

LUNG CANCER:

II. DIAGNOSTIC METHODS

SAW HUAT SEONG & M. ASHOKA MENON

INTRODUCTION

ALTHOUGH bronchogenic carcinoma was first described in the nineteenth century, it did not assume its present day significance till the early part of this century. Today, it ranks as one of the commonest visceral cancers in man. (Schneiderman & Levin, 1972; Crofton & Douglas, 1975; Carnow & Meier, 1973).

The diagnosis of lung cancer and its assessments for operability are especially important since Evarts Graham's epoch-making first pneumonectomy for cancer in 1933 — an event which heralded surgery as one of the therapeutic modalities in the management of lung cancer. In spite of the increasing popularity that pulmonary resection enjoys, carcinoma of the lung is still looked upon as an incurable disease by some clinicians and as such, too much emphasis and reliance are placed on the plain chest x'ray in making a diagnosis. While this practice may be partially justifiable in far-advanced malignancy, when the clinical diagnosis may be fairly accurate every endeavour should be made to obtain tissue diagnosis in the more favourable patient.

This paper reviews our experience with the various methods of obtaining a histological diagnosis and analyses the yields obtained therefrom.

PATIENTS AND RESULTS

The case protocols of all 278 patients with histologically proven lung carcinoma admitted to the University Hospital, Kuala Lumpur between the years 1967 and 1977, were studied and analysed retrospectively.

Departments of Medicine & Surgery
University Hospital, Kuala Lumpur, MALAYSIA.

SAW HUAT SEONG, M.B.B.S., F.R.A.C.S.,
Associate Professor

M. ASHOKA MENON, M.B.B.S., M.R.C.P., F.C.C.P.,
Lecturer

Table I illustrates the diagnostic methods employed and lists the frequency of utilization of each method. It also shows the proportion of positive yields obtained from each diagnostic procedure.

Table I

Method of Obtaining Histological Diagnosis and its Efficacy		
METHOD	FREQUENCY OF UTILIZATION (%)	POSITIVE YIELD (%)
Sputum Cytology	30	64
Bronchoscopy	44	41
Lymph Node Biopsy	21	74
Effusion Cytology	11	61
Open Biopsy (Mediastinotomy & Thoracotomy)	7	100
Needle Pleural Biopsy	10	55
Biopsies from secondaries	9	100
Mediastinoscopy and Biopsy	5	29
Percutaneous Needle Lung Biopsy	1	33

As can be anticipated, the highest yields (100%) were obtained from open biopsies and biopsies from secondaries.

It was disappointing to note that sputum cytology was requested for in only 30% of the patients in spite of the fact that it provided tissue diagnosis in 64% of the specimens examined.

The frequency of the various cell types are shown in Table II.

DISCUSSION

The suspicion that a patient may be suffering from lung carcinoma is based on clinical features and radiological appearances of the chest. In a good number of patients, the chest x'ray (Figs. 1 and 2) may be so classical that, coupled with the clinical features suggestive of far-advanced

Table II
Cell Types of Lung Carcinoma

CELL TYPES	FREQUENCY (%)
Squamous	34
Adenocarcinoma	25
Oat (Small) Cell	12
Large Cell	12
Anaplastic	15
Others	2

malignancy, further work-up beyond some relatively non-invasive procedures may appear to be an academic exercise. Also radiological features suggestive of an infectious process (Fig. 3) may make invasive investigations unjustifiable. Notwithstanding these remarks, errors in the diagnosis of malignancy, based purely on clinical and radiological grounds do occasionally occur. (Figures 4, 5 & 6) Likewise, the apparently benign lesion is occasionally subsequently proven to be malignant. In view of this, every attempt should be made to obtain a histological diagnosis and to determine the extent of the disease.

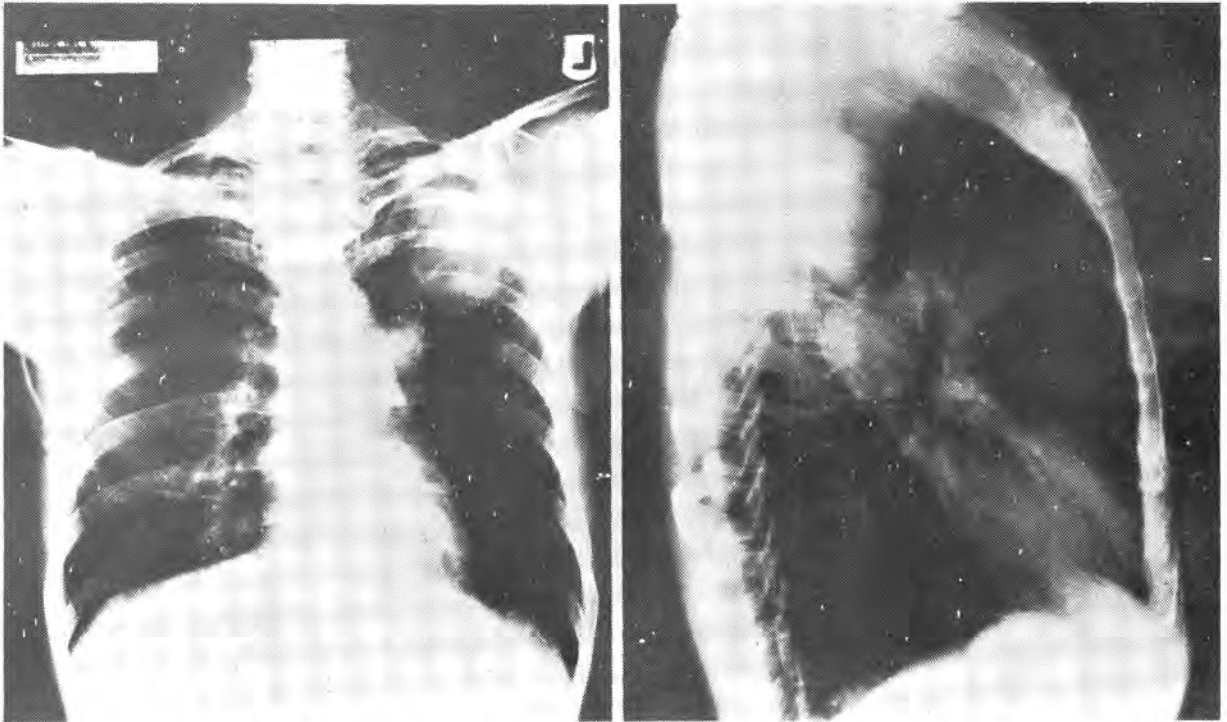


Fig. 1. Posteroanterior and lateral chest x'ray of a 37 year old Malay male showing a mass shadow in the left upper zone with associated prominence of the left hilum indicative of lymphadenopathy.

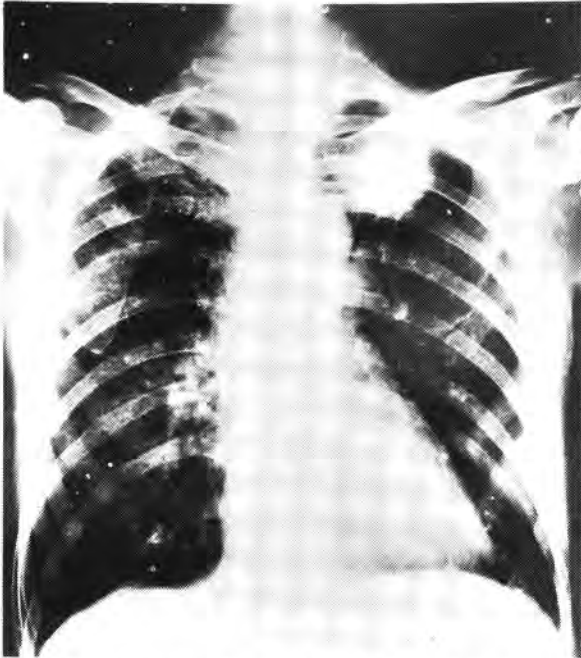


Fig. 2. Posteroanterior chest radiograph of a cachetic 65 year old female who complained of dyspnoea and haemoptysis.

SPUTUM CYTOLOGY

In this series, sputum cytology was requested for in only 30% of patients. In spite of the inadequate attention paid to obtaining a good specimen, the yield was surprisingly good (64%). Ideally, post-tussive morning specimens should be submitted, although specimens obtained after vigorous physiotherapy will do just as well. In patients with minimal or dry cough, sputum production may be induced with the aid of aerosol sprays.

The examination of multiple specimens of sputum will also increase the yield. It has been stated that the positive rate is slightly less than 50% with single specimen examinations, improving to over 75% when multiple specimens are examined (Koss, 1967; Nasiell, 1967; Frable, 1968).

As expected, and further supported by Srivastava's (1973) study, centrally placed tumours, even when small, tended to give a higher yield than peripherally positioned ones. This is a useful observation to bear in mind since centrally placed

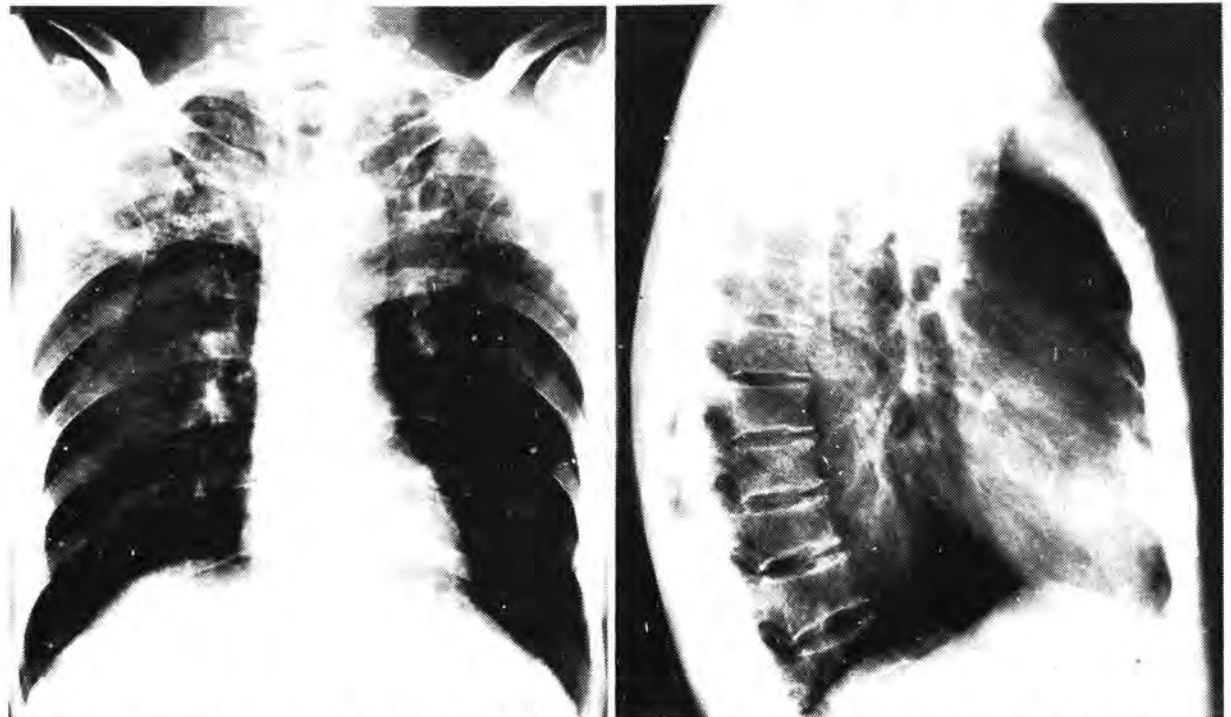


Fig. 3. Chest x-rays of a 60-year old man with a history of night sweats and chronic cough. Note the bilateral apical scarring typical of chronic pulmonary tuberculosis.

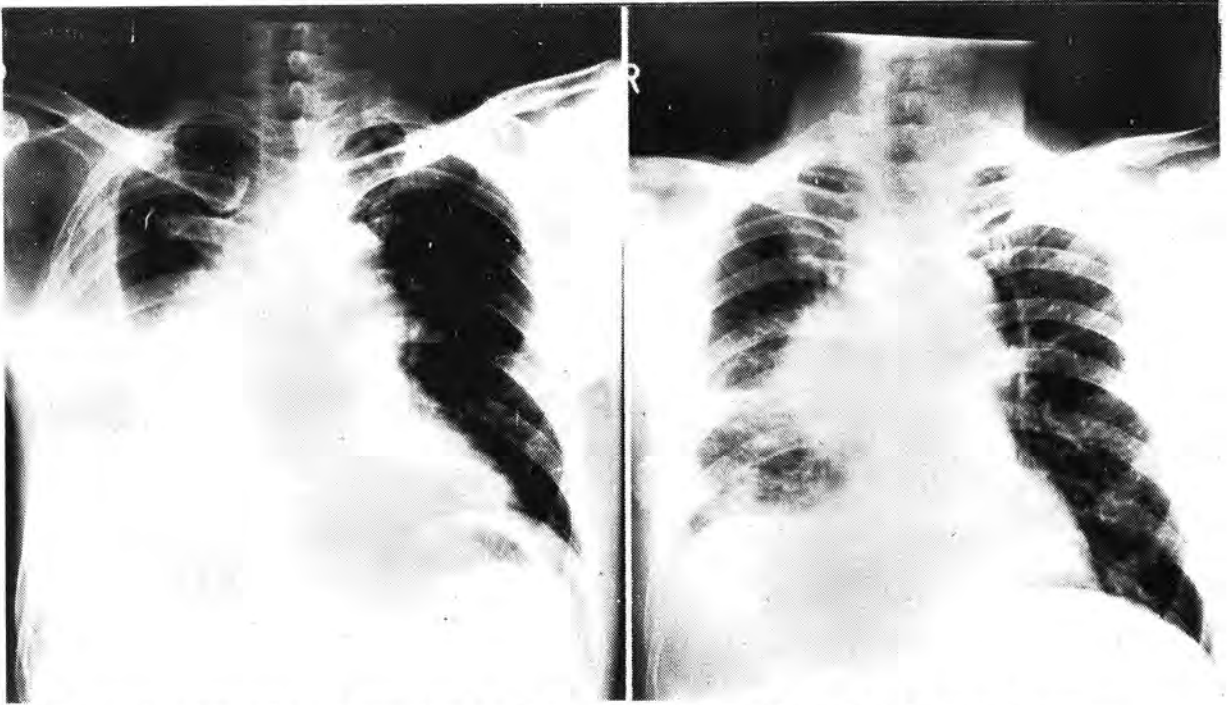


Fig. 4. These x-rays belonged to a 63-year old man with very strong circumstantial evidence of lung cancer. However, all investigations short of open biopsy did not reveal any malignancy. He was finally proved at exploratory thoracotomy and direct biopsy to have primary amyloidosis.



Fig. 5. When non-invasive investigations did not confirm malignancy in the patient who presented with this chest x-ray, he was given a therapeutic trial with various antibiotics. These too, did not produce any resolution. Exploratory thoracotomy with wedge resection and frozen section subsequently confirmed the lesion to be suppurative pneumonia.

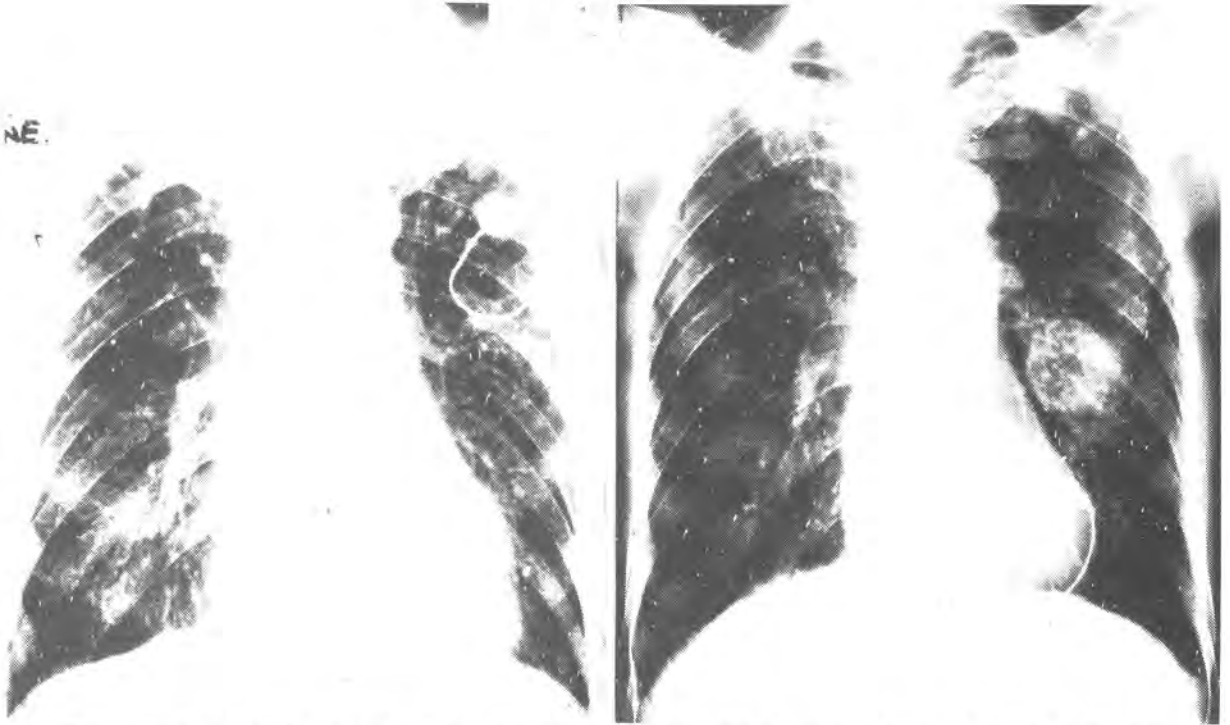


Fig. 6. The routine chest x-ray (left) taken in 1974 when a permanent pacemaker was implanted in this 60 year old man was typical of tuberculosis. In 1977, he returned for a change of pacemaker at which time the preoperative chest x-ray (right) done showed a mass lesion in the left midzone. Investigations for malignancy were negative. When subsequently subjected to exploratory thoracotomy and open biopsy, this mass proved to be a benign granuloma.



Fig. 7. This 70 year old male presented to the National T.B. Centre with complaints of haemoptysis and weight loss. The chest x-ray done (above) showed some scarring in the right apex and the Mantoux Test was positive. He was therefore started on antituberculous treatment. Five weeks after initiation of therapy, a right scalene node was palpable. This was biopsied and reported as being infiltrated with a well-differentiated squamous cell carcinoma. Subsequent bronchoscopy showed a similar tumour in the left main bronchus. (Note that his chest x-ray appeared essentially normal).

tumours may be difficult to detect radiologically (Fig. 7) so that sputum cytology and bronchoscopy may provide the key to diagnosis in these patients.

BRONCHIAL WASHINGS AND BRUSHINGS

Examination of bronchial brushings for malignant cells has been advocated by some workers (Fry & Manalo-Estrella, 1970; Saltzstein *et al.*, 1977). In the initial technique described, a catheter is percutaneously introduced into the cervical trachea and advanced under fluoroscopic control, to the area of density. A thin wire with a brush at its tip is then advanced through the catheter to obtain specimens for microscopic examination. Using such a technique, a 75% diagnosis rate has been reported (Fry & Manalo-Estrella, 1970).

This rather laborious procedure has not gained popularity. However, during bronchoscopy with a rigid bronchoscope, many endoscopists have found it useful to instill about 10ml. of normal saline down the bronchoscope and to examine these aspirated washings cytologically.

With the introduction of the fiberoptic bronchoscope, bronchial brushings and washings have been most encouraging (Saltzstein, *et al.*, 1977) and should be routinely carried out when no tumour is visualised.

PLEURAL EFFUSION CYTOLOGY

In patients with obvious pleural effusions and those where the costophrenic angles are obliterated, suggesting the presence of an effusion, diagnostic aspirations should be carried out and the fluid so obtained examined. Irrespective of the nature of the fluid malignant cells should be looked for because blood-stained effusions in association with bronchial carcinoma is not necessarily equated with pleural secondaries (Le Roux 1968). In our series, out of a total of 30 cases wherein the fluid was submitted for cytology, 61% were positive. Repeated aspirations and examination of the sanguinous fluid obtained from one patient did not reveal any tumour cells — this patient was subsequently proven to have primary amyloidosis.

BRONCHOSCOPY

Today bronchoscopy continues to provide an

important method of investigating for pulmonary carcinoma. It is not without risks, so that it should be performed only in patients assessed as operable or in patients in whom a diagnosis by less invasive procedures has not been obtained.

To date, all bronchoscopies performed in this institution has been with the rigid bronchoscope. Although it has the disadvantage of limiting examination to the more central portions of the tracheobronchial tree, the rigid instrument allows for better assessment of the fixity of the carina and the displacement of the main stem bronchus. In addition, bronchial washings and biopsies are more easily obtained through its larger lumen.

The flexible fiberoptic bronchoscope has several advantages over the rigid bronchoscope (Table III) but it should not be used to the exclusion of the latter. Used in conjunction with rigid bronchoscopy, positive histological results and assessment of operability will be enhanced.

Table III

Advantages of Fiberoptic Bronchoscopes

1. Better patient tolerance under local anaesthesia.
2. May be passed beyond constricted and distorted segments of bronchi.
3. Allows for brushing biopsies of lesions in distal bronchi.
4. May reveal occult lung cancer situated peripherally.

LYMPH NODE BIOPSY

Scalene node biopsies were undertaken only when they were clinically palpable. We do not believe that a routine scalene fat pad biopsy should be undertaken. This policy is in keeping with the general observation that there is less than a 10% pick-up rate in patients with peripheral lesions which do not show radiological evidence of mediastinal lymphadenopathy (Mulder, 1977).

MEDIASTINOSCOPY, MEDIASTINOTOMY AND OPEN BIOPSY

Mediastinoscopy has not been done as a routine diagnostic procedure in our set-up because the lack of operating time and personnel forces us to embark upon procedures which are

more likely to give a positive result. Hence exploratory thoracotomy and open biopsies are resorted to more frequently (7%) than we would have otherwise preferred.

Mulder (1977) feels that if scalene node biopsies are positive, mediastinoscopy can be dispensed with. Apart from it being superfluous under such a circumstance, mediastinoscopy should not be considered as a minor surgical procedure since serious complications like large vessel injury, tension pneumothorax and cerebrovascular accidents caused by temporary occlusion of the innominate artery (Trinkle *et al.*, 1970; Stanford *et al.*, 1975) though infrequently reported may assume major proportions if this procedure was performed with impunity.

These potential complications have led McNeill and Chamberlain (1966) to suggest mediastinotomy as an alternative to mediastinoscopy. Here, these authors feel that an extra-pleural approach through the bed of the second or third costal cartilage provide a safer access to the mediastinum especially in lesions of the left lung and hilum. We have also preferred this approach and have had no hesitation to extend the incision intrapleurally to enable us to obtain a direct biopsy of the tumour. This technique was used in 7% of our patients with a 100% positive result.

NEEDLE BIOPSY

Needle biopsy of the lung and pleura although providing a high positive yield, was done in only 11% of patients since this simple procedure is not without risks. It is usually performed in patients with pleural effusions and in the elderly or ill patients in whom a thoracotomy is contraindicated on account of high risk — the very group of patients who would tolerate the not insignificant incidence of pneumothorax and bleeding poorly. Presently, we have tended to limit this procedure to poor risk patients in whom the tumour is up against or invading the chest wall and where a diagnosis is required for radiotherapy or chemotherapy.

EXPLORATORY THORACOTOMY

In the final analysis, the diagnosis and extent of the tumour are most accurately established by exploratory thoracotomy. This does not mean that all patients should be exposed to this most

invasive investigatory procedure. In fact, exploratory thoracotomy should be reserved only for patients in whom there is a good chance of accomplishing curative resection.

CONCLUDING REMARKS

From the foregoing discussions it can be appreciated that there are numerous investigatory procedures that a patient suspected of harbouring lung cancer can be subjected to — some are quite innocuous while others carry a substantial risk. It is important, therefore, to have a practical and safe approach to these patients (Fig. 8).

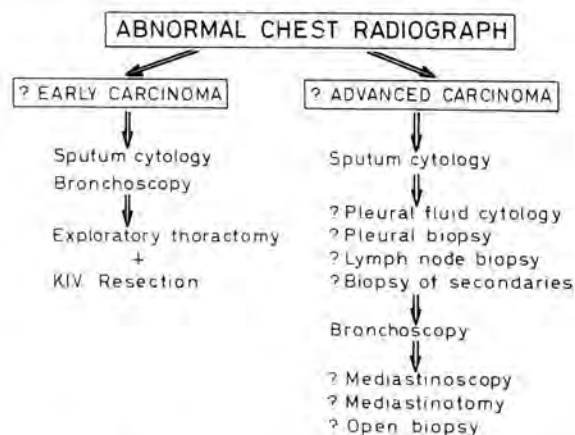


Fig. 8. Suggested Flow-chart for patients suspected to have pulmonary carcinoma.

When early carcinoma is suspected, too much time should not be unnecessarily spent on non-invasive investigations. Exploratory thoracotomy with a view to curative resective surgery should be embarked upon with little time loss.

The patient with suspected advanced carcinoma is a different problem altogether. Here sputum cytology should be repeatedly performed in the first instance. If a pleural effusion is present, diagnostic aspirations should be done. Where secondaries and lymph node involvement are suspected they should be biopsied. If these investigations prove negative, bronchoscopy and the other procedures outlined in Fig. 8 may be justified.

SUMMARY

The rising incidence of lung cancer in Malaysia warrants a reappraisal of the approach to patients suspected of having pulmonary carcinoma. This paper reviews our experience with the disease at the University Hospital, Kuala Lumpur, over a 10-year period. The various diagnostic methods utilized are critically analysed and a recommendation is made as to the diagnostic work up of these patients.

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