Ultrasound of Superficial Lumps and Bumps

Robert D. Harris

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Ultrasound of Superficial Lumps and Bumps

Robert D. Harris, MD, MPH
Layers of the Skin

- Epidermis
- Dermis
- Subcutaneous Fat Layer
- Nerve endings
- Sweat gland
- Hair follicles
- Blood vessels
- Sebaceous glands
- Arrector pili
Superficial Anatomy

Epidermis and Dermis

Subcutaneous

Deep Fascia

Muscle

Bone

Shah and Callahan, Pediatric Radiology 2013; 43:S23-40
Skin Layers

- Epidermis
  - Thinnest layer
  - Keratinocytes
  - Merkel cells, melanocytes
- Dermis
  - Fibroblasts, endothelial and neural cells
  - Collagen
- Subcutaneous
  - Lipid cells, blood vessels, septa
General Principles

- History—especially for post-trauma pts.
- Physical exam is mandatory (MD)
- Scan with highest frequency transducer (> 8-12 MHz)
- Lots of gel/stand-off pad/light touch
- Color Doppler—optimized for slow flow
- **Use contralateral side for comparison—Dual imaging mode**
POSSIBLE MASS

CLINICAL EXAM AND US

NO US ABNORMALITY

MRI or CT IF SUSPICIOUS

MASS-LIKE LESION

SUPERFICIAL AND < 5 CM.

CHARACTERISTIC OF LIPOMA

CHOICE OF EXCISION OR CLINICAL F/U

NOT CHARACTERISTIC OF LIPOMA

EXCISION, NEEDLE BX, OR MRI

>5 CM OR DEEP

MRI (OR CT)

SPECIFIC DIAGNOSIS

foreign body

hernia

ganglion cyst

lymph node

bone/calcs

epidermal incl cyst

abscess

hematoma

from J. Wagner, Ultrasound Clinics, 2014
4 Criteria of a Simple Cyst by U/S

- Anechoic
- Imperceptible walls
- Smooth, round shape
- Increased through transmission
- Rarely, simple cysts in the skin or subQ tissue
US-All ages (1-90+)

- Foreign Bodies
- Cellulitis/Abscess
Sensitivity, PPV – both > 95%
Wood, thorns, glass, plastic, metal: all well shown

*Echogenic structures +/- shadowing*

If Hyperechoic rim surrounding hypoechoic center, + compressibility, think = abscess
Foreign body - Ultrasound is best search method (before plain films)

Wooden splinter
Deep wood splinter causing partial tendon tear
Skin and ST Infection

- **Cellulitis/Phlegmon**
  - Infection of skin and soft tissues

- **Ultrasound Findings**
  - Skin thickening
  - Hyperemia (color Doppler)
  - Subcutaneous edema

- **Classic cobblestoning**
  - Fluid tracking between fatty lobules in SubQ

- **Dirty shadowing**
  - Think gas from infection
“Cobblestoning” of Sub-Q fat

Sonosite 180, Kigali, Rwanda
Cobblestoning-Sub Q edema++
Cellulitis

Skin/fat thickening  MRI with contrast  Frank abscess

Shah and Callahan, 2013
Abscess

- Early-difficult clinically to distinguish from cellulitis
- Complex (int. echoes) fluid collection with thick, irregular (+/- hyperemic) wall
- May be pockets of gas-echogenic foci
- US allows for easy aspiration, drainage
Early abscess-discrete, anechoic collection with marginal hyperemia
Late lymphadenitis/early abscess
Early abscess
Early abscess in IV drug abuser
Granulation Tissue @ PEG site
77 yo with Gluteal area lump with + color Doppler-concern for sarcoma

UW bx 5/18–granulation tissue
Non-painful lump in back-asymmetry

No biopsy or f/u imaging—presumed hematoma
Hematoma-no blood flow
Hematoma clip
Lymph Node

- Among most common superficial nodules/lumps
- Children-95% are benign, reactive, hx infection/inflammation
- Lymphadenitis on U/S
  - Hypervascular cortex, loss of fatty hilum, adjacent cellulitis, indurated fat
  - +/- Necrosis and abscess*
  - *Hard to differentiate from cancer
Lymph nodes

Benign in 8 yo male neck
- Oval Shape, wider than high, uniform cortical thickness

Malignant in 72 yo woman w/ breast CA
- Focal cortical bulge, CA finding + FNA

Shah and Callahan, 2013
Axillary Lymph node-hypoechoic lesion in fatty hilus
+ FNA of focal lesion in sinus
Lymphadenitis in 7 y.o. girl: left pre-auricular space
Lymphadenitis in 7 year old female
Neck lump in 33 yo pt.
Neck lump
Multiple superficial lymph nodes in elderly African female
Superficial lymphadenopathy
Use Spectral Doppler to confirm color Doppler
Lumps/Bumps in Pediatrics

- Infantile hemangiomas (IH) / Vascular lesions
  - Hemangioma, vascular malformation (low or high flow), lymphangioma, or AVM
- fibromatosis colli
- ectopic breast tissue
Fibromatosis Colli

- Contracture of SCM
- Head tilt to ipsilateral side
- Chin rotates to contralateral side
- Right side 75%
- Frequent traumatic breech or forceps delivery HX
- Occurs ~ age 4-6 weeks, regresses over 4-8 months
- Treat conservatively
- US-fusiform swelling of SCM
Fibromatosis Colli
Fibromatosis Colli

Contralateral SCM  Trans neck view
Fibromatosis Colli

Transverse view of the neck anteriorly
Rib chondroma in 2 year old girl
Ectopic Breast tissue

- Failure of regression of embryologic tissue
- Puberty-becomes more prominent
- Palpable, tender lesion(s) in axilla
- Echogenic tissue similar to breast tissue
Ectopic breast tissue

- Generally ill-defined
- Multiple small, hypoechoic areas
- May mimic lymph nodes
- Comparison to contralateral breast or area helpful
Common Lumps/Bumps in Adults

- Lipoma
- Hernia
- Epidermal inclusion cyst
- Ganglion cyst
- Popliteal cyst
- Morton’s “neuroma”
- Fat necrosis
- Neurofibroma
- Uncommon-Sarcoma/malignancy
Lipoma

- Common in adults
  - > 50% or more of superficial lesions on U/S
  - 2-4% prevalence overall
- Rarer in children
  - 10% of all lesions
- Variable in appearance
  - Hypo- to hyperechoic, well-defined to vague borders
- Difficult to separate from surrounding fat
- Asymmetry of soft tissues
- Hard to see—Look at contralateral body part
- Ultrasound usually pathognomonic
Lipoma - typical and atypical
Ill-defined upper back mass in 62 yo male
Lipoma – use contralateral side comparison!!

LT BACK

RT BACK

Trans
Lipoma in 57 yo woman - back
Lipoma – usually compressible
7 of 31 (23%) echogenic masses (lipoma or lipoma-like) in subQ fat had blood flow on color Doppler US

Most were in upper arm, mean size 1.7 cm.
Second most common site: trunk and chest
Well-circumscribed
Half homogeneous, half heterogeneous echogenicity

Superficial lesion in 25 yo male with hx of Burkitt’s lymphoma
Bx x 3 => mature fibrous and fatty tissue
Cine clips of lipoma in axilla
Hernia-Inguinal
Hernia-Inguinal
Abdominal hernia—mind the gap!
Hernia—only visible standing
Ventral Hernias - large and small
Epidermal Inclusion Cyst (EIC)

- Most common subcutaneous “cyst”
- Most common over trunk & scalp
- Rarely extremities
- Often clinical diagnosis
- Congenital or post-traumatic etiology
- Inclusion of squamous epithelium into dermis
- Hypoechoic rim
- Varying internal echoes
- No vascularity
Epidermal Inclusion Cyst - Scalp
Epidermal Inclusion Cyst
If in doubt, always exclude color Doppler twinkle artifact with **spectral Doppler**—if it is artifactual, only see noise.
Epidermal Inclusion Cyst

Shah and Callahan, Pediatric Radiology 2013; 43:S23-40
Gluteal Crease Mass in Man

Pilonidal Cyst
Baker’s or Popliteal Cyst

- 5% of palpable masses
- Fluid in bursa behind knee
  - Postero-medial to the joint
  - Usually anechoic fluid, may contain debris or septa
  - Usually reflects knee joint pathology
  - May see septa in R.A., inflammatory processes
Popliteal (Baker’s) Cyst
Ganglion Cyst

- Hand and wrist most common--near articular joints
- Pain and/or palpable abnl. *often feel hard*
- 10-40 years of age
- 2nd most common soft tissue lesion after lipoma
- U/S appearance
  - Anechoic or mildly complex cystic
  - Generally round or oval
  - Often, lobulated or septated
  - No blood flow
  - Connection to tendon sheath or joint capsule
Ganglion Cyst
Wrist ganglion
Morton’s “Neuroma”—perineural fibrosis

- 2nd-3rd web space of foot - most common site
- Bilateral in 10%
- Multiple in up to 30% of pts
- Middle aged
- Female
- US appearance
  - Hypoechoic
  - Well-defined
  - Ovoid, ~ 5-7 mm. diameter
Morton’s “Neuroma” — “pops” out
Fat (Dystrophic) Necrosis

- Etiology
  - S/p blunt trauma (but pt may not recall, often minor)
  - Sickle cell dz, vasculitis
  - Autoimmune disease (SLE, Wegener’s)
  - Hypothermia
  - Medication injection

- PE-Firm, non-tender

- US
  - Hyperechoic, in subcutaneous tissues
  - Indistinct, hypoechoic margins
  - Little vascularity
Fat necrosis

Shah and Callahan, Pedi Radiology, 2013
Fat necrosis in 70 yo female
Fat Necrosis

Hysterectomy 1994
LLQ LONG
Fat necrosis s/p hysterectomy
Neurofibroma/Schwannoma

- Benign lesion of nerve / nerve sheath (Schwann cells)
- Age ~ 20-50
- Most in deep locations
- Rarely superficial-dermal
- Tenderness, numbness frequent symptoms
- Smooth, well-defined
- Optimally-see nerve at either end of lesion
36 yo male with slow growing lump
Vascularity??

SAG LEFT CHEST

cm/s
Neurofibroma with degen. changes
Neurofibroma - Mercy Ships (West Africa) screening

13 yo male, Congo-Brazzaville, 2013
88 yo s/p melanoma resection

Large groin hematoma - confirmed by MRI, no tumor
Hematoma (s/p melanoma resection) – color Doppler absence helpful
81 yo female with thigh pain, lump

Probable hematoma, no therapy given
Abdominal wall mass in young woman, tender, near umbilicus
Abdominal wall mass at surgery: Endometrioma
62 yo cardiologist with painless lump 3\textsuperscript{rd} DIP jt
Lesson-use plain films – bony or Ca++
Benign vs. Malignant ST Masses

- Benign much more statistically common (~ 50:1)
- No single US predictor very accurate
- Margins & Vascularity “important”
- Clinical hx important
- PE-not so important (cysts or LN can feel fixed and solid & malignancy feel somewhat soft, mobile!)
Giant Cell Tumor of Tendon Sheath

Looks malignant, path: benign!

Shah and Callahan, Pediatric Radiology 2013; 43: S23-40
ST tumors: Malignant trending...

- Size > 5 cm., or intramuscular location
- Involvement of the deep fascial layers
- Lesion heterogeneity
- Poorly defined margins
- Increased vascularity +/-
Supporting Malignant Lesions:

- rapid growth
- clinical predisposition
- syndromes
- family history
Color Doppler grading scheme

Type I

Type II

Type III

Type IV

Journal of Ultrasound in Medicine, 1999, 18: 89-93
# Color Doppler Discrimination: Benign vs. Malignant

N = 71 lesions  
(39 benign, 32 malignant)

<table>
<thead>
<tr>
<th>Type</th>
<th>Benign (total 100%)</th>
<th>Malignant (total 100%)</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>86</td>
<td>9</td>
</tr>
<tr>
<td>II</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>III</td>
<td>0</td>
<td>50</td>
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<tr>
<td>IV</td>
<td>0</td>
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</tr>
</tbody>
</table>

Giovagnorio, JUM 1999, 18:89
Malignant Soft tissue tumors

- Incidence - 1: 100 palpable soft tissue tumors in adults
- Uncommon in pediatrics
Malignant lymph node

- Height : Length > 0.5
- Loss of hilar fat sign
- Cortical thickening
- Hypervascularity
Metastases to axillary lymph node male breast cancer
Subcutaneous carcinosarcoma metastasis upper abdomen
Carcinosarcoma pt-rectus hematoma—probably benign?
Sarcoma

- 1 percent of all adult malignancies and 12 percent of pediatric cancers
- 80 percent of sarcomas originate from soft tissue, and the rest from bone
- ~12,000 new cases of soft tissue sarcoma diagnosed each year in the United States, with 4,740 deaths
- Thigh, buttock, groin - ~ 50% cases
Sarcoma vs. dermatofibroma vs. desmoid tumor-57 yo man
Sarcoma or Desmoid tumor?
72 m–myxoid spindle cell tumor

Surgery- intramuscular myxoma
Superficial soft tissue bumps are common, malignancy rare (1-2%)

Diff Dx based upon age, clinical hx, US appearance-get good history

Know “leave-alone” lesions-fibromatosis coli, lipomas, cysts, hematomas

Color Doppler very helpful- ~25% of lipomas may show Color Doppler flow

Size > 5 cm. or deep location suggests malignancy (needs MRI or CT)

If heavy Ca++ or bone, get plain films
POSSIBLE MASS

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from J. Wagner, Ultrasound Clinics, 2014
Thank you for your attention....