SPOTS AND DOTS
What Is That In My Lung?

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DISCLOSURE

ANTI-TOBACCO

PRO-LUNG FORCE
TODAY’S PRESENTATION

Discuss work-up of lung spot
Discuss what a lung spot could be
Discuss what a lung spot looks like
Discuss possible tests needed to evaluate the lung spot
Discuss possible biopsy approaches to determine what kind of spot is in the lung
PATIENT STORY

Mrs. Juniper sweet 65 YO woman playing with grandkids at the park
Takes a daily medication for high blood pressure
Has smoked 1 pack per day since age 18
Developed chest pain in the park
Daughter brought her to the Emergency Department
Evaluated for heart attack
No heart attack
Had Chest Xray done
CHEST XRAY

Solitary Nodule
“OH BY THE WAY”
90% Incidental findings
PATIENT STORY

Mr. Austin 60 YO pleasant gentlemen who went to his primary care physician for routine physical exam

Has smoked since age 20

Smokes 2 packs per day

No lung symptoms

Met criteria for LUNG CANCER SCREENING
LUNG CANCER SCREENING CT
LUNG SPOT

LUNG NODULE = Spot smaller than 3 cm / 1.2 inches

LUNG MASS = Spot greater than 3 cm / 1.2 inches
WHAT COULD THAT SPOT BE?

IS IT BENIGN OR NON-CANCEROUS LUNG NODULE?

IS IT MALIGNANT OR CANCEROUS LUNG NODULE?
NON-CANCEROUS LUNG NODULES

**INFECTION**
- Fungal:
  - Histoplasmosis, blastomycosis, coccidiomycosis, aspergillos
  - Tuberculosis/Tuberculoma
  - Lung Abscess
  - Parasite/Echinococcus cyst

**NON-INFECTION**
- Rheumatoid arthritis
- Sarcoid
- Bronchogenic cyst
- Pulmonary Infarct/Lung clot
- Blood vessel abnormality/AV malformation
- Lipoma/fat deposit
- Hamartoma/fat & bone deposit
CANCEROUS LUNG NODULES

LUNG CANCER
ADENOCARCINOMA LUNG
SQUAMOUS CELL CARCINOMA LUNG
LARGE CELL CARCINOMA LUNG
SMALL CELL
CANCEROUS LUNG NODULES

CANCER FROM OTHER ORGANS CAN SPREAD TO THE LUNG

Breast cancer
Head and Neck cancer
Melanoma
Colon
Kidney
Sarcoma
Lymphoma
CHEST XRAY vs CHEST CT

CHEST XRAYS SEE SPOTS AT LEAST 1CM OR 1/3 INCH IN SIZE

CHEST CTs CAN SEE SPOTS LESS THAN 1CM OR LESS THAN 1/3 INCH IN SIZE
A tumor that is 5 centimeters across is about the size of a lime.
WHAT DOES THE SPOT LOOK LIKE?

Is it completely calcified or not?

ALL CALCIUM
PARTIAL CALCIUM
NO CALCIUM
CALCIUM PATTERNS

BENIGN

MALIGNANT

Diffuse

Central

Popcorn

Laminar, Concentric

Stippled

Eccentric
WHAT DOES THE NODULE LOOK LIKE?

OTHER CLUES

Is it round, smooth edged?
Is it ragged, star burst pattern?
Has it grown?
SPICULATED SPOT

SUN BURST PATTERN
MALIGNANT
SPICULATED
WHAT QUESTIONS WILL THE DOCTOR ASK?

AGE: Older or younger than 40

SMOKING HISTORY
Secondhand smoke
Environmental Risk
Radiation in Home/Radon
Any history of cancer
Family history of lung cancer
Any old chest Xrays or chest CTs

PULMONOLOGISTS BEST FRIEND IS AN OLD XRAY
DO YOU HAVE ANY SYMPTOMS?

Cough
Coughing up blood/hemoptysis
Shortness of breath/wheezing
Voice change/hoarseness
New headaches
Facial/neck swelling
Arm/shoulder pain or new boney aches/pains
New facial droop/eye droop/numbness
**WHAT CLUES CAN YOU DOCTOR FIND ON THE EXAMINATION?**

<table>
<thead>
<tr>
<th>AREA</th>
<th>CLUES</th>
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<tbody>
<tr>
<td><strong>EYES</strong></td>
<td>DROOP</td>
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<tr>
<td><strong>NECK</strong></td>
<td>HOARSENESS</td>
</tr>
<tr>
<td><strong>LUNGS</strong></td>
<td>WHEEZES OR DECREASED BREATH SOUNDS</td>
</tr>
<tr>
<td><strong>HEART</strong></td>
<td>SAND PAPER SOUND/FRICTION RUB</td>
</tr>
<tr>
<td><strong>NEUROLOGIC</strong></td>
<td>MUSCLE WEAKNESS, NUMBNESS, CONFUSION</td>
</tr>
<tr>
<td><strong>SKIN</strong></td>
<td>SKIN NODULES, SWOLLEN BLOOD VESSELS ON THE CHEST</td>
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<tr>
<td><strong>LYMPH GLANDS</strong></td>
<td>SWOLLEN GLANDS</td>
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</table>
WHAT INITIAL TESTING MAY I NEED?

CHEST CT
PET CT
HEAD MRI
PFTS/Pulmonary Function Testing
CHEST CT

WHOLE PICTURE OF YOUR LUNGS
Takes pictures from top of shoulders to your kidneys
Looks for your spot and any other possible spots in your chest
Looks for any abnormal, swollen lymph glands in your chest
Looks to see if the tumor involves the windpipe, heart, blood vessels
Looks for spots in other places: liver, bones and adrenal glands
Will help guide further work-up of your lung spot
PET-CT
POSITRON EMISSION TOMOGRAPHY

If nodule greater than or equal to 1 cm
Cancerous tumors are usually **ACTIVE**
Looks to see if the nodule is an **ACTIVE** spot/tumor
Looks to see if there are other **ACTIVE** spots or lymph glands in the chest
Looks to see if there are **ACTIVE** areas outside the chest
PET-CT

IMPORTANT FOR **STAGING** THE LUNG NODULE/TUMOR
IS IT AN **EARLY** LUNG CANCER OR IS A MORE **ADVANCED** LUNG CANCER?

STAGES NON-Small CELL LUNG CANCER: I, II, III & IV

70% OF ALL LUNG CANCER FOUND IN ADVANCED STAGE: STAGE III & IV
ADVANCED STAGE = CAN’T REMOVE TUMOR WITH SURGERY
PET-CT

Injected with glucose/sugar that has been attached to small amount of radiation:
18 F-2-deoxy-2-flouro-D-glucose = FDG

Where does it light up on the scan?
MRI-BRAIN

Are you having headaches, blurred vision, confusion, change in memory?
Do you have evidence of more advanced disease based on your chest CT or PET-CT?
PULMONARY FUNCTION TESTS

NEED TO CHECK YOUR BREATHING CAPACITY PRIOR TO CONSIDERING SURGERY

FEV1 > 40%
DLCO > 40%
How Do We Biopsy the Nodule?

Bronchoscopy
Navigational bronchoscopy
EBUS/Endobronchial Ultrasound
Computed Tomography (CT) guided Fine Needle Aspiration
VATS (Video-Assisted Thorascopic Surgery) wedge resection
BRONCHOSCOPY

Outpatient procedure performed by pulmonologist

Endoscopy unit

Nothing to eat or drink the night before except medications with sip of water

No Aspirin, nonsteroidal anti-inflammatory medications, blood thinners

Moderate sedation: “Sleepy Land”

Pass a thin tube with a camera and light, BRONCHOSCOPE, through your mouth or nose down into your lungs to obtain a piece of tissue from the spot
NAVIGATIONAL BRONCHOSCOPY

Special “GPS” like bronchoscopy

Good for tumors that are farther out in the lung

Requires a special CT looking for a roadway or direct bronchial tube to the tumor

Electromagnetic navigation bronchoscopy creates a road map to the tumor

Uses a special catheter with a sensor probe

Probe can be steered through several small bronchial tubes to the peripheral lung tumor

Once the tumor is located, it can be biopsied

Can’t undergo navigational bronchoscopy if you have a PACER
NAVIGATIONAL BRONCHOSCOPY
STAGING EBUS

Outpatient procedure performed by pulmonologist
Endoscopy unit
Nothing to eat or drink the night before except medications with sip of water
No Aspirin, nonsteroidal anti-inflammatory mediations, blood thinners
Moderate sedation: “Sleepy Land”
Pass a thin tube with a camera, light and ULTRASOUND with the BRONCHOSCOPE through your mouth or nose down into your lungs to obtain a piece of tissue from the spot
Look for and biopsy LYMPH GLANDS for diagnosis and staging of the mediastinum
Cytology team at the procedure to assist with tissue processing
CHEST LYMPH GLANDS
Endobronchial Ultrasound (EBUS)
CT GUIDED NEEDLE BIOPSY

Outpatient procedure done by an interventional radiologist
Radiology Department
Nothing to eat or drink the night before except medications with sip of water
No Aspirin, nonsteroidal anti-inflammatory medications, blood thinners
Local numbing medication
Have to be able to hold your breath; no coughing

Use chest CT to guide passing a needle through your chest from outside into the nodule to obtain a sample
CT-GUIDED NEEDLE BIOPSY RIGHT LUNG MASS
VIDEO ASSISTED THORACOSCOPIC SURGERY (VATS)

Inpatient procedure
Performed by dedicated Lung **Thoracic Surgeon in the OR**
Used to biopsy tumors closer to the outer edge of the lung
Tiny camera (thoracoscope) and surgical instruments are inserted into your chest through several small incisions
Thoracoscope transmits images of the inside of your chest onto a video monitor
Surgeon can make “Pie”-Wedge resection to biopsy the tumor
Pathologist reviews the specimen, a **FROZEN**, while you are still in the OR
If cancer is seen under the microscope, the surgeon then proceeds with removal of the lung lobe, a **lobectomy**
WHAT IF LOW CHANCE OF CANCER?

< 1/3 inch in size
No significant risk factors
Pulmonologist will monitor the lung spot with follow-up chest CT based on current guidelines

If the nodule does not grow over time, over 2 years, than it is not felt to be cancer
If the nodule does grow over time, concern is for cancer and surgery to remove the spot would be recommended.
### Recommendations for Follow-up and Management of Nodules Smaller than 8 mm Detected Incidentally at Nonscreening CT

<table>
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<tr>
<th>Nodule Size</th>
<th>Low-Risk Patient $^1$</th>
<th>High-Risk Patient $^2$</th>
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<tbody>
<tr>
<td>$\leq 4$</td>
<td>No follow-up needed $^5$</td>
<td>Follow-up CT at 12 mo; if unchanged, no further follow-up $^3$</td>
</tr>
<tr>
<td>$&gt;4-6$</td>
<td>Follow-up CT at 12 mo; if unchanged, no further follow-up $^3$</td>
<td>Initial follow-up CT at 6-12 mo then at 18-24 mo if no change $^1$</td>
</tr>
<tr>
<td>$&gt;6-8$</td>
<td>Initial follow-up CT at 6-12 mo then at 18-24 mo if no change</td>
<td>Initial follow-up CT at 3-6 mo then at 9-12 and 24 mo if no change</td>
</tr>
<tr>
<td>$&gt;8$</td>
<td>Follow-up CT at around 3, 9, and 24 mo, dynamic contrast-enhanced CT, PET, and/or biopsy</td>
<td>Same as for low-risk patient</td>
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Note—Newly detected indeterminate nodule in persons 35 years of age or older.

$^*$ Average of length and width.

$^1$ Minimal or absent history of smoking and of other known risk factors.

$^2$ History of smoking or of other known risk factors.

$^3$ The risk of malignancy in this category ($<1\%$) is substantially less than that in a baseline CT scan of an asymptomatic smoker.

$^1$ Non-solid (ground-glass) or partly solid nodules may require longer follow-up to exclude indolent adenocarcinoma.
WHAT IF MEDIUM CHANCE OF LUNG CANCER?

Need more information about the spot
If the nodule is 1/3 inch or bigger, you will need further evaluation: PET and biopsy.

If the PET is ONLY ACTIVE in the spot or the biopsy show cancer cells, your doctor will recommend SURGERY
If the PET is NOT ACTIVE, your doctor will discuss proceeding with biopsy versus a short term 3 month follow-up chest CT
WHAT IF HIGH RISK FOR LUNG CANCER?

A SPOT FELT TO BE HIGH CHANCE OF LUNG CANCER (> 65%)

Your doctor will **recommend breathing tests, PFTs, prior to surgery**

Your doctor will recommend **PET** to check for spread outside the lungs and for any evidence of ACTIVE mediastinal lymph glands

Your doctor will recommend surgery, VATS, to remove the spot if there is no evidence of advanced disease on the PET

Your surgeon, will remove the tumor and remove the chest lymph glands at time of surgery for **PATHOLOGICAL STAGING**

Pathologist will look under microscope as see if there is definite cancer in the tumor and if there is any cancer in your lymph glands
WHAT IS THAT SPOT IN MY LUNG?

Answer could be Cancer or non-cancer
Answer involves assessing risk factors for cancer
Answer involves assessing symptoms
Answer involves good physical exam
Answer involves various imaging studies

Answer may require further TISSUE BIOPSY if there is MODERATE to HIGH SUSPICION for LUNG CANCER

TISSUE IS THE ISSUE FOR DIAGNOSIS AND STAGING
YOU AND YOUR DOCTOR ARE A TEAM WORKING TO FIND AN ANSWER
THANK YOU

584-QUIT

1-800-
LUNGUSA