Lung Cancer
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Recent retrospective studies point out several dramatic facts in the typical life history of lung cancer:

a. Lung cancer is present for several months before it is visible on chest X-ray;
b. It is then seen on chest X-ray for almost 20 months before symptoms develop;
c. When symptoms appear, the patient usually delays for about three months before seeking medical advice;
d. Since lung cancer may mimic other diseases, such as acute respiratory infection, asthma, pneumonia and pleurisy, the physician generally delays four months attempting to clear up the symptoms with antibiotics.

Thus, more than 27 months have elapsed before lung cancer—now symptomatic and at a late stage—is diagnosed.

Even more discouraging, statistics show that one third of patients with symptomatic lung cancer will be declared clinically unresectable. Another third will be explored but found unresectable, and one third will be explored and the tumor resected. Only about one third of the patients with resected lesions, and one ninth of the entire group, will be cured. Those patients who are found unresectable, either clinically or at exploration, have a very short life expectancy. In our experience, the mean survival is somewhat less than one year and averages seven to nine months.

Obviously, there is presently much interest in detecting lung cancer in asymptomatic patients, especially those with so-called Stage 0 disease (Table, below), and in determining whether prompt localization and treatment of these early lesions results in higher cure rates for lung cancer.

During the past thirty years, approximately 30 patients with Stage 0 lung
cancer
deliberately studied for Stage 0 disease, with the results shown in Table.

**Table. Clinical Staging of Lung Cancer**

| Stage | Description |
|-------|-------------|
| 0     | Chest X-ray negative; sputum cytology positive; no bronchial evidence of involvement in trachea or carina. |
| 1     | Chest X-ray shows "coin" lesion or solid sphere, 3 cm or less in diameter; patient asymptomatic; sputum cytology negative; no evidence of metastasis. |
| 2     | Coin lesion over 3 cm in diameter; other findings similar to Stage 1. |
| 3     | Chest X-ray shows a lesion contiguous with the diaphragm, in a superior sulcus location or adjacent to the mediastinum; no evidence of mediastinal involvement; pleural effusion or other spread. |
| 4     | Mediastinal involvement, no distant metastasis. |
| 4B    | Scalene lymph node metastasis. |
| 5     | Metastasis outside the chest; beyond scalene lymph nodes. |

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cancer were seen at Memorial Hospital. In 22 patients, the carcinoma was promptly found by means of bronchoscopy combined with bronchograms of the tracheobronchial tree and multiple biopsies. We and other investigators feel that most Stage 0 cancers can be located by these techniques. Following treatment, nearly 60 percent of this group were "cured"—living and well at five years. However, in the remaining patients where the tumor was not promptly found but was subsequently detected on routine chest X-ray or as symptoms appeared, cure rates were similar to those found in patients with symptomatic lung cancer, namely about 10 percent.

Several essential questions must still be answered. For instance, what percentage of all lung cancer start as Stage 0? What percentage of these, in a larger series than the one conducted at Memorial, could be cured? Also, what percentage of lung cancers go through the "coin" lesion stage instead of through Stage 0? These questions will hopefully be answered by major prospective studies which will monitor the chest X-ray and sputum cytology of high-risk patients, such as males over 45 years of age with a 20-year history of smoking more than one pack of cigarettes a day. If a lesion appears in the chest X-ray, it would be handled in the conventional fashion; if the sputum cytology becomes suspicious but the chest X-ray is negative, careful endoscopy would be indicated. The lesions could then be identified and resected, providing meaningful data on the curability of lung cancer using this type of surveillance.

Data from Memorial Hospital shows that approximately 80 percent of patients with previously untreated lung cancer have positive sputum cytology. The remaining 20 percent with negative cytology are usually classified in the coin lesion group, suggesting that at least one fifth of patients do not go through Stage 0.

In another recent review of 800 patients with previously untreated lung cancer seen at Memorial Hospital from 1964 to 1968, only 65 patients or eight percent had coin lesions. The national coin lesion percentage is probably higher. Patients with coin lesions showed a 50 percent three-year survival rate but the five-year survival rate approached 30 percent.

Based on these facts, it seems reasonable to suggest that primary physicians, who hold the key to early diagnosis, maintain a high index of suspicion for lung cancer and perform routine chest X-rays and sputum cytologies on high-risk patients. Chest X-rays alone
have not resulted in markedly higher cure rates and must be combined with cytology and, if necessary, thoracotomy. Obviously, an improved diagnostic technique is urgently needed; a serology test for lung cancer antigen would probably be ideal and is now being sought. Until perfected, screening with a chest X-ray every six months, perhaps in March and September, combined with sputum cytology every six months, in June and December, can detect more cancers at an early stage—either Stage 0 or coin lesion—and result in a significantly higher rate of survival.

We prefer to treat primary lung cancer with a radical lobectomy which conserves lung tissue and minimizes the surgical risk, but still removes as many mediastinal lymph nodes as possible. If there is gross involvement of the mediastinum, the prognosis is much worse, but some patients can be cured. The exact percentage is unclear; our estimate is that from six to 12 percent of patients with metastases to mediastinal lymph nodes can be salvaged.

Although surgical excision, especially of early lung cancers, offers the best hope for cure, radiation therapy also plays an important role in the control and potential cure of lung cancer. External radiation therapy alone has had discouraging results, but preoperative radiation therapy, at times combined with internal irradiation, has provided more favorable responses. We treat lung cancer in the superior sulcus with ap-
approximately 4,000 rads of preoperative radiation therapy in four weeks, followed by surgical excision of the residual tumor. If there is any residual tumor left in the apex, we implant radioactive iodine-125 seeds. In selected patients treated with preoperative radiotherapy and excision, Paulson has reported more than a thirty percent survival rate. Our figures agree with this percentage. When superior sulcus tumors were treated by external radiation and internal implantation therapy alone, we had a survival rate of 16 percent. In addition, internal radiation therapy plays an important role in smaller tumors, which because of their strategic location cannot be removed or could be removed only with excessive risk. The poor-risk patient with limited pulmonary reserve may also be treated with internal radiation therapy plus external irradiation which conserves lung tissue and still offers a chance for cure. In a small group of patients with tumors 6 cm. or less in diameter who were deemed technically non-resectable, implantation plus external radiation therapy provided an eight percent cure rate.

Chemotherapy has not proven beneficial in the routine handling of patients with lung cancer probably because it is used only in patients with the most advanced disease. We are now interested in improving the end results by studying individuals with more favorable prognoses. In recent years, postoperative radiation therapy and long-range chemotherapy in moderate doses have been administered to all resected patients with metastases to the lymph nodes. Some patients without demonstrable lymph node metastases have also been maintained on long-range chemotherapy. Recurrence of disease has been prevented in a reasonable number of patients. In view of the increased efficacy and excellent response currently being achieved in pediatric leukemia and pediatric solid tumors, further evaluation of chemotherapy for lung cancer patients with minimal disease is warranted.

Another area of investigation involves augmenting the immune status of the cancer patient. Patients with lung cancer do not have obvious impaired immunity, such as those with melanomas and sarcomas. However, the lung cancer patient with impaired immunity tends to do worse than the patient with better immunity.

In summary, new diagnostic and therapeutic modalities are currently being investigated. Until they are perfected and widely available, a high index of suspicion, routine chest X-ray and sputum cytology and, of course, encouraging patients to stop smoking, remain the best defenses against lung cancer.