MMed and DCH Lectures

Paediatric oncology I

May 24, 2021

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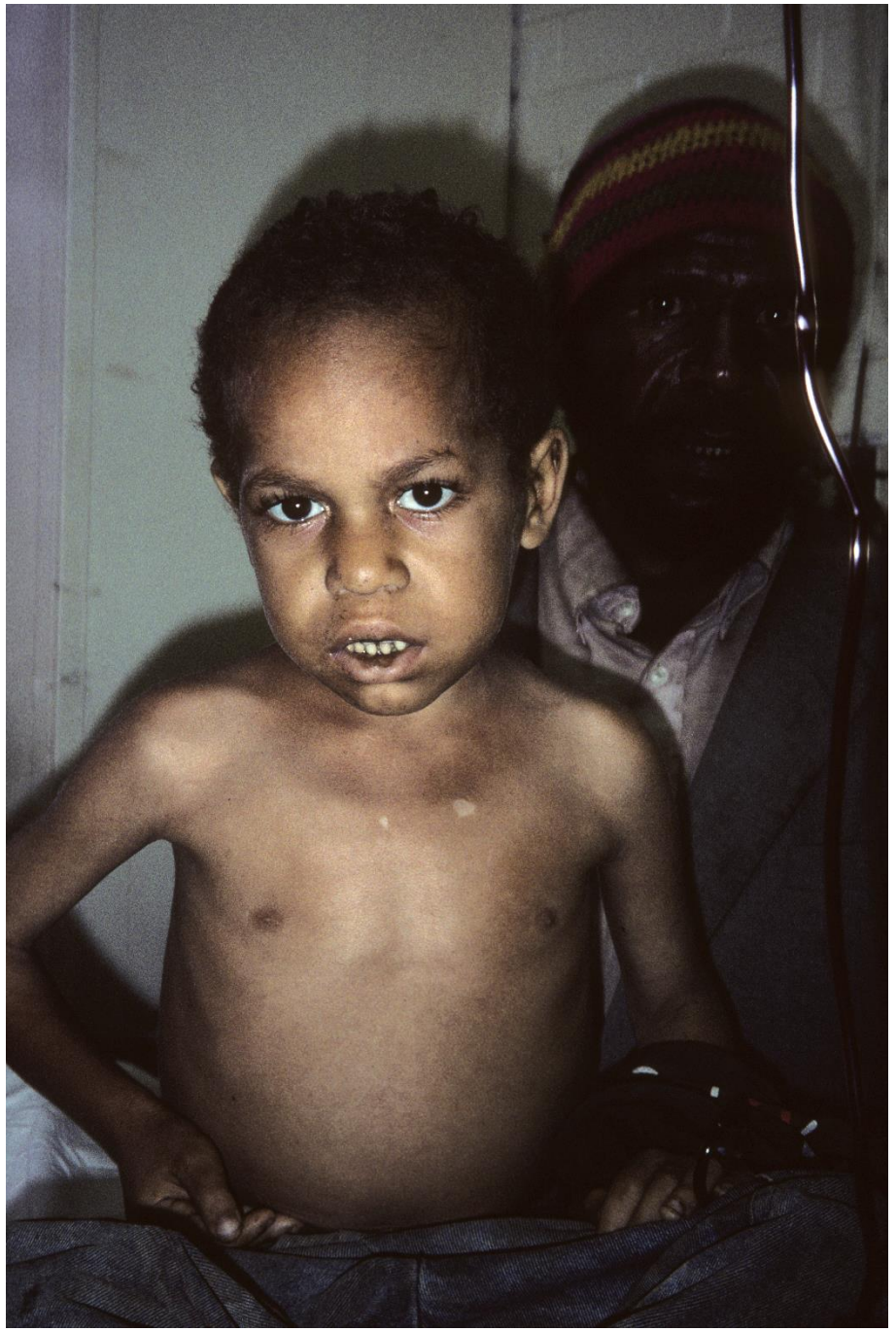
Cancer in children

1. Paediatric cancer in PNG
2. Acute leukaemia
3. Lymphoma
4. Retinoblastoma
5. Chest tumours
6. Abdominal tumours
7. Cancer emergencies

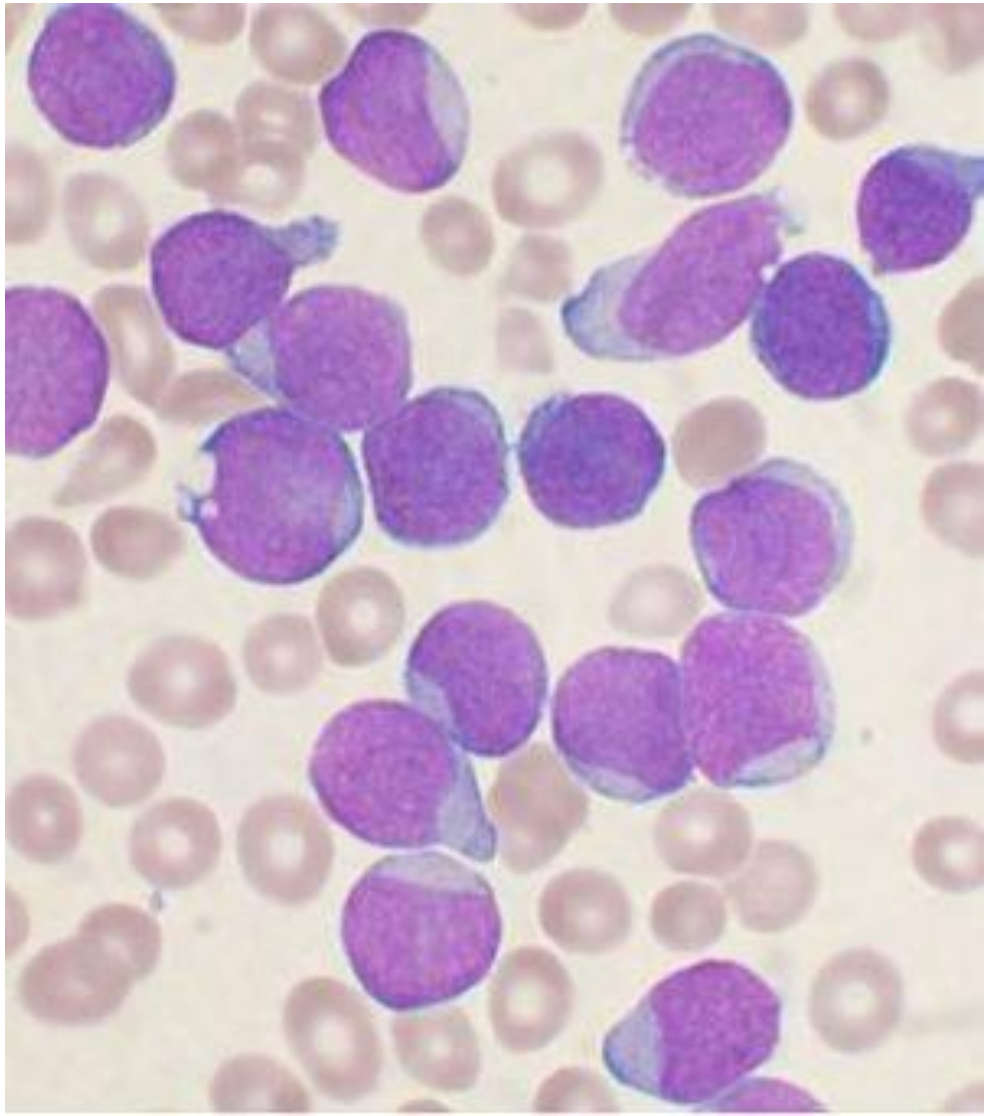
Acute leukaemia

- Pallor, easy bruising and bleeding, lethargy, anorexia, bone pain or reluctance to walk
- Pallor, hepatosplenomegaly, skin infiltration, gum hypertrophy, CNS (5-10%), testes
- ALL (80%)
  - most “pre-B ALL”
  - T-cell ALL 10-15% adolescents
- AML (15%)
- CML (JMML) 5%



Acute leukaemia

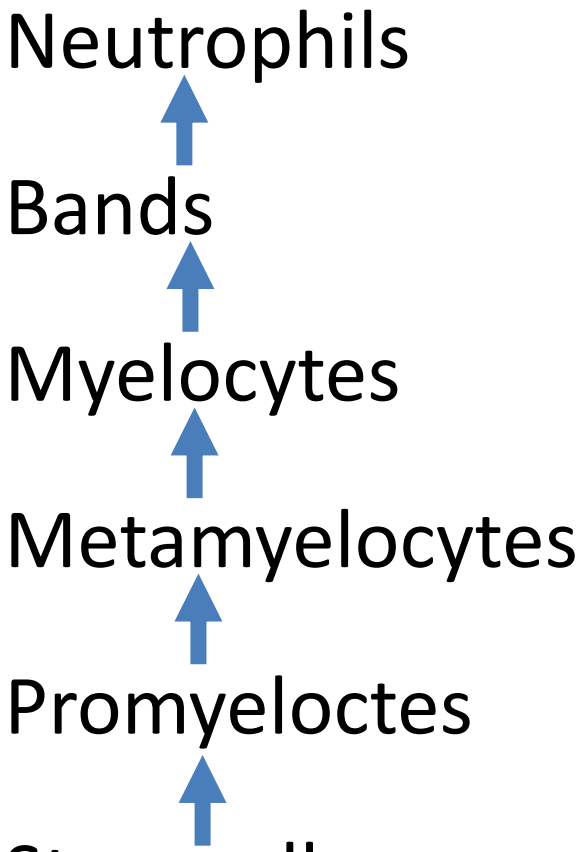
- Blood film: leukaemic blasts (lymphoblasts, very large nuclei)
- Prognostic factors (old)
  - Height of WCC
  - Age (very young or adolescent)
- Prognostic factors (current)
  - Chromosomal translocations: t(8;14)
  - Philadelphia chromosome t(9;22) CML and 5% of ALL
  - Response to steroids
  - CNS / testicular disease
  - High MRD: “minimal residual disease”
  - T-cell phenotype



Treatment

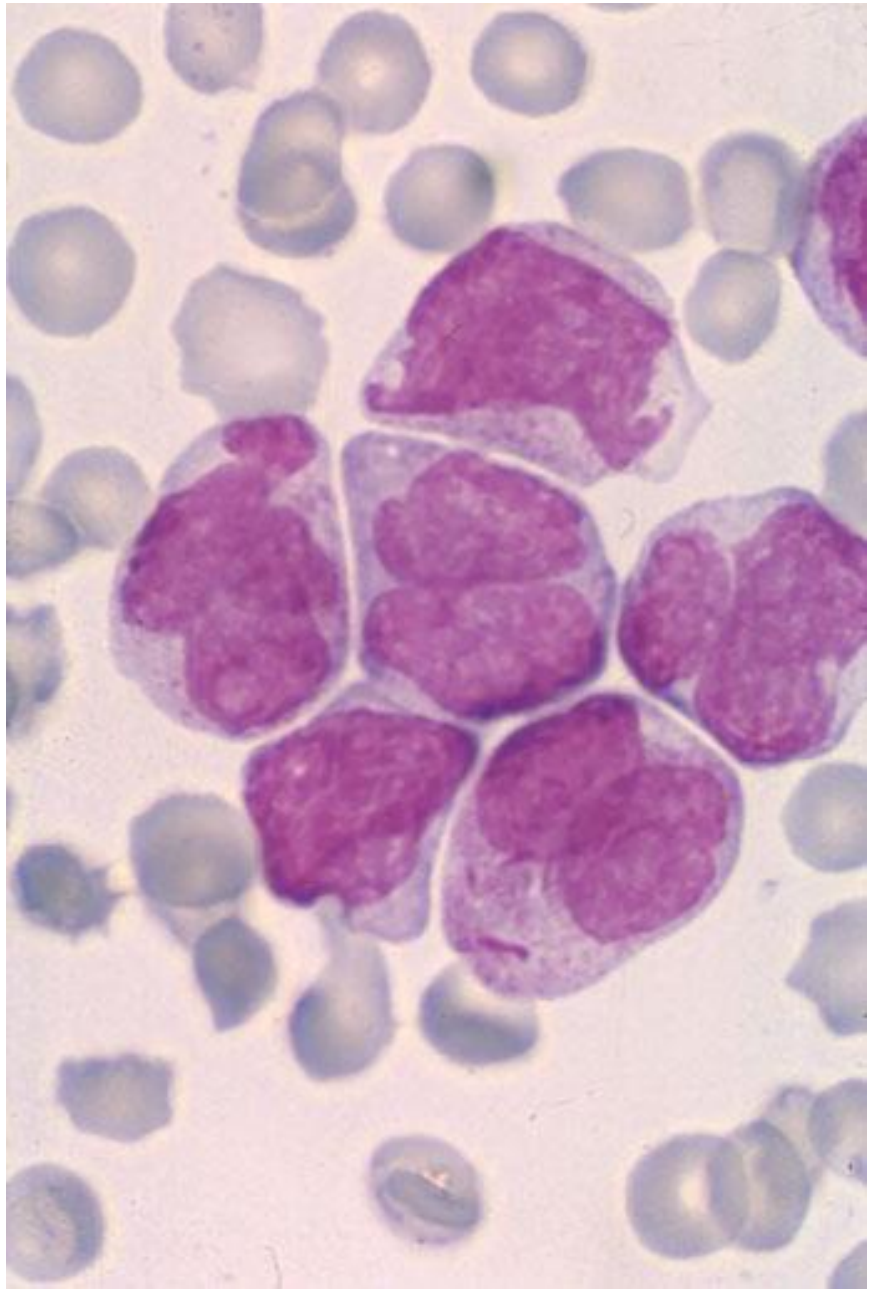
- Phases
  1. Induction (1 month) – vincristine, daunorubicin, prednisolone, asparaginase
  2. Consolidation – VCR, MTX, PNL, 6-mercaptopurine
  3. CNS treatment – intrathecal methotrexate
  4. Re-induction – re-intensification using same agents
  5. Maintenance – 2 years
- 95% go into remission after induction
- 80% successful cure with chemotherapy

Granulocyte differentiation



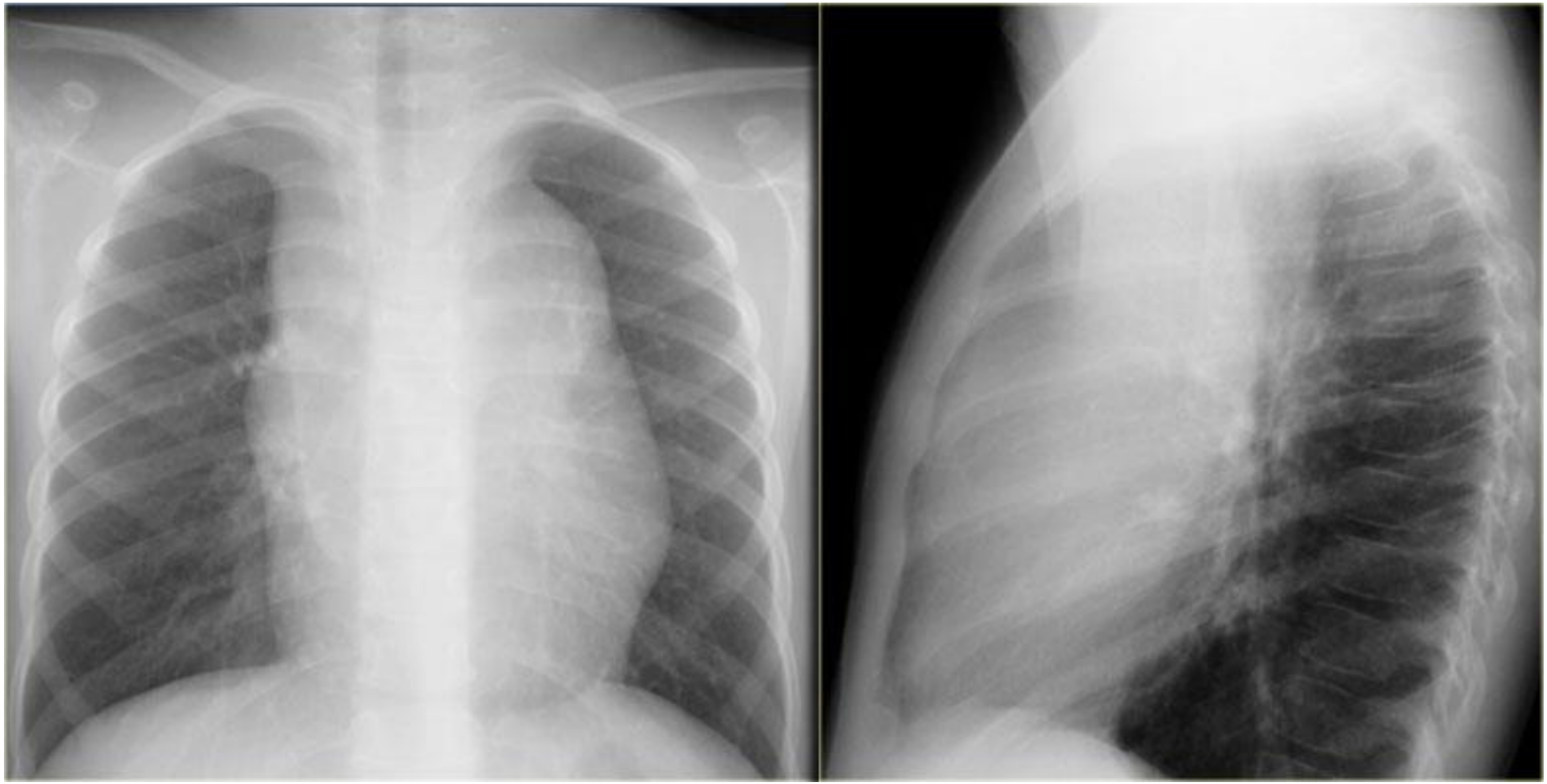
AML

- Cancer of myeloid white blood cells
- 20% of childhood leukaemia
- APML – Coagulopathy, DIC
- AMML – skin infiltration, gum hypertrophy (chloroma)
- CNS more common 5-15%
- Survival rates 50-75%



Lymphoma

- Can be T-cell origin (30%) or B-cell origin (Burkitt, 70%)
- T-cell ALL / lymphoma
  - T= Thymus origin
  - Age 10-15 years (compared to ALL 2-5 years; AML all ages)
  - Mediastinal mass, SVC syndrome, trachea / bronchial obstruction
    - Stridor, cough, wheeze
    - Pleural effusion,
  - Large mass disease: high risk of tumour lysis syndrome



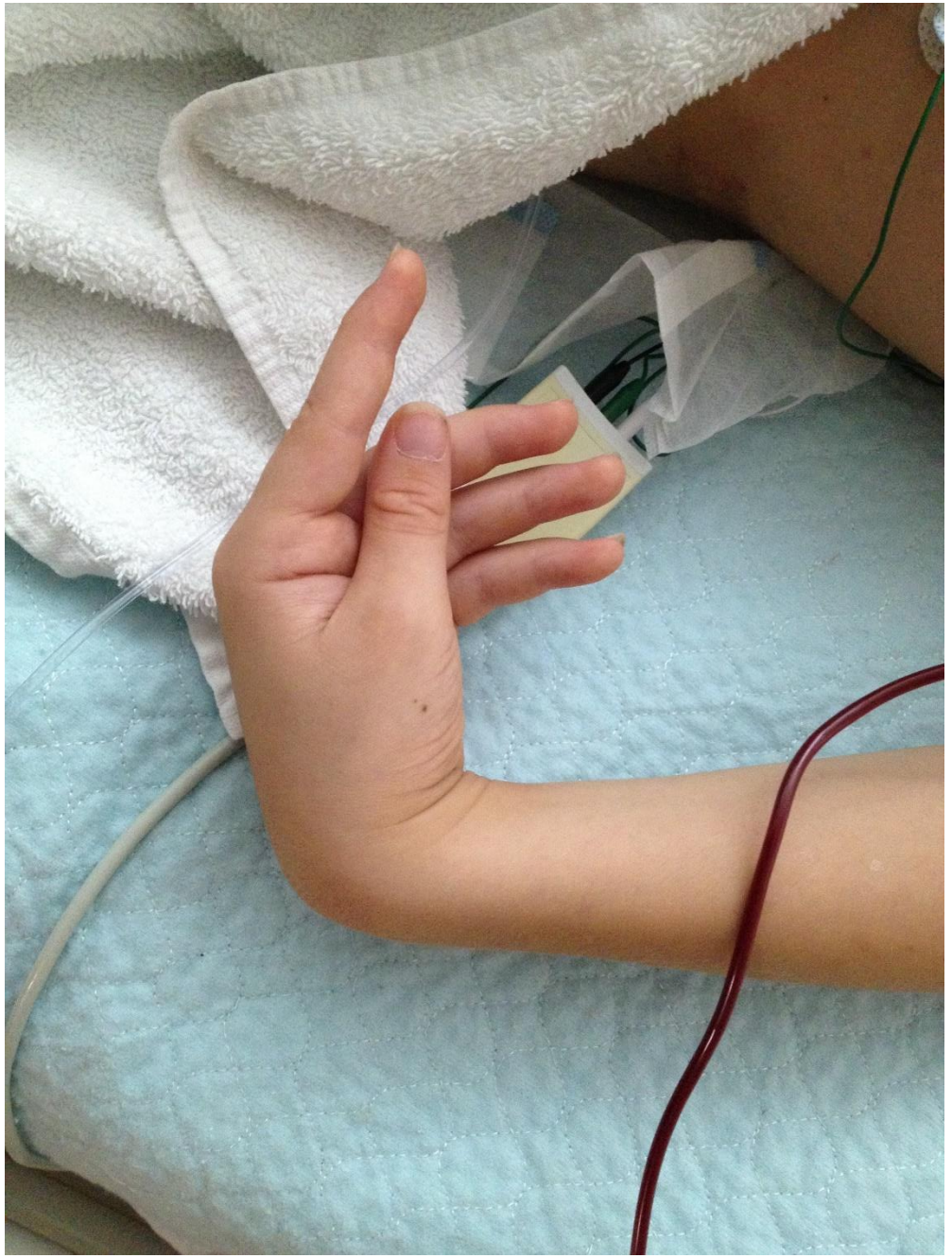
Oncology emergencies: Tumour lysis syndrome

- Highest risk: large mass disease – hyperleukocytosis (WCC>100,000), mediastinal mass, hepatosplenomegaly
- Lysis of cells by chemotherapy
  - Release of phosphate, potassium, uric acid (DNA breakdown)
  - Hyperkalaemia, metabolic acidosis
  - $CaPO_4$ precipitates → hypocalcaemia
  - Uric acid and $CaPO_4$ → kidney injury

Tumour lysis syndrome

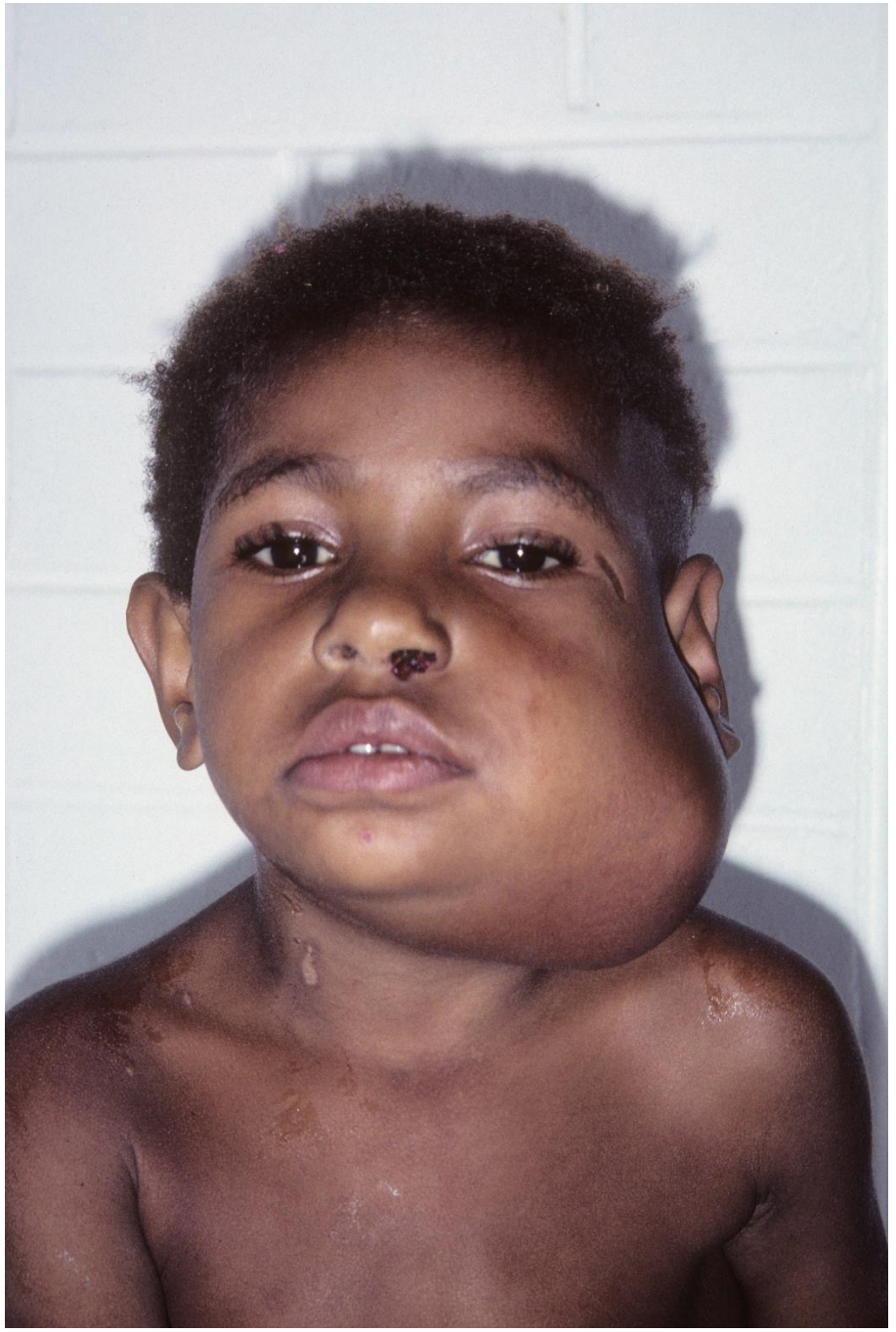
Prevention with:

- Allopurinol / rasburicase
- Hyperhydration with isotonic solution + $NaHCO_3$
- Alkalinise urine (pH 7-8)
- Do not give IV calcium



Burkitt lymphoma

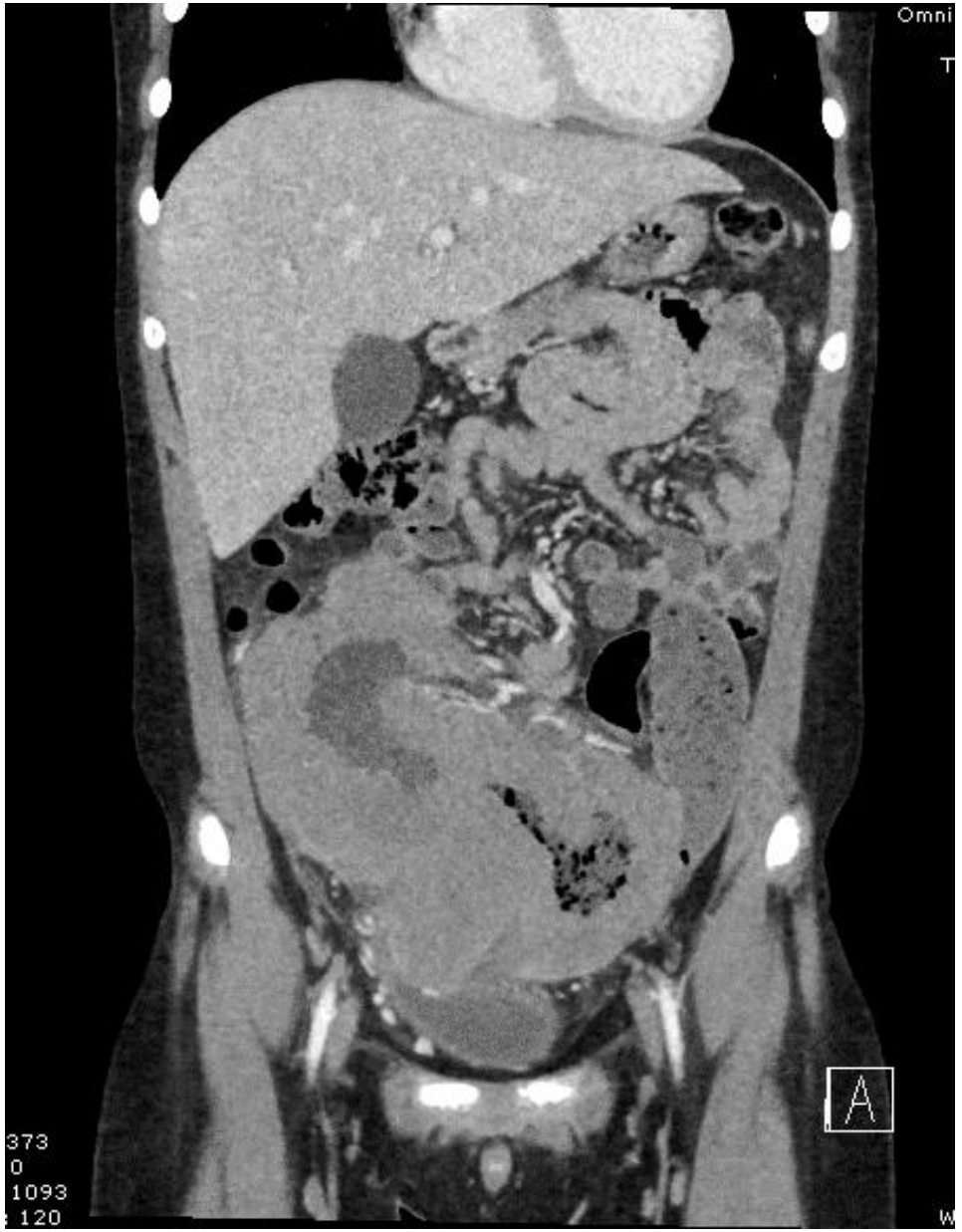
- Fastest growing human cancer
- Fever, weight loss, night sweats, painless lymphadenopathy
- Associated with EBV, HHV8, HIV
- Airway obstruction, GI tract obstruction, spinal cord compression
- Pancytopenia, raised uric acid, LDH↑↑
- “C-myc proto-oncogene” t(8:14) reciprocal translocation
- Endemic: “African type” – jaw
- Sporadic: “American type” – GIT, para-aortic LN



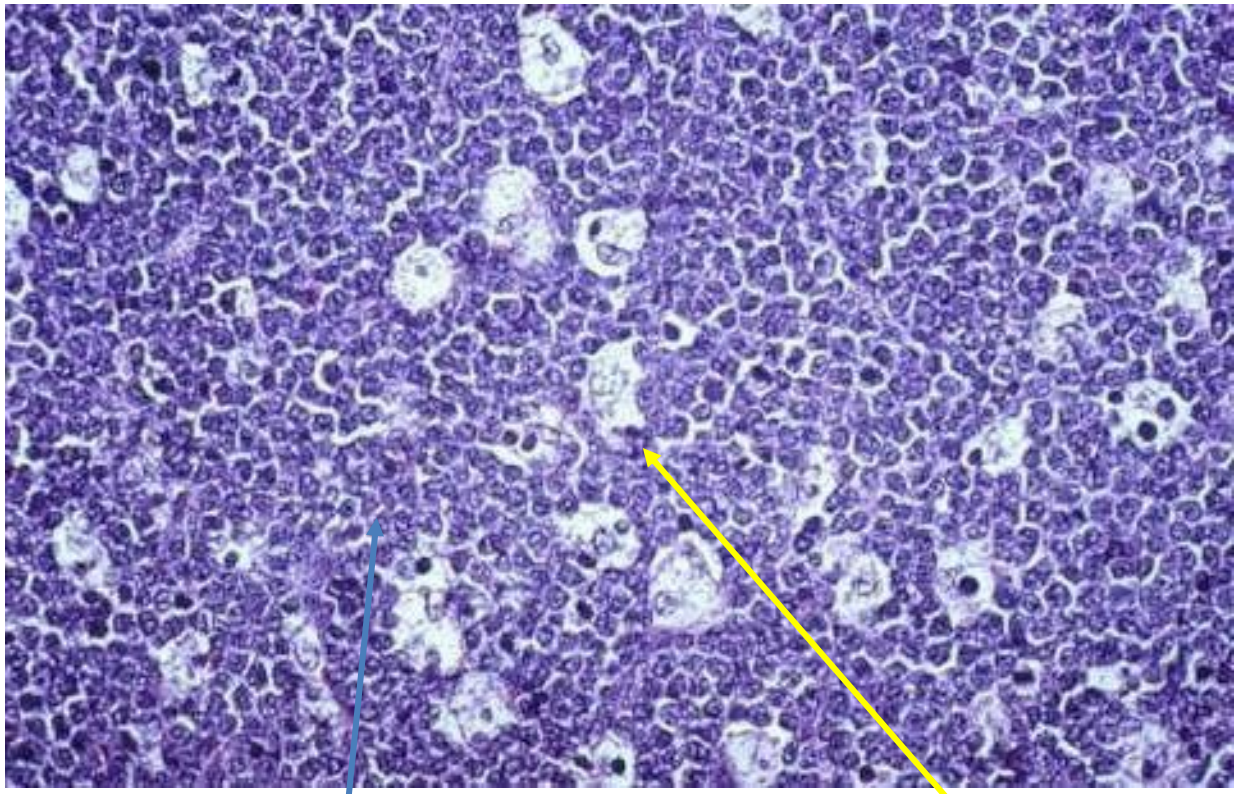
Burkitt lymphoma in PNG

- Malaria-holo-endemic areas, coastal PNG, but also in highland region
- 16% of childhood malignancies
- Age 6 years
- Males 8: Females 1
- 58% facial structures, 20% spine
- Immuno-pathogenesis?
  - Chronic immune suppression by malaria may result in lymph nodes developing BL in response to EBV infection
  - “C-myc proto-oncogene” t(8:14) may predispose to BL after EBV infection

Abdominal Burkitt

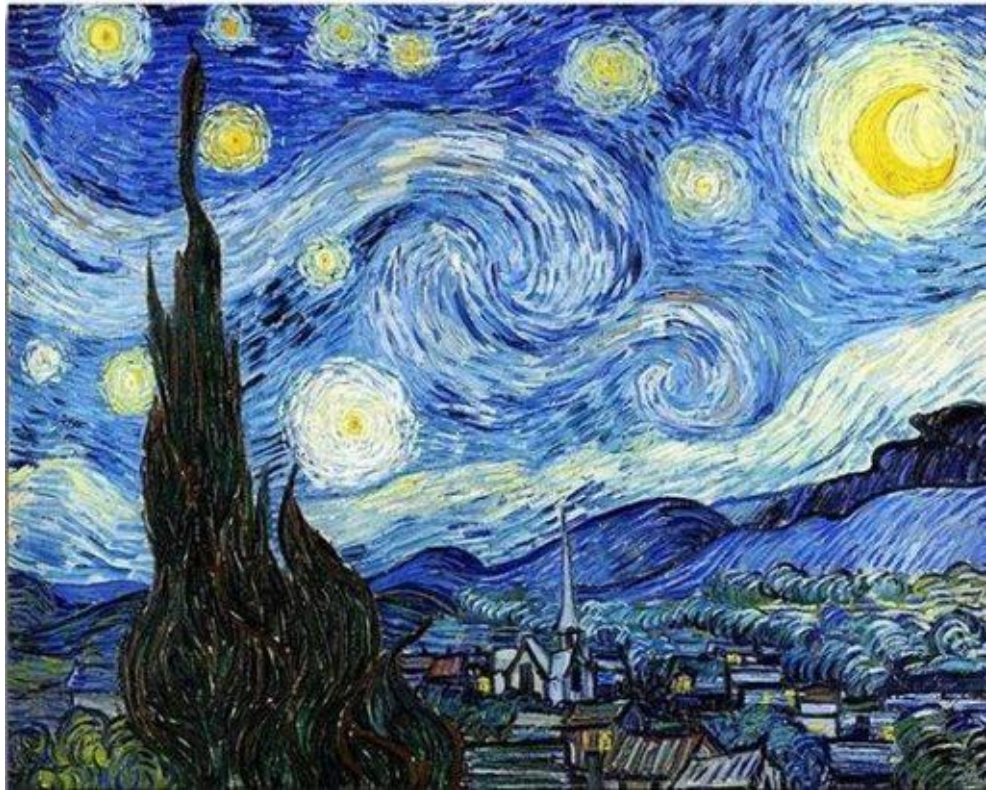


“Starry sky” histology



Sky: Neoplastic B-cells

Stars: Reactive histiocytes

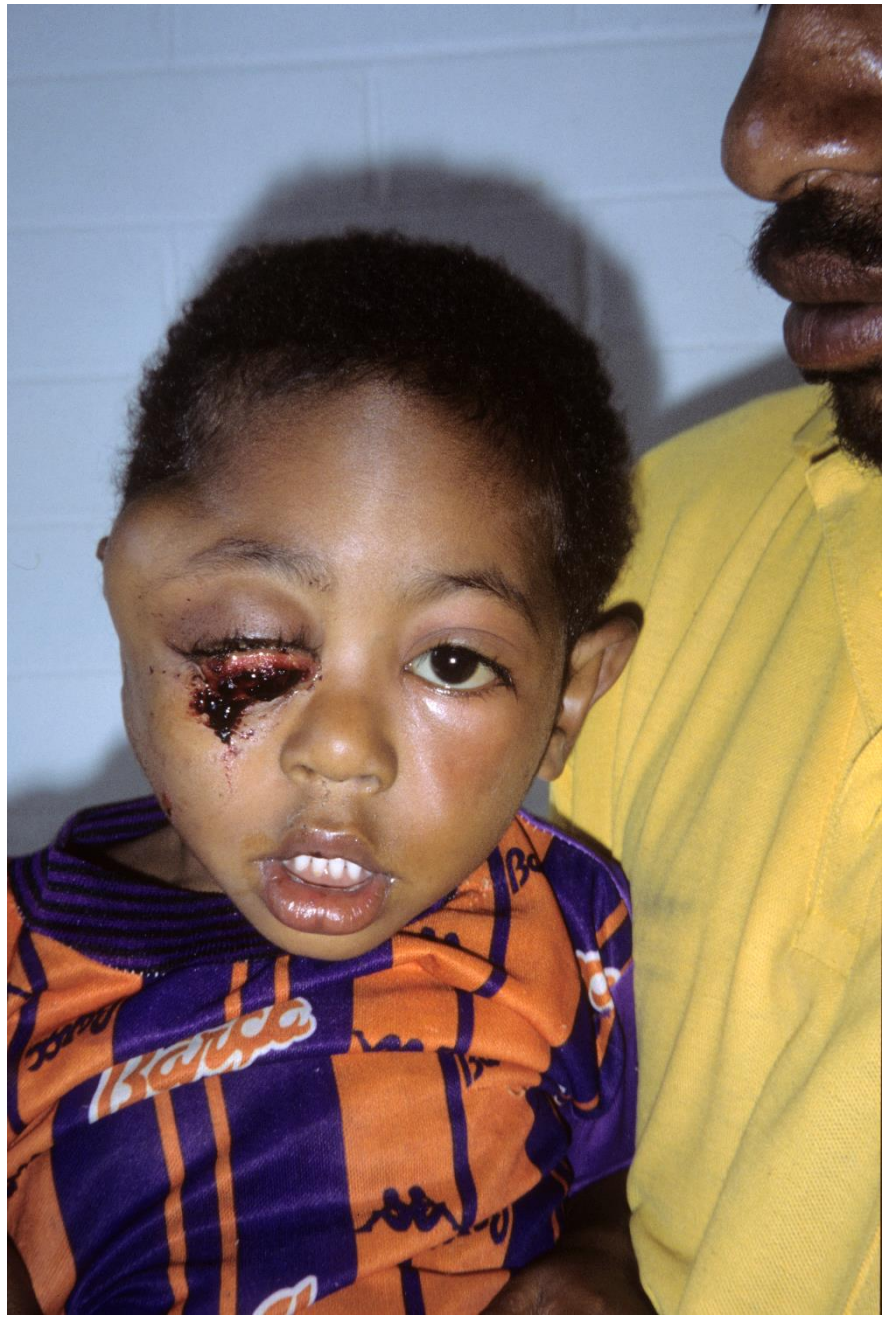


Burkitt treatment

- CHOP
  - Cyclophosphamide
  - Vincristine
  - Doxorubicin
  - Prednisolone
- Must start early, late treatment futile
- Tumour lysis syndrome will occur

Retinoblastoma

- *Heritable* retinoblastoma –associated with germline mutations (i.e., mutations in sperm and eggs in the retinoblastoma (RB1) gene
- Bilateral disease, multifocal disease (eyes and brain): 1/3 bilateral
- Leukocoria (white reflex), strabismus (squint), nystagmus, red eye
- <5 years (most <3 years)



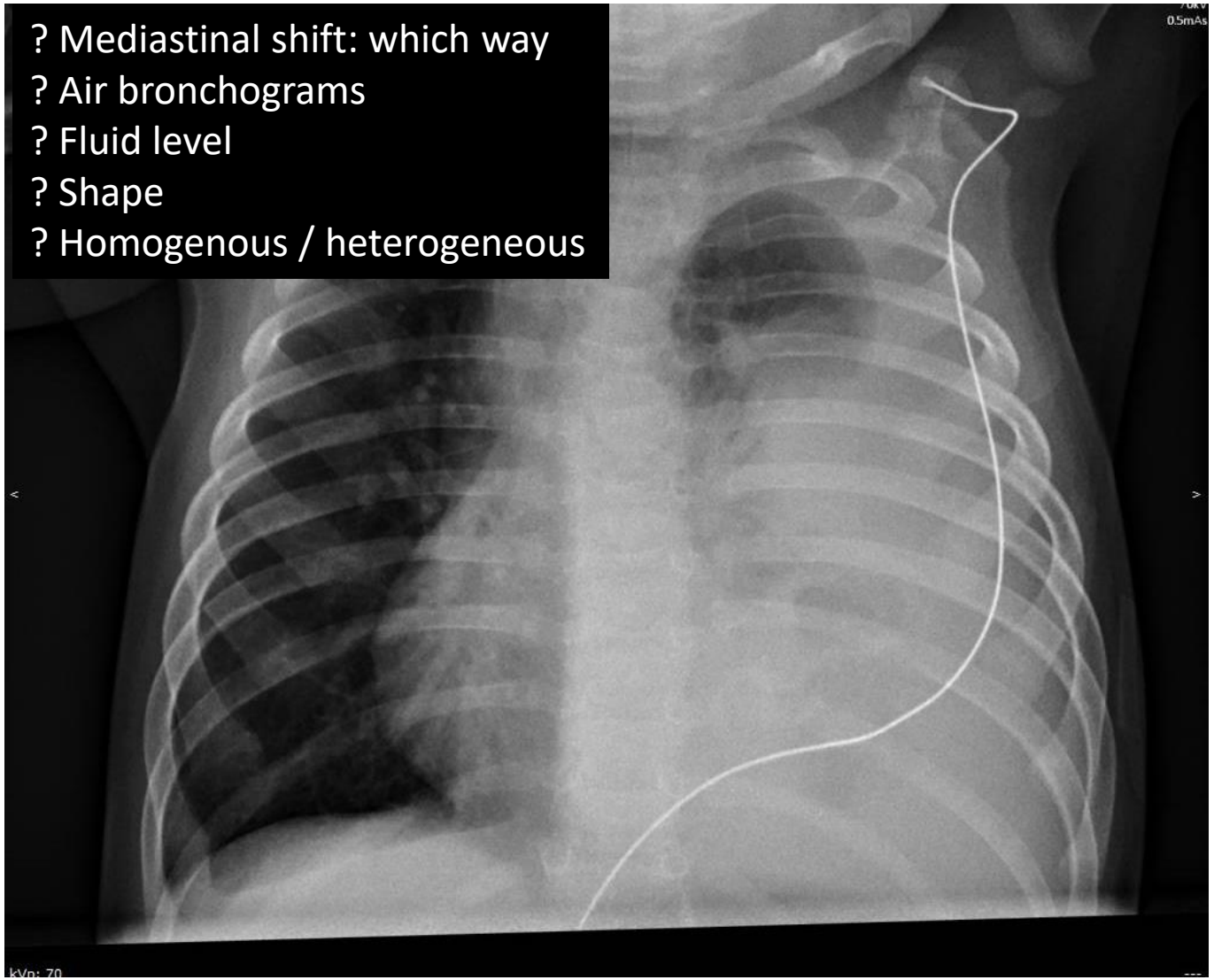
- First-line therapies:
  - Local and systemic chemotherapy
  - Cryotherapy
  - Laser photo-ablation
  - Radioactive plaques (I-125 brachytherapy)
  - Enucleation
- Depends on spread: involvement of vitreous or eye destroyed

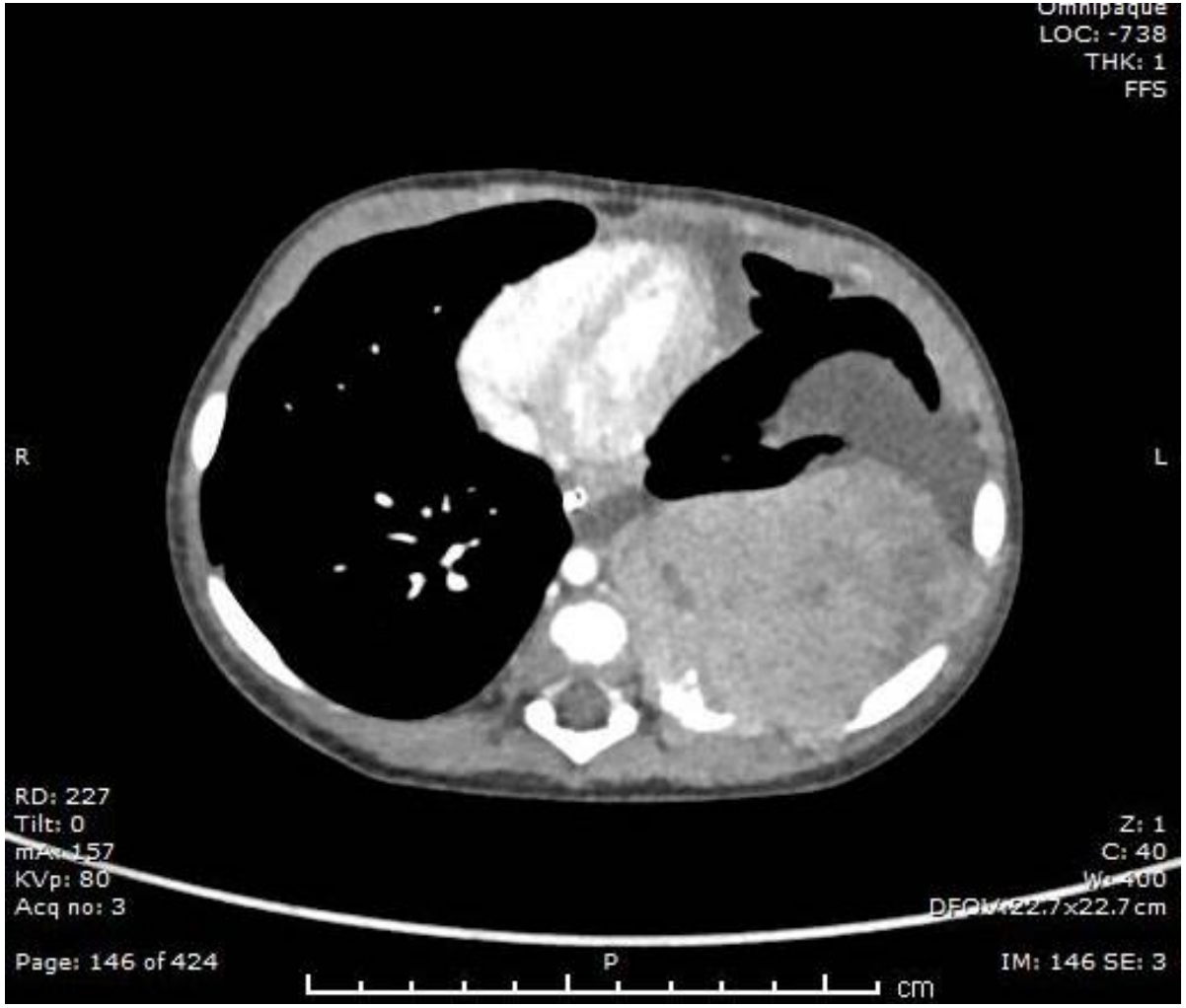
Chest tumours

- Thymus origin: T-cell lymphoma, thymoma
- Sympathetic ganglion: neuroblastoma (malignant), ganglioneuroma (benign)
- Sarcomas – tumours of muscle (rhabdomyosarcoma), bone (osteosarcoma)
- Teratoma (germ cell tumous)

Chest x-ray: white out of one lung

1. Fluid
   - Empyema
   - Effusion
   - Blood
   - Lymph
2. Consolidation
3. Collapse
4. Mass

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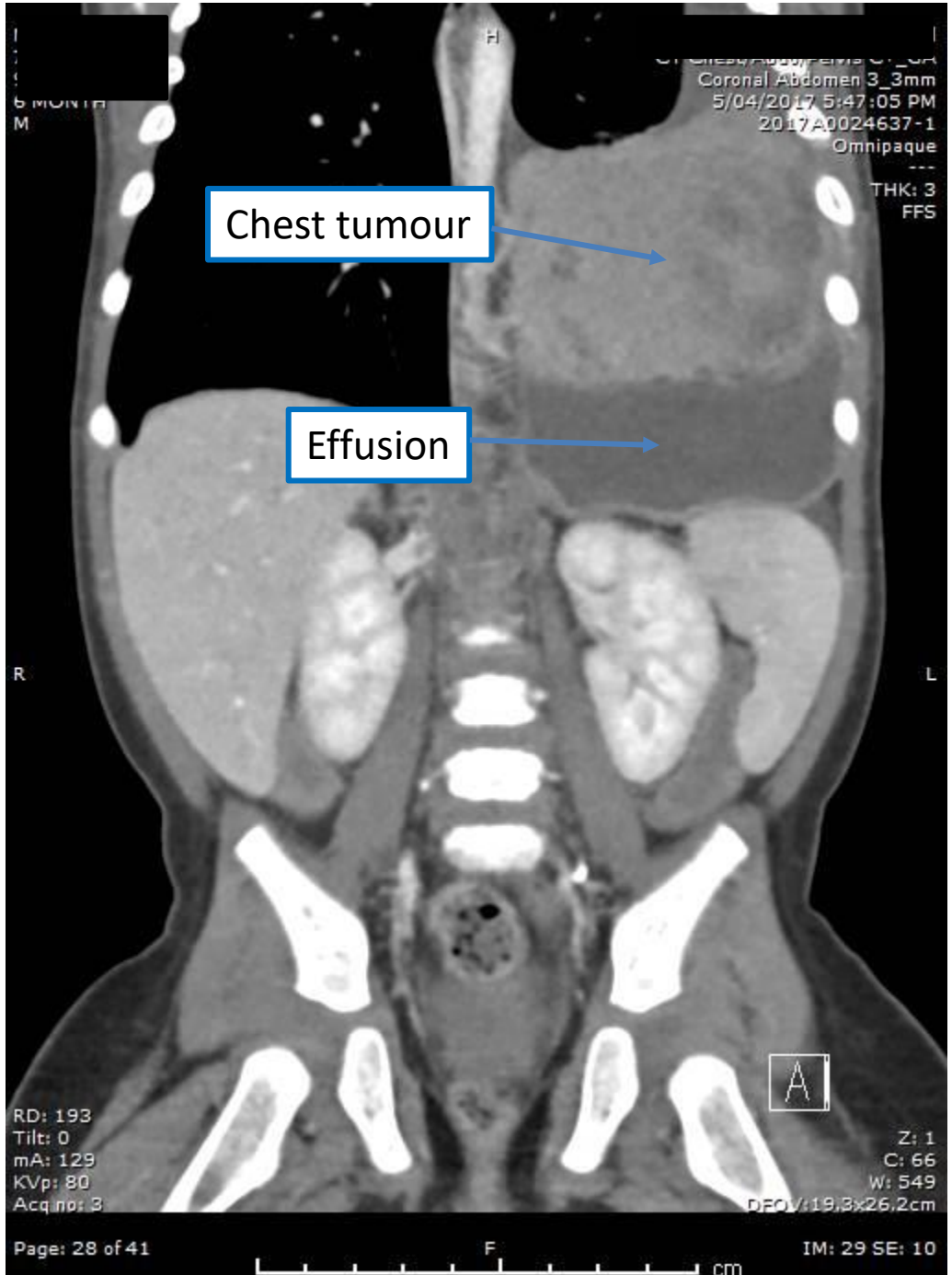
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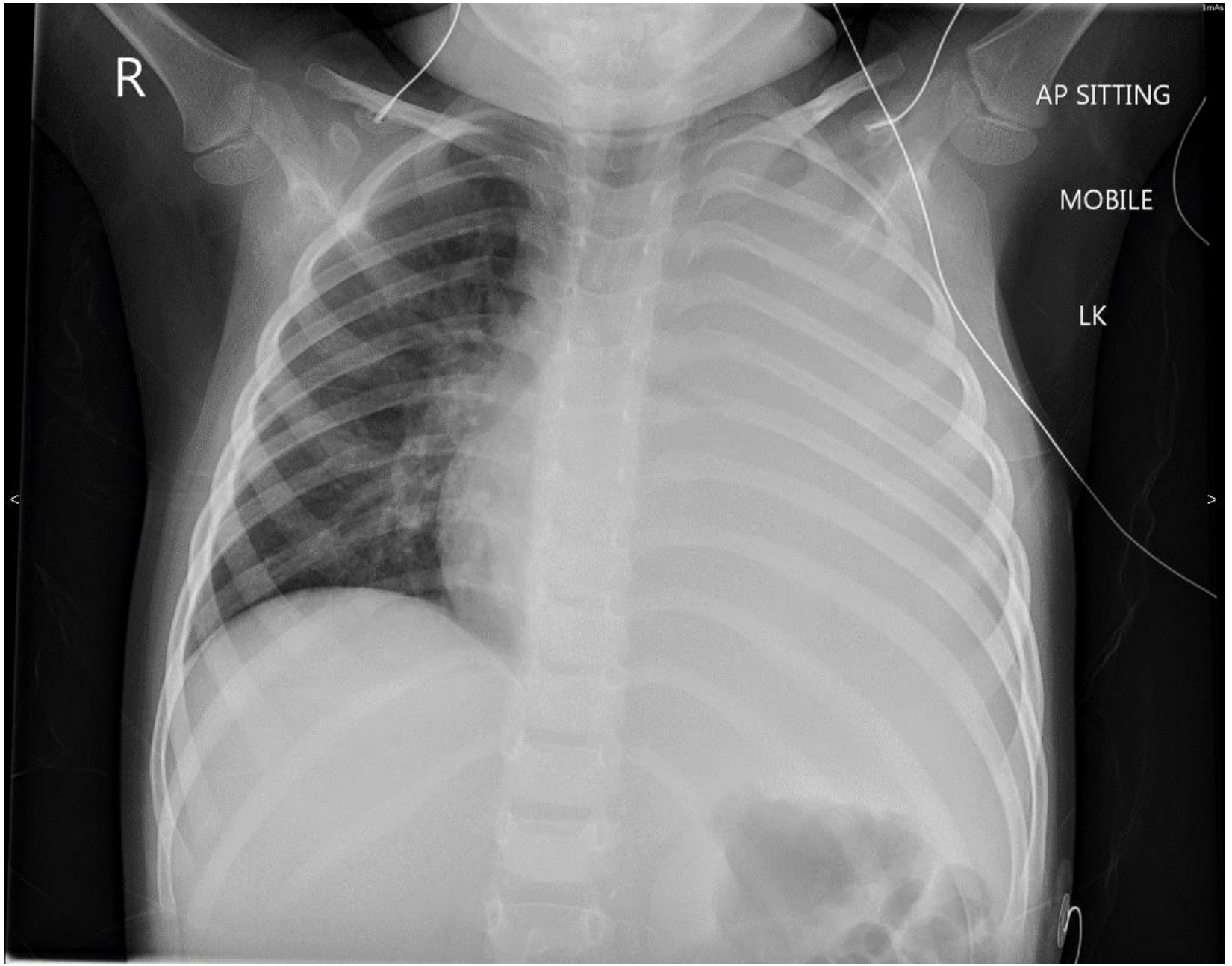
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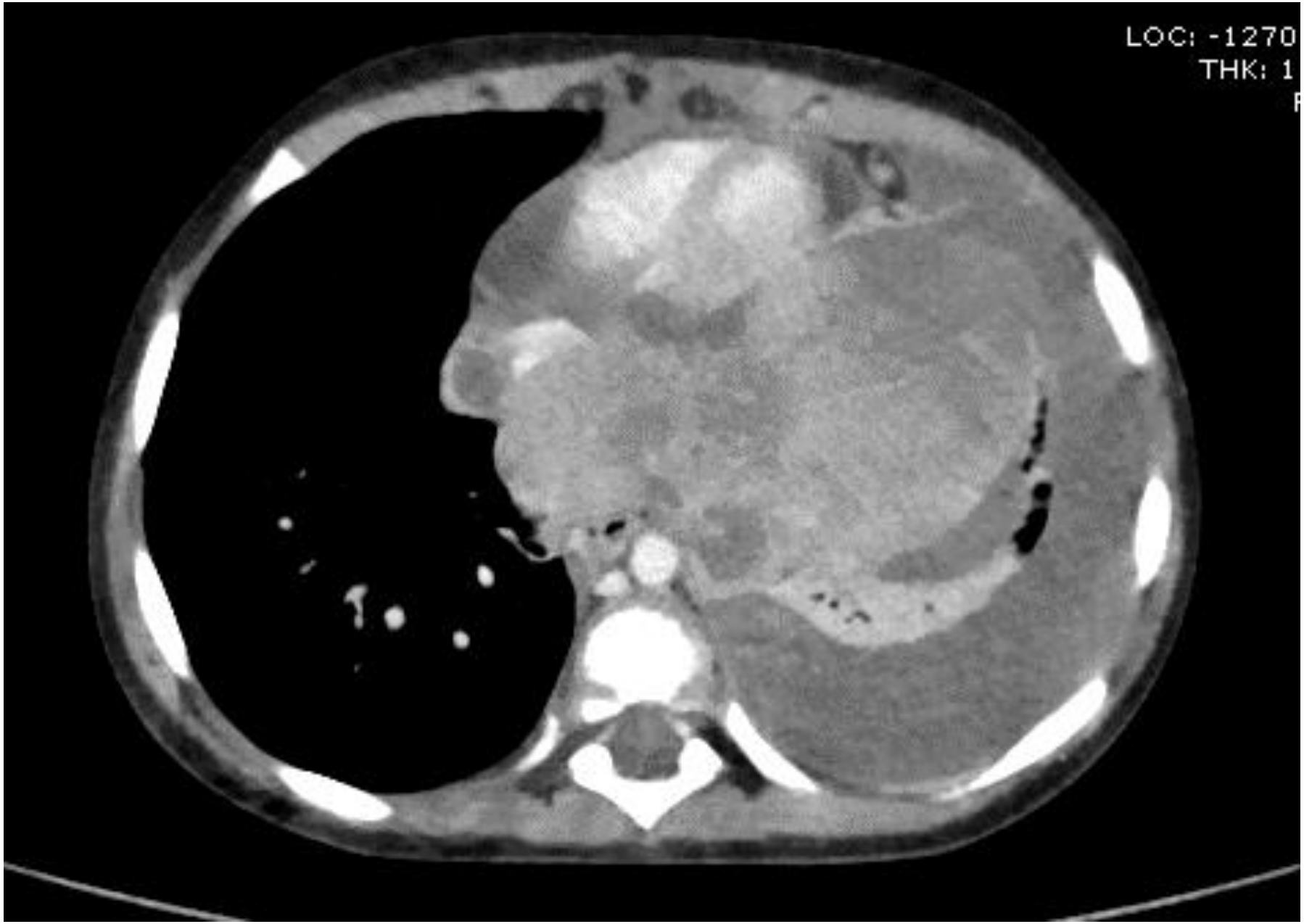
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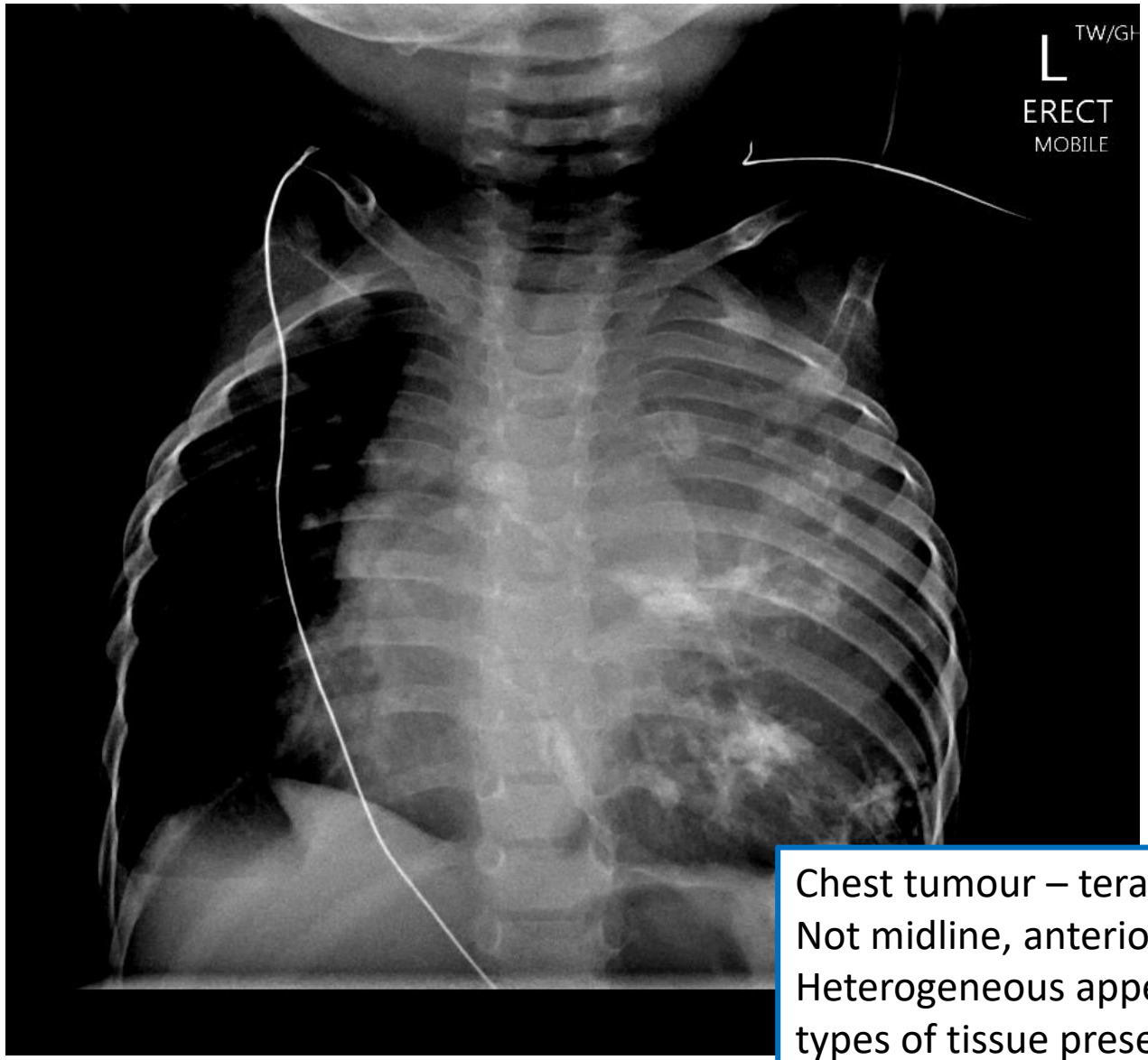
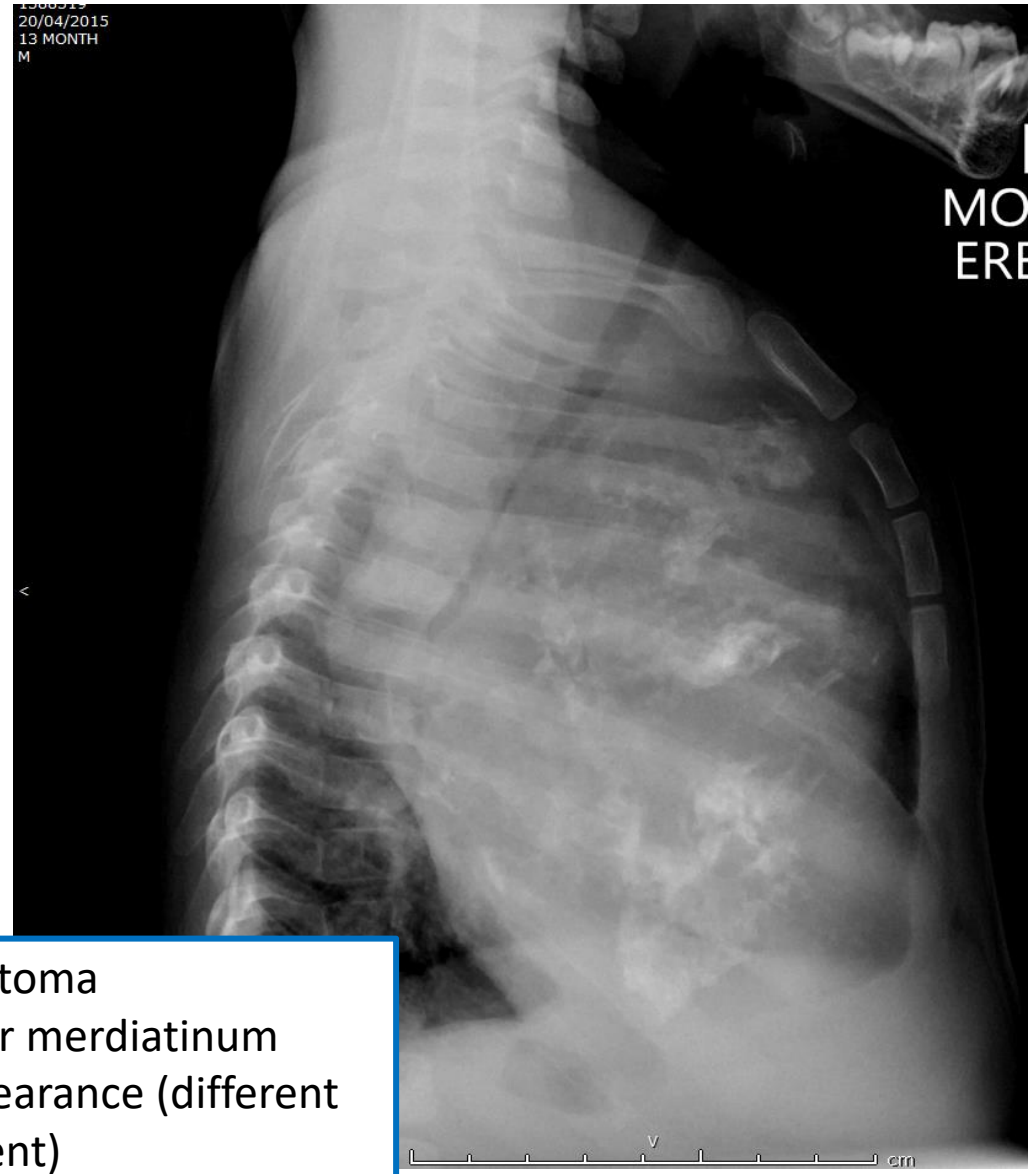
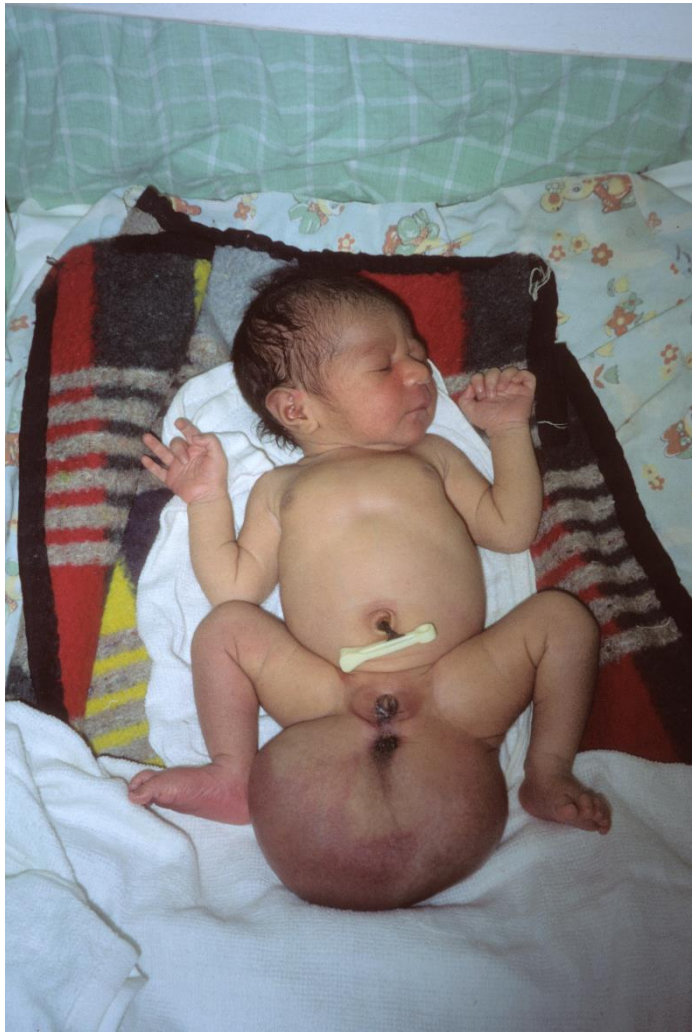




Chest tumour – teratoma
Not midline, anterior merdiatinum
Heterogeneous appearance (different types of tissue present)
Teratoma isd a germ cell tumour, so may have bone or connective tissue

Teratoma

- Germ cell tumours
  - Gonadal (testis and ovaries) and extra-gonadal
  - Tumour markers: βHCG and α-fetoprotein
  - Complete surgical excision
- Sacrococcygeal teratoma
  - Often benign, malignant transformation unlikely if fully excised in the first month of life

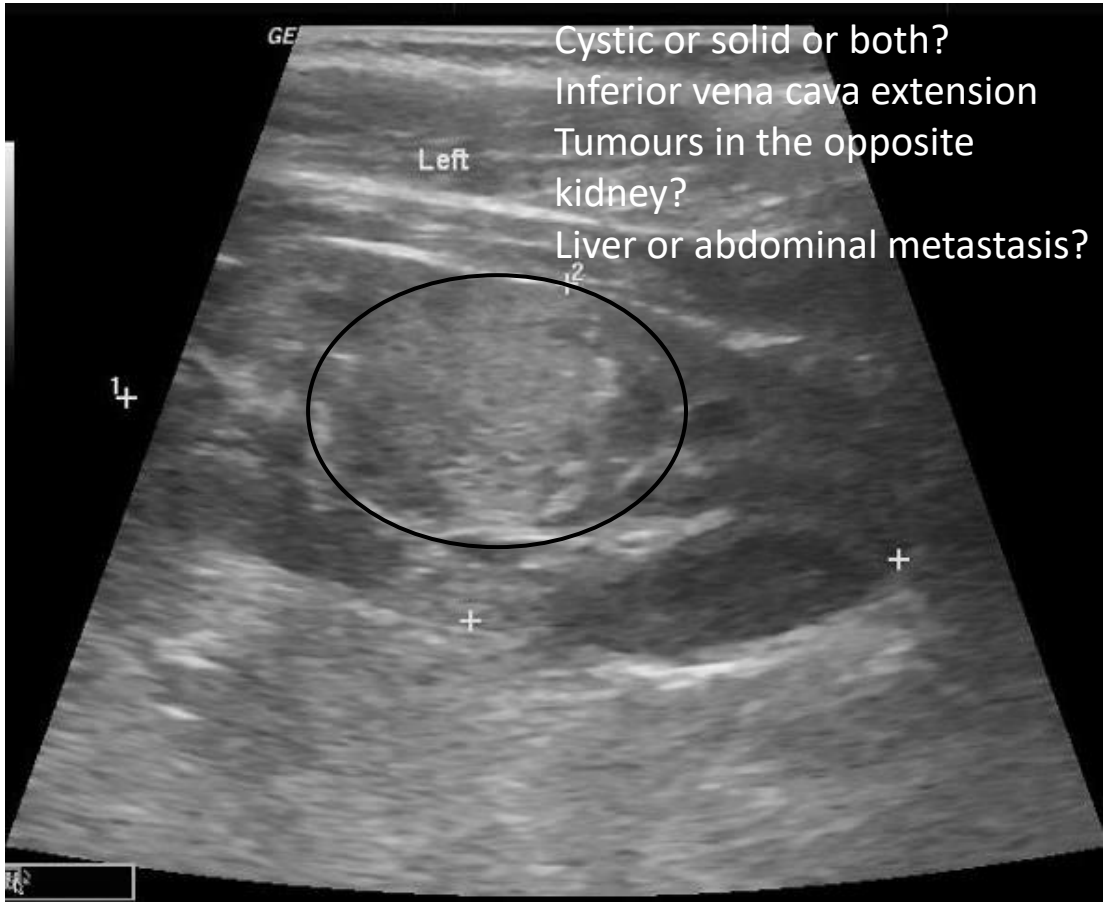


Abdominal tumours

- Wilms tumour
- Neuroblastoma
- Hepatoma
- Burkitt
- Teratoma

Wilms tumour

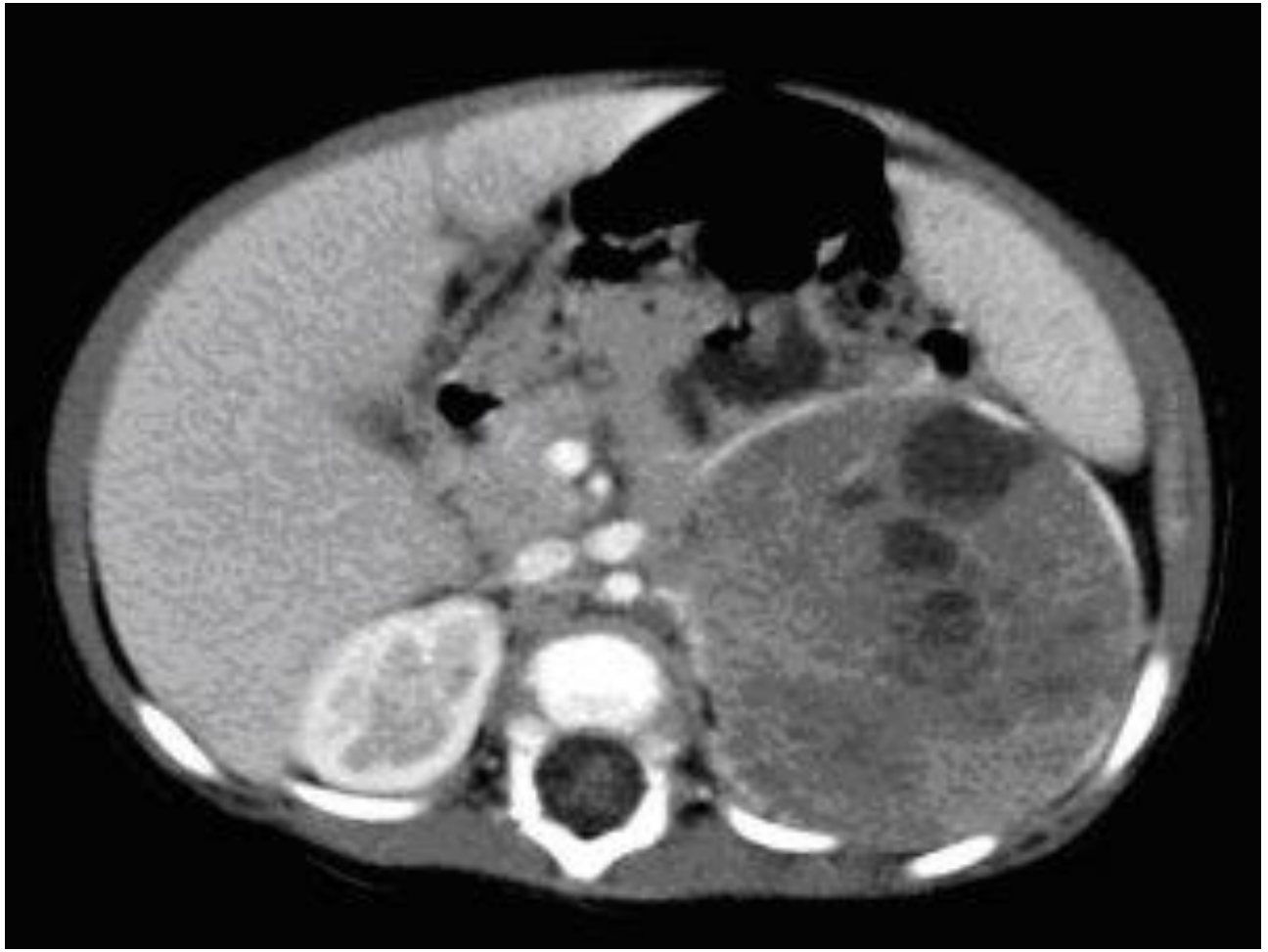
- Painless abdominal mass
- 20% bleed or rupture → pain
- Haematuria 25%, hypertension
- Some associated with congenital anomalies – hypospadias, hemihypertrophy, aniridia
- Most unilateral, 7% bilateral, 12% multifocal
- Metastasise to liver and lung
- Extension to renal vein 5%



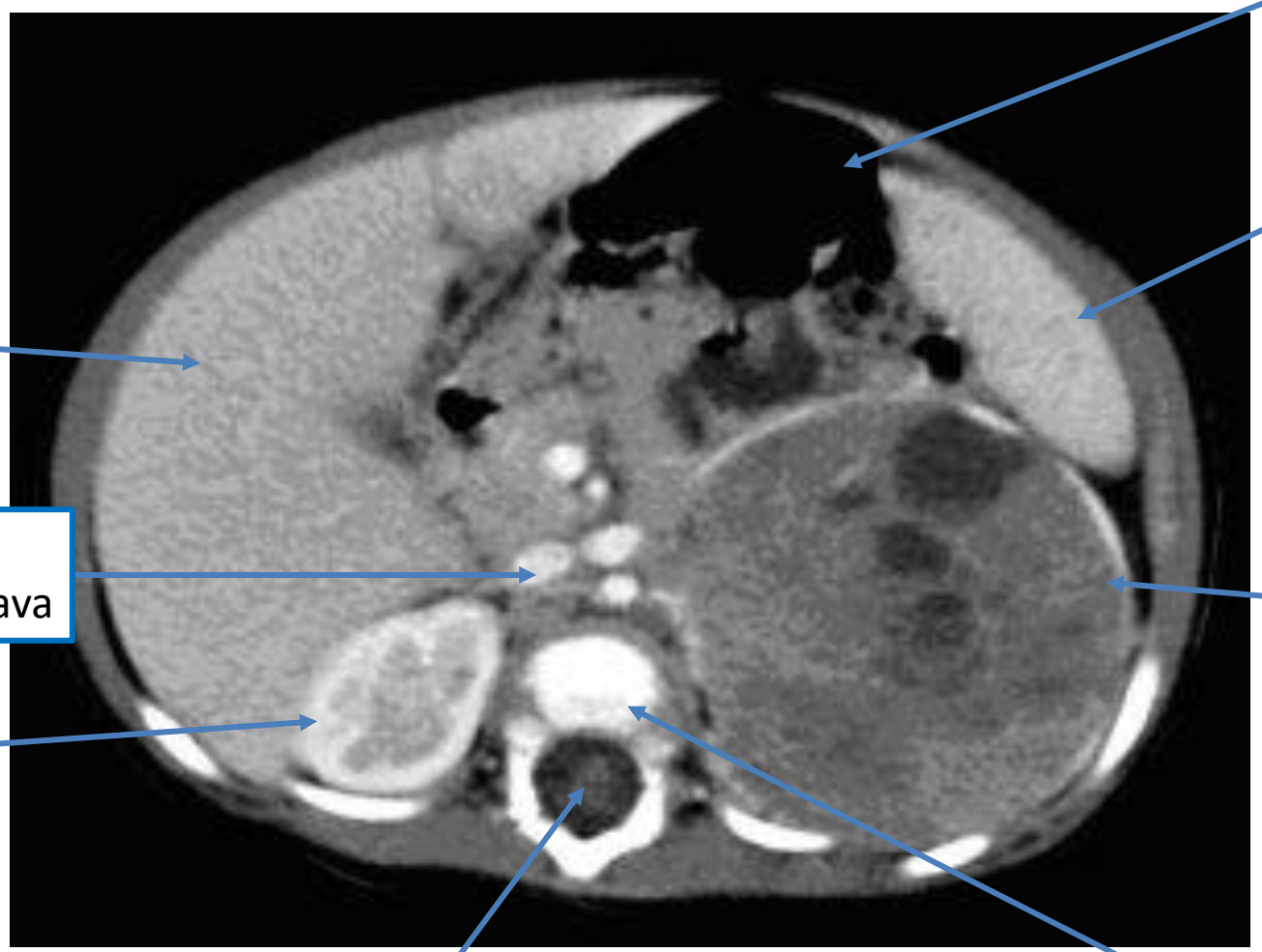
Wilms tumour – treatment and prognosis

- Surgery + chemotherapy (15-25 weeks)
- Preoperative chemotherapy reduces tumor volume, makes surgical excision easier, decreasing the likelihood of tumor spillage
  - Doxorubicin
  - Actinomycin
  - Vincristine
- Prognosis
  - Very good: 90% 5-year survival if tumour in early stages (no lung or bone metastases, favourable histology)
  - Anaplastic histology – poorer prognosis

Neuroblastoma



Neuroblastoma



Gas in stomach air = black

Spleen

Liver

Blood vessels:
Aorta, inferior vena cava

Right kidney

Tumour, above left kidney
Heterogeneous, areas of hypodensity (dark = water)

Spinal cord

Vertebral body (bone = dense = white)

Neuroblastoma

- Tumour of the sympathetic nervous system – arise from neural crest cells
- Adrenal gland (40%)
- Sympathetic ganglia: abdominal (25%), thoracic (15%), cervical (5%), pelvic (5%)
- Abdominal pain, mass, constipation, anaemia, opsomyoclonus (dancing eyes), para-spinal mass, lower limb oedema, failure to thrive
- Metastases: lymph nodes, bone, dura, orbits, liver, skin, lung, brain

Neuroblastoma

- Compared to Wilms tumour, children often much more unwell, anaemia, FTT and metastases more common
- Unusual features:
  - Infants with disseminated disease (stage 4S): good outcome following treatment with chemotherapy and surgery
  - Children older than one year of age with stage 4 disease high mortality despite intensive multimodality therapy.
  - Secrete catecholamines
- Cyclophosphamide, carboplatin or cisplatin, etoposide, doxorubicin

Recognising paediatric cancer: start with the common symptoms

- Differential diagnosis of:
  - Pallor
  - Easy bruising
  - Bone pain and refusal to walk
  - Frequent infections
  - Lump
  - Abdominal mass
  - Chest mass
  - Proptosis