BACTEROIDES FUNDULIFORMIS SEPTICAEMIA

Report of Successful Treatment of a Case

By A. D. M. SMITH, B.Sc., M.B., B.Ch.(Wales)

Senior House Officer in Medicine, Bristol Royal Infirmary

The genus *bacteroides* are gram-negative bacilli which do not form spores and are strictly anaerobic. There are two main species—*funduliformis* and *fragilis*. They are normal inhabitants of the mouth, female genital tract and intestine. Their sensitivity to antibiotics is variable. Since these bacteria may be the predominant organisms in adult faeces there was an illogical tendency at one time to regard their presence in the blood or in suppurative lesions as of no clinical significance. In recent years, however, the organism has been incriminated as the cause of a wide variety of lesions.

It has been found that clinically these fall into five main groups:

- (1) Infection via the skin, usually from contact with animals—this is the smallest group.
- (2) Infection via the throat. This may sometimes occur after tonsillectomy or be associated with a sore throat or middle ear infection.
- (3) Infection of the female genital tract.
- (4) Empyema.
- (5) Intra-abdominal sepsis.

The last group appears to have been comparatively neglected, but has recently been re-emphasized (Gillespie and Guy, 1956).

Claus (1931) and Kissling (1929) have observed that infections sometimes occur in the nature of small epidemics. According to Lemierre (1936) the commonest cause is a tonsillar or peritonsillar abscess which has either been incised too late or to an insufficient degree. In fact, even an apparent simple tonsillitis may conceal numerous small foci of suppuration in the depths of the tissues which cannot be demonstrated clinically. Lemierre further observed that septicaemias due to the organism were always accompanied by the formation of distant metastatic abscesses. Although these occurred most frequently in the lungs, articular lesions and sometimes suppurative arthritis were also commonly present. Icterus and sub-icterus with urobilin in the urine and renal lesions were also reported. Alston (1955)

found that in his experience of 12 cases there were, in addition to the lesions already quoted, purulent meningitis, lateral sinus thrombosis, sublingual abscess, extensive suppuration of neck and mediastinum, splenic abscess, abscess in the broad ligament of the uterus and osteomyelitis of the femur. Bacterial endocarditis was described in two patients by Fisher and McKusick (1953). In the presence of pyaemia the diagnosis may be suggested by a peculiar odour like Limberger or overripe Camembert cheese which is supposed to be imparted by the pus (Alston, 1955).

Septicaemias may progress very rapidly and end fatally in 7-15 days. In these cases, the commonest findings at post mortem are necrotic infarcts in the lungs. It is interesting to note that at one time German workers used to ligate the internal jugular vein on the side of the affected tonsil and thereby try to prevent the complication of metastatic spread (Lemierre, 1936). Sometimes the infection develops extreme chronicity and many of the cases reported were fatal in spite of treatment with antibiotics. Furthermore, in some instances, the interval between apparent cure and a return of the infection was several months.

Alston (1955) reviews necrobacillosis in Great Britain and quotes 21 cases recorded as occurring in this country, of whom 13 died (62 per cent.). He feels that many less severe infections may have been missed. Of the 12 cases reviewed by Alston, a positive blood culture was reported as being obtained in only one, and this case was rapidly fatal. It is not clear whether blood cultures were performed as a routine measure. Forbes and Goligher (1944) describe a case of septicaemia complicating a compound fracture of the leg in which a positive blood culture was obtained, but this, too, was rapidly fatal. Although the introduction of antibiotic therapy appears to have improved the prognosis, deaths still occur in a high proportion of cases (McVay and Sprunt, 1952).

The following case of *bacteroides funduliformis* septicaemia which completely responded to anti-

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biotic therapy is presented. From a review of the literature, it appears that cases reported as occurring in Great Britain in which a positive blood culture was obtained are very rare. Furthermore, there is apparently only one case of this nature which has survived (Jones, 1944). Here the infection complicated an incomplete abortion and no specific therapy was given apart from supportive blood transfusions.

Case Report

A labourer, aged 17, was admitted to the Bristol Royal Infirmary on October 4, 1956. Seven days prior to admission he had developed a mild sore throat and this was followed by severe frontal headache, malaise, rigors, sweating and vomiting. The severity of the vomiting was quite astonishing and he had been unable to retain even sips of water without expelling them in a projectile manner. His doctor had given him no treatment during this period apart from an aspirin mixture, and there was accordingly no clouding of the clinical picture. He had had no contact with animals.

On admission he was gravely ill. He was disorientated, tachypnoeic and had generalized muscle tenderness with acute tenderness in both

renal angles. In the seven days of the illness obvious wasting of the gluteal muscles had developed and was, in fact, akin to the wasting that used to be seen in long-continued septicaemic cases prior to the introduction of antibiotics. Examination of the throat revealed only slight reddening of the fauces. There was a moderate degree of neck stiffness and Kernig's sign was positive. The temperature was 102.4° F. and the pulse rate 96 per minute. His blood pressure was 100/50. In particular, it must be mentioned that the apex beat was in the fifth space within the mid-clavicular line. There were no cardiac murmurs. No skin wounds or abrasions were to be found.

It was felt on clinical grounds that this was a case of septicaemia, the exact nature of which remained to be proved. A white blood count taken on admission showed 12,300 cells with 10,000 polymorphs. A mid-stream specimen of urine showed protein + with scanty red cells and a moderate number of casts, both granular and hyaline. Culture of the urine was sterile. Lumbar puncture produced a clear, colourless fluid containing no increase of cells and 39 mg. per cent. of protein. Blood was withdrawn for agglutination for organisms of the *Salmonella*

group and Weil's disease, and blood cultures set up for aerobic and anaerobic organisms. A throat swab was taken. Both the agglutination tests and the throat swab were negative when subsequently reported on.

On the morning following admission his condition had deteriorated still further and it was felt that antibiotics could no longer be withheld. Penicillin 500,000 units and streptomycin 0.5 g. six-hourly were accordingly given. A portable X-ray of the chest showed only a diffuse loss of translucency at both bases. A plain X-ray of the abdomen was normal. In view of the continued vomiting and evidence of renal involvement his blood non-protein nitrogen and electrolytes were estimated and found to be: N.P.N. 50 mg. per cent., plasma Na 131 mEq., plasma potassium 3.6 mEq., plasma chloride 85 mEq. with plasma proteins of 15 mEq., and a blood haemoglobin of 98 per cent. There was a marked increase of urobilin and urobilinogen in the urine.

Two days after admission, and in spite of the commencement of antibiotic therapy, his condition had deteriorated even further. Examination now revealed enlargement of the heart with the apex beat in the sixth space in the anterior axillary line. A blowing systolic murmur was heard to the left of the sternum. Enlargement of the heart was confirmed radiologically which also demonstrated a probable small right pleural effusion. There was no clinical evidence of a pericardial effusion. An E.C.G. was normal. His blood pressure remained consistently around a systolic level of 100 mm.Hg. Dilatation of the heart was assumed to be due to myocardial damage. The possibility of an accompanying endocarditis suggested itself.

On the fourth day it was reported that the blood culture taken on admission had grown a pure growth of a pleomorphic anaerobic gram negative bacillus, i.e. a member of the bacteroides group. Its morphology suggested that it was *bacteroides funduliformis*. No aerobes were grown. Quantitative sensitivity revealed that the organism was sensitive to 0.03 units/c.c. of penicillin as compared with the Oxford staphylococcus's sensitivity to 0.015 units/c.c. It was also reported as being doubtfully sensitive to streptomycin and fully sensitive to terramycin, chloramphenicol and erythromycin. In spite of the organism's extreme sensitivity to penicillin *in vitro* it was noticeable that his temperature and general condition had completely failed to respond to 2 million units of the drug per day. The radiological changes at the right base made us feel that possibly a metastatic lesion of the lung was developing and might provide a nidus for the future dissemination of the infection. Accord-

ingly, on the sixth day the streptomycin was discontinued and the dose of penicillin increased to a total of 8 million units daily. This immediately produced a considerable improvement in the patient's condition. His temperature, which had been maintained at a level of 101-103° F., decreased to between 99 and 100° F., the heart size returned to normal and the systolic murmur disappeared. However, in spite of this big increase in the penicillin dosage he continued to run an irregular mild fever, and on the twelfth day following admission it was increased still further to 12 million units daily. This produced the required effect and his temperature reverted to normal and remained so throughout the subsequent course of his treatment. It was felt that in view of the cardiac dilatation and the poor prognosis of previous cases of septicaemia due to this organism that full antibiotic therapy should be continued for a total of six weeks and this was adhered to. He was kept on 12 million units a day for seven days with a subsequent reduction to 8 million a day for a further seven days and then 4 million a day for the remainder of the six-week period.

A chest X-ray taken on the eighteenth day following admission showed that radiologically the heart had reverted to its normal size. There was an area of collapse and consolidation in the right lower lobe involving the basal segments in addition to the small right-sided pleural effusion. The sinuses were also X-rayed at this time and found to be of normal translucency. His haemoglobin now was 89 per cent. with 6,700 W.B.C., total polymorphs 4,400 and the E.S.R. 46 m.m./1 hr. Repeated mid-stream specimens of urine showed no abnormality and further blood cultures were sterile both for aerobic and anaerobic organisms after the addition of penicillinase. His non-protein nitrogen had fallen to 32 mg. per cent.

After a further week, the X-ray of his chest showed that there was some resolution of the consolidation in the right lower lobe, but it was by no means complete. Some fluid still remained in the right pleural cavity. On the thirty-ninth day following admission the chest X-ray showed that the consolidation had now resolved completely. However, in view of the persistent nature of the organism as reported in the literature it was felt wise to screen him and exclude a sub-phrenic focus. This was performed (Dr. J. H. Middlemiss) and showed only some residual thickening in the right costo-phrenic angle with adherence of the right periphery of the diaphragm. Eight weeks after admission the patient looked and felt fully recovered and was discharged home.

A careful watch has been kept on him as an out-patient, but six months after discharge he was

still perfectly well with a static chest X-ray appearance, and an E.S.R. of 5 mm./1 hr. It therefore seems reasonable to suppose that he has made a complete recovery.

Discussion

There appear to be several features of this case worth stressing. Firstly, the extreme virulence of the organism when it invades a susceptible host as was obviously what occurred with this patient. Secondly, the development of acute cardiac dilation shortly after admission which would possibly have progressed to cardiac failure or acute endocarditis if the infection had remained unchecked. Finally, the massive doses of penicillin which were required to eradicate the organism in spite of its extreme sensitivity in vitro. It seems certain that this was due to the formation of a metastatic lesion in the right lower lobe of the lung which required very high concentrations of penicillin to overcome it.

The routine of setting up blood cultures under both aerobic and anaerobic conditions undoubtedly allowed the diagnosis to be made and the appropriate therapy instituted. Clearly, if this procedure is not adopted in all cases of septicaemia the diagnosis may only be made when considerable numbers of metastatic lesions have developed and the infection become impossible to eradicate.

Summary

A brief survey of the pathological effects of infection by *bacteroides funduliformis* has been produced.

A review of the literature has shown that even with the use of modern antibiotic agents a high mortality is still to be expected.

The successful treatment of a case of true septicaemia due to this organism is described and points of interest discussed.

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