Report Body - findings/generic descriptive language
Impressions - Dx, conclusions
myelogram - metrizamide, headaches, arachnoiditis, alot of false negs
bone scan - tech99, whole body dose, gamma camera
CT - hounsfield units, volume averaging, voxels, can get study done w/ generic dx
- $$\$, avoid on people w. recent radiation, artifacts 2nd to metallic implants
spiral CT - fast, optimized contrast delivery, reduced ill effects of respiration, more sensitive than X for fracture
PET - can cross BBB
SPECT - pars fracture imaging : SPECT to bonescan as PF is to CT
MR - Damadin did 1st full body MR 1.5T magnet minimum
RF coils - excite target tissue and reduce noise
low signal/noise ratio = bad image
larmor equation
precession = wobble during alignment w. magnet
cfreq of precession = gyro magnetic ratio
RF add > H align > RF off > H relax & release RF energy > gathered by SFC coil
high signal intensity = bright image
TR = repetition time, TE = echo time, analogous to KVP/maS
weight:TR:TE
proton:long:short, T1:S (200-600):S (25ms), T2:L:L
not the best axial images, but OK
superior coronal/sagittal images
superior angiogram study
reports physiology NOT anatomy
contrast - gadolinium (noniodinated), shortening agent, CNS tumor, MS, disc scar
consult radiologist prior to giving pt w/ renal failure
fMRI - blood O2 level dependent (BOLD), mapping brain activity

<table>
<thead>
<tr>
<th></th>
<th>Benign</th>
<th>Primary</th>
<th>Secondary (metastasis)</th>
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<tbody>
<tr>
<td>Age</td>
<td>1, 2, 3</td>
<td>1-7</td>
<td>4, 5, 6, 7</td>
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<tr>
<td>Size</td>
<td>+++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Monostatic</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Polyatomic</td>
<td>+</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Cortical Dstrct</td>
<td>-</td>
<td>+++</td>
<td>+++</td>
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<tr>
<td>Periosteal Rctn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid</td>
<td>+++</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Laminated</td>
<td>++</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>Spiculated</td>
<td>-</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Codman’s</td>
<td>-</td>
<td>++</td>
<td>+</td>
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<tr>
<td>Destruction</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Geographic</td>
<td>+++</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Motheaten</td>
<td>-</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Permeative</td>
<td>-</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Margins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharp</td>
<td>+++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Imperceptible</td>
<td>-</td>
<td>+++</td>
<td>+++</td>
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<tr>
<td>Matrix</td>
<td>+++</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Soft Tissue Mass</td>
<td>-</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Joint Space</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</table>
codmans - never assoc w/benign - so aggressive it burst through lamination
spiculated - never benign, shredded periosteum pointing away from lesion
lamination - body can't fight it off, so it tries to wall it off
permeative - aggressive only - pinholes in bone
motheaten - when pinholes merge together
ST mass - only 1° aggressive
ZPC = most mature epiphysis OR least mature metaphysis
diaphyseal side of growth plate

ACHONDROPLASIA
affects single long bones
rhizomelia
champagne glass pelvis (straight sides/floor)
femur neck angle vara or valga
L5 is NOT widest vertebra
central canal stenosis (most common adult problem)
small foramen magnum (deadly for babies)
CSF pulsations cause posterior scalloping
BULLET NOSE VERT
mushroom shaped femurs
DJD
very shallow olecranon fossa - carry arms differently
trident hand - star trek
small inf/sup pubic rami

CLEIDOCRANIAL DYSPLASIA
missing clavicles (partial or full, 10% have full)- FUNNEL CHEST
midline defects - cleft palate
wormian bones - small, oddly shaped skull bones (but skull is still normal looking)
missing pelvic body, sometimes missing pubic body
concern for brachial plexus

MARFAN SYNDROME
ARACHNODACTYLY - huge feet, spider fingers
conn tis disorder - AORTIC TEARING
pectus excavatum - ant ribs very curved/arched - sunken chest - no R heart border
eye lens dislocation
thumb sign
scoliosis

OSTEOGENESIS IMPREFECTA - BRITTLE
undertubularization - very thin cortex (cortical:medullary ratio is low, should be 1:1)
huge callus formation
thin, bowing, easily broken bones (normal length, abnormal width)
congenitiform - noticed at birth, most frequently fatal, short stature
tardiform - noticed later in life
may show short or long digits (bradydactyly or arachnodactyly)

MEDULLARY OSTOSIS - SCLEROSING
bone added OUTSIDE and INSIDE
stronger than normal bone
candle wax appearance
typically affects thumb, non TTT
vulnerable to neurovascular compression
progressive and benign, monitor for lymph compression

**OSTEOPETROSIS - BRITTLE**
- bone within bone
- primordial bone remains - failed resorption of fetal bone matrix
- anemia
- congenital and tardiform
- RUGGER JERSEY
- CHALK BONE

**OSTEOPIKYLYOSIS**
- spotted bone
- never looked for, always accidentally found
- normal bone in atypical locations
- no bone scan activity
- arranged in periarticular locations

**APERT’S MITTEN HAND**
- brachicephaly - prem closure coronal sutures
- scaphocephaly - prem closure sagittal sutures

**SPONDYLOEPHYSEAL DYSPLAGIA (SED)**
- vert endplates affected
- hump vertebra - hump on lateral view
- prim oss ring not developed properly
- also seen in hip - cysts, irregular femur contour, dec jt space
- epiphysis’s job: provide chondrocytes, mediate repair, articulate sfc for jt dev
- hyperkyphosis

**PROGRESSIVE DIAPHYSEAL DYSPLAGIA (PDD)**
- filling in of bone - NO EXTRA BONE ON OUTSIDE
- humerus

**PICNODYSTROSTOSIS - BRITTLE**
- straight inferior mandible line
- no teeth
- tiny face, but giant head
- patchy inc density - some sclerosing dysplasia
- acroosteolysis - tiny 1st/2nd distal phalanges bilaterally

**Hyperostosis frontalis internis**
- thick skull w/o marrow space (aka diploic space)
- frontal sinus may be filled w/ bone

**Parietal Foramen** - bilateral congenital holes in the skull

**Cranial Vertebral synostosis aka Occipitalization**
- extra foramen on occiput when viewing xray
- limited flex/ext - otherwise HYPERmobile
- seen on flex view
- ADI suspect
**BLOCK VERTEBRA**
congenital - wasp waist, rudimentary disc, ant/post fusion (body & sp)
most serious - leads to atlantoaxial instability
most common - premature DJD

**AGENESIS POSTERIOR ARCH C1 - CLINICALLY SIG**
huge space b/w C2/occ
huge C2 SP
pressure on C1 directs force laterally = no football for johnny

**Os Odontoidium - CLINICALLY SIG**
indented retropharyngeal space
begins to occlude airspace
caused by: ununited oss centers or longstanding nonunion fracture
VBAI CONCERN
sub-occ musc spasms and headaches, relief from adj not long lasting

**Spondyloschisis**
missing both A&P tubercles
axial load injury catastrophic

**ARCUATE FORAMEN aka POSTERIOR PONTICLE**
kimmerly anomaly
posticus ponticus ligament involved
calcific bridge b/w lateral mass & post tub
15% pop w/ visible calcification
VBAI concerns
10% of AF pts have symptoms attributable to calcified lig

**SOFT TISSUE CALCIFICATION**

<table>
<thead>
<tr>
<th></th>
<th>Physiologic</th>
<th>Dystrophic</th>
<th>Metastatic</th>
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<tbody>
<tr>
<td>Serum Ca2+</td>
<td>Normal</td>
<td>Normal</td>
<td>High</td>
</tr>
<tr>
<td>Tissue Health</td>
<td>Normal</td>
<td>Abnormal</td>
<td>Normal</td>
</tr>
<tr>
<td>Examples</td>
<td>thyroid cart, stylohyoid lig, arcuate foramen</td>
<td>calc tendonosis, calc bursitis, myositis ossificans</td>
<td>HPT, lytic mets</td>
</tr>
</tbody>
</table>

**DEVELOPMENTAL CLEFT**
insertion of longus colle musc
endplates parallel (so you know its not a compression fracture)
normal variant - looks like a notch taken out of ant body

**CERVICAL RIB w/ EXTRA JT aka Cervical Digit**
not cause for TOS
C/S TPs point down, T/S TPs point up

**DS aka Trisomy 21 - CLINICALLY SIG**
1/600 births - most common
small nose w/ flat bridge, slanted eyes w/ protruding tongue
brachycephaly - short AP distance
ABSENCE OF TRANSVERSE LIG in 20% of DS patients, need stress views
leukemia more common

**WINGED SCAPULA aka Klippel Feil**
sprengle’s deformity - failure of scapula to descend properly
pterigium coli - prominent traps
web neck - omovertebral bone scapula

**COSTALCHONDRAL OSSIFICATION**
heavy breathing
no tissue malfunction - physiologic calcification
2nd most likely tis to take up calcium

**Pectis carinatum** - opposite of pectis excavatum

**Limbus Vert**
not clinically sig b/c not trauma (looks like fracture of notch in ant sup body)
caused by NP penetrates growth plate as consequence of axial load

**WINKING OWL SIGN**
agenesis of pedicle - more often hypoplasia
most commonly caused by lytic mets
if contralateral pedicle is hypertrophied = no sweat

**SPONDYLOLISTHESIS**
comp/dist used to determine stability/instability (more than 5mm)
Wiltse Classification
  Type 1 - Dysplastic - cong abn upper sacrum or L5 arch (RARE)
  Type 2 - Isthmic alteration to pars
    A - lytic or stress frac (most common) (pars most com str frac)
    B - elongated, but intact
    C - acute pars fracture
  Type 3 - degen (aka pseuospodylo) -(2nd mos com) secondary to chron
degen arthrosis of lum Z jts & IVD artic w/o pars separation
  Type 4 - Traumatic - secondary to frac of arch, but not pars
  Type 5 - Pathologic - conjuction w/ bone disease
7% of pop w/ spondylo, mainly youngsters

**SACRALIZATION**
1 - large TP (greater than 19mm sup/inf dimension)
2 - forms accessory jt, 2A clin sig b/c of disc hern (80% 2A pts w/ HNP)
3 - bone fusion - no disc sig
4 - 1 fusion + 1 jt

**AGENESIS POST ELEMENTS aka Knife Clasp (S1/S2 segs)**
SBO analog of sacrum
L5 SP enlarges due to lack of S1/S2 tubercles = knife clasp deformity
large L5 SP may enter sacral canal during extension

**SACRAL AGENESIS** - hunched forward due to NO development of sacrum

**COXA** - valga may change w/ time, vara (knock kneed) will never fix itself

**FABELLA**
accessory ossicle embedded in tendon of lat head of gastroc - no pain

**JOINT MOUSE**
osteochondral fragment in jt space - injury and pain
BIPARTATE SESSMOID BONES
usually congenital - if not = stress fracture

POLYDACTYLY - extra metatarsal - usually bilateral - huge callus

SUPRACONDYLAR PROCESS (humerus)
no clinical significance
always on ANTERIOR DISTAL surface of humerus
always points TOWARDS elbow
struther’s ligament may go through elbow jt cap

OSTEOCHONDROMA
tumor, can be anywhere
always points AWAY from nearest jt

SYNOSTOSIS - fusion where there should be a jt - i.e. finger that can’t bend

BILATERAL OVERHANG (C1) - normal in child, ring fracture in adult from axial load

PSEUDOCYST of HUMERUS - benign, just attachment site of rotator cuff muscles

NOTOCHORDAL PERSISTENCY aka CUPIDS BOW

ROCKER BOTTOM FOOT
curved bottom of foot due to tiny talus
other bones of foot underdeveloped
first toe curls underneath others

Calcification on Calcaneus - could be calcific tendonitis (TTT/red) or os peronei

MADELUNG’S DEFORMITY
V-shaped wrist jt w/ POSTERIOR ULNA
large articular sfc b/w ulna and radius

ULNA MINUS - short ulna (carpal dislocation poss w/ UM & Madelung’s)

BUTTERFLY VERTEBRA - sup/inf oss centers not formed (triangle on film)

INTRATHORACIC RIB
extra rib that branches off of another rib, protruding through lung tissue inferiorly
may cause pneumonia, otherwise clinically insig

nucleus pulposus through end plate = Schmorl’s Node
nucleus pulposus through growth ring = Limbus Vertebra
nucleus pulposus through annual fibers = herniation (HNP)