INTRATHORACIC SYMPATHETICOBlastoma

REPORT OF A CASE

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It is a well established fact that the sympathetic nervous system appears relatively early in the embryo as primordia of cells of neural crest origin and in critical stages of embryonic development these cells can be traced to their definitive regions. According to the conception of Kuntz (1), the sympathetic primordium consists of cells which are peripherally displaced from the ventral nerve roots as well as from the neural crests. A critical examination of the cells of the sympathetic primordia shows distinctly that these elements are totally undifferentiated, being spherical in shape, possessing round chromatin-rich nuclei surrounded by scanty protoplasm. They have often been described as "lymphoid" cells or sympathogonia. These cells change into slightly larger cells with more vesicular nuclei and a wider rim of clear cytoplasm, the sympathoblasts, which, according to Bailey (2), are pluripotential and may give rise to: (a) neuroblasts, from which the ganglion cells of the sympathetic system develop; (b) pheochromoblasts, the progenitors of the pheochromocytes of the adrenal medulla and of the paraganglionic bodies; (c) immature glial cells of the sympathetic system, the astroblasts, which ripen into mature supporting units, astrocytes.

Neoplasms containing one or several of these cell types, namely, sympathogonia, sympathoblasts, neuroblasts, ganglion cells, pheochromoblasts, pheochromocytes, astroblasts, and astrocytes, are being more frequently reported in the literature. Due to the fact that the sympathetic system is developed by a progressive growth and differentiation from pluripotential mother cells, it is to be expected that tumors arising during the process of differentiation may contain cells in varying degrees of maturity, thus producing new growths difficult of classification. On the other hand, one should anticipate finding tumors containing a single cell type, in which case the diagnosis should be relatively easy. A study of the cases reported bears out this supposition, for since these tumors
were first definitely associated with the sympathetic system by Wright (3), in 1910, the nomenclature has continued to grow in complexity.

At the present time the names assigned to these tumors are both excessive and contradictory, and none of the classifications thus far proposed has been fully accepted. In 1922 von Fischer (4) proposed the following scheme:

I. Completely Differentiated
   1. Ganglioneuroma simplex
   2. Ganglioneuroma immaturum
   3. Ganglioneuroma imperfectum
   4. Ganglioneuronblastoma

II. Incompletely Differentiated
   1. Neuroblastoma gangliocellulare
   2. Proliferating ganglioneuroma

III. Completely Undifferentiated
   1. Sympathoblastoma
   2. Sympathogonioma

This classification is the best yet presented, but the following objections have been raised to it. Bailey objects to the use of the term “neuroblastoma” as applied to a tumor containing cells which are omnipotential and in which all cells may not develop into true neurones, but in some instances may differentiate into chromaffin-bearing or supporting units. Schultz (5) has pointed out that the distinction between “ganglioneuroma immaturum” and “ganglioneuroma imperfectum” is not sharp, and that the two might be combined into a single class. He makes the same suggestion concerning the two groups, “neuroblastoma gangliocellulare” and “proliferating ganglioneuroma.”

We believe that an adequate classification should be composed of descriptive names and that the scheme should follow the lines of embryological development, thus bringing tumor types to correspond to cell types recognized in the normal process of differentiation. Such a classification would follow the plan proposed by Bailey and Cushing (2) for tumors of the central nervous system. We are therefore proposing the following scheme:

I. Completely Undifferentiated—Sympatheticoblastoma
   1. Tumors composed of migratory cells and sympathogonia
   2. Sympathoblastoma
II. Incompletely Differentiated
   1. Sympathetic neuroblastoma
   2. Pheochromoblastoma
   3. Astroblastoma

III. Completely Differentiated
   1. Ganglioneuroma
   2. Pheochromocytoma
   3. Astrocytoma

In attempting to classify any neoplasm with reference to this scheme, the predominating histologic picture must be considered. In addition, a careful consideration of the location of the tumor, the clinical history, and the gross pathology are important factors in the more confusing cases.

The literature is most confusing in respect to the tumors which we classify as sympathetic neuroblastomata. The remaining types are so described in the literature as to be easily recognized and placed in their proper groups.

In 1914 the literature of this subject was ably reviewed by Dunn (7). Three years later Lehman (8) compiled a table of the “neuroblastomas,” as he designated them, in which he discarded those reports that were incomplete or fragmentary. In the tables presented here we have attempted to make a careful study of each case and to establish a grouping that will meet all the requirements of our classification.

Our present discussion includes only those cases arising in the cells of the sympathetic system other than those within the medulla of the adrenal glands. A review of the literature indicates that such tumors are being recognized in a continually increasing number of locations in the body, having been reported as occurring in the cervical sympathetic, the thoracic sympathetic, the abdominal sympathetic, the coccygeal gland, the celiac ganglion, the mesentery, the jejunum, the liver, the uterus, the cavity of the nose, the skin or subcutaneum, the paravertebral region, the spinal canal—extradural, and the scapular region.

In order to group the tumors of the sympathetic system in conformation with the views already expressed, we have complied three tables.

Table I: Sympatheticoblastomata: We have tabulated 18 cases in this group and have added one case of our own. Eleven of the patients were females, 5 males; the sex was not stated in 3 cases.
## Table I

**Tumors Arising in the Sympathetic Nervous System, Except the Adrenal Gland: Completely Undifferentiated**

*Sympatheticoblastomata*

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Author</th>
<th>Sex</th>
<th>Age</th>
<th>Site</th>
<th>Size</th>
<th>Extensions</th>
<th>Gross Appearance</th>
<th>Microscopic Appearance</th>
<th>Cell Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1909</td>
<td>Hecht</td>
<td>F</td>
<td>9 yr.</td>
<td>Retroperitoneal</td>
<td>Large?</td>
<td>Lymph nodes, liver, duodenum</td>
<td>Typical in liver</td>
<td>Fibrillar stroma</td>
<td>Large pale nuclei, little cytoplasm</td>
</tr>
<tr>
<td>2</td>
<td>1910</td>
<td>Wright</td>
<td>F</td>
<td>16 mo.</td>
<td>Retroperitoneal</td>
<td>?</td>
<td>Skull, pelvis, mediastinum, liver</td>
<td>?</td>
<td>No rosettes</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1912</td>
<td>Pick</td>
<td>F</td>
<td>23 yr.</td>
<td>Uterus</td>
<td>10 × 8 cm.</td>
<td>Lymph nodes and elsewhere</td>
<td>Nodular</td>
<td>Rosettes; fibrillar stroma</td>
<td>Lymphoid-like cells</td>
</tr>
<tr>
<td>5</td>
<td>1912</td>
<td>Landau</td>
<td>F</td>
<td>8 mo.</td>
<td>Retroperitoneal</td>
<td>7 × 7 × 3½ cm.</td>
<td>Liver</td>
<td>Lobulated oval mass</td>
<td>Rosettes; cells in fibrillar network</td>
<td>Scanty cytoplasm; rounded or oval nuclei rich in chromatin</td>
</tr>
<tr>
<td>6</td>
<td>1913</td>
<td>Symmers</td>
<td>M</td>
<td>44 yr.</td>
<td>Right scapular region</td>
<td>18 × 9 cm.</td>
<td>Four recurrences at site of operation</td>
<td>Firm mass</td>
<td>Rosettes; fine fibrillar matrix</td>
<td>Small, deeply staining cells</td>
</tr>
<tr>
<td>7</td>
<td>1915</td>
<td>Harbitz</td>
<td>?</td>
<td>3 yr.</td>
<td>Anterior to sacrum</td>
<td>Orange</td>
<td>No autopsy</td>
<td>&quot;Tube&quot; and rosette formations</td>
<td>Rosettes; alveolar arrangement</td>
<td>Scanty cytoplasm, chromatin-rich nuclei</td>
</tr>
<tr>
<td>8</td>
<td>1917</td>
<td>Lambert</td>
<td>F</td>
<td>5 yr.</td>
<td>Retroperitoneal</td>
<td>Large?</td>
<td>Lymph nodes, spleen, pelvis, skull</td>
<td>Gray, firm, nodular</td>
<td>Rosettes; alveolar arrangement</td>
<td>Small round and oval cells</td>
</tr>
<tr>
<td>9</td>
<td>1919</td>
<td>Stewart</td>
<td>?</td>
<td>9 mo.</td>
<td>Cervical sympathetic</td>
<td>Orange</td>
<td>No autopsy</td>
<td>Cut surface</td>
<td>Resembles oat-cell sarcoma; rosettes</td>
<td>Small cells and large cells with more cytoplasm</td>
</tr>
<tr>
<td>10</td>
<td>1923</td>
<td>Anderson and Shennan</td>
<td>F</td>
<td>3 mo.</td>
<td>Post-pleural on right 2d and 3d ribs</td>
<td>4.2 × 2.8 cm.</td>
<td>None</td>
<td>Smooth surface; soft and spongy</td>
<td>Cells contained in alveolar-like spaces</td>
<td>Small round &quot;lymphoid&quot; cells</td>
</tr>
<tr>
<td>11</td>
<td>1925</td>
<td>Ritter</td>
<td>F</td>
<td>55 yr.</td>
<td>Jejunum</td>
<td>15 × 10 cm.</td>
<td>Mesenteric lymph nodes</td>
<td>Oval, firm, grayish-white mass</td>
<td>Rosettes; alveolar arrangement</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Author</td>
<td>Sex</td>
<td>Age</td>
<td>Site</td>
<td>Size</td>
<td>Extensions</td>
<td>Gross Appearance</td>
<td>Microscopic Appearance</td>
<td>Cell Types</td>
</tr>
<tr>
<td>-----</td>
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<td>-----------------------------</td>
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<td>---------------------------------</td>
<td>------------------------------------------</td>
<td>------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>12</td>
<td>1925</td>
<td>Ritter (Case 2)</td>
<td>M</td>
<td>64 yr.</td>
<td>Jejunum</td>
<td>5 × 2.5 cm.</td>
<td>Mesenteric lymph nodes</td>
<td>Nodular surface; firm mass</td>
<td>Small cells in</td>
<td>&quot;Lymphoid&quot; cells; few pyriform cells</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>?</td>
<td>few pyriform cells</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>1926</td>
<td>Schultz</td>
<td>F</td>
<td>1 mo.</td>
<td>Left abdominal sympathetic</td>
<td>?</td>
<td>None mentioned</td>
<td>?</td>
<td>Small cells with dark nuclei</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>1927</td>
<td>Cushing and Wolbach</td>
<td>M</td>
<td>2 yr.</td>
<td>Paravertebral at right D.</td>
<td>?</td>
<td>Extravascular in spinal canal</td>
<td>?</td>
<td>Oval nuclei</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capaldi (Case 1)</td>
<td></td>
<td></td>
<td>VI vertebra</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1927</td>
<td>Lemeland and Durante</td>
<td>F</td>
<td>44 yr.</td>
<td>2 intrathoracic 1 retroperitoneal</td>
<td>Size of bean to that of apple</td>
<td>Secondary in spinal canal</td>
<td>Grayish-white, rather firm masses</td>
<td>Cells arranged in lines and rosettes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 spinal extradural tumors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>1928</td>
<td>Jungmichel</td>
<td>F</td>
<td>25 yr.</td>
<td>Uterus</td>
<td>?</td>
<td>None observed at operation</td>
<td>Soft mass; reddish, streaked with yellow</td>
<td>Rosette-like formations</td>
<td>Cubical and polygonal cells</td>
</tr>
<tr>
<td>17</td>
<td>1929</td>
<td></td>
<td></td>
<td>5 wk.</td>
<td>Liver</td>
<td></td>
<td>None</td>
<td>?</td>
<td>Alveolar arrangement</td>
<td>Sympathogonia; sympathoblasts</td>
</tr>
<tr>
<td>18</td>
<td>1930</td>
<td>Jacobsen and Hosoi</td>
<td>M</td>
<td>9 mo.</td>
<td>Skin and subcutaneous of thigh</td>
<td>Weight 1255 gm.</td>
<td>Original tumor 4 cm; recurrence 8 × 8 × 3 cm.</td>
<td>Encapsulated; hemorrhagic areas</td>
<td>Cells with small, dense nuclei and scanty cytoplasm; few large cells</td>
<td>Sympathogonia; sympathoblasts</td>
</tr>
<tr>
<td>19</td>
<td>1931</td>
<td>Authors' case</td>
<td>M</td>
<td>22 mo.</td>
<td>Intrathoracic</td>
<td>13 × 13 × 7.5 cm. Weight 572 gm.</td>
<td>Extravascular in spinal canal</td>
<td>Encapsulated; smooth, lobulated surface; cut surface uniformly finely granular</td>
<td>Rosettes; scanty stroma; fibrillae</td>
<td></td>
</tr>
</tbody>
</table>
## Table II

**Tumors Arising in the Sympathetic Nervous System, Except the Adrenal Gland: Incompletely Differentiated (Sympathetic Neuroblastomata)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Author</th>
<th>Sex</th>
<th>Age</th>
<th>Site</th>
<th>Extensions</th>
<th>Description</th>
<th>Author's Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1907</td>
<td>Alezais and Imbert</td>
<td>M</td>
<td>6 yr.</td>
<td>Between sacrum and rectum. (From coccygeal gland?)</td>
<td>None</td>
<td>Many large cells in tumor tissue</td>
<td>&quot;Tumeur parasympathique&quot;</td>
</tr>
<tr>
<td>2.</td>
<td>1908</td>
<td>Miller</td>
<td>F</td>
<td>16 yr.</td>
<td>Left celiac ganglion</td>
<td>Lymph node</td>
<td>Undifferentiated areas</td>
<td>Metastasizing ganglioneuroma</td>
</tr>
<tr>
<td>3.</td>
<td>1909</td>
<td>Jakobsthal</td>
<td>?</td>
<td>8 yr.</td>
<td>Celiac ganglion</td>
<td>Liver metastases</td>
<td>Undifferentiated areas</td>
<td>Ganglioneuroma</td>
</tr>
<tr>
<td>4.</td>
<td>1909</td>
<td>Schilder</td>
<td>F</td>
<td>7 da.</td>
<td>Right abdominal sympathetic</td>
<td>None</td>
<td>Masses of ganglion cells</td>
<td>Glioma</td>
</tr>
<tr>
<td>5.</td>
<td>1909</td>
<td>Wegelin</td>
<td>F</td>
<td>20 yr.</td>
<td>Left abdominal sympathetic</td>
<td>None</td>
<td>Undifferentiated areas</td>
<td>Ganglioneuroma</td>
</tr>
<tr>
<td>6.</td>
<td>1912</td>
<td>MacNaughton-Jones</td>
<td>F</td>
<td>18 yr.</td>
<td>Mesentery</td>
<td>None</td>
<td>Undifferentiated areas</td>
<td>Ganglioneuroma, embryonic in parts</td>
</tr>
<tr>
<td>7.</td>
<td>1913</td>
<td>Martius</td>
<td>M</td>
<td>2½ yr.</td>
<td>Right cervical sympathetic</td>
<td>None</td>
<td>Two tumors: a neuroblastoma and a mature ganglioneuroma</td>
<td>Malignant sympatho-blastoma</td>
</tr>
<tr>
<td>8.</td>
<td>1913</td>
<td>Anitschkow</td>
<td>F</td>
<td>4 mo.</td>
<td>Left abdominal sympathetic</td>
<td>Invaded spinal canal; extradural</td>
<td>Mixed with small and mature cells</td>
<td>Malignant neuroblastoma</td>
</tr>
<tr>
<td>9.</td>
<td>1915</td>
<td>Robertson (Case 1)</td>
<td>F</td>
<td>16 yr.</td>
<td>Anterior to sacrum</td>
<td>None</td>
<td>One large neuroblastoma and two small ganglioneuromata</td>
<td>Ganglioneuroblastoma</td>
</tr>
<tr>
<td>10.</td>
<td>1922</td>
<td>von Fischer</td>
<td>?</td>
<td>Still-born</td>
<td>Left cervical sympathetic</td>
<td>None</td>
<td>Mixture of cell types</td>
<td>Ganglioneuroma</td>
</tr>
<tr>
<td>11.</td>
<td>1926</td>
<td>Boyd (Case 2)</td>
<td>M</td>
<td>4½ yr.</td>
<td>Left abdominal sympathetic</td>
<td>Skull, orbit, ribs, femur</td>
<td>Cells resembling ganglion cells; fiber bundles</td>
<td>Ganglioneuroma with metastases</td>
</tr>
<tr>
<td>12.</td>
<td>1927</td>
<td>Karelitz</td>
<td>M</td>
<td>2½ yr.</td>
<td>Abdominal sympathetic</td>
<td>Skull, brain, and kidney metastases</td>
<td>Large and small undifferentiated cells; ganglion cells present</td>
<td>Ganglioneuroma and neuroblastoma</td>
</tr>
<tr>
<td>13.</td>
<td>1928</td>
<td>Crile and Ball</td>
<td>F</td>
<td>40 yr.</td>
<td>Right side of neck presenting in supraventricular fossa</td>
<td>None</td>
<td>Sympatheticoblastoma in cortical areas, with ganglion cells in medullary areas</td>
<td>Ganglioneuroma and sympatheticoblastoma</td>
</tr>
</tbody>
</table>
Eleven cases (58 per cent) occurred in children of three years or less; only 6 cases were in adults. Definite metastases or extensions of the neoplasm were found in 11 cases, with recurrences at the site of operation in two cases. These figures bear out the malignant nature ascribed to these tumors.

*Table II: Sympathetic Neuroblastoma:* We have been able to find 13 cases of this group in the literature. Seven cases were in females, 4 in males; the sex was not stated in 2 cases. Only 5 cases (38 per cent) occurred in children of three years or younger, with the same number of cases in individuals sixteen years or older. Extensions of the growth or metastases were present in only 5 cases. Though the number of cases is small, it is still apparent that these tumors are less malignant than those of the former group.

If the comparison is extended to the ganglioneuromata, the benignancy of the completely differentiated forms is corroborated. Accepting the work of Schultz (5) who reported (1926) 53 cases of ganglioneuromata not in the adrenal, we find that 26 cases occurred in females, 16 in males, with the sex not stated in 11 cases. Twenty-four of these cases were in adults, and 21 in children, the age not being stated in 8 of the cases.

*Table III: Miscellaneous Cases:* Table III is a tabulation of tumors that we have been unable to classify definitely because of incomplete data.

We believe that the following case which came under our observation during the past year is a typical example of sympathecticoblastoma.

**Case Report**

C. D., a white male child, aged twenty-two months, was admitted to the University Hospital (No. 301747) on Nov. 4, 1929. The chief complaint, as given by the parents on admission, was a cough that had persisted over a period of six weeks.

The child had been a full-term baby and delivery had been normal. Until thirteen and one-half months of age, the child was apparently progressing normally. At that time it had a series of coughing attacks lasting over a period of two or three weeks. The cough was severe but not productive. Each attack lasted from a few moments to two or three hours. The time interval between attacks was irregular. A low fever developed with occasional chills. There were periods of marked dyspnea.

Following this acute period the attacks became more irregular and less frequent, but the general condition grew progressively worse.
### Table III

**Tumors Arising in the Sympathetic Nervous System, except the Adrenal Gland: Miscellaneous Cases**

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Author</th>
<th>Sex</th>
<th>Age</th>
<th>Site</th>
<th>Extensions</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1923</td>
<td>Benedict</td>
<td>M</td>
<td>8 yr.</td>
<td>Left orbit</td>
<td>None</td>
<td>Large clear cells with deeply staining nuclei</td>
<td>Description insufficient to permit classification</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lack of description of histology</td>
</tr>
<tr>
<td>2.</td>
<td>1927</td>
<td>Cabot, R.</td>
<td>M</td>
<td>34 yr.</td>
<td>Region bronchial glands (?)</td>
<td>Right lung, liver, kidneys, retroperitoneal lymphatics</td>
<td>No rosettes, few large cells</td>
<td>Probably an adrenal case</td>
</tr>
<tr>
<td>3.</td>
<td>1927</td>
<td>Kwartin and Twiss</td>
<td>M</td>
<td>3 mo.</td>
<td>Retroperitoneal</td>
<td>Adrenals, liver, pancreas, testis, stomach</td>
<td>Undifferentiated neuroblastomatous tissue; large cells present</td>
<td>Probably an adrenal case but author stated that he was not sure of the fact</td>
</tr>
<tr>
<td>4.</td>
<td>1929</td>
<td>Villata</td>
<td>M</td>
<td>4 yr.</td>
<td>Region right adrenal</td>
<td>None</td>
<td>Benign growth</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>1929</td>
<td>Nieden</td>
<td>F</td>
<td>5 yr.</td>
<td>Left cervical and intra-thoracic regions</td>
<td>No autopsy</td>
<td></td>
<td>Insufficient description</td>
</tr>
</tbody>
</table>
Dyspnea was practically continuous, the child did not gain satisfactorily and became listless and inattentive. Ten days prior to admission both cough and dyspnea became more marked.

Clinical Examination: There was an asymmetry in the chest, the right side being noticeably larger than the left. The intercostal spaces on the right were full, while on the left there was retraction. Motion was limited on the left side. The abdomen was distended and symmetrical. The child was too weak to stand or walk.

Palpation confirmed the fact that the left side of the chest was taking but a small part in respiration. The apex beat of the heart was located just over the lower end of the sternum.

On percussion there was dullness along the right sternal margin from the second to the sixth ribs. On the left side of the chest all the percussion sounds were flat except over the left apex, which gave a dull note.

On auscultation, bronchial breathing and moist râles were heard along the right sternal margin. On the left side no breath sounds were heard, regardless of the position of the patient, except in the left apex, where a few moist râles were distinguished. The heart sounds were normal and of good quality, although the apex beat was near the midline.

The pulse was 140, the respirations 35 per minute, and the temperature 99.4°F.

Blood count: 4,070,000 erythrocytes, 15,800 leukocytes. The differential leukocyte count showed 64 per cent neutrophiles, 34 per cent small lymphocytes, and 2 per cent large lymphocytes.

A thoracentesis was attempted. A cubic centimeter of bloody fluid was obtained which on further examination showed nothing of diagnostic value.
The x-ray plate reproduced in Fig. 1 was interpreted as showing fluid in the left pleural cavity, with a displacement of the heart to the right. 

Clinical Diagnosis: A provisional diagnosis of left empyema following whooping cough was made.

Clinical Course: The cough continued and at no time was productive. Three more attempts at thoracentesis were unsuccessful. An x-ray plate two weeks later showed that the shadow was more extensive than on admission.

The temperature averaged 99–100° F.

On Dec. 5, 1929, a 4 mm. bronchoscope was passed through an infant size laryngoscope into the trachea, which was found to be partially occluded by thick mucous plugs that could not be removed by suction. After one and a half minutes of instrumentation, respiration suddenly ceased. The child was revived, but the pulse gradually failed, dyspnea became more marked, and death followed nine hours later.

Autopsy (abstract): The abdomen was distended. The peritoneal cavity contained a slightly increased amount of fluid, and the intestines were moderately distended with gas. The liver extended 3½ cm. below the costal margin. The vault of the diaphragm was depressed. The mesenteric lymph nodes showed a general enlargement of slight degree.

An anterior view of the thoracic viscera, including a tip of the tumor, is shown in Fig. 2. The heart was markedly displaced to the right. The pericardial cavity contained 200 c.c. of clear fluid. The right lung was apparently large. The left lung was pushed to the right. In the position in which the lower left lobe was sought, a firm mass was found. Investigation revealed that this mass was posterior to the lower lobe of
the lung and that the lung was compressed and atelectatic. There were no adhesions between the tumor mass and the lung. In the lower posterior part of the right pleural cavity a second smaller mass was found protruding. There were also several nodular masses along the spinal column, closely adherent to the vertebrae. The two large tumor masses bridged the vertebrae anteriorly but were entirely behind the parietal pleurae. The larger mass on the left side was intimately attached at the articulation of the left seventh rib with the vertebrae. This articulation was eroded, fracturing on gentle manipulation. The left eighth rib was affected in a like manner but to a less degree. The bodies of the vertebrae were roughened but not definitely eroded.

![Image](image.png)

**FIG. 3. CUT SURFACE OF INTRATHORACIC TUMOR. X 2/5**

The attachment of the tumor was further investigated and an extension between the vertebrae into the spinal canal was found between the seventh and eighth thoracic vertebrae. At this level within the spinal canal an extradural tumor was found. This tumor was not attached to the dura in any way, was movable, and was attached by a pedicle which passed along the spinal nerve foramen to the area of erosion previously described. On removal of the extradural tumor a distinct depression of the cord remained, but the underlying dura and pia mater were not adherent. Grossly the cord appeared normal.

**The Specimen: Gross Description:** The specimen consists of two portions, a large retropleural tumor and a small intraspinal tumor. The retropleural tumor is a lobulated, encapsulated mass weighing 572 grams and measuring 13 cm. in transverse diameter, 5.5 cm. in the antero-posterior, and 13 cm. in the right portion, 7.5 cm. in the left portion in the vertical diameter.

The surface of the lobulations is smooth and rounded, each lobulation being surrounded by shallow sulci. The overlying pleura stripped away
easily. Posteriorly the tumor was adherent to the thoracic wall, the aorta being almost completely surrounded.

The cut surface shows the capsule to be thin, measuring about 0.4 mm., but very distinct. It separates into indefinite layers which may be stripped off. The lobulations appear on the cut surface as shown in Fig. 3. The cut surface of the lobules is homogeneous and finely granular in appearance except for the darker areas of hemorrhage.

The intra-spinal tumor is small, roughly cylindrical, and weighs 2 grams. It measures 2.5 X 1.3 X 0.8 cm. It is slightly lobulated and is encapsulated. The spinal cord has a dish-like depression at the level of this tumor, as shown in Fig. 4.

Microscopic Description: The tumor is distinctly separated into small lobules of varying sizes and shapes by strands of adult connective tissue.

In this supporting tissue there are blood vessels in moderate numbers. Delicate prolongations of the fibrous septa enter the lobules carrying in the finer vessels, which are very scarce.

The lobules are made up of densely packed cells. The nuclei of these cells are prominent and are of a rounded or slightly ovoid shape. Two types of cells are observed. In the first and more numerous group the nuclei are small and deep-staining. These cells may be called "lymphoid" cells and are taken to be the sympathogonia. Scattered among these latter are cells with much larger and more vesicular nuclei, the chromatin granules being larger and grouped together. These are the so-called sympathoblasts, the next cell in line of differentiation. The cytoplasm of either type of cell can only occasionally be outlined. It is largely unipolar and is often drawn out into tail-like prolongations. These are apparently structureless, failing to stain for either glial fibrils by the Hortega technic or for neurofibrils by the Cajal or Bielschowsky technic. In many places the cells are arranged in ball-like clumps with these cytoplasmic processes extending radially and centrally, forming pseudorosettes. These are illustrated in Fig. 6.
FIG. 5. PHOTOMICROGRAPH OF TUMOR. × 100

FIG. 6. PHOTOMICROGRAPH, SHOWING ROSETTE FORMATION. × 350
Summary

1. The adaptability of a modified form of von Fischer's classification of neoplasms arising in the sympathetic nervous system is pointed out.

2. An attempt is made to tabulate the cases reported to date into completely undifferentiated and incompletely differentiated forms, listing only those cases not occurring in relation to the adrenal.

3. A typical case of malignant neoplasm of sympathetic tissue is described under the title of sympatheticoblastoma.

Literature