Current Practice

RESPIRATORY TRACT DISEASE

Early Diagnosis of Bronchial Carcinoma

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The early diagnosis of bronchial carcinomas is not the same as the diagnosis of early bronchial carcinomas: it is diagnosis at the earliest stage that is possible with present diagnostic techniques. How early this is depends on a number of factors, many of which are not within the control of either the patient or the physician. One of these factors is the site of the lesion. A main-bronchus tumour will probably not be detected until late in its development; but, on the other hand, even a small lesion in a small bronchus may cause pneumonia in the involved segment and diagnosis may thus be possible relatively early in the course of the disease. Early diagnosis also depends on the speed at which the tumour is growing. This is related to the type of cellular differentiation: thus squamous tumours grow less rapidly than undifferentiated ones, and as a result of these different rates of growth large tumours may be younger than small ones. We do not know the factors that determine differentiation and speed of growth in individual patients and certainly they are not at present controllable.

The importance of early diagnosis lies in the relation of survival after resection to the duration of symptoms before operation. In general, patients who either have no symptoms or symptoms of only a few weeks' duration survive longer than those with symptoms for six months. However, the nature of the condition is such that even the earliest possible diagnosis in all cases would not vastly improve the total results of treatment. The resection rate might possibly be 60% instead of 25%. The five-year survival rate after resection in patients with no symptoms is of the order of 40%, but in patients with several months' symptoms it is about 30%. Thus if all patients were diagnosed before symptoms arose—an impossible achievement—the five-year survival rate of the whole group without symptoms would be approximately 25%, compared with less than 10% for those with symptoms. This would be a worth-while improvement, particularly for the individual patients: but to consider that early diagnosis is the panacea for bronchial carcinoma obscures the real problem.

Use of Routine Chest Radiography

It has been proposed on several occasions that men over the age of 45 should be advised to have their chests x-rayed every six months, for it is argued that this would result in more patients having the tumour diagnosed at an early stage with consequent improved survival after treatment. However, there is at present no convincing evidence that this does indeed occur; and routine radiography at regular intervals has some disadvantages. A man who has a haemoptysis a few weeks after receiving a satisfactory report of a chest x-ray examination may attach little significance to it because of this

report. He may not seek medical advice until the next routine film is taken and this may show an advanced and inoperable condition. Thus the gains from early diagnosis in some patients must be set against possible losses from late diagnosis in others.

There are other potential disadvantages that are more difficult to evaluate. If the person reporting the films is continually on the look-out for small abnormalities he will refer for investigation some patients who have in fact no abnormality in their lungs. These patients may need to be fully investigated with bronchoscopy, tomographs, and repeated sputum examinations. This will cause considerable additional work in the hospitals; and, more important, it will also cause great anxiety among the patients. It may be argued that these objections are purely theoretical: but so also is the hypothesis that mass routine radiography will reduce the mortality from bronchial carcinoma. There is a great need for controlled studies of this problem, so that facts can replace theories. To test the hypothesis it is necessary to study a population divided at random into a group who are offered six-monthly chest x-ray examinations and a group who are not, and to compare the mortality of the two groups over a period of years. One such study is in progress at the present time. Until the results are available it seems undesirable to recommend frequent routine chest x-ray examinations on a wide scale.

Early Symptoms of Bronchial Carcinoma

Cough

The symptoms of bronchial carcinoma are commonly insidious and unobtrusive. Almost all patients have a chronic productive cough, which may be denied on first questioning, for the morning production of a little mucoid sputum has become so habitual in heavy smokers that it is taken to be normal, and they do not complain of it. When a bronchial carcinoma develops in a patient with chronic bronchitis there may be no change in the quality of the cough or the quantity of sputum. On the other hand, the cough may slowly become more troublesome. The patient may cough more frequently during the day; and sputum, though still mucoid, may increase in volume. However, all these changes can occur in patients with chronic bronchitis who do not have a bronchial carcinoma, for they are part of the fluctuating picture of the disease. Even when the changes become sufficiently obtrusive for the patient to seek advice it is unreasonable to suggest that the general practitioner should arrange for x-ray examination in all patients with chronic bronchitis whose symptoms get slightly worse.

In patients whose only symptom is a change of cough physical examination may show no abnormalities other than

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those associated with the chronic bronchitis. In a small number of cases there is found on careful auscultation of the chest a difference in intensity between the breath sounds in corresponding parts of the two lungs, which is perhaps most easy to detect over the upper lobes—anteriorly below the clavicles. It is caused by altered ventilation of one lobe due to narrowing of the bronchus, and may be accompanied by a persistent rhonchus in the same area. Either of these physical signs is a clear indication that a chest x-ray examination is necessary.

With changes in the cough and sputum alone there will inevitably be delay before the diagnosis is made. The patient will delay going to the doctor until he thinks that the change in cough and sputum is more than the usual exacerbation to which he is accustomed: and the doctor will delay investigations other than a physical examination because he sees so many men with similar complaints who have nothing more than chronic bronchitis. Diagnosis at this stage will usually be made by routine chest radiography or by the acumen of a practitioner who from an intimate knowledge of his patient decides that the change of symptoms is sufficiently suspicious to justify investigating further.

This inevitability of delay is insufficiently acknowledged. Patients are blamed for delaying seeking advice and practitioners are blamed for delaying sending their patients to hospital. If the symptoms are merely changes in the "normal" cough and sputum no one is to blame.

Dyspnoea

Middle-aged patients with chronic bronchitis are usually more short of breath on exertion than men of the same age without bronchitis. When a lung cancer develops the dyspnoea may increase. In some cases the increase is quite rapid and sufficiently noticeable to the patient that he seeks medical advice with little delay; but more commonly the increase, if it occurs at all, is slow. As in the case of cough and sputum there will in such cases be an inevitable delay before the diagnosis is made.

Febrile Episodes

Destruction of the bronchial wall interferes with the defence mechanisms against infection, and episodes of pneumonia in the involved segment or lobe occur with fever, purulent sputum, and in some cases pain in the chest. However, patients with chronic bronchitis also have these episodes and there is little to distinguish them from the illness caused by a bronchial carcinoma. With a carcinoma, although the fever and purulent sputum may disappear with antibacterial treatment, the patient may continue to feel unwell, and rales may persist over the involved area. Continued ill-health or persistent rales are indications that the chest should be x-rayed. Similarly, if the patient appears to recover completely but has a further febrile episode after a short interval an x-ray examination should be done.

Chest Pain

Chest pain in patients with bronchial carcinomas is generally of three types. First, there may be pleuritic pain from infection of the involved segment or from neoplastic invasion of the pleura. This may disappear. The pain from pleurisy accompanying pneumonia subsides as the infection subsides, while the pain from neoplastic involvement may also disappear spontaneously as a pleural effusion develops. In this latter case the increase of breathlessness and the presence of the signs of a pleural effusion will lead to further investigation.

Secondly, the pain may be a dull deep ache, usually on the side of the lesion, and sometimes located by the patient deeply between the shoulder blades. It is unrelated to effort, chest movement, and breathing, and is remarkably persistent, although its intensity varies. This pain usually indicates that the mediastinum is involved by the tumour, and as an early symptom it is unusual. Thirdly, there may be pain due to direct involvement of a rib or to a metastasis in a rib. These pains are also unusual as early symptoms, and are persistent; but they are superficial and well localized by the patient. The involved area is usually tender, and the pain may spread around the chest in the distribution of the intercostal nerve.

Pain in the chest of more than a few days' duration, even in the absence of other symptoms or of any abnormal signs, should be investigated by chest x-ray.

Haemoptysis

Coughing up blood frightens patients, and most will seek advice without delay. Haemoptysis therefore offers the best chance that carcinoma will be diagnosed early. The haemoptysis is seldom large. It is usually a mere streaking of the sputum with blood, which may occur on only one occasion; or every piece of sputum coughed up may contain streaks or specks of blood. Coughing up clots of blood or large amounts of liquid blood is rare. There are causes of blood-streaked sputum other than diseases of the bronchi. Blood may have entered the sputum from the gums, the tongue, the pharynx, or the larynx. Careful inquiry into the circumstances of the episode and in particular into the character of the cough at the time may give some indication of the site of bleeding. Examination of the mouth and pharynx may show a bleeding point. If there is no obvious source for the blood the investigation must be carried further.

The main diagnostic difficulty arises in patients with severe chronic bronchitis. Slight bleeding is not uncommon in such patients during exacerbations of the bronchial infection, but even in these cases the first haemoptysis should be a sign for an x-ray examination of the chest.

Further Investigations

Radiography

The majority of carcinomas begin in the proximal parts of the lobar or segmental bronchi or in the main bronchus itself. This region is a radiographically highly congested area. The shadows of small tumours cannot be distinguished from the shadows of normal structures. Highly critical radiography, including tomography, may detect some relatively small tumours in this region, but the standard postero-anterior projection will not do so. By the time the tumour is visible radiographically it is either already a large one or it has spread to the regional lymph nodes which are contributing to the abnormal shadow. It might be thought that tumours arising in the more peripheral parts of the lung would be easier to detect radiographically, but even with these there are difficulties. Not all the lung field can be clearly visualized in the standard postero-anterior film. Quite large opacities may be hidden by overlapping rib shadows or by the shadows of the heart or diaphragm, and very small tumours are quite undetectable. In patients having x-ray examinations at regular intervals it is rare for the first abnormal shadow detected to be less than 1.5 cm. diameter. In whatever part of the lung they arise small tumours are usually radiographically undetectable unless they have caused other abnormalities.

If a patient with no symptoms has a doubtful abnormality of a hilar shadow or a small peripheral opacity further inves-

tigation short of thoracotomy is most unlikely to detect the carcinoma. If the patient has had a haemoptysis and the chest film is apparently normal he probably does not have a carcinoma. Bronchoscopy is commonly done in such cases, but the yield of carcinomas is very small. It is a common practice to continue to take x-ray films in such patients for six months or a year after the haemoptysis, but again the yield is very small.

Chest radiography is an essential diagnostic tool; but there are limitations to what it can do in early diagnosis.

Bronchoscopy

Bronchoscopy is not a pleasant procedure for the patient. If it is done under local anaesthesia it is not an experience which many patients would willingly repeat; while even under general anaesthesia it has discomforts, particularly the upper abdominal pain that is relatively common after muscle relaxants have been used. These discomforts can be willingly accepted on behalf of the patient if the need is sufficiently great, but bronchoscopy is not a procedure that should be applied uncritically as a means of early diagnosis.

There are other shortcomings, such as the relatively small range of visibility in the segmental bronchi of the upper lobe, where small carcinomas may be bronchoscopically invisible. The procedure can be made more searching if suckings are taken from the suspected bronchi. It is quite out of the question to use bronchoscopy as a screening procedure similar to the examination of cervical smears in women.

Bronchography

This procedure, like bronchoscopy, is also uncomfortable and should not be used uncritically.

Carcinomas in segmental bronchi can sometimes be detected after bronchoscopy has shown no abnormality. No appearance is absolutely diagnostic, but the absence of filling in the involved area with good peripheral filling elsewhere is sometimes sufficient evidence to justify thoracotomy.

Cytology

Examination of sputum and bronchial secretions for tumour cells requires a high degree of skill and experience.

If these are available the investigation can be of considerable value.

An attempt has been made to use sputum examination as a screening procedure. It is relatively simple to obtain the specimens, but to examine very large numbers of them by the present techniques is a formidable undertaking. The techniques will probably be improved in future. It may indeed be possible to devise automated methods of examination, which would make it possible for large numbers of specimens to be examined by relatively few and relatively unskilled people. Techniques for inducing sputum production are already available, and in association with automated reporting these might make it possible to examine the hundreds of thousands of specimens needed for a full screening programme.

The combination of regular chest x-ray and sputum examination of middle-aged men offers what is theoretically the best chance of early diagnosis; but a considerable amount of research is required before the yields of such a programme can be assessed against the economic cost.

Conclusions

With the existing diagnostic procedures early diagnosis is still largely a matter of chance. More patients would be diagnosed early if they sought advice earlier, but in many cases symptoms are so insidious and unobtrusive that the disease will inevitably be at an advanced stage before this occurs. The value of frequent routine chest x-rays has not yet been demonstrated. It is at present impracticable to carry out large-scale programmes of sputum examination, although suitable techniques for this may be developed.

For the present we must rely largely upon the clinical acumen of the general practitioners, whose task in early diagnosis is by no means easy, together with readily available and accurate chest x-ray services and the clinical acumen of physicians and surgeons in hospitals.

The yield from improvement in these factors will not be large. No major improvement can be expected until an efficient technique of mass detection has been devised.

The immediate outlook for improving early diagnosis is not good. Nor is the immediate outlook for improving the results of treatment. It is therefore all the more necessary to try harder to prevent this largely preventable disease, which is so difficult to detect in the early stages of its evolution.

ANY QUESTIONS?

We publish below a selection of questions and answers of general interest.

External Cardiac Massage

Q.—*In what sort of cases is external cardiac massage of value? What is the technique, and does this differ with the age of the patient?*

A.—External cardiac massage is indicated in any previously healthy individual who dies suddenly and unexpectedly. Most successes in resuscitation initiated by this technique can be expected to occur in patients with mild to moderately severe myocardial infarction—that is, in patients with apparently good prognosis and “hearts too good to die” but who nevertheless suffer electrical cardiac arrest in ventricular fibrillation.¹ Other indications are ventricular fibrillation induced

by electric shock—either accidental or therapeutic (cardioversion), or by myocardial concussion as in bruising steering-column injury. I have had experience of successful resuscitation using this method in patients whose hearts have been arrested by barbiturate, quinidine, and accidental cyanide poisoning. Then there is the historical indication which still holds to-day, of cardiac arrest during anaesthesia when resuscitative measures will be initiated by external massage, especially if the chest or the abdomen is not already open.

Lightning speed in beginning is most important. The praecordium should first be struck by a heavy blow with the clenched fist, which may in itself reverse ventricular

fibrillation or asystole.² Immediately after cardiac compression has begun the patient should be laid on a firm surface (on the floor or on bed-boards). The operator should kneel beside or astride the patient's abdomen and place the heel of his hand on the lower third of the patient's sternum, fingers pointing to the neck, and press down from the shoulder in a slightly crescendo jerky fashion so that the sternum moves inwards $\frac{1}{2}$ to $\frac{3}{4}$ in. (1.3 to 1.9 cm.) about 80 times per minute. Very little force is required, but the operator may find it less tiring to place one hand on top of the other and bear down from both shoulders.³ Efficacy is judged by contraction of the pupils, resumption of skin circulation, and a clinical impression that the patient is not inanimate. A femoral pulse is not definite evidence of adequate circulatory forward flow.⁴

Attention should be paid to the airway, and if respiration has ceased intermittent