The Diagnostic Problem of Peripheral Pulmonary Lesions*

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Much emphasis has been placed on early diagnosis and treatment of bronchogenic neoplasms. The responsibility for delays preceding definitive therapy lies with both the patient and the physician. Current campaigns directed at the public cite danger symptoms and signs of pulmonary as well as other tumors and advise early consultation with the physician. Allbritten, et al,1 and Jewett2 report that an average of 2.8 and 4.1 months respectively are allowed to elapse before a patient seeks the advice of a physician regarding complaints referable to the chest. Ideally, a pulmonary tumor should be detected in the asymptomatic phase. This can be accomplished by serial routine chest surveys. But Guiss3 states that three to six months are allowed to elapse before a patient is subjected to surgery in some instances of definite primary pulmonary neoplasms discovered in a mass chest survey.

The second significant procrastination period is attributed to the physician. His contribution to the time loss averages 5 and 6.4 months respectively according to the two reports cited above.1,2 The physician, having found a pulmonary lesion of questionable etiology, may assume an attitude of watchful waiting, or recognizing the possible serious significance, undertakes an investigation towards a precise diagnosis. The first approach is generally discredited. It is the second approach that is the concern of this paper.

No physician is desirous of subjecting the patient to thoracotomy without proper indication. Confronted then with an unexplained pulmonary infiltrate he will request additional studies, principally radiological and laboratory, hoping to achieve an exact diagnosis.

As radiologists, we were in a favorable position to observe some aspects of the intensive in-patient pre-operative work-up. Impressive was the frequency of negative results of radiological surveys, particularly in search of a primary tumor, when a lung lesion was suspected of representing a metastatic focus. It was elected to study whether x-ray and other procedures usually employed were helpful in reaching a diagnosis which might preclude surgery.

The material used for this survey included all patients who, during the past five years, were subjected to thoracotomy for resectional surgery for peripheral pulmonary lesions other than obvious or known tuberculosis. The pulmonary masses or infiltrations under discussion were not necessari-

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ly sharply circumscribed or nodular in appearance ("coin" lesions) on the roentgenograms. They varied in size, location, shape and sharpness of margin. Excluded was any lesion with concomitant finding of atelectasis, cavitation, lymphadenopathy, pleural effusion or thickening, or metastasis, either local to the ribs or distant. There were 78 such cases in most of which the precise nature of the lesion was reasonably in doubt prior to surgery. Fifty of them were admitted to the private service and 28 to the ward service.

Methods of Investigation and Findings

Attempts to establish a diagnosis pre-operatively were directed into the following channels:

A. Radiography:

The x-ray studies employed could be subdivided into two groups—thoracic and extrathoracic. There is no question regarding the necessity of intensive examination of the chest in an attempt to shed further light onto the nature of the undiagnosed infiltration. The techniques included frontal, lateral, oblique, lordotic, decubitus and Bucky views. Tomography is of particular importance for precise localization, delineation and the detection of the presence of calcium or of excavation. Occasionally this will be the only method of uncovering multiple foci of parenchymal disease and aiding in their interpretation. Bronchography and pulmonary angiography may also be employed. All other radiographic examinations are done principally in an effort to uncover a primary extrapulmonary tumor and establish the lung lesion as metastatic. In this series 28 patients were subjected to 46 extrathoracic x-ray studies. These examinations included pyelography (intravenous and retrograde) (22 studies); gastro-intestinal series (15 studies); barium enema (7 studies); bone survey (1 study) and cholecystogram (1 study). In no instance was a primary tumor uncovered.

B. Sputum Studies:

These were done in an attempt to establish tuberculosis as the etiologic basis for the pulmonary infiltrate. Thirty-four patients had repeated examinations (up to 22 per patient) for acid-fast bacilli. No positive smears or cultures were obtained. This held true even in the eight instances in which histological sections of the resected specimens showed them to be of tuberculous origin. It is of further interest that in spite of negative results, a few of the patients were placed on an extended trial of antituberculosis chemotherapy because of the strong clinical impression of tuberculosis.

C. Bronchoscopy:

This procedure was performed on 57 patients in an effort to visualize and biopsy the lesion. In only 12 instances was a positive diagnosis obtained. This is understandable because of the peripheral location of the mass or infiltration.

D. Cytological Studies (Papanicolaou Smears)

These were obtained either from sputa or bronchoscopic washings. Of the total of 55 bronchogenic carcinomas, 33 were subjected to such studies.
Only seven were reported as positive and six questionable. Thirteen of the non-carcinoma group were examined with 10 reported as negative and three as questionable.

A breakdown of the histological diagnoses established by surgery is as follows: bronchogenic carcinoma 55, malignant lymphoma one, bronchial adenoma three, hamartoma three, chondroma one, bronchogenic cyst one, pericardio-coelomic cyst one, granuloma (tuberculosis) 11, and organizing pneumonia (lipoid) 2. Of interest regarding the localization of these lesions was the rarity of carcinoma in the right middle lobe (only one case) and the diffuse distribution of the tuberculous lesions (right upper lobe four, right lower lobe two, right middle lobe one, left upper lobe three, left lower lobe one).

Discussion

The period of hospitalization prior to surgery varied from two days to over two months, averaging about two weeks. The elapsed time could be directly correlated with the extent of the pre-operative studies.

Routine radiological search for primary tumor on the presumption that a lung nodule represents a metastasis is generally a fruitless procedure. Certainly any leading symptom or sign such as change in bowel habits, hematuria or presence of a mass would warrant appropriate examination. The possibility of a solitary metastatic focus in the presence of a silent primary tumor is not denied. Breast, colon and kidney are reported by Minor as the commonest sites of primary tumor producing pulmonary metastasis. But with the low mortality incidence for thoracotomy and pulmonary resection, as illustrated in a report by Bernatz and Clagett, it would appear more feasible to establish a diagnosis by this method. Even known or definitely suspected solitary pulmonary metastatic nodules have been resected. Wood et al, excised 17 metastatic lesions which represented 10.9 per cent of their total series of resected solitary circumscribed lesions. In all instances a malignant tumor had previously been removed from an organ other than the lung. Effler, et al, and Wolpaw each report cases with solitary metastatic carcinoma removed from the lung. In reviewing the material at this hospital, seven instances of solitary metastatic lung nodules ranging up to 7 cm. in diameter were encountered. All were from known primary extrathoracic tumors—colon two, ovary two, testis one, bone one, and cheek one. A single pulmonary focus of metastasis can justifiably be resected when it appears after a significant interval of time has elapsed following control of the primary tumor either by surgery or irradiation.

Even in the presence of a known primary tumor the discovery of a pulmonary nodule need not signify metastasis. Schafer and Scott reported a patient who had a giant cell sarcoma of the wrist and who subsequently developed a nodule in the lung. On resection this was revealed to be a hamartoma. Wood, et al, reported two instances in their series of circumscribed lung lesions of presumed metastatic foci in the lung which proved to be independent benign pulmonary tumors. In the first case
two separate adenocarcinomas had previously been removed from the colon. Histological diagnosis was bronchial adenoma. In the second case a carcinoma of the descending colon was detected at the same examination which disclosed a solitary lung lesion. Following removal of the adenocarcinoma of the colon, exploratory thoracotomy for presumed metastatic growth revealed a hamartoma. The possibility of a second primary malignant tumor of the lung should also be considered in such cases.

The presence of calcium in a pulmonary mass has been regarded as a reasonably certain criterion for benignity. Yet Trimble\textsuperscript{10} reminds us that a bronchogenic carcinoma may occur in or incorporate the region of a calcified Ghon tubercle. Hodes\textsuperscript{11} saw four patients with calcified primary nodules which, when closely followed, ultimately revealed bronchogenic carcinoma.

The presence of a not-too-well circumscribed upper lobe density would bring tuberculosis in mind and justify a short intensive search for acid-fast organisms. Age of patient, history of exposure, symptoms, and comparison with previous roentgenograms, if available, would influence decision regarding pursuit of that diagnosis. The coincidence of tuberculosis and carcinoma is reported at 1 per cent by Hedberg, et al,\textsuperscript{12} so that even the finding of specific bacilli might lead to false security.

Bronchoscopy and Papanicolaou studies are always indicated in the presence of a central pulmonary lesion. Positive yields with peripheral foci are low. This has also been the experience of Wood, et al.\textsuperscript{8} Negative reports do not exclude malignancy.

There is no intent here to disparage diagnostic procedures generally employed in evaluating a pulmonary lesion. A swing of the pendulum in the opposite direction, i. e., rushing a patient to surgery immediately following discovery of a lung lesion on a chest roentgenogram may result in unnecessary surgery and needless fatalities. The physician must be thorough and deliberate in his approach. Complete medical history and physical examination are fundamental. This was strikingly demonstrated recently in a patient admitted for surgery because of discovery of a mass in the left lower lobe on a routine chest survey film. Careful examination revealed the presence of a soft tissue mass in the calf of the left leg. The patient had volunteered no information regarding this, but on questioning, stated that it was there many years and not troublesome. Biopsy of the leg revealed a hemangiopericytoma. The pulmonary lesion was found on thoracotomy to be a metastatic focus.

Diagnostic procedures should be judiciously selected and expedited. An arbitrary time limit for pre-operative work-up might be set at two weeks. This may be too short a period of observation. For example, a pneumonic infiltration may persist for several weeks before starting to clear. Reports by Abeles and Ehrlich\textsuperscript{13} and Bondi and Leites\textsuperscript{14} emphasize the fact that, in an appreciable percentage of cases, differentiation between benign and malignant intrathoracic lesions by any current means short of any histologic examination is impossible. A more direct approach, i. e., surgical exploration, with consequent shorter hospitalization would be of consider-
able economic benefit to both patient and hospital. However, with appreciation of the varying growth potential of lung cancer, we cannot determine whether the saving of only days or a few weeks will significantly alter the ultimate prognosis of the individual patient.

SUMMARY

1. The experience at one institution with the radiological and laboratory examinations performed in conjunction with evaluation of 78 obscure peripheral pulmonary lesions, all of whom eventually came to surgery, is presented.

2. The examinations included radiography, both thoracic and extra-thoracic (the latter principally a search for a primary tumor) sputum for acid-fast organisms, bronchoscopy, and cytological studies.

3. The elapsed hospital time in accomplishing these investigations averaged about two weeks.

4. Histology of surgical specimens revealed bronchogenic carcinoma in 55 of the 78 cases.

5. The endeavor of establishing a lung lesion as metastatic or of tuberculous origin was particularly unrewarding.

6. The low percentage of positive returns in the diagnostic procedures described appears outweighed by the disadvantages of delaying definitive therapy and prolongation of hospitalization.

RESUMEN

1. Se presenta en este trabajo la experiencia de una institución con exámenes radiológico y de laboratorio en cooperación para la valuación de las lesiones periféricas, obscuras, que en número de 78 más tarde llegaron a cirugía.

2. Los exámenes incluyeron radiografía tanto torácica como extratorácica (esta última en la búsqueda de un tumor primario) esputos investigando ácido-resistentes, broncoscopia y estudios citológicos.

3. El tiempo transcurrido dentro del hospital para llevar a cabo estos estudios fué por término medio de dos semanas.

4. La histología de especímenes quirúrgicos reveló carcinoma bronquigénico en 55 de los 78 casos.

La tarea de establecer si una lesión era metastática o de origen tuberculoso fué particularmente infructuosa.

6. El porcentaje bajo de resultados positivos en los procedimientos de diagnóstico descritos parece contrapesado por las desventajas de retardar un tratamiento definitivo y por la prolongación de la hospitalización.

RESUME

1. Les auteurs présentent leurs observations à l'occasion de l'examen de 78 lésions pulmonaires périphériques de nature indéterminée, mais toutes considérées comme devant être opérées. Les examens des malades comprenaient l'étude radiologique et bactériologique dans le même établissement.
2. Ces examens consistaient en radiographies à la fois thoraciques et extrathoraciques (ces dernières pour la recherche d'une tumeur primitive), bacilloscopie des crachats, broncoscopie et examens cytologiques.

3. Le temps passé à l'Hôpital pour accomplir ces investigations était en moyenne de deux semaines.

4. L'étude histologique des pièces chirurgicales révéla un cancer bronchique dans 55 des 78 cas.

5. Les efforts des auteurs pour établir l'origine tuberculeuse ou métastatique de la lésion pulmonaire furent couronnés de succès.

6. Le faible pourcentage des réponses positives obtenu par les procédés diagnostiques décrits ne compense pas suffisamment les inconvénients du retard apporté à la mise en œuvre de la thérapeutique appropriée ni celui d'une hospitalisation prolongée.

REFERENCES