Commentary

It has long been known that intermittent applications repeated at a number of sittings will succeed in moving a feebly magnetic particle (see Crawford, R. A. D., *Brit. J. Ophthalm.*, 1943, 27, 227), and no doubt others have had similar experiences to ours with recent battle casualties; but it seemed to us and to Major Applin that it may not be generally realized that a small magnetic F.B. or a larger feebly magnetic particle may behave as a non-metallic F.B. for a considerable number of magnet applications and be labelled as such. Moreover, with such particles the magnet test of pain production in a cocaineized eye is useless.

There are further lessons to be learned from this case and other recent cases we have dealt with.

1. The posterior route is ordinarily best for posterior-segment F.B.s.

2. The shortest route to the exterior is probably always best, provided it does not drag the particle over or through an intraocular part or structure of relatively greater importance than that in which it is lodged.

3. A beak-shaped magnet terminal is almost essential for work well behind the equator; a blunt cone-shaped terminal is sometimes a danger, especially with highly magnetic large bodies, unless they are situated in the anterior segment, since the field is too diffuse to direct the delivery accurately.

4. The removal of small metallic intraocular F.B.s of feeble magnetism, which it is desirable to remove as in the case of iron compounds, is sometimes determined by the patience and perseverance of operator and patient and the life of the magnet and rectifier—possibly oftener than we have thought heretofore.

5. It is perhaps stating the obvious to say that exploration of intraocular F.B.s lodged superficially in the skin of face or body or in the conjunctiva, as to their composition and magnetism, is desirable.

6. To those accustomed to the localization of civil hospitals in peacetime the slower and less accurate methods necessitated by war conditions constitute a great handicap.

7. The fact that frequent applications of the giant magnet increase the magnetism of feebly magnetic alloys should influence technique.

8. The application of a surface diathermy terminal to the sclera in the neighbourhood of a metallic intraocular F.B. is likely to produce an uncontrollable reaction emanating from the F.B. For this and other reasons (e.g., the greater difficulty of withdrawing a magnetic particle from a bed of coagulum) it is probably better technique to apply diathermy to the neighbourhood of the scleral wound after the F.B. is removed.

9. If prolonged applications of the Army portable giant magnet are required, as in the case described above, it is almost essential to place it on an adjustable stand with a tilting top, beside the operating-table.

LATENT MASTOIDITIS IN INFANCY

BY

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The frequency with which pus is found at necropsy in the middle ears and mastoid cavities of infants is now generally recognized, but the exact part it plays in the causation of death is still controversial. The present paper is based on an analysis of 120 consecutive necropsies in which the middle ears were specially examined. It is felt that observations on a comparatively small series might be of value in reaching a solution to what is admittedly a difficult clinico-pathological problem.

The Literature

The literature is extensive, but the conclusions reached by the various authors on the significance of latent mastoiditis in infancy and early childhood are by no means unanimous.

In this article only a representative few of these papers will be considered. Prof. Tröltzsch of Würzburg in 1867 recorded the frequency with which he found purulent otitis media in infants aged from 16 hours to 1 year. Parrot (1877), in Paris, was surprised how often he found pus in the middle ear of infants at necropsy. In his lectures on "l'athrepsie" he expressed the opinion that there was close association between athrepsia and otitis media: "Soit comme maladie primitive, soit comme complication." Johnston, Brown, and Tisdall (1930) in a clinical study of 171 cases of intestinal intoxication found otitis media in 109 (63.7%), the predominant organism being the streptococcus, which has also been recorded as the chief causative organism in American reviews of the subject. They point out the differences between the symptoms of gastro-enteritis and those of classical primary mastoiditis, and conclude that "intestinal intoxication is not due to masked infection in the middle ears and mastoid antra." Findlay (1932) and Yampolsky (1933) hold the same opinion. Melle (1934) reported on the examination of mastoids in 300 consecutive necropsies in children. In 140 no abnormality was found in middle ears or mastoids, though of this number 62 had died of some alimentary condition. In the remaining 160 pus was found in the middle ear or mastoid. The cause of death in 73 of these had been alimentary intoxication or chronic malnutrition. The remaining 87 of the "pus in mastoid" group had died of causes other than alimentary. In other words, pus in the middle ear or mastoid was not found more often in patients dying of acute alimentary intoxication or chronic malnutrition than in those dying of any other cause. He stated that "from a clinical point of view, and from one's observations at post-mortem, I can see no justification for blaming the mastoid as the primary cause of an acute alimentary intoxication."

Le Mée (1937), discussing Parrot's findings, suggested that the condition was a "post-mortem empyema" and the mechanism one of elementary physics. Cooling of the air in a cavity results in a reduction of pressure, and suction of adjacent fluid (in this case from the pharynx) takes place. Consequently, if looked for, pus may be found not only in the middle-ear cavities but also in the sinuses of infants. Le Mée thought that "the finding of pus in the middle-ear cavities of infants had not the same significance as in the child." Ebbs (1937) examined at necropsy the ears of 880 children aged up to 14 years who had died from a great variety of medical and surgical conditions. Pus was found in the middle ears of just over half of these patients. His series included 603 infants under 1 year, and 61% of them had purulent otitis media when examined after death. A clinical history of "gastro-enteritis" was obtained in 238 infants under 2 years, and 81.4% of these had pus in the mastoids. Further, he found at necropsy that 71.6% of 134 so-called "primary pneumonias" and 70% of secondary pneumonias had otitis media. Ebbs concluded that "otitis media [as found in his series] had played a very large part as the aetiological, complicating, or final cause of death in a great many of these children."

Cooper (1937), investigating infantile diarrhoea clinically in 300 infants, found parenteral infection in 122. Though otitis media was by far the most common infection, "it did not seem to prejudice the outlook." McConkey and Ross Couper (1938) found that of 1,324 infants admitted to hospital, 195 had otitis media or otitis media and mastoiditis, and they thought that the presence of these was responsible for diarrhoea and vomiting in a certain proportion of cases, especially in the toxic groups, caused by "a pent-up infection in the middle ear" and lack of drainage. Campbell and Cunningham (1941), with 574 cases of gastro-enteritis, concluded that "only those parenteral infections found in the early days of illness could be regarded as playing a part in causing the disease."

The question of the association between infantile diarrhoea and vomiting and middle-ear infection has been raised again by Leathart (1943), who believes that "many infants dying from diarrhoea, vomiting, and dehydration have had in addition an unsuspected bilateral mastoiditis two or three weeks before death." He attributes the condition to milk, vomit, or infected mucus entering the Eustachian tube in children either too young or too ill to sit up and accordingly nursed while lying on their

backs. He is convinced that all progressive cases require operative treatment.

The Present Investigation

The patients in this series were mainly infants, and the term "mastoid" is used to include the middle ear and mastoid antrum. Under the age of 2 years there is no sharp division between them, and the mastoid cells are as yet undeveloped.

Except for some patients who died within a few hours of admission to hospital, most survived long enough to allow of full clinical investigation. Careful analysis of the clinical picture revealed no new facts. It is worth noting that 27 of the patients in whose mastoids pus was found post mortem had normal or subnormal temperatures throughout the course of their illness. There was no correlation between leucocyte counts and the presence of mastoid pus as demonstrated after death. Quite low total leucocyte counts were recorded in some cases which had pus in both mastoids. This fact, however, cannot be used as an argument that the mastoid suppuration was "inactive," because total leucocyte counts in infants are often unreliable indices in differential diagnosis.

Many of the "positive" cases had adequate courses of one or other of the sulphonamide drugs, but the clinical course in these patients was unaffected even temporarily. Although sought for in all patients, otitis media was discovered in only 12 patients before death. Pus was found in 71 after death, bilaterally in 38. Of the 120 patients 115 were under 2 years of age.

TABLE I.—Age Incidence

Age	Pus in Mastoids	No Pus in Mastoids
4 weeks and under ..	4	6
5 weeks to 6 months ..	46	26
7 to 12 months ..	10	6
1 to 2 years ..	9	8
3 years and over ..	2	3
All ages ..	71	49

As a result of the clinical and pathological diagnoses the cases have been divided into four groups, three of which are fairly well defined, while the fourth contains a variety of conditions.

Group 1: Diarrhoea and Vomiting.—The 49 cases in this group were diagnosed clinically as "gastro-enteritis," and the other pathological findings, mostly inconclusive as regards inflammatory changes, left one with no alternative than to support the clinical diagnosis. Pus was found in the mastoids of 35 of these.

Group 2: Respiratory Conditions (Bronchopneumonia, Bronchiectasis, and Atelectasis).—Of the 30 patients in this group mastoid pus was present in 17, while in 13 the mastoids were clear.

Group 3: Marasmus and Athreptic Conditions.—Six of the 12 cases had pus in the mastoids.

Group 4: Miscellaneous Conditions.—There were at least 20 different causes of death in this group of 39 patients, and here 13 had positive mastoid findings.

Bacteriology

At necropsy each mastoid cavity was swabbed separately and the swabs were examined microscopically and culturally. Attempts have been made by various writers to determine the significance of the bacteriological findings in the pus in cases of latent mastoiditis, particularly so in the symptom-complex of diarrhoea and vomiting of infancy, investigation of the intestinal flora of which so often gives negative results. Floyd (1925), Jeans and Floyd (1926), and Marriott (1925) found haemolytic streptococci to be the predominating organisms in mastoid pus in this condition, and Marriott went so far as to suggest that the infantile diarrhoea and vomiting syndrome was probably a specific intoxication due to haemolytic streptococci, which were found in all his cases. Spahr (1929) concluded that where intestinal organisms were found in cultures of the mastoid pus the prominent symptoms were diarrhoea and vomiting, and that other organisms, though frequently met with, did not give rise to these symptoms. The findings in our series are set out in Table II.

It will be seen that the bacteriology was extremely varied, not uncommonly two or three different organisms being present in one mastoid. There were no characteristic findings in any

TABLE II.—Bacteriological Findings in Cases with Mastoid Pus

Organisms Isolated	Group 1. Diarrhoea and Vomiting	Group 2. Respira- tory Conditions	Group 3. Marasmus and Athrepsia	Group 4. Miscel- laneous Conditions
Pneumococcus ..	17	3	2	4
" and Bact. coli ..	2	2	2	
" " Str. haemo- lyticus ..		2		
" " B. proteus non-haemolytic streptococcus, and H. influenzae				1
Str. haemolyticus ..	4			1
" viridans " and Bact. coli	1		1	1
Non-haemolytic streptococcus	1	1		
Staph. pyogenes ..		1		
" albus ..		1		
" pyogenes and Str. viridans			1	
" " " H. influ- enzae ..				1
Bact. coli " " Bact. coli	3	2		1
Bact. aertrycke ..	1			
B. proteus ..	2	1		
M. catarrhalis ..		1		1
" " and Bact. coli ..	1			
Diphtheroid bacilli ..	1			
No growth obtained on culture	2	2		3
Total in group ..	35	17	6	13

group, and our results do not support the conclusions of Marriott or of Spahr (loc. cit.). In none of the groups did streptococci predominate, and in the three larger groups pneumococci, either alone or along with other organisms, were most commonly found. Pneumococci were four times as numerous as streptococci in the whole series, and in the diarrhoea and vomiting group were present in 54% of the cases in which there was pus. Crooks and Signy (1936) found the pneumococcus to be the most frequent causative organism in nasal sinusitis in childhood. It is interesting to note that pneumococci were seen in the mastoid pus of one patient with tuberculous meningitis and in one case of meningococcal meningitis. *Bact. aertrycke* was present in one case with diarrhoea and vomiting, but was not isolated from the faeces, and *Bact. coli* was present in three cases in the same group.

Discussion

This investigation was carried out primarily to try to reach some conclusion as to the place "latent mastoiditis" occupies in relation to the diarrhoea-and-vomiting syndrome in infants. Although we have been able to confirm the frequency with which pus is found in the aural cavities at necropsy in these cases, it is almost as common in a wide variety of conditions.

Acute otitis media is one of the commonest diseases of infancy. It is often undetected, sometimes for want of looking, and frequently because the symptoms and otoscopic signs are not as characteristic as in older children and adults. The infant tympanic membrane is tough, and spontaneous perforation is often later in following acute middle-ear suppuration than in older children. Apart from this, however, the anatomy of the infant's aural cavity is such that acute septic processes in it should rarely remain "latent" for long. The otologists teach that, while it is the "chronic ear" in children and adults which develops complications, it is in the acute stage that the infant is most liable to develop local extension of the suppuration. It is generally accepted that acute middle-ear infection in infancy implies involvement of the antrum in most cases. At this age the antrum is quite superficial, and its outer wall may even be deficient where the squamo-mastoid suture lies over it. Subperiosteal abscess should be, and in fact is, a very common complication of mastoiditis in babies. Again, the presence of the unossified petro-squamous suture in the infant presents an easy pathway direct from middle ear to middle cranial fossa. Extradural abscess and meningitis are ever-present dangers, and not rare complications, of acute otitis media in infants.

We think it is an important point that, except for one case of meningitis due to *H. influenzae*, none of our patients had any of the local complications which might reasonably be expected if the pus found in the mastoids was the result of an acute primary active process, and, moreover, so virulent as to cause death from toxæmia and dehydration. Death did

not occur too soon for complications, because the majority survived for over two weeks.

The clinical records in our Groups 2, 3, and 4, where pus was found in the mastoid after death, do not reveal that diarrhoea and vomiting were a feature of the illness, as might be expected if the association of mastoiditis and diarrhoea were that of cause and effect. Indeed, while the "parenteral" infection is well recognized as often being associated with vomiting and diarrhoea in infants, "gastro-enteritis" is not a common associate with, say, a pneumococcal empyema or a staphylococcal osteomyelitis, even when undrained. Why should the same infection in the mastoid cause such profound results?

The shorter, wider, and more patent Eustachian tube is often evoked to explain how milk-infected mucus, etc., can find its way to the middle ear. It seems to us that the reverse holds—namely, that "pent-up" pus is less likely to be present in the middle ear of infants than in older patients, because some drainage can take place through the tube into the pharynx. In fact, this is possibly one of the reasons why classical drum signs are often absent in infants with acute otitis media.

Infants have fairly well developed antral, ethmoid, and sphenoidal sinuses. While clinically recognizable "sinusitis" is not common in infants, it would seem logical to suspect these also as being the seat of "pent-up" infection. Ebbs (1937) has shown that pus can be found in one or more sinuses at necropsy in a by no means negligible number of patients. In the age group he investigated the findings were positive in 30.6% of 496 cases examined. We agree with Findlay (1932) that the climax of the "focal sepsis" theory was surely reached when Odeneal (1928) stated that the nasal accessory sinuses are infected in 50% of cases of gastro-enteritis, and that if myringotomy and mastoidectomy do not cause improvement in the infant's condition the sinuses should be opened and drained!

The diversity of organisms found in our cases and in other investigations makes it difficult to believe that such a constant syndrome as infantile diarrhoea and vomiting can be the result of such infection. Finally, the highly infectious nature and the mode of spread of gastro-enteritis in infants' wards in hospital form, we think, one of the strongest points against latent mastoid infection being the key to the aetiology of this condition.

Summary

In a series of 120 necropsies in infants and young children pus was found in the mastoid cavities of 71.

Though the highest incidence was in patients with a clinical history of "diarrhoea and vomiting," it was found almost as often in a wide variety of conditions.

Clinical, post-mortem, and bacteriological findings suggest that so-called "latent mastoiditis" is not an aetiological factor in the diarrhoea-and-vomiting symptom-complex.

REFERENCES

- Campbell, R. M., and Cunningham, A. A. (1941). *Arch. Dis. Childh.*, **16**, 211.
Cooper, E. D. (1937). *Ibid.*, **12**, 339.
Crooks, J., and Signy, A. G. (1936). *Ibid.*, **11**, 281.
Ebbs, J. H. (1937). *Proc. roy. Soc. Med.*, **30**, 1297.
Findlay, L. (1932). *Arch. Dis. Childh.*, **7**, 307.
Floyd, M. L. (1925). *Arch. Otolaryng.*, Chicago, **1**, 411.
Jeans, P. C., and Floyd, M. L. (1926). *J. Amer. med. Ass.*, **87**, 220.
Johnston, M. M., Brown, A., and Tisdall, F. F. (1930). *Canad. med. Ass. J.*, **23**, 231.
Leathart, P. W. (1943). *British Medical Journal*, **2**, 168.
Le Mée, J. M. (1937). *Proc. roy. Soc. Med.*, **30**, 1293.
McConkey, G., and Couper, E. C. R. (1938). *Arch. Dis. Childh.*, **13**, 137.
Marriott, W. McK. (1925). *Amer. J. Dis. Childh.*, **30**, 577.
Melle, B. G. (1934). *Sth. Afr. med. J.*, **8**, 636.
Odeneal, T. H. (1928). *Arch. Otolaryng.*, Chicago, **7**, 623.
Parrot, J. (1877). *Bull. Mém. Soc. méd. Hôp. Paris*, p. 190.
Spahr, M. B. (1929). *Amer. J. Dis. Childh.*, **37**, 541.
Trötschel, A. von. (1867). *Disease of the Ear*, New York, p. 167.
Yampolsky, J. (1933). *Sth. med. J.*, Nashville, **26**, 366.

The Club for Research on Ageing has received from Lord Nuffield a donation of £3,000, which will enable Dr. V. Korenchevsky to continue his gerontological investigations for a period of three years. Clinical trials of the effects of vitamins on aged persons at the Tooting Bec Hospital will be finished at the end of this year. These were rendered possible during the last two years by substantial grants from Lord Nuffield and the Nuffield Foundation. The Club expresses its heartfelt thanks for these benefactions, and is also very much indebted to the London County Council for most valuable co-operation.

SECONDARY ABDOMINAL PREGNANCY

BY

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Secondary abdominal pregnancy is a well-recognized but uncommon complication of pregnancy, and numerous cases have been described in the past. The case here recorded is of interest in view of the complications which had arisen by the time the patient was brought for treatment.

Case Report

On April 22, 1944, a Kanuri woman aged about 30 was brought to the African Hospital, Maiduguri. She complained of twelve months' amenorrhoea, increasing abdominal swelling for the same period of time, and for the last month a purulent discharge from the umbilicus. She did not complain of pain, but on questioning stated that she had suffered from an attack of abdominal pain three months previously, at the approximate time when her pregnancy should have terminated. She did not admit to having had any pain at an earlier period of the pregnancy. On examination the woman was seen to be extremely ill and considerably dehydrated. Her temperature was 99° F. and pulse rate 120 a minute. There was a swelling in the abdomen which appeared to be a pregnant uterus up to the level of 3 in. below the ensiform cartilage. There was a purulent discharge from the umbilicus, from which a portion of a foetal foot was protruding. Traction on this produced the whole foot as far as the ankle-joint. The skin of the foot was somewhat macerated. Over the whole of the left side of the abdomen were well-marked gas crepitations, which extended to well beyond the nipple line. There was a copious and offensive vaginal discharge.

The woman was taken to the theatre immediately, and under light chloroform anaesthesia the small opening in the umbilicus was enlarged upwards and downwards for about 2½ in. each way. This revealed a large cavity full of pus and lined with thick granulation tissue. A macerated foetus was extracted and the cavity washed out with saline, hydrogen peroxide, and finally eusol. There was no umbilical cord attached to the foetus or to any part of the gestation sac, and the foetal umbilicus was closed. The gestation sac was not within the uterus, and there was no opening out of the sac other than that through the umbilicus, which had been enlarged at the operation. The anterior wall of the gestation sac consisted of the anterior abdominal muscles and skin only. The wound was loosely sutured by silk-worm-gut stitches through all the layers, and a large drainage-tube was left in the cavity.

The patient was returned to bed and given anti-shock treatment. Rectal saline was administered several times in the first 24 hours and was retained well. To counteract the general infection and the gas infection of the abdominal wall 20 c.cm. of 10% soluseptasine was given immediately and 10 g. of sulphanilamide daily by mouth for the first two days. Antitetanus serum, 3,000 units, was given on admission, but no anti-gas-gangrene serum was available. The sulphanilamide was reduced to 5 g. daily on the third and fourth days and then to 4 g. daily for a further four days. The cavity was washed out at first thrice daily with hydrogen peroxide followed by eusol, and the vagina was douched twice daily with weak potassium permanganate. Recovery was far more satisfactory than could reasonably have been expected. The toxæmia diminished rapidly and the gas crepitations had disappeared within 48 hours. The tube was removed on the fifth day and the stitches on the eighth. By this time the wound was being syringed out once daily and the discharge had decreased considerably. The vaginal discharge had almost ceased. During this week routine examinations of the blood and faeces resulted as follows. Blood: no malaria parasites seen; haemoglobin 40%. Faeces: ova of *Ancylostoma duodenale* and live *Trichomonas intestinalis* were both present in considerable numbers. Treatment of the anaemia was instituted immediately, and at a later date the ancylostome infection was treated successfully with oil of chenopodium.

Convalescence was naturally slow, for the patient had been very debilitated. On May 1 she developed a bed-sore over the sacrum which took six weeks to heal. The abdominal wound healed slowly and a sinus persisted which required to be laid open and packed with bipp. She was discharged from hospital on June 17, by which date the abdominal wound was healed. The haemoglobin was then 65%, and there was no evidence of hookworm infection.

Discussion

Secondary abdominal pregnancy—i.e., continuation of pregnancy within the abdominal cavity following rupture of a tubal pregnancy—is described as being of two varieties—intraperitoneal and intraligamentary, depending on whether the tube