

Paediatrics

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Renal disease

- Use of most radiopharmaceuticals limited as excreted via kidneys
- However some role for infection specific studies in no-working kidneys
 - Eg Infected polycystic kidney
- However clearer role for renal cortical imaging

Renal cortical imaging

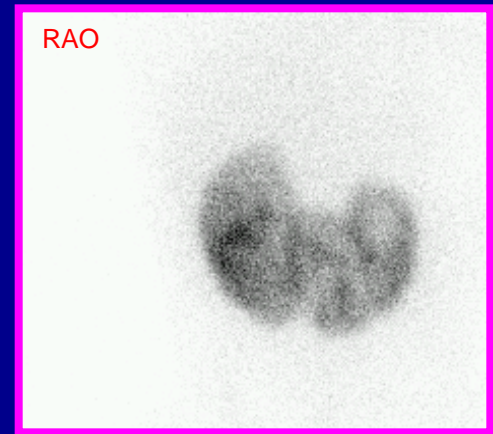
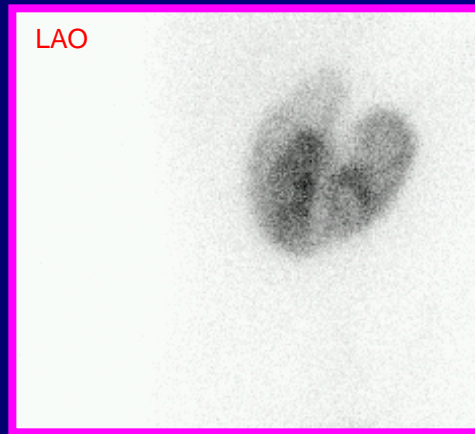
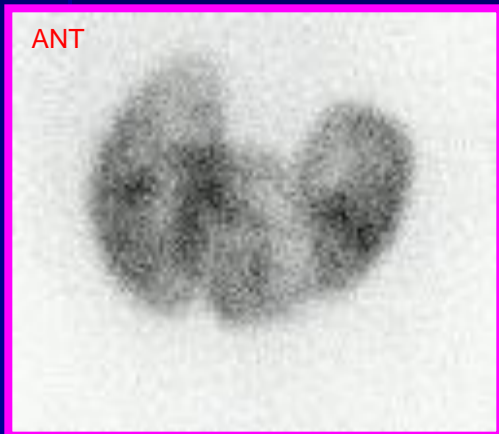
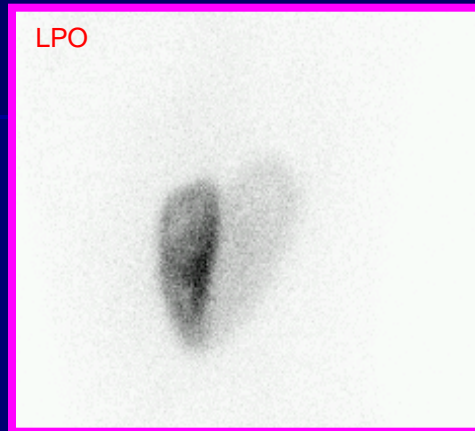
- Use of agent which is filtered by glomerulus and then re-absorbed in tubules
- Maps working nephrons
- Tc-99m Glucoheptanate, Tc-99m DMSA
- Planar imaging adults and children

Image Acquisition

- Excellent quality DMSA scan acquired with child lying directly on a low energy high resolution collimator
- The ability to see the internal renal architecture is the hallmark of a high quality scan

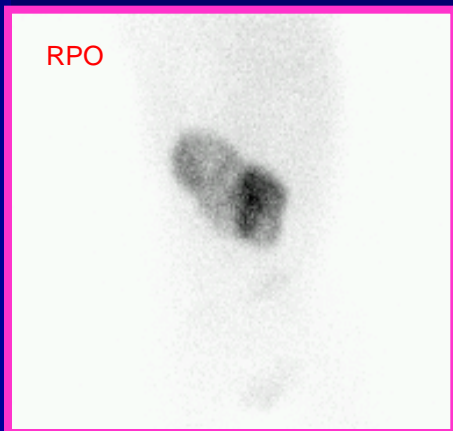
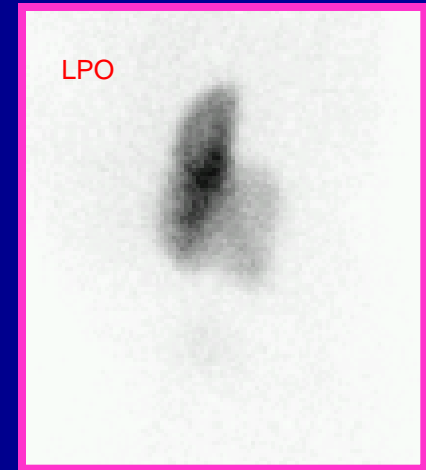
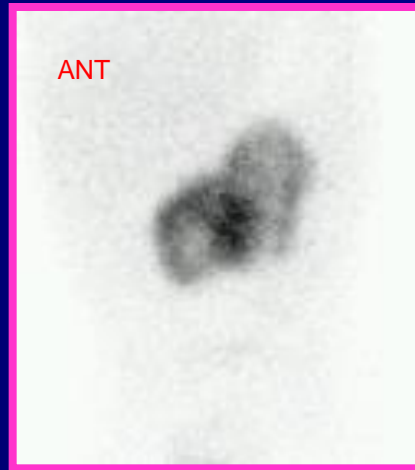


Normal Variants - Horseshoe Kidney



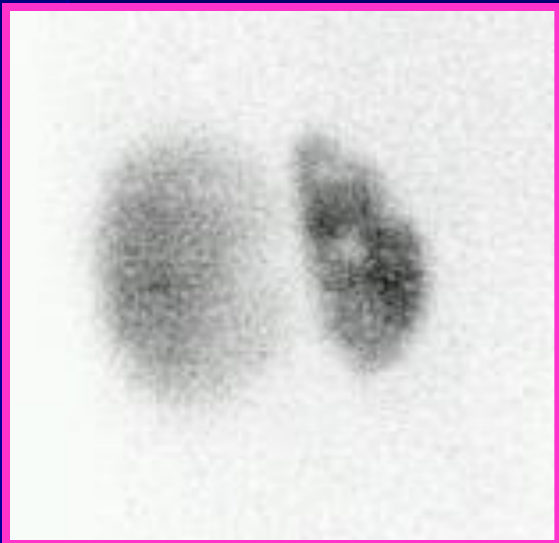
– note that the horseshoe is better visualised on the anterior and anterior oblique images

Normal Variants - Cross Fused Ectopia



as with ectopic kidneys, always perform anterior imaging

Previous UTIs. Multiple scars in the right kidney which has globally reduced function



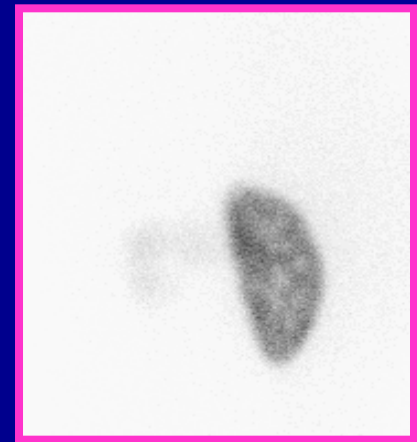


-Scarring progressed with further reduction in right renal function
- **PITFALL** do not call defects 'scars' in the setting of a recent UTI; allow at least 3 but preferably 6 months before performing the DMSA to determine the presence of scarring

L 12% R 88%



- Reflux nephropathy: Scarred, atrophic and poorly functioning left kidney

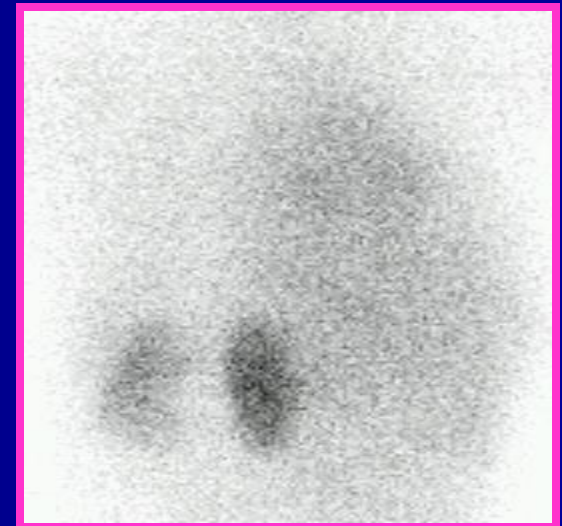
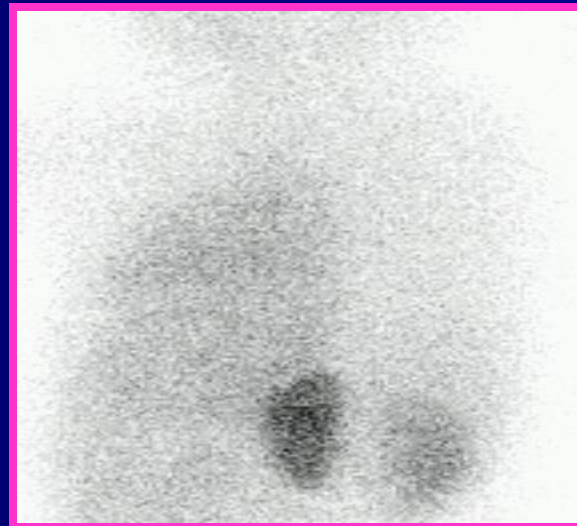


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rig

POST

RPO

reduced target to background ratio)
provides the clue to the ARF



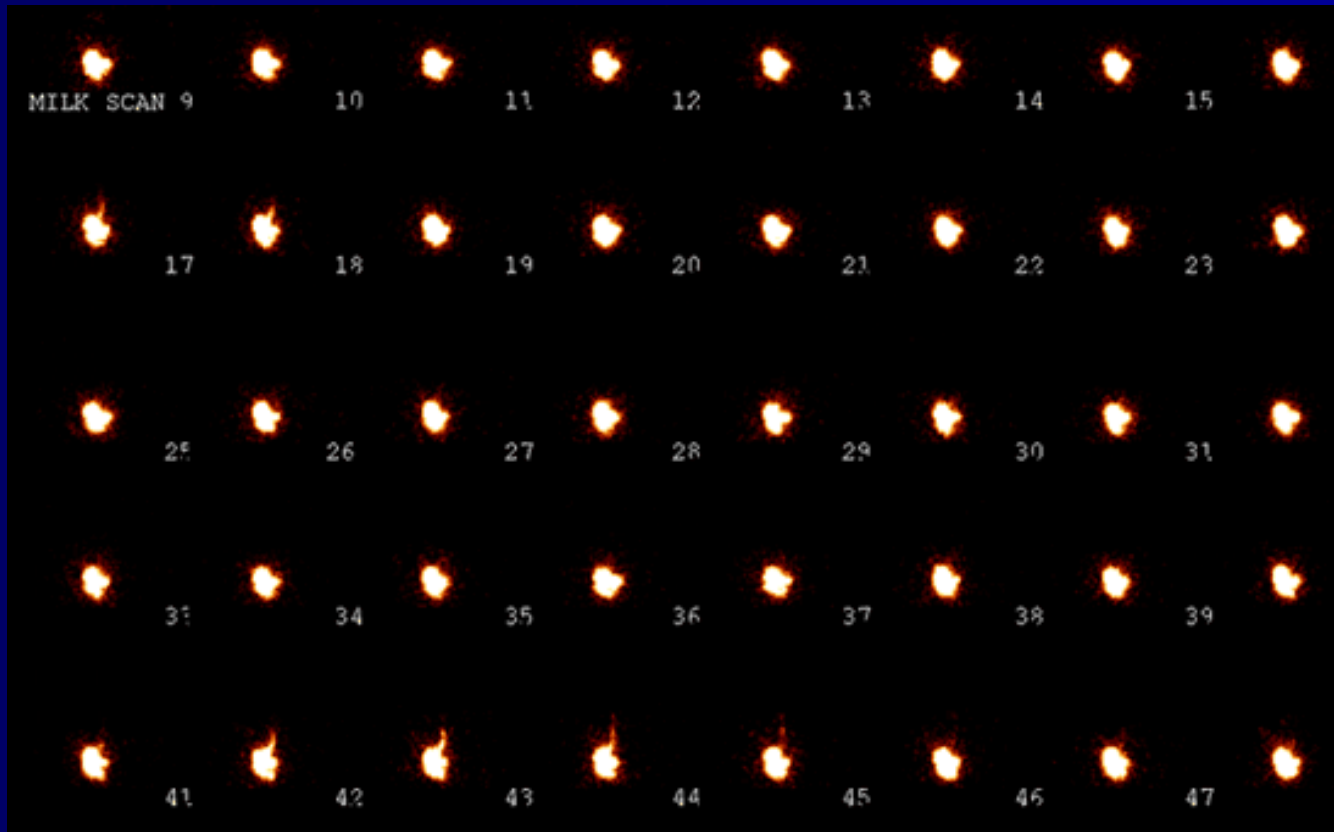


- Gross left hydronephrosis
- Functioning parenchyma still present
- IVU 'non-functioning'
- Assessment of function on MAG3 will be inaccurate as ROI outside body contour

Milk scan

- Used to look for gastro-oesophageal reflux in babies
- Mix Tc-99m colloid with milk (inc breast milk)
- Give feed then image over 30 mins and look for reflux

Milk scan



Meckel's diverticulum

- Very common maybe 40% of patients
- Anywhere from pylorus to anus
- Most described at or near junction of jejunum and ileum or in ileum
- Pathological if contains ectopic gastric mucosa-rare (Denver children's have found 12 in 20 years (over 2000 studies))

Presentation of ectopic gastric mucosa-Denver

- Normally under age 2
- Pain following food
- Central abdomen
- Next most common symptom obstruction
- Bleeding in less than 20%
- Never seen a positive over age 5

This is what it looks like

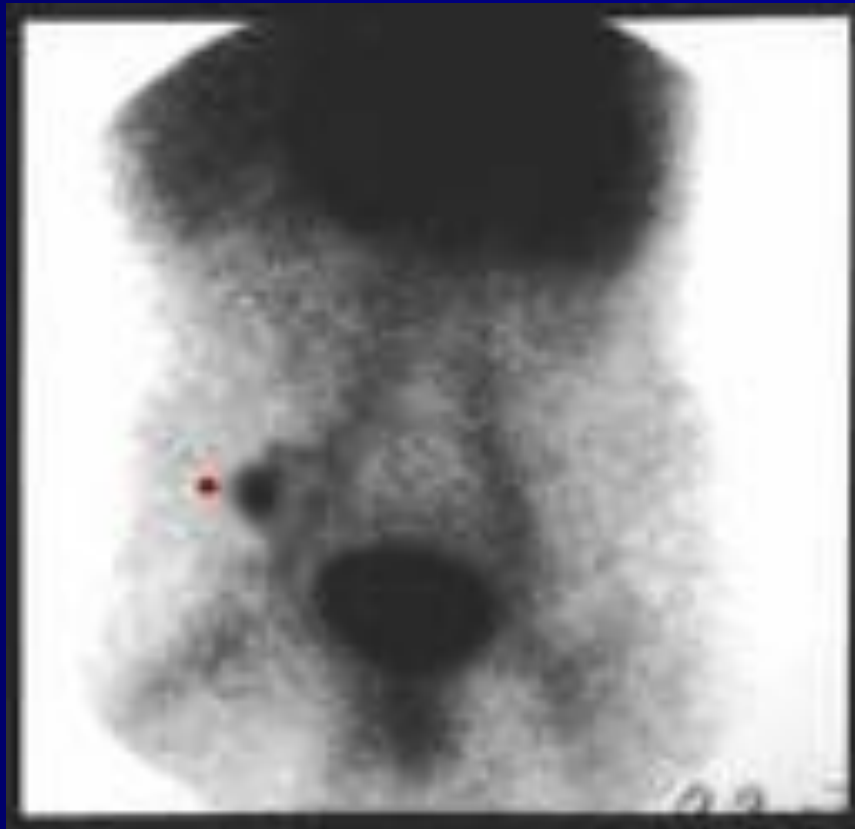


Figure 3—This large Meckel's diverticulum was identified at the time of surgery. A perforation with localized abscess can be seen at the tip.

Imaging method

- Best if patient comes after 4 hour fast
- To reduced gastric movement Cimetidine may be used 30 minutes before scan do not use PPI
- Position patient with abdomen under camera stomach at top of image
- 30x60 second or 60x30 second frames
- Inject 70-700MBq Tc-99 pertechnetate (determined by patient weight)
- Look for site of uptake appearing at same time as stomach mucosa
- May only be seen in 1-2 frames so review dynamic imaging

Meckel's scan



Biliary atresia

- Medical emergency
- Cause of neonatal jaundice
- If not settled in 10 days consider either biliary atresia
- Differential is Gilbert's disease
- In Biliary atresia if not corrected by 3 months kernicterus – brain damage and fits

Performing study in biliary atresia

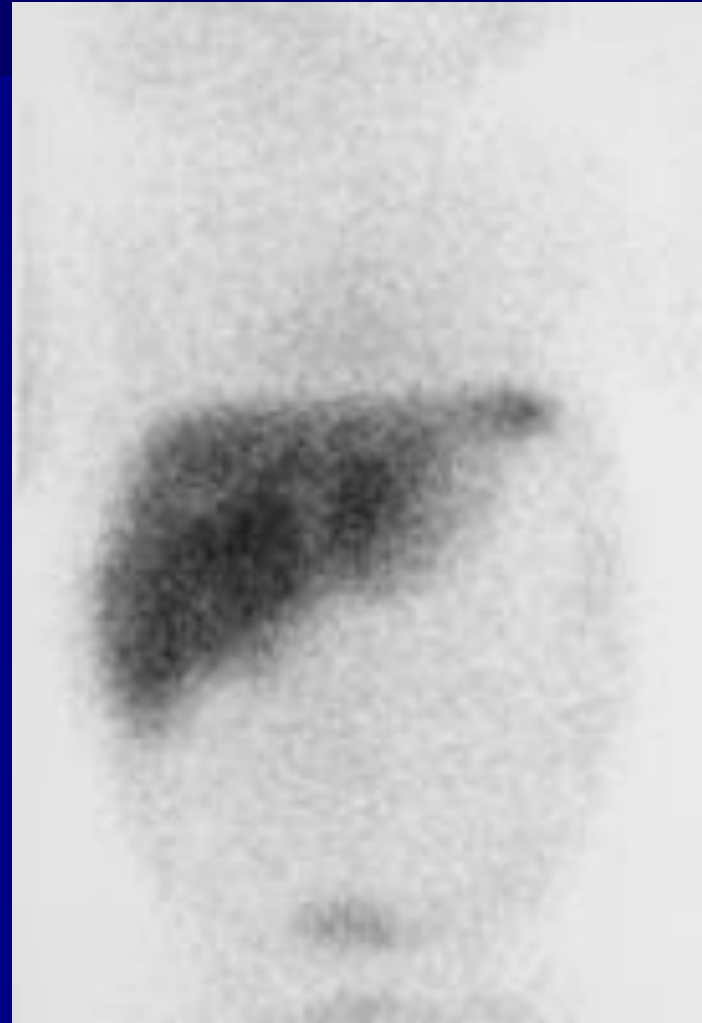
- Use 3rd generation HIDA (Tc-99m mebrofenin or IODIDA)
- Prepare patient with 48 hours of phenobarbitone to stimulate biliary system and reduce possibility of false positive
- Inject activity related to weigh (minimum 20MBq Tc-99m Mebrofenin)

Imaging

- Image anteriorly
- Can be done probe with child lying on camera head
- Children often very passive
- Image up to 24 hours
- In no activity in small bowel by 24 hours positive study
- Needs urgent operation

Positive study in BA

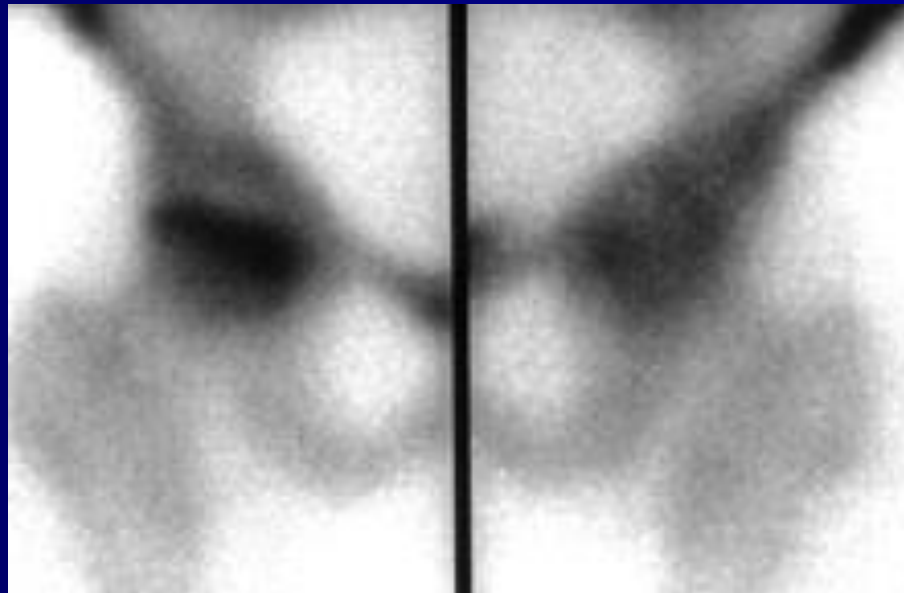
- 24 hour image
- Note good uptake
- No excretion
- Some bladder activity due to breakdown of circulating Tc-99m Mebrofenin



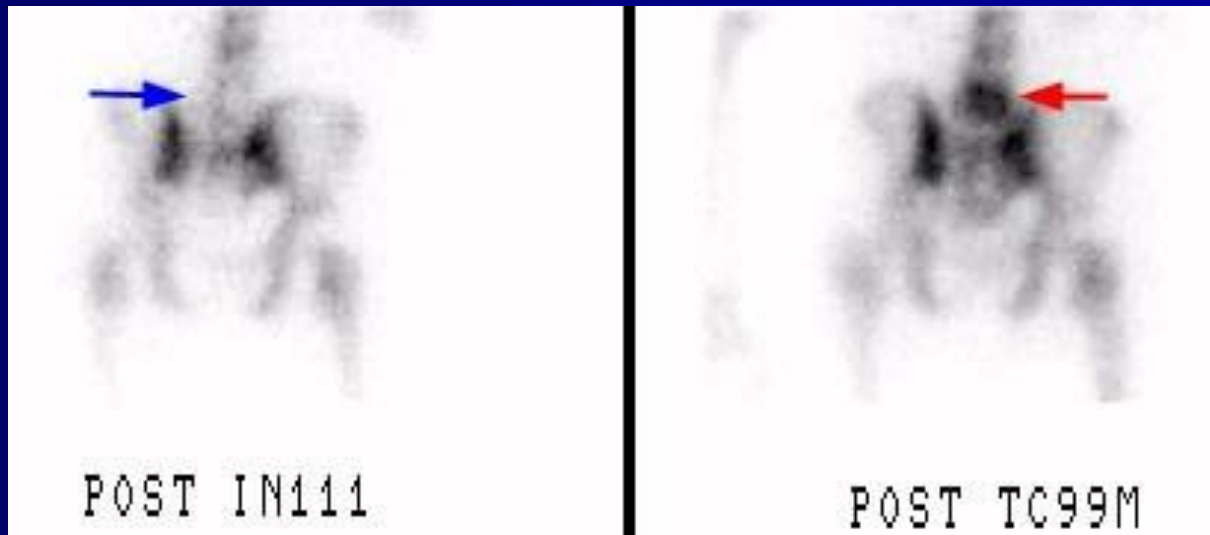
Bone imaging in children

- Most indications need dynamic 3 phase imaging
 - Osteomyelitis
 - AVN
 - Primary bone tumour
- Static imaging to stage childhood cancer
- Remember epiphyseal uptake

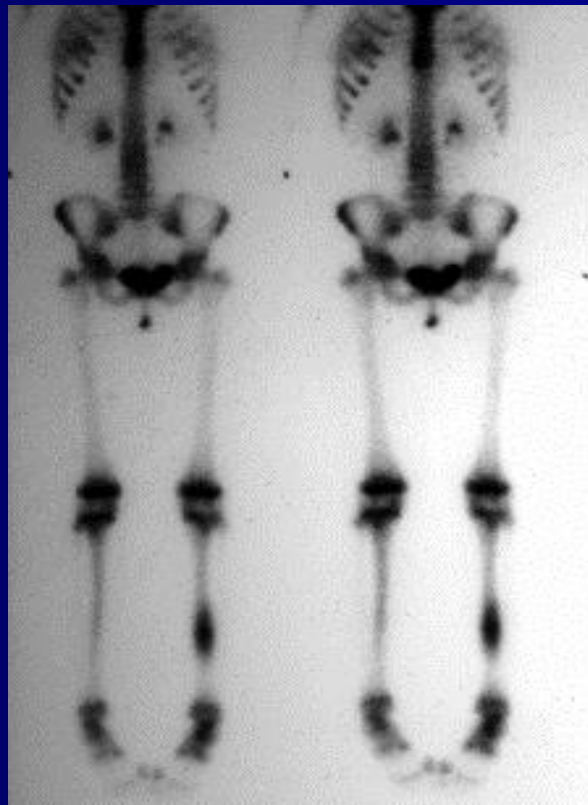
In AVN pinhole may help



Discitis in child



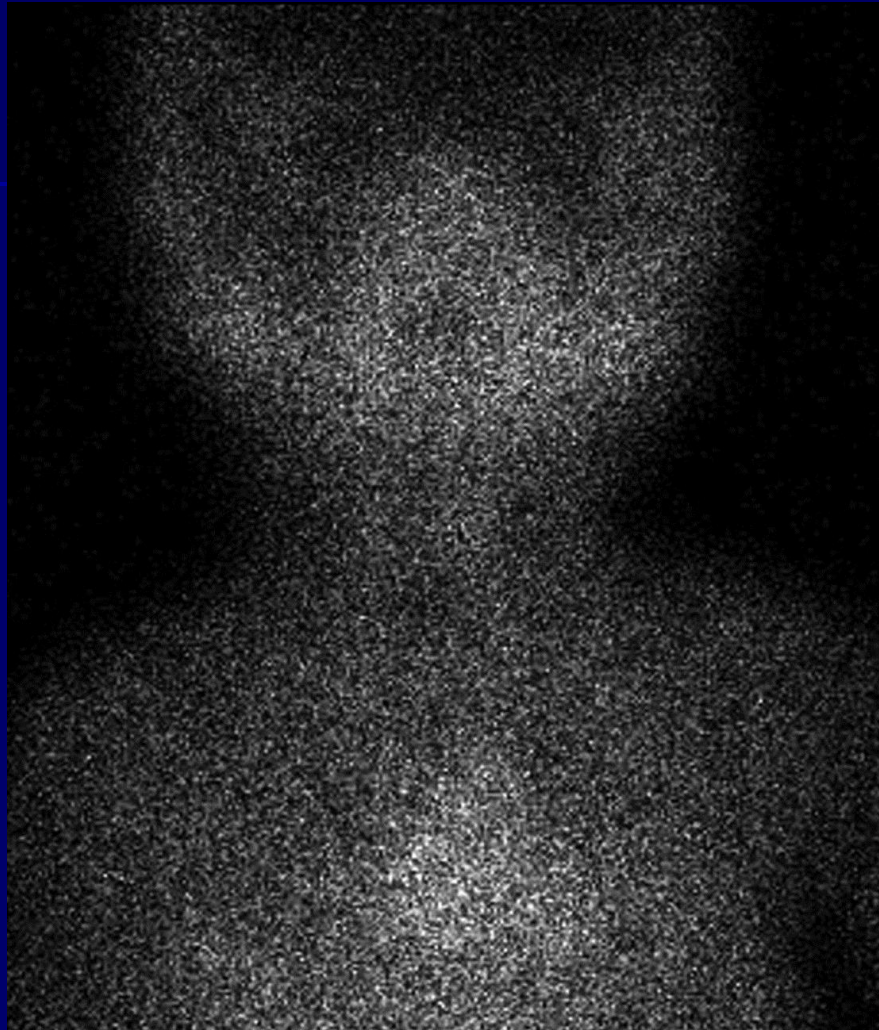
Osteosarcoma



Congenital hypothyroidism

- Screened at birth
- Important lack of thyroidal tissue can be found with pertechnetate scan
- Do scan ASAP
- Iodine expensive and high radiation dose
- Failure of organification
- Need I-123 and perchlorate washout

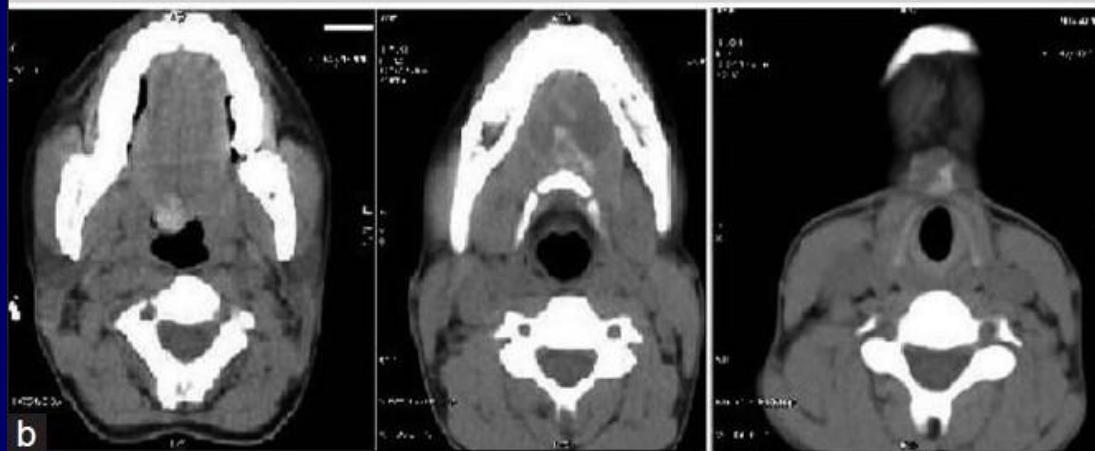
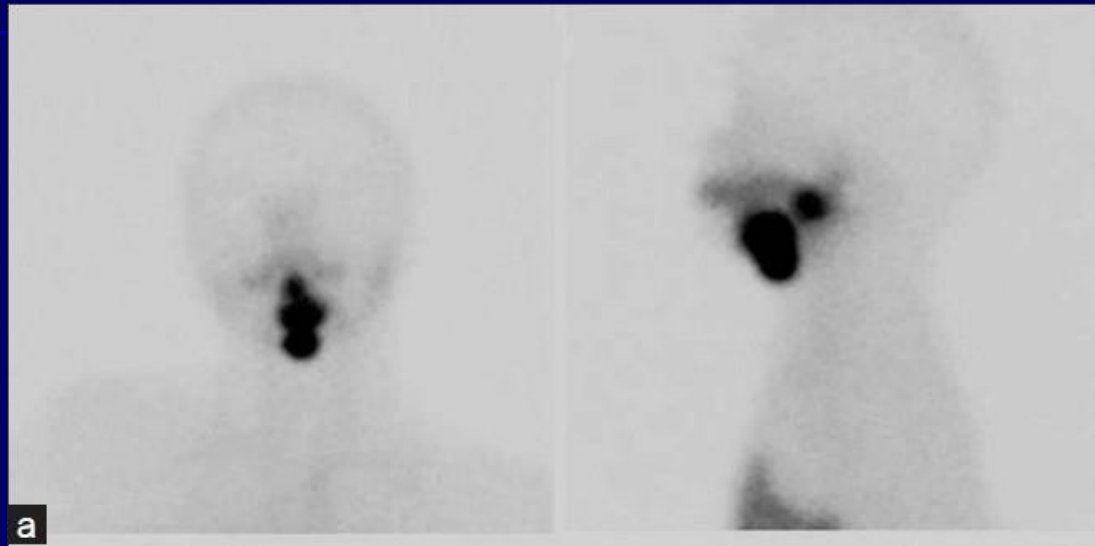
Images in a 2-week-old female patient with discordant scintigraphic and US findings and TSH of 35.05 μ IU/mL at initial scanning.



Chang Y et al. Radiology 2011;258:872-879

Radiology

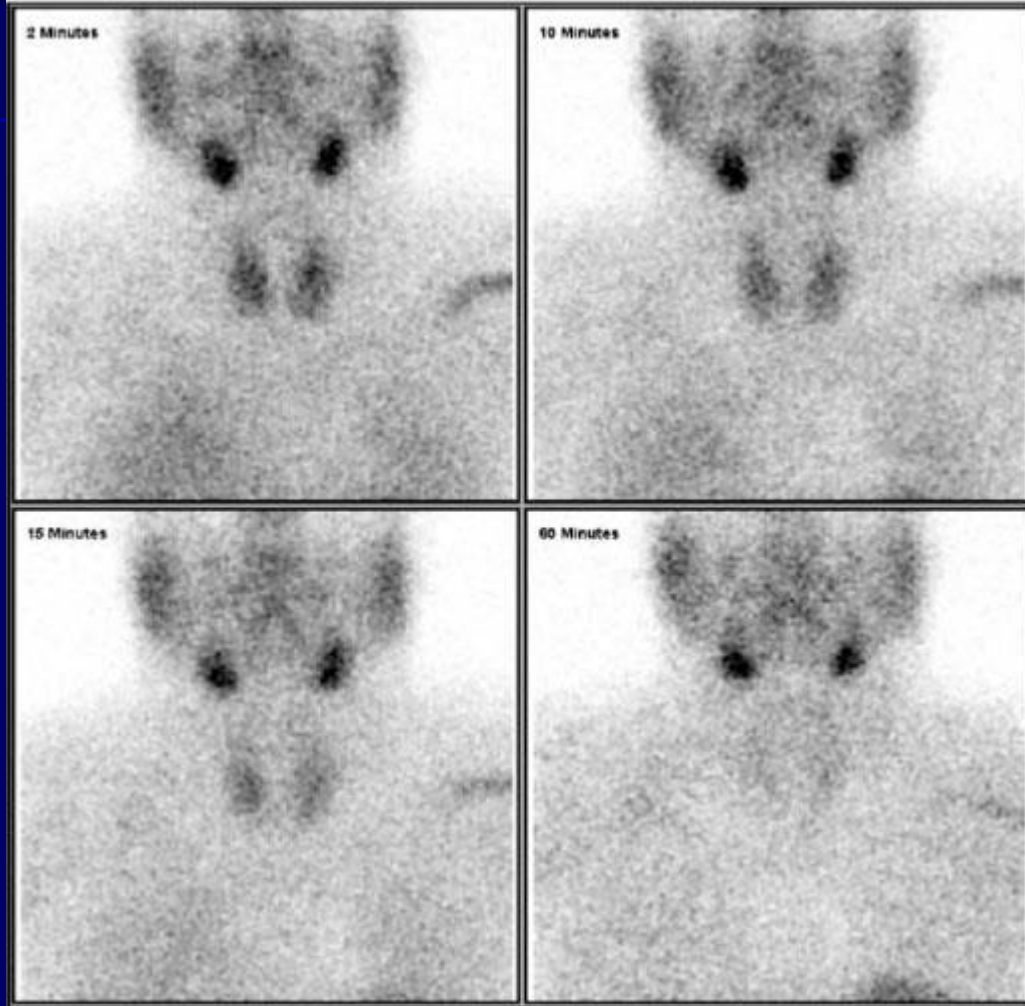
Lingual thyroid



Lack of organification

- Test rarely done
- 4 times in 24 years
- Involves giving radioiodine
- Uptake of iodine 30 min iv 4 hour oral depends on NIS
- Give perchlorate (rare since 9/11)
- Washout over 30 mins if no organification

Washout over 30 min



Insulin/diabetes

- Hyperinsulinaemia
 - Focal or diffuse
- Insulinoma
- Diabetes
 - Pancreatic inflammation
 - Consequences for children mainly GFR and renal assessment

Tc-99m IL2

- IL 2 attaches to CD25 epitope on T lymphocytes
- Involved in the early inflammatory attack on pancreatic islet cells
- Chianelli et al Diabetes Meta Re 2008
- Used Tc-99m IL2 imaging to show reduced inflammation in pancreas in children treated with high dose nicotinamide
- Correlated with reduced insulin requirements

Hyperinsulinaemia

- Hyperinsulinaemia
- Can be due to diffuse or focal defect in the pancreas
- Imaging may guide appropriate surgery
- GOS/UCLH joint project using F-18 DOPA imaging
- F-18 DOPA PET able to find focal lesion (Capito et al radiology 2009)

F-18 DOPA PET (Capito et al, Radiology 2009)

