MMed and DCH Lectures

Weekly by Zoom

Prof Trevor Duke

MMed and DCH Lectures

Paediatric oncology I

June 21, 2020

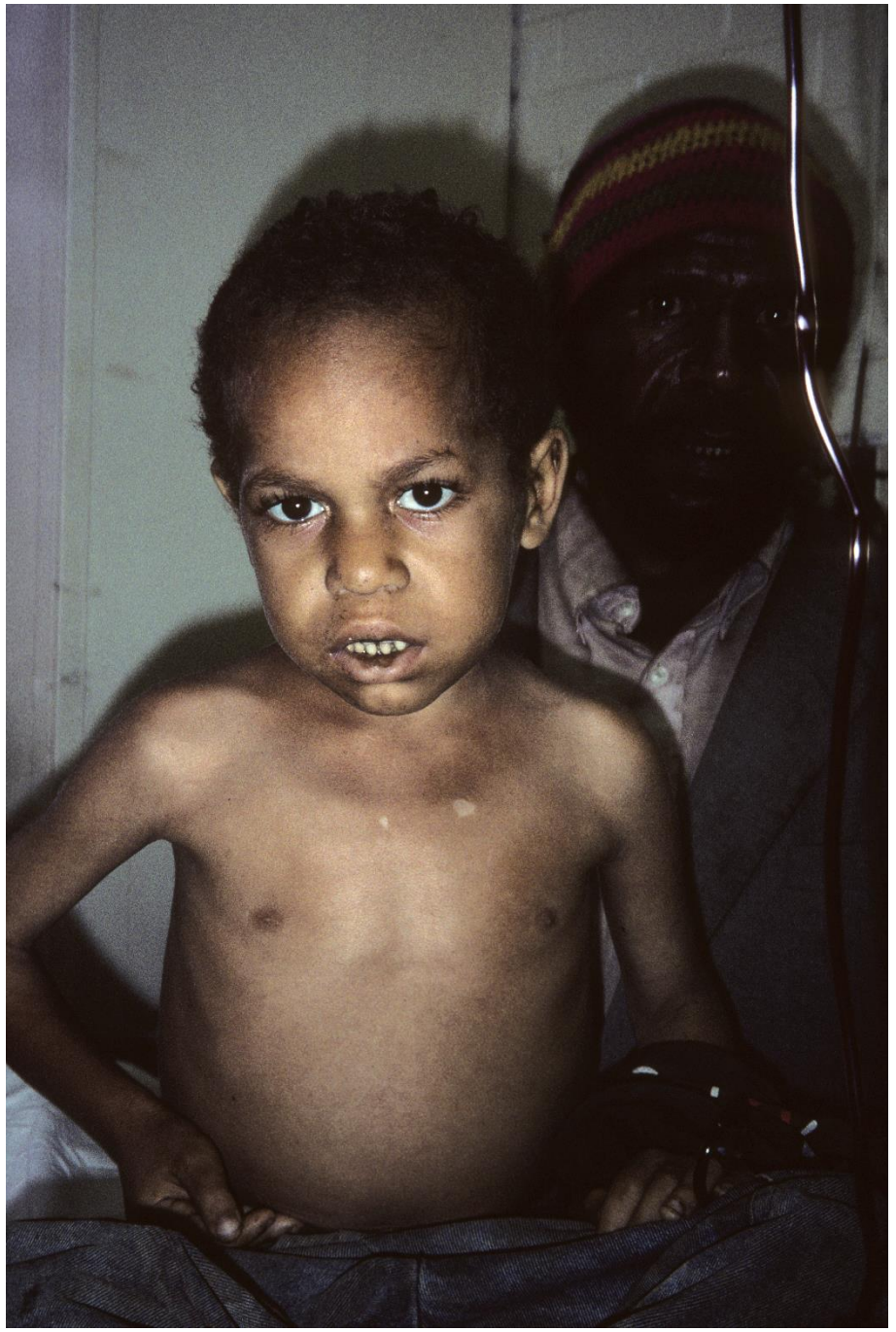
Prof Trevor Duke

Cancer in children

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

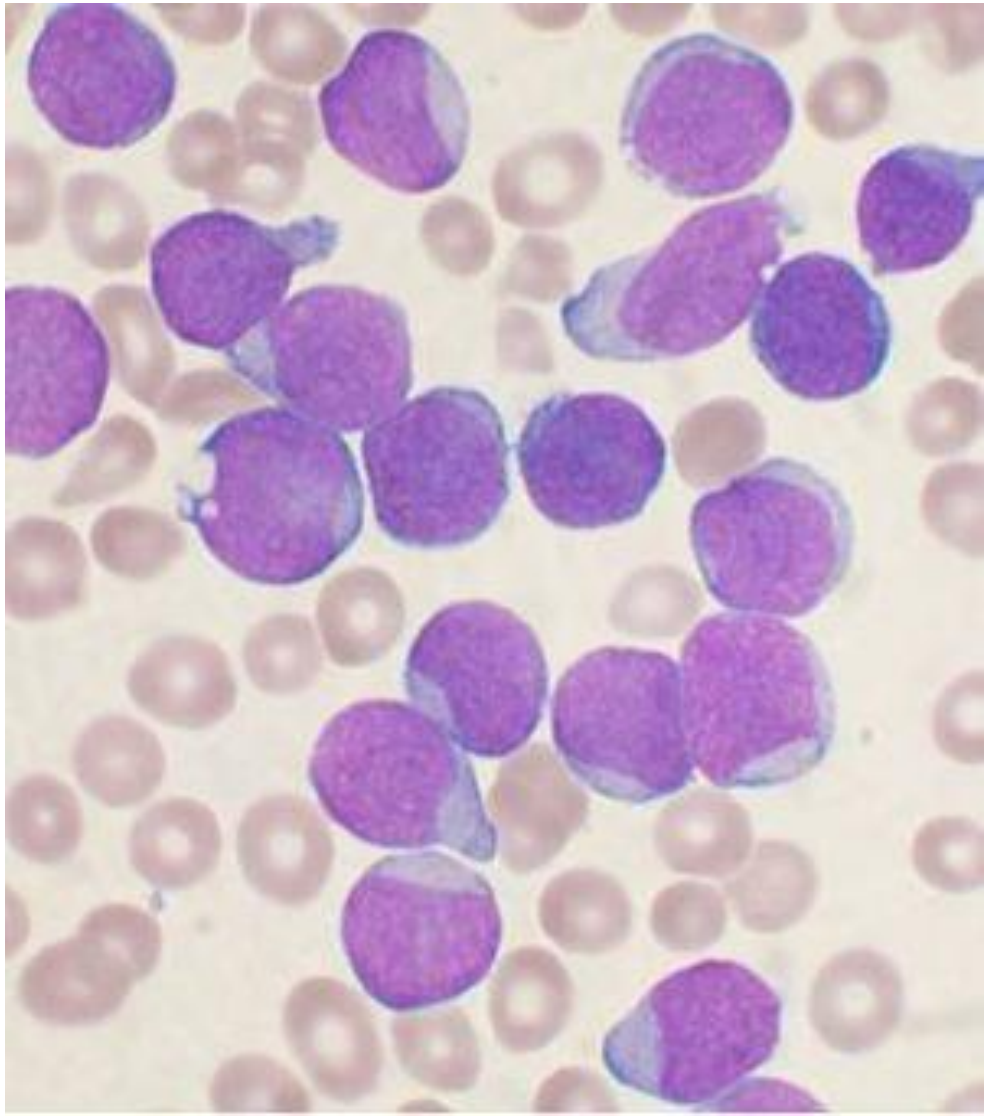
Acute leukaemia

- 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: leukaemnic 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

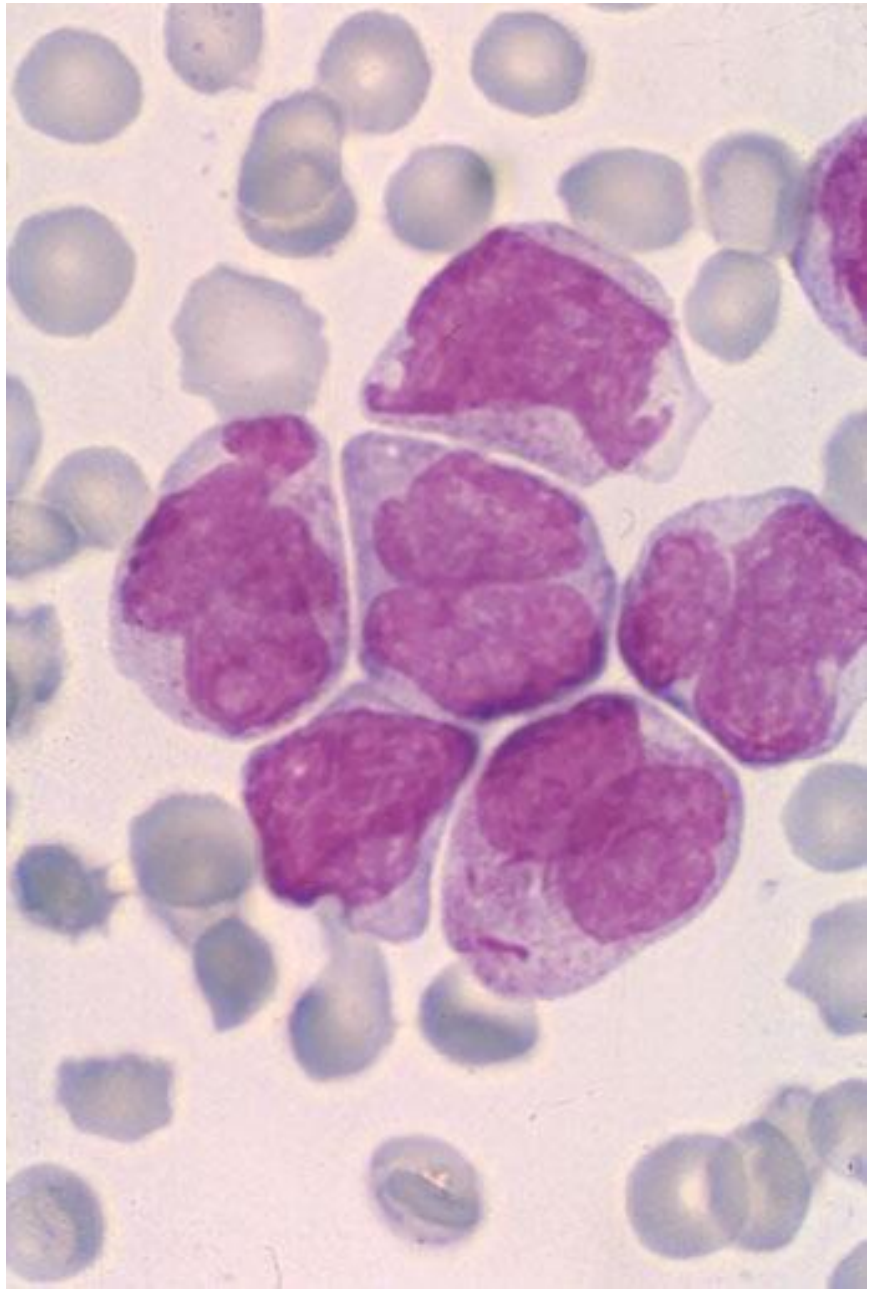


Treatment

- Phases
  1. Induction (1 month) – vincristine, asparaginase, prednisolone, duanorubicin
  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

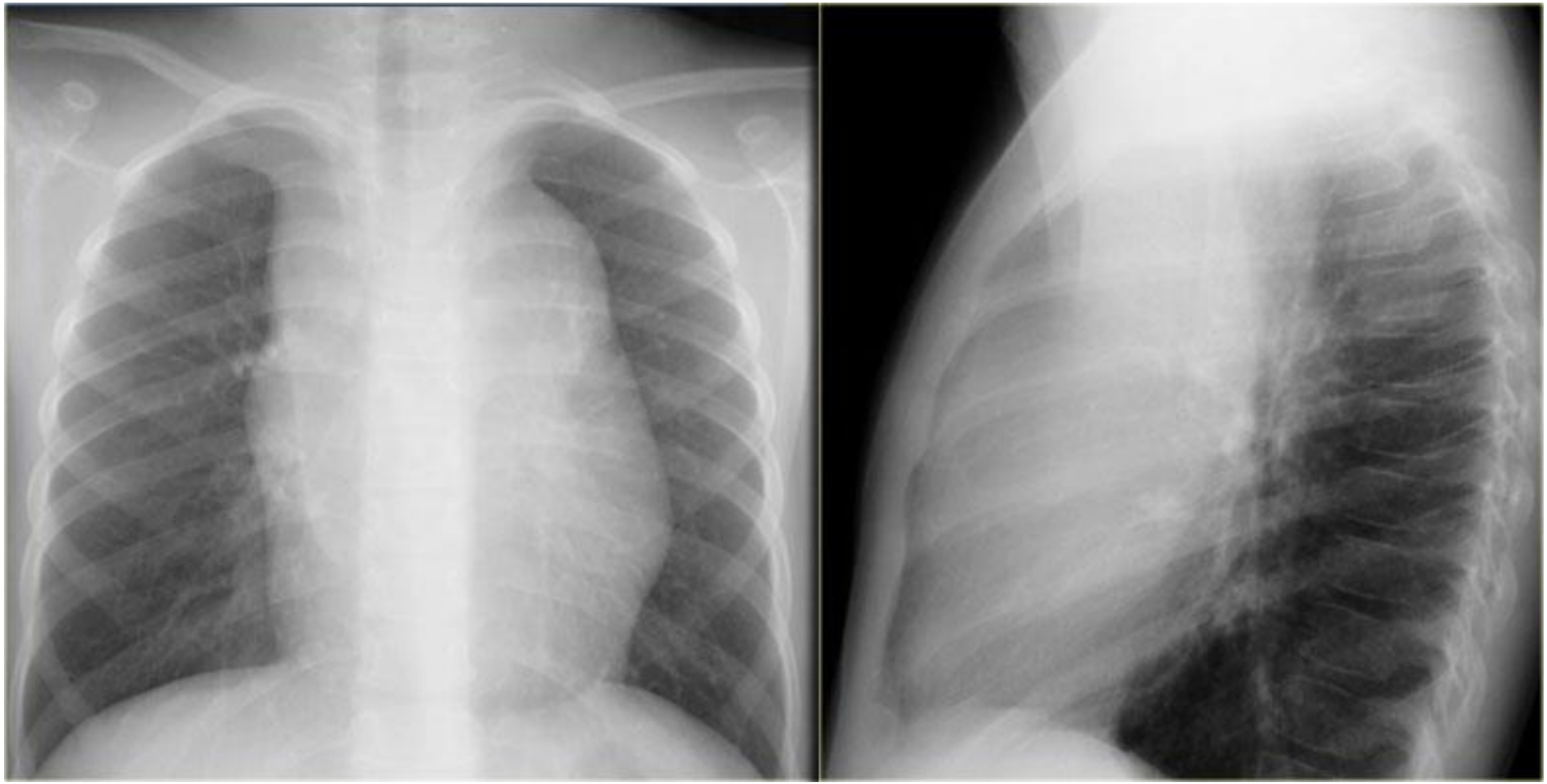
AML

- 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



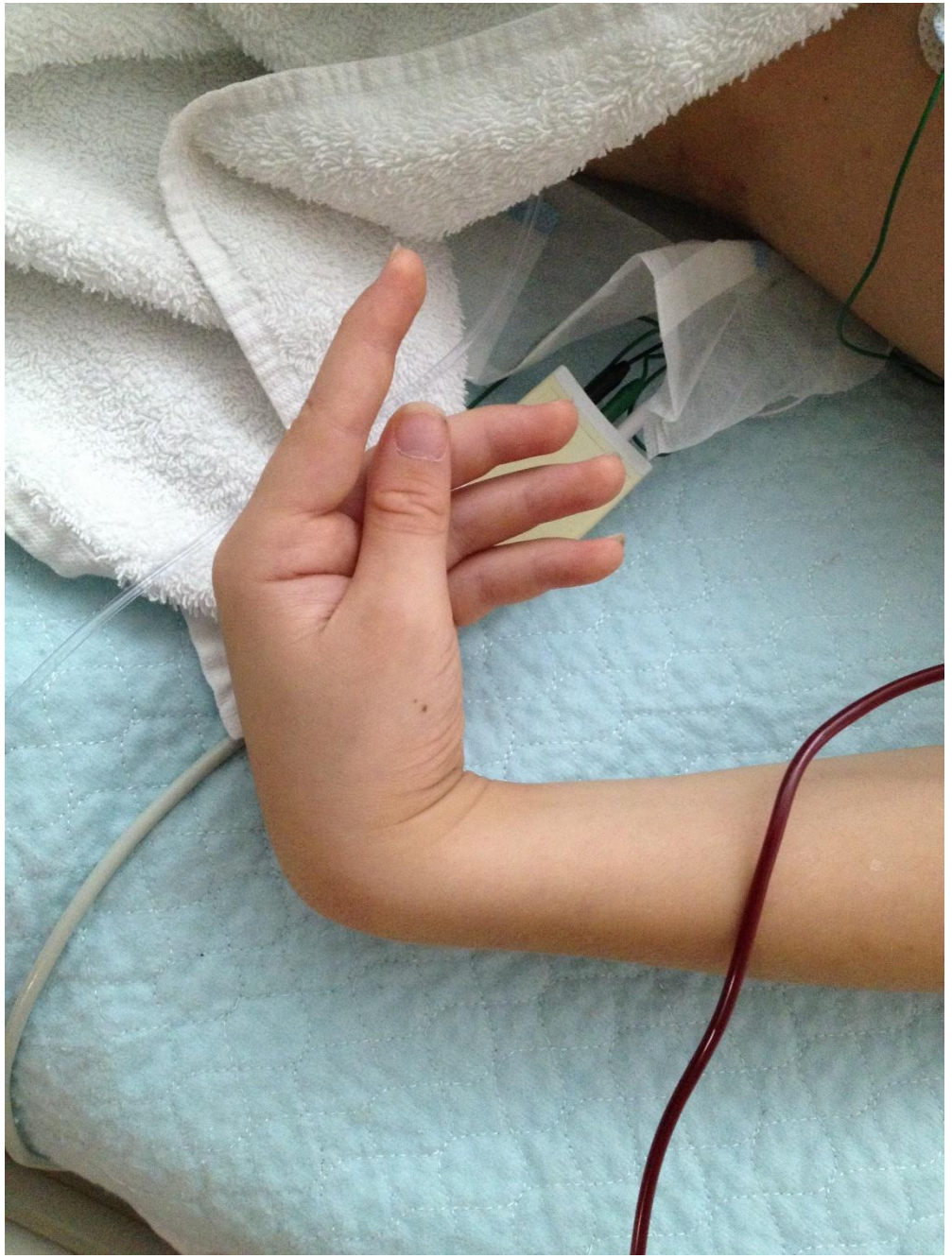
Oncology emergencies: Tumour lysis syndrome

- 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

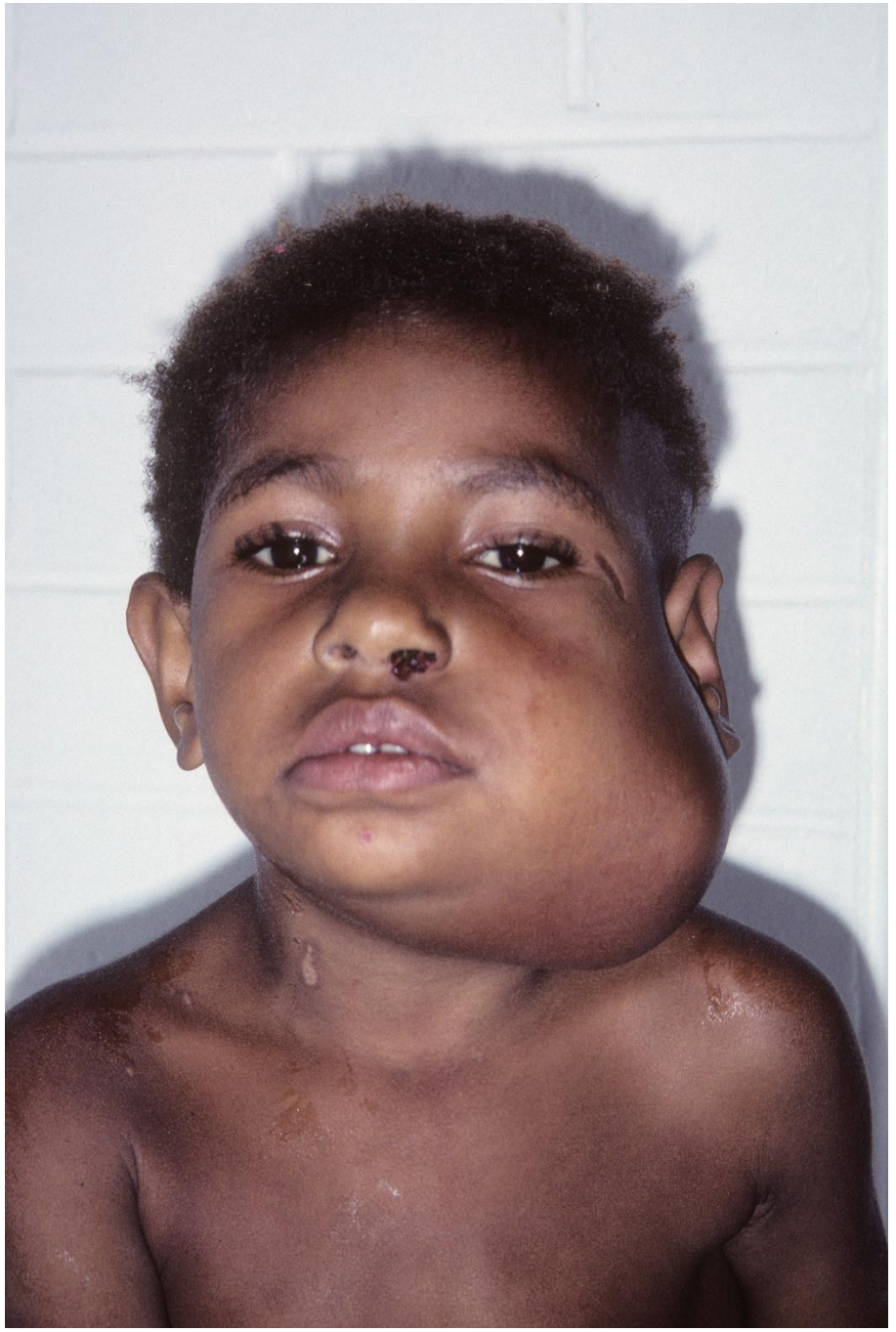
Prevention with:

- Allopurinol / rasburicase
- Hyperhydration with isotonic solution + $NaHCO_3$
- Alkilinise urine (pH 7-8)
- Don’t give IV calcium



Burkitt lymphoma

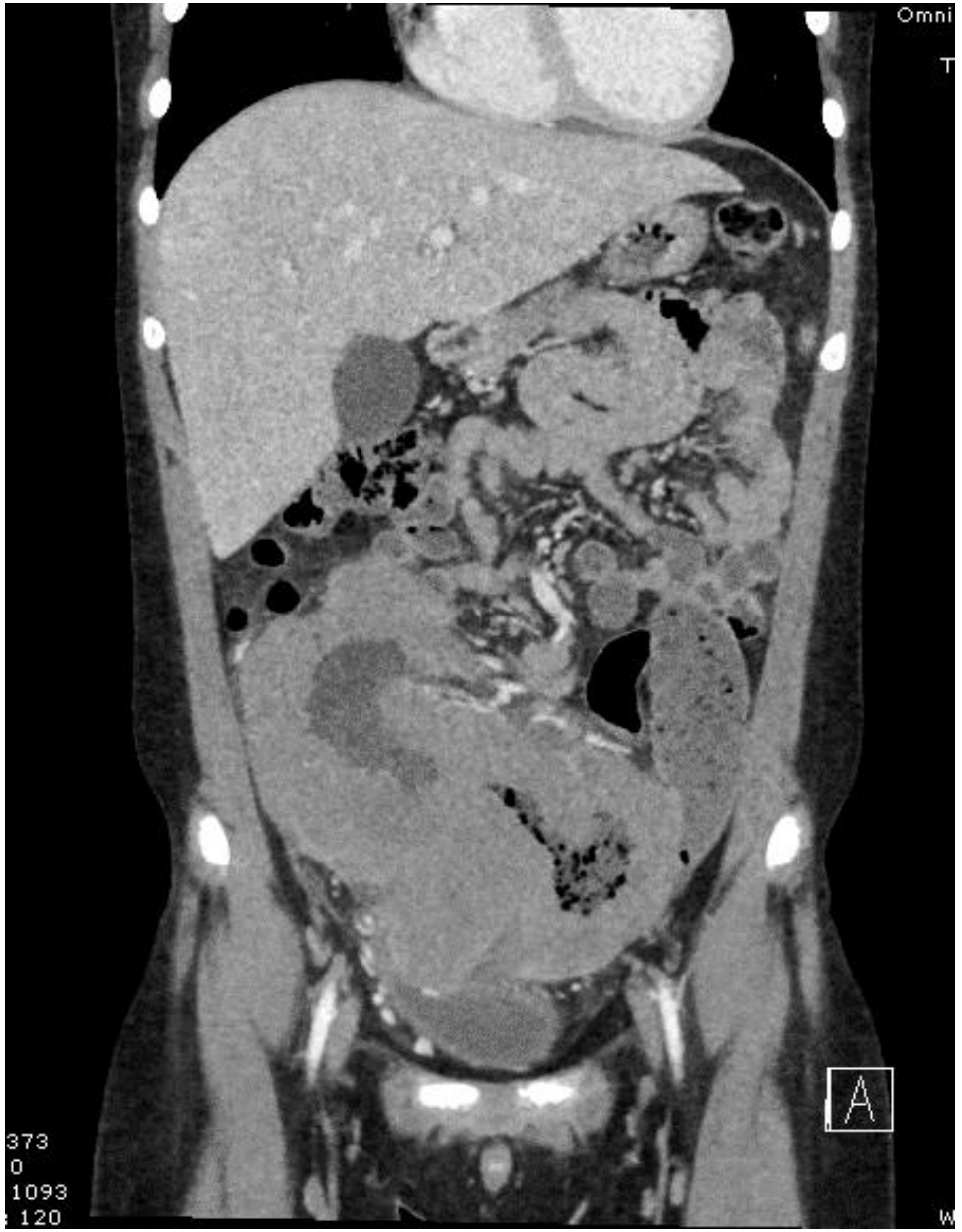
- Fastest growing human cancer
- Fever, weight loss, night sweats, painless lymphadenopathy
- Associated with EBV, HHV8, HIV
- Airway obstruction, GI tract obstruction, spinal cord compression
- Pancytopenia, raised uric acid, LDH↑↑
- “C-myc proto-oncogene” t(8:14) reciprocal translocation
- Endemic: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



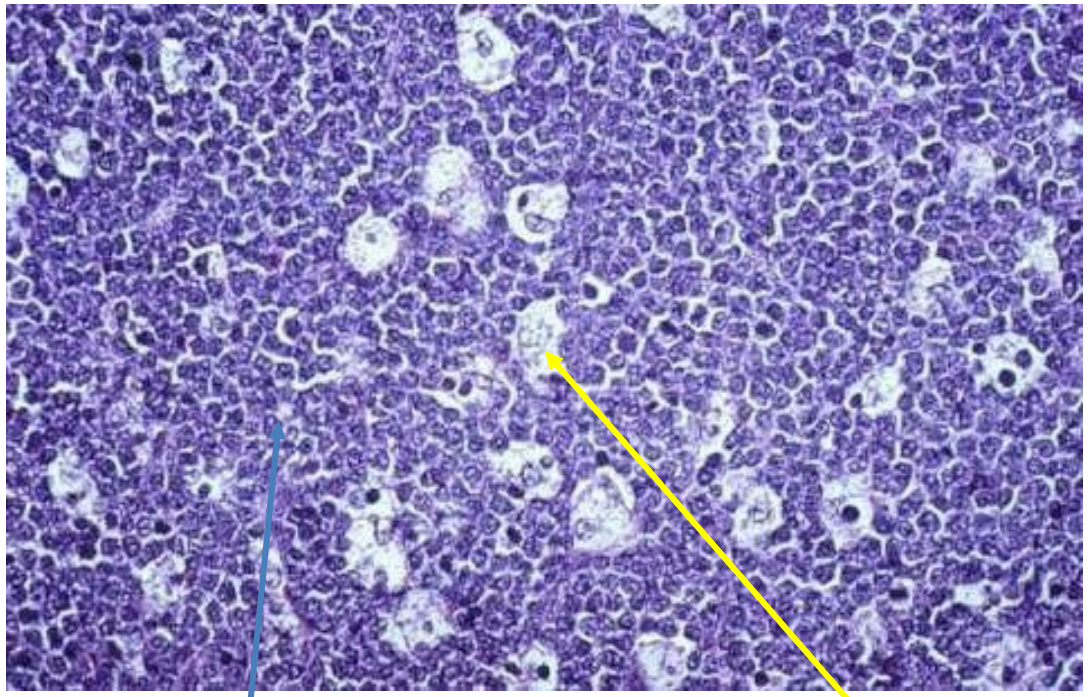
Burkitt lymphoma in PNG

- 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

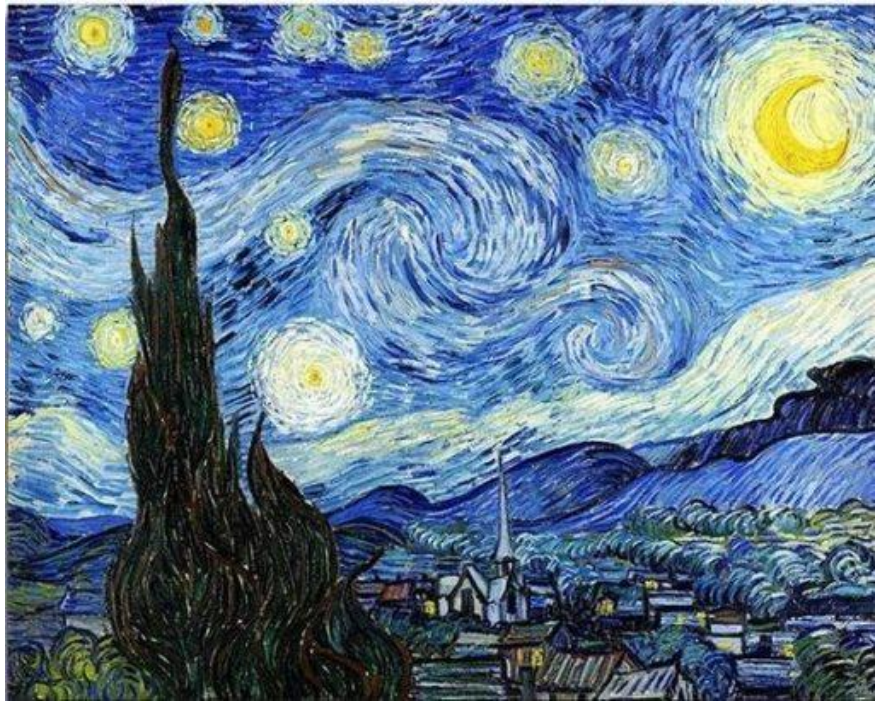


Starry sky histology



Sky: Neoplastic B-cells

Stars: Reactive histiocytes

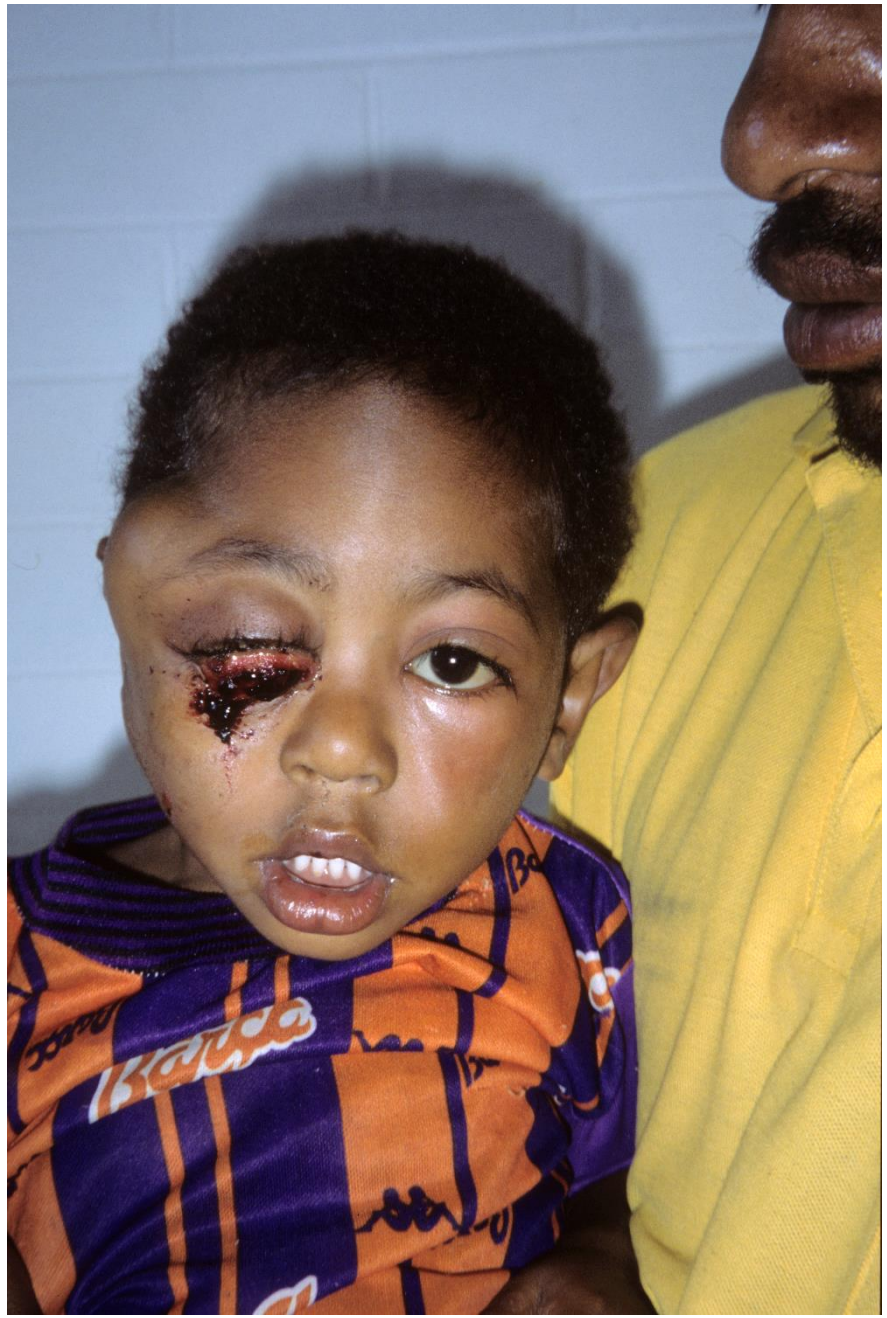


Burkitt treatment

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

Retinoblastoma

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



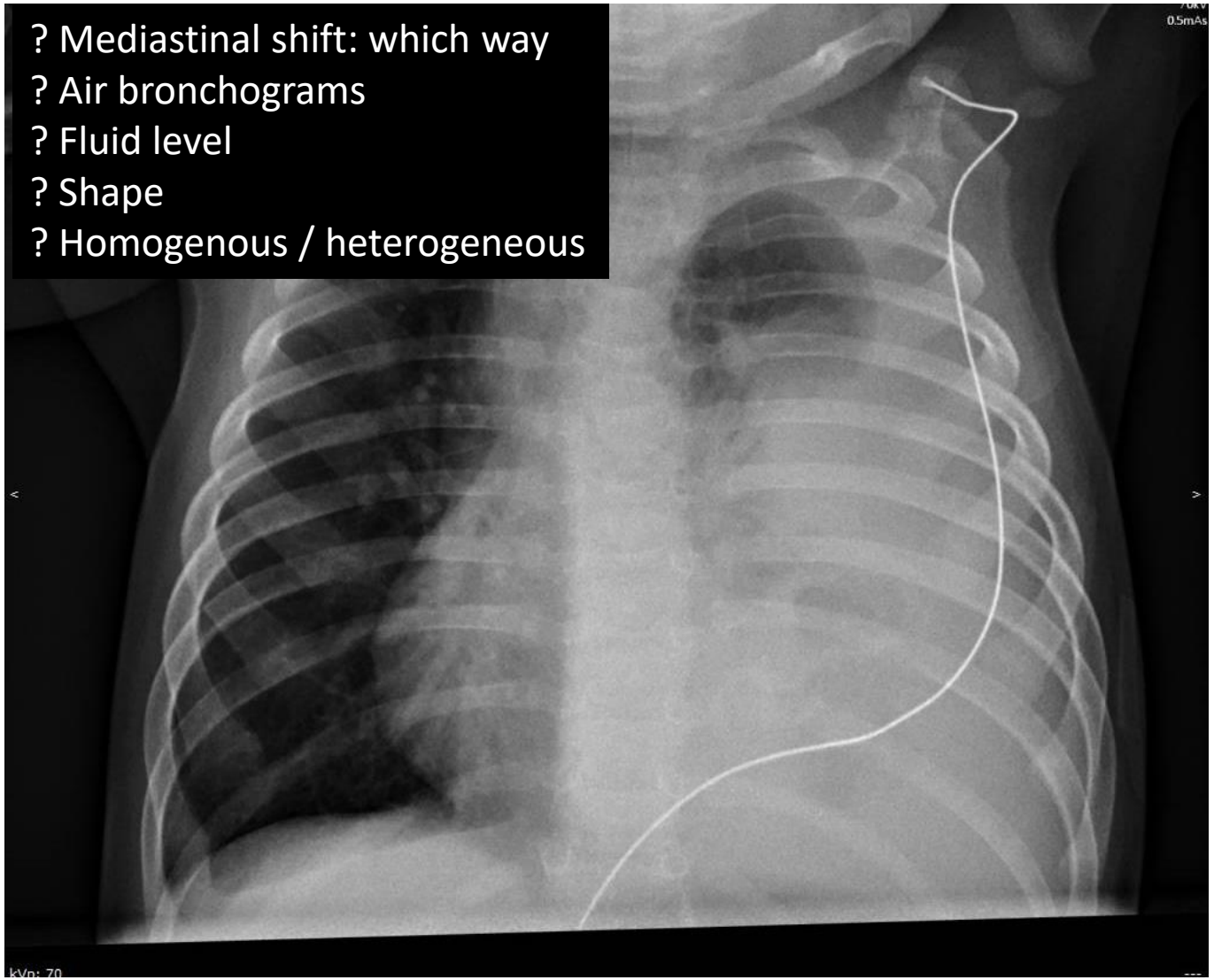
- First-line therapies:
  - Local and systemic chemotherapy
  - Cryotherapy
  - Laser photoablation
  - Radioactive plaques (I-125 brachytherapy)
  - Enucleation
- Depends on spread: involvement of vitreous or eye destroyed

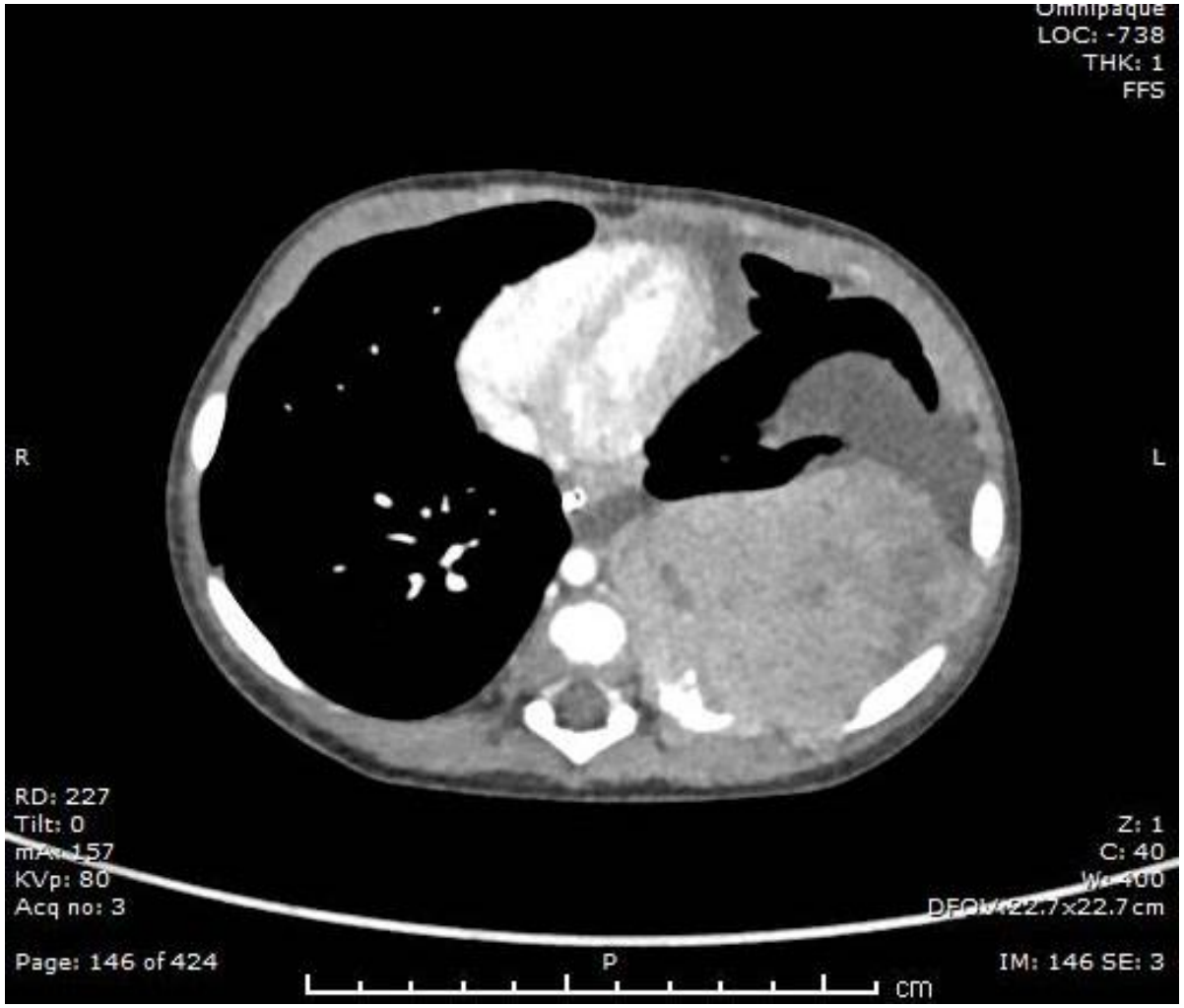
Chest tumours

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

Chest x-ray: white out of one lung

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

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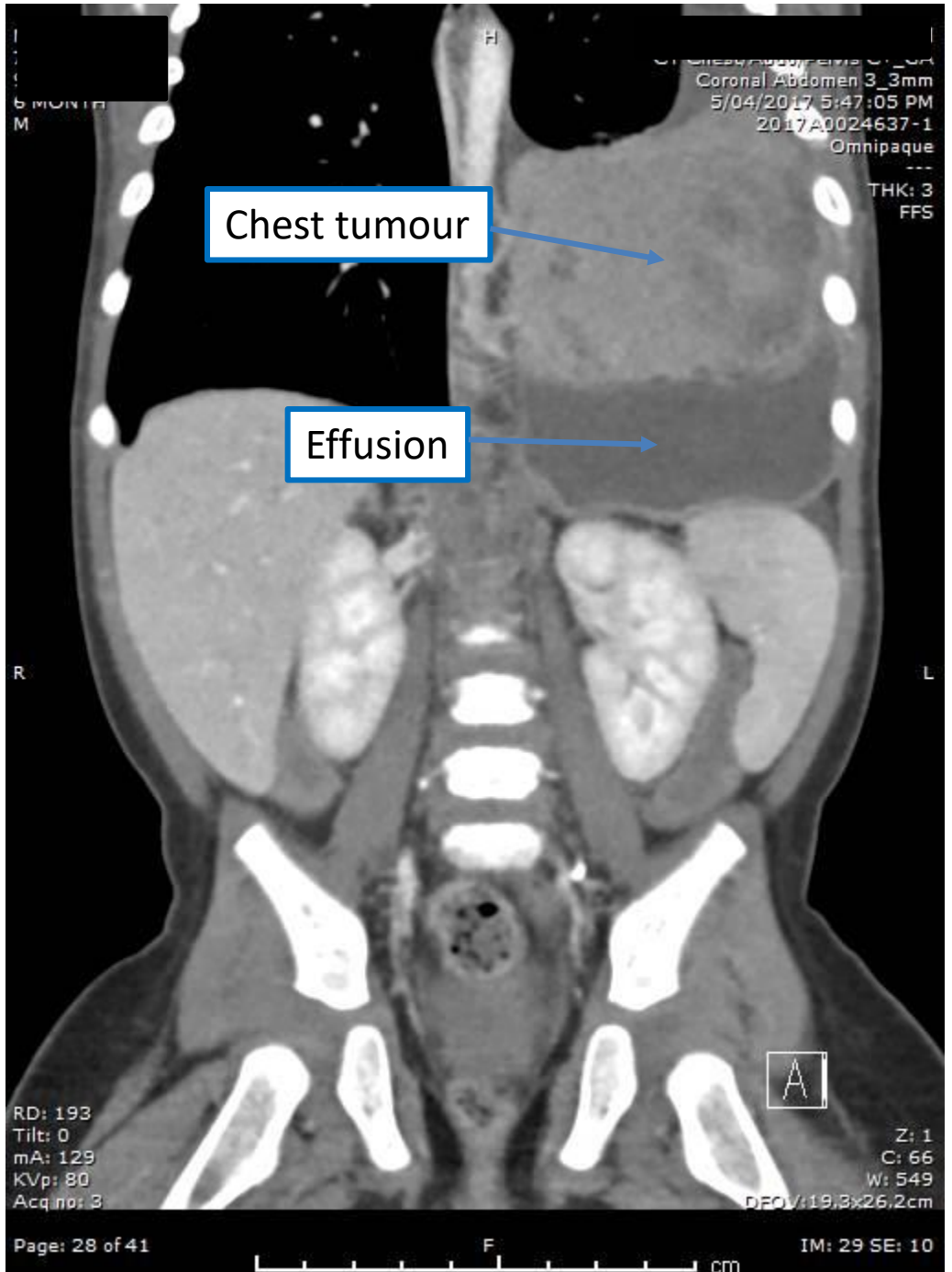
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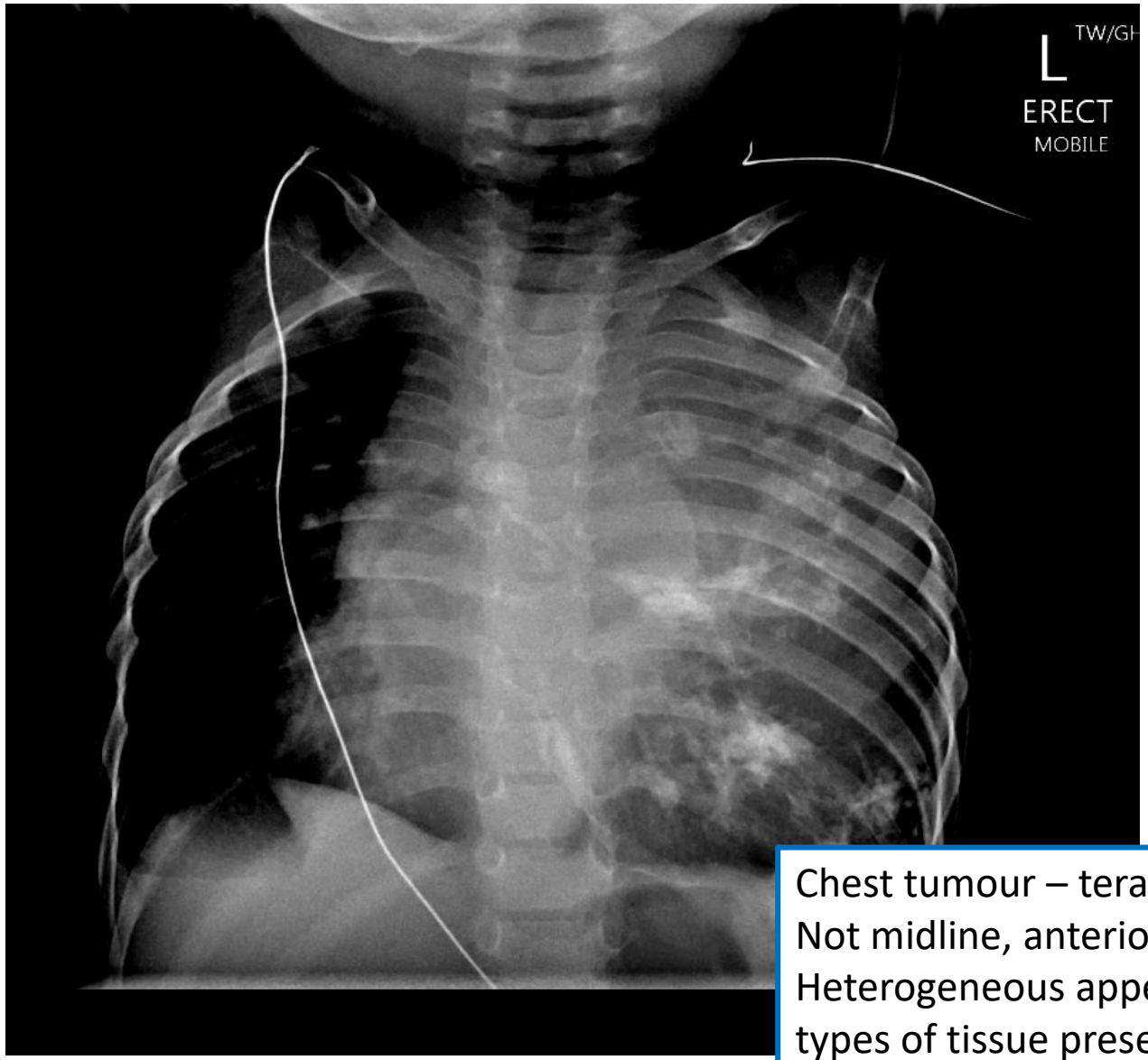
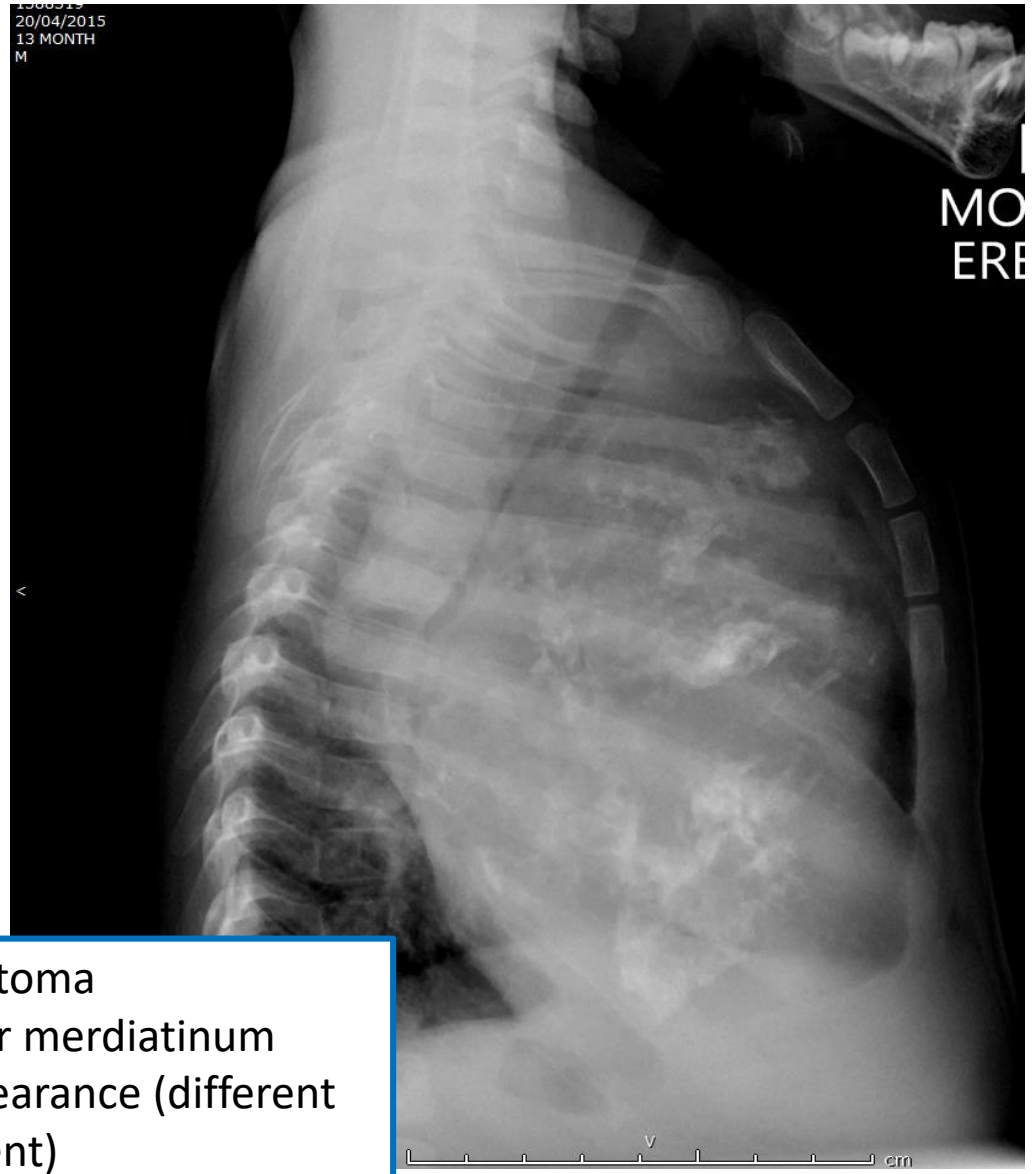
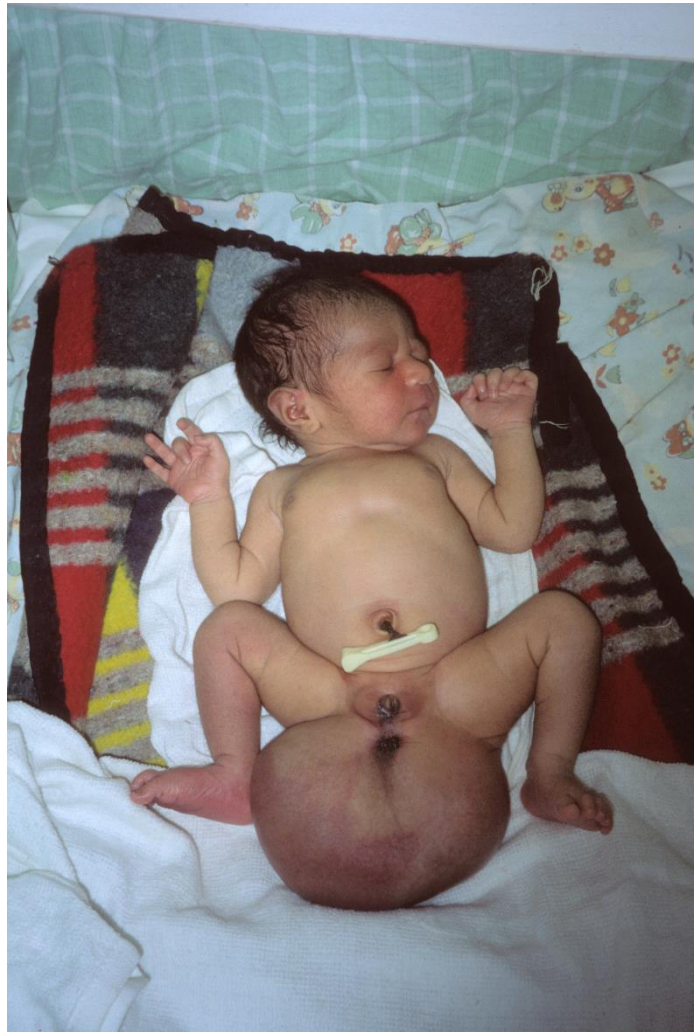




Chest tumour – teratoma
Not midline, anterior merdiatinum
Heterogeneous appearance (different types of tissue present)
Teratoma isd a germ cell tumour, so may have bone or connective tissue

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

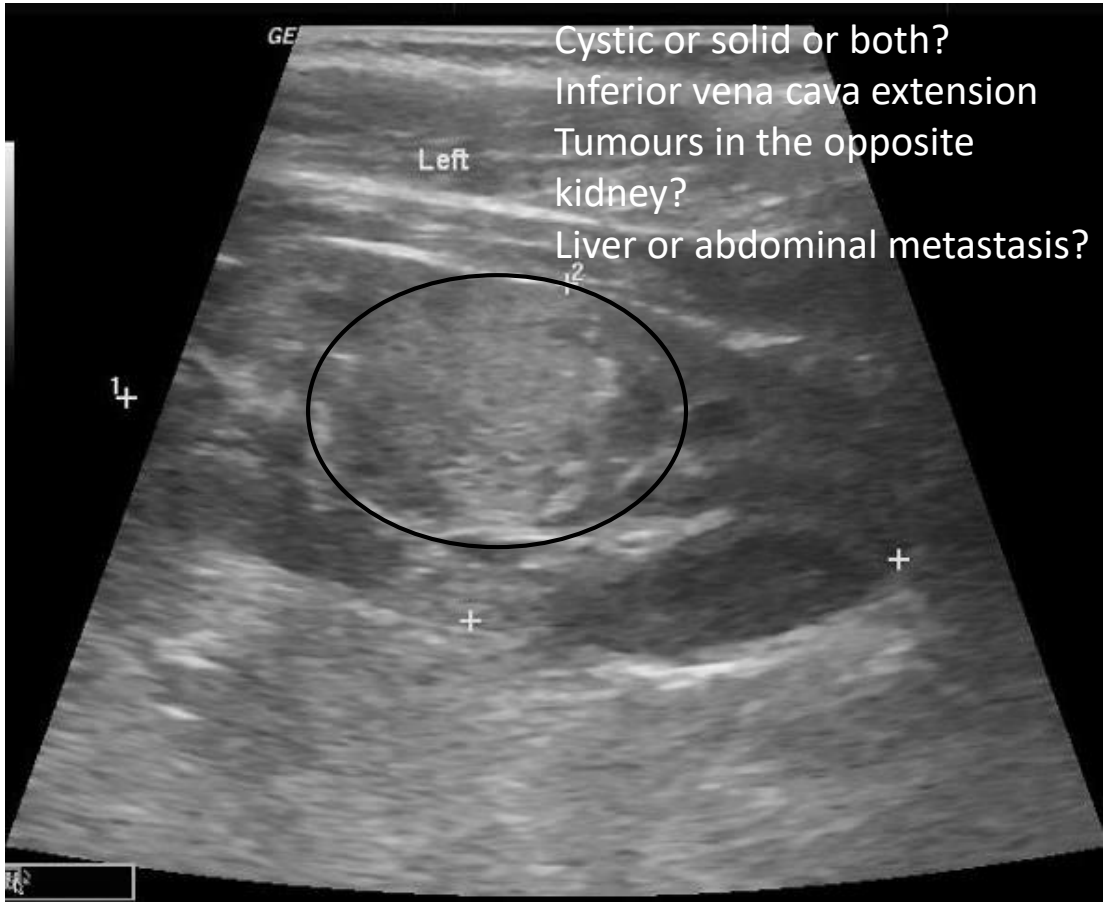


Abdominal tumours

- Wilms tumour
- Neuroblastoma
- Hepatoma
- Burkitt
- Teratoma

Wilms tumour

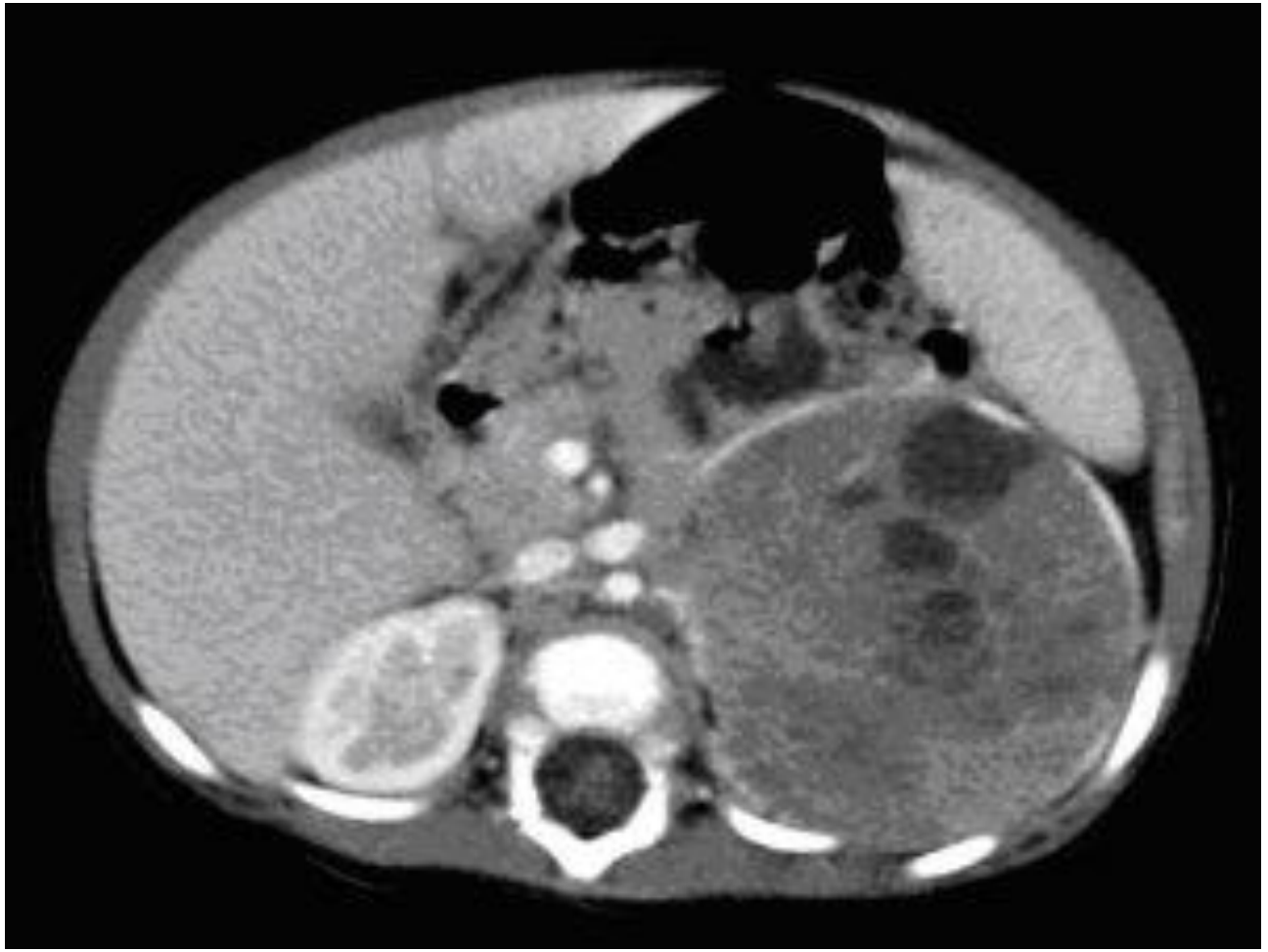
- Painless abdominal mass
- 20% bleed or rupture → pain
- Haematuria 25%, hypertension
- Some associated with congenital anomalies – hypospadias, hemihypertrophy, aniridia
- Most unilateral, 7% bilateral, 12% multifocal
- Metastasise to liver and lung
- Extension to renal vein 5%



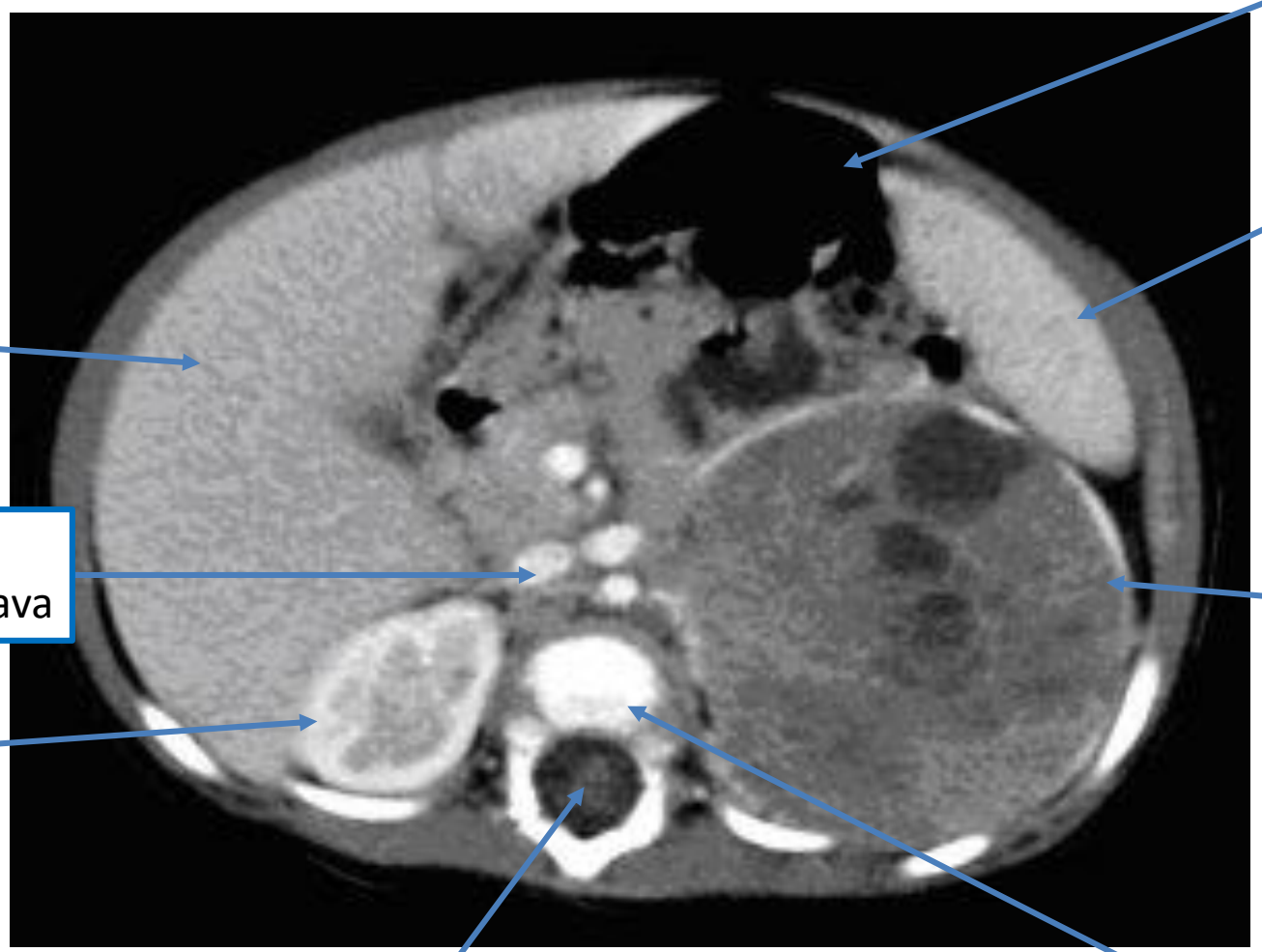
Wilms tumour – treatment and prognosis

- 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