INITIEST in intrathoracic tumors has increased steadily in the past 25 years because of great advances in thoracic surgery with diminished risk of curative surgical procedures, and because roentgenographic surveys have been responsible for earlier and more frequent detection of such lesions. In adults when malignancy cannot be ruled out, thoracotomy has been deemed imperative. This dictum has perhaps not been so fully accepted in children. It was thought that a review of the abnormal intrathoracic masses seen in a large children’s hospital in the past quarter of a century might be of value. The series does not include secondary tumors of the chest, air-containing blebs or cysts, nor massive herniation of abdominal contents into the chest cavity.

A tabular summary of data relating to the 209 cases in the series is presented in Table I. The lesions are classified under 3 headings: congenital; infected and infested; malignant or potentially malignant. This latter group includes 49 per cent of the total (114 cases).

Admittedly, certain masses could be classified as belonging to more than one group. A given mass has therefore been assigned to the category of estimated greatest importance. For instance, teratomata are congenital, but are of most interest because of their potentially malignant nature, and are therefore classified as malignant tumors. Certain other discrepancies in classification may be noted. Hamartomas, for instance, have included only the chondromata, although, as described by Albrecht, this designation might apply to any tissue indigenous to the area forming a mass, and would therefore include fibromas, lipomas and certain vascular anomalies.

The following case presentations are given because of the rarity of the lesions or the presence of some unusual finding.

Case I. Extralobar Sequestration

This boy presented a puzzling problem from the time of his first visit to the hospital at 3 years of age until his death at 8 years of age. The chief complaint was crampy abdominal pain for which no explanation could be found. Early in the course of the illness a Meckel’s diverticulum was removed without relief of symptoms. At 6 years of age cough developed. A mass demonstrated by roentgenogram (Fig. 1a) was mistakenly interpreted as indicative of bronchiectasis and the lower lobe of the right lung was removed. It was not bronchiectatic. Sputum became dark and foul, and sometimes thin and “prune juice” in type.
<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Remarks</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrom.</td>
<td>Left upper lobe—isolated circular shadow.</td>
<td>Removed at operation—mostly fibrous tissue with slight bronchiectatic changes around it.</td>
<td>1</td>
</tr>
<tr>
<td>Hamartoma</td>
<td>Chondromata right middle chest compressing bronchus of right middle lobe.</td>
<td>Both children first seen because of pulmonary hemorrhage and later obstructive symptoms.</td>
<td>2</td>
</tr>
<tr>
<td>Vascular</td>
<td>Arteriovenous shunts.</td>
<td>(Case 3.)</td>
<td>8</td>
</tr>
<tr>
<td>Isolated Telangiectatic</td>
<td>Anomalous lesions of major vessels.</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Diaphragmatic (hiatus) hernia</td>
<td>Presented as tumors right costophrenic angle.</td>
<td>Many of these are seen and diagnosed because of gastrointestinal symptoms, but show no mass in chest (Case 11).</td>
<td>4</td>
</tr>
<tr>
<td>Thoracic kidney</td>
<td>Lower thorax, left side.</td>
<td>No treatment (Case 3).</td>
<td>1</td>
</tr>
<tr>
<td>Subternal Thyroid</td>
<td></td>
<td>Newborn, treated with radiation. Cured.</td>
<td>1</td>
</tr>
<tr>
<td>Bronchial adenoma</td>
<td></td>
<td>The first was found in a specimen of lower lobe removed because of bronchiectasis after aspiration of a peanut. The other two were removed by the bronchosocptist and one (Case 10) was cauterized.</td>
<td>3</td>
</tr>
<tr>
<td>Vascular anomalies large vessels</td>
<td></td>
<td>Appearance of lung cysts. If angiograms had been made, thoracotomy might have been avoided.</td>
<td>8</td>
</tr>
<tr>
<td>Pharyngothymic cyst</td>
<td></td>
<td>Discovered at necropsy.</td>
<td>1</td>
</tr>
<tr>
<td>Bronchogenic cyst</td>
<td>Any location. Two were mediastinal.</td>
<td>Removed successfully surgically.</td>
<td>15</td>
</tr>
<tr>
<td>Gastroenterogenous cyst</td>
<td>Intrathoracic.</td>
<td>One had duplicated stomach.</td>
<td>4</td>
</tr>
<tr>
<td>Lymphangiomata (cystic hygroma)</td>
<td>Neck and left upper lobe.</td>
<td>Many occur in the neck but they seldom extend into the chest (Case 10).</td>
<td>3</td>
</tr>
<tr>
<td>Tracheal cyst</td>
<td>Two were mediastinal.</td>
<td>Five removed surgically. One discovered at necropsy.</td>
<td>6</td>
</tr>
<tr>
<td>Pericardial cyst</td>
<td></td>
<td>Diagnosis was made clinically on two occasions but one was a rhabdomyoma and one a bronchial cyst.</td>
<td>0</td>
</tr>
<tr>
<td>Intralobular pulmonary sequestration</td>
<td>Anterior or posterior.</td>
<td>Seven removed by operation.</td>
<td>8</td>
</tr>
<tr>
<td>Extralobar sequestration</td>
<td>Right cardiophrenic angle.</td>
<td>Communicated with gastroenterogenous cyst below diaphragm (Case 1).</td>
<td>1</td>
</tr>
<tr>
<td>Lipoma</td>
<td>Lower chest, left side.</td>
<td>Both tumors were vascular. One patient had a superficial lipoma of the chest previously (Case 14).</td>
<td>4</td>
</tr>
<tr>
<td>Thymoma</td>
<td>Anterior chest, right side.</td>
<td>Large vascular tumor removed surgically. One possibly malignant (Case 6).</td>
<td>8</td>
</tr>
<tr>
<td>Tumor of pleura</td>
<td>Diaphragm, right side.</td>
<td>Probably sequestrated lung.</td>
<td>7</td>
</tr>
</tbody>
</table>

(Table continued on next page)
### TABLE 1—(continued)

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Remarks</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung abscess</td>
<td>Anywhere in lung.</td>
<td>These were chronic abscesses and although suspected in some, not diagnosed preoperatively in others.</td>
<td>1</td>
</tr>
<tr>
<td>Infected congenital cyst</td>
<td>Anywhere in lung.</td>
<td>Two chocolate colored material. Six removed successfully. Two died on operating table due to hemorrhage.</td>
<td>8</td>
</tr>
<tr>
<td>Echinococcus cyst</td>
<td>Rounded mass, lower anterior portion of chest, right side.</td>
<td>Unrecognized clinically preoperatively. In excising cyst hooklets scattered through pleural cavity but child has remained well (6 years).</td>
<td>1</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Lower lobe of right lung.</td>
<td>Calcified in the course of 3 years.</td>
<td>1</td>
</tr>
<tr>
<td>Cyst containing tubercle bacilli</td>
<td>Upper lobe of left lung.</td>
<td>Child 15 months old with symptoms of tuberculosis and organism insensitive to drugs. Failed to respond—isolated cystic area walled off.</td>
<td>2</td>
</tr>
<tr>
<td>Mediastinal abscess</td>
<td></td>
<td>One had appearance of cystic hygroma but contained pus. Evacuation of abscess resulted in cure. One represented infected foreign body—child died.</td>
<td>2</td>
</tr>
<tr>
<td>Massive hemorrhage into thymus</td>
<td>Upper lobe, left lung.</td>
<td>Newborn infant died at 3 days of age.</td>
<td>1</td>
</tr>
<tr>
<td>Diaphragmatic tumor</td>
<td>Right side.</td>
<td>Mesothelioma (Case 13).</td>
<td></td>
</tr>
</tbody>
</table>

### Primary Malignant and Potentially Malignant Tumors

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
<th>Sex</th>
<th>Age</th>
<th>Sex. Age</th>
<th>Number of Cases (Total = 115 cases) and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroblastoma</td>
<td>Mostly posterior</td>
<td>M-10</td>
<td>0-9</td>
<td>0-9 yr</td>
<td>8 (Cases 7 and 8).</td>
</tr>
<tr>
<td>Sarcoma (One melanotic)</td>
<td>Mediastinum, glands</td>
<td>M-10</td>
<td>0-14</td>
<td>0-14 yr</td>
<td>8 All died.</td>
</tr>
<tr>
<td>Lymphoblastoma</td>
<td>Anterior mediastinum</td>
<td>M-14</td>
<td>0-14</td>
<td>0-14 yr</td>
<td>18 Ten developed leukemia.</td>
</tr>
<tr>
<td>Ganglioneuroma</td>
<td>Four posterior Three anterior Two right upper Five right lower</td>
<td>M-6</td>
<td>0-14</td>
<td>0-14 yr</td>
<td>7 Two malignant. One phaeochromocytoma (Case 4). Four no evidence of malignancy.</td>
</tr>
<tr>
<td>Hodgkins</td>
<td>Anterior mediastinum</td>
<td>M-14</td>
<td>0-14</td>
<td>0-14 yr</td>
<td>18</td>
</tr>
<tr>
<td>Endothelioma</td>
<td>Pleura and lung</td>
<td>M-4</td>
<td>4 mo to 10 yr</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Rhabdomyoma</td>
<td>Right side of chest near heart</td>
<td>M-2</td>
<td>0-2</td>
<td>0-2 yr</td>
<td>3 One died as newborn. One still living (Case 8).</td>
</tr>
<tr>
<td>Teratoma</td>
<td>Anterior or middle Four right lung One left lung</td>
<td>M-3</td>
<td>0-7</td>
<td>0-7 yr</td>
<td>5</td>
</tr>
<tr>
<td>Thymoma</td>
<td>Right lung</td>
<td>M-1</td>
<td>8</td>
<td>8 yr</td>
<td>1 Questionably malignant.</td>
</tr>
<tr>
<td>Rib tumors: osteochondroma or chondrosarcoma</td>
<td>Four left chest Three right chest</td>
<td>M-3</td>
<td>4-7</td>
<td>4-7 yr</td>
<td>0</td>
</tr>
</tbody>
</table>
Fig. 1. Case 1: Extralobular sequestration. a (Upper). Roentgenogram of the chest in the postero-anterior projection at age 6 years. b (Lower). Photograph of findings at necropsy at age 8 years showing rounded tumor adjacent to bronchus.
Death resulted from peritonitis. The unusual nature of the necropsy findings may be seen in Figure 1b. The mass which had been demonstrated by roentgenography was found to be a rounded tumor adjacent to the bronchus. A tract from this mass extended through the diaphragm into a large sinus which entered a gastric cyst. The tumor itself was a large mass of tissue, irregular in outline, formed of multiloculated sinus tracts which communicated with the main tract. The duct opening into the gastric cyst was of pin-point size and contained bile.

The case is of interest because of its rarity and because it closely resembles cases reported by Scheidegger2 and by Davies and Gunz.3

Case 2. Rhabdomyoma

An asymptomatic 2-year-old boy was referred to the hospital because of a rounded shadow adjacent to the right heart border discovered during the course of a routine roentgenographic survey (Fig. 2). A diagnosis of pericardial cyst was made but permission for removal was refused. He was readmitted to the hospital 6 months later because of cardiac failure. The liver was large and auricular fibrillation was present. The mass was larger than at the time of the previous examination and appeared less cyst-like (Fig. 3). The electrocardiogram showed low-voltage QRS complexes and periods of nodal arrhythmia. There was partial right bundle-branch block, auricular rhythm (wandering pace maker) and frequent auricular extrasystoles. A diagnosis of rhabdomyoma was made. Thoracotomy was performed in December, 1954, and revealed a large tumor mass so thoroughly infiltrating the myocardium that removal was impossible. The diagnosis was confirmed by biopsies and a gloomy prognosis was given to the parents. A good postoperative recovery was made and the patient discharged from the hospital in 2 weeks. Since then he has appeared and acted as a normal child despite the auricular fibrillation and the daily requirement of large doses of Digoxin® to prevent cardiac failure. The tumor now fills half of the right side of the thorax and the heart sounds are loud and most unusual.

Case 3. Thoracic Kidney

A 15-month-old boy was admitted to the hospital because of pneumonia. Roentgenograms disclosed a rounded mass in the left hemithorax (Fig. 4) which did not have the appearance of any of the usual intrathoracic tumors. Pyelograms were made (Fig. 5) and
Case 3. Thoracic kidney. Roentgenograms of the chest of a 15-month-old boy showing a rounded mass in the left hemithorax. a (Left). Posteroanterior projection. b (Right). Right lateral projection.

showed the mass to be renal. There was no disturbance of renal function and therefore no attempt was made to replace the kidney in the abdominal cavity.

Bugden has reported 2 similar cases.

Case 4. Ganglioneuroma with Symptoms of Pheochromocytoma

M.M., a 3-year-old boy, was admitted to the hospital because of persistent vomiting for several weeks, and momentary blanching of the skin for about 2 years. Urinalysis revealed the presence of albumin and of occasional erythrocytes and leukocytes. Blood pressure was 210/115. A semiquantitative ketosteroid reaction was 3 times greater than normal and corticoid levels were one-tenth the normal value. Urinary concentration test was normal. Electrocardiogram showed evidence of left ventricular hypertrophy and the T-waves were similar to those seen in tracings of patients with potassium intoxication although the concentration of potassium in the serum was 4.5 mEq./l. Glucose tolerance test disclosed elevated values. Following administration of dibenamine the blood pressure decreased from 178/90 to 158/68. Adrenalectomy (right) was done and a normal adrenal was found. Roentgenogram of the chest showed a mass in the right costophrenic area in the mid-zone of the chest. This was removed and found to be a ganglioma with debatable pheochromocytoma cells. The symptoms all disappeared after removal of the ganglioma.

Ganglioneuromas associated with pheochromocytomas are very rare but have been reported by Maier, Overholt et al. and Wahl and Robinson.

Case 5. Arteriovenous-shunt Vascular Tumor

An infant girl, N. B., was admitted to the hospital at the age of 6 months because of pneumonia. Roentgenogram revealed the presence of a round, rather “wormy” mass in the postero-superior portion of the thorax on the left side (Fig. 6). There were no other vascular anomalies or hemangiomas. A thrill was heard over this mass but none in the skull. Angiogram (Fig. 7) and tomograph showed a typical
Fig. 5 (Left). Case 3: Thoracic kidney. Intravenous pyelogram.

Fig. 6 (Lower). Case 5: Arteriovenous-shunt vascular tumor. Roentgenogram of the chest in the posteroanterior projection demonstrating a rounded, rather "wormy" mass in the superior portion of the thorax on the left side in a 6-month-old girl.

Case 6. Thymoma. Roentgenogram of the chest in the right lateral projection demonstrating a large mass in the lower portion of the chest on the right side in an 11-year-old boy.

Unfortunately, a bronchogram was performed and, because of prolonged retention of iodized oil, surgical correction of the abnormality was deferred and the baby died of pneumonia 2 months later.

Case 6. Thymoma

G.F., an 11-year-old boy, had had bouts of coughing with severe colds since the age of 4 years. The bouts of coughing were believed to be manifestations of pneumonia and roentgenograms were not made until January, 1955. At this time a roentgenogram revealed a large mass in the lower portion of the chest on the right side (Fig. 8) and the child was admitted to the hospital. Physical signs consisting of flatness on percussion and absence of breath sounds on auscultation were present over the lower one-half of the anterior portion of the chest on the right side. Bronchograms demonstrated the complete outline of the bronchial tree and showed a large mass into which iodized oil did not enter. The mass was excised and found to measure 23 by 14 by 11 cm. The pathologic diagnosis was benign thymoma. Because of the rarity of these tumors and the fact that most of the reports have concerned isolated case reports without long-term follow-up, a guarded prognosis was given.

Case 7. Neuroblastoma

D.B., a 2-month-old girl, was well until 7 weeks of age when she developed respiratory infection. Roentgenogram revealed a large mass in the posterosuperior portion of the chest on the right side (Fig. 9). When the respiratory infection had subsided she was admitted to the hospital for resection of the mass. No abnormal cells were found in smears of blood or bone marrow. Thoracotomy revealed a large tumor invading all adjacent structures. The pathologic diagnosis, on the basis of study of biopsy specimens, was neuroblastoma. Later, roentgenograms showed extension into the upper lobe of the left lung. Radiation was started 2 weeks later. After 2 months there was little change in the size of the mass and the infant appeared to be in a terminal state. Aminopterin® was administered in addition to the radiation and much improvement was noted. Now, 2 years later, no tumor is apparent and the baby is well.
Fig. 9 (Upper). Case 7: Neuroblastoma. Roentgenogram of the chest in the posteroanterior projection demonstrating a large mass in the superior portion of the chest on the right side in a 2-month-old girl.

Fig. 10 (Lower). Case 9: Anomalous aorta. Roentgenogram of the chest in the posteroanterior projection demonstrating a circular mass in the superior portion of the chest in an asymptomatic 10-year-old girl.
Case 8. Neuroblastoma

A roentgenogram of the chest of R.C., an 8-year-old boy, taken during a survey, showed a rounded solid shadow in the posterior segment of the lower lobe of the right lung. It appeared walled-off and there was no evidence of metastasis. Resection was undertaken and the tumor was thought to have been completely removed. The pathologic diagnosis was neuroblastoma of very immature type. The child was completely well for 1 year, when there appeared an increased density in the lower mediastinum. Radiation was used with little effect. Six months later evidence of involvement of the spinal cord was apparent and signs of involvement of the urinary bladder soon became manifest. The last year of the child's life, 2 years after resection, was one of great pain during which he was completely bedridden.

Case 9. Anomalous Aorta

During the course of a roentgenographic survey, a circular mass was discovered in the chest of A.K., an asymptomatic 10-year-old girl (Fig. 10). The mass was thought to lie adjacent to the aorta. The possibility of an anomalous vessel was considered but thought to be untenable for the following reasons: the density was less than the cardiac shadow; there was no pulsation on fluoroscopic examination and the barium-filled esophagus did not deviate from the normal position; there were no murmurs; blood pressure and heart sounds were normal. The electrocardiogram was normal and a serologic test for syphilis was negative. Thoracotomy was performed and disclosed an aortic aneurysm and possibly a bifid aortic arch.

Case 10. Cystic Hygroma

E.C., a 2-year-old girl, was noted to have some swelling in the neck early in infancy. The swelling gradually became larger and breathing became obstructed. Figure 11 is a photograph of a roentgenogram taken after instillation of iodized oil into the neck. The tumor was successfully removed and found to be a lymphangioma. Thereafter all of the symptoms disappeared.

Fig. 11 (Left). Case 10: Cystic hygroma. Roentgenogram of the chest in the posteroanterior projection following instillation of iodized oil into the neck of a 2-year-old girl.

Fig. 12 (Right). Case 14: Lymphosarcoma. Roentgenogram of the chest in the posteroanterior projection demonstrating 2 small rounded masses at the right of the mediastinum in an 8-year-old boy with a "brassy cough."
Lymphangiomata are common in the neck, but rare in the mediastinum. There were only 3 such cases in this series.

Case 11. Hiatus Hernia
A.S., an 11-year-old girl, was sent to the hospital because of anemia for which no cause could be found. Roentgenograms of the chest were made and a rounded mass presented in the right costophrenic angle. Most of the usual investigations were made to identify the tumor but roentgenographic examination after ingestion of barium was not done. Thoracotomy was performed and hiatus hernia recognized and repaired. The postoperative course was uneventful.

Many hiatus hernias are seen at the Hospital for Sick Children. In only 3 have opaque shadows in the chest been the presenting complaint.

Case 12. Adenomatous Bronchial Tumors
J.H., a 7-year-old girl, came to the hospital because of cough of several months' duration and because of acute symptoms of obstruction of the right main-stem bronchus. Bronchoscopic examination revealed that masses of hemorrhagic, pedunculated material were responsible for the obstruction. Some of these were removed but hemorrhage precluded excision of all. The masses were variously diagnosed as adenomatous, hemangiomata and, on 1 occasion, carcinoid because of the presence of mitotic cells. There was no evidence of true malignancy except for rapid growth locally frequently necessitating bronchoscopic removal. Finally, cautery with an electric cautery was carried out and after a stormy postoperative course, the child recovered. During the past 10 years there has been no recurrence.

In 1 other case similar tumors ceased to grow after bronchoscopic removal had been carried out on several occasions and a third patient underwent lobectomy. (Most authors classify these tumors as malignant.)

Case 13. Lipoma
A lipoma of the chest wall of J.F., a 2-year-old boy, was excised. Following excision, discharge continued from a small sinus tract opening at the site of the thoracic wound. Physical examination and roentgenogram revealed evidence of a large mass in the lower lobe of the left side of the chest in the region from which the superficial tumor had been removed. Thoracotomy was performed and a fatty tumor with a rather high degree of vascularity was removed. Evidence of malignancy was not present.

One other similar tumor was discovered post mortem.

These tumors are probably connective tissue tumors, which, according to Thompson, should be classed as hamartomas and considered benign. Although rather common in other sites, lipomata are rarely seen within the thorax.

Case 14. Lymphosarcoma
J.S., an otherwise well 8-year-old boy, complained of a "brassy cough." Roentgenograms were performed and were reported to show no significant abnormality. The child was examined again 6 months later and a large mediastinal mass and bloody pleural effusion were present. Retrospective study of the roentgenograms made previously (Fig. 11) disclosed the presence of 2 small, rounded masses at the right side of the mediastinum.

Attention is drawn to this case to point out the importance of careful scrutiny of the mediastinal region in the roentgenogram of the child with "brassy cough."

Other Tumors of Special Interest
Intralobar pulmonary sequestration presented as a pulmonary mass in 8 cases. Six of these have been reported in detail. The other 2 presented similar pictures and the masses were removed surgically.

Lung cysts form the largest group of abnormal shadows in the chest, even when air-containing cysts are excluded as they have been in this series. There were 33 found and 30 operated upon. Three contained mucoid material, 1, chocolate-colored, thick material, and the remainder pus. Two patients with cysts containing purulent material died at operation as the result of hemorrhage. Thoracotomy is indicated in all pa-
patients with lung cysts in order to confirm the diagnosis and to excise the cyst-containing lung to prevent infection from occurring.

Diaphragmatic tumors are very rare. Two such tumors were seen in our series, one at necropsy and one presenting by roentgenogram as a bulging mass in the lower portion of the right side of the chest. The latter was a mesothelioma. The first was described as a mixed cell tumor but on review consisted of cystic bronchial tissue such as is seen in some sequestered lobes, but no abnormal blood vessels were described.

DISCUSSION

It was somewhat disconcerting in the review of these cases to find that nearly half were malignant or potentially malignant. Thoracotomy therefore seems imperative in children as well as adults when circumscribed masses are found in the chest. This dictum does not apply to mediastinal tumors when removal is obviously impossible. It is still a moot question whether, when a diagnosis of neuroblastoma is confirmed, surgery should be performed, or whether radiation plus the use of nitrogen mustard or one of the folic acid antagonists is preferable. Some are of the opinion that manipulation of the tumor at the time of thoracotomy produces an adverse effect on the tumor. The 2 cases cited (Cases 7 and 8) imply that this view may be fallacious.

Thoracotomy has become a relatively safe procedure, but nonetheless carries some risk. Every effort should therefore be made to establish a diagnosis without resorting to surgery, and surgical procedures should be carried out only in those patients for whom removal of the mass is indicated, or in whom the diagnosis can be made by no other means.

It is well known that most of the masses do not produce symptoms until they become infected or grow to such an extent that pressure on surrounding structures causes discomfort. This is as true of small cysts as of large sequestered areas, and of benign as well as malignant masses. One symptom of significance would seem to be persisting “brassy cough.” In a child “brassy cough” usually indicates pressure in the mediastinum before the mass is very large. Attention to this symptom might result in earlier diagnosis.

Large masses in the chest, such as teratomas, thymomas, lipomas, and pulmonary sequestration are often not diagnosed for years until secondary infection or malignancy develop. Physical signs are compatible with the diagnosis of pneumonia. Furthermore, the presence of respiratory infection, a frequent occurrence in such a child, may make the diagnosis of pneumonia seem likely. Roentgenograms are necessary to establish the diagnosis.

Engorged veins on the chest wall usually indicate mediastinal obstruction to venous return.

Both physical findings and symptoms are usually lacking in patients with lung cysts, and most of them are referred for study because routine roentgenograms of the chest have disclosed the presence of intrathoracic masses.

The roentgenogram not only frequently gives the first evidence of abnormal masses in the chest, but may provide the greatest help in diagnosis. Routine examination should include both anteroposterior and lateral projections of the chest, preferably taken in the upright position. An oblique view often adds further information. Tomographs may contribute a great deal in determining the location of the mass. Bronchograms may be invaluable but should be used with discrimination. In the case of a large mass, e.g., thymoma, dermoid, sequestered lung, or lipoma the demonstration of a mass free of iodized oil in the bronchogram indicates the independence of the mass from the normal bronchial tree. Bronchograms are of no value in establishing the diagnosis in vascular or mediastinal tumors. In the first, the radio-opaque material remains in the lung for a long time and operation may be
delayed in the hope that the material will eventually disappear. Roentgenographic studies of the esophagus after administration of barium or iodized oil may provide valuable information regarding pressure of abnormal tissue in the mediastinum and also of its relation to the heart. Such studies are essential in excluding or proving the presence of hiatus hernia.

Bronchoscopic examination is often of value in determining the presence or absence of masses in the bronchial tree, and their treatment by this route when found. Examination of the material aspirated may also give a clue to the diagnosis. This is not commonly achieved in children but was accomplished twice in this group. In 1 case malignant cells were found and in another the finding of many squamous cells suggested the presence of teratoma.

The examination of pleural fluid, particularly hemorrhagic fluid, not infrequently confirms the suspicion of malignancy. This was true in 12 patients.

Angiograms are often contributory and may be of great assistance. In the arteriovenous shunt (Case 5), a beautiful picture of the true nature of the pulmonary mass may be shown. The diagnosis was already apparent in the tomograms, so this procedure, while confirmatory, was not essential. However, in Case 9, and in 1 other case its employment would have obviated the necessity for thoracotomy.

Electrocardiograms should be made where a mass closely approximates the heart border. The latter may be only a pericardial cyst, in which case the tracing will be normal but if the electrocardiogram shows evidence of myocardial involvement, it suggests tumor, as in Case 2.

Hematologic examination should not be neglected. In the lymphoblastomas the progress of the disease will be manifest in the development of the leukemic process in the peripheral smears. Marrow studies should be made where there is any question of malignancy. They frequently demonstrate leukemia and may show malignant cells. Malignant cells have not been demonstrated in our patients with primary tumors but others have reported frequent positive findings in patients with neurogenic tumors. Pyelograms are indicated where a mid-diaphragmatic mass presents which cannot be diagnosed otherwise. Ectopic kidneys (Case 3) are at least as common as diaphragmatic tumors. A sedimentation rate greater than normal or the presence of leukocytosis suggests either infection of the mass or breakdown of malignancy.

If diagnosis cannot be established after employment of other diagnostic measures, thoracotomy is indicated both for diagnosis and possibly for treatment. Sarcoma of the lung itself has not yet been reported and those of the mediastinum are not removable. Neuroblastomas usually prove inoperable. Large masses are usually amenable to surgery and should be removed. Ganglioneuromas can usually be excised and should be removed because they are potentially malignant.

**SUMMARY**

Two hundred nine primary opaque intrathoracic masses were seen at the Hospital for Sick Children in the past 25 years. Malignant potentialities were present in 49 per cent of these cases.

Summaries of unusual cases are presented and recommendations for diagnosis and treatment are made.

**REFERENCES**

SOLID INTRATHORACIC MASSES IN CHILDREN
Gladys L. Boyd
Pediatrics 1957;19;142

Updated Information & Services
including high resolution figures, can be found at:
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