

Evaluation of Solitary Pulmonary Nodules (SPN) Found On Chest X – Ray

Introduction

The objective is to provide clinically relevant, evidence based guidelines for appropriate imaging modalities and diagnostic testing and indications for obtaining preoperative tissue diagnosis for patients with a solitary pulmonary nodule.

Definition

A Solitary Pulmonary Nodule or “Coin “ Lesion is an approximately round lesion that is less than 3 cm in diameter. That is completely surrounded by pulmonary paranchyma & unassociated with atelectasis

1. INITIAL EVALUATION OF THE LESION

1ST STEP

- Ensure that the Nodule is **solitary & truly arises in the lung Parenchyma.**

Exclude the following :-

- Callous Around a Rib Fracture
- Hypertrophied Costochondral Junction.
- An Exostosis arising From a Rib
- Pleural Nodule or Plaque
- Skin Nodule
- Extrathorasic Opacity projected over the Lung

In order to differentiate these conditions a Radiologists opinions is indicated wherever radiologists services are available (Recommendation Y)

1.1.1. Three Main Categories Of Solitary Pulmonary Nodule

1. Malignant Neoplasm
2. Inflammatory
 - Infective – TB / Fungal / Bacterial
 - Non Infective – Rheumatoid / Wegeners
3. Benign Tumour - Hamartoma

2. SUBSEQUENT STEPS

2.1 DEPEND ON;

- Age – Elderly Patient with H/O Smoking is more likely to be a Malignant Lesion
- Long Duration of Symptoms
- Presence of Fever / Weight Loss
- Primary Tumor elsewhere with propensity to Metastasis in lung
- Size of the Nodule

- Nodule Less than 9mm Never Visible on Plain Radiograph.
- SPN Less than 1cm is readily detected on CT.

Solitary Nodule larger than 1cm in diam. is sufficiently likely to be a primary lung cancer. A definitive Diagnosis should be arrived at without undue Delay.

Grade (X)

6mm nodule discovered incidentally or screening CT is (up to 30 times) More likely to be benign than Malignant.

2.1.1 MORPOLOGIC FEATURES

- No Radiologic Feature is specific for lung cancer. These features should be considered in arriving at diagnosis
- Size, Shape, Calcification, Cavitations,
- Rate of Growth

2.2 IMAGING OBSERVATIONS

2.2.1 Features Of Benign SPN

1. Detection of benign pattern of calcifications
2. Specific shape with a well defined, smooth and non lobulated edge.
3. Rate of Growth
 - The rate of growth is either too slow or too fast (Volume doubling time faster than one month or slower than 18 months)
 - Doubling time faster than one month suggests infarction, infection, and slower than 18 months suggest process such as granuloma, hamartoma or bronchial carcinoid.
 - However this does not exclude diagnosis of malignancy completely.
4. Unequivocal evidence that the nodule is the end stage of a previous pathological process such as infarction or granulomatous infection.

2.2.2 FEATURES OF MALIGNANT SPN

Shape of the lesion is often helpful for diagnosis.

- Very irregular margins
- Corona radiata (numerous strands radiating from the surface)
- lobulation / Notching (uneven growth)

Rate of Growth

- Volume doubling time 1 – 18 months in bronchial Cancer (An increase in diameter of 26% corresponds to a doubling volume.
- Average doubling time 4.2 – 7.3 months depending on cell type (Doubling time faster than one month may occur in aggressive lymphoma or fast growing malignancy such as germ cell tumour and certain sarcomas.
- If the nodule has remained the same size or a period of two years, it is more likely to be benign and the follow up is a reasonable course of action.

2.2.3 When evaluating a solitary pulmonary nodule found on chest x-ray the following should be considered;

- When is a CT scan indicated?
- Is there an indication for positron-emission tomography scanning?
- Is there a place for biopsy?
- What is the best biopsy method?

2.2.4 RECOMMENDATIONS

- Arrive at a tentative diagnosis
- Review all previous chest x-rays. **Grade (X)**
- A solitary pulmonary nodule (SPN) with central calcification is likely to be benign and does not require further diagnostic testing.
(Reference:- Tan BB, Flahery AR, Kazerooni EA, Iannetoni MD. SPN Chest 2003 Jan 123:)
- Other type of benign calcifications within SPN are laminated or “popcorn”
- However calcific pattern that are stippled or eccentric may associate with lung cancer.

- Presence of calcifications, fat, cartilage and pattern of calcifications are readily demonstrated on CT. Therefore CT can confirm the benignity of the lesion.
- Spiral chest computed tomography (CT) scan with contrast should be performed for new SPNs. **Grade (Y)**
- Patient at high risk (i.e. elderly, heavy smoker, presence of cancer) CT scan should be performed. **Grade (Y)**
- Spiral CT of the chest with contrast is useful for better characterization of the nodule, the lung parenchyma and the mediastinum. **Grade (Y)**
- CT can be useful in staging of malignant SPN. And to detect associated mediastinal adenopathy. **Grade (Y)**
- Contrast enhanced CT evaluates the degree of the enhancement. An increase in attenuation of 20HU is considered as a malignant lesion.

Enhancement must be measured at each of 1,2,3,4 minutes and the contrast must be adequately given. (Y)

- SPN due to lung CA shows homogenous enhancement with gadolinium DTPA on MRI. Therefore MRI maybe useful (Z)
- Positron-emission tomography (PET) is used for differentiating benign from malignant process. And staging information. i.e occult extra thoracic disease. (Z)
- Combined CT and PET for staging of malignant SPN is a highly sensitive method. (Z)
- Positron-emission tomography (PET) scan is not recommended for SPN <1 cm in size. (Z)

2.2.5 Management and follow-up evaluations

- SPN that does not change on chest x-ray after 2 years, follow-up is a reasonable course of action (X)
- If the growth occurs during follow up the nodule should be further evaluated/ (X)
- Chest x-ray at 3, 6, 12, and 24 months should be performed for patients who are not good surgical candidates. (X)
- For patients with an SPN who are surgical candidates and have a negative mediastinal evaluation on CT, PET scanning with 18-fluorodeoxyglucose (FDG) as an investigational tool, where available, may be warranted (Z)
- For patients with an SPN who are marginal surgical candidates, if there are unchanged results from prior CXRs and negative PET scan findings, serial follow-

up is recommended, consisting of an initial CXR, and CT scanning at 3, 6, 12, and 24 months **(Y)**

- For operable patients with a SPN which is peripherally situated who decline surgical intervention, TTNA (Trans Thoracic needle aspiration) is the preferred procedure for establishing a diagnosis.

Grade (Y)

- TTNA (Trans Thoracic Needle Aspiration) is recommended for larger than 1cm and more suspicious lesions

Grade (Y)

- TTNA should be performed under image guidance by the consultant radiologist.

Grade (Y)

- Presence of Consultant Pathologist during the image guided TTNA is optional.

Grade (Y)

- For patients with a SPN who are not operable candidates, or are at high risk, TTNA may be helpful to establish tissue diagnosis.

Grade (Y)

- Without a definitive tissue diagnosis, follow-up for 2 years is recommended with chest x-ray (at 3, 6, 12, and 24 months) **Grade (X)**
- Without a definitive tissue diagnosis, follow-up for 2 years is recommended with chest CT (at 3, 6, 12, and 24 months) **Grade (Y)**
- For operable patients with an SPN, if the lesion is amenable to a wedge resection, then wedge resection is the procedure of choice followed by a lobectomy if the pathologic finding is positive for cancer. **Grade (X)**
- For operable patients with an SPN, if the lesion is not amenable to a wedge resection, a diagnostic lobectomy is acceptable. **Grade (Y)**
- All pulmonary resections, anatomic or nonanatomic, must include a systematic lymph node dissection. **Grade (X)**

Reference:

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