HAEMOPTYSIS, BRONCHIECTASIS, AND FOREIGN BODY IN LUNG

BY

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Parents and doctors are often amazed by the variety of objects, other than food, that children delight in placing in their mouths. Some of these are swallowed, but a few are inhaled, and the consequences are then usually dramatic. If not coughed up and out immediately, early bronchoscopy may be urgently necessary.

Occasionally, however, there is merely a short, easily forgotten episode of choking after such an inhalation. No more is thought of the incident until, maybe years later, the patient presents with symptoms and signs of segmental putrid bronchiectasis, in which the inhaled foreign body may be found. Jackson and Jackson (1950) mention 1,485 patients with bronchial foreign bodies ; in 200 the diagnosis was overlooked for periods ranging from one month to forty years. Other and similar cases are reported by Leary (1950) and by Glennie, Dark, and Lindars (1952).

As foreign bodies are commonly inhaled by children, if a mother insists that her child has "swallowed something down the wrong way," or with something in its mouth has choked, gagged, or coughed, attention should be paid to the story and every practicable investigation be carried out to exclude the presence of a foreign body in the respiratory tract ; laryngoscopy and bronchoscopy may be essential, as often there are no immediate radiological changes in the lungs. However, apart from possibly revealing the impacted material, radiology may help further in the diagnosis by showing an alteration in aeration of the affected lung. It is essential in this procedure to obtain, in addition to a lateral radiograph, a postero-anterior radiograph of the chest both in inspiration and in expiration (Asherson, 1940).

In the three patients whose clinical histories are given below, the foreign bodies were probably present for 12 months, 5 months, and 6 weeks respectively before being removed. All were composed of vegetable matter, and none could be seen radiologically. In the second patient, however, radiological evidence of obstructive emphysema was obvious, and in the third patient there was clinical and radiological evidence of pulmonary collapse. The first case was unusual in that the patient had recurrent severe haemoptyses—a departure from the typical clinical syndrome which merits special emphasis.

Case 1

On July 1, 1951, a boy aged 5 choked over a piece of "grass in seed." His mother tried to retrieve it by putting her finger down his throat, but, being unable to make him cough it up, assumed he had swallowed it. Five days later he complained of colicky central, and later right-sided, abdominal pain, loss of appetite, and constipation. He also had a painful cough and almost continual generalized chest pains.

On July 7 he was admitted to hospital. Examination then revealed a flushed ill-looking boy with a temperature of 102.4° F. (39.1° C.) and obvious respiratory distress. Respirations, at a rate of 30 a minute, were grunting and inverted,

his alae nasae were working and there was slight cyanosis of his lips. The chest showed diminished movement, and impaired percussion note and air entry on the right side, with a pleural rub and crepitations at the right base. The tongue was dry and furred, and oral fetor was present. There was some guarding and tenderness in the right upper abdomen. Throat and mouth swabs showed normal mixed flora. The Hb was 13.3 g. (90%) ; W.B.C. 23,500 per c.mm. (83% neutrophils). Degenerated pus cells and a few organisms were seen in the sputum. Culture yielded a moderate growth, chiefly *Streptococcus viridans*. Mantoux 1 in 1,000 was negative. An x-ray film of the chest showed pleural effusion at the right base with probably consolidation in the anterior segments of the right lower lobe.

As the boy was obviously ill on admission, he was placed in an oxygen tent and treated for supposed pneumonia with "sulphatriad" and penicillin. Chest radiographs taken two days after admission showed an abscess cavity with a fluid level in the right lower lobe and a right pleural effusion. As there was no apparent response to treatment after 48 hours, chloramphenicol was given, and 48 hours later, again because of lack of clinical response, it was replaced by aureomycin. This was continued for two weeks, sulphadiazine being given for the first six days of this course. He remained very unwell, with a high swinging temperature. Subsequent chest radiographs showed a second abscess cavity to have formed alongside the first, with accompanying consolidation of the right middle lobe and increase in size of the right pleural effusion. Pleural aspiration was attempted, but no pus was obtained. Because he was so ill treatment with chloramphenicol was repeated, but with no better result than before.

Eighteen days after admission he coughed up a little sticky yellow sputum for the first time and produced a larger quantity on subsequent days, from which a culture yielded a moderate mixed growth of *Str. viridans*, *Staphylococcus aureus*, and a scanty growth of *Candida*. His temperature soon settled, and with physiotherapy he became more active and his appetite improved. A chest radiograph showed some residual pleural thickening at the right base only. On September 11 he was discharged to convalescence. There he remained well until October 3, when he developed a loose cough and shortly afterwards had repeated small haemoptyses. There were clinical and radiological signs of partial collapse of the right lower lobe, so that on October 31 he was readmitted to hospital.

At this time he was afebrile, looked fairly well, and, apart from the above signs, the only new feature noticed since his previous admission was early finger- and toe-clubbing.

Bronchoscopy on November 2 showed that the whole tracheo-bronchial tree was hyperaemic, and a purulent discharge was observed coming from the right main bronchus. A bronchogram done on November 15 showed poor filling of some segments of the right lower lobe.

The boy had repeated and alarming haemoptyses, though remaining afebrile. On November 24 he coughed up about 6 oz. (170 ml.) of blood with a piece of tissue which was reported histologically to be "vegetable matter." There were no further symptoms until two weeks later, when he had a moderate pyrexia. A second bronchoscopy on January 4, 1952, under "cover" of aureomycin, showed no changes from those seen previously, and thereafter he was afebrile, fairly well, and, in fact, was discharged on January 22 to a convalescent home. After a short period he produced increasing amounts of pink-stained sputum which later became frankly blood-stained. On February 11 this amounted to about 4 oz. (114 ml.) in 12 hours. He was therefore again admitted to hospital, where he was found to be pale and slightly cyanosed, with a significantly greater degree of finger-clubbing, a mucopurulent nasal discharge, and clinical signs of collapse of the right lower lobe. Culture of his sputum yielded a profuse growth of "mixed organisms" sensitive to aureomycin only.

On February 14 the third bronchoscopy showed the right bronchial tree full of foul fetid pus. Further radiological

investigations, including tomograms, showed no more than collapse at the right base. Considerable difficulty was experienced in controlling secondary staphylococcal lung infection, but a further bronchoscopy on May 21 showed this was now much less, and despite general clearance of the exudate a foreign body was not found. Haemoptyses,

FIG. 1.—Case 1. Cavity in posterior basal segment of right lower lobe in which an ear of corn (inset) was found.

varying from 6 to 19 oz. (170 to 540 ml.) in 24 hours, continued, and on July 3 the right lower lobe was removed. On examination and dissection of the excised tissue it was noted that the lobe contained a cavity in the posterior basal segment which was in direct communication with a bronchus and might well have been a fusiform dilatation of a bronchus. It was filled with vegetable matter resembling an ear of wild barley (see Fig. 1).

Case 2

A female infant aged 18 months, the only child of healthy parents, had a cold in August, 1952, and a cough had since persisted for which her own doctor saw her in November. She was then febrile, and examination of the chest showed significantly diminished air entry over the left mid-zone posteriorly. Despite an inconclusive diagnosis she was treated with penicillin, and the temperature returned to normal. Subsequently, a radiograph of the chest was reported to show "epituberculosis of the left upper zone." At this stage she was referred to hospital.

Her listlessness had returned and her cough was more severe. Examination at this time, approximately five months after the onset of her cough, revealed a moderately well nourished but pale and somewhat wasted child in whom the only abnormal signs were confined to the respiratory system.

FIG. 2.—Case 2. Compensatory emphysema in left mid-zone of chest. (Foreign body found in left lower lobe bronchus.)

There was no finger-clubbing or evidence of mediastinal displacement. Movement and air entry were diminished on the left, but the percussion note was considered to be equal on the two sides of the chest and no adventitious sounds were detectable. Radiological examination showed collapse of the left upper lobe and part of the left lower lobe, and indicated also some compensatory emphysema of the remaining portion of the left lung (Fig. 2). The left hilar shadow was enlarged. It therefore seemed that there was obstruction to the left lower lobe bronchus, either the result of hilar adenitis due to tuberculosis or pertussis, or as the result of an inhaled foreign body. Tuberculosis was excluded by negative Mantoux tests. On direct questioning a "choking attack," was remembered by the mother and thought to have occurred with a sweet. This was thought to favour the presence of a foreign body, and the child was consequently admitted for bronchoscopy on December 26. The haemoglobin was 12.4 g. (84%) and the white-cell count 12,700 per c.mm. (neutrophils 9,600).

A bronchoscopy was performed on December 31. Vascular granulation tissue was seen in the left lower lobe bronchus, and below it a foreign body; this was removed and was subsequently shown to be a burr (fruit of *Agrimonia eupatoria*).

Subsequently, auscultation showed that air entry over the affected part of the chest had improved. There followed a short period during which signs of left lung collapse recurred, but with the aid of intramuscular penicillin and physiotherapy clinical and radiological recovery was complete. A bronchogram done later showed no abnormality.

Case 3

A boy aged 2½ developed a cough at the beginning of January, 1953. As his six siblings were thought to have whooping-cough at the time, his cough was attributed to this infection. He developed signs of bronchitis, which resolved when treated with sulphadimidine. However, a week later his cough returned and signs of collapse of the right lower lobe were detected. Despite courses of chloramphenicol and penicillin, these signs persisted and he had a constant fever. He was therefore referred to hospital on February 12. He was afebrile and looked pale. Abnormal physical signs were confined to the respiratory system. Signs of collapse of the right lung base were found clinically and confirmed radiologically. After admission the Mantoux 1 in 10,000 and 1 in 1,000 was negative; the E.S.R., 44 mm. in 1 hour (Westergren); haemoglobin, 78% (11.6 g.); white-cell count, 13,700 per c.mm. (neutrophils 6,800).

As the collapse of the right lower lobe was known to have been present for at least six weeks a bronchoscopy was performed on February 23. The right stem bronchus was obstructed by vascular granulation tissue, in the centre of which lay a friable white foreign body. This was removed in one large and several small pieces and appeared to be a nut. No gross damage to the wall of the bronchus could be seen. Re-expansion of the collapsed portion of lung was aided by physiotherapy, and three weeks later the collapsed lobe appeared clinically and radiologically to be fully aerated. On April 9 a bronchogram showed a mild degree of bronchiectasis of all the right middle and lower lobe bronchi. Physiotherapy was continued, and a bronchogram taken six months later showed the bronchial tree to have returned to normal.

Discussion

Ears of corn, grasses, and other vegetable matter may easily be inhaled; they may prove to be more dangerous than some inorganic or hard organic substances such as bone or teeth, particularly as vegetable matter may swell by imbibition and increasingly irritate the tracheo-bronchial mucosae. Often, in a matter of weeks or months, exuberant granulation tissue forms around such matter, and this reactionary mucosal swelling, when touched, bleeds easily, and

usually indicates the presence of a foreign body. This type of bronchial granulation tissue was seen in Case 1.

Inhaled material may travel far along the respiratory tract, and there are several reports of foreign bodies ultimately reaching the pleural cavity (Graham, 1929; Davidsohn, 1931) without the appearance of symptoms. Occasionally the inhaled foreign body has gradually penetrated the thoracic parietes and presented as a chest-wall swelling (Seydell, 1937; Sehring and Shaw, 1948) which might have the characters of a pointing empyema.

Mayo (1836) reported that "a boy, aged about 12, who was travelling in a carriage, happened to have an ear of rye in his mouth: the carriage being jolted, the ear of rye disappeared: it had dropped into the lungs, where it produced abscess." At necropsy the offending ear was found in an abscess involving the lungs and liver. Lung abscesses are, however, uncommon in children. Thus Brock (1952), in an analysis of 477 cases of lung abscess, found that only 15 (3.1%) occurred in children under 14 years of age, and none of these were considered to be due to foreign bodies. The same author quotes other workers for details of the incidence of lung abscess in children, with a variation from 2.6% to 18.3%. In a total of 2,250 lung abscesses reported in the American literature (Smith, 1934), of 59 abscesses in infants and children only 1 was recognizably due to an inhaled foreign body. Hence, on the evidence available, lung abscess would not appear to be a common sequel to the inhalation of a foreign body.

Owing to the anatomical distribution of the bronchial tree, foreign bodies are more common in the right than in the left lung and are particularly rare in the right middle lobe.

As stressed already, the symptoms may be delayed for a very variable period, possibly for weeks or even months. Cough is common and later becomes productive. Occasionally the sputum is blood-streaked, but frank and recurrent haemoptyses of several ounces at a time, such as occurred in Case 1, are distinctly unusual. A search of the literature has revealed only three other examples of haemoptysis occurring as the result of foreign bodies in the lungs. This is perhaps rather surprising considering how often the presence of a foreign body in a bronchus promotes the formation of vascular granulation tissue, which bleeds so easily when touched through a bronchoscope.

Flandin and Poumeau-Delille (1932) report the case of a patient aged 24 who was investigated for tuberculosis on account of recurrent haemoptyses. Eventually radiological examination revealed a needle in his lung. Linneweh (1935) reports a rather similar case. In 1918 a man aged 28 sustained a grenade splinter wound in his neck. Over the next 17 years he was investigated for recurrent haemoptyses and, finally, following a fatal haemorrhage, it was found that this splinter had travelled to the right main bronchus and had eventually penetrated a major blood vessel. Steiner (1947) reports a most extraordinary case of a patient who introduced a metal sound into the vagina in order to procure an abortion; this was lost and "forgotten about." Eventually the sound migrated to the left lung and caused severe haemoptysis. It was removed at operation, but the patient died one month later.

Despite three bronchoscopies the correct diagnosis in Case 1 was not made for a considerable time. This case was further misleading in that the patient appeared to recover for a time after coughing up the first foreign body; his relapse was due to a suspected second foreign body which could not be seen. It should be stressed, therefore, that, in a patient who may have inhaled a foreign body, full radiological investigation and expert bronchoscopy may be required, and even then the object may be beyond the range of view. If symptoms and signs persist after the removal of a foreign body the presence of a second one should be suspected. As bronchiectasis is sometimes a sequel to the inhalation of foreign material, a bronchogram should always be done once all such material has been removed. Case 3 exemplifies this.

Summary

The reports are presented of three children who inhaled foreign bodies. In the first, lung abscesses developed which were followed by severe and alarming recurrent haemoptyses. After 12 months' illness a lobectomy revealed an ear of corn in the removed lung. The other two patients had persistent coughs. In the second there were clinical signs of obstructive emphysema, and in the third signs of pulmonary collapse. After removal of a foreign body from the latter patient, bronchiectasis was found to be present.

The literature is reviewed and the following points are stressed: (1) The rarity of lung abscess in children even as a complication of inhaled foreign bodies. Chronic suppuration of unknown aetiology, occurring in the right lung especially, should, however, suggest the presence of a foreign body. (2) Haemoptysis is an uncommon complication of an inhaled foreign body. (3) The value of a complete radiological investigation and the importance of expert bronchoscopy in children alleged to have inhaled or choked over any object. (4) As bronchiectasis is often a sequel to the inhalation of a foreign body, bronchography is usually essential after the foreign body has been removed.

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The City Analyst of Birmingham, Mr. H. H. Bagnall, has been looking into the potency of the oral penicillin tablets sold in local pharmacies. During five months last year 82 samples were examined. Twelve samples had less than 80% of the prescribed potency. Of these, four contained less than 10% of the stated amount of penicillin, which Mr. Bagnall interprets by saying that "a patient stands a one in twenty chance of being supplied with tablets entirely devoid of any therapeutic value." The cause of the loss of potency appears to have been moisture admitted when the manufacturers' sealed containers were opened to dispense smaller numbers of the tablets. In his report (for the Third Quarter of 1953) Mr. Bagnall points out that this state of affairs is likely to be widespread in the country, but only in the largest centres is it possible for city analysts to undertake the research necessary to uncover it. As a solution, he suggests the establishment of about half a dozen regional laboratories to monitor the dispensing of the "wide range of new drugs listed in the *Pharmacopoeia* which have never yet come under the purview of the public analyst."