Superficial Lumps and Bumps

SPR US Course

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I have no relevant financial relationship.
Learning Objectives

✓ List the wide gamut of superficial lumps and bumps encountered in pediatric patients.

✓ Describe the ultrasound findings that help to characterize various masses.

✓ Understand when sonography may be used to evaluate superficial masses in order to reduce radiation exposure, risk of iodinated contrast, need for preparation/sedation, and cost.

✓ Determine when higher tech imaging is necessary!
Superficial lumps and bumps may arise in skin, fat, muscle!

...and/or in the underlying bone
Superficial Lumps and Bumps

✓ Most superficial masses in children are benign!
✓ Most common benign masses:
  - lymph node
  - post-traumatic (hematoma)
  - infectious/inflammatory (abscess)
  - congenital vascular tumor (hemangioma)
  - cyst
  - lipoma
  - neurofibroma
Differential Diagnosis

derived from

✓ Clinical history

- congenital or acquired
- presence or absence of fever
- painful or painless
- stable, growing, shrinking
Physical Examination
essential prior to scanning

- Location
- Consistency
  - firm, hard (solid)
  - compressible (cystic)
- Fixed, easily movable
- Surface - smooth, irregular
- Tender?, red?, hot?
Duplex/color Doppler US modality of choice for evaluation of superficial lumps and bumps!!!

- Rapid acquisition information
- Location of mass
- Size & shape
- Borders (well defined, blends with surrounding tissue, spiculated)
- Internal consistency (cystic, solid, mixed, calcifications, acoustic enhancement, shadowing, twinkling)
- Vascularity
- Vascular encasement/displacement
- US guided biopsy/interventional procedure
Duplex color/Doppler US

☑ Correlation of US & clinical findings helps narrow differential diagnosis
The big question:

“Touch” or “Don’t Touch” lesion?

✓ Goal is to determine the next best step:
  - watchful waiting (clinical observation, follow-up US)
  - plain film radiography
  - CT/MRI/NM
  - US guided bx/interventional procedure
  - surgical resection
Scanning Technique

✓ High-frequency (12-5, 17-5, 9-3 MHz) linear transducer
✓ “Hockey stick” (17-5io) linear probe for tiny babies
✓ Curvilinear transducer and/or extended FOV
✓ Gel stand-off pad rarely
✓ Pacifier, lollipop, beverage, gameboy, video, cellphone

with grandparental permission
Cranial superficial lumps and bumps

- Cephaloheamatomata
- Subgaleal hematoma
- Fracture
- Craniosynostosis
- Cranial defects with superficial mass
- Dermoid cyst
- Epidermoid cyst
- Langerhan’s
Infant w compressible lump post auricular area of scalp noted at birth
dermoid cyst

- Well defined SQ avascular compressible cystic mass superficial to periosteum
- Strong back wall with good through transmission
- Unremarkable underlying skull
9 mo F with hard right frontal mass

- small (0.4 x 0.6 x 0.8 cm) hypoechoic avascular well defined cystic mass
- apparent extension through right frontal bone
- periosteal draped over mass
epidermoid

- Well defined cystic structure in corresponding part of the skull
- MRI confirms convexity of mass intracranially & cystic nature of mass (T2 hyperintense)
7 yo M with painful occipital mass

**Langerhan’s histiocytosis**

- **1.1 x 1.3 x 1.5 cm** solid mass with minimal vascularity extends from diploic space through the inner and outer tables of skull with local periosteal spread
- MRI confirms US findings

✓ MRI confirms US findings
Cervical Masses

*majority benign!*

- Cervical Adenitis - most common
- Congenital
  - Fibromatosis colli
  - Thyroglossal duct cyst
  - Branchial cleft cyst
  - Cystic hygroma
  - Cystic hygroma
  - Thymic ectopia/cyst
  - Hemangioma
- Teratoma
15 mo M w right clavicular trauma 2 mos prior & subsequent growing hard immobile mass medial right clavicle

- Medial aspect clavicle not visualized
- Expansion, splaying remaining most medial portion clavicle
✓ medial end clavicle markedly expanded

RT CLAVICLE TRV

✓ multiple fluid/fluid levels within multiseptated mass replacing medial clavicle
aneurysmal bone cyst (ABC)

- expansile, benign, multilocular lesion, blood filled fibrous cyst
- fluid-fluid levels due to internal hemorrhage & debris
- can occur in virtually any bone
Chest

superficial lumps and bumps
Chest
superficial lumps and bumps

- Bone lesions
- Breast (gynecomastia, galactocele, fat necrosis)
- Lipoma
- Hemangioma
- Abnormal contour costochondral cartilage
4 yr M hard lump above left nipple
costochondral cartilage
contour abnormality
Abdominal Wall

superficial lumps and bumps
Abdomen

superficial lumps and bumps

- Hernia
- Hematoma
- Hemangioma
- Urachal cyst
- Degenerating Wharton’s jelly
Underlying peritoneal contents freely move during respiration
Swollen gelatinous-like umbilical cord degenerating Wharton’s jelly

✓ Wharton’s jelly - gelatinous substance within umbilical cord, largely made up of mucopolysaccharides

✓ Cord quite enlarged and gelatinous

✓ Appears sausage-shaped on US
2 yo M red, hot, painful STS umbilicus/mid abd

infected urachal cyst with tract to umbilicus

✓ Hypervascularity consistent with acute infection
Neonate with oozing from umbilicus

**infected granuloma**

- Hypoechoic solid appearing non-compressible mass within umbilicus
- Large vessel supplies infected granuloma
Everted umbilicus hernia

- US evaluation for hernia is done in both the supine and upright positions, both w/wo Valsalva maneuver
- Without compression, gas-filled bowel loop protrudes into the umbilical hernia
- With compression, the “mass” reduces
- May be paraumbilical
Inguinal Regions

superficial lumps and bumps
Inguinal superficial lumps and bumps

- Nodes
- Hernia (may contain gonads)
- Undescended testes
- Pseudoaneurysm
- Hydrocele
- Hydrocele of cord

Groin Hernias

- Protrusion of an organ or tissue via abnl body opening
- Examine in supine/upright positions w/wo Valsalva
- Location (type: indirect, direct, femoral)
- Size of neck
- Content of sac (fat &/or bowel)
- Reducibility (dynamic maneuvers)
- Incarcerated (cannot be reduced)
- Strangulation (? Ischemia)
Sonography of Hernias

hernia contents

- fat
- fluid
- bowel (peristalsis)
- gonad
- omentum (complex echogenic mass)
- incarceration
- bowel obstruction
- strangulation

herniated mesentery  testis
Peristalsis of hernia content helps differentiate from complex hydroceles, hematoceles, scrotal abscesses, and urinomas.

Inguinal canal width >4 mm at level of inguinal ring reliable indicator of IH.
IH in Pediatrics

- Indirect more common in children than direct
- Almost always associated with patent processus vaginalis
- Incidence up to 4.4%
- Increased in premature infants
- Increased intra-abdominal pressure (positive-pressure ventilation, VP shunt)
Inguinal Hernia

identify internal inguinal ring

- Identify inferior epigastric a (IEA)
- IEA arises from external iliac a (EIA)
- Origin of IEA marks the deep inguinal ring (entrance to inguinal canal)
- Courses medially from the EIA
- May prefer to assess AIIS to symphysis pubis
Inguinal Hernia
indirect

- Enters deep ring (marked by IEA)
- Extends from peritoneal cavity into deep ring & down inguinal or canal of Nuck
- Anterior to spermatic cord
- Contains fat &/or bowel
- May strangulate
- M > F
- R > L
Inguinal Hernia

direct

AKA “old man’s hernia”

- Usually wide, broad neck
- Poor coverage conjoined tendon (IOM, TA)
- May be tear of transversalis fascia
- From medial & behind cord
- Moves post to ant
- Does not strangulate
- Usually reducible
**Inguinal Hernia**

**femoral hernia**

- Just above saphenous merger w FV
- Medial to FV
- Moves from sup to inf
- Extends into medial thigh
- Contains fat and/or bowel
- F>M
- Risk of strangulation
Inguinal Hernia
scanning guideline for detection

✓ Femoral - med to FV
✓ Indirect - AIIS to symphysis, ant to cord
✓ Direct - med & behind cord
5 yo F with bilateral IH

testicular feminization syndrome

- At surgery, structures within inguinal hernia sacs felt firmer than expected.
- Pelvic US following bilateral herniorrhaphies showed no internal gynecological structures.
Testicular Feminization 46,XY

✓ Testes usually undescended in abdomen, pelvis, or inguinal region
✓ May present with inguinal masses
✓ Testes produce androgens and Müllerian inhibition factor
✓ No seminiferous tubules
✓ No germ cells
✓ No end organ response to androgens
✓ Do not develop uterus, fallopian tubes, or upper 2/3 vagina
4 mo F with left groin mass & vomiting
torsed left ovary in left inguinal hernia

- Right ovary clearly identified in right adnexal region
- Left ovary not seen left adnexal region
- Large oval shaped avascular structure identified within left groin contains multiple follicles
Musculoskeletal System

superficial lumps and bumps
Musculoskeletal System

superficial lumps and bumps

- Ganglion cyst
- Baker’s cyst
- Pseudomass with fracture
- Osteomyelitis
- Benign bone mass (osteoma)
- Neoplasm muscle
- Inflammatory mass with foreign body
NB with hard “mass” left knee

displaced Salter 2 fracture

Marked soft tissue swelling left knee
Right sided cartilaginous distal femoral epiphysis normally aligned with shaft
Left sided Salter 2 fracture with posterior displacement distal femoral epiphysis
7 yr M acute left thigh pain with STS x 3 days, fever 40° C, ↑ESR, H/O trauma

- Soft tissue swelling left posterior thigh
- Right sided muscular structures normal
osteomyelitis

- Elevation periosteum over posterior femur below which is echogenic fluid consistent with pus
- Periosteal reaction on plain films and subperiosteal fluid on CT

Dist 2.91 cm
Dist 4.28 cm
Dist 1.21 cm

LT THIGH SAG POST DISTAL FEMUR
10 yr M with pain & STS sole of foot after stepping on something that hurt

- Normal underlying skeletal structures
- Arrows point to brightly echoic structure surrounded by sort tissue edema
Foreign Body

splinter

✓ Sagittal projection confirmed presence of 2.39 cm long splinter surrounded by hypoechoic edematous tissue
Superficial Lumps and Bumps in Children

1% are malignant

80% of malignant lesions can be recognized on basis of 5 risk factors
1. onset neonatal period
2. history of rapid or progressive growth
3. skin ulceration
4. fixation to or location deep to the fascia
5. firm mass >3 cm in diameter

2 mo M with bluish mass upper Lt chest

*pilomatricoma*

- Hard (often contain calcium), uncommon, harmless, hair follicle tumor derived from hair matrix cells.
- Single skin-colored or purplish lesions mainly head and neck
- Dx: darkly stained ‘basophilic’ cells and ‘shadow’ cells with missing nuclei.
12 yr F with steadily growing painless anterior abdominal wall mass

alveolar soft parts sarcoma

✓ Solid well defined hypervascular mass anterior body wall
alveolar soft parts sarcoma

MRI confirms likelihood of malignancy
15 yo F with rapidly growing hard rt buttocks mass

**myxoid liposarcoma**

- Large well-defined heterogeneous hypoechoic non-compressible hard mass in region of clinical interest
myxoid liposarcoma

✓ Malignant nature of mass confirmed with MRI and PET/CT
Superficial Lumps and Bumps in Children

- In the absence of any of risk factors, parents can be reassured with a 99.7% accuracy about the benign nature of their child’s lump at the initial consultation.

- Approximately 6% will spontaneously regress and do not require excision.

- More than 90% will persist or slowly enlarge and may be electively excised:
  - for cosmetic reasons
  - to remove or prevent infection or inflammation
  - to diagnose the remaining 3 malignant lesions per 1,000 that would not be recognized using the 5 risk factors.

Conclusions

✓ **US is sufficient if** the entire lesion is in FOV & boundaries are clearly defined.

✓ **CT &/or MRI required**
  - in equivocal cases
  - if FOV is insufficient for complete visualization of an obvious lesion
  - if lesion too dense to adequately penetrate
  - or if there is high suspicion of malignancy
Thank You!