CASE 1 a
Clinical History

- 29 yo woman with polyhydramnios
- Cardiac mass at fetal ultrasound
- At 35 weeks, newborn died 30 minutes after delivery
Interface between tumor and normal myocardium
Smaller well-demarcated tumor nodule
“Spider cell”
Diagnosis

CARDIAC RHABDOMYOMA
Case 1 b
Clinical History

• 38 yo woman
• Spontaneous pneumothorax
• History of:
  – subependymal calcifications
  – bilateral renal tumors
  – dermal angiofibromas
Multiple cystic lesions
Nodules of hyperplastic type II pneumocytes
Diagnosis

LYMPHANGIOLEIOMYOMATOSIS (LAM)

MICRONODULAR PNEUMOCYTE HYPERPLASIA (MPNH)
Systemic Disease

TUBEROUS SCLEROSIS COMPLEX (TSC)
Tuberous Sclerosis Complex (TSC)

- Autosomal dominant disease
- Multiple hamartomas
- *TSC-1* on 9q34: hamartin
- *TSC-2* on 16p13: tuberin
- 1 per 6000 live births
<table>
<thead>
<tr>
<th>Major Features</th>
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<tbody>
<tr>
<td>• Facial angiofibromas</td>
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<tr>
<td>• Ungual or periungual fibroma</td>
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<tr>
<td>• Connective tissue nevus</td>
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<tr>
<td>• Cortical tuber</td>
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<tr>
<td>• Subependymal nodule</td>
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<tr>
<td>• Subependymal giant cell astrocytoma</td>
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<tr>
<td>• <strong>Cardiac rhabdomyoma</strong>, single or multiple</td>
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<tr>
<td>• Lymphangioleiomyomatosis</td>
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<td>• Renal angiomyolipoma</td>
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<table>
<thead>
<tr>
<th>Minor Features</th>
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<tbody>
<tr>
<td>• Pits in dental enamel</td>
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<tr>
<td>• Hamartomatous rectal polys</td>
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<tr>
<td>• Bone cysts</td>
</tr>
<tr>
<td>• Cerebral white matter migration lines</td>
</tr>
<tr>
<td>• Gingival fibromas</td>
</tr>
<tr>
<td>• Nonrenal hamartomas</td>
</tr>
<tr>
<td>• Retinal achromic patch</td>
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<tr>
<td>• &quot;Confetti&quot; skin lesions</td>
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<tr>
<td>• Multiple renal cysts</td>
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</table>
Cardiac Manifestations

- Cardiac rhabdomyoma
- Aortic and peripheral aneurysms
- Congenital cardiac malformations
- Vascular dysplasia
Cardiac Rhabdomyoma

- Most common cardiac tumor of infancy
- 47-86% with TSC
- 50-90% have TSC
- < 1 yo
Location

% Location

MPA 1
RA 6-7
RV 39-79

Ao 0
LA 0
LV 61-100
Symptoms

Valvular motion impairment

Cardiac arrhythmias

Non-immune hydrops

Outflow tract obstruction
Prognosis

Regression

Bad outcome

Nir et al
Bosi et al
Muhler et al
Involutet cardiac rhabdomyoma
Differential Diagnosis

- Extra-cardiac rhabdomyoma
- Histiocytoid cardiomyopathy
- Hamartoma of mature cardiac myocytes
- Adipose lesions
- Storage diseases
- Drug reaction
- Ischemia
Extra-Cardiac Rhabdomyoma

- Rare benign tumor of soft tissue
- Classification:
  - Adult
  - Fetal
  - Genital
Cardiac rhabdomyoma

Adult rhabdomyoma

Fetal rhabdomyoma

Genital rhabdomyoma
Adult Rhabdomyoma

- 4 cases
- 2W:2M; 35-54 yo
- Arrhythmia
- 3RA, 1RV
- 2-9 cm

Burke et al *Hum Pathol* 2002; Hu et al *Hum Pathol* 1993
Hamartoma of Mature Cardiac Myocytes

- Men, 9-28yo
- Arrhythmia
- Localized mass (2)

Burke et al, *Hum Pathol* 1998
Histiocytoid Cardiomyopathy

- Oncocytic CM
- Purkinje cell hamartoma
- Infants, 4F:1M
- Arrhythmogenic disease
Pulmonary Manifestations

- Lymphangioleiomyomatosis (LAM)
- Micronodular pneumocyte hyperplasia (MPNH)
- Clear cell tumor
- Angiomyolipoma
<table>
<thead>
<tr>
<th></th>
<th>TSC no LAM</th>
<th>TSC and LAM</th>
<th>LAM no TSC</th>
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</thead>
<tbody>
<tr>
<td><strong>GENDER</strong></td>
<td>M=W</td>
<td>W (1M)</td>
<td>W</td>
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<tr>
<td><strong>AGE</strong></td>
<td>Infant/child</td>
<td>34-36 yo</td>
<td>33-39 yo</td>
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<tr>
<td><strong>TSC FEATURES:</strong></td>
<td></td>
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<tr>
<td>Angiofibroma</td>
<td>75-89</td>
<td>80</td>
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<tr>
<td>CNS</td>
<td>53-100</td>
<td>11-88</td>
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<td>Retinal lesion</td>
<td>75</td>
<td>25</td>
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<tr>
<td>Rhabdomyoma</td>
<td>47-86</td>
<td>0</td>
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<tr>
<td>Angiomyolipoma</td>
<td>54-80</td>
<td>60</td>
<td>15-60</td>
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<tr>
<td>PULMONARY SYMPTOMS:</td>
<td>TSC no LAM</td>
<td>TSC and LAM</td>
<td>LAM no TSC</td>
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<td>---------------------</td>
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<tr>
<td>None</td>
<td>0-40</td>
<td>25-70</td>
<td>59-91</td>
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<tr>
<td>SOB</td>
<td>25-70</td>
<td>30-60</td>
<td>49-81</td>
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<tr>
<td>Pneumothorax</td>
<td>30-60</td>
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<tr>
<td>Chylothorax</td>
<td>0-10</td>
<td>2-33</td>
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<thead>
<tr>
<th>CAUSES of DEATH</th>
<th>Cerebral, renal or cardiac</th>
<th>Pulmonary</th>
<th>Pulmonary</th>
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LAM

78 F with TSC

26 with Chest CT and/or lung biopsy
33%

52 without CT chest
67%

20 with LAM
26%/77%

6 without LAM

8 asymptomatic
40%

12 with respiratory symptoms

Prognosis

- Respiratory insufficiency with “cor pulmonale”
- Rate of progression variable
- 5-year and 10-year survival 50-80%
Treatment

• Hormonal treatment
• Pulmonary transplantation
HRCT scan

Gross
Thin walled cyst
Differential Diagnosis

CLINICAL
1- Eosinophilic granuloma
2- Emphysema
3- Idiopathic pulmonary fibrosis

PATHOLOGIC
1- Benign metastasizing leiomyoma
2- Metastatic endometrial stromal sarcoma
3- Muscle cirrhosis
4- Emphysema
5- Pulmonary hemorrhage syndrome
Metastasizing leiomyoma
Metastatic ESS
MPNH

- Recognized in 1962
- Nodular hyperplasia of pneumocytes
- Micronodular hyperplasia of type II pneumocytes, acinar atypical adenomatoid proliferations of epithelium and atypical adenomatoid proliferation of cuboidal epithelium
MPNH
20F:3M
mean 37 yo

TSC
17 (74%)

LAM
13 (57%)
12F:1M

No LAM
4 (17%)
3F:1M

No TSC
6 (26%)

LAM
3 (13%)
3F:0M

No LAM
3 (13%)
2F:1M
Differential Diagnosis

- AAH / BAC, non-mucinous type
- Papillary adenoma
- Alveolar adenoma
- Meningothelial-like nodule
- Sclerosing hemangioma
Atypical Adenomatous Hyperplasia
Take Home Points

CARDIAC RHABDOMYOMAS:
- Most common neoplasm of infancy
- Associated with TSC
- Large vacuolated/spider cells
- Distinct from extra-cardiac rhabdomyomas
LYMPHANGIOLEIMYOMATOSIS:

- Women of child-bearing age
- > 3% with TSC
- Multiple cystic lesions
- Smooth-muscle cells HMB-45 and ER/PR +
MICRONODULAR PNEUMOCYTE HYPERPLASIA:

Women with TSC and LAM
Benign proliferation of type II pneumocytes
Distinct from AAH/BAC
On to Case 2