Clinical Studies of Abdominal Tumors in Infants and Children
— Ten Year Review —

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ABSTRACT

We have clinically observed 39 patients with abdominal tumors who were admitted in Severance Hospital during the past 10 years from April 1960 to March 1970. Unfortunately follow-up study couldn't be made.

The following results were obtained.

1) Of the total number observed, 25 patients were male and 14 patients female.

2) The majority of the patients, 34 (87\%) were under 6 years of age and 20 (51\%) were between 1 to 3 years of age. The youngest patient was a 3-month-old female with Wilms' tumor.

3) In our series, Wilms' tumor (15 cases, 38.5\%) was the most common and neuroblastoma (8 cases) was next most common tumor in the abdominal cavity. In addition we found another 4 cases of neuroblastoma in other sites. We observed hepatoma (8 cases), ovarian tumor (3 cases), lymphosarcoma (2 cases), mesenteric cyst (one case) and adenoma of the left adrenal gland (one case) in that order of frequency.

4) In 15 patients with Wilms' tumor, hypertension was observed in 8 patients and hematuria in 4 patients. Compared with Wilms' tumor, no hematuria was noted in the cases with neuroblastoma and hypertension occurred in 3 of these.

5) On abdominal X-ray, calcification was present in 4 cases with neuroblastoma (50\%) and was present in only one of 15 patients with Wilms' tumor.

6) Comparing the sites of metastasis between Wilms' tumor and neuroblastoma, 4 of 15 patients with Wilm's tumor had lung metastasis and 4 of 8 patients of neuroblastoma had bony metastasis. Liver metastasis was found at autopsy in one case of neuroblastoma.

7) Three cases of hepatoblastoma were under 2 years of age and three cases of hepatocarcinoma were over 12 years of age.

8) Three cases of ovarian tumor were benign cystic teratoma. Torsion of the ovarian pedicle occurred in one of 3 patients with severe low abdominal pain. All patients were discharged in good condition after salphingo-ophorectomy.

9) One case of lymphosarcoma of the ileum was associated with intussusception.

10) A one year old female with adenoma of the left adrenal gland had typical Cushing's syndrome.

INTRODUCTION

Abdominal tumors are important as a rela-
tively common cause of death in the childhood age group. Cancer is the second most frequent cause of death in children, surpassed only by accidental injury.

Abdominal tumors are preceded in frequency only by leukemia and brain tumor. These tumors in children are properly considered apart from abdominal tumors in adults. Most of these tumors are embryonal in origin, and teratomas and sarcomas make up the bulk of the remaining neoplasms.

The sites of origin of these tumors are most commonly the retroperitoneal space and the kidneys. Also most of the patients are asymptomatic and the parents may note enlargement of the abdomen of the child while bathing the child or changing the clothes.

Early detection of abdominal tumors was important as the trend to cure with chemotherapy increased.

Recently though progress of diagnostic techniques and management, the survival rate has increased and active research of abdominal tumors has been made. In our country, there have been many case reports of the individual patients, but a clinical review of this problem has not been thorough. We have summarized 39 patients with abdominal tumor in regard to clinical and statistical status along with a review of the literature.

**SUBJECTS AND METHODS**

We have observed 39 patients who were admitted to Severance Hospital for 10 years from April 1960 to March 1970.

Diagnosis was made by patient’s clinical history, physical examination, X-ray studies including IVP, pathologic findings and bone marrow reports.

Four patients with neuroblastoma were excluded without palpable mass in abdomen in our discussion.

Making a diagnosis of hypertension was depended on the standard blood pressure reported by Lee(1963) and Choi(1968).

**RESULTS**

1) Cases:

As seen in Fig. 1, Wilms' tumor (15 cases) is the most common and neuroblastoma (8 cases) is next most common, of those found in the abdominal cavity, in addition to that we found another 4 cases of neuroblastoma in other sites.

Hepatoma (8 cases), ovarian tumor (3 cases), lymphosarcoma of the ileum (2 cases), cystic lymphangioma of the mesentery (one case) and an adenoma of the left adrenal gland were observed in that order of frequency.

2) Sex and age incidence:

Of the total cases observed, 25 patients were male and 14 patients female. The majority of the patients, 34 patients (87%), were under 6 years of age and the peak age incidence was between 1 to 3 years of age with 20 patients (51%). The youngest patient was a 3 month old female with Wilms' tumor. It was of

!!! Fig. 1. Incidence of abdominal tumors in infants and children. Parenthesis indicates No. of pts. !!!
interest that the 3 patients with hepatocarcinoma were over 12 years of age.

3) Wilms' tumor:
   a) Eleven of 15 patients (73%) were in the first 3 years of life. And there was no sex difference in incidence as seen in Table 1.

   b) Many patients was asymptomatic and a palpable abdominal mass was noted in the majority of cases (13 cases). In two patients the initial complaint were abdominal pain. As seen in Table 2, hypertension were present in 8 cases and hematuria in 4 cases.

c) X-ray studies: Chest X-ray, simple abdominal X-ray and IVP were taken in all patients. Calcification was observed in only one case and in 5 patients a nonfunctioning kidney was noted on IVP, while the opposite kidney was normal in function. 10 patients showed renal distortion with delayed function. On chest X-ray lung metastasis was noted in 4 patients.

d) Treatment and results:

As seen in Table 2 exploratory laparotomy was performed in 10 cases and in 9 cases total excision were successful, but one patient, a 3 year old boy, excision was impossible due to multiple ruptures of renal capsule and marked adhesion to the liver surface. Although irradiation was done, he expired on the 10th hospital day. Seven of 9 patients were discharged in good condition after total surgical excision. One of them, one year and 11 month old boy, received Actinomycin D and irradiation and was discharged in good general condition. One died of cardiac arrest during operation and the other died on the 19th postoperative day. Three cases with lung metastasis were inoperable on admission. Unfortunately the survival rate couldn't be made because the follow-up study was not made.

4) Neuroblastoma:

In the incidence by sex and age the ratio of male to female was 7:1 with male predominating and all patients were under the age of 6 years. The peak age group was that between 4 to 6 years (4 cases) and the youngest patient was a 5 month old male. Compared with Wilms' tumor, no hematuria was noted in neuroblastoma while hypertension occurred in 3 patients of all neuroblastoma. These patients were relatively worse in general condition on admission and anorexia and weight loss were present in 3 patients. High fever was also noted in 4 patients on admission. Location of the mass was more often on the left side of the abdomen with the ratio right to left, 2 to 6.

The abdominal X-ray showed calcification in 4 patients of all neuroblastoma. Renal displacement downward and laterally was noted in all patients, but no morphological and functional changes of the kidney was present on IVP. Bony metastasis was found in the skull.
Table 2: Comparison between Wilms' tumor and neuroblastoma in infants and children.

<table>
<thead>
<tr>
<th></th>
<th>Wilms' tumor</th>
<th>Neuroblastoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms on admission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Abdominal mass</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>2) Hematuria</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3) Hypertension</td>
<td>8 (53%)</td>
<td>3 (37%)</td>
</tr>
<tr>
<td>4) Abdominal pain</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5) Fever</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>6) Weight loss</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>7) Anorexia</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8) Joint pain</td>
<td>0</td>
<td>2</td>
</tr>
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<table>
<thead>
<tr>
<th>Location of tumor</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1) Right</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>2) Left</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>3) Others*</td>
<td></td>
<td>4</td>
</tr>
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<table>
<thead>
<tr>
<th>Radiological findings</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Non-functioning kidney</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2) Displacement of kidney</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3) Distortion of renal pelvis</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>4) Calcification</td>
<td>1</td>
<td>4</td>
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</table>

<table>
<thead>
<tr>
<th>Metastasis</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1) Lung</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2) Long bone</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3) Skull bone</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4) Liver</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5) Regional lymphnodes</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Operation only</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>2) Operation and chemotherapy</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3) Operation and irradiation</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4) Operation, irradiation and chemotherapy</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5) Irradiation only</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6) Discharge against treatment</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

| Operable Rate | 9/10 | 2/4 |
| Death during hospitalization | 3 | 1 |

* Neuroblastoma originated from sympathetic ganglion or adrenal gland without abdominal mass
* Diagnosed by bone marrow aspiration and lymphnode biopsy

X-ray in one patient and 4 cases of long bone metastasis were confirmed by bone marrow biopsy. Also 4 cases of lymphnode metastasis were present.

One patient with neuroblastoma of the right adrenal gland had hepatic metastasis and regional lymphnode metastasis at autopsy. Exploratory laparotomy was performed in 4 cases of abdominal neuroblastoma, but complete surgical excision was done in only two cases and the other 2 cases received only partial resection. Cytoxan was used in one patient who received complete surgical excision because bony metastasis was noted on bone marrow biopsy.

One patient, who received radiation therapy and chemotherapy with Cytoxan and Vincristin sulfate after partial resection of tumor mass, is doing well up to the present (7 month). A 5 month old male died on the 7th hospital day with liver and regional lymphnode metastasis as noted by autopsy.

One patient with cervical lymphnode metastasis had only radiation therapy without any improvement. Of 8 patients 4 couldn’t be treated. Besides above mentioned abdominal neuroblastoma, 4 patients with neuroblastoma at other site and without a palpable abdominal mass were observed. In two patients with exophthalmos and leg pain, irregular osteoporosis and destructive bony changes were noted in the skull X-ray and malignant neuroblast cells was found in the bone marrow. A 5 year and 7 month old male was admitted with inability to urinate. His tumor mass arise from spinal column on the left side and was attached to the abdominal aorta. He had a good result from removal of the tumor mass.

5) Hepatoma:
Two peak age incidence were noted with 3 cases from 1 to 3 years and 3 cases over 12 years. Two patients under one year of age were observed and the youngest one was a
Clinical Studies of Abdominal Tumors in Infants and Children

Table 3-1. Symptoms and signs in 8 cases of hepatoma

<table>
<thead>
<tr>
<th>Case No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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</thead>
<tbody>
<tr>
<td>Age(year)</td>
<td>15</td>
<td>15</td>
<td>36/12</td>
<td>12</td>
<td>12/1</td>
<td>10</td>
<td>13</td>
<td>13/12</td>
</tr>
<tr>
<td>Sex</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Hepatomegaly (cm)</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>10</td>
<td>2</td>
<td>10</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Splenomegaly (cm)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jaundice</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ascites</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Anemia (Hb, gm%)</td>
<td>9.8</td>
<td>-</td>
<td>-</td>
<td>8.2</td>
<td>9.2</td>
<td>4.3</td>
<td>-</td>
<td>9.7</td>
</tr>
<tr>
<td>Fever (°C)</td>
<td>37.5</td>
<td>37.4</td>
<td>-</td>
<td>38.5</td>
<td>-</td>
<td>38.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Indigestion</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
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</table>

Table 3-2. Liver function of hepatoma (6 cases)

<table>
<thead>
<tr>
<th>Case No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<tbody>
<tr>
<td>Total protein</td>
<td>7.3</td>
<td>6.8</td>
<td>7.6</td>
<td>7.1</td>
<td>7.1</td>
<td>7.1</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Albumin (gm/dl)</td>
<td>4.7</td>
<td>4.3</td>
<td>4.6</td>
<td>4.2</td>
<td>4.4</td>
<td>4.4</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Globulin (gm/dl)</td>
<td>2.6</td>
<td>2.5</td>
<td>3.0</td>
<td>2.9</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>Total bilirubin (mg%)</td>
<td>0.4</td>
<td>0.4</td>
<td>1.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SGOT (unit)</td>
<td>123</td>
<td>98</td>
<td>55</td>
<td>43</td>
<td></td>
<td></td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>SGPT (unit)</td>
<td>15.5</td>
<td>28</td>
<td>9</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alk. phosphatase (u%)</td>
<td>8.1BU</td>
<td>9.5BU</td>
<td>2.95BU</td>
<td>11.93SU</td>
<td>5.1SU</td>
<td>2.3SU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol (mg%)</td>
<td>243</td>
<td>189</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prothrombin time (sec.) (% Normal)</td>
<td>17 (80%)</td>
<td>16 (90%)</td>
<td>15.8 (83%)</td>
<td>12.9 (100%)</td>
<td>12.4 (100%)</td>
<td></td>
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</table>

Table 4. Type of hepatoma

<table>
<thead>
<tr>
<th>No. of pts.</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatocarcinoma</td>
<td>3</td>
</tr>
<tr>
<td>Hepatoblastoma</td>
<td>3</td>
</tr>
<tr>
<td>Hemangioma</td>
<td>1</td>
</tr>
<tr>
<td>Undetermined*</td>
<td>1</td>
</tr>
</tbody>
</table>

* Diagnosed by only liver scanning with 131I-Rose-Bengal

6 month old male who had a hemangioma by biopsy. Of 8 patients with hepatoma only one was female (Table 3-1).

On admission all patients had abdominal enlargement and hepatomegaly. But jaundice was present in only one and anemia was noted

Table 5. Incidence of abdominal tumors in literature

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Wilms' tumor</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>Neuroblastoma</td>
<td>48</td>
<td>15</td>
</tr>
<tr>
<td>Hepatoma</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>Ovarian tumor</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Intestinal tract tumor</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Mesenteric cyst</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Adenoma of adrenal gland</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Undetermined type of sarcoma</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bladder tumor</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Kidney tumor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>53</td>
</tr>
</tbody>
</table>
in 5 cases as seen in Table 3-1.

As seen in Table 3-2, liver function was relatively good in all cases. Pathologically 3 cases under 3 years of age were hepatoblastoma and 3 cases over the age of 12 years were hepatocarcinoma. One patient was diagnosed by liver scanning only.

One patient (case 6) died within 24 hours of admission and lung metastasis was found at autopsy. Another one (case 8) with hepatoblastoma received surgical excision of a well-encapsulated tumor mass and is living well with good condition, but prognosis is unknown. Case 7 received 5 fluoro-uracil, but no improvement occurred.

6) Ovarian tumor:

Three cases of ovarian tumor were found in girls aged 2 $\frac{1}{12}$, 5 $\frac{5}{12}$ and 11 $\frac{7}{12}$ and all patients were admitted with a palpable mass in the lower abdominal area. One patient had suffered from abdominal pain for one week before admission.

Displacement of intestines and a soft tissue mass was noted in all cases by barium X-ray study and abnormal calcification was seen in one case.

The tumor mass was right sided in two and left sided in one. All patients were pathologically diagnosed as benign cystic teratoma. All patients had resection of the tumor mass and salpingo-oophorectomy with good results. Torsion of the ovarian pedicle was noted in one case suffering from abdominal pain.

7) Lymphosarcoma of the ileum

Our patients were a 2 $\frac{6}{12}$ year old female and a 4 $\frac{8}{12}$ year old male. They were admitted with abdominal pain and a palpable abdominal mass. Tumors arose from the terminal ileum and in one was associated with intussusception. Both had tumor resection and end-to-end anastomosis. Both were alive after treatment, but survival since is unknown.

8) Cystic lymphangioma of the mesentery:

A two year and 4 month old male with abdominal pain and distension was confirmed pathologically as mesenteric cystic lymphangioma.

He was discharged in good condition after resection of the tumor mass.

9) Adenoma of the adrenal gland:

A one year and 2 month old female with typical Cushing's syndrome, i.e. obesity, polyphagia, hirsutism and Buffalo hump was pathologically diagnosed as adenoma of the left adrenal gland.

She was living with left adrenalectomy through an anterior abdominal approach but she is living well until now.

10) Undetermined type sarcoma:

A two year and 4 month old male with a palpable low abdominal mass and frequent urination had sarcoma arising from the sacrum. Only exploratory laparotomy was performed without surgical resection.

DISCUSSION

Second only to accidental injury, cancer is the most frequent cause of death in childhood (Boles, 1962, Lee et al, 1956). Lee et al (1956) stated that 8-11% of all pediatric deaths are due to cancer. DeLorimier et al (1969) report that neuroblastoma occurred in 10-12% of malignant neoplasms and this tumor was preceded in frequency only by leukemia and brain tumor.

Most of the abdominal tumors are embryonal in origin and the site of the mass was most commonly the retroperitoneal space and kidney and a smaller number originated in the liver and ovaries (Boles, 1962). Boles (1962)
stated that neuroblastoma (48 cases) was the most common tumor and next was Wilms' tumor (22 cases) in his series of 115 abdominal tumors, but Lee et al. (1956) reported that Wilms' tumor (23 cases) was the most common in their series followed by neuroblastoma (16 cases). In our country, Lee (1967) reported that Wilms' tumor (20 cases) occurred more commonly than neuroblastoma (15 cases). In our series Wilms' tumor (15 cases) was the most common and next in frequency neuroblastoma (8 cases).

It is of interest that hepatoma (8 cases) was preceded by neuroblastoma and occurred more often than reported in large series from Europe and the United States. In order of site frequency it was shown to be similar to that reported in other series i.e. liver, ovaries, and intestinal tract. Many authors stated that most of the abdominal tumors occurred during the first 5 years of age. In our series, 34 of the 39 patients were under the age of 6 years, and 64% under 3 years of age.

The sex ratio male to female was 1.8:1 with males predominating. Diagnosis was delayed because most patients are asymptomatic. A palpable abdominal mass was noted by the mother while bathing the child or in changing the clothes (Boles, 1962).

Most of the abdominal tumors are embryonal in origin and grew during fetal life and it was considered that the growth rate was constant. Prognosis after treatment was related to the age of first diagnosis by the Collin's hypothesis (Collins, 1958).

"Period of risk" suggested by Collins is helpful in estimating the prognosis and the time of recurrence.

"Period of risk" would be equal to the age of the patient at the time of diagnosis plus nine months. Cure is achieved when the patient reaches the "safe period", that is, twice the age of the child at the time of diagnosis plus nine months.

1) Wilms' tumor:

Age: In the large series most of the patients were in the 0-6 yr. age group and the average was 3 years (Lee, 1963). 85.5% of 422 patients reported by Collins (1956) were under the age of 6 years and 88% under the age of 6 years in the report of Sukarochana and Kiesewetter (1966). In our patients, 14 of 15 Wilms' tumors were under 6 years of age and in 11 cases occurred during the first 3 years of life.

In our series no sex difference in incidence was observed and was similar to the report of Arey (1915).

The tumor mass is usually smooth and regular in outline and dose not cross the midline, while the neuroblastoma is more apt to be irregular, nodular and commonly extends across the midline. Some patients complained of abdominal discomfort and pain and weight loss was noted. Fever appeared in 20% of all patients (Lee, 1963). Hypertension occurred in many patients and Silver (1941) reported that hypertension was present in 7 of 8 cases checked. Synder (Lee, 1963) stated that 72% had hypertension. Bloody urine is an unusual symptom but it is a poor prognostic sign (Arey, 1963). Hematuria occurred in only 2 cases of 18 cases reported by Silver (1947).

In our series hypertension was noted in 8 cases and hematuria in 4 cases. The tumor metastasizes widely by lymphatics and blood stream and the lung is the most frequent site. By the report of Sukarochana and Kiesewetter (1966) lung metastasis was seen in 19 of 33 cases. In our series lung metastasis was noted by chest X-ray in 4 cases and no bony metastasis was noted.

Chest X-ray is important since lung metastasis occurs first (Boles, 1962). And also IVP
is important to demonstrate the presence and normality of the unaffected kidney and also
to be differentiated from other abdominal
tumors(Arey, 1963). As demonstrated by IVP,
disturbance of the renal function is noted in
most Wilms' tumors and in our series all
patients had poor renal function with 10 cases
of non-visualized kidney. Lee(1963) stated
that calcification was rarely seen in the abdo-
minal X-ray and was present in only 10-15%
of the patients.

In our series only one case had calcification.
Management aims at rapid diagnosis prior to
dissemination of the tumor and surgery should
be performed as early as possible, usually with-
in 12 to 24 hours after admission (Arey,
1963). Postoperative radiation therapy is defi-
nitely superior to surgical excision alone(Boles,
1962).

Actinomycin D appears to be a promising
drug. Sukarochana and Kiesewetter(1966) sta-
ted that the factors influencing long-term sur-

vival are the age of patient, sites of metastasis
and the treatment regimen. Prognosis is grave
and by the report of Gross and Neuhauser
only 18 of 38 patients(47.3%) were surviving
two years or longer after treatment. Sukaro-

chana and Kiesewetter(1966) stated that over-
all survival rate was 43.6% of 62 cases(with
follow up study for 2 years) and 84.6% in 26
cases without metastasis and 12.0% in 33 cases
with metastasis. In our series nephrectomy
was performed successfully in only 9 cases and
2 of these died after nephrectomy. Our survi-
val rate was not obtained because follow-up
study couldn't be made.

2) Neuroblastoma:

Of 212 cases recorded in the California
Tumor Registry for 24 years(1942-1965), 83%
were under the age of 7 years and there was
no sex difference. Gross et al (1959) reported
that 87% of 217 cases of neuroblastoma were
under 6 years of age and 134 cases (62%)
were under 3 years of age. In our series all
patients were under the age of 6 years and
the sex ratio was 7:1 with males predomi-

nating.

The tumor was located more frequently on
the left side and by Gross et al (1959) the
left predominated 2:1. In our series the ratio
was 3:1. As in Wilms' tumor most patients
did not appear ill and were asymptomatic. The
first symptom may come from a metastatic
focus, such as causing a limp or a complaint of
leg pain, or periorbital swelling and ecchymosis.

In more advanced cases, pallor, weight loss,
fever and anorexia were present (Boles, 1962).
The palpable mass is more apt to be irregular
and nodular and commonly extended across
the midline.

In our series all patients had a palpable
abdominal mass and half of the patients had
fever. Leg pain was complained of in 2 cases
and exophthalmos in only one case.

Hypertension was observed in 3 cases and
no patient had hematuria. In large series renal
function was normal and displacement of the
kidney was present in most patients with neu-
roblastoma. Calcification was present in 45%
of the patients by abdominal X-ray(Arey,
1963).

In our series calcification was seen in 4 of
8 patients with abdominal neuroblastaoma and
in 6 cases the kidney was displaced downward
and laterally without distortion of the renal
pelvis.

Skull and bone X-rays are important in eva-
luating a neuroblastoma since bone metastasis
is more common than in Wilms' tumor and
tumor metastasis already present at the time
of diagnosis was more frequent with a 55-88
%(DeLorimier, 1969). By the report of Cali-
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California Tumor Registry 67% had distant metastasis. In our series bone metastasis was observed in 4 of 8 cases, liver metastasis was noted in one case, and there was no pulmonary metastasis. Widespread metastasis tends to occur early and a rapid downhill course generally follows (Martin, 1969).

Koop and Hernandez (1964) stated that for practically all childhood neoplasms 14 months is equivalent to the five-year cure period used in adult cancer statistics. Usually surgical excision, radiotherapy and chemotherapy are used in the treatment of neuroblastoma.

James and co-workers (1965) reported prolonged survival in 7 of 9 children having unresectable tumors by using a combination of Vincristine sulfate and Cyclophosphamide.

The overall cure rate is probably related to the age of the patient, the primary site of origin and the extent of the tumor when first diagnosed. By the report of De Lorimier (1969) survival rate for all age groups with retropéritoneal tumor was 20%, but for under 1 year it was 49% (22/45) and over 1 year 6%. Also they stated the survival rate for 111 patients with mediastinal neuroblastoma was 50% for all age groups.

Lingley et al (1968) stated that 16 of 50 cases (32%) survived without recurrence for more than 3 years and that survival rate was dependent on the primary site of origin along with other factors. Complete surgical excision of neuroblatoma can seldom be accomplished and in their series 5 of 50 cases (10%) were considered to have had “gross total” tumor removal (Lingley, 1968).

In our series complete surgical excision could be accomplished in only 2 of 4 cases. One case which received radiotherapy and chemotherapy with Cytoxan and Vincristine sulfate after partial tumor excision, was discharged in good condition and he has done well up to date. Two who received complete excision were discharged in good condition.

3) Hepatoma:

Liver tumors in children are a rare condition and there are no large series. Alcalde et al (1962) reported 6 cases of primary carcinoma of the liver over a 10 year period (1950-1960). In 47 cases reported by Ishak and Glunz (1967) 35 cases were hepatoblastoma and 12 cases were hepatocarcinoma.

They stated that 34 of the 35 hepatoblastomas were under the age of 3 years, but 11 cases of 12 hepatocarcinoma were over the age of 5. In hepatoblastoma the sex ratio male to female was 5:2 and males predominated 11:1 in hepatocarcinoma.

In our series hepatoma was more common than that reported by other authors. Three cases of hepatoblastoma were under the age of 2 and 3 cases of hepatocarcinoma were over 12 years of age. Boles (1962) stated that most liver tumors were hepatoblastoma, an embryonal tumor occurring in the early age group.

A palpable abdominal mass is most often the presenting sign and general manifestations such as weight loss, anorexia, vomiting and fever may be present.

Jaundice and ascites are uncommon in hepatoma but was found in 3 of 47 hepatomas reported by Ishak and Glunz (1967) and one of 6 cases had jaundice by the report of Alcalde (1962).

In our series all the hepatomas complained of abdominal distension due to abdominal tumor and only one had jaundice.

Lung is the most common metastatic site (Boles, 1962) and pulmonary metastasis was noted by Alcalde (1962) in 2 of 6 patients with primary carcinoma of the liver. In our series no lung metastasis was observed at first.
diagnosis. The survival rate and prognosis is grave and the 7 cases reported by Lee et al (1966) died in less than 9 months. Alcalde's 6 cases died within 8 months after diagnosis. In our series one patient (1/12, hepatoblastoma) received left lobectomy and was discharged in good condition, but survival was unknown due to lack of follow-up study.

The other seven cases did not receive any treatment. Hemangiomata of the liver is infrequent in infants but may present with an enlarged abdomen or a palpable mass first noted at birth or in very early infancy (Arey, 1965). Rupture of a hemangiomata of the liver may be responsible for death by massive intraperitoneal hemorrhage (Arey, 1965).

Of seven cases reported by Lee et al (1966) one case was a hemangiomata and survived over 5 1/2 years after radiation therapy. In our series a 6 month old male infant was shown to have hemangiomata of the right lobe of the liver by exploratory laparotomy, but he didn't receive any treatment.

4) Ovarian tumor:

Ovarian tumors in childhood are relatively uncommon and by Groeber (1963) observed 13 cases over 25 years and Boles (1962) recorded 10 ovarian tumors among 115 abdominal tumors.

In Groeber's series 131 of 263 ovarian tumors (50%) were benign cystic teratoma. Ein et al (1970) reported that of 75 cases over 44 years, 35 cases (47%) were benign cystic teratoma.

Ovarian tumor is more common in the prepubertal age group. Of the ovarian tumors reported by Groeber (1963) 44% were between 10 to 14 years of age and in Ein et al (1970) 35 cases out of 75 cystic teratoma (47%) were between 11 to 15 years.

In our series the patients' ages were 10, 12, 5, 5 1/2 and 11 7/12. Clinical manifestations were abdominal pain, a palpable mass and sexual precocity in that order of frequency (Boles, 1962).

Torsion of the ovarian tumor pedicle is responsible for the onset of severe abdominal pain. Nausea and vomiting are infrequently associated with abdominal pain, particularly in cases of torsion of the pedicle (Arey, 1965).

This torsion occurred in 10% of all ovarian tumors (Blackwell et al, 1946), and by Ein et al (1970) was 25%. Most ovarian tumors were observed on the right side of the abdomen (Ein et al, 1970), but Blackwell et al (1946) stated that there was no difference in the site of the tumor. Occasionally calcification in a dermoid cyst or ovarian teratoma was apparent on abdominal X-ray.

Of our three cases of ovarian tumor one patient with torsion complained of severe abdominal pain and calcification was noted in one case. Ein et al (1970) stated that complete surgical excision was the treatment for all benign and most malignant tumors.

All three of our patients survived after salpingo-oophorectomy. Microscopically in cystic teratoma ectodermal tissue is present in 100%, mesodermal admixture in 92-93%, and endodermal derivatives are seen in 72% (Marcial-Rojas and Medina, 1958 and Blackwell et al, 1946).

5) Lymphosarcoma of the ileum:

The gastrointestinal tract, the most frequent primary site of adult carcinoma, is seldom involved in infancy and childhood (Boles, 1962). Of 115 cases reported by Boles (1962) three cases were lymphoma involved with intussusception and were living after resection.

Lee et al (1965) had three in their series. All were malignant lymphomas and died in three months after resection.

We had two cases of lymphosarcoma arising
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from the terminal ileum and were living after resection. One patient who had intussusception complained of vomiting and abdominal pain.

6) Mesenteric cystic lymphangioma:

This is a rare condition and there was no case in 115 cases of abdominal tumor reported by Boles (1962).

Lee et al (1956) stated that 2 year old boy with mesenteric cystic lymphangioma was living after excision and radiation therapy. We have had one case in a 2 1/2 year old boy.

7) Adenoma of adrenal gland:

Cushing's syndrome is very rare in infancy and only 30 cases of Cushing's syndrome in infancy were reported in the literature up to 1966.

In half the cases adrenal carcinoma is the cause of Cushing's syndrome (Loridan and Senior, 1969). They stated that females were predominant and Cushinoid appearance was noted in all cases.

In our series a 1 year and 2 month old female had typical Cushing's syndrome since the age of 11 months and the final pathological diagnosis was reported as a benign adenoma of the left adrenal gland.

REFERENCES


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