and respiration rates, and the extent of the radiological opacity. We believe that this explains the greater severity of Group II, and suggest that if treatment is inadequate the condition may progress to bacterial lobar pneumonia superimposed upon the absorption atelectasis.

Treatment

It should be more widely recognized that even such upper respiratory infections as the common cold can give rise to segmental atelectasis and that this may progress to a moderately severe pulmonary involvement. Treatment should be directed to the prevention of atelectasis by deep-breathing exercises, promotion of cough, and the avoidance of cough depressants. Particularly we deprecate the use of Dover's powders and codeine phosphate.

In Group I the aim of treatment must be to prevent sustained bronchial occlusion, and to this purpose the same measures will apply. In addition postural drainage should be instituted and expectoration assisted by simple inhalation therapy. If pleuritic pain is present, on no account must the respiratory excursions be restricted by the application of strapping. However, it is essential that this pain should be promptly relieved, because it may cause diminution of voluntary movement and suppression of the cough. For this purpose we have used pethidine, 100 mg. orally, or have sprayed the chest with ethyl chloride local analgesic. If these measures are employed early, and vigorously carried out, admission to hospital or additional chemotherapy will not be required.

In Group II chemotherapy will be required, for in addition to bronchial occlusion there are infection, consolidation, and a neutrophil leucocytosis. All our cases responded to sulphadimidine.

Conclusions and Summary

During the winter of 1950-1 393 Service men reported sick with coryzal symptoms.

Forty-eight of these presented with abnormal chest radiographs.

Forty-five cases were thought to be due to aspiration from the upper respiratory tract. They were divided into two groups on the basis of the neutrophil count. Group I had a normal white count, while Group II was more severe and was associated with a leucocytosis. Evidence is presented to suggest that Group II resulted from a more sustained bronchial occlusion and might have progressed to bacterial pneumonia.

A scheme of treatment has been described: in no circumstances must the cough reflex be depressed.

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FRIEDLÄNDER'S PNEUMONIA

A REPORT ON SIX CASES

BY

J. M. BARBER, M.D., M.R.C.P.Ed.

AND

A. P. GRANT, M.D., M.R.C.P.

(From the City Hospital, Belfast)

In 1882 Carl Friedländer described the large Gram-negative capsulated bacillus which he found at necropsy in several cases of pneumonia. He regarded it as the cause of lobar pneumonia. This was disproved, and for a time it was thought to be of no pathogenic significance. Weichselbaum (1886) established that it was the infecting organism of a small percentage of cases of pneumonia. Series of cases with reviews of the literature have been published by Solomon (1937), Bullowa et al. (1937), Perlman and Bullowa (1941), and Hyde and Hyde (1943).

We wish to draw attention to a type of pneumonia which is not affected by penicillin. In the absence of specific therapy, cavitation can occur in a few days. In spite of advances in treatment the prognosis remains serious.

Case 1

Five days before admission a man aged 57 got a severe wetting on the golf course. That night he felt shivery. The next day pain in the right side of the chest, worse on coughing, was noticed. The cough became more persistent and productive.

On examination he looked extremely ill, but was rational and co-operative. His temperature was 102.4° F. (39.1° C.). There was dullness at the right base, where numerous crepitations were heard, and the voice sounds were increased. The sputum was yellow and sticky. The initial chest film revealed consolidation, involving most of the right lung. The sputum yielded a growth of Friedländer's bacillus. This was stated to be streptomycin-sensitive but penicillin-resistant.

On his first day in hospital, before the result of the sputum examination was known, the patient was placed on sulpha-

FIG. 1.—Case 1. One year after acute attack. Multiple small cavities in right upper lobe. Surrounding fibrosis. Appearance substantially unchanged for 10 months.

dimidine and penicillin. Next day he became wildly delirious. After the bacteriological report the treatment was changed to streptomycin, 1 g. eight-hourly. This was given for five days. The fever showed a prompt fall when streptomycin was given, although after its discontinuance there were occasional rises in temperature to between 99° F. (37.2° C.) and 100° F. (37.8° C.) during the next two weeks.

After the first 48 hours of streptomycin treatment the patient's general condition improved rapidly. Subsequent cultures of the sputum grew pneumococci but not Friedländer's bacillus. No tubercle bacilli were detected in five cultures. After two weeks the chest film showed evidence of several small cavities in the right upper lobe; repeated chest films revealed slow clearing of the lung fields. There was slight displacement of the mediastinum to the right. Bronchoscopy (Mr. J. A. W. Bingham) was normal.

The patient was discharged after eight weeks, and has been followed for a year and a half at the out-patient clinic. He feels perfectly fit and has returned to work. There is no sputum. Chest films continue to show thin-walled cavities in the right upper lobe.

Comment.—We regard this as a typical acute case of Friedländer's pneumonia. During the first 24 hours in hospital his condition rapidly deteriorated. There was a dramatic response to streptomycin, which was life-saving in this patient. There seems to be no indication for surgery in this case.

Case 2

A man aged 78 had suffered from dyspnoea on exertion for years. He was said to have had influenza for ten days before coming into hospital. The main complaint on admission was exhaustion.

On examination he was dyspnoeic and there were physical signs of consolidation at the left base. His temperature on admission was 100.8° F. (38.2° C.), rising the next day to 101.4° F. (38.55° C.). He was at first treated by means of penicillin and "sulphatriad," but the pyrexia persisted, although it never again rose above 101° F. (38.3° C.). The sputum was mucopurulent. It grew a pure culture of Friedländer's bacillus. An x-ray film of his chest showed patchy consolidation throughout the right lung and in the left lower lobe.

Streptomycin was given, 2 g. daily by aerosol for eight days. There was a marked improvement in his clinical condition in 24 hours. Friedländer's bacillus disappeared from the sputum, and subsequent cultures showed a mixed growth of *Pseudomonas pyocyanea*, pneumococci, and *Proteus vulgaris*. Repeated attempts to isolate the tubercle bacillus failed.

He made an uninterrupted recovery. In six months he was symptomless and the chest film revealed no abnormality. The response to streptomycin was complete.

Case 3

Three weeks before admission a man aged 61 had suddenly become severely dyspnoeic. This was associated with a sharp pain in the left lumbar region. There was a persistent cough. The sputum was mucopurulent.

On examination he was dyspnoeic. There were signs of consolidation at the right apex and at the right base. He was at first regarded as a case of lobar pneumonia and treated with penicillin. The temperature fell in five days and there was some clinical improvement, but it rose again on the fourteenth day, when a pure culture of Friedländer's bacillus was obtained from the sputum. Streptomycin therapy was begun.

A chest film taken on admission showed a patchy consolidation involving the apical region of the right upper lobe and the lower part of the right lower lobe. At the beginning of the third week a small right-sided pleural effusion developed which later slowly resolved. There was

FIG. 2.—Case 3. Right apical region, showing residual small cavities and fibrosis.

a slow improvement in the chest films, although several small thin-walled cavities developed at the right apex. He continued to bring up a few ounces of mucopurulent sputum daily. Bronchoscopy revealed nothing abnormal.

When seen as an out-patient six months later he felt well, although there was a small amount of sputum each day. A chest radiograph showed resolution of the disease in the lower lobe, except for pleural thickening. At the right apex the small cavities were still present with an increased amount of surrounding fibrosis.

Comment.—In this case there was a rapid response to streptomycin. The residua were minimal. Surgery was not indicated.

Case 4

This patient, a man aged 49, had a vague feeling of ill-health the day before admission. Within a few hours rigors occurred. A "gripping pain" began in the right side of the chest. This was aggravated by coughing. He described his sputum as "rusty in colour and sticky."

On examination he was somewhat dyspnoeic. The respiratory rate was 28. Expansion was diminished at the right base. There was dullness on percussion in the same area. A chest film showed dense homogeneous consolidation spreading out from the right hilum. The white blood cells numbered 1,000 per c.mm. (40% polymorphs, 54% lymphocytes, 6% monocytes). His temperature was 101.2° F (38.4° C.) on admission.

For the first 24 hours he was given penicillin. His condition deteriorated. The next day dyspnoea was more severe and the pneumonia had extended to include the whole of the right lung. Direct examination of the sputum revealed that the predominant organism was a Gram-negative bacillus, and Friedländer's organism was isolated in pure culture. On this day it was noticed that the sputum was extremely tenacious, sticking to the patient's lips and to the sides of the sputum mug. It was bright red in colour and resembled sticky tomato sauce.

The patient was given chloramphenicol and streptomycin, and placed in an oxygen tent. In spite of this his condition steadily deteriorated and he died on the third day in hospital, or the fourth day of his illness.

Pathology (Dr. J. M. Drennan).—On macroscopic examination the lung appeared rubbery, and the trachea and bronchi contained a large amount of dark-red semi-solid material with a curious mushy consistency. A fibrinous pleural exudate covered the whole of the right lung, which was consolidated. Similar but smaller patches of consolidation occurred in the left lung. Microscopically the alveoli and the consolidated areas were filled with a cellular exudate composed chiefly of large mononuclear histiocytes with vacuolated cytoplasm. The alveolar capillaries were intensely congested, and small haemorrhages had occurred in many of the alveolar spaces. In section, stained by Brown's stain, large numbers of Gram-negative bacilli could be seen lying free in the alveoli or within the cytoplasm of the mononuclear cells. The spleen showed a classical picture of "acute splenic tumour" with widespread infiltration of the trabeculae by lymphocytes and polymorphonuclear cells, and a general increase of pulp cells. The adrenal cortex showed marked depletion of lipid and advanced toxic and degenerative changes in the cells of the parenchyma.

Comment.—The fatal result in this case in spite of starting chloramphenicol and streptomycin therapy on the third day of disease must be attributed to the granulopenia because of extreme toxæmia. It is of some interest that the patient did not appear gravely ill on admission, but steadily deteriorated.

Case 5

Two days before admission this patient, a man aged 67, had a rigor. This was followed by cough, pain in the left side, and a "rusty spit." There had been no previous chest trouble.

On admission his temperature was 101° F. (38.3° C.), and he was slightly cyanosed. Dyspnoea was severe, with a respiratory rate of 56 a minute. The heart rate was 94. There was dullness all over the left lung. Vocal resonance and fremitus were increased and crepitations were heard. An x-ray film of the chest showed infiltration of the left upper zone, with some clear areas attributed to localized emphysema. There was also patchy consolidation of the right lower lobe.

He was given penicillin and sulphadimidine. In a few days the temperature fell, but subsequently it rose again, varying between 99° F. (37.2° C.) and 100.6° F. (38.1° C.). The sputum became more copious, and was thick and greenish in colour. An x-ray film on the twenty-first day in hospital showed an abscess cavity with a fluid level surrounded by consolidated lung in the left upper lobe.

Postural drainage was begun. Examination of the sputum revealed a pure culture of Friedländer's bacillus, and streptomycin was started. There was a rapid improvement in his general condition. His temperature became normal, and remained so. He steadily gained weight, and the sputum decreased in amount. There were no further positive cultures of Friedländer's bacillus, and repeated attempts to demonstrate the tubercle bacillus were negative.

Bronchoscopy was carried out, but no abnormality of the bronchial tree was detected. The abscess cavity slowly disappeared, being replaced by fibrosis.

When seen 11 months after the commencement of his illness he had no complaints. A chest film revealed minimal fibrosis in the left upper lobe.

Comment.—There was considerable delay in isolating the infecting organism in this case. It is interesting to note that there was some subjective improvement on penicillin and sulphadimidine, although the chest disease progressed steadily to cavitation. The response to streptomycin was clear-cut.

Case 6

Four days before admission a man aged 68 had a series of rigors and noticed a cough which became progressively

more troublesome. The next day he produced some blood-stained sputum. He remained in bed at home, and on the third day felt much weaker. His doctor was not called until the morning of the fourth day of the illness, when he found the patient cyanosed and collapsed. Immediate transfer to hospital was arranged.

On admission he was cyanosed. There was evidence of peripheral circulatory failure. His temperature was 101° F. (38.3° C.), and his respiratory rate 42 a minute. There were signs of consolidation in the right lower lobe, bronchial breathing, increased breath sounds, and crepitations. He was rational on admission, but rapidly deteriorated. Within one hour of admission the dyspnoea was much more pronounced. The sputum was a bright-red colour and extremely sticky—so much so that it was difficult to remove it from the patient's lips.

He was placed in an oxygen tent and given injections of nikethamide, but he died about an hour after entering hospital. Permission for necropsy was not obtained. The sputum grew a pure culture of Friedländer's bacillus.

This fulminating case, in which the patient was moribund on admission, closely resembled Case 4.

Discussion

The incidence of Friedländer's pneumonia has been given as about 1.6% of all pneumonias (Hyde and Hyde, 1943). This is probably too low a figure. Our incidence was 2.5%. The disease has a well-marked tendency to involve patients in the older age groups. It is extremely rare in childhood.

The ratio of males to females is about six to one. All the present cases were males. The importance of chronic alcoholism as a predisposing factor has been stressed in the past, but none of our patients was a chronic alcoholic.

The onset is usually acute, with rigors, pleural pain, and cough. When seen the patient is usually severely ill. Herpes is not a feature. Some authors have suggested that the signs of consolidation are not so well marked as in pneumococcal lobar pneumonia and that this fact was of diagnostic help. We found no significant differences in the chest signs in these two types of pneumonia. Frequently more than one lobe is affected: the upper lobes are particularly vulnerable. The temperature is rarely as high as in pneumococcal pneumonia: 102.4° F. (39.1° C.) was the highest in this series, and in most cases 101° F. (38.3° C.) was the peak. The fever is irregular in type.

Solomon (1937) described the characteristic sputum as "a brick-red homogeneous emulsion of blood and mucus." Bullowa *et al.* (1937) state that in one-third of cases it is thick, gelatinous, diffusely bloody, and adheres to the lips and to the sputum cup. In the remainder it does not differ from that of pneumococcal pneumonia. Two of our cases showed a red emulsion type of sputum. Free haemoptysis has been recorded.

A positive blood culture is not uncommon, but does not seem to affect the prognosis.

Leucopenia may occur, and relative monocytosis has been described. One of our fatal cases had a total white cell count of 800 per c.mm. the day before death. Before the introduction of antibiotics the mortality was about 80% (Bullowa *et al.*, 1937; Solomon, 1937; Julianelle, 1941).

The most important complication is the development of multiple thin-walled cavities in the lung. The residual cavities have to be differentiated from tuberculous cavities, especially as they often involve the subapical regions. The tendency for the cavities in Friedländer's pneumonia to be multiple and thin-walled has been mentioned. The patient is usually symptomless and the condition may remain stationary for years. There seems to be no indication for surgery in these patients. This contrasts with the experience of Wylie and Kirschner (1950), who found that 11 of their 16 cases required lobectomy or pneumonectomy. Pleural effusion, empyema, pericarditis, meningitis, pneumothorax, activation of quiescent pulmonary tuberculosis, gastroenteritis, erythematous skin rashes, and non-suppurative polyarthritis have all been described.

The radiological picture of acute Friedländer's pneumonia may resemble that of ordinary pneumonic consolidation, but, as was pointed out by Bullowa *et al.* (1937), the most striking finding initially is the density of the shadow, which is usually homogeneous and may be suggestive of fluid. A bronchopneumonic phase was described by Kornblum (1928). This was not seen in these cases. After a day or two one notices less-opaque areas due to the formation of abscesses. It is sometimes found that there is bulging or sagging of the interlobar septa, and this is well illustrated in the recent paper by Kirby and Coleman (1951), who reported it in half of their 11 cases. As the chronic stage is reached fibrosis makes its appearance, combined with a honeycomb effect due to small cavities.

Keefer *et al.* (1946), in their clinical trials, found streptomycin effective if given early in lung infections due to Friedländer's bacillus. Chloramphenicol and aureomycin have also produced good results in small series. We found records of 38 cases treated with streptomycin, chloramphenicol, aureomycin, or combinations of these antibiotics. In these the mortality rate was 37%. We were impressed by the rapid downhill course of Case 4, who at 49 years was the youngest of the series. Rapid bacteriological diagnosis is still important in pneumonia. Our routine is to collect sputum at the initial clinical examination. Some of this is stained by Gram's method. If Gram-negative bacilli are found to be the predominant organism, streptomycin, 1 g. eight-hourly, is given pending the result of sputum culture. No cases have been seen since aureomycin became freely available. We intend to substitute it for streptomycin.

Summary

Six cases of Friedländer's pneumonia have been seen. Short clinical histories of these are given. They represented 2.5% of all cases of pneumonia admitted to the two medical units of a general hospital. The clinical picture and radiological findings are described.

This pneumonia is almost entirely a disease of elderly men. Essentially it differs from pneumococcal lobar pneumonia in that there is destruction of the lung stroma and no response to penicillin. Clinically the patient seems gravely ill. About 25% have a characteristic sputum—a sticky homogeneous emulsion of blood and mucus. Cavitation can occur in the lung within a few days.

Before the introduction of antibiotics the mortality was about 80%. The importance of early bacteriological diagnosis is stressed.

Streptomycin has reduced the death rate, but the prognosis remains serious, as about one-third of the cases recorded in the literature died in spite of antibiotics. Only one of the treated cases in this series died. Two of the patients were left with multiple small thin-walled cavities in the lungs. They nevertheless were able to return to strenuous work.

The differential diagnosis from tuberculous cavities is most important, and depends on: (i) a history of pneumonia; (ii) often no symptoms; (iii) cavities smaller and more numerous; (iv) failure to culture tubercle bacilli from the sputum.

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CIRCUMCISION IN A NATIONAL SAMPLE OF 4-YEAR-OLD CHILDREN

BY

D. MacCARTHY, M.D., M.R.C.P., D.C.H.

J. W. B. DOUGLAS, B.M., B.Ch., B.Sc.

AND

C. MOGFORD, B.Sc.

(From the Joint Committee of the Institute of Child Health (University of London), the Society of Medical Officers of Health, and the Population Investigation Committee)

This brief note gives some figures showing the frequency of circumcision, the age at which it is performed, and the immediate complications of the operation. These figures are derived from a sample of children drawn from all social classes and from all parts of England, Wales, and Scotland, and they supply the answers to some of the questions raised by Gairdner (1949). His article was the stimulus for the present study.

For the last five years the Joint Committee of the Institute of Child Health (University of London), the Society of Medical Officers of Health, and the Population Investigation Committee,* with the help of health departments throughout the country, have been following the growth, health, and development of 5,380 children. These children are a national sample of all legitimate births in the first week of March, 1946. For the purpose of the survey they have been visited on three occasions—when aged 8 weeks, 2 years, and 4 years. On each occasion health visitors recorded a wide range of information of medical and social interest. Before the last inquiry, which took place in 1950, one of us (D. MacC.) suggested that the subject of circumcision should be studied. This study was limited to questions of fact, and no attempt was made to uncover the reasons for circumcision. Each mother was asked whether her child had been circumcised and, if so, his age when operated upon and details of any complications that ensued. We feel that this information, though scanty, will be of interest because it is based on a representative national sample of young children.

Numbers Under Survey

This follow-up survey has recently been described in some detail (Douglas, 1951) and it is enough to note here that of 5,380 children born in the first week of March, 1946, 4,906 were still living in this country in 1950.† Of these children 96% are still enrolled in the survey, and enough is known of the early history and home conditions of the remaining 201, who are untraced or have dropped out of the survey for other reasons, to show that the sample is in no way biased by their loss.

Among survivors still living in this country in 1950 there were 2,578 males, and the questions on circumcision were completed for 2,428 of them. The proportion of these 2,428 infants who were circumcised in different age groups up to 4 years is shown in Table I. The first three rows of this table show the difference in incidence between the social classes; the last row shows the position for the whole population. Of these children 24% were circumcised by the age of 4 years 3 months. This figure agrees well with the estimate made by Gairdner for the country as a whole.

*The chairman of the committee is Professor James Young, the vice-chairman Professor A. A. Moncrieff, and the secretary Professor D. V. Glass. Funds for the inquiry have been generously supplied by the Nuffield Foundation.

†229 had died and 245 had left the country with their families. This is a natural decrease which is unavoidable.