MMed and DCH Lectures

Weekly by Zoom

Prof Trevor Duke

MMed and DCH Lectures

Care of children with CNS TB and chronic lung disease

August 10, 2020

Prof Trevor Duke

A. A 12 month old boy presents with abnormal movements.

Needed bag-mask resuscitation at birth, slow to breast feed, sleepy in the perinatal period. Has not smiled or vocalized. Fevers sometimes in the first year of life, mostly associated with coyza, and 2 seizures at 4 and 8 months of age. Persistent movements first noticed at 10 months of age.

B. A 12 month old boy presents with abnormal movements.

Well in the neonatal period, fed well, smiled at 6 weeks of age, able to sit at 7 months. Fever and seizures for 2 weeks at 8 months, treated with antibiotics, ever since then not fed well, now cannot sit up. Persistent movement first noticed at 10 months of age.

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Presentations of CNS TB

- Meningitis
- Seizures and acute encephalopathy
- Cranial nerve palsies
- Raised intracranial pressure
- Focal motor deficits
- Movement disorders – dystonia
- Coma
- Progressive loss of developmental milestones

Differential diagnosis: depends on the type of presentation, e.g.

- Meningitis
  - Bacterial, viral, cryptococcal
- Progressive loss of developmental milestones
  - Neurodegenerative condition
  - Tumour
  - Nutritional deficiency (such as B12)
  - Cerebral palsy
- Focal motor deficit (e.g. hemiparesis or monoparesis)
  - Stroke, polio
- Movement disorder
  - Cerebral palsy – dystonia / athetosis
  - Sydenhams chorea

Evaluation: history and examination

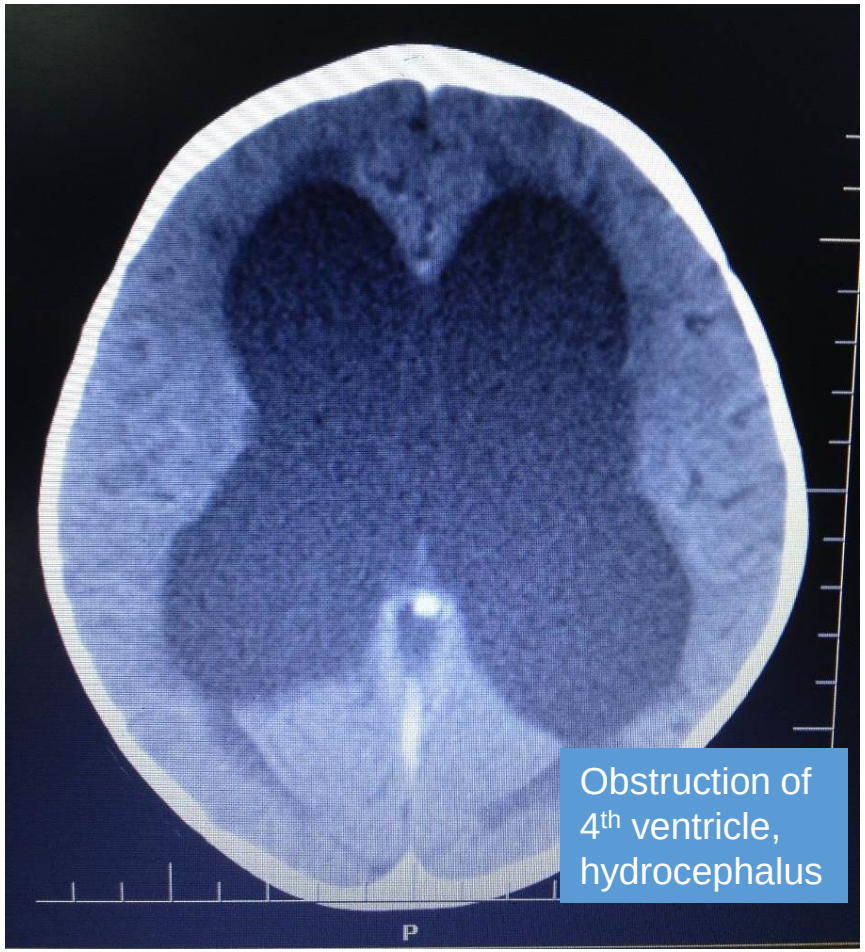
- Onset?
- Development before first signs of illness (longitudinal and cross sectional development history)
- Static or progressive?
- Stiff or floppy?
- Alert or not?

1. Where is the lesion?
2. What is the lesion?

Raised intracranial pressure in tuberculosis

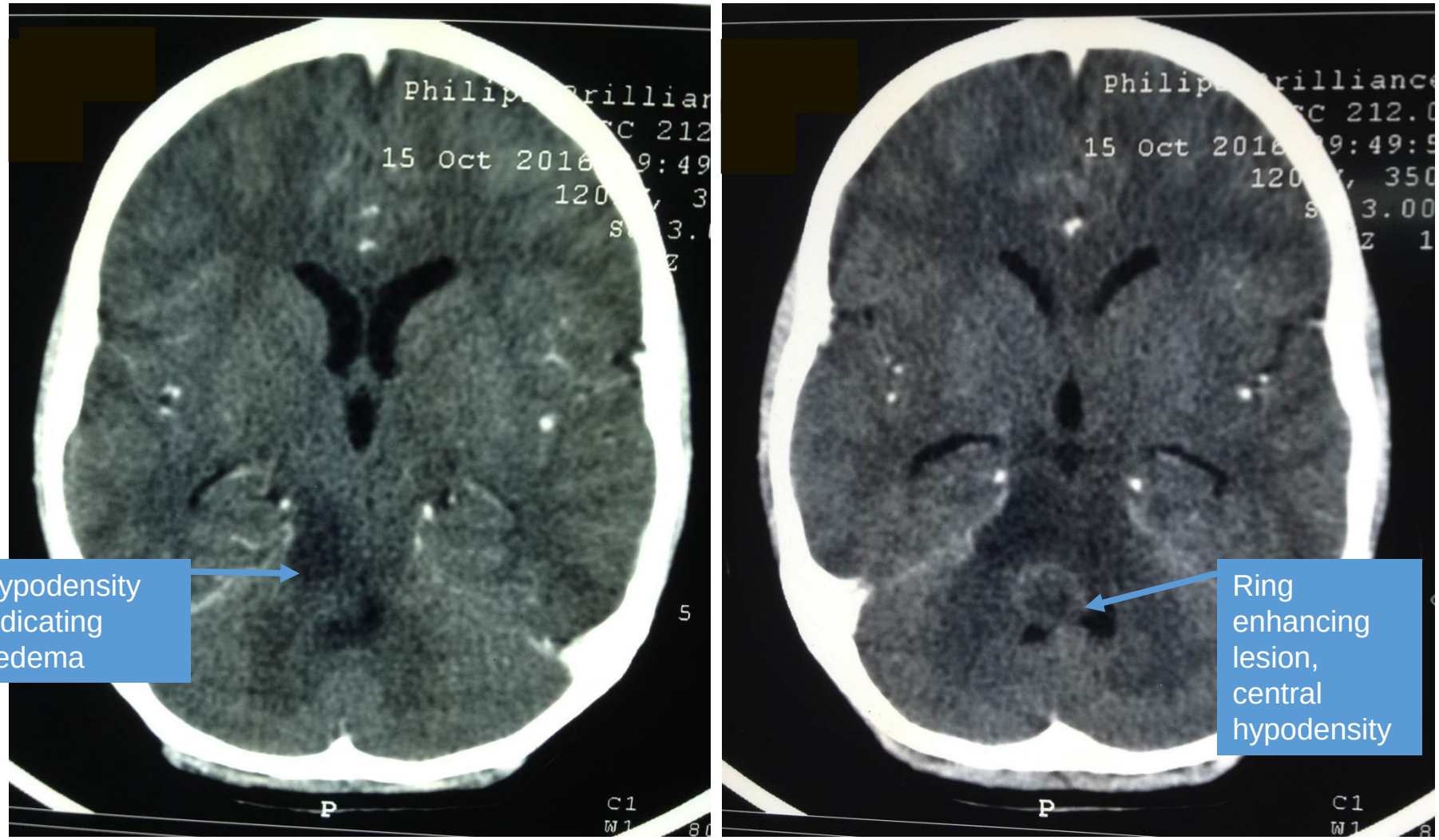
- Tuberculoma
- Brain oedema
- Cerebral infarction
- Venous thrombosis
- Hydrocephalus

Cystic lesion with septation, hyper-dense relative to ventricular CSF



Obstruction of 4th ventricle, hydrocephalus

Posterior fossa tuberculoma in a 3 year old girl with progressive macrocephaly, responded well to Tb treatment



Ring-enhancing lesion in cerebellar vermis, with oedema of brainstem, and cranial nerve signs

Care of the child with CNS Tuberculosis

Problem	Management
Airway and lung protection	Positioning – 30° head up Suctioning
Nutrition	Regular and early feeding by nasogastric tube if needed, calculate daily caloric requirement Micronutrients, iron
Intracranial hypertension	Nurse at 30° head up Avoid excessive IV fluids (check for eyelid oedema) Dexamethasone reduces oedema around ring-enhancing lesions Careful use of mannitol Acetazolamide if hydrocephalus proven on CT
Electrolyte imbalance	Avoid prolonged use of IV fluids Avoid hypotonic IV solutions Regular checking of serum [Na^+] when patient on IV fluids ↓Na (cerebral oedema), ↓K (weakness, arrhythmias), ↓Mg (arrhythmias), ↓PO4 (weakness)
Nosocomial infection	Hand washing IV site care Pulmonary suctioning Avoid prolonged bladder catheterization Avoid unnecessary antibiotics
Staff infection protection	P2 masks, Hand washing

Problem	**Management**
Contractures and wasting	Teach parents physiotherapy, full range of joint movement Early mobilization in wheelchair, walking aids
Constipation	Regular lactulose / Movicol
Gastric ulceration	H2-receptor antagonist to reduce gastric acid production (when on corticosteroids) Feeding protection
Urinary retention	Intermittent catheterization if needed
Monitoring	Glasgow Coma Score SpO_2 Temperature
Alert for drug resistance	When is poor recovery due to brain injury or multi-drug resistance?
Adverse drug reactions (ADR) *	Jaundice / hepatitis: pyrazinamide, INH, Rif (2-7%) Rash (2-21%) Gastrointestinal intolerance (2-5%) Pyridoxine for INH peripheral neuropathy Ethambutol eye toxicity (0.3%) Hearing loss if on aminoglycosides (20%)

* 16% of all TB patients required treatment modification due to ADRs.
Females have a higher tendency to ADRs than males
Malays J Med Sci. 2018 Sep; 25: 103–114.

Monitoring improvement in CNS TB

- Baseline neurology?
- Time?
- Opportunity?
- Objective markers of infection resolution?
- Adherence?
- Adverse drug reactions?
- Iatrogenic complications?
- Untreated comorbidities?
- MDR?

TB-related chronic lung disease

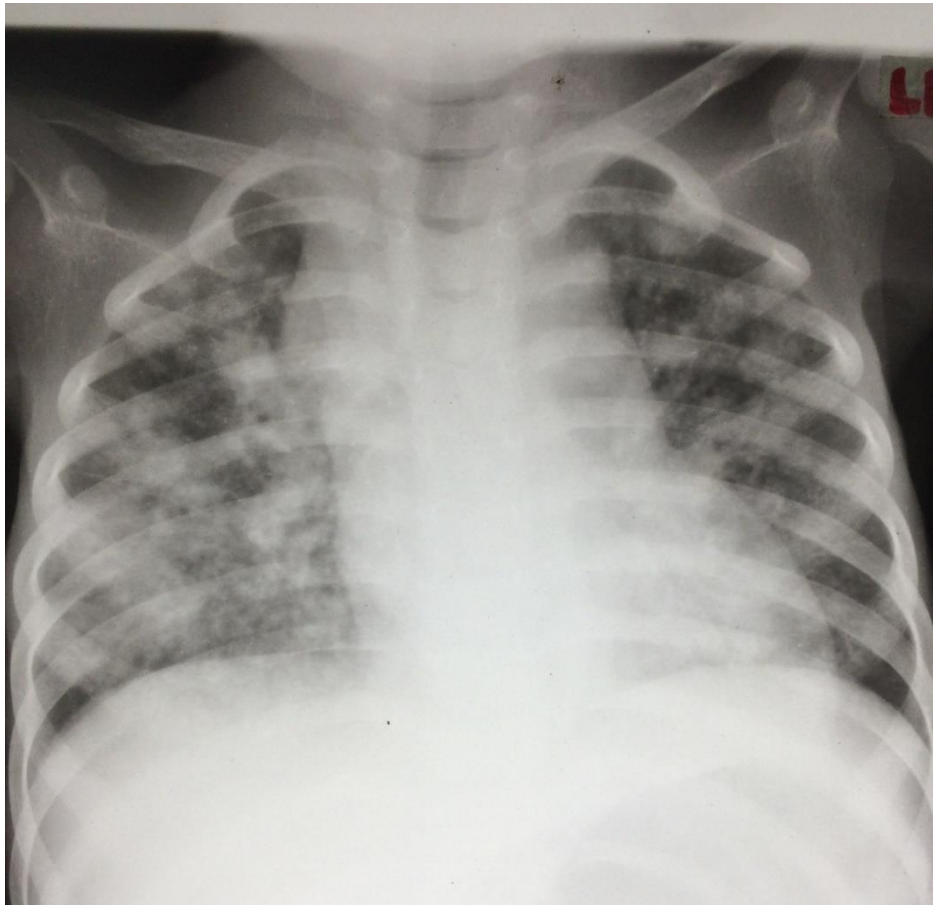
Differential diagnosis
Work-up
Management
Physiology and prognosis

Chronic lung disease in TB: differential diagnosis

- Persistent *or* recurrent pneumonia
- Asthma / chronic airways disease
- Bronchiectasis
- Pulmonary hypertension
- Effusion
- If HIV
  - PjP
  - LIP
  - IRIS
  - Aspergillus
- If TB
  - Poor adherence
  - MDR TB

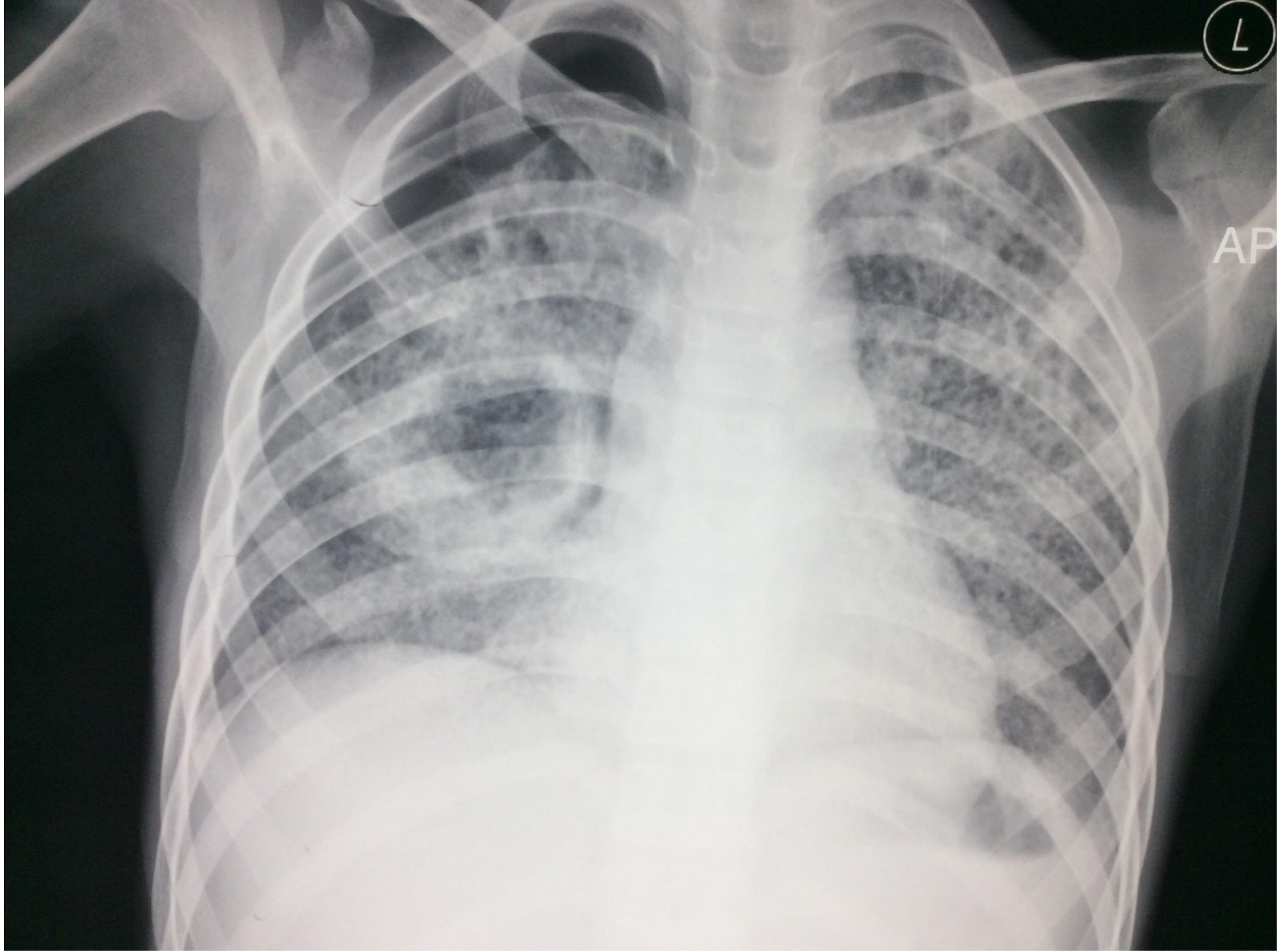
Work-up for TB related chronic lung disease

- Is the child growing?
- The home environment
- Signs of HIV
- Clubbing
- Anaemia
- Lymphadenopathy
- Check for effusion, wheeze, crackles
- Loud pulmonary second sound, signs of heart failure



Work-up for Tb-related chronic lung disease

- HIV test
- Cardiac Echo: ? Pulmonary hypertension
- Sputum smear for GeneXpert, AFB stain and fungal elements
- Mantoux test
- Chest CT if you can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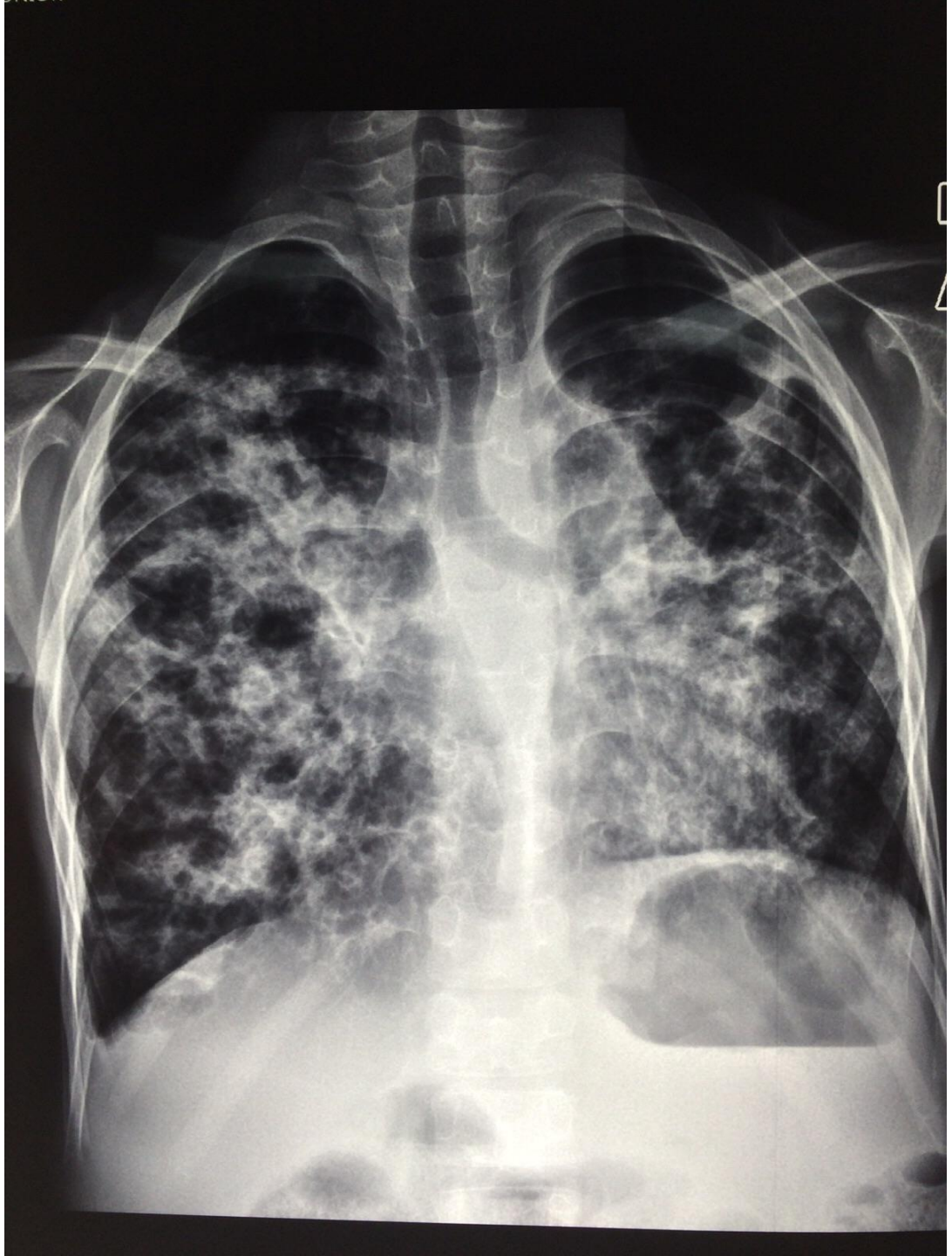
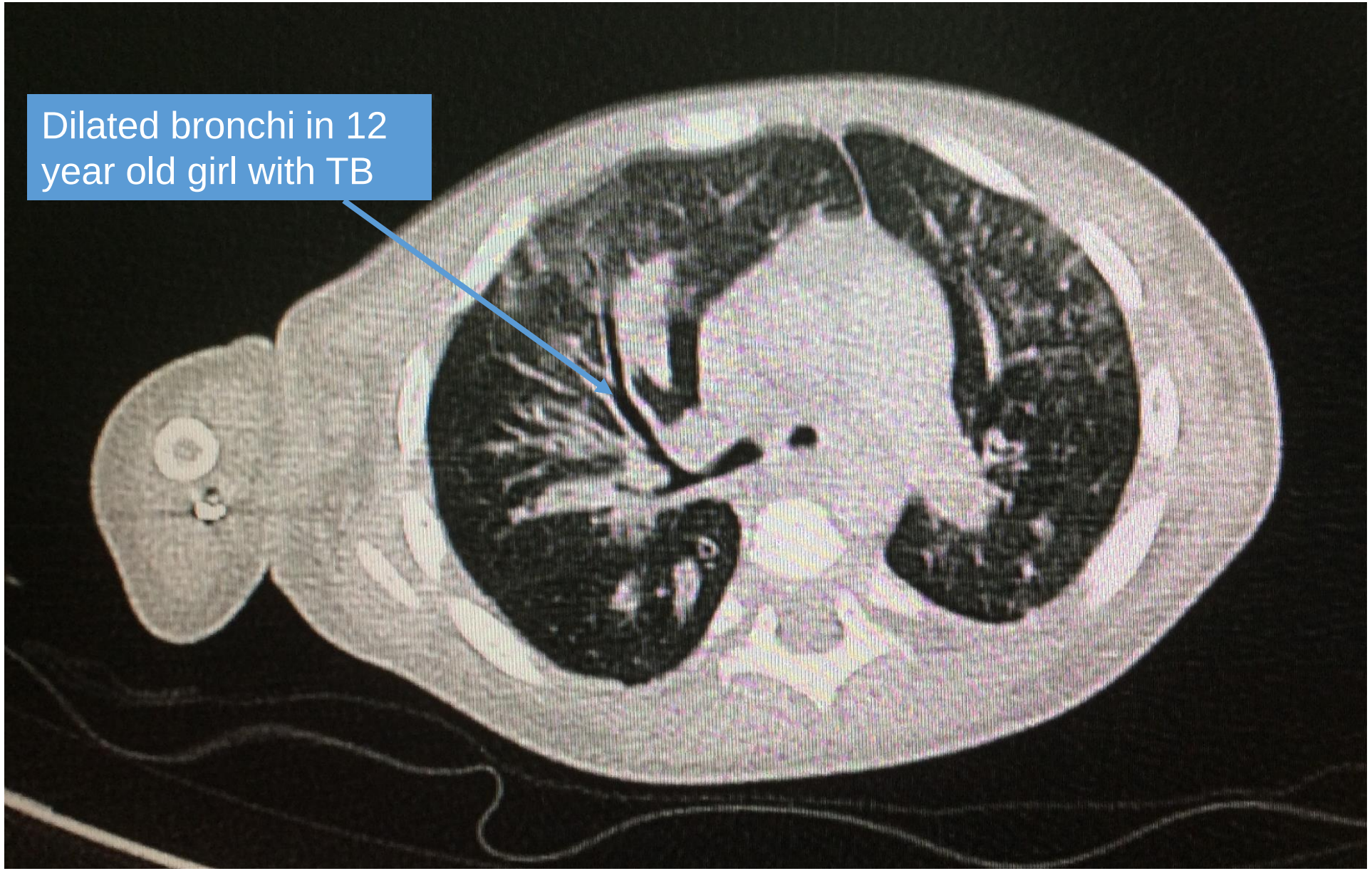
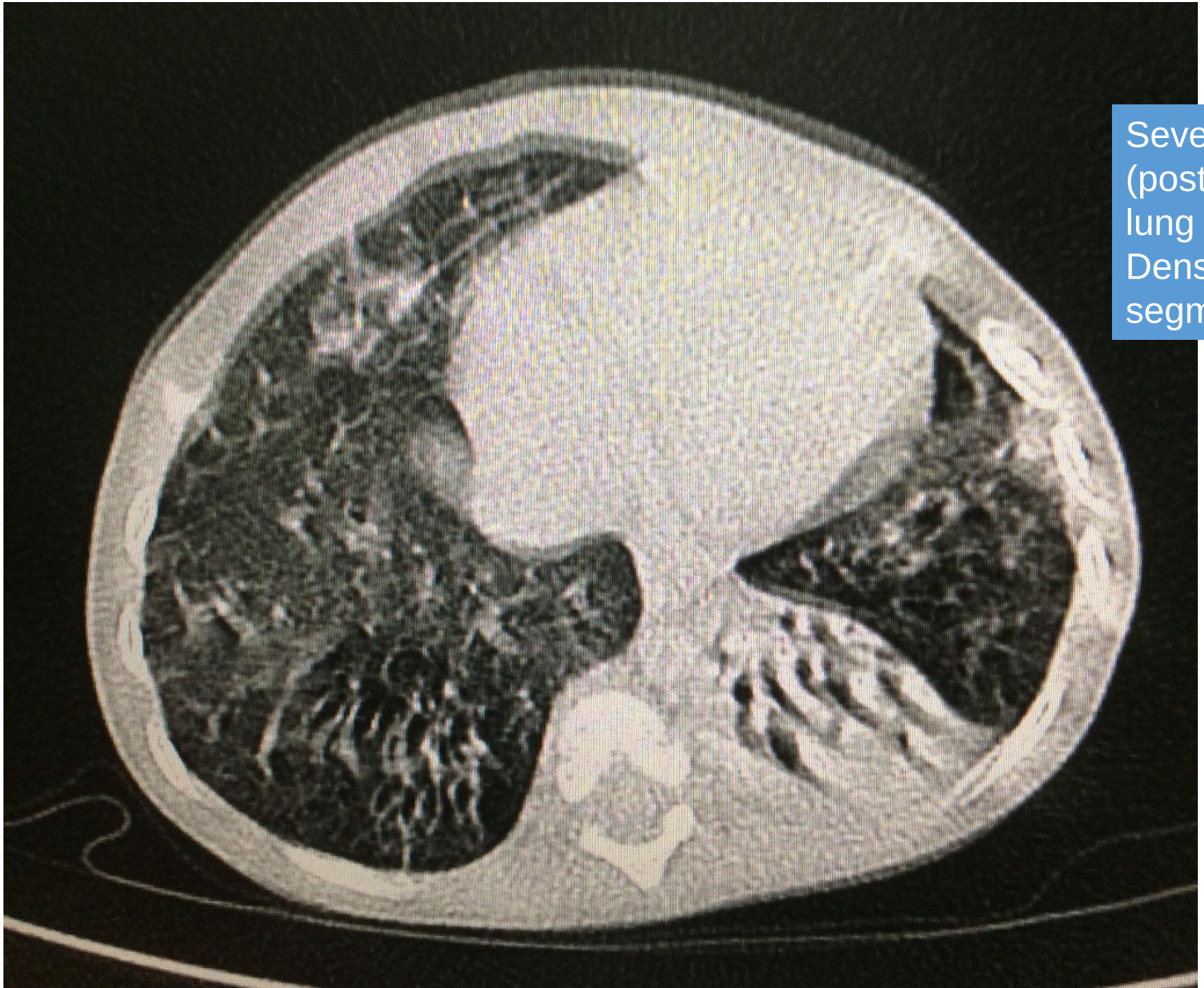


Multi-cystic TB
related lung disease
and bronchiectasis


Dilated bronchi in 12 year old girl with TB



Severe bronchiectatic (posterior) and cystic (anterior) lung disease.
Dense collapse of left posterior segments, with dilated bronchi

Table 1. Aetiology of chronic lung disease in HIV-infected and uninfected children in Durban, South Africa.

	Chronic lung disease (n = 42)	
Confirmed diagnoses	HIV-infected (n = 28)	HIV-uninfected (n = 14)
Tuberculosis (n)	8 (29%)	4 (29%)
Pulmonary tuberculosis	2	2
Miliary tuberculosis	1	1
Endobronchial tuberculosis	3	1
Tuberculosis bronchiectasis	2	0
Lymphoid interstitial pneumonitis (n)	16 (57%)	0
Alone	3	–
With bronchiectasis	3	–
With bacterial infections	10	–
Other interstitial pneumonitis (n)	4 (14%)	4 (29%)
Post-viral	0	2
Schistosomiasis	0	2
Non-specific	4	0
Bronchiectasis (n)	0	3 (22%)
Miscellaneous (n)	0	3 (22%)
Extrinsic allergic alveolitis	0	1
Non-Hodgkin's lymphoma	0	1
Cryptogenic fibrosing alveolitis	0	1

Persistent and chronic lung disease in HIV-1-infected and uninfected African children

Prakash M. Jeena, Hoosen M. Coovadia, Stanley A. Thula, David Blythe*, Noel J. Buckels* and Runjan Chetty†

There are things we can do

- Bronchodilators for wheeze, inhaled steroids
- Antibiotics for bronchiectasis
- Saline nebulisation
- Sildenafil, diuretics for PHT
- PjP prophylaxis
- Vaccines (all, including pneumococcal + influenza)
- Mobilisation, nutrition, Hb, home oxygen
- Chest physiotherapy
- MDR treatment
- Be patient, plan beyond hospital care

Physiology

- Lung tissue keeps growing with growth of *new alveoli* well into adolescence
- If you reduce secondary damage to the lungs, they will heal and grow new gas exchange tissue in time
- Many children “outgrow” their chronic lung disease if you keep their lungs healthy

Exercise test

- Start with a 1 min walking test, between cones separated by 10m
- Baseline measurements:
    1. Respiratory rate
    2. Heart rate
    3. SpO_2 at rest
    4. Self-assessment of respiratory difficulty (no difficulty, mild, moderate, severe)
    5. Peak expiratory flow rate or spirometry if it can be done (best of three attempts).
- Ask the child to walk *as fast as they can* for 1 min, and then measure all again
- Test weekly. Progressively increase the exercise duration to 2 and then 3 min and the distance between cones to 20 m as tolerated.
- Graph progress so that the child can see improvement.
- Point out to the child and the family the type of activities that can be done safely if they can walk for 1 min without getting breathless or needing oxygen.

There are things we can do

- Psychological support
- Encouragement
- Quality of life
- Schooling, play, reading
- Philosophy:
  - *“The minimal worthwhile goal of hospital care is to get children home to be with their families in a safe environment”*

  (i.e. it is not an acceptable goal to linger in hospital with no prospects of going home), so focus on the steps required to get every child home.

MDR TB treatment

Group A

- Levofloxacin 15–20 mg/kg/d
- Linezolid 12 mg/kg OD
- Bedaquiline (not yet commonly used in children)

Group B

- Cycloserine 15–20 mg/kg/d

Group C

- Ethambutol 15–25 mg/kg/d
- Ethionamide 15–20 mg/kg/d
- Pyrazinamide 30–40 mg/kg/d
- Isoniazid 15-20 mg/kg/d (high dose)
- Delamanid (also not yet routinely used in children, unless all others resistant on culture).

If sensitivities unknown, initially choose 4 or 5 drugs.
At least one from each group.