CARCINOMA OF THE BRONCHUS:
MEDICAL ASPECTS

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ANDERSON: Carcinoma of the Bronchus: Medical Aspects

Here we shall consider the recognized modes of presentation of the disease and discuss the means at present at our disposal to confirm the clinical diagnosis.

Clinical Patterns

It is convenient for purposes of discussion and description to divide the clinical manifestations of carcinoma of the bronchus into more or less well defined clinical entities while it remains clear that such division is largely arbitrary and considerable over-lapping in fact exists.

Cough

Cough is the predominant symptom in only about a quarter of the cases (Brooks et al., 1951), and it is so common a complaint that, in any event, it is unprofitable to discuss it further beyond saying that persistent cough or sudden change in cough habit calls for complete investigation.

Haemoptysis

Haemoptysis is often admitted to by chronic bronchitic subjects and is, in fact, on further investigation and follow-up, found to have no important cause in the great majority who suffer it. Of proved bronchial carcinomas, on the other hand, it is the presenting symptom in 14 per cent. (Brooks et al., 1951) and 60 per cent. suffer from it during the course of the illness (Price Thomas, 1948).

In these circumstances a single small haemoptysis which amounts to staining or streaking of the sputum when there are no abnormal physical signs and the chest films (PA and laterals where necessary) are normal can safely be dealt with by taking a further film in six weeks and another film three months later.

Whether all patients who have blood spitting should be bronchoscoped is an unresolved problem. Medical experience dictates that such a degree of thoroughness is in fact both unnecessary and impracticable. Surgical experience, digesting the discoveries by bronchoscopy in what is admitted to be a selected series of cases, largely referred by physicians, finds four cases of bronchial carcinoma out of 71 patients who had haemoptysis and normal chest radiographs (MacHale, 1953). This figure is one to think on and an antidote to complacency. However, when the haemoptysis is repeated, it will be necessary to go further into the problem by bronchoscopy and, if this is negative, by bronchography and examination of the sputum for malignant cells. It is essential to stress that repeated haemoptysis, no matter how individually small or how widely spaced in time, calls for a complete investigation because bronchial carcinoma may cause repeated haemoptyses for

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months and even years before producing any X-ray changes.

In the case described below the value of examination of the sputum for malignant cells in the face of repeated normal X-rays and normal bronchoscopy is clear.

A man aged 60 suffered from crippling emphysema and had repeated haemoptyses of small amounts on many occasions. He was thoroughly investigated and no abnormality was found on repeated physical examinations, chest films, and bronchoscopies during three years. Malignant cells were found in the sputum on several occasions. Three years after his first attendance for haemoptysis, a new growth was shown by X-rays in the lingular segment of the left lung and confirmed by autopsy. Although this patient was at no time suitable for surgery because of emphysema, the moral is clear. Examination of the sputum for malignant cells by an experienced pathologist is extremely helpful.

Valuable information is sometimes obtained by doing a bronchoscopy while the patient is bleeding, as the lobar site of the haemorrhage may in this way be found, and even if surgery is impossible, palliative radiotherapy will control the haemorrhage.

**Dyspnoea**

Dyspnoea is not a common early symptom (9 per cent, Brooks *et al.*, 1951), but it is of theoretical importance because it is sometimes seen where the neoplasm is only involving a minor portion of the total respiratory tissue, and in such case Rienhoff (1944) has suggested that localized obstructive overdistension of alveoli is the cause of the dyspnoea through pulmonary reflexes.

When dyspnoea is associated with a fixed wheeze in some part of the chest, it is a symptom of vital importance, and so is the finding of unilateral or localized bronchitis. On occasion notable dyspnoea will be found associated with unilateral emphysema due to partial bronchial obstruction of a major bronchus. Where there is a pleural effusion, or a large portion of the lung is invaded, or there is much pulmonary infection, or there are multiple secondary metastases throughout the lungs, or the pulmonary lymphatics are infiltrated (Harold, 1952) or the major air passages are encroached upon, or 'alveolar celled' carcinoma is present, the dyspnoea is often severe and may be extreme and coupled with cyanosis.

**Dysphagia**

Dysphagia is rarely the first symptom, but not uncommon in the later stage, when the mediastinal paroesophageal glands are invaded by new growth. This symptom indicates that surgical removal is impossible, but it responds well to radiotherapy although frequently made temporarily worse by irradiation.

**Pain**

Typical pleural pain occurs when inflammatory changes complicate bronchial obstruction; this responds to antibiotics and chemotherapy. The pain of pleural invasion by new growth and the pain of invasion of chest wall structures, especially the upper ribs and bronchial plexus, is continuous and intractable (Pancoast, 1932).

In my experience, radiotherapy is not effective in the relief of this pain, excision of wide areas of chest wall has failed, resection of several intercostal nerves likewise, even spinothalamic tractotomy is not always effective unless done at midbrain levels. Patients who suffer in this way may live for months or even years and get no relief from drugs in less than stupefying doses.

Rarely pain which simulates angina pectoris or pain in extremely violent paroxysms, felt deep in the chest and radiating into the head and neck or into one or both shoulders and arms is met with when mediastinal structures are invaded.

**Pneumonia and 'Influenza' and febrile respiratory illness**

Any acute respiratory infection which fails to
follow the expected course and shortly terminate with complete resolution calls for a complete investigation, as does relapse or repetition of infection. Naturally the interpretation of the term 'shortly' must remain an individual one; but miniature mass radiography is generally available, and at present mass 70 per cent. of bronchial neoplasms are first seen in a stage when no attempt to cure is possible (Davidson, 1951); both these factors dictate early rather than late investigation. Much of this waste is due to the nature of the neoplasm which develops in a rich lymphatic and vascular field, and diagnosis depends largely on fortuitous circumstances, such as haemoptysis or infection or dyspnoea, to bring the condition to light before local involvement or distinct metastases have occurred. Yet much waste is still due to failure to recognise significant symptoms, and even to delays in dealing with the problem once the diagnosis is established.

**Pleural Effusion**

A pleural effusion may be the initial finding. Examination of the fluid by Dudgeon's method (1936) for malignant cells should always be done. When the effusion is bloodstained this suggests neoplasm, but it should not be forgotten that pleural tuberculosis can also cause haemorrhagic effusion.

Occasionally removal of a quantity of fluid followed by air replacement will show masses of new growth on the inner surface of the chest wall, or show neoplasm in the lung.

Rarely empyema is the presenting sign, and when a cure does not follow standard treatment bronchoscopy will reveal the cause.

**Fever**

Fever of long duration will be found on occasion to be due to bronchial neoplasm, as in the patient whose history is given here.

A man, aged 50, had three years' continuous fever while living in the tropics. During this time he was treated in the east energetically for malaria, hookworm, and amoebiasis without effect. He was investigated in England and further treatment for worms and malaria was given. His fever continued. Eventually, a chest X-ray showed a round opacity in the right lower lobe which proved on removal to be a squamous celled carcinoma of the bronchus. With removal of the growth his temperature, which had ranged up to 102°F, settled for the first time for three years.

**Radiological Abnormalities**

A proportion of bronchial carcinoma is found on X-ray examination of the chest of the patients who are apparently in good health.

Where the abnormality is a collapsed or partially collapsed lobe the subsequent investigations will be by bronchoscopy to examine the bronchial lumen, and biopsy to confirm the macroscopic diagnosis of growth. It is important to recognize that even when the growth is clearly seen a single biopsy and even repeated biopsy may be negative, and treatment must be undertaken on other grounds than a proved diagnosis. Likewise where the upper lobe bronchus is affected the new growth may be out of reach, and action will depend on probable diagnosis. Where the radiological abnormality is an area of consolidation of lobular distribution, it may be that the affected portion of the bronchus is not visible. If neoplastic cells are not found in the sputum treatment will again depend on purely clinical grounds. It will be found at operation in some of these cases that the disease is in fact inflammatory and not neoplastic; comfort lies in the knowledge that such chronic pneumonias are best resected because they do not resolve satisfactorily (Logan, 1949).

A peripheral tumour presenting as a rounded radiological shadow is nearly always out of reach of bronchoscopic vision. In such a case careful search must always be made to exclude the possibility that the tumour is a secondary metastasis, especially from the kidney where a hypernephroma may be small and silent. Nor should it be forgotten that excision of such a solitary secondary neoplasm in the lung together with removal of the primary neoplasm is sometimes successful and compatible with long survival of the patient (Minor, 1950). Where bronchoscopy does not help, and neoplastic cells are not found in the sputum, final diagnosis will be made by examination of the removed specimen. It will seldom be wise to watch the mass to see whether it grows, and it is generally agreed that needle biopsy through the chest wall is unwise for fear of implantation in the needle tract, although the evidence for this having happened is more theoretical than proved (Gledhill et al., 1949; Ochsner et al., 1942). Hydatid disease should not be forgotten.

Rarely the X-ray abnormality is a thin-walled cyst or cavity in the lung (Anderson and Pierce, 1953), and where the sputum is persistently negative for tubercle bacilli by all methods of examination the possibility that the lesion may be a neoplasm, which has produced a distension cyst by partial bronchial obstruction, should be borne in mind. This condition should not be confused with the commoner appearance produced by a neoplasm which has broken down and excavated. The former has a thin, regular, and often hairline wall, the latter a thick, irregular, and ragged wall.
Neuropathy

Apart from direct involvement by newgrowth of nerves which course near the tumour, such as the recurrent laryngeals, the phrenics, the cervical sympathetics, the brachial plexuses, and the intercostal nerves, at times the central and peripheral nervous systems are involved (Wyburn Mason, 1948; Denny Brown, 1948). This variety of neuropathy is a combination of motor and sensory polyneuritis and myelitis which is not due to direct involvement of nerves and spinal cord by metastases but to deficiency or toxaemia. In such cases there are commonly no symptoms to suggest pulmonary disease and the tumour may be found only after careful search. All cases of polyneuritis should therefore be critically scrutinised in order to exclude bronchial newgrowth. Surgical excision can effect cure of the neuropathy.

Hypertrophic Pulmonary Osteoarthropathy

Commonly bronchial carcinoma is associated with clubbing of the fingers, nails and toenails and in some cases it is gross and there occurs an associated overgrowth of the periosteum of the long bones, tarsals, metatarsals and phalanges. (Hypertrophic Pulmonary Osteoarthropathy.) This condition may be symptomless, or present simply as oedema of the feet and legs, or be associated with a sensation of hot hands and feet, because there is a greatly increased blood flow in the limb, (Mendlowitz, 1942) or there may be considerable effusion into the joints, and periarticular thickening with or without pain and reduced movement. It should be recognized that clubbing of the fingers is not an invariable accompaniment of hypertrophic osteoarthropathy.

Myasthenia Gravis

Unequivocal myasthenia gravis may coexist with bronchial neoplasm and dominate the clinical picture (Anderson et al., 1953). The precise connection here is as yet uncertain but improvement of the myasthenia when the neoplasm is removed suggests a definite causal relationship.

Dermatomyositis

Neoplasms of various organs may be associated with dermatomyositis, and bronchial carcinoma is no exception. I have had one such patient under my care in whom both diseases were proved.

Pericarditis and Auricular Fibrillation

Not rarely in the terminal stages of bronchial carcinoma the pericardium is invaded, giving rise to haemorrhagic effusion and the syndrome of chronic pericardial tamponade; often auricular fibrillation coexists due to direct invasion of auricular myocardium by growth. These findings may also be the earliest evidence of bronchial carcinoma and an essential part of the investigation of a pericardial effusion is examination of the fluid for neoplastic cells.

Metastatic Tumours

Metastasis, in the brain particularly, may occur while the primary tumour is entirely silent and presenting no abnormality detectable by existing methods. In such a case years may elapse after removal of the metastatic tumour before the primary is found.

Indigestion

I have on several occasions met with indigestion as the patient's major symptom where the stomach was normal and a bronchial neoplasm was found. Successful removal of the tumour cured the patient of the gastric symptoms.

'Alveolar Cell' Carcinoma

A rare form of bronchial neoplasia presents as illness with much dyspnoea, often haemoptysis, copious frothy white sputum, and an X-ray appearance which at first shows a poorly defined area of consolidation resembling pneumonitis, which progresses to involve more and more lung tissue until eventually a whole lobe is consolidated. In other cases there are multiple poorly defined shadows which coalesce into extensive areas of consolidation or single large tumours. Bronchoscopy is not helpful in establishing the diagnosis. Malignant cells of characteristic form are often found (Good et al., 1950)

There is much discussion over the origin of this tumour which is said by some to arise from alveolar lining cells (the very existence of which cells is denied by others) and comparisons are made between this tumour and infective pulmonary adenomatosis of sheep. It is moreover certain that an identical appearance can be met with secondary metastatic tumours from the stomach, etc., or even from major bronchial primary growths. The clinical importance is that such an obscure chronic spreading pneumonia should excite suspicion, and cures have been reported following excision in the early stages.

Venous Thrombosis and Migrating Thrombophlebitis

It should not be forgotten that certain cases of bronchial carcinoma present with superficial fixed or recurrent or migrating thrombophlebitis. And the investigation of such a case includes most careful search for a bronchial neoplasm.

Criteria of Operability

Before referring a patient with bronchial car-
cinoma for surgical treatment the physician must satisfy himself that the patient has sufficient pulmonary reserve and cardiac vascular reserve to withstand pneumonectomy should that be necessary. He must be certain there are no metastases. He must satisfy himself that the phrenic nerves, the sympathetic nerves, and the recurrent laryngeal nerves are not involved. He must, by examining the barium swallow, be certain that mediastinal glands are not involved by growth, and he must satisfy himself that the great veins in the thorax are not compressed or invaded. At the same time he must realize that even a pleural effusion or involvement of a phrenic nerve do not inevitably signify that the growth is irremovable. Surgical excision is often the best prospect of cure and no patient should be considered to be beyond surgical aid without most careful deliberation.

Furthermore exploratory thoracotomy is without serious consequence if the tumour is irremovable.

It has recently been suggested that angiopneumography (Weiss et al., 1951) is an essential preoperative investigation in order to determine prospects of surgical removal. While this may be true in some centres such studies elsewhere will continue to take second place to surgical exploration.

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✓ UNUSUAL MANIFESTATIONS OF CARCINOMA OF THE LUNG

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The increasing frequency of carcinoma of the bronchus is a problem which is of concern to all, and the results of treatment at the present time are somewhat disappointing, the most successful treatment being early surgical excision. It is important, therefore, that the early diagnosis of the condition be recognized, and while the common manifestations of the disease such as haemoptysis, cough and loss of weight are well appreciated, it is important to recognize the more unusual modes of onset in order that it may be detected as soon as possible, thereby giving the patient the best chance of recovery.

The various ways in which carcinoma of the lung may present can be most readily appreciated if the nature of the lesion is borne in mind. That is to say that symptoms arise from one of two sources, either the primary growth itself or from secondary deposits occurring in distant parts of the body when the primary itself is of insufficient size to cause symptoms. Those symptoms which arise from the growth itself usually occur as a result of direct spread into the surrounding structures, which may involve the bronchi, the nerves, the veins, the oesophagus and the pericardium and myocardium.

In this article I propose to deal with the less common manifestations of carcinoma of the bronchus in two groups, firstly, the unusual initial symptoms and, secondly, the unusual later manifestations due to peripheral secondary deposits.

**Unusual Initial Symptoms**

The early symptoms of a primary pulmonary neoplasm which may be overlooked are those where the pulmonary symptoms are absent or where they suggest an acute pulmonary infection. These less common symptoms can be easily understood by considering the involvement of the various structures in the mediastinum, as these are invaded by the growth.