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Multi-modality Typical Imaging features in Superior Pulmonary Sulcus (Pancoast) tumour: A case report

Clinical history: A 53 years old male patient came with complaints of pain and tingling sensation of left shoulder joint & left upper limb since 3 months. Patient is a chronic smoker with past history pulmonary tuberculosis. The patient had completed ATT 15 years back.

Imaging:

The patient was initially subjected to cervical spine and Chest radiograph. Later followed with CT and MRI cross sectional study. They showed the following imaging findings –



Figure 1: Cervical radiograph AP view – shows ill defined in-homogenous opacity in the left upper zone (straight arrow) with destruction of posterior aspect of 1st, 2nd & 3rd ribs (curved arrow) and supra-clavicular soft tissue component (block arrow).

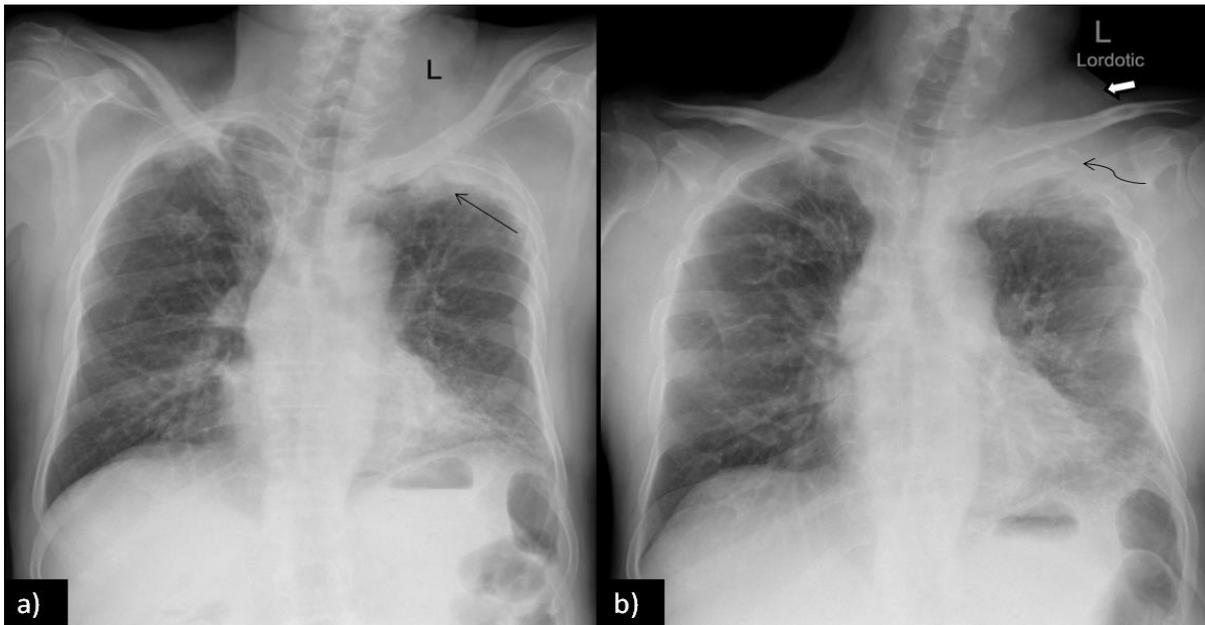


Figure 2(a and b): Frontal Chest radiograph (PA and Lordotic view) – Left irregular apical cap thickening(straight arrow) with adjacent bone destruction of 1st-3rd ribs(curved arrow) and cervical soft tissue component(block arrow). Linear and reticular opacities are seen in right upper and left lower zone.

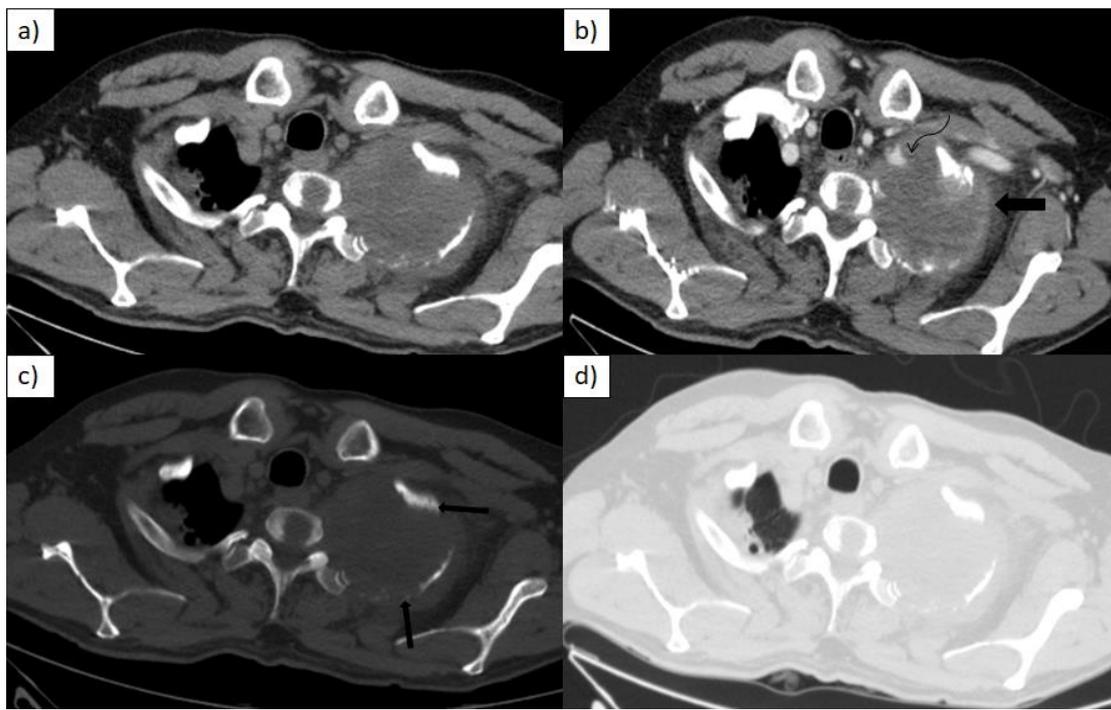


Figure 3[a]Plain Mediastinal window, **b)** Post contrast mediastinal window, **c)** bone window & **d)** lung window]: Axial CT thorax shows heterogeneously enhancing necrotic mass in the apical segment of left upper lobe with adjacent bone destruction(straight arrows), encasement of subclavian artery(curved arrow) and extra-thoracic extension(block arrow).

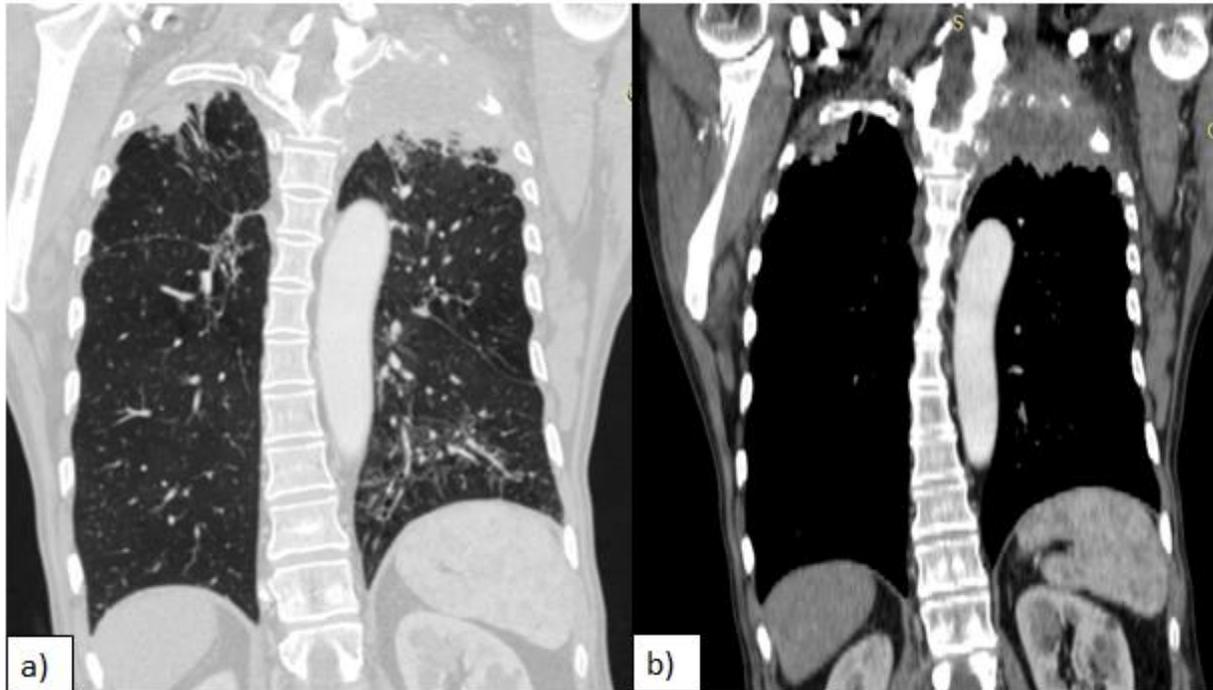


Figure 4 a)Lung window and b) Post contrast mediastinal window : Axial CT images shows the left apical mass which extra-thoracic extension.

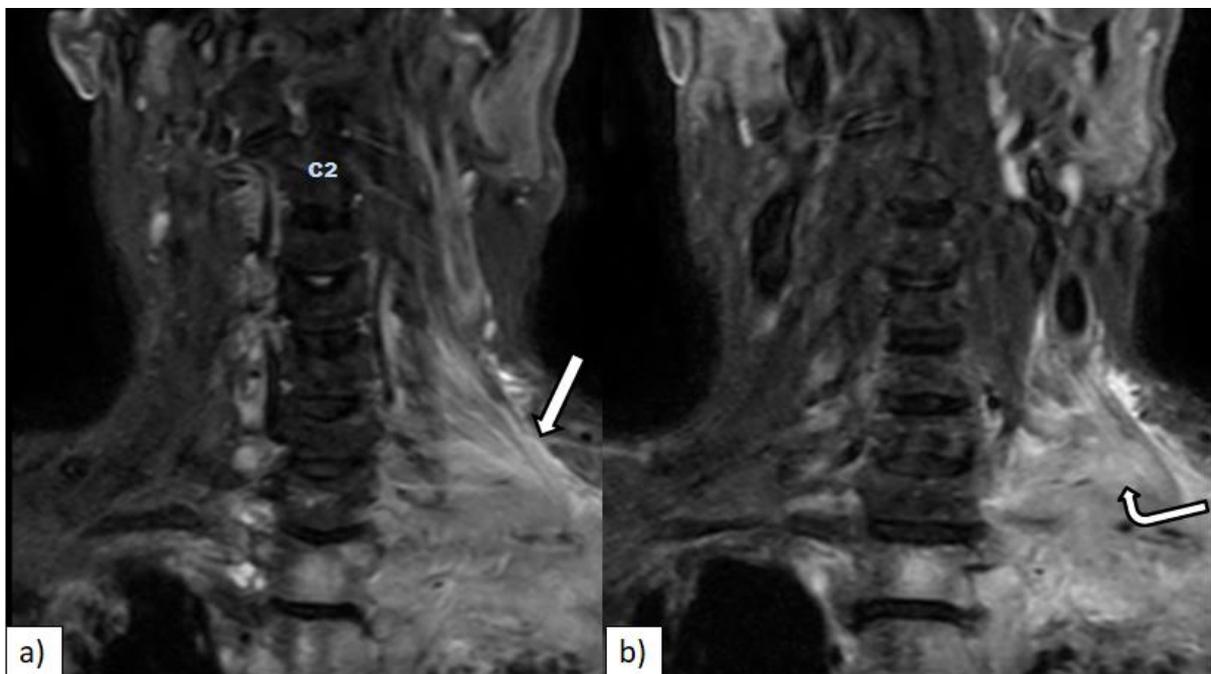


Figure 5: MRI STIR Coronal images of neck- a) shows the edematous & hyperintense nerve roots (straight arrow). b) Left apical hyperintense mass is seen extending superiorly with indistinct trunks & divisions of brachial plexus (curved arrow), suggestive of infiltration.



Figure 6: MRI STIR sagittal image of neck shows the mass extending postero-superiorly to involve the C8, T1, T2 and T3 nerve roots (arrows).

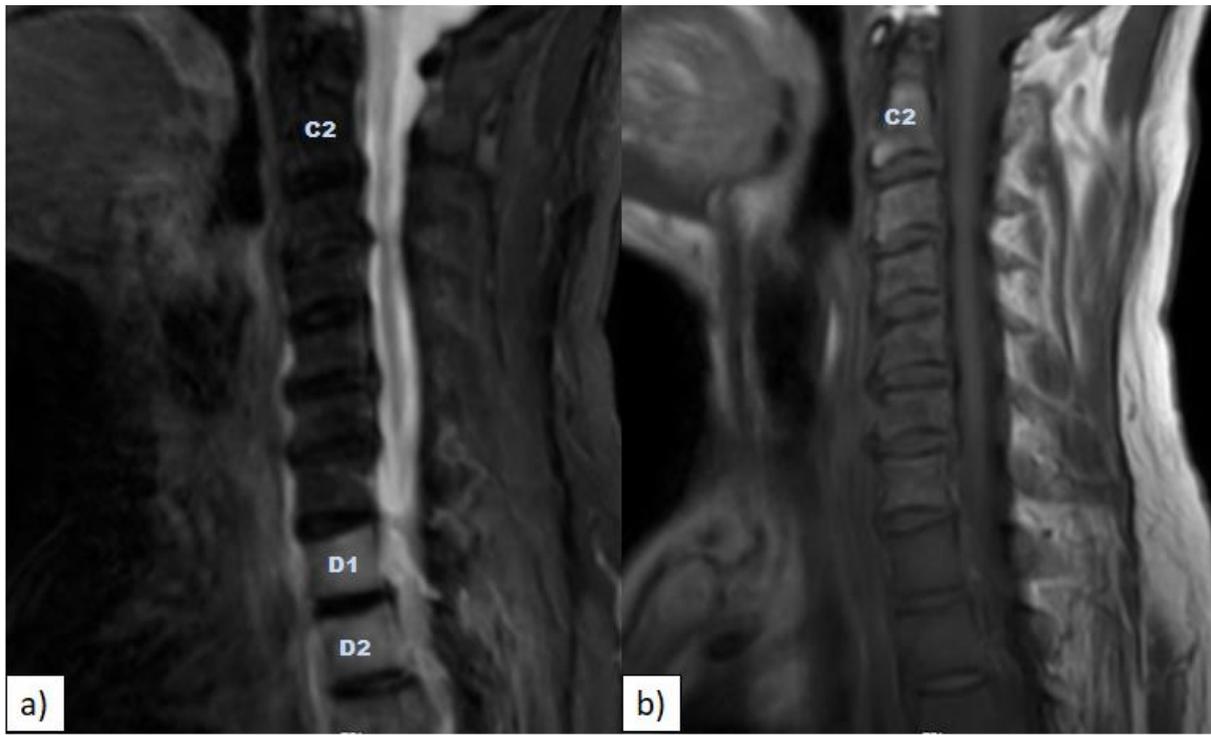


Figure 7 (a and b): MRI STIR Sagittal and T1W images of neck shows diffuse hyperintensity of D1, D2 and D3 vertebral bodies with corresponding hypointensity on T1W – likely metastasis.

Differential diagnosis:

Differential diagnosis of unilateral asymmetrical apical cap thickening/apical mass include –

- Neural or posterior mediastinal mass.
- Mesothelioma.
- Chest wall tumor.
- Tuberculosis- peripheral upper lobe collapse.
- Radiation fibrosis.

Final diagnosis: Superior Pulmonary Sulcus (Pancoast) tumour.

Discussion:

Tumors arising at or near the lung apex are termed as superior sulcus carcinoma, thoracic inlet carcinoma or apical carcinoma. The term Pancoast tumor is reserved for patients with signs and symptoms of Pancoast syndrome [1].

Epidemiology and pathology:

Superior Sulcus (Pancoast) tumour account for 3-5% of lung carcinomas[1]. They are usually non-small cell carcinoma. Previously squamous cell carcinoma was considered predominant histological type, however recent studies shows adenocarcinoma as most common type [2].

Clinical presentation:

- The most common presenting complaint is pain confined to the shoulder or radiating to the arm. The usual symptoms of lung cancer like cough, dyspnea, and hemoptysis are usually absent due to the peripheral location of tumor in the lung apex [2].
- Pancoast syndrome - pain in the shoulder & arm and features of Horner syndrome (ipsilateral anhidrosis of the face, miosis, and ptosis). However classic Pancoast syndrome is uncommon, accounting for only 25% [1].

Imaging features-

- **Chest radiography** - may show an apical mass or unilateral asymmetrical pleural thickening with or without adjacent bone destruction. Lordotic views can be helpful.
- **Computed tomography** - Chest CT scan is the modality of choice in the diagnosis of lung cancer. Advantages include:
 - Used for depicting bone abnormalities adjacent to the primary mass, such as rib and vertebral body erosion,
 - Assessing the patency of subclavian and other vessels.
 - Evaluating the intrathoracic structures (particularly the mediastinum) and extra-thoracic extension.
- **MRI** - For evaluation of loco-regional extension (particularly brachial plexus, subclavian vessels, parietal pleura, subpleural fat, neurovertebral foramina, and spinal canal)
- **PET-CT**- Helps in assessing nodal and distant metastases. PET-CT also helps in accurate delineation of the gross tumor volume, which will be essential for the radiation treatment planning [2].

Therapeutic options-

- Multimodality therapy with or without chemotherapy is now the standard of care. Complete surgical resection with neoadjuvant chemotherapy and radiation is preferred [2].
- The neoadjuvant radiation therapy and concurrent chemotherapy aims of control the primary tumor, loco-regional lymphatic extension and to lower the stage of locally advanced tumors.
- Absolute contraindications for surgery: Brachial plexus invasion at a level above the T1 Nerve, Vertebral body invasion > 50%, Invasion of the esophagus or trachea, Distant metastases, mediastinal or contralateral supraclavicular nodal metastases.
- Prognosis remains poor with an overall 5-year survival of only 36%. Complete resection is the most important factor in determining survival:
 - Complete resection achieved - 45% 5-year survival
 - Incomplete resection only - 0% 5-year survival

Teaching points –

- Imaging findings include lung apical mass with or without bone destruction, mediastinal extension, extra-thoracic extension to involve brachial plexus and stellate ganglion (lower Cervico-thoracic sympathetic nerve plexus).
- Most common histological type – adenocarcinoma.
- Most common presenting symptom – Pain in shoulder with or without radiating pain to the arm.
- MRI plays a significant role in the assessment of soft tissues involvement and local staging.

References:

1. Webb W R, Higgins C B. Thoracic Imaging: Pulmonary and Cardiovascular Radiology, 3rd ed. Philadelphia: Wolters Kluwer, 2017.
2. Bruzzi JF, Komaki R, Walsh GL, Truong MT, Gladish GW, Munden RF, Erasmus JJ. Imaging of non-small cell lung cancer of the superior sulcus: part 2: initial staging and assessment of resectability and therapeutic response. Radiographics. 2008 Mar-Apr;28(2):561-72. doi: 10.1148/rg.282075710.