PEDIATRIC MALIGNANT SOLID TUMORS
PEDIATRIC CANCER

- 2nd leading cause of death in children
- 1/350 children diagnosed annually
- or the incidence per year would be 15-16 cases / 100 000 children per year/
- 11 000 new cases in children under 20 years of age each year in the whole world.
- Considered in the past as hopeless diseases now 70% of children with cancer can be cured definitively
CANCEROGENESIS

I. EXOGENOUS FACTORS

- Radiation Exposure.
- Other Factors of the Surrounding. Environment - Chemical Cancerogens.
- Oncogenic Viruses.
II. ENDOGENOUS FACTORS

- Familial and Genetic Factor
- Cancer Malformation Syndromes
- Multiple Primary Tumors
- Second Malignant Neoplasms
CHARACTERISTIC FEATURES OF CHILDHOOD CANCER

- Child’s Organism is with forming Immune System and with Rapid Growth.
- Different Histological Types from those of Adults.
- Different Localizations from those of Adults.
- Higher Sensitiveness to Chemotherapy than Adults.
CLASIFICATION OF PEDIATRIC MALIGNANCIES

Systemic Neoplasms (Leukaemias and Lymphomas) : Solid Tumors = 1:1.
SYSTEMIC NEOPLASMS - 50%

- Leukaemias - 1/3 of Pediatric neoplasms - 35%
- Lymphomas (NHL 55% and Hodgkin’s Disease 45%) - 15%
MALIGNANT SOLID TUMORS - 50%

- Embrional Tumors - 17% (Neurollastoma - 8%, Nephroblastoma - 7%, Retinollastoma - 1.5%, Hepatoblastoma - 0.5%)
- Brain Tumors - 17%
  (Astrocytoma, Medulloblastoma....)
MALIGNANT SOLID TUMORS - 50%

- Soft Tissue Sarcomas 8%
  (Rhabdomyosarcoma - 6%...)
- Bone Tumors - 4% (Sarcoma,
  Osteogenes, Sarcoma Ewing...)
- Germ Cell Tumors - 2%
- Epithelial Tumors - Carcinomas and
  other very Rare Tumors - 2%
Wilms’ Tumors (Nephroblastoma)

- Epidemiology - 7% of Neoplastic Diseases in Children
- Unfavorable Histology (Focal or Diffuse Anaplasia) - 10%
- Favorable Histology (Multicystic and with Fibroadenomatous Structures) - 90%
- Gene Mutations - 11p 13 for WT1 and 11p 15 for WT2
- Cancer Malformation Syndromes
INCIDENCE

Incidence rates per 100,000

Age

Incidence rates per 100,000

<1 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Girls □ Boys
Wilms Tumor:

Histology: mixture of immature cells metanephric, stromal, tubular

CLINICAL MANIFESTATION

- Good Clinical State
- Haematuria - 25%
- Abdominal pain - 35%
- High blood pressure - 35%
- An abdominal Tumor mass - discovered accidentally
CLINICAL STAGES

I. Tumor limited to the Kidney, in size - 5 cm. Intact Renal Capsule, Excised Completly.

II. Tumor extends outside the Kidney in size - 10 cm, Excised Completly.

III. Tumor over 10 cm in size. Infiltrated other Organs in Abomen, without Hematogenous Mts, Complete Excision Impossible.

IV. Tumor with Hematogenous Mts (Lungs - 10% liver - 1% ets.)

V. Bilateral Renal Tumors
LABORATORY AND RADILOGICAL EXAMINATIONS

- Hb, Plt, WBS,
- LDH,
- Urine analysis
- CT and Abdominal Ultrasound
- Chest X-ray
- Tumor Histology
RISK FACTORS

- **Low Risk** - Cases with favourable histology, in I and II stages, under 3 years of age

- **High Risk** - Cases with unfavourable histology, in III, IV and V stages, over 3 years of age
TREATMENT

- Surgery - Nephrectomy, Lymphadenotomoy, Excision when it is possibly of lung or liver Mts. In V stade - partial resection.

- Radiotherapy. No RT in I and II stage. In III and IV stage RT in Tumor Region with Dose 20-30 GY. In Mts regions - 15 GY
CHEMOTHERAPY

- L. R. Actinomycin D, Vincristine
- H. R. Act D, Vcr, Farmarubicin, VP16
PROGNOSIS

- **Low Risk** - 85% survival
- **High Risk** - 40% survival
NEUROBLASTOMA

- Epidemiology - 8% of Neoplastic Diseases in children
- Unfavourable Histology (Neuroblastoma) - 90%
- Favourable Histology (Ganglioneuroblastoma) - 10%
NEUROBLASTOMA LOCALIZATION -

- 70% Abdomen (1/2 of Cases from suprarenal gl.)
- 15% Mediastinum,
- 3% Neck,
- 8% Paravertebral Region,
- 4% Other Rare Regions (Olfactory Region, Multiple Primary Tumors C.N.S etc)
NEUROBLASTOMA

- “Small blue round cell” tumor
- Immunohistochemical stains: neurofilament proteins, synaptophysin, NSE
- Electron microscopy: neurosecretory granules, microtubules and filaments
- Chromosome 1 deletions or N-myc oncogene amplification

From, Principles and Practice of Pediatric Oncology, Lippincott Williams & Wilkins, p 903.
Incidence

Incidence rates per 100,000

Age

Girls □ Boys
CLINICAL MANIFESTATION

- Poor clinical State
- Symptoms of Primary Localization
- Symptoms of Metastatic Localization
- Paraneoplastic Symptoms
There are orbital and skull vault metastases, with associated enhancing soft-tissue masses. The skull lesions are extradural masses which deform the underlying brain. The right orbital lesion forms a superior extraconal mass, depressing the right globe.
bilateral ecchymosis in a child with metastatic neuroblastoma.
CLINICAL STAGES (EVANS ET AL.)

- I Tumor Limited to the Organ or Structure of Origin. Excised Completely.
- II Tumor with Regional Spread, not Crossing the Midline.
- III Tumor Crossing the Midline, Bilateral Lymph Nodes May by involved. Complete Excision impossible.
- IV Tumor with Distant Mts (Bone - 50% of cases, Lymph Nodes, Organs, Soft Tissues)
- IV-S Tumor in I and II Cl Stage, with Limited Dissemination to Liver, Skin and Bone Marrow (without Bones), Infants under 2 Years of Age, especially under 1 Year of Age.
International Neuroblastoma Staging System (INSS)
LABORATORY AND RADIOLOGICAL EXAMINATIONS

- Hb, Plt, WBC, LDH,
- Bone Marrow Aspiration
- Urinanalysis
- CT and Abdominal Ultrasound
- Bone Isotope Scanning, Scanning with 131I-MIBG
- Chest X-ray
- Tumor Markers - N-myc, Ferritin, NSE, Catecholamines’ Metabolites
- Tumor Histology
RISK FACTORS

- **Low Risk** - Cases with Ganglioneuroblastoma, in I, II and IV-S Stages, under 1 Year of age, with Neck and Mediastinum Localisation

- **High Risk** - Cases with Neuroblastoma, in III and IV Stages (Bone Mts), over 2 Years of age, with High Levels of LDH, NSE and Fevritin, with Abdominal and Paravertebral Localisation, with Amplification of N-myc.
TREATMENT

- Surgery - Survival is better when Radical Excision is done.

- Radiotherapy - No RT in I, II and IV-S Stages

- In III and IV Stages RT in Tumor and Mts Redions with Dose 15-35 GY.
CHEMOTHERAPY

- L. R. - Vcr, Endoxan, Farmarubicin

- H. R. - Vcr, Endoxan, VP16, Cisplatin, Carboplatin, Holoxan, Farmarubicin
PROGNOSIS

- **Low Risk** - 80% survival
- **High Risk** - 35% survival
Rhabdomyosarcoma

- **Epidemiology** - 5% of Neoplastic Diseases in Children
- **Histology** - Embrional and Botroid - 75%; Alveolar + Pleomorphic - 20%; Undifferentiated - 5%.
- **Mts** - Lungs, Bones, Lymph Nodes, Brain.
INCIDENCE

Incidence rates per 100,000

Gir ls
Boys

< 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Incidence rates per 100,000

Age

<1 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Girls □ Boys
**Rhabdomyosarcoma Localization**

- Head and Neck - 40%;
- Pelvis + Urinary Tract - 25%;
- Limbs - 20%;
- Other Rare Localizations - 15%; (Diaphragm Thorax and Abdominal walls, Viscera and every Region originated from Mesenchyme arising in Striated Muscle.)
Rhabdomyosarcoma

- Clinical Manifestation depends from Primary Localisation.
Nasopharyngeal Rhabdomyosarcoma
Rhabdomyosarcoma

- **Alveolar**
  - 20% of pediatric cases
  - Chromosomal translocation: t(2;13) or t(1;13)
  - Gene amplification
  - Tetraploid DNA

From, Surgical Pathology of the Head and Neck, Lippincott Williams & Wilkins, p 157.
**Rhabdomyosarcoma**

- **Pleomorphic**
  - Rare in children

- **Botryoid**
  - 5-10% of pediatric cases
  - Grape-like tumor masses

*From, Diagnostic Surgical Pathology of the Head and Neck, W.B. Saunders, p 554.*
**CLINICAL STAGE**

- I Limited Tumor Excised Completely.
- II Grossly Removed Tumor with microscopic residual disease.
- III Incomplete Removal or only Biopsy with Gross Residual Tumor.
- IV Metastatic Disease at Diagnosis.
LABORATORY AND RADIiological EXAMINATIONS

- Hb, Plt, WBC, LDH
- CT and MRI of Primary Tumor
- Chest X-ray and CT
- Bone Scan
- Tumor Histology
RISK FACTORS

- **Low Risk** - I and II stages - 70% survival

- **High Risk** - III and IV stages, Parameningial Localization, Alveolar Histology - 30% survival
**TREATMENT**

- Surgery
- Radiotherapy
- Chemotherapy - Vcr, Holoxan
- Farmarubicin, VP16, Endoxan
- Carloplatin, Actinomycin D.