CANCER OF THE LUNG.

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Cancer of the lung is a condition of clinical importance both because of the increasing frequency with which it is encountered and of the evolution of measures for its alleviation.

INCIDENCE.

Almost 4,000 deaths from lung tumours are occurring yearly in England and Wales. The mortality rates per million population (standardised) for cancer of the lung during the first decade of the present century were 10.2 and 7.0 for males and females respectively, whilst the corresponding figures for the year 1937 were 100.9 and 23.2.¹

Such statistical evidence suggestive of a rising incidence is obtainable from other countries,² and many explanations—most of them involving dubious etiological factors—have been offered. The probability that this increased incidence might, in reality, be only apparent, should be considered. Much has been made of the increased proportion of the cases occurring in the autopsy series of large university hospitals during recent years, but such figures are not necessarily real indices: it may merely mean that as interest in these cases has been stimulated by the development of modern radiological methods, a greater proportion of them are dying in hospitals of the type possessing active pathological departments rather than in their own homes or in tuberculous sanatoria—where such facilities are usually inadequate. Formerly, many such cases characterised by wasting, cough, expectoration of sputum and the presence of abnormal physical signs in the chest, probably languished in sanatoria as T.B. minus cases. Further, the disease is now diagnosed with much greater accuracy as a consequence of modern methods of investigation.

It is a disease of middle age—in the great majority of cases occurring between the ages of forty-five and fifty, although it is encountered occasionally in very young adults and in others in extreme old age. It occurs something like five times as frequently in men as in women, and in the latter sex much more frequently among those who are married.

A great variety of occupations is represented in any large series of cases, but there are some grounds for believing that gas workers and coal miners are amongst those most frequently affected. There is no striking evidence that exposure to war gases has any etiological significance.³

PATHOLOGY.

These growths usually arise from the bronchial epithelium—hence the commonly used term of bronchogenic carcinoma—and three histological types are common, i.e., the epidermoid, the oat-celled and the glandular, the first two occurring slightly more frequently. Attempts have been made to correlate the anatomical situation of the growth with its histological characteristics, but these probably should be more properly regarded merely as an expression of the degree of cellular differentiation achieved in each particular instance. Similarly, attempts to deduce prognostic information from histological data are constantly being made; as yet these are inconclusive and in no circumstances should they be allowed to deflect the surgeon from the radical treatment of any individual case presenting otherwise favourable features.

The right lung is affected more frequently than the left in a ratio of approximately three to two, and although in about half the cases one or other stem (primary) bronchus is involved, by the time the investigation is undertaken many cases occur in which the lesions are in secondary bronchi and in some it is these smaller bronchi, inaccessible to endoscopic investigation, which are affected. The condition characterised by diffuse thickening of the parietal and visceral layers of the pleura, by pleural effusion, eventually by matting and invasion of most of the intra-thoracic structures and formally described as a "diffuse pleural endothelioma" is usually regarded as a low-grade poorly differentiated type of bronchogenic carcinoma.

As the initial growth increases in size, it may ulcerate and the discharge therefrom be evidenced as expectoration; or it may bleed and hæmoptysis occur. Sooner or later the parent bronchus becomes obstructed; if this obstruction is incomplete and infection occurs, purulent sputum is coughed up. Once the obstruction becomes complete, collapse of the area of lung drained by the blocked bronchus results, with consequent distortion of the thoracic contents, pain, etc. Septic changes predominate in other cases with extensive destruction leading to abscess formation in, and even gangrene of, the lung behind the obstruction; as an extension of the process a pleural effusion or even an empyema may develop. Frond-like

processes of growth may project from one stem bronchus into the mouth of the other and severe dyspnoea result.

Dissemination is to some extent by direct extension into the mediastinum, pericardium, chest wall, etc., but principally and in most cases by the lymphatics or the blood stream.

DIAGNOSIS.

Unfortunately, most pulmonary growths are characterised in their earlier stages by their clinical silence; attention usually being drawn to them—unless accidentally discovered by some chance X-ray examination—by the occurrence of some complication.

Cough, sputum, loss of weight, lassitude, dyspnoea, pain, hæmoptyses and huskiness of the voice, in that order, have been the most striking and constant symptoms in a large series of cases. Unfortunately, some of them are symptoms of which relatively little notice is taken at first, and if medical attention is sought, placebos and expectant treatment are usually all that are provided. Strangely enough, even with those cases in which hæmoptysis—especially if it is, as is usual, slight—is a feature, medical attendants are often satisfied with a sputum examination, and if this is negative, merely reassure the patients with some such explanation as that they have only “burst a blood vessel in the throat.” It cannot be too strongly urged that hæmoptysis must be regarded as being in every way as serious a symptom as hæmaturia and as urgently requiring investigation.

A sudden onset characterised by fever, pain in the chest and shoulder, and a small initial hæmoptysis (staining) a few days after an abdominal operation, led, in two cases, to a diagnosis of pulmonary symptoms, and the ultimate development of a lung abscess resulted in their admission to a thoracic clinic, where bronchoscopy showed that the cause of their trouble was a bronchial carcinoma. Both had become “inoperable” in the interval between the onset of their symptoms and their submission to proper investigation.

It is quite impracticable to investigate completely every person complaining of such a common symptom as cough, but it should be emphasised that this occurring in an adult—especially if persistent and not capable of some simple explanation—calls for a most careful investigation by all the methods now at our disposal.

Cases are sometimes seen in which the history and the clinical and radiological examination lead to a diagnosis of chronic lung abscess, and the underlying carcinomatous nature may only be discovered by bronchoscopy, or even, in a few cases, by histological investigation of the “abscess” wall.

Full investigation, including bronchoscopy, should be insisted upon where abnormal physical signs persist in some part of the lung after a supposed “pneumonia,” or where such a lesion fails to “resolve.” A bronchial carcinoma will be frequently found in such cases.

One case with a vague dyspepsia accompanied by persistent cough and loss of weight, and another which had symptoms suggestive of bronchiectasis with a collapsed lower lobe lasting for several months and accompanied by a profuse purulent expectoration proved, on investigation to have “operable” bronchial cancers.

Interpretation of the variable physical signs encountered is purely speculative unless correlated with the findings of a careful X-ray examination, and the latter is accordingly, the first most important step to be taken in the investigation of these cases. This will include, if necessary, special views to aid localisation and tomography to reveal the relationship of an abnormal shadow to a bronchus.

The various X-ray appearances likely to be seen in these patients can be most conveniently summarised by reference to an approximate analysis of the findings recorded in a recent series of 107 cases on admission to our central clinic. In 64 per cent. of these cases, the picture was one of collapse either of an entire lung (24 per cent.), or of a lobe (40 per cent.). A dense shadow was present in the hilus of the lung in 17 per cent., and in 10 per cent. a cavity with a fluid level mimicking a chronic lung abscess was seen. A solitary mass—the so-called cannon ball tumour—was noted in the centre or periphery of the lung in 4 per cent. In 3 per cent. the lesion resembled fibro-cavernous tuberculosis of an upper lobe, and in 2 per cent. a complete unilateral opacity was found to be due to the effusion associated with a diffuse carcinomatous infiltration of the parietal and visceral layers of the pleura—the condition formerly called pleural endothelioma. Only one case of the so-called “Pancoast” or superior pulmonary sulcus tumour—in which an opacity of the apex of the lung is associated with Horner's syndrome, pain down the upper side of the arm and wasting of the small muscles of the hand—occurred in the series, and it proved to be a malignant neurogenic tumour and not, as is usually the case, a bronchogenic carcinoma.

The discovery by screening of immobility of the diaphragm on the same side as a lung growth, especially if this is near the path of the phrenic nerve, is usually regarded as due to phrenic paralysis, the result of direct invasion of that nerve. Recently, however, cases of this sort have been met in which no invasion could be demonstrated at operation, and so far as that was concerned, the condition was "operable"; presumably, the nerve had been paralysed by pressure or by an associated inflammation in the nearby lung. Hence, a fixed diaphragm should not be regarded as a contra-indication to operation.

Bronchography—a method of contrast delineation of the bronchi by X-rays, after introduction of some such radiopaque substance as lipiodol—is often recommended, especially for the detection of lesions in those lesser bronchi inaccessible to direct inspection by the bronchoscope. Its use in the diagnosis of growths is, however, to be deprecated as there are so many pitfalls connected with the method that reliance cannot be placed on the findings obtained; there is the further disadvantage that subsequent X-ray examination may be rendered useless for variable periods, because of the persistence of residual opacities.

An artificial pneumothorax is sometimes usefully induced to obtain better contrast X-ray delineation of a suspicious lung shadow (cf. pneumoperitoneum). This also permits thorascopic inspection, should it be considered necessary.

Bronchoscopy will reveal the presence of any lesion in the main bronchi. The Negus wide aperture type of instrument is the most useful, as material for pathological examination can usually be easily obtained with its aid, and special "retrograde" telescopes passed along it when inspection of the upper lobe bronchi is required. The method also enables the collection of useful information as to the intrabronchial extent of the growth.

Examination of the sputum for the presence of malignant cells is advocated by some as a useful method,⁴ but it has not been generally adopted because of the impression that these cells have only been found in the sputum in cases so far advanced that diagnosis was already obvious.

Attempts have been made to popularise the use of direct lung puncture to obtain biopsy material from suspicious areas in the lungs.⁵ This method is unsurgical and unsafe because of the risk both of infecting a possibly "virgin" pleural cavity from a septic lung lesion and of initiating septic or neoplastic emboli.

It is commonplace knowledge amongst physicians who deal with tuberculosis that the general condition of patients with cancer of the lung may show a marked improvement whilst under observation in sanatoria, even considerable increases in weight being noted from time to time. This phenomenon should be remembered when taking into consideration the general condition of cases where carcinoma is suspected.

The very great majority of such cases have sought medical advice at an early stage. Yet the average duration of their symptoms prior to admission to our clinic was 9.8 months. Whilst a history of one month was obtained from the earliest case, the longest gave a continuous history of five years. During the past year there has been some improvement, probably as the knowledge of the existence of facilities for active treatment has become more widely known; and for the last thirty-six cases the average duration of symptoms prior to admission was 5.33 months, the longest being two years and the shortest one month. Practitioners often refer their patients to tuberculosis clinics or general hospitals first; and for a variety of reasons there is, unfortunately, too often a fatal time lag before they are passed on to thoracic surgical centres. The importance of early reference to such centres cannot be too strongly emphasised. Procrastination and the desire to mark time whilst observing the patient's progress before doing so must be overcome, if what Churchill⁶ has termed the salvage rate for these cases is to be markedly improved. Valuable time would be saved if such observations of progress were made in the special centres, where at the same time investigations could be proceeded with. Another point that should be emphasised is the importance of repeating investigations where such are inconclusive in suspicious cases.

TREATMENT.

Grey Turner has rightly emphasised, in speaking of malignant disease generally, that "it is our duty to use the art of surgery to the utmost of our power for the relief of sufferers from this dread malady."⁷ The only treatment that holds out any reasonable prospect of prolonged survival is surgical extirpation of the affected lung—in a few cases it may suffice to remove the lobe—at an early stage of the disease. The immediate mortality of these cases in which it has proved possible to complete the removal is in the vicinity of 30 to 40 per cent., and recently several five-year survivals have been recorded from active American clinics.^{8, 9}

All other forms of treatment are palliative—or even useless—with the exception in a few cases of X-ray therapy.

All our cases in which it is not possible to carry out radical surgical treatment—and these, of course, form the greater part of our material—are referred to the radiotherapist. They almost all receive appreciable symptomatic relief, especially from the dyspnoea and venous obstruction associated with mediastinal involvement. Massive shadows previously seen in the X-ray films disappear, collapsed lobes re-expand and the patients often gain weight. Unfortunately, the improvement is not usually maintained, and most of the patients die within six months of the conclusion of the treatment from cachexia or distant generalised metastases.

One or two of our cases treated thus have survived for over a year and remained in good health, and one recent case—a young man—returned after fifteen months with a recurrence of a carcinomatous mass in the mediastinum and upper lobe of the right lung, associated with intense dyspnoea, cyanosis and engorgement of the veins of the neck, head and arms; apparent resolution occurred again with complete symptomatic improvement after repetition of the X-ray treatment, the course of which has just been completed.

There can be no disagreement with Overholt's statement that these cases must be regarded as surgical problems until the question of the operability of each individual case is settled, as excision provides the only hope of cure. He considers that the problem should be regarded in the same way as it would in handling patients suspected of harbouring malignancy of abdominal viscera, and he points out that whilst the surgical issue is frequently forced in cancer of the digestive tract by obstruction, and although malignant bronchial obstruction does not demand intervention so dramatically, without its help the lesion that produces the obstruction is, in the end, as fatal as an untreated intestinal obstruction due to malignancy.⁹

Our practice is to recommend exploration for every case in which there is no obvious evidence of dissemination and whose general condition does not absolutely preclude operation. If it is found that the lung cannot be removed, either because of parietal or mediastinal involvement—and this is often the case—then the exploration does not usually cause any great upset, and after healing has occurred, the patient is referred for radiotherapy. Sometimes, it may be necessary to operate in stages, mobilising the lung at the first operation and completing the removal at a later stage. Rienhoff⁸ has recommended for certain difficult cases that the pulmonary artery should be tied at the same stage as that at which the mobilisation is carried out, but this paper is not primarily concerned with such technical points. Unfortunately, it may occasionally happen that localised spread to the mediastinum may not be recognised until the pneumonectomy is almost completed and then malignant tissue may have to be cut through arbitrarily. Such cases should then, of course, if they recover, be given the benefit of a course of deep X-ray treatment.

So far as the details of the radical operation are concerned, it must suffice to say that usually the whole lung rather than one of the lobes should be removed, and that this should be done by dissection of the individual vascular and bronchial elements of the pedicle, rather than by the use of mass ligatures, tourniquets, etc., as the former method facilitates the removal of any mediastinal or sub-tracheal glands which may be involved.

There is little deformity or disability after a successful pneumonectomy performed by modern methods, although subsidiary operations may be required for complicated cases.

Finally, mention must be made of a few directions in which the surgeon may be of assistance in the alleviation of cases unsuitable for radical extirpation.

The severe pain so often a feature of these is usually easily abolished by the paravertebral injection into the appropriate intercostal spaces of such permanent or semi-permanent anæsthetic substances as absolute alcohol or Proctocaine.

The drainage of complicating abscesses relieves the associated toxæmia, and what is of greater benefit, may materially reduce the amount of foul sputum coughed up.

If X-ray therapy is not available, or if it fails to relieve the intense dyspnoea, etc., often associated with massive glandular deposits in the upper thoracic wall, division of the manubrium sterni may prove beneficial.

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