Ultrasound Evaluation of Lumps, Bumps and Small Parts of the Extremities

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No disclosures
Learning Objectives

- Background information
- BCH experiences
- Clinical perspectives
Learning Objectives

• Background information
• BCH experiences
• Clinical perspectives
Pediatric superficial soft tissue masses

- Common
- Variable pathology
- Most can be treated conservatively
Pediatric superficial soft tissue masses

Benign >>> malignant
Pediatric superficial soft tissue masses

- 1% of all pediatric soft tissue tumors are malignant

- up to 25% malignant if small superficial lesions are excluded

Clinical Evaluation

• Radiologist & Sonographer
  – Direct examination & discussion
  
  – Facilitates accurate report
Clinical Evaluation

- Where?
- Does it hurt?
- Mobile or fixed?
- Skin Changes?
- Systemic Symptoms?
Clinical Evaluation

- Age of patient?
- Lesion Duration?
- Congenital?
- Growth pattern?
Ultrasound Examination

- Location
  - Anatomic location
  - Depth
- Shape / Margins
- Echotexture / Internal Characteristics
- Vascularity
Ultrasound Examination

• Comparison views of contralateral side
Ultrasound Examination

- High frequency Linear Transducer
- Gel
- Standoff Pad
- Waterbath
Standoff Pad
Waterbath
Anatomy

- Dermis
- Subcutaneous tissues
- Fascia
- Muscle
- Bone, Joint
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BCH experiences

Ultrasound evaluation of superficial lumps and bumps of the extremities in children: a 5-year retrospective review

Shah S, Callahan MJ. Pediatric Radiology MSK supplement, In press
BCH experiences

• IRB approval

• Extremity US
  – CPT codes 5 - year period (2007-2012)
  – “Mass, lump, bump, nodule”
BCH experiences

• 1052 results from search
  
  – 754 studies head, neck, torso
  
  – 298 studies of extremities
    (272 patients)
BCH experiences

- Male = 131 (48%)
- Female = 141 (52%)
- Mean age = 8.7 years
- Range = 2 wks – 24.8 years
BCH experiences

- Upper extremity = 109 (40%)
- Lower extremity = 163 (60%)
- Mass = 208
- Focal abnormality = 35
- No abnormality = 29
BCH experiences

- SQ = 191
- Deep fascia = 7
- Muscle = 21
- Joint = 3
- SQ w tail to joint = 12
- Bone = 3
- Other (skin, inguinal canal, tendon) = 5
BCH experiences

- 54 (20%) no clinical or imaging follow-up
  - excluded
- Remaining patients
  - Pathologic confirmation 42 (21%)
  - MRI evaluation 49 (24%)
BCH experiences

• Impression
  - Benign Dx = 142
  - Narrow Ddx (all benign dx) = 19
  - Non – Specific = 27
  - Non – Specific vascular lesion = 5
  - Wide Ddx (including malignancy) = 5
  - Highly concerning for malignancy = 5
BCH experiences

- None of the “benign” diagnoses were found to be malignant
- None of the sonographically “non-specific” lesions were malignant
- Many of our cases had “benign” clinical follow up, but no pathologic or MR diagnoses
• Pilomatrixoma = 3
• Giant Cell Tumor of the TS = 3
• Foreign Body = 3
• Granuloma Annulare = 3
• Axillary Breast Tissue = 3
Pilomatricoma

- Benign tumor
- Hair follicle
- < 20 yr
- Head & Neck, upper extremity
Pilomatricoma

- Firm
- Often dx clinically
- Surgical excision

- Dermis, grows into SQ tissues
Pilomatricoma

- Well-defined
- Heterogeneous
- Hypoechoic rim
- Homogeneous hyperechoic
- Ca 2+
Granuloma Annulare

- Asymptomatic
- Benign inflammatory process
- SQ form children
- Peak 2-5 yrs
- Pre-tibial location
Granuloma Annulare

- Hypoechoic
- Ill-defined or nodular
- SQ tissues
- Vascular
Granuloma Annulare

4 yo male, left forearm mass
Granuloma Annulare

22 mo female, “cysts” on the hands / fingers
8 & 9

- Epidermal Inclusion Cyst = 4
- Herniae = 4
Epidermal Inclusion Cyst

- Most commonly excised SQ cyst
- Dx usually clinical / excisional
- < 10% occur in extremities
- Keratin

8 year old male with left heel nodule
Epidermal Inclusion Cyst

- Well-circumscribed
- Relatively homogenous internally
- Hypoechoic rim
- No color
  - Doppler flow
7

• Lipoma = 6
Lipoma

- More common in adults
- 2/3 of adipocytic tumors
- Variable US appearance
  - Hypoechoic to echogenic
Lipoma
Lipoblastoma

10 month old with painless knee mass
5 & 6

- **Infection = 13**
  - *Abscess (6)*
  - *Cellulitis (5)*
  - *Phlegmon (2)*

- **Baker’s cyst = 13**
Infection

- Cellulitis
- Phlegmon
- Abscess

Overlap

- Exclusion of abscess
Infection

• Sonographic findings mirror the clinical picture

  - Skin thickening
  - Hyperemia
  - SQ edema
Abscess

7 y.o. female with right thigh mass & fever
Baker’s Cyst

- 2% asymptomatic children
- 6% w knee pain
- Semimemb. & medial head of gastroc. tendons
• Trauma = 18
  - Hematoma (6)
  - Fat Necrosis (3)
  - SQ injury (4)
  - Muscle injury (2)
  - Muscle Hernia (3)
Hematoma

3 y.o. male with leg pain and swelling
Rectus Femoris Strain
• Ganglion = 19

• LN = 19
  – Normal (9), reactive (4), lymphadenitis (4), dermatopathic (1), Hodgkin’s disease (1)
Ganglion Cyst

- Periarticular
- +/- Pain
- 2nd – 4th decades
- Hand / Wrist
- No synovial lining
Ganglion Cyst

- Simple
- Septated
- Tail
- Debris / Solid
- Vascularity
Ganglion Cyst

6 y.o. female w mass near great toe MTP joint
Lymph Nodes

- Very common in adults and children
- Vast majority have benign etiology
- Ultrasound often provides reassurance
Lymph Nodes

- Benign
  - Oval shape
  - Fatty Hilum
  - Central Vascularity
Lymph Nodes

• Malignant
  – Enlargement
  – Round
  – Loss of fatty hilum
  – Heterogeneity
  – Necrosis
  – Peripheral hypervascularity
Reactive Lymphadenopathy

Shape & vascularity can mimic malignancy
Vascular Anomalies = 36

Venous Malformation = 16
Lymphatic Malformation = 9
Infantile Hemangioma = 8
Vascular Lesion NOS = 2
AVM (post traumatic) = 1
Vascular Anomalies

• Vascular Malformations
  – VM
  – LM
  – VLM
  – AVM

• Infantile Hemangioma
17 year old HIV + girl with arm mass
Infantile hemangioma

3 month old female with thigh mass & cutaneous hemangioma on eyelid
Top Ten List

- Vasc malf
- Ganglion
- Lymph nodes
- Trauma
  - Hematoma, Fat necrosis
- Baker’s cyst
- Infection
- Lipoma
- Hernia
- Epidermal Inc Cyst
- Misc
  - Pilomatricoma, GCell Tumor TS, Foreign Body, Granuloma Annulare, Axillary Breast Tissue
Malignancy
Malignancy

- > 5 cm
- Pain
- Increase in size and depth beneath the deep fascia
- Significant displacement of surrounding tissues
14 y.o. girl w/ palpable lymphadenopathy
Nodular Sclerosing Hodgkin’s Disease
16 year old girl with painless palmar mass
Rhabdomyosarcoma
17 y.o. male, enlarging thigh mass
Dermatofibrosarcoma protuberans
17 y.o. male, new left shoulder mass
Malignant peripheral nerve sheath tumor
2 mo female with enlarging forearm mass
Undifferentiated Sarcoma
Learning Objectives

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Surgical perspective

• Imaging may be avoided
  – Pilomatricoma
  – Cutaneous infantile hemangioma
  – Subcutaneous infection
  – Post traumatic hematoma
Surgical perspective

- Imaging should be performed if biopsy or surgical procedure is planned
Lesion Characteristics

- Cystic components
  - Pure cysts nearly pathognomonic of benign lesions (cyst, hematoma, abscess, LM)
  - Some malignant tumors can have cystic components (necrosis)
Lesion Characteristics

- Fat
  - Fatty component suggests a benign lesion (lipoblastoma, fibrolipomatous hamartoma, lipoma, dermoid cyst)
Lesion Characteristics

• Vacularity
  - Poor predictor benign vs. malignant
  - Complete absence of vascular flow indicates benignity
Pitfalls

< 5 cm

Past Med History

Vascular Lesions

Spindle Cell CA

Reactive Lymphadenopathy

HIV +
Objectives of Imaging

- Primary objectives:
  - Confirm solid mass
  - Define precise location and characteristics
  - Guide the decision of whether to perform biopsy, excise or observe
Objectives of Imaging

• Know your limitations:
  - Frequently ultrasound cannot determine the exact nature of a soft tissue lesion
Further imaging

- MRI
  - Superior contrast resolution
  - Deep extent of lesion
Absence of definite signs of benignity

- Short term f/u
- MRI
- Biopsy
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