INFORMATION ABOUT NEUROBLASTOMA

WHAT IS NEUROBLASTOMA?

Neuroblastoma is a cancerous tumor involving sympathetic nerve tissue found in the adrenal glands and other sites such as the neck, chest, along the spine and in the spinal cord itself. Normally, cells grow and divide to form new cells as our body needs them. When cells grow old, they die and new ones take their place. However, there are times when this orderly process goes wrong. New cells form even when the body does not need them or old cells do not die when they should.

The adrenal glands are located on top of each kidney. It acts to produce substances called hormones such as adrenalin or epinephrine which helps our body cope with stress, and other substances that help control blood pressure, heart rate and blood sugar levels. The same nerve tissue found in the adrenals is also scattered along the neck, chest and spinal cord (called sympathetic ganglia).

Neuroblastoma is the most common tumor occurring during infancy and tends to spread early, involving the lymph nodes, liver, bone, bone marrow and skin. Most patients are diagnosed before the age of 5 years, with 40% of cases diagnosed within the first year of life. Up to 75% have signs of spread (metastasis) to other organs at the time of diagnosis.

WHAT ARE THE TYPES OF NEUROBLASTOMA AND WHAT CAUSES IT?

Neuroblastoma has been classified as to having either a favorable or an unfavorable histology based on its appearance under microscopic examination. The terms favorable and unfavorable refer to the relationship of the appearance of the tumor and outcome.

There are also biologic markers that have been identified as being associated with good or poor outcome such as the over expression of the MYCN oncogene, deletion of the short arm of chromosome 1, etc.

Also to be taken into consideration in predicting outcome of children with neuroblastoma is stage or extent of the disease and age of the child at diagnosis.

The cause of neuroblastoma is unknown and to date there is no strong data supporting the role of environmental exposure to toxic agents.

WHAT ARE THE SYMPTOMS OF NEUROBLASTOMA?

The signs and symptoms of neuroblastoma vary depending on what particular area of the sympathetic nerve tissue is affected. Most (65%) primary tumors occur within the abdomen (adrenal glands), presenting with an abdominal mass with or without accompanying symptoms. Masses may also be found in the neck and chest. Other common findings include dark circles around the eyes (“raccoon eyes”), bone pain, bluish lumps in the skin of infants (“blueberry muffin” rash), and weakness or inability to move the arms or legs (with spinal cord involvement). Other symptoms may be nonspecific such as pallor, bleeding/easy bruising, malaise, high blood pressure, diarrhea, jerky eye or muscle movements, or shortness of breath.

HOW IS THE DIAGNOSIS OF NEUROBLASTOMA MADE?

Once suspected, a careful health history, physical examination with specific attention to the suspected body area involved along with several tests are done to confirm the diagnosis of neuroblastoma and to determine extent of disease involvement. A careful neurologic examination is also done to check the function of the brain, spinal cord and nerve tissues.

A family history of cancer will be asked, as well as the patients past illnesses and treatments.

The urine will be collected over a 24 hour period and sent to a special laboratory to measure the amount of certain substances called Vanillylmandelic acid (VMA) and/or Homovanillic acid (HVA). Very high levels of these substances are found in children with neuroblastoma.
A bone marrow aspiration and a biopsy (or the removal of a piece of tissue of the mass or of the bone marrow) is also done for further examination under the microscope to further establish the diagnosis.

Other laboratory tests include a complete blood count, liver and renal function tests, tests to look for specific molecular or chromosomal abnormalities found in neuroblastoma. Imaging or radiologic tests are also done as appropriate to detect masses in the adrenals, chest, spine or other sites. Modalities employed include ultrasound, computed tomography (CT) scan, magnetic resonance imaging (MRI).

**HOW DOES ONE STAGE NEUROBLASTOMA?**

Staging refers to the process used to follow to find out the extent of involvement of the disease. Knowing disease stage is important for treatment planning as well as knowing the child’s chance of cure.

- **Stage I:** Tumor is located in only one body area and completely removed
- **Stage II:** Tumor is in only one area but cannot be completely removed or Lymph nodes near the tumor also contain cancer cells
- **Stage III:** Tumor cannot be completely removed or has spread to lymph nodes in another body area or is present on both sides of the body
- **Stage IV:** There is involvement of the skin, distant lymph nodes, and other parts of the body
- **Stage IVS:** There is widespread involvement in an infant (age younger then 1 year)

**HOW IS THE TREATMENT PLANNED AND WHO ARE INVOLVED IN THE TREATMENT?**

The most cancer treatment is based on staging, operability and extent of spread. For treatment purposes, children with neuroblastoma are stratified into low, intermediate or high risk groups. Risk grouping takes into consideration, not only stage, but also information regarding histology (microscopic appearance of the tumor), age of the child, number of chromosomes, and whether there is over expression of the MCYN oncogene. Risk refers to the chance that a child will be cured and whether he or she would need more aggressive treatment.

For patients with neuroblastoma, a multidisciplinary team composed of the pediatric oncologist, other physicians and health professionals trained in the care of children with cancer will be involved. Depending on what other organs may be affected, physicians such as a pediatric surgeon, neurologist, radiologist, radiation oncologist, endocrinologist, oncology nurses, pharmacists, psychologists, social workers, physical and occupational therapist, etc. may be involved. Each member of the multidisciplinary care team will contribute to the treatment and support of the child.

**WHAT ARE THE AVAILABLE TREATMENT OPTIONS FOR NEUROBLASTOMA?**

The treatment of neuroblastoma involves the combination of surgery, chemotherapy and radiation therapy and hematopoietic stem cell transplantation.

Surgery is done for confirmation of the diagnosis and to remove as much tumor as possible while avoiding loss of function or disfigurement. In cases where removal is not possible, a piece of the tumor is removed for microscopic examination and confirmation of the diagnosis. In very localized disease, surgical removal may be curative.

Chemotherapy is the use of drugs to kill cancer cells. It may be given by mouth or injected through a vein or muscle (systemic therapy). The drugs circulate throughout the body, killing as much cancer cells as possible. The kind of drug combinations used for the different stages of neuroblastoma will be discussed by your physician.

Radiation therapy uses high-energy X-rays or other radiation energy to kill cancer cells. There are several methods by which radiation therapy may be delivered. They type of method will vary depending on the patient’s particular need. Radiation therapy is administered by a radiation oncologist.

For patients with high risk disease the treatment includes the use of very high doses of chemotherapy followed by transplantation of blood forming stem cells. For this children, their own stem cells are used and is called an autologous transplant.
In very few cases, watchful waiting or closely monitoring the patient’s condition without giving any treatment (as in the rare cases of infants less than 1 year with Stage IV disease) may be done since there are cases of spontaneous remission or recovery from the disease.

New therapies are also being tested such as the use of monoclonal antibodies or substances that block cancer cell growth. Another new therapy includes the use of a vitamin A like substance called 13-cis retinoic acid that slows down the growth of neuroblastoma cells and allow it to mature into normal tissue.

This information is made possible through the efforts of the Philippine Society of Pediatric Oncology, Inc. (PSPO), a subspecialty society of the Philippine Pediatric Society (PPS). For details regarding the treatment of individual patients, it is strongly recommended that they confer with their pediatric oncologist.