symptoms of established secondary infection. That explains the beneficial effect of the penicillin when streptomycin was ineffectual. Nitrogen mustard was also ineffective.

The course of the disease in this case is also interesting in comparison with others reported. The latter had a chronic, nearly always benign, clinical course on every occasion when, in addition to the bronchial fistula, there was a skin fistula through which most of the pus drained. But in those cases, like my own case, in which a fistula into a bronchus or lung was the only clinical finding (Brooks, 1942), the patient died quickly of bronchopneumonia or pulmonary abscess when the abscess ruptured. However, my patient had a relatively favourable course before he came to hospital, in spite of the abundant suppuration and the fact that it was two months before he had treatment.

The interruption of the treatment, with the return of secondary infection and abundant sputum, was obviously fatal. The final decline was probably due to a progressive anaemia and amyloidosis.

Summary

A case of tuberculous spondylitis of the thoracic spine with a cold abscess which ruptured into a bronchus is described. The abscess was later contaminated with pyogenic micro-organisms, and in the clinical picture abundant expectoration predominated. An abscess of the mediastinum and caries of the seventh and eighth thoracic vertebrae were demonstrated radiologically. The communication between abscess and bronchus was proved by the injection of Congo red into the abscess. The dye was immediately expectorated. The patient was treated with penicillin and streptomycin, and with nitrogen mustard. While under treatment with antibiotics a significant amelioration of the clinical picture was achieved, but the nitrogen mustard was ineffectual. The patient voluntarily refused further treatment and left hospital; he gradually deteriorated and died of cachexia.

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On the subject of the notification of infectious diseases, the Medical Officer of Health for Barnsley, Dr. G. A. W. NIFILL, writes as follows in his annual report: "Notification by general practitioners of infectious disease has improved somewhat, but is still far below the standard required by law. It is appreciated that many practitioners consider that notification of certain diseases is of little value. In neglecting to notify they overlook the fact that they are still required by statute to carry out the procedure of notification and that by their omission they commit an offence. This causes a very great deal of difficulty for everyone concerned and could well give rise to great unpleasantness and friction. It would seem that a better way would be for doctors who hold this view to attempt to alter the law constitutionally by representation through the appropriate professional body than by persistent breach of it. No notifications on the statutory forms were received in respect of some 99 cases of infectious disease seen by general practitioners and admitted to hospital. On this account it should be emphasized that a telephone call to the medical officer of an isolation hospital to arrange admission does not constitute notification in the manner required by the Public Health Act, 1936, s.144."

TRAUMATIC RUPTURE OF A MAIN BRONCHUS

BY

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Rupture of a main bronchus is a rare complication of closed injuries to the chest. In the following case of complete rupture of the left main bronchus the patient died after 55 hours. It is recorded because it illustrates some important diagnostic problems. Had these been understood at the time the patient might have survived.

Case Report

A healthy girl aged 18 was run over by a bus at 7 p.m. on December 27, 1953. On admission to hospital she was distressed and dyspnoeic, and complained of severe pain in the back and left shoulder. Examination of the chest revealed an area of paradoxical respiration beneath the right scapula and a left-sided pneumothorax. The maximal cardiac impulse was felt just to the left of the sternum. A radiograph of the chest (Fig. 1) showed fractures of the posterior angles of the sixth and seventh ribs on the left, and fractures of the necks of the sixth, seventh, and eighth ribs on the right. There was a left pneumothorax with partial collapse of the lung and displacement of the trachea and mediastinum to the right. Following an injection of morphine, $\frac{1}{4}$ gr. (16 mg.), the patient settled down to sleep. In the absence of cyanosis and with a respiration rate of 30 a minute no treatment of the pneumothorax was thought necessary. The next day she seemed a little better; respirations were steady at 32 a minute and the colour remained good.

At 1 p.m. on the third day, however, she collapsed with extreme dyspnoea and cyanosis. A radiograph (Fig. 2) now showed complete collapse of the left lung and a small pneumothorax on the right. Within a few minutes a needle was inserted in the left pleural cavity and connected to an under-water seal. A small negative pressure developed with each inspiration and air bubbled out with each expiration. The expected improvement in the patient's condition did not occur. An exhaust pump was then connected to the outlet of the bottle so that air was drawn off the chest continuously. There was still no improvement, and it was noted that when the air was drawn off rapidly there was an increase of respiratory distress. A bronchial fistula was then diagnosed, and after inserting an intercostal catheter an attempt was made to re-expand the left lung by a combination of vigorous pleural suction and bronchoscopic aspiration. Several ounces of fluid was drawn off through the bronchoscope, but the lung remained completely collapsed. By this time the patient was *in extremis* and no further treatment was possible. She died at 2 a.m. on December 30.

Necropsy revealed a small quantity of blood-stained fluid in the left pleural cavity. There was a small tear in the pleura over the root of the left lung which exposed a completely divided main bronchus. The ends of the divided bronchus were widely separated. None of the other hilar structures was damaged. The left lung was completely collapsed but undamaged. The right pleural cavity contained about 10 oz. (284 ml.) of blood. The right lung was partly collapsed and contained extensive haemorrhages. A probe was passed down the trachea and left main bronchus before disturbing the thoracic contents; this went straight into the pleural cavity, thus demonstrating the source of the fluid obtained by bronchoscopic suction. Many more rib fractures than were found than were visible on the radiographs; 14 were recognized with certainty. The effect of

pressure on the thoracic cage after death convinced me that the bronchus had been severed by being nipped between the anterior chest wall and the vertebral column.

Review of the Literature

Comprehensive reviews of the literature by Vaccarezza and Raimondi (1943) and Kinsella and Johnsrud (1947) provide clinical details of 38 cases of rupture of a main bronchus recorded between 1848 and 1942. Twenty other cases have been described since 1942, giving a total of 58 cases for analysis. Of the 55 cases in which the cause of

life is to be saved. Such a case was the one encountered by me, and the challenge was not met because of the delay in diagnosis. If the bronchial rupture had been diagnosed before function in the opposite lung had become impaired by oedema and collapse then surgical treatment would have been possible and might have been successful.

A traumatic pneumothorax usually indicates a perforation of the lung. In most cases this quickly seals off and absorption of the air takes place. Occasionally an opening in the lung or bronchus acts like a valve and tension develops, necessitating urgent decompression. However, it is evident that a complete rupture of the bronchus which results in free communication between the trachea and pleural cavity will not give rise to a tension pneumothorax. In our patient there was never any evidence of intrapleural tension; when the pneumothorax was first connected to the underwater seal, air bubbled out only on expiration. When continuous suction was applied the pneumothorax remained stationary, but vigorous suction increased the dyspnoea by drawing off from the trachea a large volume of the tidal air. It is often stated that the presence of a pneumothorax does not demand treatment unless it is of the tension variety. In the vast majority of cases this is true, but where there is a bronchial rupture an expectant policy can be disastrous. It is suggested, therefore, that a diagnostic needling should be done in all cases of pneumothorax due to crushing injury whether there is tension or not. (A simple and readily available apparatus for this procedure can be made by changing around the tubes entering the bung of an empty blood-transfusion bottle to which a small quantity of sterile water is added.) If, in spite of continuous aspiration of air, the lung does

FIG. 1.—Radiograph taken shortly after admission. Note the partial aeration of the left lung. FIG. 2.—Radiograph taken on the third day. The left lung is totally collapsed and there is a partial pneumothorax on the right.

not re-expand, then a large broncho-pleural fistula must be present. In this event thoracotomy should be seriously considered, and should not be delayed if there is evidence of damage to the opposite lung.

Only two emergency thoracotomies for the treatment of ruptured bronchus in a closed chest injury have been recorded. Kirkpatrick (1950) did a pneumonectomy on a boy of 13 who had a complete division of the right main bronchus, and Scannell (1951) sutured a hole in the right main bronchus in a boy of 10. Both these operations were successful, and it is significant that both were done within four hours of the accident. No one has yet recorded a primary suture of a completely ruptured main bronchus, but there are three reports of successful suture of a main bronchus divided accidentally during the course of a lobectomy. The clean division of the bronchus in our patient seemed to indicate that suture would have been technically possible.

The cases fall into three groups according to the mode of presentation. Twelve victims (20%) died instantly or within an hour of the accident from associated injuries. The bronchial rupture in most of these cases was no more than a post-mortem finding.

Twenty-three patients (40%) presented with serious intrathoracic injuries. Twelve of these died, some under conditions similar to those described in our case. Of the 11 patients who survived 9 recovered from the acute illness without the aid of surgery, but they subsequently developed bronchial stricture. The two operative cases are discussed later.

Twenty-three patients (40%) were referred to the authors as cases of established pulmonary collapse due to bronchial stricture. They gave a history of chest injury weeks, months, or years before which had been treated elsewhere. Some of these patients were said to have been very ill at the time of the accident, but nearly all had recovered without the true nature of the injury being suspected. Probably most of these were cases of partial rupture of the bronchus without interruption of the continuity of the lumen. Where there had been no history of pneumothorax or emphysema the injury has been more correctly described as a bronchial fracture (Griffith, 1949).

Discussion

From this brief summary of recorded cases of rupture of a main bronchus it is apparent that many survive the emergency in the absence of surgical treatment. Aspiration of air may well be all that is necessary to tide the patient over the acute injury, and the inevitable bronchial stenosis can be treated later. But among the acute injuries there are a few which present a challenge to the surgeon. These demand early diagnosis and urgent operative treatment if

Summary

A case of complete division of the left main bronchus in a run-over accident is described. The patient died after 55 hours, but might have survived if diagnosis had been early and thoracotomy had been done. It is suggested that all severe crushing injuries to the chest complicated by pneumothorax should be immediately investigated with the possibility of bronchial rupture in mind.

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