The Many Faces of Sarcoidosis
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Sarcoidosis
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Objectives
• Review the history of sarcoidosis
• Highlight the etiology and pathogenesis of sarcoidosis
• Demonstrate the varied radiological features of sarcoidosis
• Look at clinical features and syndromes associated with sarcoidosis

History of Sarcoidosis
• Multisystem disease dating back to 1899
• Norwegian dermatologist Caesar Boeck coined term “sarkoid” to describe skin lesions characterized by “epithelioid cells with large pale nuclei and a few giant cells”
• Thought resembled sarcoma so called it multiple benign sarcoid of the skin

Caesar Peter Møller BOECK (1845-1917)

Epidemiology of Sarcoidosis
• All ethnic and racial groups affected
• Usually develops before age 50 with peak incidence 20-39 years
• Incidence varies widely throughout world possibly due to differences in environ exposures, surveillance methods, predisposing HLA alleles and other genetic factors

Annual Incidence of Sarcoidosis Worldwide
• Highest annual incidence observed in northern European countries (5-40 cases/100,000)
• In Japan, 1-2 cases/100,000, peaking in third decade of life
• Adjusted annual incidence among black Americans nearly 3x that of white Americans (35.5/100,000 compared with 10.9/100,000)
• Bimodal peak in Scandinavian women (25-29 and 65-69)
Possible Etiology of Sarcoidosis

- Environmental exposures
  - Emissions from wood-burning stoves, tree pollen
  - More recently exposure to inorganic particles, insecticides, moldy environments, service in the US navy, metalworking
  - Rescue workers involved in 9/11
- Infections
  - Mycobacterial and propionibacterial DNA and RNA recovered from sarcoidal tissues

Genetic Associations with Sarcoidosis

- Appear to be genetic associations
  - HLA alleles
  - Tumor necrosis factor α, interferon-γ, and chemokine receptors in non-HLA patients
- Susceptibility to sarcoidosis appears to depend on both environmental and genetic exposures, hence identification between the two will be helpful in determining cause and treatment

Hypothetical Immunopathogenesis of Sarcoidosis

- Granuloma is the earliest lesion in sarcoidosis, non-caseous
- Centrally, epithelioid histiocytes, and occasional multinucleated giant cells surrounded by activated T cells, monocytes and fibroblasts
- Epithelioid cells secrete cytokines and other mediators including ACE
- Granulomas are interstitial, located along lymphatics and bronchovascular bundles, interlobular septa and pleura

Pathologic Features

- Requires clinical and imaging features consistent with dx
- Identification of non-caseating granulomas in at least one organ
- L.N., liver and lung most commonly sampled
- TBBX >90% dx yield with good sample
- Yield with TBBX in patients with L.N.E. and nl lung parenchyma >80%
**Mediastinal and Hilar LNE**

-Stage 1 Sarcoidosis

- LNE most common abnormality (75-80%)
- Usually right paratracheal, AP window, hilar, and subcarinal regions
- Uncommon to see anterior, posterior mediastinal, or paracardiac nodes

**Natural History of Sarcoidosis**

- ~60% resolve (particularly those with E. Nodosum)
- LNE shrinks as lung disease starts
- 45-55% patients show nodal Ca++ and is dystrophic
- Ca++ is eggshell but some amorphous cloudlike Ca++

**FDG in Sarcoidosis**

**Parenchymal Sarcoidosis**

- Seen in a little under 1/2 of pts at presentation
- 1/3 patients go on to parenchymal disease from stage I (10-43%)
- Classification: reversible and irreversible disease useful
  - Reversible = reticulonodular, large nodules and ill-defined with consolidation (alveolar), GGO
  - Irreversible = fibrosis

**Reticulonodular/Nodular Sarcoidosis**

- Most frequent pattern (75-90%)
- Nodules range in size 2-4 mm
- More commonly bilateral and symmetric; mid and upper lung zones
- Characterized by peribronchovascular thickening and irregularity; small nodules in perilymphatic region
- Nodules along subpleural, interlobular septa, bronchovascular bundles
- Can be centrilobular

**Nodular Pattern of Parenchymal Disease**
Reticulonodular Sarcoidosis

Ground Glass Opacification

- Seen in about 40% of patients
- Generally patchy and may have lobular distribution
- Due to presence of innumerable small interstitial granulomas beyond resolution of CT not due to alveolitis
- Usually but not always reversible

Alveolar Sarcoidosis

- Occurs in 10-20% of patients
- Due to loss of alveolar air from compression of alveoli by coalescent granulomas
- Radiologically - bilat, multifocal, poorly defined opacities 1-10 cm
- Peripheral distribution
- Forms acinar rosettes due to break up of edge of these lesions
- Reticulonodular opacities in 2/3 of pts
Large Nodular Sarcoidosis

- Large nodules ~ 2.4% prevalence rate
- Usually bilat and multiple; 0.5 – 5 cm
- Occur anywhere but slight mid zone predilection
- Margins can be sharp or ill-defined
- May have innumerable adjacent satellite nodules...galaxy sign
- Cavitation is rare

Fibrosis in Sarcoidosis: Irreversible Disease

- Develops in 5-25% of patients
- Gross fibrosis develops in 10-15% of patients with stage c-II
- Takes 2-14 years to develop
- CT findings include conglomerate fibrosis in UL, parenchymal distortion, cyst or bulla formation, honeycombing (less common than other forms of end stage lung dz, traction bronchiectasis
- Mycetoma is a potential complication

Imaging Appearance of End Stage Sarcoidosis

End Stage Sarcoidosis

Syndromes Associated with Sarcoidosis

- Lofgren's syndrome – E. Nodosum, sarcoidosis and arthralgia
- Heerfordt-Waldenstrom syndrome – sarcoidosis, uveitis, swelling of the parotid gland, chronic fever, and sometimes facial palsy
- Schmidt's syndrome – sarcoidosis, Addison's dz, hypothyroidism

Conclusions

- We have
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