1. Which sonographic sign may help to differentiate atelectasis from pneumonia?
   A. Dynamic air bronchogram
   B. Absence of sliding of the parietal pleura on the visceral pleura
   C. Deep sulcus sign
   D. Presence of internal cystic components

Correct Answer: A

Rationale: In the experience of Lichtenstein et al dynamic air bronchogram sign, consistent of moving air bubbles within the bronchi, has a 94% specificity and a 97% positive predictive value for differentiating pneumonia from atelectasis.

References:

2. US of the chest is performed in a child with fever and respiratory distress. What is the most likely diagnosis?
   A. Transudative pleural effusion
   B. Empyema
   C. Pneumothorax
   D. Pleuropulmonary blastoma

Correct Answer: B

Rationale: Transudative pleural effusions on US are typically anechoic. However, exudative pleural effusions, are more complex, may reveal a heterogeneous appearance with internal echoes, loculations or septations, such as in the case of empyemas. Pleural fluid could be better characterized with US than with CT. If echogenic, loculated or multiseptated may indicate the necessity for intervention and drainage, the instillation of intrapleural fibrinolytics or even video-assisted thoracoscopy.
**References:**


**Ultrasound of the Lungs**

Michalle Soudack, MD

3. You are scanning an intubated premature neonate to rule out pneumothorax. You notice 2 “B” lines in one intercostal space. What information does this provide you with?

A. The ultrasound is positive for pneumothorax
B. Pneumothorax can be safely ruled out
C. To rule out a pneumothorax you must see at least 3 B lines in the intercostal space
D. The infant has PIE (pulmonary interstitial emphysema)

**Correct Answer:** B

**Rationale:** The B line originates at the visceral pleura. They can only be seen in absence of a pneumothorax.

**References:**


4. Which of the following signs are specific for pneumothorax on ultrasound?

A. Lung point
B. Stratosphere (M-Mode)
C. Absent lung sliding
D. Pronounced A- lines

**Correct Answer:** A

**Rationale:** The only sign that has a specificity of 100%; in other words no patients without pneumothorax will have the sign.

**References:**


ii. Lung Ultrasound for Diagnosing Pneumothorax in the Critically Ill Neonate RSS Download PDF Francesco Raimondi MD, PhD, Javier Rodriguez Fanjul MD, Salvatore Aversa MD, Gaetano Chirico MD, Nadya Yousef MD, Daniele De Luca MD, PhD, Iuri Corsini MD, Carlo Dani MD, Lidia Grappone MD, Luigi Orfeo MD, Fiorella Migliaro MD, Gianfranco Vallone MD and Letizia Capasso MD, PhD Journal of Pediatrics, The, 2016-08-01, Volume 175, Pages 74-78.
iii. Understanding and using sensitivity, specificity and predictive values Rajul Parikh, MS, corresponding author Annie Mathai, MS, Shefali Parikh, MD, G Chandra Sekhar, MD, and Ravi Thomas, MD. Indian J Ophthalmol. 2008 Jan-Feb; 56(1): 45–50

**Ultrasound of the Pediatric Breast**

*Sarah Milla, MD, FAAP*

5. What is the most common histopathology of surgically removed breast lesions in children and adolescents?
   A. cystosarcoma phyllodes
   B. lymphoma
   C. fibroadenoma
   D. hemangioma

**Correct Answer: C**

**Rationale:** In a large recent series, 75% of excised pediatric breast masses were fibroadenomas. All of the excised masses were benign. Cystosarcoma phyllodes is the most common malignant primary breast cancer in children, but is extremely rare.

**Reference:**

6. What is the diagnosis in a patient with bloody discharge and retroareolar tubular anechoic structures?
   A. PASH (pseudoangiomatous stromal hypertrophy)
   B. Mastitis
   C. Ductal ectasia
   D. Galactocele

**Correct Answer: C**

**Rationale:** Ductal ectasia is typically characterized by tubular anechoic structures, often in the retroareolar location. Patients often present with bloody discharge or palpable mass. Mastitis usually presents with heterogeneous echogenicity and associated fluid collections are typically complex abscesses. PASH presents as hyperechoic solid tissue. Galactoceles usually are oval or rounded with variable echogenicity due to protein/fat contained in the fluid.

**Reference:**
Vascular Malformations: An Introduction from a Clinical Perspective
Craig Johnson, DO

7. A patient presents as teenager with growing right face pigmented mass-like region for ultrasound. The sonographer states there has been bleeding from the skin and the images demonstrate multiple tangled high flow vessels as well as pulsatile venous waveforms.

What is the most likely diagnosis?

A. Infantile hemangioma
B. Congenital Hemangioma
C. Venous malformation
D. Arteriovenous malformation

Correct Answer: D

Rationale:
A. Incorrect. Infantile hemangiomas can cause bleeding and can grow but these are seen in the months after birth while in the proliferative phase and by definition have entered the involutional phase by the first few years of life. The syndromic infantile hemangiomas seen in PHACES syndrome and other lumbosacral syndromes can proliferate longer but are still involuting or involuted by 4-6 years of age.

B. Incorrect. Congenital hemangiomas are fully developed at birth. While they can bleed and do have an arterial component, the vast majority that do bleed occur with the rapidly involuting subtype (RICH) which happens in the first months of life. The non-involuting (NICH) subtypes grow slowly with the patient and in proportion to the patient. Neither is responsive to increased hormones in pregnancy or puberty.

C. Incorrect. Venous malformations are present at birth but may become much larger with age. They do become symptomatic during pregnancy and puberty more so secondary to slow internal flow and internal clot formation. If there is a cutaneous component this lesion may bleed profusely. However, if there is no arterial component to these lesions and no AV shunting to give pulsatile venous waveforms.

D. Correct. Arteriovenous malformation. Teenage years and puberty are the classic time that AVM’s upstage in the Schobinger classification and become more aggressive with tissue destruction and bleeding. Pregnancy is also another time. The reason for the relative ischemia, mass-like enlargement and necrosis is due to AV shunting which is seen on both the arterial and venous sides of the color Doppler sampling and in this case gave the pulsatile venous waveforms. The lesions are classically a tangle of vessels without a solid mass like component which is seen on ultrasound and also other imaging modalities. There can be a mass like appearance clinically due to the surrounding engorged vessels coupled with the ischemic swollen tissue which has relative hypoxia secondary to the AV shunting.
8. Ultrasound is requested for a 6 month old with a reddish mass of their shoulder which is growing. Images demonstrate a vascular mass with both arterial and venous components. You open the electronic medical record and see blood count and metabolic panel were drawn. The only abnormality seen is severe thrombocytopenia. The most likely diagnosis is?

A. Rapidly involuting congenital hemangioma  
B. Kaposiform hemangioendothelioma  
C. Infantile hemangioma  
D. Venous malformation

Correct Answer: B

Rationale:
A. Incorrect. Congenital hemangiomas are fully developed at birth. By definition the rapidly involuting hemangioma will shrink in the first few months of life. They can be associated with a mild thrombocytopenia. They can bleed and do have an arterial component, the vast majority that do bleed occur with the rapidly involuting subtype (RICH) which happens in the first months of life. Neither is responsive to increased hormones in pregnancy or puberty.

B. Correct. Kaposiform Hemangioendothelioma (KHE) is a tumor with a mass component. These tumors have enlarged and more numerous arteries and veins. This can be an aggressive tumor and is classified as a borderline malignancy. The classic finding is KHE which is not always present is Kasabach-Merritt or consumptive coagulopathy and profound thrombocytopenia. When present this is helpful in stratifying the differential diagnosis. These are usually more common in the first years of life. The bleeding associated with KHE is usually secondary to the thrombocytopenia and can be at secondary sites like epistaxis and gums but tissue destruction is rare. AV shunting with these lesions is rare and this is helpful for ultrasound.

C. Incorrect. Infantile hemangiomas can cause bleeding and can grow but these are seen in the months after birth while in the proliferative phase and by definition have entered the involutional phase by the first few years of life. The syndromic infantile hemangiomas seen in PHACES syndrome and other lumbosacral syndromes can proliferate longer but are still involuting or involuted by 4-6 years of age.

D. Incorrect. Venous malformations are present at birth but may become much larger with age. They do become symptomatic during pregnancy and puberty more so secondary to slow internal flow and internal clot formation. If there is a cutaneous component this lesion may bleed profusely. They can be associated with a mild thrombocytopenia if there is a large amount of internal clotting. However,
there is no significant arterial component to these lesions and no AV shunting to give pulsatile venous waveforms or a significant arterial component.

References:

Ultrasound of Soft Tissue Vascular Anomalies
Oscar M. Navarro, MD

9. In a 4-month-old infant with a rapidly growing raised lesion in the trunk, the diagnosis of infantile hemangioma can be supported by the following sonographic finding:
   A. Ill-defined margins with involvement of multiple planes
   B. Presence of intralesional calcifications
   C. High vascular density on color Doppler interrogation
   D. Multiple veins with arterialized flow

Correct Answer: C

Rationale: Answer is C. The demonstration of a high density of vessels (>5/cm2) with color Doppler ultrasound is characteristic of infantile and congenital hemangiomas and rarely seen in other soft tissue tumors at this patient's age.

Option A is not correct. Infantile hemangiomas are usually well defined lesions, often confined to the subcutaneous/cutaneous planes.

Option B is not correct. Calcifications are in general uncommon in pediatric vascular anomalies and extremely rare in infantile hemangiomas.

Option D is not correct. Although infantile hemangiomas show high vascular density with both arteries and veins identified within the lesion, the presence of arteriovenous shunting is rare. This finding is more characteristic of arteriovenous malformations.

References:

10. In a 2-year-old child with a slowly growing mass in the chest wall associated with tiny vesicles on the skin, the sonographic findings of an ill-defined hyperechoic subcutaneous lesion with scattered tiny cysts and no significant vascularity on color Doppler ultrasound supports the diagnosis of:
   A. Microcystic lymphatic malformation
   B. Kaposiform hemangioendothelioma
   C. Capillary malformation
   D. Fibroadipose vascular anomaly

Correct Answer: A

Rationale: Answer is A. Microcystic lymphatic malformations usually have ill-defined margins. The microscopic dilated lymphatic vessels cause multiple interfaces resulting in increased echogenicity of the soft tissues. Within this hyperechoic tissue, scattered cysts often measuring less than 1 cm are visible.

Option B is not correct. Although kaposiform hemangioendothelioma usually has ill-defined margins, it is often a lesion of heterogeneous echogenicity with moderate vascular density on color Doppler ultrasound.

Option C is not correct. Capillary malformation is often difficult to recognize on sonography and may just appear as an area of cutaneous and subcutaneous thickening.

Option D is not correct. Fibroadipose vascular anomaly is a recently described complex vascular anomaly that often affects the extremities. On sonography it has a heterogeneous, predominantly hyperechoic intramuscular component due to fatty tissue, associated with dilated veins that may extend into the overlying subcutaneous soft tissues.

References: