# PEDIATRIC SURGERY *Update* ©

***Vol 14 No 02 FEBRUARY 2000***

*'Official Publication of the Puerto Rico Association of Pediatric Surgeons'*


## Neuroblastoma- Genetics

Neuroblastoma (NB) is a malignant tumor of the sympathetic system that develops from the neural crests: sympathetic ganglion cells and adrenal glands. NB can behave seemingly benign, undergo spontaneous regression, mature into a benign ganglioneuroma or progress to kill its host. The most characteristic genetic abnormality of NB is deletion of the short arm of chromosome 1 (1p) occurring in 70% of primary diploid tumors. Loss or inactivation of a tumor suppressor gene at this site is critical for progression of neuroblastoma. Loss of heterozygosity in chromosome 14 long arm (14q) has also been identified in 50% of NB cells studied with no clinical behavior identified. Gain of chromosome 17 is associated with more aggressive tumors. Another consistent chromosomal aberration identified in 25% of NB is the presence of double-minute chromosomes producing multiple copies of the oncogene N-myc. N-myc activation results in tumor formation and is strongly associated with advance stages of disease and poor outcome independent of the stage of the tumor or age of the patient. Most NB cells are diploid and many are hyperdiploid. Hyperdiploidy is a good prognostic feature of NB, while diploid tumors at any age and hyperdiploid in older patients carry a worse prognosis requiring more intensive treatment. TRK receptors (A, B and C) are detected in 90% of NB and correlates inversely with N-myc expression. High TRK-A correlates with improved survival playing a role in the propensity of NB to regress or differentiate. TRK-B is associated with more matured tumors and TRK-C with lower stage tumors. High levels of TRK expression are associated with better prognosis, earlier stage, lower patient age and lack of N-myc expression.

**References**


1- Rubnitz JE, Crist WM: Molecular Genetics of Childhood Cancer: Implications for Pathogenesis, Diagnosis, and Treatment. Pediatrics 100(1): 101-108, 1997

2- Kreissman SG: Molecular Genetics: Toward an Understanding of Childhood Cancer. Sem Pediatr Surg 2(1): 2-10, 1993

3- Castleberry RP: Clinical and biologic features in the prognosis and treatment of neuroblastoma. Curr Opin Oncol 4(1):116-23, 1992

4- Tracy T Jr, Weber TR: Current concepts in neuroblastoma. Surg Annu 1:227-45, 1992

5- Hata Y, Sasaki F, Naito H, et al: Late recurrence in neuroblastoma. J Pediatr Surg 26(12):1417-9, 1991

6- Ciccarone V, Spengler BA, Meyers MB, et al: Phenotypic diversification in human neuroblastoma cells: Expression of distinct neural crest lineages. Cancer Res 49: 219-225, 1989

7- Brodeur GM, Maris JM, Yamashiro DJ, et al: Biology and Genetics of Human Neuroblastomas. J Pediatr Hematol Oncol 19(2): 93-101, 1997


## Recurrent Abdominal Pain

Recurrent abdominal pain (RAP) severe enough to seek surgical advice is a common problem in children. Most of the children with RAP are females. During evaluation multiple imaging (US, CT-Scan, MRI, HIDA-CCK, barium studies) and endoscopic diagnostic studies are done, most of which are not too helpful in arriving with a diagnosis. Symptoms wane spontaneously in almost one-third of these cases after a 4-6 week period of conservative observation. With persistent symptoms a diagnostic laparoscopy can be offered due to its superior visualization of pelvic and abdominal structures. Those with right lower quadrant pain are an important group, since adhesions, chronic appendiceal inflammation and inspissated appendicolith have been identified. With laparoscopy for RAP the yield of abdominal pathology will increase (chronic appendicitis, cysts, Meckel's and hernias), school loss will minimize and an economic benefit will be obtained. The lap procedure has lent itself to a variety of patients because of its ease, safety, and diagnostic accuracy.

**References**

1-Stringel G, Berezin SH, Bostwick HE, Halata MS: Laparoscopy in the Management of Children with Chronic Recurrent Abdominal Pain. JSLS Vol. 3:215-219, 1999.
2 -Stylianos S, Stein JE, Flanigan LM, Hechtman DH: Laparoscopy for Diagnosis and Treatment of Recurrent Abdominal Pain in Children. J Pediatr Surg. 31(8): 1158-1160, 1996
3- Miller K, Mayer E, Moritz E: The role of laparoscopy in chronic and recurrent abdominal pain. Am J Surg 172(4):353-6, 1996
4- Morfesis FA, Ahmad F: Use of laparoscopy in the treatment of acute and chronic right lower quadrant pain. J Ky Med Assoc 94(1):16-21, 1996
5- Schier F, Waldschmidt J: Laparoscopy in children with ill-defined abdominal pain. Surg Endosc 8(2):97-9, 1994

## Muscle Biopsy

Muscle biopsy is a standard procedure to help establish a diagnosis in case of suspecting myopathy in children. Though the procedure is technically easy, complications can occur the result of not using appropriate anesthesia strategy. We encourage initial sedation with midazolin, followed by ketamine or propofol along with local anesthesia (xylocaine/marcaine 1-2% mixture) in this cases. We strongly discourage and avoid the use of halogenated gases or muscle paralysis whenever possible. Most frequent cause of cardiac arrest causing sudden death following anesthesia in a child suspected of having a muscular dystrophy (Duchenne, or any other type) with elevated CPK level is the result of rhabdomyolysis caused by halogenated gases (halothane, isoflurane, sevoflurane, etc.) or muscle-paralysis drugs (succinylcholine, suxamethonium). Rhabdomyolysis triggers severe hyperkalemia, hyperphosphatemia, hypocalcemia, massive increases in creatine kinase, aspartate aminotransferase, and alanine aminotransferase concentrations, and high ion gap metabolic acidosis. Following unexplained anesthetic deaths, pathologists should examine body fluid electrolytes and skeletal muscle for myopathy and dystrophin.

**References**

1- Obata R, Yasumi Y, Suzuki A, Nakajima Y, Sato S: Rhabdomyolysis in association with Duchenne's muscular dystrophy. Can J Anaesth 46(6):564-6, 1999

2- Miller ED Jr, Sanders DB, Rowlingson JC, Berry FA Jr, Sussman MD, Epstein RM: Anesthesia-induced rhabdomyolysis in a patient with Duchenne's muscular dystrophy. Anesthesiology 48(2):146-8, 1978
3- Sethna NF, Rockoff MA, Worthen HM, Rosnow JM: Anesthesia-related complications in children with Duchenne muscular dystrophy. Anesthesiology 68(3):462-5, 1988
4- Sullivan M, Thompson WK, Hill GD: Succinylcholine-induced cardiac arrest in children with undiagnosed myopathy. Can J Anaesth 41(6):497-501, 1994
5- McKishnie JD, Muir JM, Girvan DP: Anaesthesia induced rhabdomyolysis--a case report. Can Anaesth Soc J 30(3 Pt 1):295-8, 1983
6- Moore WE, Watson RL, Summary JJ: Massive myoglobinuria precipitated by halothane and succinylcholine in a member of a family with elevation of serum creatine phosphokinase. Anesth Analg 55(5):680-2, 1976

---

* Edited by: **Humberto L. Lugo-Vicente, MD, FACS, FAAP**
Associate Professor of Pediatric Surgery, University of Puerto Rico School of Medicine and University Pediatric Hospital, Rio Piedras, Puerto Rico.
Address - P.O. Box 10426, Caparra Heights Station, San Juan, Puerto Rico 00922-0426.
Tel (787)-786-3495 Fax (787)-720-6103 E-mail: *titolugo@coqui.net*
Internet: http://home.coqui.net/titolugo

*© PSU 1993-2000*