the sigmoid. Among the 29 cases in which, according to these criteria, there was no need to consider carcinoma of the colon, there were 15 with no abnormality, five with diverticulosis, and nine with diverticulitis. All the cases of diverticulitis were treated medically. As the surgical treatment of uncomplicated diverticulitis is rarely undertaken in the elderly, the question arises whether confirmation of the diagnosis by barium-enema examination serves any useful purpose. Haggie was concerned with the value of this examination in the diagnosis of carcinoma of the colon. It is suggested that this approach might apply also to the diagnosis of diverticulitis, at least in the elderly, and that a barium enema is rarely indicated if the patient has not passed macroscopic blood in the stools or has no abnormal physical signs, and if no abnormality is found on rectal examination or on sigmoidoscopy. To make it even less likely that the occasional case of carcinoma will be missed we would add "and if the stools are negative for occult blood." If Haggie's approach had been applied in our 45 patients examined by barium enema, 29 would have been spared the enema, so far as we know without ill effect. Even with our proposed additional indication for barium-enema examination—a positive occult blood test—at least 10 in whom the test was negative would have been spared an enema and probably some if not all of another seven in whom the occult blood test was not done.

Apart from the discomfort of a barium enema and especially of the preparation involved, the examination is not free from risk. A fatal case of barium sulphate embolism is reported by Truemner *et al.* (1960). Cases of retroperitoneal emphysema due to barium enema followed by air insufflation have been recorded by Pyle and Samuel (1960) and by Brunton (1960). The number of published complications of the barium enema reviewed by Pyle and Samuel is formidable. In both these papers the authors stress the special risk in the older age-groups.

It is concluded that in spite of the effort involved for many old, frail, and disabled patients, the barium-meal examination is a useful diagnostic procedure in the aged. In many of these patients, however, the more distressing barium enema might reasonably be avoided.

Summary

102 barium-meal and 46 barium-enema examinations carried out on patients in a geriatric unit are reviewed, with special reference to whether or not the examinations might have been avoided. The barium-meal examinations were found to be surprisingly valuable. There is scope for reducing the number of barium-enema examinations performed, which is desirable in view of the distressing preparation involved and the occasional complications that occur.

We are grateful to Dr. Stachurko, who was responsible for many of these barium examinations; to Dr. T. St. M. Norris and Mr. J. M. Davis, who read the manuscript and made helpful suggestions; and to Mrs. C. Carlin and Mrs. G. Mercer, the x-ray department staff nurses, but for whose kindness and sympathy these old people would have found their examinations even more of a trial.

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CORTICAL MASTOIDECTOMY IS STILL NECESSARY

BY

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Since the advent of antibiotics surgical intervention in acute middle-ear and mastoid disease has tended to decrease. Perhaps the time has now arrived to review this policy.

Nowadays, with the changing pattern of response of bacterial organisms to antibiotics and the problems associated with antibiotic-resistant strains, a different picture of mastoid infections seems to be emerging. An increasing number of cases of inadequate response to appropriate antibiotic therapy is being reported in all departments of medicine. There is constant reference to such problems as unresolved pneumonia and persistent infections of the urinary tract. Over the past 18 months we have seen a number of acute mastoid infections which have shown little if any response to antibiotic therapy.

In this article I have attempted an analysis of a series of cases in which the operation of cortical mastoidectomy was performed. In several it will be seen that there were some of the classical indications for operation, such as facial palsy, lateral sinus thrombosis, and otitic meningitis. However, most operations were performed because of the inadequate response of the infection to drug therapy. It is felt that these cases have proved the value of surgical intervention in the control of this new aspect of mastoid infection.

Cases in the Series

During a 12-month period as registrar to the ear, nose, and throat unit in Northampton General Hospital I have personally performed 13 Schwartze-type operations. This hospital serves a district of some 250,000 people. This gives an idea of the relative incidence of the problem in a fairly healthy Midland community. All the cases occurred during the winter months and the average age of the patients was 7 years. The oldest child was 15 years and there were four children under 2 years. With the exception of one infant in whom the mastoid cavity became reinfected, a satisfactory result was obtained in all cases. Even this child settled eventually, although several months passed before she was finally discharged from hospital.

Table I shows those cases in which there was a classical indication for surgical intervention. All these children had been treated with antibiotics before admission to hospital and their complication developed while under antibiotic therapy.

With the exception of Case 1, all these children recovered quickly after a relatively short stay in hospital. At follow-up several months later they had good hearing and dry, intact tympanic membranes. Case 1 later had a successful excision of his cerebellar abscess (neurosurgical unit, Radcliffe Infirmary, Oxford). There is a possibility that this complication might have been prevented by an even earlier drainage of his mastoid infection, as he presented the problem of an acute flare of a chronic suppurative otitis media. However, there can be little doubt that the indication for operation was

urgent in each case. The findings at operation have justified the procedure and there has been a rapid recovery with preservation of function in all these cases.

The other nine cases operated upon (Table II) present a new and interesting aspect of the problem of acute mastoiditis. No. 8 is the only unsatisfactory case among these. This infant had a recurrence of the mastoid infection two months after the original Schwartz operation. At this stage the cavity was reopened and found to be full of chronic indolent granulations. These were curetted clear and the wound was left open to heal from the base. This child was several months in hospital before she was finally discharged. However, at the time of writing, her ear-drum was intact and she seemed to hear satisfactorily. It should be stressed that this was a most unusual occurrence and that it was the only time in 15 years in this hospital where such a procedure was adopted.

Comment

On analysis of Table II certain facts become obvious. In the first instance, all these children were treated with antibiotics. Five of the nine had a prolonged trial in hospital under bacteriological control. There is no doubt about the use of the most appropriate antibiotic,

its adequate dosage, or the necessary duration of its course. It can be seen that in several instances no growth was obtained from the cultures of those cases treated with a heavy onslaught of antibiotic before admission to hospital. In Cases 5 and 12 a subsequent course of a second drug was given in hospital when there was no response after a full course of the first antibiotic. Both these children had cultures of haemolytic streptococcus sensitive to penicillin and chloramphenicol. We feel quite confident that a fair trial of antibiotic treatment was given in each case. Surgery was embarked upon only when it was realized that the infection was not being controlled and was showing no evidence of settling under antibiotics.

The next fact to emerge from these cases was the uniformly unsatisfactory response of the infections to antibiotics. In several instances the infection recurred within a day or two of cessation of the first course of the antibiotic. In two cases the signs of acute mastoiditis developed while the child was under appropriate antibiotic treatment.

It should be emphasized that many of these cases had only minimal signs of mastoid involvement. The paucity of physical signs in a case harbouring a widespread underlying mastoid infection is often surprising. In all

TABLE I

Case No.	Sex	Age in Years	History	Admission	Culture	Treatment	Findings	Course
1	M	14	Chronic discharge for 2 years. Recent acute ear treated with penicillin	Acute mastoid and meningitis after four days	Diphtheroid organisms	Penicillin and cortical mastoidectomy	Perisinus abscess	Later developed cerebellar abscess, treated successfully
2	F	11/12	Acute mastoid 2 weeks before. Treated with tetracycline	Subperiosteal abscess	No growth	" "	Subperiosteal abscess	Short hospital stay
3	M	4	Discharging ear for 3 weeks. Treated with penicillin V for 10 days	Acute mastoid and severe toxæmia (vomiting, headache)	<i>Staph. aureus</i> (penicillin-sensitive)	Chloramphenicol and cortical mastoidectomy	Lateral sinus thrombosis	" "
4	F	9	Aural discharge for three days	Acute mastoid and facial palsy after three days	Haem. strep. (penicillin-sensitive)	Penicillin and cortical mastoidectomy	Subperiosteal abscess (pus in cells)	Satisfactory

TABLE II

Case No.	Sex	Age in Years	History Before Admission	On Admission	Culture	Treatment	Findings	Course O.P.D. Follow-up
5	F	15/12	Right acute otitis media for 2 weeks. Penicillin and tetracycline given	Right acute otitis media—haem. strep. culture. Penicillin for 7 days. Then chloramphenicol for 8 days	Haem. strep. (penicillin- and chloramphenicol-sensitive)	Right cortical mastoidectomy	Widespread infection, with granulations	Satisfactory hearing; ear-drum normal
6	M	5	Aural discharge and deafness for 2 years. Penicillin V given previously	Acute mastoiditis	Haem. strep. (penicillin sensitive)	Cortical mastoidectomy and penicillin I.M.I.	Frank pus	Hearing and ear-drum normal
7	F	9	Earache and discharge for 2 weeks. Full course of tetracycline	" "	No growth	Cortical mastoidectomy and penicillin	Extensive granulations	" "
8	F	16/12	Left aural discharge for 3 days, left acute mastoiditis for 1 day	Penicillin for 6 days—settled; then developed acute mastoiditis again	" "	Cortical mastoidectomy and oxytetracycline	Diploic process. Some pus. Caries mastoid cortex	Reinfected two months later
9	F	7	Left acute otitis media. Treated in hospital with penicillin for 1 week—settled	Profuse discharge on second admission, 2 days after discharge from hospital	Haem. strep. (penicillin-sensitive)	Cortical mastoidectomy and penicillin	Widespread granulations	Hearing and ear-drum normal
10	F	6	Right aural discharge for 2 weeks. Treated with penicillin	Aural polypectomy. Persistent aural discharge. Penicillin given for 7 days	No growth	Cortical mastoidectomy	Widespread granulating chronic infection	" "
11	F	4	Discharge and deafness intermittently for 3 months. No accurate information on antibiotics	Left acute mastoiditis for 24 hours	<i>Staph. aureus</i> (chloramphenicol-sensitive)	Cortical mastoidectomy and chloramphenicol	Chronic granulations	" "
12	F	15	Left acute otitis media for 2 days	Penicillin for 7 days. Chloramphenicol for 10 days. Persistent discharge	Haem. strep. (penicillin and chloramphenicol-sensitive)	Cortical mastoidectomy	Pus ++ in loculated mastoid tip cell	" "
13	F	2	Left acute otitis media. Treated with antibiotics for 2 months intermittently	Acute mastoiditis	" "	" "	Extensive necrosis of mastoid cortex. Tip granulations ++	No follow-up as yet

such cases under antibiotic therapy, any tenderness or softening over the mastoid process should be regarded with suspicion. A profuse and persistent aural discharge is virtually pathognomonic of the spread of the infection to the mastoid cells. If a child develops such signs while under antibiotic treatment it would seem that immediate cortical mastoidectomy is indicated.

Perhaps the most striking characteristic of these children has been the similarity of the operative findings. In almost all cases there was evidence of infection spreading extensively through the mastoid cells. The cell system was occupied by a haemorrhagic granular process with frank granulations growing in many cases. Several showed a marked osteolytic character to the infection with dissolution of the mastoid cortex leaving a cavity occupied by indolent granulations. It was generally a simple matter to curette the soft chronically infected bone clear of disease.

The next point in the analysis of this series is the satisfactory result obtained. These children were discharged from hospital on an average of 12 to 18 days after operation. I have seen them all, except one recent case still in hospital at the time of writing, for follow-up two months after operation. They all have normal hearing and the tympanic membranes on the affected side are dry and clean.

Discussion

It should be stressed that all these patients were children. There would seem to be a strong case for referring all children with acute otitis media which has not resolved after antibiotic therapy for assessment with the view to surgery. Radiological investigation of the mastoid process is often helpful in those cases presenting minimal symptoms and signs of acute mastoiditis. When the infection has persisted for over 10 days there is almost always positive radiological evidence of its spread to the mastoid process.

The main interest in these cases has been the demonstration of this new variety of subacute mastoiditis arising out of unsatisfactory resolution of an acute mastoid infection. These cases may become increasingly common, and one should have this in mind where an acute middle-ear infection fails to respond adequately to antibiotics.

Surgery is highly advisable if these cases are to be treated successfully and their morbidity is to be minimized. It would seem that the persistence of such an infection may lead to chronic mastoiditis and eventually chronic suppuration in the middle ear, as well as to possible intracranial complications. This path of events should be avoided at all costs. As the Schwartze type of operation is a relatively simple procedure, its value in avoiding such a sequence of events is enormous.

The particular interest for the general practitioner should be an awareness of this problem. He should refer all acute middle-ear infections which have failed to respond after 10 days of adequate antibiotic therapy for consultant opinion. If the consultant is conscious of this problem, a timely cortical mastoidectomy will prevent a prolonged stay in hospital and the possibility of chronic middle-ear infection and deafness in the patient is diminished.

Summary

A series of 13 children in whom there was an inadequate response of acute mastoid infections to antibiotics is presented. A widespread subacute infection

was seen in nine of these cases. The uniformly satisfactory progress of these children after cortical mastoidectomy is shown. The necessity for careful assessment from a surgical viewpoint is made where acute otitis media in a child does not respond satisfactorily to antibiotic therapy.

I am indebted to Mr. Charles Gledhill for permission to do this work and for his encouragement and help in treating these cases.

MECHANISM AND SIGNIFICANCE OF ERYTHROCYTE SEDIMENTATION RATE

BY

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The earlier hypotheses on the causes of raised erythrocyte sedimentation rate require re-examination. The negative surface charge of the erythrocytes is not altered in bloods with a high sedimentation rate, nor are there always definite quantitative alterations in the distribution of the plasma protein fractions, and we have seen human plasmas with a normal distribution of the proteins which were associated with a raised sedimentation rate. Riva (1957) has already noted that a number of plasmas with a normal albumin/globulin ratio are associated with a high sedimentation rate, and vice versa. Thus an increase in fibrinogen or γ -globulin is only coincidental to a high sedimentation rate and not its cause. Fractionation of normal and high-sedimenting plasmas by means of ammonium sulphate precipitation or preparative paper electrophoresis has shown that the phenomenon is caused by specific proteins (Ruhensroth-Bauer, 1957, 1959; Ruhensroth-Bauer, Brittinger, Granzer, and Nass, 1960) (see Table).

By both methods protein fractions could be obtained which at a concentration of 1–2% caused a high sedimentation rate provided supplements such as 0.6% dextran had been added. The supplements by themselves had no effect, and the proteins which produce the increase in sedimentation rate behave, therefore, like incomplete antibodies. Except for fibrinogen, normal plasma contains no fractions which increase the sedimentation rate, and fibrinogen by itself is effective only at concentrations that are rarely seen even in pathological conditions. Investigations of the role of fibrinogen indicated in all cases that its contribution to the sedimentation rate was small. Thus serum from a blood with a high sedimentation rate had a diminished effect compared with that of the analogous plasma (Ruhensroth-Bauer *et al.*, 1960), and a high sedimentation rate is therefore due to specific serum proteins whose action is merely added to by the fibrinogen. It appears that the relationship between the variable levels of fibrinogen and the other factors may have some diagnostic significance.

We proposed the term "agglomin" for all plasma proteins which on the addition of supplement cause an increase in sedimentation rate. In this respect fibrinogen is an agglomin which is always present in blood. Besides dextran, collodion, and similar supplements, plasma proteins without agglomin activity may also act as supplements. This can be shown by dividing a