SKIN SONOGRAPHY IN CHILDREN

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I HAVE NO DISCLOSURES
OBJECTIVES

- RELEVANCE OF SKIN LESIONS IN CHILDREN
- ROLE OF THE RADIOLOGIST
- CLINICAL CORRELATION
- US TECHNIQUE
- NORMAL ANATOMY
- EXAMPLES OF MOST COMMON LESIONS
- VASCULAR ANOMALIES WILL NOT BE DISCUSSED
INTRODUCTION

• Superficial soft tissue lesions are not uncommon in children
• Often a matter of concern
• Malignant lesions are very rare in this age group
• Clinical findings may be nonspecific
INTRODUCTION

• High resolution ultrasonography (US) with color-Doppler study could be of help in the characterization of skin lesions and can suggest the specific diagnosis, when clinically the diagnosis is unclear.

• Significant and progressive increase in the number of studies.

• However, in many cases the final diagnosis is made histologically.
INTRODUCTION

• US can give information about the size, extension, shape, depth, involves layers and vascularity of the lesion
• Solid, cystic, complex
• Calcifications
INTRODUCTION

• There is an incredible number of different entities, based on pathological findings
• US : Different lesions may look similar
• Clinical correlation is extremely important
• US - histologic correlation
• Close relation with pathologists and dermatologists
DERMATOLOGIST

DERMATOPATHOLOGIST

RADIOLOGIST

DIAGNOSIS

- depth
- involved layers
- vascular flow
- cystic-solid-complex
- inflammation
- rupture
- EPIDERMIS
- DERMIS
- HYPODERMIS OF SUBCUTANEOUS TISSUE
NORMAL ANATOMY

Wortsman, X.
TECHNIQUE

• High-resolution linear transducers
  10-18 mHZ
• Color – Doppler US
• Jelly pad
• No sedation
• Spontaneous sleep if necessary
14 y/o. Posterior cervical mass
EPIDERMAL CYST
EPIDERMAL CYST

- Epidermal - epidermal inclusion cyst is the most common type of follicular cyst (80 %)
- Implantation of epidermal components in the dermis and subcutaneous tissue
- Congenital, traumatic, related to previous surgery or unknown cause
- Histologically composed of stratified squamous epithelium without dermal components
- Therefore, the term “sebaceous cyst” is not correct and confusing
EPIDERMAL CYST

- More common in head, face, neck, back
- Any age, more common around puberty
- Infection is common
- 1 - 6 cm
- Most cases (96%) with acoustic enhancement
- Avascular
- Ruptured or inflammed cyst could show peripheral flow
- Most are hypoechoic and may contain scattered internal echoes or keratinous debris
EPIDERMAL CYST

INTACT

RUPTURE

Wortsman X. Springer, 2013
2 y/o. History of facial trauma 6 months ago

Epidermal inclusion cyst
ANTERIOR FONTANELLE

www.ibrarian.net
DERMOID CYST

- Includes epidermal and dermal elements
- Most cases congenital
- 50% at birth
- Deep, below the hypodermis
- May have bone involvement
- Skull, orbit, midline, anterior fontanelle, nose, anterior neck
- Can grow up to a size of 1 - 4 cm.
- May persist unchanged in size or grow later in life.
- US: Hypo – hyperechoic
PILOMATRICOMA

- Also called calcifying epithelioma of Malherbe or trichomatricoma
- Benign dermal and subcutaneous tumor
- One of the most commonly excised superficial masses in children.
- More common in < 15 y.
- Most are solitary nodule
- Head and neck (50-70%), upper limbs (25 – 30 %), and less commonly on the trunk and legs (15 – 20 %)
1-month-old male infant. Posterior neck mass
SUBCUTANEOUS FAT NECROSIS
SUBCUTANEOUS FAT NECROSIS OF THE NEWBORN

• First month of life
• Tender or asymptomatic indurated nodules or plaques with or without erythema
• Thought to be secondary to ischemic injury from trauma of the delivery
• US : echogenic subcutaneous lesion
• Epidermis and dermis may be thickened
14 y/o female. 3- month history of soft tissue swelling of the right knee. Treated with anti-inflammatory with no changes.

Courtesy Dr. Marcos Silva, Chile.
Courtesy Dr. Marcos Silva. Chile.
DIFFERENTIAL DIAGNOSIS

- Paniculitis
- Edema
- Fat necrosis
- Insect bite
- Lupus
- Lipoma
- Lipoblastoma
- Lymphoma
DIFFERENTIAL DIAGNOSIS

- Paniculitis
- Edema
- Fat necrosis
- Insect bite
- Lupus
- Lipoma
- Lymphoma
Extranodal NK/T-cell lymphoma

- Rare type of non-Hodgkin lymphoma
- Extranodal NK/T-cell lymphoma, nasal type, can develop in either T cells or natural killer (NK) cells
  - Most commonly involves upper airway – nasal
  - May involve primarily the skin
  - Occurs in all age groups
  - Strongly linked to Epstein-Barr virus
  - Eritematous plaques, sometimes ulcerated
  - Bad prognosis

Kimura, Blood 2012; 119: 673-686
6 m/o. Multiple soft tissue nodules

- occipital
- anterior abd wall
- axillary
- mamary
MULTIPLE SOFT TISSUE NODULES

- Infantile myofibromatosis
- Metastatic sarcoma
- Epithelioid sarcoma
- Metatastatic melanoma
- Granuloma annulare
- Septic emboli
- Metastatic neuroblastoma
6 m/o. Multiple soft tissue nodules
METASTATIC NEUROBLASTOMA
18 y/o female. Painful, non inflammatory nodules in the right thigh.
CLINICAL DIFFERENTIAL DIAGNOSIS

“ENGLAND”

- Espiradenoma (E)
- Neurofibroma (N)
- Glomangioma (G)
- Leiomioma (L)
- Angioleomioma (A)
- Neurilemoma (N)
- Dermatofibroma (D)
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ESPIRADENOMA

- Benign neoplasm of sweat glands
- Usually a solitary multinodular lesion
- Deep dermal or subcutaneous location
- Trunk and proximal extremities
- No predilection for sex nor age
- Usually painful
- Hypervascular
- The presence of pain supports the diagnosis
3 y/o girl. Asymptomatic lesion at the posterior aspect of the right knee.

(Courtesy Dr. JD Arce, Chile)
5 y/o girl, palpable lesion left knee

GRANULOMA ANNULARE
GRANULOMA ANNULARE

- Benign inflammatory papular dermal and annular plaques.
- Relatively common
- All age groups, rare in infancy
- Cause unknown
- Usually asymptomatic, may improve in winter and worsen in summer
GRANULOMA ANNULARE

LOCALIZED GRANULOMA ANNULARE
• Most common form
• Children and adults younger than 30 years.
• Groups of 1-2 mm annular papules over distal extremities.
• Most common locations: feet, hands, fingers, arms, legs.

GENERALIZED GRANULOMA ANNULARE (10%)
• Bimodal age distribution, occurring in patients younger than 10 years and in patients aged 30-60 years.
9 y/o. Red nodule left sole
PYOGENIC GRANULOMA

PYOGENIC GRANULOMA

- Benign vascular lesion
- Most common in children: fingers and hands
- Originally, thought to be caused by bacterial infection → pyogenic granuloma
- Etiology unknown
- Histology: capillary hemangioma
- History of previous minor trauma is frequent.
- Usually solitary lesions.
- Might bleed with little or no trauma
9 y/o girl. Indurated depressed lesion of the right thigh.
MORPHEA

• Localized scleroderma
• Self-limited disorder, lasting 3-5 years
• Often history of trauma
• Superficial erythema, hardening of the skin, loss of hair, hypo or hyperpigmentation, sclerosis, atrophy
• US mostly used for f/u after treatment
CONGENITAL HISTIOCYTOSIS (Hashimoto-Pritzker)

- Unusual form of histiocytosis
- Self-healing reticulohistiocytosis
- Isolated involvement of the skin
- Presents with papules and nodules that frequently ulcerate
- Affected infants are otherwise well and the skin lesions tend to involute spontaneously within weeks to months.
CONGENITAL MELANOCYCTIC NEVUS
8 m/o. nevus anterior abd wall

CONGENITAL MELANOCYTIC NEVUS
CONGENITAL MELANOCYTIC NEVUS

- Found at birth
- 1% of infants
- Located in the area of the head and neck 15%
- May be small (less than 2 cm), medium-sized (more than 2 cm) or giant (more than 40 cm)
- May have hairy patches
- Can have histological characteristics resembling melanomas
- Risk of malignant transformation specifically the giant form
- Because of the premalignant potential, early surgery should be considered to prevent nevocytic overload.
PRIMARY CUTANEOUS MELANOMA

- Very rare in children
- Incidence may be increasing

PREDISPOSING CONDITIONS

- Transplacental melanoma, transmitted from the mother with melanoma to the fetus in utero.
- Giant congenital melanocytic nevus
- Congenital conditions: xeroderma pigmentosum, dysplastic nevus syndrome, albinism
- Development from a preexisting nevus
PRIMARY CUTANEOUS MELANOMA

ULTRASONOGRAPHY

• Usually well defined
• Oval- or fusiform-shaped, homogeneous, hypoechoic
• Smooth borders, increased acoustic transmission
• Variable degrees of vascularity, most commonly hypervascular on color Doppler
• Assessment of the vascularity, including the peak systolic velocity of the arterial vessels, may provide an idea of the angiogenic power of the tumor that can correlate with the metastatic potential
**Table 9.1**  Clark classification of the levels of invasion in melanoma

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>in situ melanoma</td>
</tr>
<tr>
<td>II</td>
<td>invasion of the papillary dermis by single cells or small nets</td>
</tr>
<tr>
<td>III</td>
<td>invasive tumor usually as an expansile nodule abutting on the reticular dermis</td>
</tr>
<tr>
<td>V</td>
<td>invasion of the subcutaneous fat</td>
</tr>
</tbody>
</table>

**Table 9.2**  Breslow classification of the depth of melanoma

<table>
<thead>
<tr>
<th>Tumor depth (mm)</th>
<th>Approximate 5-year survival (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>95–100</td>
</tr>
<tr>
<td>1–2</td>
<td>80–96</td>
</tr>
<tr>
<td>2.1–4</td>
<td>60–75</td>
</tr>
<tr>
<td>&gt;4</td>
<td>50</td>
</tr>
</tbody>
</table>
CONCLUSIONS

• US can be useful in the characterization and diagnosis of skin lesions in children when clinical findings are nonspecific
• US can be also helpful as a complement of clinical findings when the diagnosis is already known
• Most skin lesions are benign in children
• Radiologists should be familiar with the clinical and sonographic appearance of the most common lesions
CONCLUSIONS

• Interaction with Dermatologists and Pathologists is important
• Other studies such as MRI might be needed in very specific cases, mostly in larger and deeper lesions
• In many cases the final diagnosis is made histologically
THANKS FOR YOUR ATTENTION