the form of the diacetate of 10,040, and latterly in the form of the dihydrochloride, laboratory tests having shown no difference between these two salts. Throughout the 18 months that the cream has been in use, no cases of idiosyncrasy to the antiseptic have occurred.

During the period of this clinical trial not only have the number of clinical cases been reduced, but there have been no patients with serious staphylococcal infections in the hospital: but possibly of greater significance is the observation that those staphylococcal infections which did occur no longer appeared as groups in particular wards, but were scattered sporadically throughout the hospital. It may well be that other factors played a part in the remarkable results achieved and that the use of the antiseptic hand cream was not alone responsible. Nevertheless, the improvement was very real.

Discussion

In a maternity hospital staphylococcal lesions of the newborn are by far the commonest forms of cross-infection, although minor infections of mothers are by no means rare. We have stressed our view of the importance of the hands as a vehicle for transfer of organisms. Our experimental results show beyond doubt the ability of a suitable hand cream to provide a bactericidal layer of prolonged activity against this type of organism, and they have also shown that hands so treated will not readily transfer even more resistant organisms, such as coliform bacilli, from heavily contaminated material.

A possible fallacy of the fingerstall technique was the carry-over of antiseptic into the final poured plates. It was calculated that in the unlikely event of all the antiseptic becoming dissolved in the broth with which the fingerstalls were lubricated the quantity reaching the final dilution would be too small to have any inhibitory action. As an additional precaution, however, 25% serum peptone water was used in the first dilution. The preliminary-blank tests amply confirmed the absence of carry-over to the final plates.

While our work has been carried out largely with 10,040 cream, we have no doubt that other antiseptics might be used in the same way, and that a variety of formulations could be employed for application of the antiseptic to the hands. For example, the particular preparation which we have tried most extensively throughout the hospital is in the form of an emollient hand cream for use after washing, in order not only to render the hands antiseptic but also to assist in the prevention of "chapped" hands. This formulation would not be satisfactory for application before putting on surgical gloves. For such purposes powders or quick-drying lotions might be more suitable.

We have had the opportunity of trying a number of hand preparations of different antiseptics, and, while some are active, in others a base was employed by makers which inactivated the original antiseptic. For example, one of the creams had so little antibacterial activity that staphylococci could be recovered abundantly from cream inoculated and incubated for 48 hours. There were others again which, although very active against skin bacteria, were unsatisfactory from the point of view of repeated application to the hands.

It is not our intention to specify these unacceptable preparations, as they were in most cases specially prepared by the manufacturers for our experimental work, and are not at present available for general use.

Our experience with antiseptic hand creams in the laboratory and in practical hospital use leads us to conclude that a considerable contribution to the control of cross-infection can be achieved by the wide use of such creams. We therefore recommend that in departments where cross-infection is likely to occur each wash-basin should be provided with a "dispenser" or tube of antiseptic cream, and that the nursing and medical staff should be encouraged to use the hand cream as often as possible after washing between cases.

Summary

The incidence of staphylococcal infection in babies born in a maternity hospital is shown to be related to the prevalence of carriers of the staphylococcus among nurses, the organism often being conveyed by the hands. The use of an antiseptic hand cream would to a large extent prevent this transfer of bacteria from nurse to baby.

A new antiseptic compound—1:6-di-4'-chlorophenyl-diguanidohexane 10,040—was incorporated in a cream ("hibitane") and its effectiveness in keeping the skin free from bacteria tested in the laboratory, two new methods being used. Both methods showed that this cream was capable of greatly reducing the bacterial count of the skin.

Use of the cream in the wards led to a marked decrease in the number of clinical cases of staphylococcal infection; during the period of trial no groups of infection were seen in any ward or nursery.

Recommendations for the regular use of antiseptic hand cream are made.

We would like to thank our obstetric colleagues and the nursing staff of the hospital for their co-operation in the clinical trials, and we are glad to thank Mr. E. Clark for technical assistance. We are grateful to Imperial Chemical (Pharmaceuticals) Limited for generous supplies of materials, and in particular to Dr. K. G. Green, without whose continued interest and help the investigation would have been impossible.

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RUPTURE OF A COLD ABSCESS INTO THE BRONCHUS

BY

ZVONKO FASTNER, M.D.

(From the Medical Department, School of Medicine, University of Zagreb, Yugoslavia)

According to Cleveland (1940) a cold abscess is the most common complication of tuberculous spondylitis and occurs in 68–86% of cases. Ruptures of these abscesses to the body surface, with fistula formation, are less common, while rupture of cold abscesses into the pleural cavity or into the bronchopulmonary system or oesophagus is rare.

Review of Literature

Loeffler (1922) cites Ideler, who by 1911 had seen six cases of cold abscess communicating with a bronchus or pleural cavity. He does not state how many cases were pleural, and how many were bronchial, or a combination of the two. Nor does he say anything about the outcome of these cases.

Cameron (1925) reported a case of long-standing tuberculous spondylitis in which a cold abscess developed in the inguinal region. During an iodoform injection into the abscess the patient tasted iodoform in his mouth, and after several minutes expectorated iodoform. Coughing lasted for several days, then gradually lessened and stopped completely after six weeks. Evidently an old bronchial fistula

must have opened as a result of the injected liquid. Presumably this bronchial fistula was normally symptom-free, because the pus from the abscess followed the line of least resistance and drained by gravitation through the inguinal sinus.

Mayet and Gnvrir (1928) reported two cases of cold abscess rupturing into a bronchus; both remained latent, however, and were discovered only when iodoform was therapeutically injected into a skin fistula. Strasser (1938) reported two similar cases with skin fistulae coexistent with a bronchial and tracheal fistula respectively. He proved the fistulous communications by radiography.

Imbach (1938) described a case of combined cutaneo-bronchial fistula. Here again the diagnosis was demonstrated after a therapeutic injection of lipiodol was expectorated by the patient; otherwise there were no other symptoms of bronchial fistula. Imbach mentioned that he had ten case reports of rupture of a cold abscess into the bronchial system.

Brooks (1942) described six cases of rupture—two into the lung, three into the pleural cavity, and a combined one. In five cases the abscess was of tuberculous aetiology, and one was due to actinomycosis. All the ruptures into the lung caused fatal results from bronchopneumonia, pulmonary abscess, or amyloidosis, but it is significant that none of them caused disseminated tuberculosis.

Morgan and Bosworth (1946) reported a case of rupture of a cold abscess through the pleural cavity into the bronchus. This was the first case to be treated with antibiotics. The patient began to recover with streptomycin, but the eventual outcome is not recorded. Finally, Heuck (1949) described a case with a coexisting fistula to the inguinal region and to the bronchus in which there were no troublesome bronchial symptoms.

The following is a report of a case with a fistula between a cold abscess and the bronchus without fistulous communication with any other part of the body.

Case Report

A farmer aged 38 had perfect health until 1942, when, after a gunshot wound, he had his left leg amputated below the knee. In June, 1951, he started coughing, and this increased in spite of treatment by his family physician. He expectorated abundant sputum, sometimes malodorous but never blood-stained. He lost 25 lb. (11.3 kg.) in weight and observed that the left side of his body sweated profusely. The family history was without significance. The patient was admitted to hospital in November.

On examination he was seen to be tall, slim, and pale. His thorax was symmetrical and without impairment of respiratory movements. Normal resonance was found on percussion, except paravertebrally on the right side, where there was an area of dullness corresponding to the spinal processes of D 2-4. Air entry was slightly diminished on the right side, where rales were also present. The blood picture showed: red cells 3,650,000; white cells, 10,300, with 76% segmentary neutrophils. The sedimentation rate was 43 mm. Westergren in the first hour and 81 mm. in the second. *Streptococcus haemolyticus*, *Str. viridans*, *Str. non-haemolyticus*, *Bact. coli*, and *Bacillus fusiformis* were present in the sputum. The results of other investigations were within normal limits.

By the time of admission the patient was expectorating about 300-350 ml. daily. No elastic fibres could be shown in the sputum. Bronchoscopy showed massive purulent secretion into the left main bronchus, stemming mainly from the upper left bronchus. No pathological processes were to be seen in the lumen of the bronchus. X-ray examination of the chest showed abnormal hilar shadows on both sides. A tomogram of the mediastinum revealed a sharply limited shadow as large as an apricot in the posterior part. An x-ray film of the thoracic vertebrae showed destruction of the lower part of the body of D 7 and the upper part of D 8, together with a partial fusion of the vertebral bodies in their anterior

parts with some angulation. The presence of *Mycobacterium tuberculosis* in the sputum was demonstrated microscopically and by culture. From these findings it was evident that the cold abscess had ruptured into the bronchus.

A left paravertebral puncture of the abscess was performed under x-ray control with the idea of proving the communication of the abscess with the bronchopulmonary system. A 1% solution of Congo red was injected and was immediately expectorated by the patient. A further puncture was made a few days later—this time on the right side—but the injected solution was expectorated only after half an hour. The prompt expectoration of the Congo red solution when injected into the left side of the abscess proved that the cavity communicated with the left bronchus and confirmed the bronchoscopy finding that pus came only from the left bronchus, although the actual site of the fistula was not visible.

Daily injections of 200,000 I.U. of penicillin for ten days into the abscess to control the secondary infection thinned the sputum but did not lessen the amount. The dose of penicillin was therefore increased to 600,000 I.U. each day, given intramuscularly. The quantity of sputum then fell to 50 ml. a day.

By the end of January, 1952, the daily sputum amounted to only 10 ml., and streptomycin was substituted for penicillin. Leucocytes, which rose to 14,400 during the treatment, now fell to 11,600. The patient had obviously improved and his weight had increased from 115 to 132 lb. (52 to 60 kg.).

The Mantoux reaction, which was negative at the beginning of the treatment in dilutions of 1:100,000 and 1:1,000,000, became positive by the end of January in the same dilutions.

With streptomycin alone the quantity of sputum increased to 60 ml. a day, and in February penicillin was given in combination with streptomycin. The sputum again lessened. The erythrocyte sedimentation rate was 16 mm. in the first, and 30 mm. in the second hour. From the beginning of January the patient was constantly afebrile. On February 25 streptomycin was stopped, after a total of 68 g. had been given, but penicillin was continued. On March 31 treatment with nitrogen mustard was started. This treatment is based upon the experiences of Aleksandrowicz (1948), who stated that nitrogen mustard has a favourable effect upon tuberculous cold abscess. The patient was given four doses each of 7 mg. There were no troublesome reactions.

On April 8, after the treatment with nitrogen mustard was finished, a control tomogram showed that the abscess cavity had not diminished. On April 11 his erythrocyte sedimentation rate was 11-45 and the blood picture showed: erythrocytes, 4,040,000; haemoglobin, 80%; leucocytes, 3,600 (eosinophils 4%, non-segmented 4%, segmented 73%, lymphocytes 5%, monocytes 15%). The fall in the leucocyte count was due to the effect of nitrogen mustard, not to the lessening of the inflammatory process. The patient's weight was 141 lb. (64 kg.). Unfortunately he discharged himself from hospital on April 22 after having received 54,600,000 I.U. of penicillin, 68 g. of streptomycin, and 28 mg. of nitrogen mustard.

According to subsequent information the patient felt well at home for two months, but then expectoration increased, and by August it was as abundant as before treatment. Thereafter he went steadily downhill, and died on October 30, 1952.

Discussion

This case is worth recording because of its rareness and because, according to the literature, it is the second of its kind to be treated with antibiotics. But there is a difference between the two cases. The first one (Morgan and Bosworth, 1946) was treated with streptomycin immediately after a sudden rupture of an abscess in which secondary infection had not developed, while the present case had predominant

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

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

A. W. FOWLER, F.R.C.S.

Assistant Traumatic and Orthopaedic Surgeon, Bridgend General Hospital

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