# Pediatric radiology

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# Modalities

- radiography (plain x-rays, fluoroscopy)
- ultrasound
- computer tomography (CT)
- magnetic resonance imaging (MRI)
- nuclear medicine (planar scintigraphy, SPECT, PET)

# Special considerations

- ultrasound and MRI are the preferred imaging modalities
- if ionising radiation is necessary doses should be kept to a minimum (ALARA – As Low As Reasonably Achievable)
- ionising radiation increases the risk/frequency of malignant diseases
- lack of cooperation sedation, ventillation, an esthesia
- motion artifacts
- transportation trauma
- open fontanelles, sutures
- different disease etiology and morphology



#### Anterior fontanelle



#### Pars squamosa



#### Lambdoid suture







# Doppler US

#### • Transcranial scan:

- circle of Willis
- straight sinus
- transverse sinus
- superior sagittal sinus



### meningitis - sinus thrombosis



### meningitis - sinus thrombosis







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- transportation trauma
- open fontanelles, sutures
- different disease etiology and morphology
- developing CNS more sensitive to radiation/trauma

![](_page_11_Figure_0.jpeg)

# Modalities

- radiography (plain x-ray, fluoroscopy)
- ultrasound
- computer tomography (CT)
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- nuclear medicine (planar scintigraphy, SPECT, PET, PET-CT)

# X-ray

- chest (2mSv) (1y background radiation 3mSv)
- evaluating bones
- abdomen (ileus, foreign body, perforation)
- 5 basic density:
  - air dark (lung, air in abscess)
  - fat (subcutaneous fat)
  - soft tissue (solid organs)
  - bone bright
  - metal

![](_page_14_Picture_0.jpeg)

#### Normal

#### Infiltrate

Ptx

#### Pleural effusion

![](_page_16_Picture_0.jpeg)

![](_page_17_Picture_0.jpeg)

#### interstitial infiltrate

#### pulmonary nodules

![](_page_18_Picture_2.jpeg)

![](_page_18_Picture_3.jpeg)

#### air – fluid level

![](_page_19_Picture_0.jpeg)

### Case

- newborn
- respiratory distress
- perioral cyanosis following feeding
- excessive salivation

![](_page_21_Picture_0.jpeg)

### esophageal atresia

![](_page_22_Picture_1.jpeg)

- types
- often accompanied by other GI anomaly
- surgery needed

### Case

- newborn
- severe respiratory distress

![](_page_24_Picture_0.jpeg)

![](_page_25_Picture_0.jpeg)

# Congenital diaphragmatic hernia

- diaphragm defect
- abdominal organs, bowel in chest
- lung hypoplasia outcome
- intrauterine ultrasound

![](_page_27_Picture_0.jpeg)

![](_page_28_Picture_0.jpeg)

![](_page_28_Picture_1.jpeg)

![](_page_29_Picture_0.jpeg)

Map 3 170dB/C4 **Persist Med** 2D Opt:Res Fr Rate:High

HDI 5000

### Cases

![](_page_31_Picture_0.jpeg)

![](_page_32_Picture_0.jpeg)

![](_page_33_Picture_0.jpeg)

![](_page_34_Picture_0.jpeg)

![](_page_35_Picture_0.jpeg)






# CT

- pros:
  - hi res
  - fast
  - 3D/ multiplanar reconstructions
- cons:
  - expensive
  - radiation
  - sedation/anesthesia may needed
  - altered renal function contraindicated

CT

- every organ
- tumorstaging / met detection
- radiotherapy planning
- chest
- musculosceletal
- polytrauma
- angiography

• windowing







# CT angiography (CTA)





# MIP/MinIP and virtual bronchoscopy















# Ultrasound

- brain (newborn/infant)
- chest (pleural effusion, tumor)
- abdomen
- pelvis full bladder
- periphery (thyroid, testis, soft tissue lesions)







# Ultrasound

#### • pros:

- unexpensive
- safe, no radiation
- any plane, realtime
- bedside
- biopsy and drainage
- Doppler
- CONS:
  - user dependent
  - poor image quality in obes
  - can't penetrate gas and bone

### Case

- projectile vomiting
- dehydration
- lagging growth



# Pyloric stenosis

- muscle hypertrophy
- boy:girl = 4:1
- usually 3-8 weeks after birth
- often palpable
- on ultrasound the pyloric channel is elongated, the wall is thickend

## Case

- 2 y/o
- drowsiness
- intermittant abdominal pain
- vomiting
- blood in stool







## Intussusception

- bowel section herniates into an other
- the majority is ileocoecal
- bowel infarct
- peak incidence is between 6 months and 2 years of age
- in olders malignancy
- reduction





#### • LRQ pain





# Appendicitis

- thickened wall
- not compressible
- high blood flow
- edema in surrounding tissues
- free fluid
- enlarged lymph nodes





# Congenital hip displasia

• US – screening



- CNS: brain, spine
- musculoskeletal system
- cardioMRI
- chest (mediastinum, vessels, chest wall)
- abdomen
- pelvis

# MRI

#### • pros:

- multiplanar
- no radiation
- high resolution in soft tissues
- vessel imaging w/o,w contrast agent
- functional information (DWI, perfusion, permeability BOLD)
- CONS:
  - cost
  - poor quality in lungs
  - time consuming, anesthesiology
  - not feasible with pacemaker, metal implants
  - artifacts pulsation, motion, peristalsis

### Case

- 16 y/o girl
- headache
- vomiting w/o nausea



# MR Angiographia



# MR Venographia



## Contrast enhanced MRA





#### T1WI

# Diffusion weighted imaging (DWI)



decreased iffusibility – higher signal

DWI




### FLAIR

DWI







# Nuclear medicine

functional information

- GI (Meckel's diverticulum, IBD)
- biliary (atresia, cholecystitis, obstruction)
- urinary tract
- bones (tumor, osteomyelitis)
- thyroid/parathyroid
- FUO

## Nuclear medicine

#### • SPECT

- radioisotopes emitting photons - planar

### • PET

- positron-emitting isotopes
- brain (epilepsy, tumor)
- tumor (low-grade tumors false negative)

# SPECT/MR



RADIOLOGY

























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### thank you for your attention