

The mean average of the differential count in Manson-Bahr's series of cases is 70.8% polymorphonuclears, 22% lymphocytes, 6% large mononuclears and 1% eosinophiles.

With liver abscess of long duration there is usually severe secondary anaemia. Very occasionally the blood changes may approximate those of the pernicious type.

Although/

Although the foregoing is a fairly common history in liver abscess, there are many instances in which the initial symptoms are much more urgent, and the disease progresses much more rapidly. In other instances, subjective symptoms are almost entirely absent, or so subdued that the true nature of the case may be entirely misapprehended until the abscess bursts through the lung or the bowel, or a fluctuating tumour appears in the neighbourhood of the liver, or perhaps until after death when the unsuspected abscess is discovered on the postmortem table.

Sometimes the initial fever is high and persists for a considerable time, but later it becomes distinctly quotidian and intermittent in type. There is not one single cardinal sign which may not be absent in hepatic abscess, thus large collections of pus have been noted unattended by fever of any description. Case 3 is an example. Marked rigors are rare and when present often indicate threatened rupture of the abscess through the diaphragm or into some viscus. The sweating accompanying the pyrexia usually takes place about the head and neck. Enlarged cervical and axillary glands on the affected side may sometimes occur, while rheumatic like pains and swellings, which may accompany any chronic specific infection, may be noted. Pain of some description is rarely absent, a sense of fullness and weight in the region of the liver, which may be referred to the infrascapular region, is commonly complained of. Stabbing and stitch like pains may be increased by pressure and especially by deep inspiration or coughing. Localised painful areas usually occur below the costal margin and indicate that the abscess is pointing in that direction.

Pain on swallowing at the moment the bolus traverses the lower end of the oesophagus has been recorded. Pain on firm pressure with the finger tips in an inter-costal space and over a limited area is a common and valuable localising sign. Pain in the shoulder is said to be present in about 1/6th of the cases, and

may /

may be the only symptom complained of. It may be noted before the advent of the fever.

Attention may be drawn to the respiratory symptoms, a cough of painful character, possibly due to reflex irritation of the diaphragm, may be a prominent symptom, while the respiration may be rapid and shallow. The patient usually lies on his back, inclining slightly to the affected side, the tongue is usually furred, the digestion disturbed, flatulence and diarrhoea are frequently noted. There may be concurrent dysentery.

The area of hepatic dullness is usually extended upwards and downwards. The upper line of dullness is not as a rule horizontal as in hydrothorax; usually on approaching the spine it turns downwards. The heart may be displaced laterally or upwards by pressure of the abscess when this is of large size. Tachycardia and cardiac irregularities may result from toxic absorption or from pressure.

Swellings in the epi- or hypogastrium may be noted, simulating closely intra-abdominal tumours, and in apyrexial cases their nature may not be suspected until they are aspirated. Varicosity of the epigastric veins may also be noted. Local oedema over one or more intercostal spaces is sometimes apparent, and often accompanied by bulging of the chest wall.

Friction rubs, pleuritic or peritoneal, may sometimes be found, while pneumonic signs at the right base indicate contiguity of the abscess to the diaphragm. The abscess may rupture into any contiguous organ and there produce spontaneous cure. Most generally it ruptures into the lung or pleura. When into the lung, the abscess contents may be suddenly coughed up in mouthfuls of frothy pus and blood, but generally this process is much more gradual - a few drachms being brought up at a time, and in favourable cases the expectoration gradually diminishes.

Amoebic/

Amoebic abscess of the lung resulting from trans-diaphragmatic rupture is liable to be mistaken for pulmonary tuberculosis. Amoebae are not usually found in the expectorated pus but on two occasions Manson-Bahr has been able to recognise striated muscular fibres from the diaphragm.

Arrest of the discharge may not mean recovery. Cessation of the cough may be followed by a rise of temperature, and a re-appearance of night sweats. The alternate emptying and filling of the abscess cavity may recur many times before recovery takes place.

The appearance of expectorated liver pus is usually pathonemonic, being chocolate brown in colour and particularly viscid. When haemorrhagic, these cases are very apt to be treated as examples of tuberculous haemoptysis. Rupture into the pleura may lead to a suddenly developed pleural effusion which may give rise to all the signs of empyema. Aspiration above the line of pus in these cases may yield a clear yellow and highly albuminous pleuritic fluid.

An hepatic abscess may rupture into the stomach causing vomiting of pus; into the bowel causing diarrhoea and discharging of pus into the foeces; into the peritoneum, as in Case 11, or it may burst with fatal results into the pericardium.

Finally, spontaneous rupture may take place through the skin of the abdominal wall, and the abscess thus empty itself in a painless and natural manner. This is the most favourable natural cure of liver abscess. The skin itself may become secondarily infected with amoebae.

DIFFERENTIAL DIAGNOSIS.

The differential diagnosis has to be made from many conditions in which blood and

mucous/

mucous is passed in the stools and is, of course, the differential diagnosis from all other forms of dysentery, colitis and even intestinal disease.

There is one aspect, mainly the differential diagnosis from malignant disease of the bowel, which deserves emphasis. Many observers (Gun and Howard, Reference 24) have described a hypertrophic form of intestinal Amoebiasis - an amoebic granuloma which may affect different portions of the large bowel, caecum or sigmoid, for instance, and which may produce tumours 12 cm. or 10 cm. in extent, and on account of these physical characters may resemble carcinoma very closely. Cases 13, 15 are examples of granulomatus thickening of the caecum, which very closely resembled an appendicular abscess, but which subsided on specific treatment. The process consist of an isolated ulcer with progressive erosion of the bowel wall in response to long continued secondary infection. Large amounts of aedematous granulation tissue appear, and the process may affect the entire bowel wall and the neighbouring mesocolic fat.

Differential diagnoses are considered in more detail later, but the general superficial resemblance to diverticulitis must be stressed. Generally it is safe to regard an acutely developing diarrhoea as being of bacillary or amoebic origin. The clinical distinctions are often unreliable. Possibly some assistance may be obtained from the more rapid onset, the febrile condition, and the rapid pulse, in the bacillary disease. As a rule the number of stools in bacillary dysentery is greater and their bulk less. The character of the stools should be taken into consideration. Usually they contain more dark blood, and occasionally they may be tarry-like melaena, almost suggesting duodenal ulceration.

In these circumstances, laboratory diagnosis should be resorted to, the clinician having regard to the experience of the observer

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and his ability to determine whether any amoeba-like body discovered in the foeces be Entamoeba Histolytica, Entamoeba Coli, or merely large tissue cells. With practise this becomes comparatively easy. Entamoeba may be absent in some portions of a stool, though numerous in others. Several preparations must be searched, and whenever possible a portion of mucous must be picked out for examination.

The organisms may be difficult or almost impossible to detect in a specimen containing much congealed blood, and it is important that the specimen should be as fresh as possible. The discovery of active amoeba containing ingested red blood cells is generally sufficient to clinch a diagnosis of Entamoeba Histolytica. In the more chronic and latent forms of the disease, the characteristic cysts must be searched for. No examination should be considered as completely excluding an amoebic infection until the stool has been searched on three consecutive days.

The cultural method may assist diagnosis in scanty infections. In all microscopic examinations of the foeces, the amoebae tend to congregate in masses or clumps so that they may be found in one field and not in another. In cases in which there is any doubt as to the identity of the cysts, staining of the films by the addition of Weigerts iodine solution (Iodine 1 part, Pot. Iod. 2 parts, water 100 parts) renders the details much more evident.

Many authorities are of the opinion that Charcot-Leyden Crystals are encountered solely in the foeces in amoebic dysentery, and they regard their presence in this situation as being of considerable diagnostic importance. The crystals vary very much in size, averaging 5 to 25 m.; their typical shape resembles that of a whetstone and they are soluble in warm water, strong mineral acids and alcohol. They may also be obtained in the scrapings of the bowel wall through the sigmoidoscope.

Manson-Bahr/

Manson-Bahr (Reference 29) emphasises the danger of placing too much stress on the presence of these crystals as necessarily diagnostic of intestinal amoebiasis. He has encountered these crystals in association with malignant disease of the rectum, with mucous colitis and with various helminthic infections.

An additional feature which may serve as a means of differentiation from bacillary dysentery is the moderate leucocytosis of 10,000 to 15,000 with a low proportion of polymorphonuclears, which usually accompanies intestinal Amoebiasis.

COMPLEMENT FIXATION TESTS.

Mainly due to the studies of Craig in America, it has been demonstrated that specific complement fixing bodies are to be found in the blood serum of individuals infected with Entamoeba Histolytica, when alcoholic extracts of these organisms are used as antigen.

Craig (Reference 30) in a series of contributions described the technique employed in the test and the practical application of it in the diagnosis of human cases of Amoebiasis.

He used a human haemolytic system, the sera were inactivated at 50°C. for one-half hour, and the antigen was an alcoholic extract of 48 hour old cultures of Entamoeba Histolytica grown on the Boeck-Drbohlav medium.

Craig (Reference 30F) concludes following on analysis of the results of the test in 1,000 individuals, that:-

(1) Normal individuals, though suffering from other infections or diseases do not give a positive fixation reaction with the prepared antigen unless there is a coincident infection with Entamoeba Histolytica.

(2) /

(2) The specific complement fixation bodies disappear from the blood serum following anti-amoebic treatment and the disappearance of Entamoeba Histolytica.

(3) In relapsing cases of Amoebiasis the complement fixation test which has been negative during the interval of apparent freedom from Entamoeba Histolytica again becomes positive, in rare instances even before the parasite is again demonstrable in the foeces. Thus a negative reaction, unless repeatedly so for several weeks, does not prove the absence of amoebic infection, or that anti-amoebic treatment has resulted in cure.

(4) The time of disappearance of the positive fixation reaction after treatment resulting in the disappearance of Entamoeba Histolytica from the foeces vary between three and 28 days.

(5) Individuals infected with other species of amoebae or with the intestinal flagellates, do not give a positive complement fixation unless Entamoeba Histolytica is also present.

(6) The complement fixation reaction occurs in all stages of Amoebiasis, but the strongest positive results are usually obtained in symptomless carriers or in those presenting mild symptoms of infection with Entamoeba Histolytica. In several cases of very acute amoebic colitis the reaction has been doubtful or negative, although in most severe cases the reaction has been positive.

(7) The test has proved of value in diagnosis of amoebic abscess of the liver unaccompanied by intestinal symptoms, in the diagnosis of apparently healthy carriers of Entamoeba Histolytica and of those presenting a typical or mild symptom of infection and in the control of anti-amoebic treatment.

A survey of the work of Craig, as well as the infrequent studies of other confirming observers, shows that the complement fixation test in Amoebiasis is highly specific and is of value in the diagnosis, especially in the hepatic type, and other stages of latent infection.

However, one must agree with Craig when he states "Where the services of a trained protozo-ologist are available and it is possible to make repeated miscroscopic examination of the foeces in suspected cases, this test would be of comparatively little help in diagnosis, as I am convinced that every case of intestinal infection with Entamoeba Histolytica can be diagnosed by microscopic examinations of the foeces, provided repeated examinations are made, if necessary".

The practical application of the complement fixation test is greatly limited. The preparation of an efficient antigen is difficult as cultures have to be continuously maintained over long periods to supply the necessary material. In addition Craig has pointed out that not all of his extracts possessed antigenic properties. He obtained frequently inert extracts from the same strain of Entamoeba Histolytica that had previously given, and afterwards gave, excellent antigenic extracts, although the inert ones were made in the same manner as the active.

SIGMOIDOSCOPIC EXAMINATION.

Amoebic ulceration may extend into the rectal canal, so that a sigmoidoscopic examination, which should be conducted without an anaesthetic, may afford valuable information. As a general rule, small yellow ulcers, with surrounding hyperaemia are seen; when scraped and examined microscopically it is often possible to find living entamoebae in the scrapings, even when these organisms cannot be demonstrated in the patients' foeces. As compared with similar examinations in the chronic bacillary disease, the most striking fact is the absence of pain. Amoebic ulcerations

may/

may be touched and scraped without causing any sensation to the patient, while the passage of the instrument caused at the most a feeling of discomfort. The mucous membrane surrounding individual lesions shows a total absence of inflammation and preserves its normal pinkish colour, but is usually more reticulated and folded than in a normal subject. Amoebic lesions are then seen in the crypts between the folds. Early lesions may appear either as small, yellow elevations, the size of a pin's head, or as superficial snail-track ulcers with haemorrhagic margins. Often again the only signs of abnormality are small flame-shaped haemorrhages, in the centre of which the entamoebae may be discovered in scrapings obtained by means of a probe passed through the sigmoidoscope.

In chronic partially healed latent amoebic dysentery, or even in symptomless cyst-passers, amoebic lesions may be distinguished as minute oval or circular pits or depressions on the mucous surface. They may be almost microscopic in size, requiring a magnifying eye-piece for their detection.

X-RAYS DIAGNOSIS.

X-ray diagnosis has been tried out on an extensive scale at the Hospital for Tropical Diseases in London.

Occasionally filling defects are observed in the caecum, but similar appearances are seen in other forms of dysentery and colitis. It is disappointing that only small assistance can be obtained by this method.

DIAGNOSIS OF LIVER ABSCESS.

Of all the grave tropical diseases, none is so frequently overlooked as an abscess of the liver. Acute cases are readily enough recognised - not so the insidious cases.

The most common mistakes in diagnosis

are/

are:-

(1) Failure to recognise the presence of disease of any description, even when an enormous abscess may occupy the liver.

(2) Misinterpretation of the significance and nature of a basal pneumonia a condition so often accompanying suppurative hepatitis.

(3) Attributing the fever symptomatic of liver abscess to malaria.

(4) Mistaking other diseases for abscess of the liver and vice versa, for example, hepatitis of a non-suppurative nature such as that attending malarial attacks; suppurative hepatitis before the formation of the abscess; syphilitic disease of the liver; softening gunmata which are often attended with fever of a hectic type; pylephlebitis, suppurating hydatid; gall-stone and inflammation of the gall-bladder; subphrenic abscess due to ruptured gastric or duodenal ulcer or appendix abscess; abscess of the abdominal or thoracic wall, pleurisy, encysted empyema, pyelitis of the right kidney; bilharziasis, scurvy and similar blood diseases associated with hepatic enlargement, kala-azar; undulant fever; trypanosomiasis; tuberculosis and malignant disease. Any of these may be attended with fever of a hectic type, increased area of hepatic percussion dullness and pain in or about the liver.

Frequently a correct diagnosis can be arrived at only by repeated and careful study of the case and its aspects. Golden rules in tropical practice are to think of hepatic abscess in all cases of progressive deterioration of health, and to suspect it in all obscure abdominal cases associated with an evening rise of temperature,

and/

and this particularly if there be an upward enlargement of or pain in the liver, leucocytosis and a history of dysentery - not necessarily recent.

Cort (Reference 31) in reporting 530 cases of Amoebiasis, called attention to the fact that 97 had hepatic involvement, with liver abscess development in 17. He confirms Roger's findings (Reference 32) in that treatment with emetine brought about reduction in the size of the liver within two to four days.

This test is employed regularly in my wards in any case of doubt, and has proved of the greatest assistance in excluding or confirming a diagnosis of Amoebiasis.

Low pneumonia of the right base in a tropical patient should always be regarded with suspicion, for it may mean abscess of the subjacent liver.

The presence of Entamoeba Histolytica cysts in the foeces is suggestive but by no means conclusive of amoebic abscess. They are found in a large proportion of cases, and amoebae may be cultured from the foeces in many of the cases in which they are not found under the microscope. An X-ray examination may confirm the upward enlargement of the liver and bulging of the right dome of the diaphragm, which does not move on respiration. Should, however, the abscess be situated in the centre of the liver, even if it be of considerable size, no definite information is obtainable by radiography except when the abscess has become partially encystal, thus making the outlines apparent to X-ray.

Occasionally, too, after aspiration there is secretion of gas into the abscess cavity which prevents an opaque appearance to X-rays. In America the use of "thorotrast" - an opaque preparation of thorium which is injected intravenously - is said to assist diagnosis in outlining the abscess cavity, and blurring of the outline of the diaphragm occurs if the abscess is situated near the upper part of the liver. The cardiophrenic

angle/

angle becomes less acute and more approaching a right angle. This may form a valuable indication in the X-ray appearances of hepatic Amoebiasis. In abscesses of long standing, the margins of the cavity may become cretified, and may then become visible to the rays, or it may present itself as a definite opacity.

The bromsulphalein and other liver function tests, as an indication of hepatic disease and liver abscesses, have so far proved disappointing.

Perhaps the most common error is to regard the hectic fever of liver abscess as attributable to malaria. The regularity with which the daily fevers recur, the daily chilliness or even rigor coming on about the same hour, the profuse sweating and other circumstances so compatible with a diagnosis of malaria, all contribute to this mistake. So common is this mistake that Osler said he hardly ever met with a case of liver abscess which had not been drenched with quinine, and this has been the experience of others. Medical men have made this mistake, not only in their patients, but in their own persons. The periodicity of the fever and the presence of a polymorphonuclear leucocytosis should obviate so serious an error.

To mistake other forms of suppuration for liver abscess is of no great moment, because in many suppurative diseases, the treatment is the same as for liver abscess, and no bad result need be looked for if diagnosis is not quite accurate.

Intrahepatic suppuration may occur in ascaris infection; as the result of ascending pylephlebitis, and as a metatastatic phenomen to diverticulitis. Large suppurating abscesses have been reported secondary to duodenal ulceration. Carcinomatoses of the liver unaccompanied by jaundice may simulate amoebic abscess. A right perinephritic abscess may have to be considered.

Sub-/

Sub-diaphragmatic abscess is most commonly caused by perforation of a gastric or duodenal ulcer. An abdominal swelling can usually be recognised occupying a triangular area on the affected side. Gas is usually present and can be recognised by a resonance in the upper part of the swelling, which should distinguish it from liver abscess.

A serious error, however, is to overlook the presence of leucocythaemia, kala-azar, pernicious anaemia or scurvy, and proceed to aspirate an enlarged liver on the supposition that the symptoms arise from abscess.

Amoebic abscess of the liver which has ruptured through the diaphragm may have to be differentiated from many other pulmonary conditions, such as broncho-pneumonia, tuberculosis, actinomycosis and some malignant disease of the lung.

DIAGNOSTIC ASPIRATION.

In order to make the diagnosis of liver abscess certain, aspiration must be resorted to.

When the needle enters the liver, an up-and-down pendulum-like movement is communicated to its outer extremity, in harmony with the rising and falling of the organ in respiration.

If the needle does not exhibit this movement, its point may be in an abscess cavity, but such an abscess is not in the liver.

TREATMENT.

So many different drugs have been advocated in the treatment of Amoebiasis that the mental attitude of the student is often confused.

I propose to mention the drugs of

importance/

importance in logical sequence, and to describe the methods used by other authorities, and to give an account of the treatment I have found most successful in dealing with the natives of Natal.

The Ipecacuanha Group. Ipecacuanha, used for dysentery by the natives of Brazil, was first advocated for use in Amoebiasis by Simon (Reference 33). Ipecacuanha is of value in the treatment of Amoebiasis, but because of the difficulties associated with its use (nausea and vomiting) and the introduction of more modern drugs, it has been generally discarded.

Emetine, the alkaloid of Ipecacuanha, introduced by Rogers and Veddor in 1912, has had perhaps the widest and most universal use of all the alkaloids of ipecacuanha, emetine is superior to the others (Cephaeline and psychotrin). Its action on the acute manifestations, particularly on amoebic hepatic abscess, is spectacular. In fact since its introduction, death from Amoebiasis has become rare.

However of late emetine seems to be much criticised, both because of its toxicity and because of the fact that such men as Craig (Reference 34) and Willner (Reference 35) state that even with increasing dosage the percentage of permanent cures is exceedingly low.

The toxic dose of emetine is given by various authors as one grain daily for 21 days. Most clinicians give from ½ to 1 grain daily for a week or 10 days, though some give 1 grain twice daily for a period of 4 days.

Brown (Reference 36) uses as a rule for an average dose, 12 grains subcutaneously over a period of 4 weeks. This is given in two courses of 8 grains and 4 grains, about 10 days apart.

Emetine injected subcutaneously is

much/

much less painful than when injected intra-muscularly, and appears to be just as effective.

Those employing emetine must be fully aware of its toxic symptoms and be able to detect these promptly as it has a cumulative action. Its toxic effect appears to exert itself upon the heart muscle, producing a myocardial degeneration which manifests itself clinically by an increase in the pulse rate. In one case which came under my observation, an elderly subject with no signs of previous myocardial weakness, developed tachycardia of 140 per minute. After 6 daily doses of one grain each, the pulse became weak and the electrocardiograph showed inversion of the T wave in all leads. The patient developed muscular weakness, confined particularly to the legs, but difficulty in swallowing was also complained of. He ran a slight temperature and the diarrhoea so often noted in emetine toxaemia, did not appear until some days after the tachycardia. The heart rate remained rapid for three weeks after the initial reaction, and the return of his strength was greatly delayed.

Emetine Bismuth Iodide, a combination of 20% emetine, 12% Bismuth and 58% Iodine, was introduced about 1915, particularly for treating carriers and resistant cases of Amoebiasis. As it contains emetine, it has the same toxic reaction when given in too large doses. In addition it frequently causes nausea and vomiting that becomes so severe that further administration has to be stopped. It is administered by the mouth in gelatine capsules of 3 grains per dose. This dose is given each night for 12 consecutive nights. After an interval of a week or two the course may be repeated if necessary.

The Arsenical Group. The following are the arsenical drugs used in the treatment of Amoebiasis :-

Acetarsone
Treparsol
Carbarsone

Acetarsone/

Acetarsone (acetyl-amino hydroxy-phenyl-arsenic acid) introduced originally for the treatment of syphilis, has been used quite extensively in France. It is known as Stovarsol and contains about 27% arsenic.

Treparsol (amino-oxy-phenyl-arsenic acid) was introduced about the same time as acetarsone, and contains slightly more arsenic, about 28%.

While both these drugs are mentioned interchangeably in the literature, it has been shown that acetarsone is eliminated more regularly than treparsol. Therefore, the percentage of toxic reactions is greater with the former than with the latter.

Willmore and Martindale (Reference 37) believe that an idiosyncrasy to acetarsone exists in certain individuals especially after repeated courses. As treparsol is eliminated more slowly and regularly, it possesses advantages over acetarsone. Elimination of treparsol begins one day after its administration and is completed by the third day after cessation of treatment. In addition treparsol is decomposed in the bowel and forms soluble salts which act directly upon the parasites in the intestine.

The dose of these drugs is 4 grains, usually given 2 or 3 times a day for periods of 4 days to a week, and repeated after a week's interval.

The toxic reactions following the use of acetarsone are :-

Toxic Erythema
Peripheral Neuritis
Vomiting and diarrhoea
Visual auditory disturbances

However, with treparsol, one sees only an occasional case of toxic Erythema, though Brown (Reference 36) reports one patient with nausea and vomiting after taking 4 doses.

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Carbarsone /

Carbarsone. (4 Carbamine-phenyl-arsenic acid) was introduced by Reed, Anderson, David and Leake in 1932 (Reference 38). It contains 28% arsenic. These authors contend that it is less toxic than acetarsone or treparsol, and a better amoebacide.

In their hands they have seen only one instance of toxic reaction in a patient with acute hepatitis.

Carbarsone is given by the mouth in gelatine capsules of 4 grains twice daily for 10 days and in resistant cases Anderson and Reed (Reference 39) suggest the use of carbarsone rectally. They propose first cleansing the bowel by irrigation, then follow with the instillation of 200 cc. of 2% Sodium Bicarbonate solution containing 1% carbarsone. This enema is retained overnight. Treatment is repeated until at least 5 enemata are given on alternate nights.

Oxyquinoline - the third big group. In 1921, Muhlens and Menk introduced Yatren as an amoebacide. Yatren chemically is sodium hydroxy quinoline sulphonate, containing about 27% iodine. The drug is also known as chinifon and anayodin.

O'Connor and Hulse (Reference 40) report 51 cases treated with yatren, 49 of whom examined 2-6 years after treatment showed negative stools. Yatren is used by some authors both orally and rectally.

Biggam, Halawain and Ragab (Reference 41) administered Yatren by the mouth in large doses, 4 pills each containing .25 of a gram, thrice daily for 15 days. An apparent cure was obtained in 72% of their cases. The usual dose of yatren is .25 of a gram thrice daily for three weeks. This occasionally causes some diarrhoea after the second or third day of treatment. The action of the drug is a direct one and depends on the iodine content. Because of this, Craig (Reference 34) and O'Connor and Hulse (Reference 40) are of the opinion that it is not effective in liver abscess.

Vioform/

Vioform (Iodochlorhydroxy-quinoline) has been available since 1933, and it would appear that there are fewer reactions and less diarrhoea than with treatment by yatren.

David, Johnstone, Reed and Leake (Reference 42) investigated some 11 halogenated hydroxy-quinoline compounds and concluded that vioform is the most promising of the group. The dosage used by these investigators is .2 of a gram, thrice daily for 10 days. The second course is given after a rest period of a week or 10 days.

Miscellaneous Group - the 4th Group.

In the 4th group of drugs are included astringents and antiseptics, the bismuth compounds, heptyresorcinols, chaparro amargosa, kurchi bark, kurchi-bismuthsiodide and auremetine.

The bismuth compounds include the subcarbonate and subnitrate. Of the bismuth compounds, the subcarbonate appears as effective as the subnitrate, and is devoid of the nitrate reaction. These drugs are frequently used as adjuncts, particularly with emetine.

Craig (Reference 34) in discussing the subnitrate of bismuth holds that as far as permanent cure is concerned, the results are most uncertain.

Heptylresorcinol and di-hydranol, suggested by Faust (Reference 44) in 1930, has been used as an amoebacide. Faust reported satisfactory results in a small group of carriers.

However, Mackie (Reference 45) and Leake (Reference 46) have had unfavourable results and the latter holds that in view of the fact that hexylresorcinol is less toxic and a better antiseptic than heptylresorcinol, it would seem that heptylresorcinol must be shown to be a better amoebacide, or else dropped from further consideration.

Chaparro Amargosa is a plant whose

habitat/

habitat is Texas. The infusion of the entire plant is used both orally and by enema. The drug is occasionally mentioned in the literature and apparently has not had wide usage.

Kurchi Bark and its alkaloids have been used for many years in the treatment of Amoebiasis. Results have not been favourable and in addition a depressing effect has been noted on the heart.

Kurchi-Bismuthsiodide has largely replaced Kurchi Bark and its alkaloids. The dose is one grain thrice daily for 6 weeks. (Craig Reference 34).

In 1926 Willmore and Martindale (Reference 37) took an aniline dye (the hydrochloride of tetramethyl-diamino-diphenyl-ketonimine) called "Auramine", and combined it with emetine, and gave it the name of auremetine. The drug contains 28% emetine, 16% auramine and 50% iodine. These authors obtained gratifying results in 40 cases, although in their acute cases they used in addition stovarsol and bismuth.

Numerous drugs have been used from time to time, including quinine, mercury, silver salts, etc.

Various other types of treatment have been suggested and tried, such as de Riva's method of irrigating the colon with water at a temperature of 55° C., using various solutions - yatren, copper sulphate, etc.

Craig (Reference 34) feels that with the exception of Yatren, colonic irrigations are of little value.

DIET.

The importance of restriction diet in the treatment of Amoebiasis depends on the type of infection.

The earlier clinicians using

ipecacuanha/

ipecacuanha and other drugs, advised liquid and low residue bland diets. It is now rather universally accepted that in the treatment of the carrier or mild symptomatic group, little attention need be paid to the diet. In the acutely ill patient, the diet is restricted and determined largely by the severity of the fever or the dysentery.

Having described the drugs most commonly used in the treatment of Amoebiasis, I will state the methods which in my experience have given the most satisfactory results in the treatment of natives. It must first be explained that the native is very much less liable to the toxic effects of emetine when administered subcutaneously or orally than the European.

Tachycardia is occasionally met with, but the most frequent sign of intolerance is daily headache. In acute amoebic dysentery where the patient, when first seen, is not too debilitated, 1 grain of emetine hydrochloride is given subcutaneously daily for 10 days. As soon as is practicable, 10 ozs. of a 4% solution of yatren is administered daily as a retention enema.

At the conclusion of the course of emetine by subcutaneous injection, emetine bismuth iodide, grains 3 in capsules, is given each night for a further 8 days.

On account of the mentality of the average native, and taking into consideration the distance most of the patients have to travel to reach hospital, an adequate follow up of cases is impossible.

At the end of the above course of treatment, the stools are invariably free from cysts or active amoebae, but this is no criterion of cure.

Several negative stool examinations, after a period of one month has elapsed from

the/

the completion of treatment, are necessary before a cure can be pronounced in any case.

From the excellent results of the comparatively few patients whose after-investigation has been possible, I am convinced that the above course of treatment gives an extremely high percentage of permanent cures. I consider that this treatment is just as essential in the treatment of the symptomless carrier. It is only by attempting to eradicate the amoebae from this group that the incidence of amoebiasis will be lowered.

My experience of the use of Carbarsone has been limited and disappointing. In 1934, 16 cases of cyst carriers with mild abdominal symptoms and without dysentery, were chosen by me for a combined treatment by carbarsone and yatren. Each patient was given three courses of carbarsone, 4 grains twice daily for 10 days, with an interval of 7 days between. Retention enemas of 4% yatren solution were given for 10 days.

Of these 16 cases, an adequate follow up was possible in 7, and of these, cysts were found in the stools of three within a month of the conclusion of treatment.

TREATMENT OF COMPLICATIONS.

Hepatitis which has not proceeded to abscess formation responds readily to the routine treatment mentioned above. If there is much pain, in spite of no suggestion of abscess formation, the removal from the liver of a few ozs. of blood by the aspirator needle is a measure of proved value, and in my Wards the early use of the aspirator has been encouraged.

When the occurrence of rigors or the development of hectic fever, the appearance of local bulging, or the persistence of the fever and the local symptoms, giving grounds for suspecting that abscess has formed, measures must be taken at once to locate by means of the aspirator, the position of the pus. If there

are/...

are localising signs, such as a tender spot, a fixed pain, localised oedema, localised pneumonic crepitus, pleuritic or peritoneal friction, these should be taken as indicating with some probability, the most promising spot for exploratory puncture. If none of these localising signs is present, then considering the fact that the majority of liver abscesses are situated in the upper or back part of the right lobe, the needle should in the first instance be inserted in the anterior axillary line in the 8th or 9th interspace, about 1" or 1½" from the costal margin, and well below the limit of the pleura. The instrument should be carried in a direction inwards and slightly upwards and backwards, and if found necessary for 3" to 3½". Provided there is complete absence of breath sounds, of vocal fremitus and resonance over the lower part of the right lung, and pus has not been reached from lower down, then the pleura or lung may be disregarded and puncture made anywhere below the line of the nipple and angle of the scapula, or wherever the physical signs suggest.

Serous fluid from the pleura may be obtained by aspiration, and often indicates an underlying abscess. The fluid is highly albuminous and often contains a number of polymorphonuclear cells.

DRAINAGE BY ASPIRATION.

In the vast majority of cases, the pus may be evacuated by means of Potains aspirator, under novocaine anaesthesia. A full sized aspirator is used.

The death rate has been reduced very considerably since open operation has fallen into disrepute. The shock to the patient of aspiration is negligible, and several pints of pus can be evacuated. Occasionally the pus may re-accumulate, but it can easily be evacuated by a second operation. The rate of recovery is remarkably rapid, and the patient's stay in hospital equally short. An effusion of serum generally takes place into the abscess cavity after aspiration. The swelling and pain thus produced may give rise to symptoms simulating

a re-accumulation of pus, while a passive effusion of serum into the pleural cavity immediately adjacent to the liver abscess sometimes occurs.

Open operation has very rarely to be resorted to in cases where the abscess cavity has been of large size, and where it is secondarily infected.

TREATMENT OF LIVER ABSCESS WHICH HAS RUPTURED THROUGH THE LUNG.

In the case of an abscess which has been discharging through the lung for some weeks, although emetine has been freely administered, the question of obtaining more efficient drainage by surgical operation, must be considered.

Not infrequently prolonged discharge of pus through the lung may induce fibrotic changes or may give rise to pneumonia or abscess of the lung with its attendant dangers, and in such cases surgical interference is usually desirable.

In the vast majority of cases seen soon after the rupture of the abscess through the lung, the routine amoebic treatment generally exerts an instantaneous and almost miraculous effect, and renders operative interference inadvisable. Case 18 - In exploring the liver in such cases, it must be borne in mind that the abscess cavity itself may have collapsed. Such an abscess is not likely to be discovered unless the needle is thrust into its full extent, and whilst a good vacuum is being maintained in the aspirator, slowly withdrawn. If by good fortune the abscess has been traversed, then when the end of the needle is crossing the cavity a small amount of pus will be seen to flow.

TREATMENT OF ABSCESS RUPTURING INTO A SEROUS CAVITY.

When there is evidence that an abscess of the liver has ruptured into the pleura, repeated aspiration of the pleural cavity, combined with the routine treatment, gives most satisfactory results.

Rupture/

Rupture of an abscess into the peritoneal cavity requires immediate operative interference. If operated upon within a few hours, such cases stand a fair chance of recovery. Occasionally the pus is prevented from spreading throughout the peritoneal cavity by adhesions, which have formed previously, but more usually pus is encountered throughout the abdominal cavity.

At operation, as much pus as possible is removed and the peritoneal cavity is washed out with saline. Drains are then inserted and should be left in position as long as possible.

TREATMENT OF ACUTE INFLAMMATION OF THE CAECUM AND APPENDIX.

As mentioned previously, numbers of cases are admitted to hospital with symptoms and signs typical of those of acute appendicitis. Occasionally large masses are to be felt in the right iliac fossa, which are most difficult to differentiate from appendix abscess. The history is often very suggestive. A sudden onset of abdominal pain settling in the right iliac fossa, fever and rapid pulse, nausea, vomiting and constipation; the tongue is furred; there may be definite rigidity of the abdominal wall, with hyper-aesthesia of the skin in the right iliac fossa; there is often a marked leucocytosis.

At operation, the most common finding is a large thick walled indurated caecum with or without involvement of the appendix. Occasionally the appendix alone is the seat of inflammatory changes, and occasionally frank appendix abscess is found.

It has been my experience that wherever possible such cases should be given a thorough trial with anti-amoebic treatment before resorting to operative interference.

Where operation is deemed imperative, in a large proportion of cases, foecal fistula develop within a few days of operation. Cases No. 17 and 19 are examples of such a complication.

C A S E 1.

EPHRAIM HILL, Zulu male, aged 29 years. Patient was admitted to hospital complaining of cough and pain in the chest. His health had been good until some months previously when he suffered from diarrhoea. The stool contained a good deal of blood and mucous. The condition lasted about a week and there had been no recurrence. Two months ago he experienced pain in the right side of the chest, just below the nipple and radiating around to the back, which was accompanied by a slight cough. The cough gradually became more persistent and he developed a temperature. For two days prior to admission his sputum had been blood-stained. Since his attack of dysentery some months ago, he had been constipated.

On admission to hospital he had a temperature of 100°, Pulse rate of 98 per minute, and respiration rate of 32 per minute. He stated that he had experienced a rigor the day before. His general condition was poor. He was badly nourished, very anaemic and his tongue was thickly furred.

On examining his chest, the physical signs were those of a right-sided basal pneumonia. A dull note on percussion extended upwards to the 4th rib anteriorly. There was bronchial breathing and increased vocal fremitus. Fine crepitations were heard over the whole of the lower lobe. The sputum at that stage was typically pneumonic. An X-ray examination of his chest suggested consolidation of the right base with no elevation of the diaphragm. The liver was just palpable below the costal margin, and was slightly tender.

On the third day of admission he had a severe bout of coughing and brought up a mouthful of purulent, foul smelling, blood stained pus. From this time onwards until the resolution of his lung condition, the sputum remained very offensive. Further X-ray photographs revealed the presence of a small cavity in the centre of the consolidated right lower lobe.

Three/

Three stools examined on consecutive days all contained cyst forms of Entamoeba Histolytica.

He was given emetine hydrochloride, 1 grain daily for 10 days, by subcutaneous injection. The sputum gradually diminished in quantity and by the 12th day had lost its pusy character. His temperature, which previously had been hectic, became normal on the 3rd day of emetine administration, and remained so until his discharge on the 28th day. The examination of the sputum was persistently negative for tubercle bacillus, nor did the X-ray examination reveal any suggestion of this condition. A course of emetine bismuth iodide, 3 grains daily for 7 days, and the administration of a retention enema of yatren (8 ozs. of a 4% solution) daily for 10 days completed his treatment.

He left hospital still coughing slightly. Occasional rhonci were still to be heard over the right base, but the crepitations had disappeared and the breath sounds had returned to normal.

Two months after his discharge from hospital he was readmitted with fracture of the forearm, and I had the opportunity of re-examining him. He still had a slight cough, but his clinical and X-ray examinations revealed nothing of his past trouble. I attributed the cough to the fact that he was smoking heavily.

This case I consider as one of primary pulmonary Amoebiasis. The history of onset, the presence of frequent rigors and hectic temperature, the presence of characteristic sputum, the absence of signs of liver abscess, his remarkably quick recovery on the administration of emetine, the finding of cysts of Entamoeba Histolytica are, I think, sufficient evidence for my diagnosis.

C A S E 2.

JOSEPH WANDA, a Zulu male, aged 30 years. This patient was admitted complaining

of/

of persistent cough and pain in the chest which he had had for some weeks. The pain came on suddenly and was worse on deep breathing. He complained of shortness of breath, loss of weight and night sweats. More recently he had developed an aching pain in the right shoulder.

On admission he was found to be running a high temperature. He was poorly nourished and the tongue was furred. On examining his chest, there was dullness at the right base, diminished breath sounds and persistent fine crepitations. His liver extended three fingers breadth below the costal margin and was extremely tender. His stools contained active amoebae. The point of maximum liver tenderness was situated in the epigastrium, and on the day of admission 13 ozs. of typical chocolate coloured pus were aspirated. On the third day 6 ozs. were removed from the same area, and 17 ozs. of thick, yellowish, creamy pus from a point in the anterior axillary line in the 8th interspace. On the 5th day pus was not encountered in the epigastrium, but 10 ozs. were aspirated from the 8th interspace.

He was given the routine treatment mentioned in detail previously, and his temperature became normal in 6 days. Altogether 46 ozs. of pus were removed from his liver. No Entamoeba Histolytica were found in any of the specimens.

After a stay of 6 weeks in the hospital and the full course of treatment, he was fit for discharge. The liver was still slightly enlarged, though no longer tender. Crepitations had disappeared from the right base, and normal breath sounds had returned.

This case of amoebic liver abscess is recorded as an example of more than one abscess being present in the liver, which is conclusively proved by the differences in the character of the pus aspirated.

Case 3/

C A S E 3.

LEONARD NZAMA, a male Pondo, aged 26 years. He was admitted to hospital complaining of abdominal swelling, which was painful, and he had had this swelling for six weeks. Temperature was normal, and he did not appear to be ill. The tongue was clean, there was no history of past or present diarrhoea, and his appetite was good. He suffered from periodic attacks of urticaria.

On examining the abdomen, there was a swelling the size of a tennis ball in the right hypochrondium. Its surface was smooth and was rubbery in consistency. Its outline was well defined, and merged into the liver edge.

The tumour was aspirated and 4 oz. of typical brownish pus were withdrawn. Amoebae were not found in the aspirated pus.

He was given the routine treatment and by the 14th day the swelling was no longer palpable and he was free from symptoms.

Cyst forms of Entamoeba Histolytica were found in each of the three specimens of stools examined on his admission. His temperature was sub-normal during the whole of his stay in hospital. A sigmoidscopic examination was carried out on this patient but revealed no evidence of ulceration.

This case of hepatic liver abscess is recorded as a contrast to Case 2, and to illustrate the great variety in the urgency of symptoms in hepatic Amoebiasis. In this case the points of interest are a subnormal temperature during his stay in hospital and no history of any previous temperature; no history of diarrhoea in spite of Entamoeba Histolytica being present in the stools, the healthy appearance of the patient who had had a liver abscess for six weeks prior to admission.

C A S E 4.

NKOMOZ ABANTU, a Zulu male aged 31 years. On admission he was complaining of pain

in/

in the chest of four days duration. He stated he was perfectly well before the pain appeared. As the pain developed he suffered from severe headache and shivering. The shivering lasted for several hours and was followed by sweating. A cough developed and the sputum was yellowish and tenacious.

On admission his temperature was 104°, pulse 110 per minute, and respiration 24 per minute. There was no history of diarrhoea. He looked ill and his tongue was furred. He was sweating profusely. He had limitation of movement on the right side of his chest during respiration; the area of liver dullness was increased both above and below, and the liver was acutely tender. On oscultation there was diminished air entry at the base of the right lung, but no adventitious sounds. Cyst forms of Entamoeba Histolytica were found in the third specimen of stool sent for examination.

He was given the routine antiamoebic treatment, and on the third day the pain had disappeared, his temperature had returned to normal and remained so during the remainder of his stay in hospital. After his full course of treatment, cysts of Entamoeba Histolytica were found in one of the three specimens sent for examination. He was given two tablets of carbarsone daily for 12 days, and the yatren installation resumed.

This case of amoebic hepatitis is mentioned as the only case to my knowledge that has shown cysts still present in the foeces immediately after the routine treatment administered in my Wards.

I had the opportunity, after his discharge from hospital 7 weeks later, of obtaining three specimens of stool on consecutive days, and their examination showed no evidence of his previous infection.

C A S E 5.

LOUIS FARO, a Zulu male aged 42 years. The patient was admitted complaining of pains in the right hypochrondium. A month previous

he commenced having frequent stools which were watery in character for the most part, but contained blood and mucous. This condition lasted for two weeks. During this time he began to suffer from pains in the right side of his chest.

On examination his tongue was furred and he looked ill. His temperature was 100°, with a pulse rate of 90 per minute. His blood count showed 4,200,000 red cells and 18,000 white cells, of which 81% were polymorphonuclears. The liver was enlarged and very tender. There was visible bulging below the right rib margin.

The liver was aspirated on two occasions, 18 ozs. of chocolate coloured pus being withdrawn altogether. He was given the routine treatment, his temperature dropped to normal on the 5th day and his recovery was uneventful.

This case is mentioned as an example of the average history, symptoms and progress of liver abscess.

C A S E 6.

NGANU NGEMA, a male Pondo aged 32 years. Was admitted complaining of pains in the abdomen and cough. The pain had been present for three months. He had been suffering from night sweats, loss of weight and anorexia.

On examination there was a mass in the left upper abdomen. It moved freely with respiration and extended below the costal margin. Its edge seemed to be continuous with the liver. There was marked dullness at the left base, diminished air entry and he was running a continuous mild temperature.

The mass was aspirated, 8 ozs. of typical amoebic pus being withdrawn. Under emetine administration his temperature, pain and cough disappeared and his progress was very satisfactory. He gained weight and was fit for discharge in five weeks.

This/

This case is mentioned as an example of left-sided liver abscess.

C A S E 7.

JOSEPH KAYIZA, a Zulu aged 12 years. This patient was admitted complaining of swelling in the abdomen, which he had had for some months.

On examination there was a tender fluctuating swelling in the left hypochrondium. Its surface was smooth, its edges indefinite, and appeared to be continuous with the liver.

It was aspirated and 13 ozs. amoebic pus were removed.

This patient had had no history of diarrhoea. He earned his livelihood as a cane-cutter on a sugar estate - a more strenuous life it is hard to imagine - and he stated that apart from the lump and slight tenderness in the abdomen he was perfectly well and able to carry out his daily work. He looked extremely well, his appetite was good, his tongue clean and during his stay in hospital his temperature was normal. His bowel action was regular and the stools were well formed. His stools contained cyst forms of Entamoeba Histolytica.

Routine treatment was administered, and the lump in his abdomen had disappeared completely at the time of his discharge from hospital.

This is an example of a case of liver abscess, which illustrates how mild the symptoms occasionally may be.

C A S E 8.

PETROS NAELE, a Zulu male aged 28 years. This patient was admitted to hospital in a state of collapse. He stated that a week previously he experienced severe abdominal pain and diarrhoea. Stools were frequent and contained blood and mucous. There was no previous history of dysentery.

On/

On examination, the abdomen was found to be distended and acutely tender. The tongue was dry and furred, he had a subnormal temperature and was very dehydrated. The liver and spleen were not palpable.

He was given continuous intravenous saline, and died a few hours after admission.

On postmortem examination, there was an abscess in the right iliac fossa, which was partially walled off from the general peritoneal cavity. It contained pus and a small amount of foecal matter. It appeared to centre about the area of a perforation in the wall of the caecum. The mesenteric lymph nodes were slightly enlarged. The appearance of the caecum was striking. It presented numerous ulcers, from ½ - 3 cm. in diameter, with soft necrotic over-hanging walls, and a central cavity filled with a yellowish or black, gelatinous material. The marginal intact mucosa was often extensively undermined, and neighbouring ulcer cavities appeared in some cases to be connected by fistulous tracts extending laterally in the deeper levels of the wall beneath bridges of intact mucosa. In some areas the undermined mucosa hung as ragged masses from the ulcer margins. In many of the ulcers the inner muscular coat was exposed, and occasionally it appeared to be destroyed, so that the serosa formed the floor of the ulcer, at least in part. In an ulcer situated 4 cm. below the ileocoecal valve, there had been complete perforation of the bowel wall. This perforation communicated with the abscess in the right iliac fossa. Foecal matter taken from the caecum showed considerable numbers of active Entamoeba Histolytica. They were found in greatest numbers immediately on the margins of the ulcer cavities. The liver showed no lesions, and observations otherwise were not remarkable.

This is a case of acute fulminating amoebic dysentery, with perforation, peritonitis and death.

C A S E 9.

MHLAHLENI MYEZA, a Pondo male aged 36

years/

years. This patient was admitted to hospital complaining of pain in the right side. The condition had been present for two weeks. It commenced with rigors and vomiting. He had had night sweats, cough, loss of weight and diarrhoea. The stools were frequent and watery, but contained no blood or mucous. He was poorly nourished.

On examination there was marked bulging of the right lower costal margin; there was dullness and absent breath signs at the base of the right lung. The liver was enlarged three fingers breadth below the costal margin, and was very tender.

The temperature, which was in the neighbourhood of 101° on admission, returned to normal on the 4th day of treatment. He was aspirated on three occasions, 1 pint, 12 ozs., and 3 ozs. respectively being removed. His general condition improved rapidly - the pain and temperature had disappeared within 4 days. He was discharged at the end of a month, free from symptoms.

This is a typical example of the good results obtained by the routine treatment and aspiration, in cases of liver abscess.

C A S E 10.

JIM NDHLOVA, a Zulu male aged 30 years. On admission the patient stated that for some time he had experienced occasional attacks of abdominal pain. On the night before admission he had suffered from an acute attack of epigastric pain, with immediate nausea followed by vomiting.

On examination his temperature was 99.6°, his pulse rate 100 per minute. His white blood count was 18,000 with 90% polymorphonuclear. There was tenderness over McBurney's point and muscular rigidity over the right side of the abdomen wall. There was no history of diarrhoea or bloody stools.

Laparotomy was performed on the 13th July, 1938, with a pre-operative diagnosis of appendicitis. The caecum appeared normal and a slightly inflamed appendix was removed. Three stools were examined on the first three days,

but/

but no active amoebae or cysts were found.

On examination of the appendix, the cross-section of the distal third showed the lumen apparently obliterated. Mucous membrane of the proximal two-thirds was rough and obviously inflamed. Scrapings of the mucous membrane in this area revealed no amoebae.

On the 16th July, the patient developed diarrhoea, which gradually became worse. Believing that an abscess had developed, the surgeons again explored the right lower quadrant on the 21st July, and found an almost gangrenous caecum and inflamed ascending colon. The wound was closed after the insertion of a soft rubber drain. In spite of almost daily stool examinations, amoebae were not found in the stools until the day of the 2nd operation, when emetine hydrochloride was commenced subcutaneously.

On the 25th July, a foecal fistula developed, followed in ten days by general peritonitis, from which the patient died.

On postmortem examination, the entire large bowel was ulcerated, the caecum and ascending colon were gangrenous and there appeared to be only a small zone near the upper end which still preserved a little mucosa. The liver showed no lesions. Microscopic examination of the scrapings of the ulcers in the caecum showed numerous amoebae.

This is a case of acute appendicitis, complicated by acute gangrenous dysentery. The facts of interest in this case are the absence of amoebae in the stools after 5 days of severe diarrhoea, and in the scrapings from the removed appendix; the extraordinary rapidity of the gangrenous development and the lack of any obvious inflammatory changes of the caecum at the first operation.

C A S E 11.

ERNEST MONEREND, a Zulu Policeman aged 35 years. This patient was admitted to hospital

complaining/

complaining of pain in the right upper quadrant of his abdomen, which had been present for two weeks. There had been no rigors and he did not consider that he had been running a temperature.

On examination he was emaciated, his tongue furred and his breathing shallow. There was marked bulging of the chest wall on the right side. The lower border of the liver extended three fingers breadth below the costal margin, and was very tender. The point of maximum tenderness was in the mid-axillary line in the 8th interspace, where there was an area of oedematous tissue. On ausculation at the base of the right lung there was diminished breath sounds and a few fine inspiratory crepitations.

A diagnosis of liver abscess was made and aspiration was planned to take place that afternoon.

Two hours after examination, however, the patient experienced sudden acute abdominal pain and vomited. On further examination he was found to have generalised tenderness over the abdomen and a marked rigidity of the abdomenal muscles. His pulse rate had increased from 84 to 124 per minute. It was evident that a perforation had occurred. The surgeons were consulted and laparotomy was advised.

At operation two hours later, the peritoneal cavity was found to contain 2 pints of typical amoebic pus. The liver was soft and adherent to the chest wall in mid-axillary line. On its lower surface was a soft, friable opening, which communicated with the large abscess cavity. The peritoneal cavity was washed out with saline and closed with a drainage tube in the pouch of Douglas.

The routine treatment for amoebiasis was commenced. Cyst forms of Entamoeba Histolytica were found in the stools 5 days after operation. The patient stood the operation well, but continued to run a slight temperature for 10 days. From that time onwards his recovery was uneventful and he was discharged from the hospital after a stay of 6 weeks.

This is an example of liver abscess rupturing into the peritoneal cavity. I have

found/

found that if surgical intervention is instituted within a few hours of such an occurrence, the chances of the patient's recovery are very fair. Several such cases have occurred in my Wards, and the results of early surgical intervention are usually excellent.

C A S E 12.

BERNARD SIBIYA, a Zulu male aged 18 years. This native was admitted to hospital suffering from pain and a lump in the abdomen. The condition had been present for two months, during which time he had been forced to lie up on account of temperature and occasional rigors. More recently he had been experiencing night sweats. Three weeks previously the patient noticed a slight swelling in the epigastrium. This had gradually increased in size and had always been acutely tender. There was no history of previous dysentery. He was a poorly nourished adult and was noticeably anaemic.

There was in the epigastrium a tender swelling the size of a large grapefruit, which was soft and fluctuating. The liver edge was palpable 4" below the right costal margin, and appeared to be continuous with tumour. His blood examination showed a red cell count of 3,000,000 and a white count of 20,000, 62% of which were polymorphonuclear. His stools contained active and cyst forms of Entamoeba Histolytica. On sigmoidscopic examination, typical small yellow ulcers with surrounding hyperaemia were numerous.

On his first day in hospital, the abscess was aspirated and 46 ozs. of amoebic pus were removed. He was given the routine course of anti-amoebic treatment.

On his third day the abscess seemed to be increasing in size again, and he complained of pain. It was aspirated and 18 ozs. of pus were removed. This measure had to be resorted to at intervals on six further occasions, viz., on his 6th day, when 20 ozs. were removed, on the 11th day, when 9 ozs. were removed, on

the/

the 13th day, when 5 ozs. were removed, on the 15th day, when 5 ozs. were removed, and on the 17th and 19th days 1 oz. of serous fluid only was withdrawn. At no time during his stay of four weeks in hospital was his temperature above normal, in spite of his previous history of rigors and night sweats.

The necessity in this case for frequent aspiration rather suggested the presence of a deeper liver abscess communicating with the external one, and for this reason on his 9th day exploratory aspiration was attempted in the 8th interspace in mid-axillary line, and also posteriorly, but no pus was encountered.

He was fit for discharge on his 28th day, without symptoms.

C A S E 13.

NDINGI NZANA, a Zulu male aged 40 years. This patient was sent into hospital with a diagnosis of chronic appendicitis. On admission he stated that he had had pain in the right iliac fossa for about five years. The pain was intermittent, and often disappeared for a week or two at a time. Usually it was a dull ache with occasional attacks of stabbing pain. During these attacks vomiting was quite frequent. He had had occasional attacks of dysentery of a mild nature for some years. He frequently suffered from attacks of urticaria.

On examination there was muscular guarding in the right lower quadrant of the abdomen, and marked tenderness over McBurney's point, where an ill defined mass, the size of an orange was palpable. His temperature and pulse rate were normal. Cyst forms of Entamoeba Histolytica were found in the stools.

He was given the routine treatment and discharged from hospital in three weeks. The mass in the right iliac fossa had decreased in size steadily under treatment and was no longer palpable on his departure from hospital.

C A S E 14.

JOHANNES NDHLOVU, a Zulu male aged 30

years/

years was admitted to hospital with a diagnosis of appendicitis.

On admission he stated that he had had frequent attacks of pain in the right iliac fossa during the last five years. At no time had there been any vomiting. For the last five days the pain in the side had been persistent and severe. The patient looked ill, had a temperature of 100.5°, and a pulse rate of 80 per minute. The liver was enlarged and tender. He was found to be very tender over McBurney's point, but no lump was palpable. The stools were examined and cyst forms of Entamoeba Histolytica were found.

He was given the routine treatment, his temperature returned to normal in four days. His liver was no longer tender and had diminished rapidly in size. He was discharged three weeks after admission without symptoms or signs.

C A S E 15.

MAQUEDA NZUMALO, a Zulu male aged 48 years. This patient was sent into hospital with a diagnosis of appendix abscess or new growth.

He stated that 17 days previously his abdomen began to feel distended and he had vague abdominal pains. He took native medicine which had caused him to vomit a good deal, and his bowel action became frequent. Since then there had been no more vomiting, but he noticed blood and a fair amount of mucous in the stools. He stated that 6 months previously he had had an attack of diarrhoea associated with passage of blood and mucous. This attack lasted a week. Seven days previously he had noticed a lump appearing in the right iliac fossa, which had steadily increased in size.

On examination of the abdomen, a tender mass was to be felt in the right iliac fossa, about the size of a large orange. It was acutely tender, but its edges were fairly well defined. He was running a temperature of 100°, and his pulse rate was 98 per minute. Cyst forms of Entamoeba Histolytica were found in his stools.

He/

He was given the routine anti-amoebic treatment. In five days his temperature had become normal and the tenderness had disappeared, and on his discharge on the 21st day the mass in the abdomen was no longer palpable.

C A S E 16.

ISIAH GWALA, a Zulu male aged 37 years. Five days before admission this patient was working with a pair of heavy pliers which slipped and struck him in the upper part of the abdomen. He experienced very severe pain which was burning in character, and had been constantly present ever since. It caused him to vomit and he had been vomiting daily ever since. He had been very constipated in spite of large doses of laxatives. For some months he had been suffering from vague pains in his chest and had been losing weight.

On examination he looked acutely ill, his tongue was furred and dry, his temperature was 101°, his pulse rate 90 per minute. There was marked rigidity of the upper right quadrant of the abdomen, which was acutely tender. On examination of the lungs there was dullness and diminished air entry at the right base.

The abdomen was explored through a midline incision in the epigastrium. Typical amoebic pus was encountered on opening the peritoneum. A drainage tube was inserted and anti-amoebic treatment commenced. The patient failed to rally and died on the 10th day.

On postmortem examination, the peritoneal cavity contained a small amount of blood-stained fluid. A right sub-diaphragmatic abscess was present. On examining the colon, small superficial ulcers were to be seen in the caecum, ascending and transverse colon. The liver contained three large abscesses and five or more smaller ones, the largest the size of a cocoanut; a second to the right of the falciform ligiment communicated with the abdominal wall through the drainage tube. Both these were in the right lobe of the liver. A third, the size of an orange was present in the left lobe.

Cysts/

Cysts of Entamoeba Histolytica were found in scrapings from ulcers in the colon.

This case is of interest as an example of lack of symptoms that can accompany a case of multiple liver abscesses. This patient was actually capable of performing manual labour in spite of numerous large abscesses in his liver. The blow from the heavy pliers caused intraperitoneal rupture of one of them. I consider that this patient would have had a fair chance of recovery had operation been possible within 24 hours of the accident, and that the delay was responsible for his death.

C A S E 17.

ALPHUS DHLAMINI, a Zulu male aged 27 years. This patient was admitted to hospital complaining of abdominal pain of two days duration. He was awakened in the early morning by a sudden sharp pain in the right iliac fossa. He described it as knife-like. The pain had been present ever since and he had been unable to leave his bed. His bowels had not acted since the commencement of the pain.

On examination his temperature was 99°, his pulse 110. His tongue was furred but moist. The right side of his abdomen was board-like. There was marked tenderness in the right iliac fossa, and he had hyper aesthesia over the skin of the right iliac fossa. An ill-defined swelling was palpable, but the rigidity of the abdominal wall made examination difficult.

He was operated upon on the day of admission. A thickened acutely inflamed appendix was removed, a drain was inserted and the abdomen closed.

Five days after operation he developed a foecal fistula which closed spontaneously after discharging for three weeks. Anti-amoebic treatment had been instituted on the day of admission.

Scrapings from the lumen of the appendix revealed numerous active Entamoeba Histolytica.

Case 18/

C A S E 18.

NGOTI NDUNA, a Xosa male aged 25. On admission to hospital, this patient complained of pain in the right side of his chest and hypochondrium which had been present for 7 months. At the commencement, the pain was of a dull aching character and was not affected by deep breathing or coughing. During the last 3 months, however, the character and position of the pain had changed. It now became a stabbing pain higher up in the chest and made breathing difficult. A temperature had developed; he began to lose weight, experienced severe night sweats and commenced coughing. There was little sputum at this time until one night about a month ago during a bout of coughing, he brought up a large quantity of blood stained sputum, which he states nearly choked him. Since that time, the sputum had been very copious and bright yellow in colour.

There was no previous history of dysentery.

On examination, the patient was emaciated and obviously anaemic. His tongue was furred and his breathing was shallow and rapid. His temperature was 100°.5 and his pulse rate 110 per minute. On inspecting his chest, movement of the right side on respiration was restricted and there was a marked bulging of the chest wall. On percussion, a dull note was elicited which extended up to the 4th interspace on the right side. Breath sounds were absent in this area.

The liver which extended three fingers breadth below the costal margin was very tender. Oedema was present in an area of tissue over the 8th and 9th ribs in the mid-axillary line.

The sputum was bright yellow in colour and copious. The stools contained cyst forms of Entamoeba Histolytica.

Anti-amoebic treatment was commenced and one pint of typical amoebic pus was aspirated from the liver in the 8th interspace in mid-axillary line. The pleural cavity was tapped on two occasions, and 16 ozs. and 8 ozs. respectively of clear pleural fluid were removed.

At the end of four weeks in hospital, his temperature, which had been irregular, at

last/..

last became subnormal. His sputum rapidly became less copious under emetine administration and had entirely disappeared on his discharge from hospital in his seventh week. He was rapidly gaining weight, but his cough had not entirely disappeared.

This is an example of a liver abscess which had ruptured into the lung and which responded well to the routine treatment.

C A S E 19.

JOHN DRIVER, a Zulu aged 32 years. This patient was admitted to hospital with a typical history of an acute appendicitis. The previous day he had experienced sudden, severe epigastric pain which caused him to vomit. During the evening the pain settled in the right iliac fossa, which was very tender to the touch. During the night he had a short interval of freedom from pain and this morning he noticed a distinct swelling in the right iliac fossa. His temperature was 100° and his pulse rate was 108. per minute.

On examining his abdomen, there was muscular rigidity in the right lower quadrant, and an ill-defined swelling was obvious. It was extremely tender on palpation. The patient states that for two weeks he had been suffering from a mild diarrhoea and the stools had contained blood and mucous. In spite of the presence of diarrhoea the surgeons, influenced, I think, by the history of the sudden appearance of the abdominal swelling, considered it a case of appendix abscess and operation was performed. On opening the abdomen they found the appendix perfectly normal, but the caecum, which was greatly thickened, was the site of multiple large purple indurated patches. The Peritoneal cavity contained a fair quantity of serous fluid. Recognising the condition as one of amoebic origin, the abdomen was closed after inserting a rubber cigarette drain.

The patient's progress was not satisfactory. On the 10th day a foecal fistula formed, which continued to discharge for four weeks. It closed spontaneously, and from then onwards the patient's recovery was uninterrupted.

This/

This case is of interest as an example of mistaken diagnosis, and resulting delay in recovery. I consider that had this patient been treated medically, his return to health would have occurred within 2 weeks. It is also of interest from the fact that a foecal fistula developed in spite of the appendix not having been removed - foecal fistula being the rule rather than the exception in appendectomy in cases of amoebic origin.

S U M M A R Y.

In my experience Entamoeba Histolytica may produce cysts ranging from 5 m. to 20 m. in diameter, the larger cysts being very much commoner in this country.

The size of the cyst corresponds in no way with the virulence of the disease, except that in the vast majority of cases complicated by liver abscess, the cysts are of the larger variety.

I consider that the virulence of an infection varies with the pathogenic activity of the infecting strain.

Contamination of water supply and handling of food in the communal pot are equally responsible for transmission amongst the natives.

Their primitive habits, their belief in witchcraft, their suspicion of European innovations in anything that affects them, renders impossible the search for the carrier state among servant food handlers as a preventive measure.

Of 100 consecutive admissions into the fracture Ward at the King Edward Hospital, 24 were found to be harbouring Entamoeba Histolytica.

Appendicitis which is an uncommon condition in the natives, is usually of amoebic origin.

Amoebic granulomata often simulate malignant tumours of the large bowel in symptoms, physical signs and radiological appearances.

Amoebic inflammation of the caecum often simulates acute appendicitis. The response to emetine administration is usually dramatic. Surgical intervention often leads to foecal fistula formation, with its dangers and protracted recovery.

Liver abscess is occasionally found in patients with few symptoms and physical signs.

Early surgical intervention in cases of intra-peritoneal rupture of a liver abscess

has/

converted this previously believed fatal complication into one with a good prognosis.

Recurrent attacks of urticaria are common and, occasionally, an only symptom of Amoebiasis.

The native has a very much greater tolerance to full doses of emetine than the European. Toxic symptoms are rare.

The method of treatment which in my experience has given the most satisfactory results is recorded.

Operative treatment of cases of Amoebic appendicitis and caecitis is frequently complicated by foecal fistula formation and has a high mortality rate.

If there is suspicion of infection with Entamoeba Histolytica in a case where surgical assistance has been considered imperative, emetine should be administered promptly and operation, whenever possible, postponed. Without this precaution, the therapeutic effect of emetine may be lost and possibly the life of a patient.

The difficulties of prophylaxis amongst the primitive natives has been mentioned. Their belief in witchcraft and their distrust of European innovations are the greatest obstacles to their education in matters of public health importance. Without such education, other preventative measures will be of little avail.

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