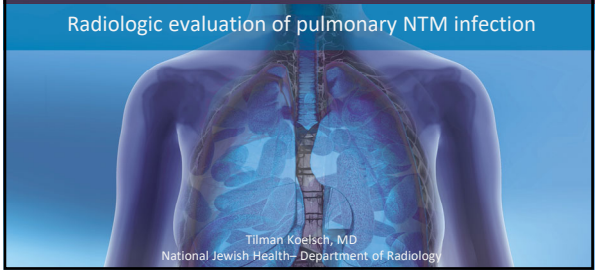
NTM Lecture Series for Providers

Radiologic evaluation of pulmonary NTM infection



Tilman Koelsch, MD
National Jewish Health– Department of Radiology

Disclosures

None

Goals

- Identify the imaging features of pulmonary NTM infection on CT and X-ray
- Understand radiological phenotypes of pulmonary NTM infection
- Understand the role of PET/CT in NTM

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Overview

I. CT technique

II. NTM imaging signs

III. Radiological/Clinical Phenotypes

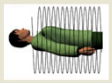
IV. NTM & Underlying Lung Disease

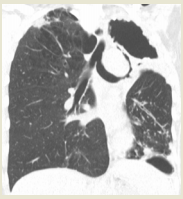
NTM Lecture Series for Providers

CT Technique

"Regular" CT - Spiral & Volumetric

- **Quick** - One breath hold (10-30 sec)
- Reconstruct in: Any plane, Any thickness, 3D





Spiral/Volumetric Reconstruction

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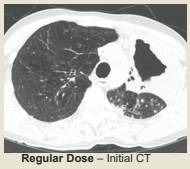
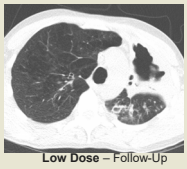
CT Technique

- **Low Dose**
  - ~ 1/3 to 1/5 Dose (smaller patients need less dose)
  - "Noisy" – but often **Still Diagnostic Quality**



Regular Dose – Initial CT



Low Dose – Follow-Up

At NJH we "automatically" use low dose for:

- **NTM Follow-Up**
- Pulm. Nodule Follow-Up
- Lung Cancer Screening

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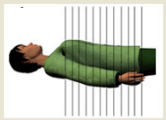
CT Technique

- **HRCT (1 mm) THIN**



Also:

- **1) End Expiration (for Air Trapping)**
- **2) Prone (Mild Pulm. Fibrosis)**

- When to order? (*examples*)
  - **Possible HP / Hot Tub Lung**!
  - Mild interstitial disease / fibrosis

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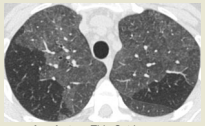
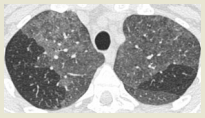
HRCT

Hot Tub Lung



Inspiratory Thin Cut Images



Expiratory – AIR TRAPPING
(areas that stay dark)

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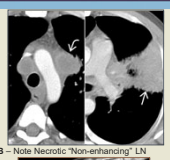
CT Technique

- **Contrast?**
  - Usually not needed for LUNG
  - Use for "Soft Tissue"
    - Mediastinum/Hila?
    - Pleura/Chest Wall?



TB – Note Necrotic "Non-enhancing" LN

Empyema – Enhancing Plural Rind

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NTM Imaging Signs

- Tree-In-Bud and Centilobular Nodules
- Bronchiectasis
- Cavities
- Ground-Glass and Consolidation
- Atelectasis

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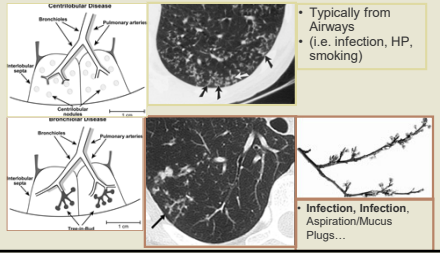
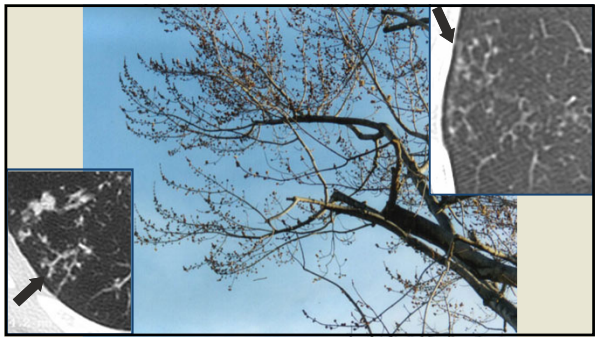
Centrilobular Nodules and Tree-In-Bud



- Typically from Airways
- (i.e. infection, HP, smoking)

- **Infection, Infection**, Aspiration/Mucus Plugs…



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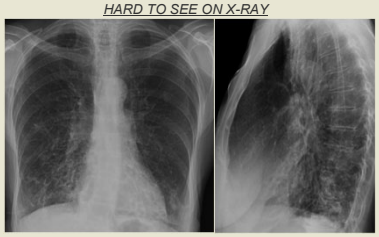
Bronchiectasis

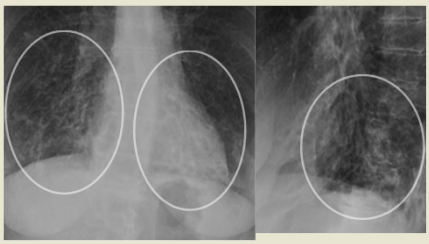
Chest X-ray "Tram-Track" lines and Rings

HARD TO SEE ON X-RAY



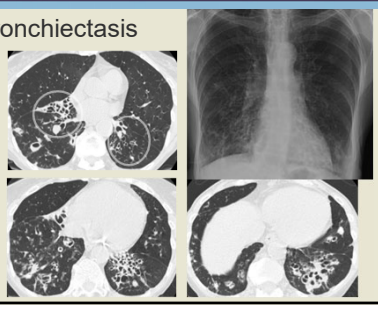
NTM Lecture Series for Providers

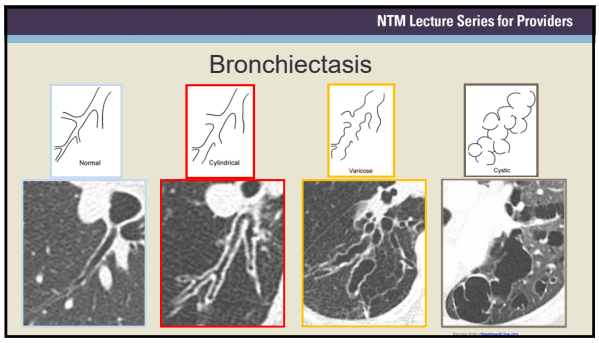
Bronchiectasis

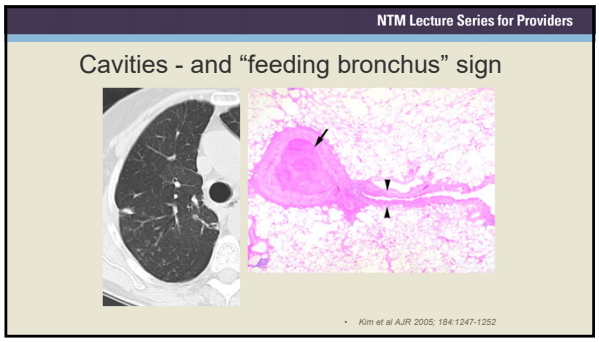


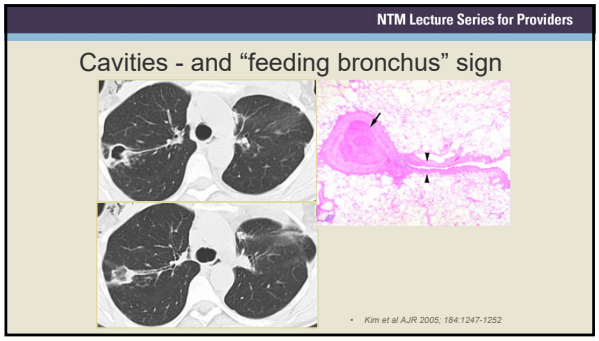
NTM Lecture Series for Providers

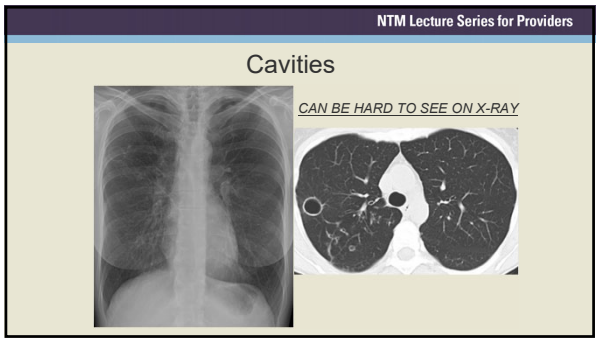
Bronchiectasis

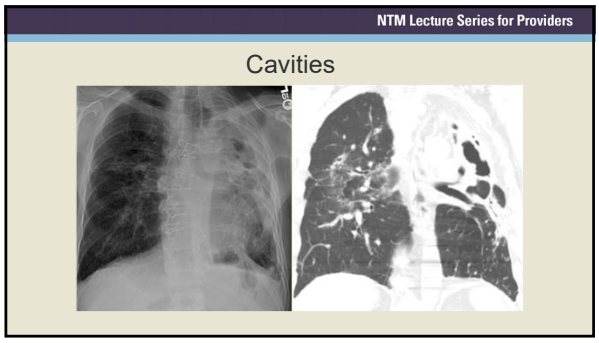


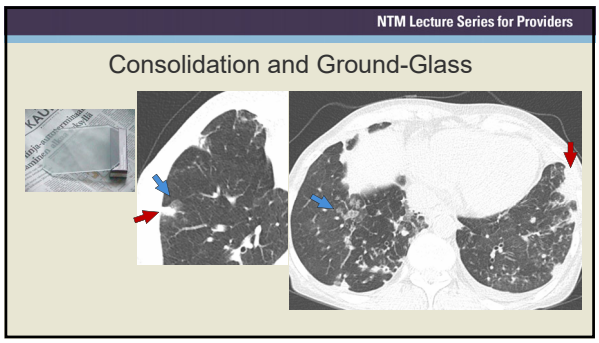


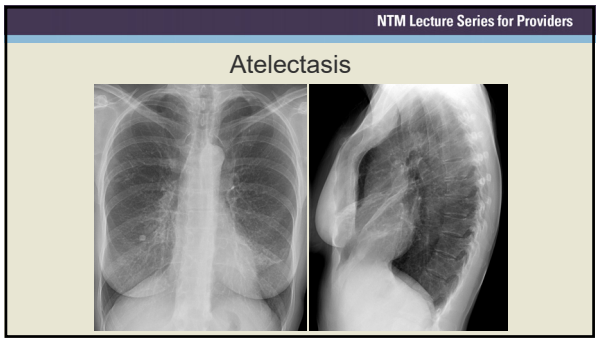


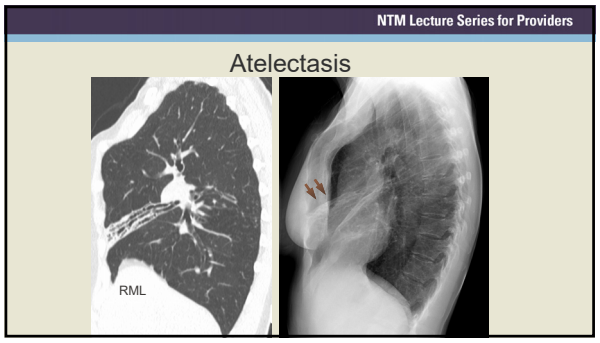


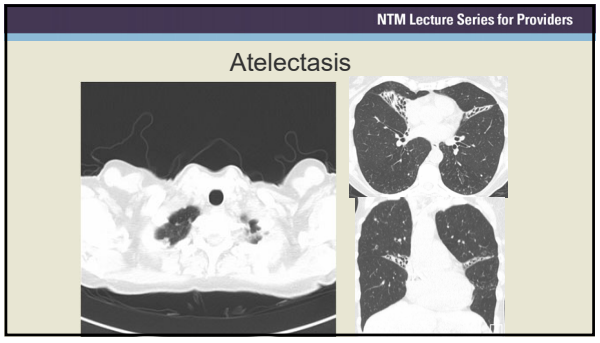


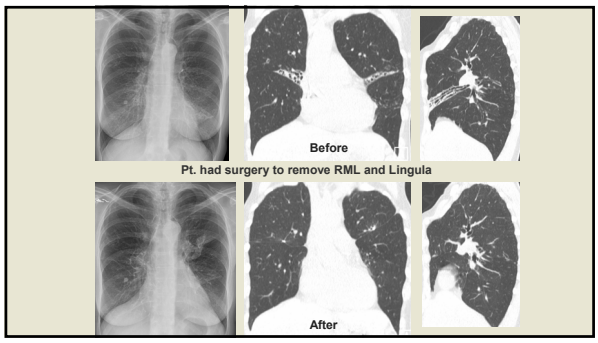


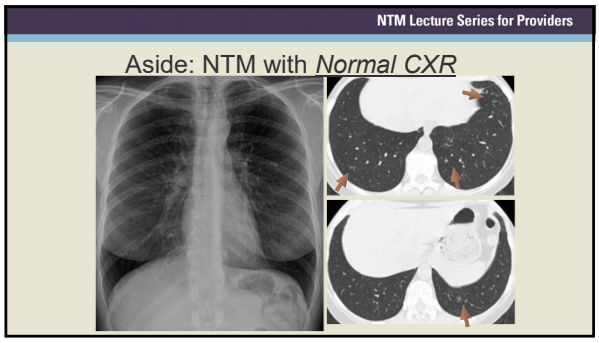


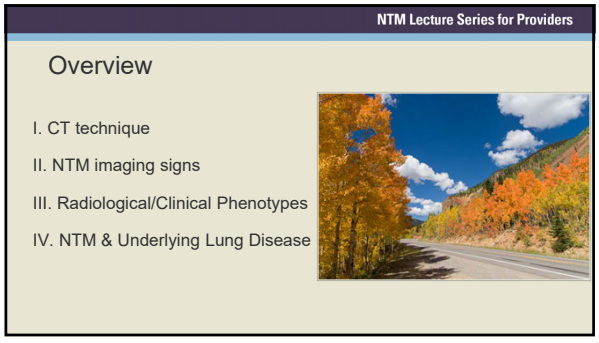












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Radiological/Clinical Phenotypes of NTM

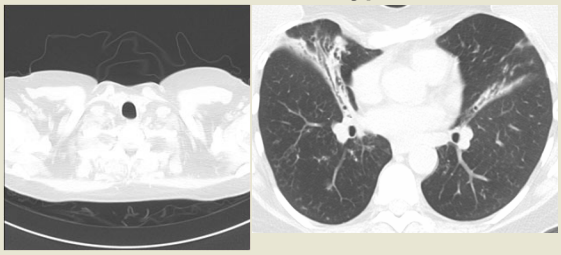
I. Nodular Bronchiectatic Type

II. Fibrocavitary Type

III. Hot Tub Lung (Hypersensitivity Pneumonitis)

NTM Lecture Series for Providers

I. Nodular Bronchiectatic Type - CASE 1



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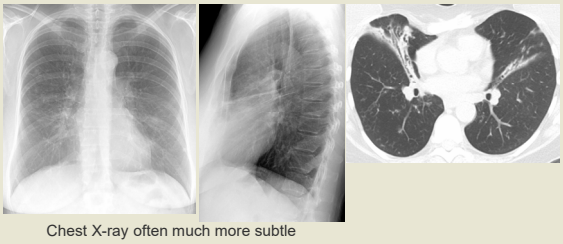
I. Nodular Bronchiectatic Type - CASE 1



Chest X-ray often much more subtle

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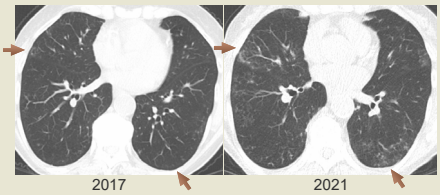
I. Nodular Bronchiectatic Type - CASE 2

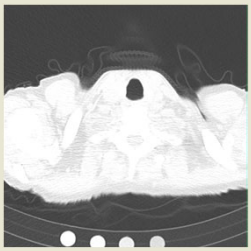


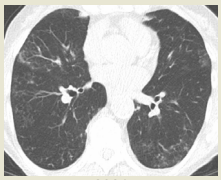
2017 2021

- **Follow-Up** - Look for active disease
  - Tree-in-bud, consolidation
    - look for stability, *(& clinical)*
  - Bronchiectasis, Cavities

NTM Lecture Series for Providers

I. Nodular Bronchiectatic Type - CASE 2





2021

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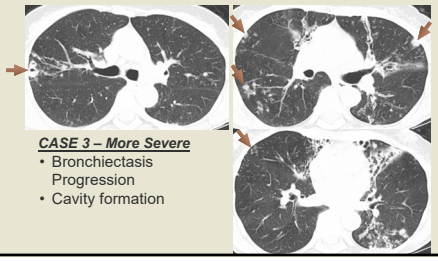
I. Nodular Bronchiectatic Type - CASE 3



CASE 3 – More Severe

- Bronchiectasis Progression
- Cavity formation

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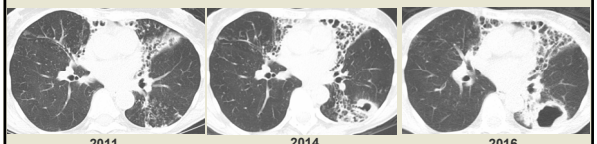
I. Nodular Bronchiectatic Type - CASE 3



2011 2014 2016

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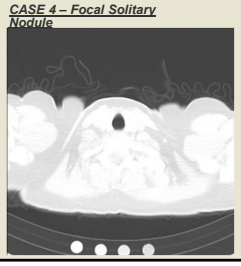
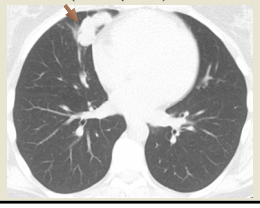
I. Nodular Bronchiectatic Type - CASE 4

CASE 4 – Focal Solitary Nodule



- Uncommon.
- Must still rule out other causes of nodule (*i.e neoplasm)*



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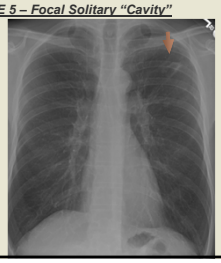
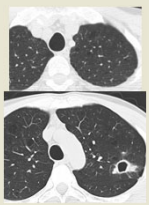
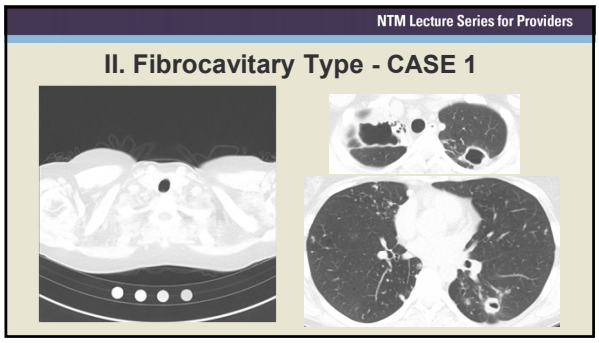
I. Nodular Bronchiectatic Type - CASE 5

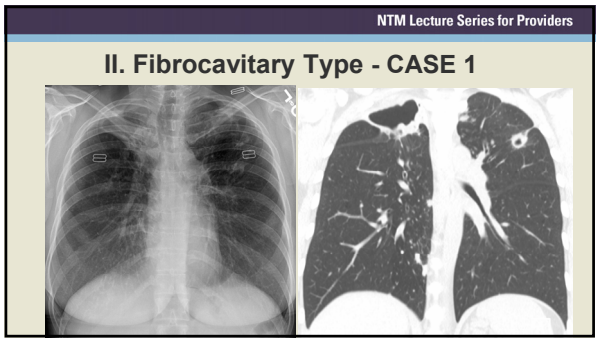
CASE 5 – Focal Solitary "Cavity"

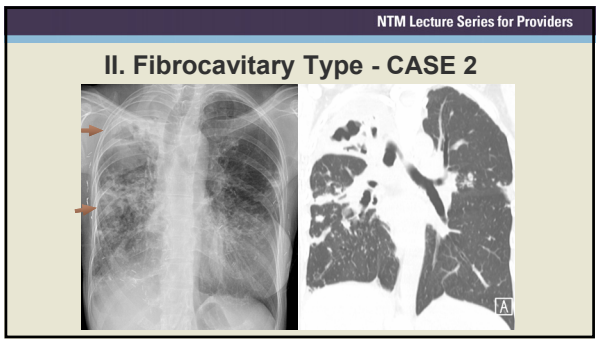




- *Rule out lung cancer*







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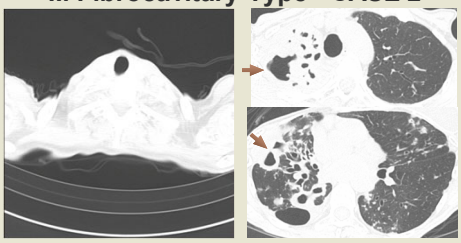
II. Fibrocavitary Type - CASE 2



CASE 2 - Severe upper lobe cavitary dz.

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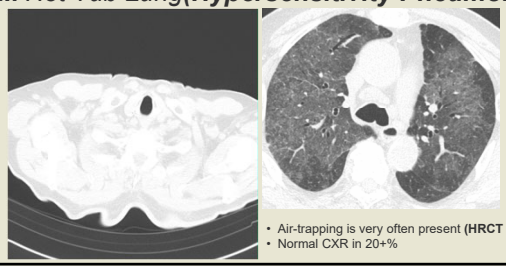
III. *Hot Tub Lung* (***Hypersensitivity Pneumonitis***)



- Air-trapping is very often present **(HRCT helpful!)**
- Normal CXR in 20+%

NTM Lecture Series for Providers

Overview

I. CT technique

II. NTM imaging signs

III. Radiological/Clinical Phenotypes

IV. NTM & Underlying Lung Disease

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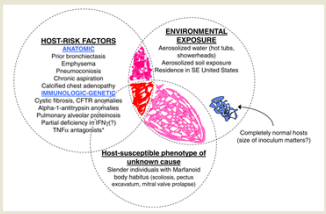
NTM & Underlying Lung Disease

Risk factors for pulmonary NTM

- *Often underlying lung disease*
  - Structural
  - Non-structural
- Radiology also has role also in underlying disease



- *Honda et al Clin Chest Med 2015; 36:1-11*

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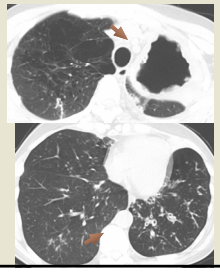
NTM in COPD/Emphysema



- Cavities can form in emphysema
- Any cavity can "spill" contents leading to worsening disease in lower lung.

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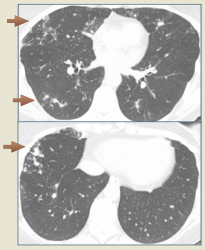
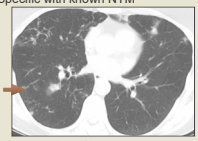
NTM in Chronic Aspiration



- Nothing Specific with known NTM

Few months later



- Migratory Ground-Glass/Consolidation *most* suggestive
- Location? Anywhere, but:
  - lower-posterior - most common.
  - unilateral - sided sleeper?
  - upper - gardening, yoga, cough?

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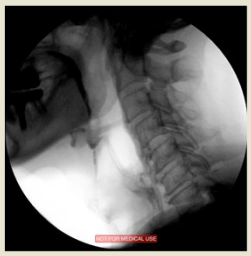
NTM in Chronic Aspiration



Aspiration Work-up

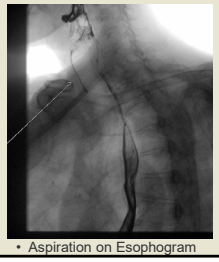
1. Esophogram
   - Also evaluates dysmotility
   - Only 2 min intermittent for GERD

2. Tailored Barium Swallow with Speech Pathology
   - Oral motility issues

3. Esophageal pH testing

NTM Lecture Series for Providers

NTM in Chronic Aspiration



- Aspiration on Esophogram

Aspiration Work-up

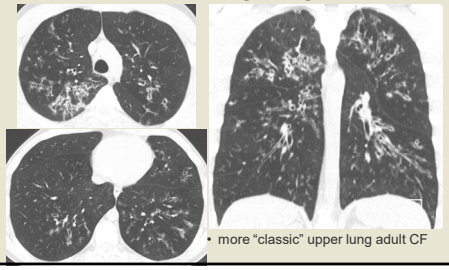
1. Esophogram
   - Also evaluates dysmotility
   - Only 2 min intermittent for GERD

2. Tailored Barium Swallow with Speech Pathology
   - Oral motility issues

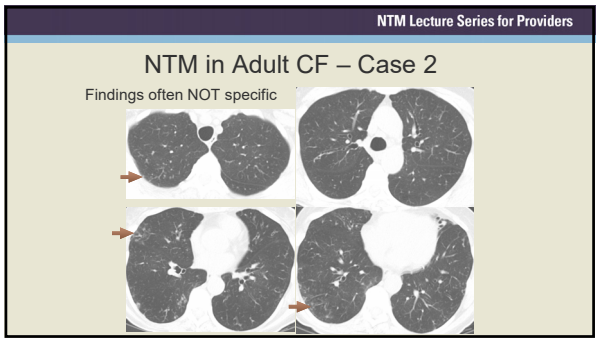
3. Esophageal pH testing

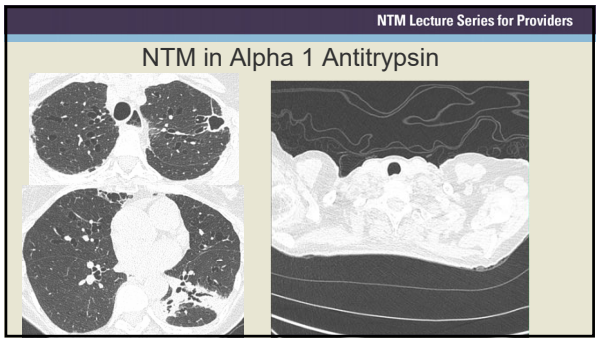
NTM Lecture Series for Providers

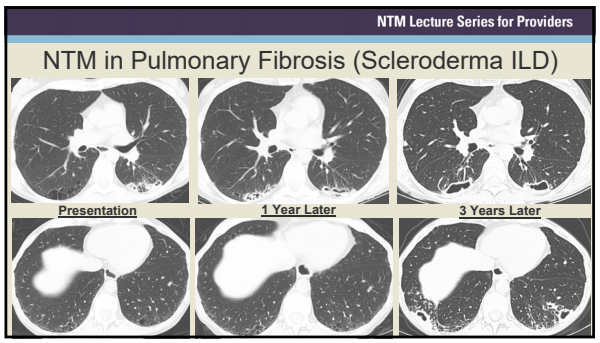
NTM in Adult CF – Case 1



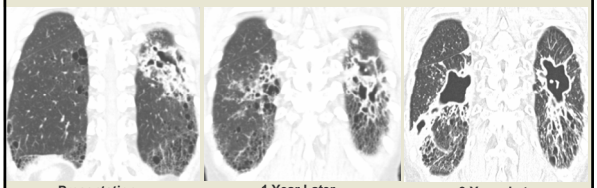
- more "classic" upper lung adult CF







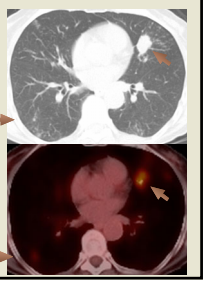
NTM in Pulmonary Fibrosis (Scleroderma ILD)



Presentation | 1 Year Later | 3 Years Later

PET/CT and NTM

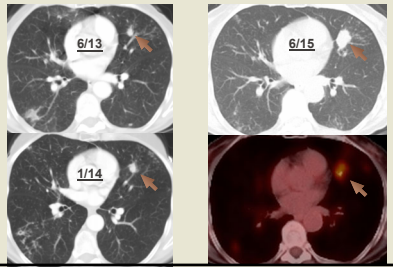
- NTM will cause increased uptake (like most infections)
- SUV typically about 8.5 (4.4-9.7)
- So ***caution*** in evaluating for cancer with NTM
- May be useful for disease activity/response (*but higher radiation*)



- *Hahm et al. Lung. 2010 Jan-Feb;188(1):25-31*
- *Treglia et al. J Comput Assist Tomogr. 2011;35(3):387-93.*

PET/CT and NTM

- Lung Cancer with NTM



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