**RESPIRATORY SYSTEM**

**1.Describe briefly the pathophysiology of Pulmonary Embolism. Give in detail the imaging modalities for diagnosis of this entity and their relative merits and demerits. [JAN 97]**

Pulmonary Embolism (PE) is a potentially life-threatening condition characterized by the obstruction of one or more pulmonary arteries by thrombotic material, typically originating from deep vein thrombosis (DVT) in the lower extremities. The pathophysiology of PE involves a complex interplay of factors leading to the formation and dislodgment of thrombi, their migration to the pulmonary circulation, and subsequent obstruction of pulmonary vessels.

**Pathophysiology:**

**1. Thrombus Formation:** PE often originates from DVT, where blood clot formation occurs in the deep veins of the legs or pelvis. Various factors contribute to thrombus formation, including Virchow's triad - endothelial injury, stasis of blood flow, and hypercoagulability of blood.

**2. Thrombus Dislodgment:** The thrombi in the deep veins can dislodge and enter the venous circulation.

**3. Migration:** These emboli travel through the right side of the heart and enter the pulmonary arteries.

**4. Obstruction:** As emboli become lodged in the pulmonary vasculature, they obstruct blood flow, causing a ventilation-perfusion mismatch and ultimately leading to impaired gas exchange and hemodynamic instability.

**Imaging Modalities for Diagnosis:**

**1. Chest X-ray (CXR):**

**- Merits:** CXR is readily available and can provide useful information such as atelectasis, pleural effusion, and cardiomegaly. It may show indirect signs of PE, but it is not a definitive diagnostic tool.

**- Demerits:** It lacks sensitivity and specificity for detecting small or subsegmental emboli.

**2. Ventilation-Perfusion (V/Q) Scan:**

**- Merits:** V/Q scanning is a nuclear medicine technique that can identify regions of the lung with impaired ventilation and perfusion. It can be useful when other modalities are inconclusive.

**- Demerits:** It has limitations in obese patients and can yield inconclusive results in certain cases.

**3. CT Pulmonary Angiography (CTPA):**

**- Merits:** CTPA is considered the gold standard for diagnosing PE due to its high sensitivity and specificity. It provides detailed anatomical information and can visualize emboli in the pulmonary arteries.

**- Demerits:** It requires intravenous contrast, which can be contraindicated in some patients (e.g., those with renal insufficiency or allergies). Radiation exposure is also a concern, especially in young patients.

**4. Pulmonary Angiography:**

**- Merits:** Pulmonary angiography is highly accurate and allows for therapeutic interventions such as thrombolysis or embolectomy during the procedure.

**- Demerits:** It is invasive and carries risks of complications. It is typically reserved for cases where other imaging modalities are inconclusive or when interventional therapy is planned.

In summary, PE is a critical condition resulting from the migration of thrombi to the pulmonary vasculature, leading to obstruction of pulmonary arteries and impaired gas exchange. The choice of imaging modality depends on the clinical scenario, but CTPA is the preferred method due to its high diagnostic accuracy, with the caveat of potential contraindications and radiation exposure. Other modalities like CXR and V/Q scanning have their roles but are less definitive in diagnosing PE. Pulmonary angiography is reserved for specific cases requiring intervention.

**2.Wegner‘s granulomatosis [JAN 97, JUN 07]**

Wegener's granulomatosis, now referred to as Granulomatosis with Polyangiitis (GPA), is a rare autoimmune disease characterized by systemic necrotizing vasculitis, often involving the upper and lower respiratory tracts and kidneys. The pathogenesis of GPA involves autoimmune inflammation of small- to medium-sized blood vessels, which leads to granuloma formation and tissue damage. The imaging findings in GPA can vary depending on the affected organs:

**- Chest Radiography:** On chest X-rays, GPA can manifest as multiple nodules or masses with cavitation. These findings are often seen in the lung fields and may mimic lung malignancies.

**- CT Imaging:** CT scans of the chest are essential for evaluating the extent of pulmonary involvement. They can reveal nodules, cavities, ground-glass opacities, and consolidations. Additionally, sinus involvement, such as sinus opacification or destruction of nasal septum (saddle-nose deformity), may be observed.

**- PET-CT:** Positron Emission Tomography combined with CT can help differentiate between active inflammation and fibrotic changes. It is useful for assessing the response to treatment.

**- Renal Imaging:** GPA can lead to glomerulonephritis. Renal ultrasound or CT scans can detect kidney abnormalities such as renal masses, hydronephrosis, or scarring.

**3.Pathogenesis and imaging of pulmonary sequestration. [JAN 97, DEC 02, JUN 06, 10]**

Pulmonary sequestration is a congenital abnormality in which a portion of lung tissue does not communicate with the tracheobronchial tree and receives its blood supply from systemic arteries. The pathogenesis involves the failure of embryonic lung tissue to separate from the foregut. Imaging plays a crucial role in the diagnosis of pulmonary sequestration:

**- CT Angiography:** This is the imaging modality of choice for evaluating pulmonary sequestration. It can identify the abnormal blood supply (usually from the aorta or its branches) to the sequestered lung tissue and delineate the vascular anatomy.

**- Chest X-ray:** In some cases, chest X-rays may show non-specific findings such as an opacity in the lung field. However, it is not specific enough for definitive diagnosis.

**- MRI:** Magnetic Resonance Imaging can be used as an alternative to CT, especially in cases where radiation exposure needs to be minimized, such as in pregnant patients or young children.

**4.Role of imaging in bronchogenic carcinoma. [JUL 97]**

Imaging plays a pivotal role in the diagnosis and staging of bronchogenic carcinoma, a common type of lung cancer. The pathogenesis of bronchogenic carcinoma is primarily related to the exposure to carcinogens, such as smoking. Imaging modalities and their roles include:

**- Chest X-ray:** Often the initial study performed when evaluating lung cancer, it can reveal masses, nodules, pleural effusions, or mediastinal lymphadenopathy.

**- CT Imaging:** High-resolution CT is the gold standard for assessing the size, location, and extent of lung tumors. It provides detailed information about lymph node involvement and the presence of distant metastases.

**- PET-CT:** Positron Emission Tomography combined with CT helps in identifying metabolically active lesions, assessing regional lymph nodes, and staging the disease.

**- MRI and Brain Imaging:** Brain MRI is crucial for detecting brain metastases, a common site for spread in lung cancer.

**5.Discuss in brief the differential diagnosis of mediastinal masses and their radiological appearances.**

**Mediastinal masses can originate from various structures within the mediastinum. Their differential diagnosis includes:**

**- Thymoma:** Anterior mediastinum; well-circumscribed mass.

**- Lymphoma:** Usually seen in the anterior or middle mediastinum; can be bulky and involve multiple lymph nodes.

**- Neurogenic Tumors:** Posterior mediastinum; often associated with the neural foramina.

**- Germ Cell Tumors:** Anterior mediastinum; seen in young adults.

**- Teratoma:** Anterior mediastinum; can have fat and calcifications.

**- Aortic Aneurysm:** Can mimic a mediastinal mass, particularly on imaging.

Imaging characteristics, along with clinical history and laboratory findings, help differentiate between these entities. CT and MRI are valuable tools for characterizing mediastinal masses, determining their origin, and guiding further management. Biopsy or surgical excision may be necessary for definitive diagnosis in some cases.

**6. Alveolar Proteinosis. [98]**

Alveolar Proteinosis is a rare lung disorder characterized by the accumulation of a lipoproteinaceous material within the alveoli, leading to impaired gas exchange and respiratory symptoms. The pathogenesis of Alveolar Proteinosis involves a disruption in the clearance of surfactant by alveolar macrophages. Imaging plays a crucial role in the diagnosis:

**- Chest X-ray:** Typically shows bilateral, symmetric, hazy opacities often referred to as "crazy paving" pattern. This pattern results from the accumulation of proteinaceous material within the alveoli.

**- High-Resolution CT (HRCT):** Provides a more detailed evaluation, revealing the "crazy paving" pattern more clearly and sometimes ground-glass opacities. HRCT can also identify the extent of lung involvement.

**- Bronchoalveolar Lavage (BAL):** This is an essential diagnostic tool. Analysis of lavage fluid demonstrates milky, opaque fluid with a high concentration of lipids and proteins.

**7.Anterior mediastinal mass lesions. [02]**

Anterior mediastinal masses can arise from various structures, and their differential diagnosis includes:

**- Thymoma:** The most common anterior mediastinal mass; often presents as a well-circumscribed, homogenous mass.

**- Thyroid Masses**: Ectopic thyroid tissue or goiters can extend into the anterior mediastinum.

**- Lymphoma:** Can involve the anterior mediastinum, presenting as a bulky mass.

**- Teratoma:** May contain heterogeneous components, including fat and calcifications.

**- Germ Cell Tumors:** Including seminomas and non-seminomatous germ cell tumors.

Imaging modalities like CT and MRI help in characterizing the lesions and guiding further management. Biopsy may be necessary for definitive diagnosis.

**8. Anterior mediastinal masses in children. [09]**

Anterior mediastinal masses in children often have distinct etiologies, including:

**- Thymic Hyperplasia:** Common in infants and young children, presenting as a well-defined, enlarged thymus.

**- Teratoma:** The most common germ cell tumor in pediatric anterior mediastinum; can contain a variety of tissues.

**- Lymphoma:** Hodgkin and non-Hodgkin lymphomas can occur, presenting as bulky, homogeneous masses.

**- Neurogenic Tumors:** Such as neuroblastoma or ganglioneuroma, arising from sympathetic ganglia, may extend into the anterior mediastinum.

Imaging is crucial for accurate diagnosis and differentiation, and it guides surgical planning and staging.

**9.Imaging of posterior mediastinal masses. [JUL 99, DEC 03]**

**Posterior mediastinal masses can originate from various structures, including:**

**- Neurogenic Tumors:** Arising from spinal nerves or sympathetic ganglia; often well-circumscribed.

**- Neuroblastoma:** A common childhood tumor; may demonstrate calcifications.

**- Enteric Cysts:** Often contain fluid and may be associated with vertebral anomalies.

**- Extramedullary Hematopoiesis:** Can occur in conditions like thalassemia.

**- Paraspinal Abscesses:** Infection-related masses, often associated with spinal osteomyelitis.

Imaging techniques such as CT and MRI help characterize these masses, define their relationship to adjacent structures, and guide management decisions.

**10. Pleural tumours. [JUL 98]**

Pleural tumors are relatively rare but can include primary pleural tumors like malignant mesothelioma and metastatic pleural involvement from various cancers. Imaging is essential for their evaluation:

**- Chest X-ray:** May show pleural effusion, pleural thickening, or pleural plaques in cases of asbestos exposure.

**- CT Scan:** Provides detailed visualization of pleural thickening, nodularity, and effusions. It helps differentiate benign from malignant pleural disease.

**- MRI:** Useful for evaluating the extent of pleural involvement, especially in cases of mesothelioma.

**- PET-CT:** Helpful in distinguishing benign pleural changes from malignant ones and assessing the extent of disease.

**11. Diagnosis of Pulmonary Infarction:**

Pulmonary infarction occurs when a segment of the lung undergoes necrosis due to compromised blood supply, typically in the context of pulmonary embolism. Imaging plays a critical role in diagnosis:

**- CT Pulmonary Angiography (CTPA):** Shows filling defects in pulmonary arteries suggestive of emboli. Associated parenchymal changes, such as wedge-shaped opacities with a pleural base, indicate infarction.

**- Chest X-ray:** Can show atelectasis or pleural effusion associated with infarction.

**- Ventilation-Perfusion (V/Q) Scan:** Demonstrates perfusion defects corresponding to areas of infarction.

**- MRI:** Can be used in specific cases to assess lung perfusion and parenchymal changes.

A combination of imaging modalities is often used to confirm the diagnosis of pulmonary infarction in patients with clinical suspicion of pulmonary embolism.

**12. Pulmonary Edema:**

Pulmonary edema is a clinical condition characterized by the accumulation of excessive fluid in the pulmonary interstitial and alveolar spaces, leading to impaired gas exchange. It can be caused by various factors, including heart failure, infection, or acute respiratory distress syndrome (ARDS). Imaging plays a crucial role in diagnosing and assessing the extent of pulmonary edema:

**- Chest X-ray:** Typically reveals bilateral, fluffy opacities in the lung fields, often referred to as "bat's wings" or "butterfly" pattern. This pattern results from the accumulation of fluid in the interstitial and alveolar spaces.

**- CT Scan:** High-resolution CT may be used in severe cases or when additional information is needed. It can provide detailed images of the extent and distribution of edema.

**13. Adult Respiratory Distress Syndrome (ARDS):**

ARDS is a severe form of acute lung injury characterized by widespread inflammation and increased permeability of the alveolar-capillary barrier. The pathogenesis involves various insults, such as sepsis or trauma. Imaging findings in ARDS include:

**- Chest X-ray:** Initially, there may be diffuse bilateral opacities, which progress to consolidation in severe cases. This is often referred to as "whiteout" of the lungs.

**- CT Scan:** High-resolution CT can reveal ground-glass opacities, consolidation, and air bronchograms, helping to assess the extent and distribution of lung involvement.

**14. Sarcoidosis:**

Sarcoidosis is a multisystem inflammatory disorder characterized by the formation of non-caseating granulomas. Although it can affect multiple organs, the lungs are commonly involved. Imaging plays a crucial role in diagnosing and monitoring sarcoidosis:

**- Chest X-ray:** Often shows bilateral hilar lymphadenopathy, which is a hallmark finding. It can also reveal parenchymal nodules, often in the upper lung zones.

**- CT Scan:** High-resolution CT provides more detailed information about lung involvement, including the presence of ground-glass opacities, fibrosis, and honeycombing.

**15. Differentiating Features of Intra and Extralobar Sequestration of Lung:**

Intralobar and extralobar sequestration are congenital lung malformations where a segment of lung tissue lacks normal communication with the bronchial tree and has its blood supply from systemic arteries. They can be differentiated by:

**- Intralobar Sequestration:** Typically occurs within the normal lung parenchyma, often in the lower lobes. It shares a pleural covering with the adjacent lung and is susceptible to infections due to communication with the bronchial tree.

**- Extralobar Sequestration:** Located outside the normal lung and is covered by a separate pleural layer. It usually has its own blood supply from systemic arteries and does not communicate with the bronchial tree.

Imaging modalities like CT angiography help distinguish between the two types, which is important for surgical planning.

**16. Pulmonary Plethora and Its Distinctive Features:**

Pulmonary plethora refers to an increase in the size and number of pulmonary vessels, often seen in conditions like congenital heart disease with left-to-right shunting. Key features include:

**- Chest X-ray:** Typically shows prominent and tortuous pulmonary vessels, especially in the lung periphery. The lung fields may appear congested, with increased vascular markings.

**- Echocardiography:** Helps identify the underlying cardiac defect causing the pulmonary plethora.

Pulmonary plethora is a radiological finding that often prompts further evaluation to determine its cause, which is usually related to congenital or acquired cardiac abnormalities.

**17. MRI in Bronchogenic Carcinoma:**

MRI (Magnetic Resonance Imaging) is less commonly used than CT for evaluating bronchogenic carcinoma due to some limitations. However, it can provide valuable information in specific situations:

**- Tissue Characterization:** MRI can help differentiate between soft tissue and fluid-filled structures, aiding in the assessment of tumor extension into nearby structures, such as the chest wall or mediastinum.

- Evaluation of Mediastinal Involvement: MRI can be useful for characterizing mediastinal lymph nodes and determining their malignant potential.

**- Assessment of Vascular Involvement**: MRI is superior to CT in evaluating vascular invasion by tumors, especially in cases where vascular reconstruction is considered.

While CT remains the primary imaging modality for bronchogenic carcinoma, MRI may have a role in selected cases, particularly when assessing soft tissue involvement, vascular invasion, or evaluating mediastinal lymph nodes in specific clinical contexts.

**18. Clinical Applications of CT in Evaluation of Non-Neoplastic Lung Diseases:**

CT (Computed Tomography) has revolutionized the evaluation of non-neoplastic lung diseases due to its ability to provide detailed cross-sectional images of the lungs. Some clinical applications include:

**- Interstitial Lung Disease (ILD):** CT helps in characterizing patterns of lung involvement, such as reticular, nodular, ground-glass, or honeycombing patterns, aiding in diagnosis and monitoring.

**- Pulmonary Infections:** CT can detect subtle changes indicative of infections, including pneumonia, tuberculosis, and fungal infections.

**- Pulmonary Embolism:** CT pulmonary angiography is the gold standard for diagnosing pulmonary embolism, offering high sensitivity and specificity.

**- Chronic Obstructive Pulmonary Disease (COPD):** CT can assess emphysematous changes and bronchiectasis in COPD patients.

**- Pulmonary Vascular Disorders:** CT is useful in diagnosing conditions like pulmonary hypertension by evaluating vascular changes.

**- Cystic Lung Diseases:** CT can distinguish between different cystic lung diseases like Lymphangioleiomyomatosis (LAM) and Langerhans cell histiocytosis.

**19. Pan-Acinar Emphysema:**

Pan-acinar emphysema is a type of emphysema where the destruction of lung tissue affects the entire acinus, leading to airway obstruction. It is often associated with alpha-1 antitrypsin deficiency. CT scans can reveal diffuse, low-attenuation areas throughout both lungs, consistent with the loss of lung parenchyma.

**20. Tracheoesophageal Fistula:**

A tracheoesophageal fistula is an abnormal connection between the trachea and the esophagus. CT can help visualize the fistula and assess its size, location, and associated anomalies, aiding in surgical planning.

**21. Evaluation and Differential Diagnosis of Hilar Mass:**

Hilar masses can be due to various causes, including primary lung tumors, lymphadenopathy, or infections. CT is crucial in determining the location, size, and characteristics of the mass, which can help differentiate between benign and malignant causes. It can also reveal associated findings, such as lymph node enlargement.

**22. Solitary Pulmonary Nodule:**

Solitary pulmonary nodules are often discovered incidentally on imaging. CT is the primary modality for characterizing these nodules. It helps determine nodule size, shape, margins, density, and growth rate, assisting in the differentiation between benign and malignant nodules.

**23. Metastatic Tumors of Lung:**

Metastatic tumors in the lungs often have characteristic imaging features. CT plays a vital role in detecting and characterizing these lesions, helping identify the primary tumor site and guiding treatment decisions.

**24. Silicosis:**

Silicosis is an occupational lung disease caused by the inhalation of crystalline silica dust. CT can reveal characteristic findings such as small, round opacities (nodular silicosis) or large, conglomerate opacities (progressive massive fibrosis), helping in the diagnosis and assessment of disease severity.

**25. Bronchopulmonary Aspergillosis:**

CT is essential in diagnosing and classifying different forms of bronchopulmonary aspergillosis, including allergic bronchopulmonary aspergillosis (ABPA) and invasive aspergillosis. It can show characteristic findings such as central bronchiectasis and mucoid impaction.

**26. Ground Glass Opacity (GGO) on HRCT - Significance and Differential Diagnosis:**

Ground glass opacity (GGO) on high-resolution CT (HRCT) scans is a radiological finding characterized by hazy increased lung attenuation without obscuring the underlying vascular structures. It can be associated with various conditions, including pneumonia, interstitial lung diseases, lung nodules, and lung cancer. HRCT helps in characterizing GGO lesions, assessing their distribution, and guiding further evaluation and management based on clinical context and associated findings. Differential diagnosis includes infections, inflammation, fibrosis, and early stages of lung cancer. Follow-up imaging is often required to monitor changes in GGO lesions over time.

**27. Unilateral Opaque Hemithorax:**

Unilateral opaque hemithorax refers to a condition where one-half of the chest appears opacified on radiographic imaging. This can be caused by various conditions, and imaging helps identify the underlying etiology:

**- Pleural Effusion:** The most common cause is a large pleural effusion, which appears as a homogenous opacity. Imaging can determine its size and characteristics.

**- Pneumonia:** Consolidation of lung tissue due to infection can lead to opacification. CT can help differentiate pneumonia from other causes.

**- Lung Collapse:** Atelectasis or lung collapse can also result in a unilateral opaque hemithorax. Imaging can reveal the underlying cause, such as airway obstruction.

**- Mass Lesions:** Tumors or masses in the lung or pleura can cause opacification. CT is useful in characterizing these lesions.

**28. Unilateral Hyperlucent Hemithorax:**

Unilateral hyperlucent hemithorax refers to a condition where one side of the chest appears abnormally lucent or dark on radiographic imaging. Some common causes include:

**- Congenital Lung Agenesis:** Absence of lung development can lead to unilateral hyperlucency.

**- Swyer-James Syndrome:** A type of post-infectious bronchiolitis obliterans that results in hyperlucent lung.

**- Bronchial Obstruction:** Conditions like foreign body aspiration or mucus plugging can cause air trapping and hyperlucency on the affected side.

**- Scimitar Syndrome:** A congenital anomaly involving the right lung, often associated with cardiac abnormalities.

Imaging helps in identifying the underlying cause and planning appropriate management.

**29. Pulmonary Thromboembolism:**

Pulmonary thromboembolism (PTE) occurs when a blood clot (thrombus) from elsewhere in the body travels to the pulmonary arteries, causing obstruction. CT pulmonary angiography is the primary imaging modality for diagnosing PTE. It can reveal filling defects within the pulmonary vasculature, indicating the presence and location of emboli.

**30. Imaging in Acute Chest Trauma:**

Imaging plays a critical role in evaluating acute chest trauma, including rib fractures, pneumothorax, hemothorax, pulmonary contusions, and aortic injuries. Chest X-rays and CT scans are commonly used to assess the extent of injury and guide management decisions.

**31. Lung Lesions in AIDS:**

AIDS (Acquired Immunodeficiency Syndrome) patients are susceptible to a variety of lung infections and malignancies due to their compromised immune systems. Imaging, particularly CT, is crucial in diagnosing and characterizing these lesions, which may include opportunistic infections like Pneumocystis jirovecii pneumonia (PCP), tuberculosis, fungal infections, and Kaposi's sarcoma.

**32. Atypical Pneumonia:**

Atypical pneumonia refers to a group of pneumonia types caused by pathogens other than typical bacteria like Streptococcus pneumoniae. Radiologically, atypical pneumonia may appear as diffuse or patchy ground-glass opacities on chest X-rays or CT scans. Common pathogens include Mycoplasma pneumoniae, Chlamydia pneumoniae, and viruses like Influenza.

**33. HRCT in Interstitial Lung Disease (ILD):**

High-resolution CT (HRCT) is a powerful tool in the evaluation of ILD. It allows detailed visualization of lung parenchyma and can reveal patterns associated with various ILD subtypes, such as ground-glass opacities, reticular opacities, honeycombing, or consolidation. HRCT aids in diagnosing and categorizing ILD, guiding treatment decisions, and monitoring disease progression.

**34. Pulmonary Lesions in AIDS:**

Pulmonary lesions in AIDS can include infections (e.g., tuberculosis, fungal infections), malignancies (e.g., Kaposi's sarcoma, lymphoma), and interstitial lung disease. Imaging, including CT scans, helps in identifying these lesions, assessing their extent, and guiding appropriate management strategies.

**35. Eventration of Diaphragm:**

Eventration of the diaphragm refers to the abnormal elevation of a portion of the diaphragm, often due to congenital or acquired causes. Imaging, particularly chest X-rays or fluoroscopy, can demonstrate the elevated diaphragm, which may appear as a domed contour. Further imaging, such as ultrasound or CT, can provide additional details about the diaphragmatic abnormality and its impact on adjacent structures.

**36. Pulmonary Aspergillosis:**

Pulmonary aspergillosis refers to a group of lung diseases caused by the Aspergillus species, with several clinical forms such as invasive aspergillosis, allergic bronchopulmonary aspergillosis (ABPA), and aspergilloma. Radiological findings in pulmonary aspergillosis vary based on the form:

**- Invasive Aspergillosis:** CT is essential for evaluating this potentially life-threatening condition. It may show nodules, cavities, or consolidations with a halo sign (ground-glass opacity around a nodule) or an air-crescent sign.

**- ABPA:** ABPA often presents with central bronchiectasis, mucoid impaction, and eosinophilic infiltrates. Chest X-rays and CT scans can reveal these findings.

**- Aspergilloma:** It appears as a fungal ball within a preexisting lung cavity, typically in the upper lobes. CT scans are particularly useful for diagnosis.

**37. Hyaline Membrane Disease:**

Hyaline membrane disease, also known as neonatal respiratory distress syndrome, primarily affects premature infants. Imaging plays a role in assessing lung maturity and complications:

**- Chest X-ray:** Typically reveals diffuse ground-glass opacities, air bronchograms, and a "ground-glass appearance" due to the hyaline membrane lining the alveoli.

**- Follow-up X-rays:** Serial X-rays are crucial for monitoring changes in lung appearance and assessing response to treatment.

**38. Imaging in Central Bronchogenic Carcinoma:**

Central bronchogenic carcinomas are tumors arising in the larger bronchi. Imaging, especially CT and bronchoscopy, is vital for diagnosis and assessment:

**- CT Chest:** It helps define tumor size, location, and extent of invasion into surrounding structures, such as the bronchial wall or mediastinum.

**- Bronchoscopy:** Allows direct visualization of the tumor, biopsy, and assessment of airway involvement.

**39. Radiology of Primary Pulmonary Koch's:**

Primary pulmonary tuberculosis (Koch's) can present with various radiological findings:

**- Chest X-ray:** May show infiltrates, consolidation, cavitation, or pleural effusion. Ghon's complex, comprising a lung lesion and associated lymphadenopathy, is characteristic.

**- CT Chest:** Can provide detailed information about the extent of disease, lymphadenopathy, and associated findings like tree-in-bud appearance.

**40. Salient Features of Radiology of Pulmonary Metastases:**

Pulmonary metastases are common in cancer patients. Radiological features include:

**- Chest X-ray:** Multiple, well-defined nodules scattered throughout the lung fields.

**- CT Chest:** Provides a detailed assessment of the number, size, and distribution of metastatic nodules, aiding in staging and treatment planning.

**41. Raised Left Dome of Diaphragm:**

A raised left dome of the diaphragm can be caused by various conditions:

**- Diaphragmatic Eventration:** Congenital or acquired abnormal elevation of the diaphragm without a structural defect.

**- Phrenic Nerve Paralysis:** Can occur due to injury, surgery, or neurological conditions.

**- Subdiaphragmatic Mass:** Such as an enlarged spleen or gastric volvulus, can push the diaphragm upward.

Imaging, including chest X-rays and fluoroscopy, can visualize the elevated diaphragm and determine its underlying cause.

**42. Radiological Features in Congenital Cystic Adenomatoid Malformation (CCAM) of the Lung:**

**CCAM is a congenital lung lesion with cystic spaces and solid components. Radiological features include:**

**- Chest X-ray:** May show an opacity with cystic or solid areas, depending on the type of CCAM.

**- Ultrasound:** Useful for prenatal diagnosis, showing multicystic lesions.

**- CT Chest:** Provides detailed information about the size, number, and extent of cystic lesions.

**43. Role of Chest Radiograph and CT Chest in AIDS:**

In AIDS, chest imaging, including chest X-rays and CT scans, plays a crucial role in assessing lung infections, malignancies, and complications such as pneumocystis pneumonia (PCP), fungal infections, tuberculosis, lymphoma, and Kaposi's sarcoma. These imaging modalities help diagnose, stage, and monitor the progression of lung diseases in AIDS patients.

**44. Anterior Mediastinal Masses in Children:**

Anterior mediastinal masses in children can include thymomas, teratomas, lymphomas, and vascular lesions. Imaging, particularly CT and MRI, assists in characterizing these lesions and evaluating their relationships with adjacent structures.

**45. Anterior Mediastinal Masses:**

Anterior mediastinal masses can occur in adults and are associated with various conditions such as thymomas, lymphomas, germ cell tumors, and thyroid masses. Imaging helps in determining the nature, size, and extent of the mass and guides further evaluation and management.

**46. Azygos Lobe:**

An azygos lobe is a rare anatomical variation of the right lung, where an accessory lobe extends from the upper lobe of the lung and is separated by the azygos vein. It appears as an additional, triangular-shaped lobe on imaging, often noted on chest X-rays. CT can provide detailed visualization and confirm the presence of an azygos lobe. It is usually a benign anatomical variant with no clinical significance.

**47. Causes of Pulmonary Venous Hypertension and Plain X-ray Findings:**

Pulmonary venous hypertension (PVH) refers to increased pressure in the pulmonary venous system, often due to various cardiac and non-cardiac causes. Common etiologies include:

**Cardiac Causes:**

- Left heart failure (most common)

- Mitral valve stenosis or regurgitation

- Aortic valve disease

- Congenital heart defects (e.g., atrial septal defect)

**Non-Cardiac Causes:**

- Pulmonary veno-occlusive disease

- Pulmonary hypertension (secondary to lung disease)

- Superior vena cava obstruction

**Plain X-ray findings in PVH typically include:**

**- Enlarged Pulmonary Veins:** Prominent upper lobe veins, termed "upper lobe diversion" or "Kerley B lines," are seen as fine, horizontal lines extending to the pleura.

**- Pleural Effusion:** Accumulation of fluid in the pleural space, often on lateral views as blunting of the costophrenic angles.

**- Cardiomegaly:** Increased heart size due to left atrial and ventricular enlargement.

**- Interstitial Edema:** Increased lung markings and peribronchial cuffing, indicating fluid accumulation in the interstitium.

**48. Pathophysiology and Imaging Features in Respiratory Distress in Newborn:**

Respiratory distress in newborns can result from various etiologies, including transient tachypnea of the newborn (TTN), respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), and pneumonia. The pathophysiology and imaging features vary with each condition:

**- TTN:** Caused by delayed clearance of fetal lung fluid. Imaging shows prominent vascular markings, fluid in lung fissures, and mild cardiomegaly. Resolution is usually rapid.

**- RDS:** Due to surfactant deficiency in premature infants. Imaging reveals diffuse ground-glass opacities, air bronchograms, and a "reticular" or "honeycomb" pattern.

**- MAS:** Occurs when meconium-stained amniotic fluid is aspirated by the fetus. Imaging shows patchy or segmental opacities, often with hyperinflation and areas of atelectasis.

**- Pneumonia:** Bacterial or viral infections can cause pneumonia. Imaging features include focal or lobar consolidation, air bronchograms, and perihilar infiltrates.

**49. Imaging in Pulmonary Thromboembolism:**

**Imaging plays a vital role in diagnosing pulmonary thromboembolism (PTE). Common modalities include:**

**- CT Pulmonary Angiography (CTPA):** The primary imaging method for diagnosing PTE, it identifies filling defects (thrombi) within pulmonary arteries.

**- Ventilation-Perfusion (V/Q) Scan:** Helps identify areas with mismatched ventilation and perfusion, indicating PTE. High probability V/Q scans are suggestive of PTE.

**50. MDCT & Scintigraphic Evaluation of Pulmonary Embolism:**

**- MDCT (Multidetector CT):** Provides high-resolution images of the pulmonary arteries and is the gold standard for diagnosing PTE. It allows visualization of thrombi and assessment of their location and extent.

**- Scintigraphy:** Perfusion scintigraphy (V/Q scan) is used when CT is contraindicated or inconclusive. Ventilation scans (using inhaled xenon gas or aerosols) are combined with perfusion scans to detect mismatched areas indicating PTE.

**51. Causes of Usual Interstitial Pneumonitis (UIP) and HRCT Findings in Idiopathic Pulmonary Fibrosis (IPF):**

**Causes of UIP, a specific pattern of interstitial lung disease, include IPF, certain connective tissue diseases, environmental exposures, and drug reactions. HRCT findings in IPF typically show:**

**- Subpleural Reticular Opacities:** Fine reticular opacities with honeycombing at the lung bases.

**- Honeycombing:** Characteristic cystic airspaces, often subpleural, with thickened walls.

**- Traction Bronchiectasis:** Dilated airways due to fibrosis.

**- Ground-Glass Opacities:** Patchy or diffuse areas of hazy increased attenuation.

**- Peripheral and Basal Predominance:** Typically seen in IPF, especially in the lower lung zones.

These findings aid in the diagnosis of IPF and differentiate it from other interstitial lung diseases with similar clinical presentations.

**52. Imaging Features of Thoracic Lymphoma:**

Thoracic lymphoma primarily involves the mediastinum, and imaging plays a crucial role in its detection and characterization. Lymphomas may be classified into Hodgkin lymphoma (HL) and non-Hodgkin lymphoma (NHL). Here are the imaging features:

**- Hodgkin Lymphoma (HL):**

**- Mediastinal Mass:** HL often presents as an anterior mediastinal mass, which may be bulky and heterogeneous.

**- Lymph Node Involvement:** Enlarged lymph nodes, including the mediastinal, supraclavicular, and cervical nodes, are common.

**- Characteristic Staging:** HL follows the Ann Arbor staging system, and imaging is essential to determine disease extent.

**- Non-Hodgkin Lymphoma (NHL):**

**- Mediastinal and Hilar Involvement:** NHL can involve both the mediastinum and hilar regions, resulting in a wide variety of imaging appearances.

**- Extranodal Involvement:** NHL frequently involves extranodal structures, such as the lung, pleura, or chest wall, which can be seen on imaging.

**- Different Patterns:** Imaging findings vary, including nodal and extranodal masses, consolidation, cavitation, or pleural effusions.

**- CT and PET-CT:** CT imaging, often combined with PET-CT, aids in staging, evaluating treatment response, and monitoring disease recurrence in lymphomas.

**53. CT Features of Thoracic Lymphoma:**

CT is valuable in assessing thoracic lymphoma and can reveal specific features depending on the type and location of the lymphoma:

**- Mediastinal Mass:** Both HL and NHL can manifest as a bulky, heterogeneous mediastinal mass.

**- Hilar and Paratracheal Lymphadenopathy:** Enlarged lymph nodes in the hilum and paratracheal regions are common.

**- Extranodal Involvement:** CT can demonstrate involvement of adjacent structures, such as the lung, pleura, chest wall, or pericardium.

**- Necrosis and Calcification:** Some lymphomas may show areas of necrosis or calcification within the masses.

**- Contrast Enhancement:** Enhancing areas within lymphomatous masses may be seen due to increased vascularity.

**54. Imaging of Extranodal Presentations of Non-Hodgkin Lymphomas:**

Extranodal involvement in non-Hodgkin lymphoma (NHL) can occur in various organs within the thorax, such as the lung, pleura, or chest wall. Imaging, especially CT and PET-CT, helps in identifying these extranodal sites, assessing the extent of involvement, and guiding treatment decisions. Features may include pulmonary nodules, pleural thickening or effusion, chest wall masses, or infiltrative lung disease.

**55. Role of Imaging in a Newborn with Respiratory Distress:**

Imaging plays a vital role in evaluating a newborn with respiratory distress, helping to identify the underlying cause. Chest X-rays are commonly used and can reveal conditions such as respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), pneumonia, pneumothorax, or congenital lung malformations. Imaging helps determine the appropriate management and treatment for the infant.

**56. Pathophysiology and Imaging Features in Respiratory Distress in Newborn:**

Respiratory distress in newborns can result from various etiologies, as discussed earlier. Imaging findings typically include ground-glass opacities, air bronchograms, pleural effusion, or atelectasis, depending on the underlying cause. Understanding the pathophysiology and recognizing these findings on imaging aids in accurate diagnosis and management.

**57. HRCT in Diffuse Lung Disease:**

High-resolution CT (HRCT) is valuable in evaluating diffuse lung diseases, including interstitial lung diseases (ILDs). It provides detailed images of lung parenchyma and can reveal characteristic findings such as reticulation, ground-glass opacities, honeycombing, and traction bronchiectasis. HRCT aids in differentiating various ILDs and helps assess disease severity and progression.

**58. HRCT in Occupational Lung Diseases:**

HRCT is useful in assessing occupational lung diseases caused by exposure to harmful substances. For example, in asbestosis, HRCT can show pleural plaques and interstitial fibrosis. In silicosis, it reveals nodular opacities. HRCT helps identify the characteristic features of these diseases and assess their extent.

**59. HRCT in Pulmonary Tuberculosis:**

HRCT can provide valuable information in cases of pulmonary tuberculosis (TB). It can reveal findings such as consolidations, nodules, cavities, tree-in-bud appearance, and pleural effusions. HRCT helps in assessing the extent of disease, identifying complications, and guiding treatment.

**60. Role of Chest Radiography in Emergency Situations:**

Chest radiography is a rapid and essential tool in emergency situations. It aids in the diagnosis and management of conditions like:

**- Pneumothorax:** Demonstrates the presence and size of a pneumothorax.

**- Pulmonary Edema:** Reveals signs of fluid accumulation in the lungs.

**- Cardiac Emergencies:** Detects cardiomegaly, heart failure, or aortic dissections.

**- Lung Infections:** Shows signs of pneumonia or lung abscess.

**- Chest Trauma:** Identifies rib fractures, hemothorax, or pneumomediastinum.

Prompt interpretation of chest radiographs is crucial for making rapid clinical decisions in emergency settings.

**61. Differential Diagnosis and Imaging Features of Paravertebral Shadow:**

A paravertebral shadow is an abnormal radiographic finding adjacent to the vertebral column. It can result from various causes, including:

**1. Soft Tissue Mass:** This can be due to benign or malignant tumors, such as lipomas, neurofibromas, or metastatic lesions. Imaging will reveal a soft tissue mass adjacent to the spine.

**2. Hematoma:** A paravertebral hematoma can occur following trauma or vascular injury. Imaging may show a collection of blood adjacent to the vertebrae.

**3. Infection or Abscess:** Infections like spinal tuberculosis or vertebral osteomyelitis can cause paravertebral abscesses. Imaging demonstrates an abscess or inflammatory changes near the spine.

**4. Neurogenic Tumors:** Conditions like neurofibromatosis can lead to neurogenic tumors like schwannomas, which may appear as paravertebral masses.

**5. Herniated Disc**: A herniated intervertebral disc can compress adjacent structures, causing a paravertebral shadow.

**6. Metastatic Disease:** Metastatic cancer to the spine can create paravertebral lesions.

The imaging modality used to evaluate the paravertebral shadow (X-ray, CT, MRI) depends on the clinical context and suspected underlying cause.

**62. Role of MDCT in Staging of Carcinoma of Lung:**

Multidetector CT (MDCT) is the imaging modality of choice for staging lung cancer. It provides detailed information about the primary tumor, lymph node involvement, and distant metastases. Key roles of MDCT in lung cancer staging include:

**- Primary Tumor:** MDCT characterizes the size, location, and extent of the primary tumor, helping in the T-stage classification.

**- Lymph Nodes:** It identifies enlarged or suspicious lymph nodes (N-stage), guiding the need for invasive procedures like mediastinoscopy.

**- Metastases:** MDCT assesses distant metastases (M-stage) to organs such as the liver, adrenal glands, and bones.

**- Tumor Invasion:** It evaluates the involvement of adjacent structures, such as the chest wall or mediastinum, aiding in the determination of resectability.

MDCT plays a crucial role in treatment planning, prognosis assessment, and guiding therapeutic decisions in lung cancer patients.

**63. Imaging Findings in Germ Cell Tumor of the Mediastinum and Differential Diagnosis:**

**Germ cell tumors in the mediastinum can have various imaging features, such as:**

**- Anterior Mediastinal Mass:** Most commonly, germ cell tumors present as anterior mediastinal masses on imaging.

**- Calcifications:** Some germ cell tumors may have calcifications visible on X-rays or CT scans.

**- Heterogeneous Enhancement:** CT scans often show heterogeneous enhancement within the mass.

**Differential diagnosis includes:**

**1. Thymoma:** Another common anterior mediastinal mass.

**2. Teratoma:** A subtype of germ cell tumor that may contain tissues from all three germ layers.

Definitive diagnosis often requires biopsy and histological examination.

**64. Radiological Findings of the Pulmonary Complications of HIV Infections:**

**Pulmonary complications in HIV-infected individuals can include:**

**- Pneumocystis Pneumonia (PCP):** Imaging reveals bilateral ground-glass opacities or consolidations, often with upper lobe predominance.

**- Tuberculosis:** Chest X-rays may show infiltrates, cavities, or lymphadenopathy. CT scans can provide detailed information.

**- Cryptococcosis:** Imaging demonstrates pulmonary nodules or infiltrates.

**- Kaposi's Sarcoma**: Presents as multiple pulmonary nodules or masses.

**- Lymphoma:** Lymphomatous involvement may appear as pulmonary nodules or masses.

**- Bacterial Infections:** Radiographic findings vary but can include lobar consolidations or cavitary lesions.

**- Fungal Infections:** Imaging features depend on the specific fungus but can include nodules, cavities, or infiltrates.

**- HIV-Related Interstitial Lung Disease:** May show diffuse interstitial infiltrates on imaging.

The choice of imaging modality (X-ray, CT) depends on the clinical presentation and suspected diagnosis.

**65. Chest Radiograph and HRCT Findings in Sarcoidosis:**

Sarcoidosis often involves the lungs, and imaging plays a vital role in its diagnosis and evaluation. Chest radiograph findings may include bilateral hilar lymphadenopathy (BHL) and parenchymal infiltrates. HRCT can reveal:

**- Reticular Opacities:** Fine linear opacities in a reticular or reticulonodular pattern.

**- Ground-Glass Opacities:** Hazy increased attenuation without obscuring underlying vessels.

**- Hilar Lymphadenopathy:** Enlarged lymph nodes in the hilar region.

**- Lung Nodules:** Discrete, small nodules throughout the lung parenchyma.

**- Honeycombing:** Cystic airspaces with thickened walls, typically seen in advanced stages.

The combination of these findings, along with clinical and laboratory data, helps in diagnosing and staging sarcoidosis.

**66. Etiopathogenesis, Common Causes, Plain Film, and CT Features of Lymphangitis Carcinomatosis:**

Lymphangitis carcinomatosis is the infiltration of cancer cells into lymphatic vessels, causing them to become thickened and inflamed. Common features include:

**- Etiopathogenesis:** It results from metastatic spread of cancer cells to lymphatic channels in the lung.

**- Common Causes:** Lung, breast, and stomach cancers are common primary sources.

**- Plain Film:** Chest X-rays may show linear or reticular opacities following the course of lymphatic channels, often associated with pleural effusions.

**- CT Features:** CT scans reveal thickened and enhanced lymphatic channels in a characteristic "tree-in-bud" appearance. Associated findings may include ground-glass opacities and consolidations.

Diagnosis typically requires a combination of clinical, radiological, and pathological findings.

**67. Plain Radiographic and CT Findings of Right Upper Lobe Pulmonary Collapse:**

Pulmonary collapse, also known as atelectasis, refers to the incomplete expansion or collapse of a lung or a lobe within the lung. Right upper lobe collapse can result from various causes, and imaging findings can differ depending on the underlying etiology. Common causes include bronchial obstruction, postoperative changes, or mass effect. Here are the imaging findings for right upper lobe pulmonary collapse:

**Plain Radiography:**

**1. Opacity:** The right upper lobe appears opaque on a chest X-ray.

**2. Mediastinal Shift:** There may be a shift of the mediastinum and trachea toward the collapsed lobe.

**3. Elevation of the Right Hemi-Diaphragm:** The right diaphragm may be elevated due to loss of lung volume.

**4. Fissure Signs:** Visualization of the horizontal fissure separating the right upper lobe from the middle lobe is often obscured.

**CT Findings:**

**1. Collapse Patterns:** CT can differentiate between complete and partial collapse and provide information on the extent of collapse.

**2. Volume Loss:** The collapsed lobe appears smaller in volume.

**3. Air Bronchograms:** In partial collapse, air may remain in the bronchi within the collapsed lobe, leading to air bronchograms.

**4. Atelectasis Sign:** The bronchus leading to the collapsed lobe may be seen as a linear or tubular structure, resembling a "comet tail" or "finger in glove" appearance.

**5. Adjacent Atelectasis:** The surrounding lung tissue may show compensatory hyperinflation.

The underlying cause should be determined through clinical history, additional imaging, and clinical evaluation. Treatment depends on addressing the causative factor.

**68. Role of CT and MRI in Staging of Lung Cancer:**

**- CT (Computed Tomography):** CT is the primary imaging modality for lung cancer staging. It provides detailed information about the primary tumor, lymph node involvement, and distant metastases. High-resolution CT (HRCT) is particularly useful for assessing tumor characteristics and determining resectability. CT findings can guide treatment decisions and prognosis assessment.

**- MRI (Magnetic Resonance Imaging):** MRI has a limited role in lung cancer staging but can be valuable for evaluating mediastinal invasion, assessing the extent of chest wall involvement, and detecting invasion into adjacent structures. It is especially useful for assessing cardiac and vascular involvement.

Combining CT and MRI with other imaging modalities like PET-CT enhances the accuracy of lung cancer staging, aiding in treatment planning and determining patient prognosis.

**69. Radiological Findings of Pulmonary Complications in Patients Infected with HIV:**

**Pulmonary complications in HIV-infected patients can encompass a range of conditions, including:**

**- Pneumocystis Pneumonia (PCP):** Imaging typically reveals bilateral ground-glass opacities, often with upper lobe predominance.

**- Tuberculosis:** Chest X-rays may show infiltrates, cavities, or lymphadenopathy. CT scans can provide detailed information.

**- Cryptococcosis:** Imaging may demonstrate pulmonary nodules or infiltrates.

**- Kaposi's Sarcoma:** Presents as multiple pulmonary nodules or masses.

**- Lymphoma:** Lymphomatous involvement may appear as pulmonary nodules or masses.

**- Bacterial Infections:** Radiographic findings vary but can include lobar consolidations or cavitary lesions.

**- Fungal Infections:** Imaging features depend on the specific fungus but can include nodules, cavities, or infiltrates.

**- HIV-Related Interstitial Lung Disease:** May show diffuse interstitial infiltrates on imaging.

Imaging plays a crucial role in diagnosing and monitoring these complications, guiding treatment and management decisions.

**70. Classify Diaphragmatic Hernias and Describe Radiological Means for Diagnosis:**

Diaphragmatic hernias occur when abdominal contents herniate through a defect in the diaphragm into the thoracic cavity. They can be classified as congenital or acquired. Radiological means for diagnosis include:

**Congenital Diaphragmatic Hernias:**

**1. Bochdalek Hernia:** Posterior-lateral hernia, typically on the left side, presenting with bowel loops or other abdominal organs in the thorax. Diagnosis is often made on prenatal ultrasound or postnatal chest X-ray.

**2. Morgagni Hernia:** Anterior hernia, usually on the right side, presenting with abdominal fat or liver in the thorax. Diagnosis is typically made on chest X-ray.

**Acquired Diaphragmatic Hernias:**

**1. Traumatic Hernia:** Usually due to trauma, such as motor vehicle accidents or blunt trauma to the chest or abdomen. CT scans are instrumental in identifying diaphragmatic tears and herniated organs.

**2. Hiatal Hernia:** Involves herniation of the stomach through the esophageal hiatus of the diaphragm. Diagnosis is often established with barium swallow studies or endoscopy.

**71. Enumerate Various Germ Cell Tumors of Mediastinum and Discuss Their Imaging Features:**

**Various germ cell tumors can occur in the mediastinum, including:**

**- Teratoma:** Often seen as heterogeneous masses with cystic and solid components on imaging.

**- Seminoma:** Typically appears as a homogeneous, well-defined mass.

**- Non-Seminomatous Germ Cell Tumors (NSGCT):** Comprise various subtypes, each with distinct imaging features. For example, yolk sac tumors may have calcifications, while choriocarcinomas can be hemorrhagic.

**- Mixed Germ Cell Tumors:** Contain elements of different germ cell tumor types, resulting in heterogeneous imaging appearances.

Imaging modalities like CT and MRI help in characterizing these mediastinal tumors, determining their extent, and guiding treatment planning. Biopsy and histological evaluation are often necessary for definitive diagnosis and classification.

**72. Causes of Acute Respiratory Distress Syndrome (ARDS) and Management of Aortic Dissection:**

**Causes of ARDS:**

ARDS is a severe respiratory condition characterized by acute onset of hypoxemia, bilateral pulmonary infiltrates, and non-cardiogenic pulmonary edema. Common causes include:

**1. Pneumonia:** Bacterial, viral, or fungal infections can trigger ARDS.

**2. Aspiration:** Inhalation of gastric contents or other irritants.

**3. Sepsis:** Systemic infection leading to a severe inflammatory response.

**4. Trauma:** Chest trauma, especially with lung contusions.

**5. Multiple Trauma:** Including head injuries, burns, and fractures.

**6. Pancreatitis:** Severe acute pancreatitis can lead to ARDS.

**7. Drug Overdose:** Especially with aspirin, opioids, or other toxic agents.

**8. Near Drowning:** Inhalation of water can cause ARDS.

**9. Transfusions:** Transfusion-related acute lung injury (TRALI).

**10. Others:** Pulmonary embolism, radiation injury, and more.

**Management of Aortic Dissection:**

Aortic dissection is a life-threatening condition in which there is a tear in the inner layer of the aorta, allowing blood to enter the aortic wall. Management involves both medical and surgical approaches:

**Medical Management:**

**1. Blood Pressure Control:** Aggressive control of blood pressure using antihypertensive medications like beta-blockers to reduce shear forces on the dissected aorta.

**2. Pain Management:** Control severe chest or back pain with analgesics.

**3. Heart Rate Control:** Beta-blockers may be used to control heart rate.

**4. Intravenous Medications:** Medications like nitroprusside or labetalol can be used to control blood pressure in hypertensive emergencies.

**Surgical Management:**

**1. Open Surgery:** Surgical repair involves replacing the damaged portion of the aorta with a synthetic graft. Indicated for acute Type A aortic dissections involving the ascending aorta.

**2. Endovascular Repair:** Thoracic endovascular aortic repair (TEVAR) involves placing a stent graft to exclude the dissected segment. Used for Type B dissections involving the descending thoracic aorta.

**3. Monitoring:** Close monitoring in the intensive care unit is crucial to assess blood pressure control and any potential complications.

Prompt diagnosis and intervention are critical for aortic dissection to prevent further complications, such as aortic rupture or organ ischemia.

**73. Etiopathogenesis, Imaging Features, and Differential Diagnosis of Silicosis:**

**Etiopathogenesis:**

Silicosis is a type of pneumoconiosis caused by inhalation of silica (crystalline silicon dioxide) dust. Silica particles deposit in the lungs, leading to inflammation and fibrosis over time. Key features include:

**- Silica Exposure:** Occupational exposure in industries like mining, construction, and sandblasting is the primary cause.

**- Chronic Inflammation:** Silica particles trigger chronic inflammation in the lung parenchyma.

**- Fibrosis:** Prolonged inflammation results in the formation of fibrotic nodules.

**Imaging Features:**

Imaging plays a vital role in diagnosing silicosis. Key findings on chest X-rays and CT scans include:

**- Small Nodules:** Multiple small (<10 mm) round or nodular opacities, often seen on chest X-ray.

**- Progressive Massive Fibrosis (PMF):** Large conglomerate masses of fibrosis, typically seen in advanced cases.

**- Eggshell Calcifications:** Calcified lymph nodes, known as "eggshell" calcifications, can be observed.

**- CT Findings:** High-resolution CT can provide a more detailed assessment, revealing nodules, PMF, and associated complications.

**Differential Diagnosis:**

**Differential diagnoses of silicosis include:**

**1. Other Pneumoconioses:** Asbestosis, coal worker's pneumoconiosis, or berylliosis.

**2. Sarcoidosis:** Can have similar nodular opacities but may show specific changes like hilar lymphadenopathy.

**3. Tuberculosis:** Tuberculous nodules may mimic silicosis nodules but often present with other features like cavitation.

**4. Metastatic Disease:** Some malignancies can present with multiple pulmonary nodules.

A comprehensive evaluation, including clinical history and occupational exposure, is essential for accurate diagnosis.

**74. Pulmonary Sequestration: Types, CT Findings, and Role of Angiography:**

**Pulmonary Seque stration:**

Pulmonary sequestration is a congenital malformation where a segment of lung tissue does not communicate with the bronchial tree and has an aberrant blood supply. There are two main types:

**1. Intralobar Sequestration:** The sequestered lung is within the normal lung, usually within the left lower lobe.

**2. Extralobar Sequestration:** The sequestered lung has its own pleura and is typically located outside the normal lung, often in the posterior mediastinum.

**CT Findings:**

CT imaging is crucial in identifying and characterizing pulmonary sequestration:

**- Vascular Supply:** CT can reveal the abnormal arterial blood supply to the sequestration.

**- Parenchymal Abnormalities:** The sequestered lung tissue may show consolidation, cystic changes, or infection.

**- Location:** CT helps differentiate between intralobar and extralobar sequestrations.

**Role of Angiography:**

Angiography, specifically selective angiography, is used to confirm the aberrant vascular supply to the sequestered lung tissue. This is essential for surgical planning and for differentiating sequestration from other vascular abnormalities.

Treatment usually involves surgical resection of the sequestered lung tissue, which helps prevent complications such as recurrent infections and hemorrhage.

**75. Causes of Unilateral Hyper-Translucency on Chest Radiograph and Findings in a 5-Year-Old Child:**

**Causes of Unilateral Hyper-Translucency:**

Unilateral hyper-translucency on a chest radiograph can be due to various conditions, including:

**1. Swyer-James Syndrome:** Also known as unilateral hyperlucent lung syndrome, often resulting from childhood infections, such as viral bronchiolitis.

**2. Bronchial Atresia:** A congenital condition where a bronchus fails to develop properly, leading to air trapping.

**3. Foreign Body Aspiration:** An inhaled foreign body can obstruct a bronchus, causing hyperinflation of the unaffected lung.

**4. Cystic Adenomatoid Malformation (CAM):** A congenital lung lesion, which can present as a unilateral hyperlucent area.

**5. Post-Infectious Bronchiolitis Obliterans:** Following severe viral bronchiolitis, the affected lung can become hyperlucent.

**Findings in a 5-Year-Old Child with Unilateral Hyper-Translucency:**

In a 5-year-old child with repeated chest infections and unilateral hyper-translucency on chest radiograph, additional imaging with CT may reveal:

**- Increased Lung Volume:** The affected lung may appear hyperinflated due to air trapping.

**- Bronchial Dilatation:** CT can show dilated bronchi in the affected lung.

**- Mucous Plugging:** Thickened bronchial walls and mucous plugging can be seen.

**- Collateral Airways:** Some conditions may lead to the development of collateral airways.

**- No Obvious Mass:** In the absence of a mass or other abnormalities, conditions like Swyer-James Syndrome or post-infectious changes may be considered.

Clinical correlation, including the patient's history and physical examination, is crucial in determining the specific etiology.

**76. Classification of Pleural Tumors and Findings of Malignant Mesothelioma:**

**Classification of Pleural Tumors:**

Pleural tumors can be classified into benign and malignant categories. Malignant pleural tumors include malignant mesothelioma and metastatic pleural malignancies.

**Findings of Malignant Mesothelioma:**

Malignant mesothelioma is a highly aggressive tumor arising from mesothelial cells lining the pleura. Imaging findings include:

**- Pleural Thickening:** Typically presents as diffuse pleural thickening, often involving both parietal and visceral pleura.

**- Pleural Effusion:** Effusion is common, with fluid accumulating within the thickened pleural space.

**- Loculated Effusions:** Malignant mesothelioma may lead to loculated effusions, appearing as multiple fluid collections.

**- Tumor Mass:** Rarely, a mass lesion may be seen invading into the lung or chest wall.

**- Calcifications:** Calcifications within the pleural thickening may occur, particularly in long-standing cases.

Chest radiography may show pleural thickening and effusion, while CT provides a more detailed evaluation of the extent and characteristics of the disease. Diagnosis often requires biopsy, which can be obtained through image-guided procedures.

**77. Diseases Caused by Inhalation of Inorganic Dust and Findings of Two Common Diseases:**

**Diseases Caused by Inorganic Dust:**

Inorganic dust inhalation can lead to conditions like pneumoconiosis, including silicosis and asbestosis.

**Findings in Silicosis:**

Silicosis results from exposure to crystalline silica dust. Imaging findings include:

**- Small Nodules:** Multiple small nodules (nodular opacities) on chest X-ray or CT, typically in the upper lung zones.

**- Progressive Massive Fibrosis (PMF):** In advanced cases, PMF may develop, with large conglomerate masses of fibrosis.

**- Eggshell Calcifications:** Calcified lymph nodes may appear as "eggshell" calcifications.

**Findings in Asbestosis:**

Asbestosis occurs due to inhalation of asbestos fibers. Imaging findings include:

**- Interstitial Fibrosis:** Irregular linear or reticular opacities on chest radiography, often at the lung bases.

**- Honeycombing:** Honeycomb-like cystic spaces on CT, representing end-stage fibrotic changes.

**- Pleural Plaques:** Calcified pleural plaques may be seen on imaging, often involving the parietal pleura.

**78. Presentation, Imaging Findings, and Role of Interventional Radiology in Pulmonary Arteriovenous Malformations (AVMs):**

**Presentation of Pulmonary AVMs:**

Pulmonary AVMs are abnormal connections between pulmonary arteries and veins, leading to right-to-left shunting of blood. They can present clinically with:

**- Dyspnea:** Due to decreased oxygenation of arterial blood.

**- Cyanosis:** Bluish discoloration of the skin or mucous membranes.

**- Stroke:** If emboli bypass the pulmonary filter and enter the systemic circulation.

**Imaging Findings:**

**- Chest Radiography:** May show abnormal vascular shadows or opacities.

**- CT Chest:** CT can reveal the AVM nidus, often characterized by a feeding artery and draining vein. It may also show parenchymal changes related to chronic hypoxia

.

**- Angiography:** The gold standard for diagnosis, it delineates the AVM anatomy, allowing for embolization.

**Role of Interventional Radiology:**

**- Embolization:** Interventional radiologists can perform embolization of the feeding artery to occlude the AVM, preventing further right-to-left shunting.

**- Follow-Up:** Interventional radiology plays a crucial role in post-embolization follow-up to assess the effectiveness of treatment and potential reperfusion.

Timely intervention is essential to prevent complications and improve the patient's quality of life.

**79. Algorithm for Managing Life-Threatening Hemoptysis and Role of Imaging:**

![Hemoptysis Algorithm](https://i.imgur.com/fxZNaz3.png)

**Step 1: Initial Assessment and Stabilization (2 marks):**

- Begin with a thorough clinical evaluation, including vital signs and a focused history.

- Initiate immediate life-saving measures, including securing the airway, administering supplemental oxygen, and establishing intravenous access.

**Step 2: Imaging Evaluation (2 marks):**

- Perform a bedside chest radiograph to assess for acute life-threatening causes, such as large airway lesions, mediastinal masses, or foreign body aspiration.

**Step 3: Urgent CT Angiography (CTA) (4 marks):**

- If the chest radiograph is inconclusive or suggests a vascular lesion, proceed to CT angiography (CTA) of the chest.

- Advanced CT technologies, such as dual-source CT and high-resolution CT (HRCT), can provide detailed information about the source and extent of bleeding.

**Step 4: Interventional Radiology (IR) Consultation (2 marks):**

- Based on CTA findings, consult interventional radiology for potential embolization or bronchial artery embolization (BAE) if a bleeding source is identified.

- IR plays a crucial role in identifying and managing the bleeding source through minimally invasive techniques.

**Role of Chest Radiograph (2 marks):**

- Chest radiograph provides a quick initial assessment of the patient's condition, ruling out emergencies like foreign body aspiration, large airway lesions, or massive pleural effusion.

- It is essential for triage and initial decision-making in the algorithm.

**Role of CT Scan (4 marks):**

- CT angiography (CTA) is the imaging modality of choice for evaluating the source and extent of hemoptysis.

- Newer advances in CT technology, such as dual-source CT and HRCT, offer improved spatial resolution, reduced scan times, and increased sensitivity in detecting vascular lesions.

- CTA helps identify the precise location and nature of the bleeding, aiding in treatment planning.

**Role of Interventional Radiology (2 marks):**

- Interventional radiology plays a pivotal role in the management of life-threatening hemoptysis.

- It offers the option of bronchial artery embolization (BAE) or other endovascular interventions to control bleeding without the need for surgery.

- IR procedures are minimally invasive and can be life-saving in cases of uncontrollable hemorrhage.

**80. Causes of Superior Vena Cava Syndrome (2 marks) and Imaging in Central Bronchogenic Carcinoma (8 marks):**

**Causes of Superior Vena Cava (SVC) Syndrome:**

Superior vena cava syndrome can result from various etiologies, including:

**1. Malignancies:** Most commonly, central bronchogenic carcinoma (lung cancer), lymphoma, or metastatic tumors compress the SVC.

**2. Non-Malignant Etiologies:** Benign causes, such as thrombosis, infections, or fibrosing mediastinitis, can also lead to SVC syndrome.

Imaging in Central Bronchogenic Carcinoma (8 marks):

Central bronchogenic carcinoma refers to lung cancer that arises within the central airways. Various imaging modalities play a role in its evaluation:

**1. Chest X-ray (2 marks):**

- Initial assessment often begins with a chest X-ray.

- Findings may include a hilar mass, atelectasis, or mediastinal widening.

**2. CT Chest (4 marks):**

- High-resolution CT (HRCT) is the primary imaging modality for characterizing bronchogenic carcinoma.

- HRCT provides detailed information on tumor size, location, invasion into adjacent structures, and lymph node involvement.

- Central bronchogenic carcinoma often presents as a mass obstructing the airway, leading to atelectasis or post-obstructive pneumonia.

- CT helps stage the tumor (TNM classification) and guide treatment decisions.

**3. PET-CT (2 marks):**

- Positron emission tomography combined with CT (PET-CT) is valuable for assessing the metabolic activity of the tumor.

- It aids in differentiating benign from malignant lesions and detecting distant metastases.

**81. HRCT Lung Findings in Interstitial Lung Disease (ILD) and Usual Interstitial Pneumonia (UIP) (6+4 marks):**

**HRCT Lung Findings in ILD (6 marks):**

HRCT is instrumental in assessing ILD and reveals various characteristic findings:

**- Ground-Glass Opacities:** Ill-defined areas of hazy increased lung attenuation.

**- Reticular Opacities:** Linear or curvilinear opacities forming a reticular pattern.

**- Honeycombing:** Clustered, small cystic spaces with thick walls resembling honeycombs.

**- Fibrosis:** Irregular linear opacities with architectural distortion.

**- Consolidation:** Homogeneous opacification of lung parenchyma.

HRCT Features of Usual Interstitial Pneumonia (UIP) (4 marks):

UIP is a specific subtype of ILD with characteristic HRCT findings:

**- Bilateral Subpleural Reticular Opacities:** Predominantly found in the lower lung zones.

**- Honeycombing:** A key feature of UIP, with clustered cystic spaces.

**- Peripheral and Basal Predominance:** Abnormalities are often peripheral and basal.

**- Traction Bronchiectasis:** Dilated airways due to fibrosis.

**82. Causes of Respiratory Distress in a Newborn (2 marks) and Imaging Findings in Congenital Lobar Emphysema and Pulmonary Sequestration (4+4 marks):**

Causes of Respiratory Distress in a Newborn (2 marks):

Respiratory distress in a newborn can result from various etiologies, including:

**1. Congenital Malformations:** Such as congenital lobar emphysema, pulmonary sequestration, diaphragmatic hernia, or choanal atresia.

**2. Infections:** Neonatal pneumonia or sepsis.

**3. Respiratory Distress Syndrome (RDS):** Due to prematurity.

Imaging Findings in Congenital Lobar Emphysema (4 marks):

Congenital lobar emphysema is characterized by overinflation of a single lobe of the lung. Imaging findings include:

**- Homogeneous Overinflation:** Affecting one lobe, often the left upper lobe.

**- Mediastinal Shift:** Towards the contralateral side.

**- Reduced Vascular Markings:** Decreased pulmonary vascular markings in the affected lobe on chest X-ray.

**- Hyperlucent Lung:** The affected lobe appears hyperlucent due to air trapping.

Imaging Findings in Pulmonary Sequestration (4 marks):

Pulmonary sequestration is a non-functioning lung tissue mass with an aberrant blood supply. Imaging findings include:

**- Cystic or Solid Mass:** Depending on whether the lesion is cystic or solid.

**- Aberrant Arterial Supply:** Seen on angiography, typically originating from

**systemic arteries.**

**- Mediastinal Location:** Often found in the posterior mediastinum in extralobar cases.

**- Association with Pleural Effusion:** May be seen in some cases due to compression of adjacent structures.

**83. Causes of Hemoptysis in an Adult Patient (2 marks) and Radiological Interventions (2+4+2 marks):**

Causes of Hemoptysis in an Adult (2 marks):

Hemoptysis in adults can be due to various underlying causes, including:

**1. Bronchitis:** Acute or chronic bronchitis can lead to hemoptysis.

**2. Bronchiectasis:** Dilated airways are susceptible to bleeding.

**3. Lung Cancer:** Malignant tumors may cause hemoptysis.

**4. Infections:** Tuberculosis or fungal infections can result in bleeding.

**5. Vascular Lesions:** Ruptured bronchial artery aneurysms or arteriovenous malformations.

**6. Coagulopathies:** Hemorrhagic disorders may cause bleeding.

Radiological Interventions (2+4+2 marks):

**- Indications (2 marks):**

- Radiological interventions are indicated in cases of severe or recurrent hemoptysis when conservative measures fail.

- These procedures aim to identify and control the bleeding source.

**- Techniques (4 marks):**

**- Bronchial Artery Embolization (BAE):** Interventional radiologists can perform BAE to occlude bleeding bronchial arteries, preventing further hemorrhage.

**- Angiography:** An initial angiographic study helps identify the bleeding source.

**- Embolization Materials:** Embolic agents like coils or particles are used to block the bleeding vessels.

**- Follow-Up:** Post-procedure imaging ensures successful embolization and identifies any potential complications.

**- Complications (2 marks):**

- Potential complications of radiological interventions include inadvertent embolization of non-target vessels, reperfusion, or post-embolization syndrome.

- Close monitoring and prompt intervention for complications are essential.

**84. Pulmonary Edema: Definition, Pathophysiology, Causes, and Radiographic Findings (1+2+3+4 marks):**

**Definition (1 mark):**

Pulmonary edema refers to the abnormal accumulation of fluid in the lung's airspaces and interstitial tissues, leading to impaired gas exchange and respiratory distress.

**Pathophysiology (2 marks):**

The pathophysiology of pulmonary edema involves an imbalance between fluid accumulation in the lung and its removal. It can be due to several mechanisms:

- Increased Capillary Pressure: Often caused by left-sided heart failure, it results in increased hydrostatic pressure, pushing fluid from capillaries into the interstitium.

- Increased Capillary Permeability: Seen in conditions like acute respiratory distress syndrome (ARDS) or pneumonia, where capillary walls become leaky, allowing protein-rich fluid to enter the interstitium.

**- Decreased Oncotic Pressure:** Occurs in conditions like hypoalbuminemia, where the decreased blood protein concentration leads to reduced osmotic pressure, favoring fluid leakage.

**- Lymphatic Obstruction:** Impaired lymphatic drainage can prevent the removal of interstitial fluid.

**Causes of Pulmonary Edema (3 marks):**

Various conditions can lead to pulmonary edema, including:

**1. Heart Failure:** Left ventricular failure, whether due to ischemic heart disease or other causes, is a common cause.

**2. ARDS:** Acute respiratory distress syndrome often follows injury to the lung tissue, causing increased permeability.

**3. Pneumonia:** Severe lung infections can lead to capillary leakage and edema.

**4. Kidney Disease:** Renal failure can result in fluid overload and pulmonary edema.

**5. Toxic Inhalation:** Exposure to toxic gases or chemicals may damage the lung and cause edema.

**Radiographic Findings in Pulmonary Edema (4 marks):**

On a plain radiograph, pulmonary edema typically presents with the following findings:

**1. Cardiomegaly:** Enlargement of the cardiac silhouette due to left ventricular hypertrophy or dilation.

**2. Kerley B Lines:** Thin, linear opacities extending to the lung periphery, representing interstitial edema.

**3. Peribronchial Cuffing**: Thickening of the bronchial walls due to peribronchial edema.

**4. Alveolar Filling Patterns:** Alveolar edema may appear as diffuse opacities, often referred to as "bat-wing" or "butterfly" opacities.

In severe cases, "whiteout" of lung fields due to widespread opacification can occur. Advanced imaging techniques like CT may provide more detailed information about the extent and characteristics of pulmonary edema.

**85. Imaging Findings of Bronchial Carcinoid, BOOP, and McLeod's Syndrome:**

**a) Bronchial Carcinoid:**

Bronchial carcinoid tumors are typically well-differentiated neuroendocrine tumors. Imaging findings may include:

**- Central Location:** Often found in the central airways.

**- Smooth Margins:** Well-defined, round or ovoid shape with smooth margins.

**- Calcifications:** May contain punctate calcifications.

**- Enhancement:** Contrast-enhancement on CT.

**- Obstructive Atelectasis:** Tumor can cause obstructive atelectasis in the adjacent lung.

**b) BOOP (Bronchiolitis Obliterans with Organizing Pneumonia):**

**BOOP is an inflammatory lung condition. Imaging findings include:**

**- Peripheral Infiltrates:** Typically seen in the subpleural and peripheral lung regions.

**- Patchy Opacities:** Radiographic and CT findings show patchy consolidations with ground-glass opacities.

**- Subpleural Distribution:** Often involves the subpleural areas.

**- Reversible:** It may show complete resolution with appropriate treatment.

c) McLeod's Syndrome:

McLeod's syndrome is a rare genetic disorder affecting the blood and neuromuscular system. Imaging findings would not be specific to this syndrome but may show:

**- Neurological Abnormalities:** Imaging, such as MRI of the brain, may reveal neurological abnormalities associated with the syndrome.

**- Muscle Changes:** Muscle imaging studies could show changes if neuromuscular involvement is present.

**86. Sarcoidosis: Definition, Stages, and Radiological Manifestations (2+2+6 marks):**

**Definition (2 marks):**

Sarcoidosis is a multisystem granulomatous disorder of unknown cause characterized by the formation of non-caseating granulomas in various organs, most commonly affecting the lungs.

**Stages (2 marks):**

Sarcoidosis can progress through various stages:

1. Stage I: Presence of hilar lymphadenopathy without lung parenchymal involvement.

2. Stage II: In addition to hilar lymphadenopathy, there

is lung parenchymal involvement.

3. Stage III: Parenchymal involvement without hilar lymphadenopathy.

4. Stage IV: Advanced fibrotic changes with lung parenchymal scarring.

**Radiological Manifestations (6 marks):**

**Radiological findings in thoracic sarcoidosis may include:**

**- Bilateral Hilar Lymphadenopathy (Hilar Adenopathy):** Enlarged lymph nodes at the lung hilum, a hallmark of stage I sarcoidosis.

**- Pulmonary Infiltrates:** In stage II, there can be parenchymal opacities, often in a perilymphatic distribution.

**- Reticular or Nodular Opacities:** In advanced stages, reticular opacities, and nodules may develop.

**- Honeycombing:** Seen in some cases with advanced fibrotic changes (stage IV).

**- Pleural Disease:** Pleural effusions or thickening may occur, albeit less frequently.

**- Cavitation:** Rarely, cavities may form within granulomas, mimicking other diseases like tuberculosis.

**87. Extramedullary Hematopoiesis (EMH): Definition, Causes, and Imaging Findings (2+2+3+3 marks):**

**Definition (2 marks):**

Extramedullary hematopoiesis (EMH) is a compensatory process where blood cell production occurs outside the bone marrow, usually in response to bone marrow failure or chronic anemia.

**Causes (2 marks):**

EMH can be caused by conditions such as:

**1. Myeloproliferative Disorders:** Like myelofibrosis.

**2. Hemolytic Anemias:** Conditions that increase the destruction of red blood cells.

**3. Hematological Malignancies:** Infiltration of bone marrow by malignant cells.

**Imaging Findings (3+3 marks):**

Imaging, such as plain film and cross-sectional studies, can reveal EMH-related findings:

**- Plain Film (X-ray):** May show radiopaque masses with a "doughnut" or "target" appearance due to central necrosis and peripheral active hematopoiesis.

**- CT Scan:** Provides better delineation of EMH lesions, which appear as soft tissue masses with central low attenuation.

**- MRI:** Can characterize the lesions further, showing different signal intensities corresponding to the various stages of hematopoiesis.

Localized EMH lesions can occur in various extramedullary sites, including the liver, spleen, lymph nodes, and paraspinal regions. These findings are indicative of the underlying hematological disorder.

**88. Pathophysiology of Pulmonary Embolism and Imaging Modalities (4+4+1+1 marks):**

**Pathophysiology (4 marks):**

Pulmonary embolism (PE) occurs when a blood clot, typically from deep vein thrombosis (DVT), travels to the pulmonary arteries. The pathophysiology involves:

**- Clot Formation:** Formation of a thrombus (clot) within a deep vein, often in the lower extremities.

**- Embolization:** Dislodgment of the thrombus, which then travels through the venous system to the pulmonary arteries.

**- Vascular Obstruction:** The embolus obstructs pulmonary blood flow, leading to increased pulmonary vascular resistance and decreased oxygenation.

**Imaging Modalities (4 marks):**

**Imaging plays a crucial role in diagnosing PE:**

**- CT Pulmonary Angiography (CTPA):** The primary imaging modality for diagnosing PE. It provides high-resolution images of the pulmonary arteries, showing filling defects caused by emboli.

**- Ventilation-Perfusion (V/Q) Scan:** Used when CTPA is contraindicated or inconclusive. It assesses lung ventilation and perfusion and can identify mismatched defects.

**- Chest X-ray (1 mark):** Often the initial imaging study, which may be normal or show non-specific findings such as atelectasis, pleural effusion, or Hampton's hump (a peripheral opacity).

**- MRI (1 mark):** Can be used in select cases but is less common than CTPA for PE diagnosis.

**89. Differentiating a Mediastinal Mass from an Intrapulmonary Mass, Localization, and Differential Diagnosis of Anterior Mediastinal Lesions (2+3+5 marks):**

Differentiating a Mediastinal Mass from an Intrapulmonary Mass (2 marks):

- On imaging, a mediastinal mass is typically located within the mediastinum, which can be seen as a central structure on imaging studies.

- In contrast, an intrapulmonary mass arises from the lung parenchyma and will be surrounded by lung tissue.

Localizing the Compartment of a Mediastinal Lesion (3 marks):

Mediastinal lesions can be categorized based on their location within the mediastinum:

**1. Anterior Compartment:** Lies in the anterior mediastinum, anterior to the heart and great vessels.

**2. Middle Compartment:** Located between the anterior and posterior compartments.

**3. Posterior Compartment:** Found in the posterior mediastinum, posterior to the heart.

Differential Diagnosis of Anterior Mediastinal Lesions (5 marks):

Common lesions in the anterior mediastinum include:

**- Thymoma:** A benign or malignant tumor of the thymus.

**- Teratoma:** A germ cell tumor that can contain various tissue types.

**- Lymphoma:** A lymphatic malignancy.

**- Thyroid Lesions:** Ectopic thyroid tissue or thyroid neoplasms.

**- Lymph Node Enlargement:** Reactive or metastatic lymphadenopathy.

Each of these lesions can have characteristic imaging features, such as thymic epithelial tumors appearing as well-defined masses in the thymus, teratomas containing fat and calcifications, lymphomas showing homogeneous enhancement,

and thyroid lesions demonstrating features consistent with thyroid tissue. A thorough clinical evaluation and additional imaging studies, such as CT or MRI, are often needed for a definitive diagnosis.

**90. Evaluation of a Patient with Hemoptysis and a Cavitating Pulmonary Mass (8+2 marks):**

A 65-year-old chronic smoker presenting with hemoptysis and a cavitating intrapulmonary mass with spiculated margins in the left upper zone on chest radiograph requires a comprehensive evaluation to determine the extent of disease and operability. Here's how I would approach this case:

**Further Evaluation (8 marks):**

**1. Clinical Assessment:** Begin with a thorough clinical evaluation, including the patient's history, smoking history, associated symptoms, and physical examination.

**2. Chest CT Scan:** Perform a contrast-enhanced chest CT scan, which is the gold standard for evaluating intrathoracic lesions. CT provides detailed information about the size, location, extent, and characteristics of the lesion.

**3. Bronchoscopy:** Consider a bronchoscopy to evaluate the airway and assess for endobronchial lesions or bleeding sources. It can help determine if the lesion is operable.

**4. PET-CT (if indicated):** In some cases, a PET-CT scan may be performed to assess the metabolic activity of the lesion, detect distant metastases, and assist in staging.

**5. Histopathological Evaluation:** A biopsy, either transthoracic needle biopsy or bronchoscopic biopsy, is crucial to establish a histopathological diagnosis. This helps differentiate between benign and malignant lesions.

**Determining Operability (2 marks):**

**To decide if the lesion is operable, the following signs and considerations would be crucial:**

**1. Extent of Disease:** Evaluate the extent of local invasion and presence of lymph node involvement on CT and PET-CT.

**2. Histopathology:** Review the biopsy results to confirm the nature of the lesion (benign or malignant). Malignant lesions may be considered for surgery, depending on staging.

**3. Performance Status:** Assess the patient's overall health, comorbidities, and functional status. Patients should be able to tolerate surgery.

**4. Absence of Distant Metastases:** Ensure that there are no distant metastases detected on imaging studies.

**5. Resectability:** Assess whether surgical resection is feasible based on the tumor location, size, and involvement of critical structures.

Ultimately, the decision for surgery would involve a multidisciplinary approach, including input from pulmonologists, oncologists, and thoracic surgeons. Operability would depend on factors such as tumor staging, patient suitability for surgery, and potential for curative resection.

**91. Changes in Chest Radiograph in Collapse of Different Lobes in Both Lungs (10 marks):**

The radiographic appearance of lobar collapse in both lungs can vary depending on the lobe affected and the underlying cause. Here are the typical changes seen on a chest radiograph for collapse of different lobes:

**1. Right Upper Lobe (RUL) Collapse:**

- On the affected side, the superior mediastinal border becomes elevated (opacified), giving the appearance of a raised horizontal fissure.

- The minor fissure, separating the RUL from the right middle lobe, may also become more prominent.

- The RUL itself may appear smaller and airless.

**2. Right Middle Lobe (RML) Collapse:**

- On the affected side, the right heart border may become more sharply defined and elevated.

- The minor fissure may be displaced superiorly.

- The RML collapses centrally and may appear triangular or wedge-shaped.

**3. Right Lower Lobe (RLL) Collapse:**

- The affected side may show loss of volume in the lower lung field.

- The horizontal fissure becomes more horizontal due to the lower lobe's collapse.

- The right hemidiaphragm may appear elevated.

- The right heart border may shift toward the affected side.

**4. Left Upper Lobe (LUL) Collapse:**

- On the affected side, the aortic arch and descending aorta may be more visible.

- The left heart border may shift toward the affected side.

- The LUL itself collapses centrally and may appear as a triangular opacity.

**5. Left Lower Lobe (LLL) Collapse:**

- The affected side may show opacification and loss of volume in the lower lung field.

- The left hemidiaphragm may appear elevated.

- The left heart border and aortic arch may become more prominent on the affected side.

The appearance of these changes on a chest radiograph can provide clues about the lobe involved and the underlying cause of collapse, which may include obstructive etiologies (e.g., tumor, foreign body, mucus plugging) or non-obstructive causes (e.g., atelectasis due to surfactant deficiency). Further evaluation with CT imaging and clinical correlation is often necessary for a definitive diagnosis.

**92. Radiological Findings in Sequestration of Lung and Pulmonary Hypertrophic Osteoarthropathy (5+5 marks):**

**a) Sequestration of Lung (5 marks):**

**- Definition:** Pulmonary sequestration is a rare congenital anomaly characterized by a non-functioning lung tissue mass that lacks communication with the tracheobronchial tree and receives its blood supply from systemic arteries.

**- Imaging Findings:** On imaging studies (CT or MRI), sequestration may present as:

- A well-defined soft tissue mass, often located in the lower lobes of the lung.

- Aberrant systemic arteries supplying the lesion, typically arising from the descending aorta.

- Absence of bronchial communication with the normal airway.

- Adjacent lung atelectasis or consolidation due to non-functional lung tissue.

**b) Pulmonary Hypertrophic Osteoarthropathy (5 marks):**

**- Definition:** Pulmonary hypertrophic osteoarthropathy is a paraneoplastic syndrome characterized by clubbing of the fingers and toes, joint pain, and periostitis. It is often associated with underlying lung malignancies.

**- Imaging Findings:** Radiological findings may include:

- Soft tissue swelling around the periosteal regions, especially affecting the long bones, and is visible on radiographs.

- "Laminated" or "onion skin" periosteal reaction, particularly in the diaphyses of long bones.

- Joint effusions or synovial hypertrophy.

- Enlargement and obliteration of the vascular markings in the fingers and toes on plain radiographs due to clubbing.

These imaging findings in pulmonary hypertrophic osteoarthropathy should prompt further investigation for an underlying lung malignancy, which is often the primary cause.

**93. Solitary Pulmonary Nodule (SPN): Definition, Causes, and Radiological Workup (1+2+7 marks):**

**Definition (1 mark):**

A solitary pulmonary nodule (SPN) is a discrete, well-circumscribed, and rounded lesion that measures less than 3 centimeters in diameter and is completely surrounded by lung parenchyma, without associated atelectasis, pneumonia, or lymphadenopathy.

**Causes (2 marks):**

SPNs can have various underlying causes, including:

**1. Benign Lesions:** Non-cancerous causes like granulomas (tuberculoma, histoplasmosis), hamartomas, or infectious nodules.

**2. Malignant Lesions:** Lung cancer, including adenocarcinoma, squamous cell carcinoma, small cell carcinoma, and metastases from extrapulmonary malignancies.

**3. Inflammatory Lesions:** Infections such as fungal infections, bacterial abscesses, or inflammatory pseudotumors.

**4. Vascular Lesions:** Pulmonary infarcts or arteriovenous malformations.

**5. Rheumatologic Diseases:** Rheumatoid nodules in patients with rheumatoid arthritis.

**Radiological Workup of Solitary Pulmonary Nodule (7 marks):**

When encountering an SPN on imaging, a systematic radiological workup is essential to differentiate between benign and malignant nodules:

**1. Characteristics on Imaging:**

- Size: Measure the nodule's size. Nodules smaller than 6 mm are less likely to be malignant, while those larger than 8 mm are more concerning.

- Density: Evaluate nodule density on CT. Ground-glass opacities or partially solid nodules are more likely to be malignant.

- Growth Rate: Assess nodule stability or growth over time with serial imaging. Rapid growth is suspicious for malignancy.

**2. Clinical History:**

- Gather the patient's clinical history, including risk factors for lung cancer (smoking history, occupational exposures) and any relevant symptoms (e.g., cough, weight loss).

**3. Calcifications:**

**- Pattern of Calcification:** Benign nodules often exhibit benign patterns of calcification, such as popcorn (central), diffuse, or eccentric calcifications. Malignant nodules tend to have punctate or stippled calcifications.

**- Lack of Calcification:** Non-calcified or predominantly non-calcified nodules are more concerning for malignancy.

**4. Margins and Shape:**

**- Spiculated or Irregular Margins:** These are more commonly associated with malignancy.

**- Smooth, Well-Circumscribed Margins:** Suggestive of a benign nodule.

**5. Dual-Energy CT (if available):**

- Dual-energy CT can help characterize nodule composition, which can aid in differentiation.

- Malignant nodules may exhibit higher iodine content.

**6. Positron Emission Tomography (PET) Scan:**

- PET can assess nodule metabolic activity. Malignant nodules often demonstrate increased uptake.

- False negatives can occur with small nodules or low-grade malignancies.

**7. Biopsy or Follow-Up:**

- If the risk of malignancy is high based on imaging features, consider biopsy (e.g., CT-guided needle biopsy) for histological diagnosis.

- For indeterminate nodules, serial imaging at intervals can help determine stability or growth.

It's essential to approach SPNs with a multidisciplinary team, including radiologists, pulmonologists, and oncologists, to determine the most appropriate management, which may include further imaging, biopsy, or surgical resection based on the likelihood of malignancy.

**94. A 30-yr-old female patient presented with h/o cough and one episode of hemoptysis. Her chest radiograph showed a cavitatory lesion measuring 3 cm in left mid zone. Enumerate the possible causes. How will you proceed with radiological evaluation in this case? [2+8 June 14]**

**Possible Causes:**

**1. Pulmonary Tuberculosis (TB):** TB is a common cause of cavitary lung lesions, especially in endemic regions. It often presents with cough and hemoptysis.

**2. Bacterial Pneumonia:** Certain bacterial infections, such as Staphylococcus aureus or Klebsiella pneumoniae, can lead to the formation of lung abscesses with cavitations.

**3. Fungal Infections:** Invasive fungal infections like aspergillosis or histoplasmosis may produce cavitary lesions in the lungs.

**4. Lung Cancer:** Particularly squamous cell carcinoma and adenocarcinoma, can present with cavitary lesions, albeit less commonly.

**5. Vasculitis:** Conditions like Wegener's granulomatosis can cause cavitary lung lesions due to granulomatous inflammation and tissue necrosis.

**6. Lung Abscess:** Non-infectious causes such as ischemic infarction or necrotic tumor can result in cavities within the lung.

**7. Cystic Bronchiectasis:** Chronic inflammation in the bronchial tubes can lead to the formation of cystic spaces.

**8. Necrotizing Pneumonia:** A severe form of bacterial pneumonia with necrosis of lung tissue can result in cavities.

**Radiological Evaluation:**

The radiological evaluation of this patient should be comprehensive and include the following steps:

**1. High-Resolution Computed Tomography (HRCT) of the Chest:** HRCT is essential for a detailed assessment of the cavitary lesion. It provides information about the size, location, and characteristics of the cavity, such as thickness of the cavity wall, the presence of air-fluid levels, and surrounding lung parenchyma. This can help differentiate between infectious and non-infectious causes.

**2. Sputum Analysis:** Collecting and analyzing sputum for acid-fast bacilli (AFB) and culture is crucial to rule out pulmonary TB. Other microbiological tests, such as bacterial cultures or fungal smears, may be indicated based on clinical suspicion.

**3. Bronchoscopy:** In cases where the diagnosis remains uncertain, a bronchoscopy can be performed to obtain samples from the lesion for histopathological examination and to rule out endobronchial lesions.

**4. Positron Emission Tomography (PET) Scan:** If malignancy is suspected, a PET scan may be considered to assess the metabolic activity of the lesion and detect distant metastases.

**5. Biopsy:** A percutaneous needle biopsy or surgical lung biopsy may be necessary if other investigations do not yield a definitive diagnosis, especially in cases of suspected malignancy or atypical infections.

**6. Follow-Up Imaging:** Serial chest radiographs or CT scans may be required to monitor the progress of treatment and assess resolution or progression of the lesion.

In summary, the approach to evaluating a cavitatory lung lesion involves a systematic assessment combining clinical history, radiological imaging (especially HRCT), microbiological testing, and, if necessary, invasive procedures such as bronchoscopy or biopsy. The specific diagnostic approach should be tailored to the individual patient's clinical presentation and risk factors.

**95. Name the anatomical structures which contribute to the hilar shadow seen on a frontal chest radiograph. Enumerate the causes of unilateral large hilum in a 50 yr old male. Describe the imaging findings in any 2 pathological causes. [2+2+3+3 June 14]**

**The hilar shadow on a frontal chest radiograph is primarily formed by anatomical structures in the region of the pulmonary hilum. These structures include:**

**1. Main Pulmonary Artery:** This large vessel carries deoxygenated blood from the right ventricle of the heart to the lungs for oxygenation. It typically forms the lower portion of the hilar shadow.

**2. Pulmonary Veins:** Pulmonary veins, which carry oxygenated blood from the lungs back to the left atrium of the heart, contribute to the hilar shadow. They are typically seen as thinner structures compared to the main pulmonary artery.

**3. Bronchi:** The bronchi, which are the airways leading into the lungs, also contribute to the hilar shadow. They appear as branching structures extending from the central hilum.

**Causes of Unilateral Large Hilum in a 50-year-old Male:**

**1. Enlarged Lymph Nodes:** Lymphadenopathy is a common cause of a unilateral large hilum. It can result from various conditions such as infection (e.g., tuberculosis or fungal infections), malignancy (e.g., lung cancer or lymphoma), or inflammatory diseases (e.g., sarcoidosis).

**2. Pulmonary Artery Aneurysm:** An aneurysm of the pulmonary artery can lead to an enlargement of the hilar shadow, especially on the side where the aneurysm is located.

**Imaging Findings in Two Pathological Causes:**

**Enlarged Lymph Nodes (e.g., due to Tuberculosis):**

**- Radiographic Appearance:** On a chest radiograph, there may be an increase in the size and density of hilar lymph nodes, causing an enlargement of the hilar shadow unilaterally.

**- CT Findings:** CT scans can provide a more detailed evaluation, showing round or oval-shaped lymph nodes with central necrosis (caseating granulomas) and calcifications in the case of tuberculosis.

**Pulmonary Artery Aneurysm:**

**- Radiographic Appearance:** On a chest radiograph, a unilateral hilar enlargement may be seen, often with a rounded or bulging contour at the hilum.

**- CT Findings:** CT angiography can demonstrate the dilated pulmonary artery segment, confirming the presence of an aneurysm. It may also reveal compression of adjacent structures by the aneurysm.

**96. A 20-yr-old female with history of fever showed an anterior mediastinal and right hilar mass on chest radiograph. Enumerate the causes. Discuss the radiological finding which shall help you in formulating your differential diagnosis. Describe in brief features which are useful in differentiating Hodgkin‘s disease and non-Hodgkin‘s lymphoma. [2+6+2 June 14]**

**Causes of an anterior mediastinal and right hilar mass in a 20-year-old female could include:**

**1. Lymphoma:** Both Hodgkin's and non-Hodgkin's lymphoma can present as mediastinal masses.

**2. Thymoma:** A tumor originating from the thymus gland.

**3. Germ Cell Tumor:** Such as a teratoma.

**4. Sarcoidosis:** Can cause lymphadenopathy in the mediastinum.

**Radiological Finding for Formulating a Differential Diagnosis:**

- The radiological finding that can help in formulating a differential diagnosis is the pattern of contrast enhancement on a contrast-enhanced CT scan. Different tumors and pathologies have characteristic enhancement patterns (e.g., homogeneous enhancement in thymomas, heterogeneous enhancement in lymphomas).

**Distinguishing Features between Hodgkin's Disease and Non-Hodgkin's Lymphoma:**

**Hodgkin's Disease:**

- Characterized by the presence of Reed-Sternberg cells.

- Typically has contiguous spread, involving lymph nodes in a predictable manner.

- Often presents with localized mediastinal lymphadenopathy.

- Bimodal age distribution with a peak in young adulthood and another in late adulthood.

**Non-Hodgkin's Lymphoma:**

- Comprises a diverse group of lymphoproliferative disorders.

- Can involve lymph nodes in a non-contiguous, skip pattern.

- May not involve the mediastinum as frequently as Hodgkin's disease.

- No Reed-Sternberg cells are present.

In summary, the radiological evaluation of an anterior mediastinal and right hilar mass should include a contrast-enhanced CT scan to assess the enhancement pattern. Differential diagnosis should consider various tumors and conditions, with specific features aiding in distinguishing between Hodgkin's disease and non-Hodgkin's lymphoma.

**97. Describe the radiological anatomy of diaphragm. Enumerate various types of diaphragmatic hernias. Discuss the imaging findings in any two hernias which can be seen in a 40 yr old patient. [3+1+3+3 June 14]**

**Radiological Anatomy of Diaphragm:**

The diaphragm is a dome-shaped, musculotendinous structure that separates the thoracic and abdominal cavities. It plays a crucial role in respiration. The radiological anatomy of the diaphragm can be described as follows:

**1. Central Tendon:** The diaphragm's central portion is a strong, avascular, tendinous structure known as the central tendon. On radiographs, this appears as a radiopaque curvilinear line, forming the highest point of the diaphragm's dome.

**2. Muscular Diaphragm:** The diaphragm's periphery consists of muscular fibers that originate from the xiphoid process, lower ribs, and vertebral bodies. These muscles converge toward the central tendon, forming the diaphragmatic dome. On radiographs, the muscular diaphragm is not as radiopaque as the central tendon and may appear relatively lucent.

**3. Openings:** The diaphragm has several natural openings for structures to pass between the thoracic and abdominal cavities. These include the aortic hiatus (for the aorta), esophageal hiatus (for the esophagus), and the caval opening (for the inferior vena cava).

**Types of Diaphragmatic Hernias:**

Diaphragmatic hernias are abnormal openings or defects in the diaphragm through which abdominal organs can herniate into the thoracic cavity. Various types of diaphragmatic hernias include:

**1. Congenital Diaphragmatic Hernia (CDH):** This type is typically seen in infants and results from a failure in the diaphragm's formation during fetal development. Organs such as the stomach or intestines herniate into the chest.

**2. Hiatal Hernia:** Hiatal hernias involve the protrusion of the stomach into the thoracic cavity through the esophageal hiatus. It can be classified as sliding or paraesophageal, depending on the position of the gastroesophageal junction.

**3. Traumatic Diaphragmatic Hernia:** This results from trauma or injury to the diaphragm, often due to blunt or penetrating trauma. Herniation of abdominal organs into the chest can occur.

**Imaging Findings in Two Diaphragmatic Hernias in a 40-Year-Old Patient:**

**Hiatal Hernia:**

**- Radiographic Findings:** On a chest radiograph, a hiatal hernia may appear as a curvilinear or round opacity in the region of the lower thoracic esophagus. A barium swallow study may show the herniated stomach in the thoracic cavity.

**Traumatic Diaphragmatic Hernia:**

**- Radiographic Findings:** Traumatic hernias may be challenging to diagnose on radiographs alone. Suspicion arises when there is a history of trauma, and findings may include an elevated hemidiaphragm or visceral air-fluid levels in the thorax. Confirmation typically requires CT or fluoroscopy.

**98. Enumerate causes of cystic mediastinal lesions. Describe imaging features of any 2 conditions. [2+4+4 Dec 14]**

**Causes of Cystic Mediastinal Lesions:**

**Cystic mediastinal lesions can have various etiologies, including:**

1. Bronchogenic Cysts: Arise from remnants of the primitive foregut and contain bronchial elements.

2. Pericardial Cysts: Result from an abnormality during pericardial development.

3. Thymic Cysts: Develop from remnants of thymic tissue.

4. Neurogenic Cysts: Arise from neural elements.

5. Lymphangiomas: Comprise lymphatic tissue and cystic spaces.

6. Teratomas: Germ cell tumors with cystic components.

**Imaging Features of Two Conditions:**

**Bronchogenic Cysts:**

**- Radiographic Appearance:** On chest radiographs, bronchogenic cysts appear as well-defined, round or oval, lucent lesions in the mediastinum. They do not usually enhance with contrast on CT scans.

**- CT Imaging:** CT can provide detailed characterization, showing a fluid-filled cyst with thin walls and no enhancement. MRI can demonstrate high fluid signal intensity.

**Pericardial Cysts:**

**- Radiographic Appearance:** Pericardial cysts typically appear as well-defined, round or oval, lucent lesions in the cardiophrenic angle on chest radiographs.

**- CT Imaging:** On CT, these cysts are seen as fluid-filled structures with thin, smooth walls that do not enhance with contrast. They may have a "water-density" appearance.

**99. a) Castleman‘s disease b) Role of Dual energy CT in pulmonary embolism. [5+5 Dec 14]**

**a) Castleman's Disease:**

Castleman's disease is a rare lymphoproliferative disorder characterized by the abnormal growth of lymphoid tissue. It can occur in various locations, including the mediastinum. Radiologically, it may present as a well-defined mediastinal mass on imaging studies, often with lymph node enlargement.

**b) Role of Dual Energy CT in Pulmonary Embolism:**

Dual Energy CT (DECT) is a valuable tool in evaluating pulmonary embolism (PE). It helps differentiate between clot material and other vascular or non-vascular structures in the pulmonary arteries. DECT can provide information on clot composition (e.g., fresh thrombus vs. chronic thrombus) and assess the degree of perfusion defects in the lungs, aiding in the diagnosis and characterization of PE.

**100. Enumerate causes of solitary pulmonary nodules. Discuss the role of various newer imaging techniques in assessment of these lesions. [2+8 Dec 14]**

**Causes of Solitary Pulmonary Nodules:**

Causes of solitary pulmonary nodules include benign and malignant conditions, such as granulomas, infections, primary lung cancer, metastases, and benign neoplasms.

**Role of Various Newer Imaging Techniques:**

Several advanced imaging techniques play a crucial role in the assessment of solitary pulmonary nodules:

**1. Positron Emission Tomography (PET) Scan:** PET scans can help differentiate between benign and malignant nodules by assessing their metabolic activity. Malignant nodules typically exhibit increased metabolic activity.

**2. CT Perfusion Imaging:** This technique provides information on tissue perfusion and can help distinguish between benign and malignant nodules based on differences in blood flow.

**3. Magnetic Resonance Imaging (MRI):** MRI can provide detailed soft tissue characterization of pulmonary nodules, helping in the assessment of their vascularity and morphology.

**4. Artificial Intelligence (AI):** AI algorithms can assist in the characterization of solitary pulmonary nodules by analyzing various imaging features and providing predictive models for malignancy.

In summary, newer imaging techniques, such as PET scans, CT perfusion imaging, MRI, and AI, have improved our ability to evaluate solitary pulmonary nodules, aiding in their diagnosis and management.

**101. Discuss various chest complications in a post-operative patient. Describe in detail imaging features in any two conditions. [4+3+3 Dec 14]**

**Chest Complications in a Post-Operative Patient:**

**Post-operative patients can experience various chest complications, which may include:**

**1. Atelectasis:** Partial or complete collapse of a lung or a portion of it due to mucus plugging, decreased lung expansion, or compression.

**2. Pneumonia:** Infection of the lung tissue, often due to impaired cough reflex or intubation-related factors.

**3. Pleural Effusion:** Accumulation of fluid in the pleural cavity, often due to surgical trauma or inflammation.

**4. Pneumothorax:** Air accumulation in the pleural space, which can result from barotrauma, chest tube insertion, or underlying lung disease.

**5. Hemothorax:** Accumulation of blood in the pleural space, typically due to vascular injury during surgery.

**Imaging Features in Two Conditions:**

**Atelectasis:**

**- Imaging Features:** Chest X-ray or CT may show volume loss in the affected lung or lobe, with increased opacity (consolidation) and mediastinal shift toward the atelectatic side. Air bronchograms may be visible within the collapsed lung.

**Pleural Effusion:**

**- Imaging Features:** Chest X-ray or CT can reveal a meniscus sign, which is a curved line representing the fluid level in the pleural cavity. On lateral views, a blunting of the costophrenic angle is often observed. Ultrasound can provide real-time visualization and guide fluid aspiration.

**102. A 55 yr male patient presents with left opaque hemithorax. Enumerate the likely causes and discuss the imaging features in two common conditions. [2+4+4 Dec 14]**

**Causes of Left Opaque Hemithorax in a 55-Year-Old Male:**

**Various conditions can result in a left opaque hemithorax, including:**

**1. Pleural Effusion**: Accumulation of fluid in the left pleural cavity.

**2. Pneumonia:** Infection causing consolidation of the left lung.

**3. Lung Mass or Tumor:** Such as lung cancer.

**4. Atelectasis:** Partial or complete collapse of the left lung.

**5. Hemothorax:** Accumulation of blood in the left pleural space.

**Imaging Features in Two Common Conditions:**

**Pleural Effusion:**

**- Imaging Features:** Chest X-ray or CT may show a complete or partial opacification of the left hemithorax with a meniscus-shaped fluid level. On lateral views, the costophrenic angle will appear blunted. Ultrasound can visualize the effusion and guide diagnostic and therapeutic procedures.

**Lung Mass or Tumor (e.g., Lung Cancer):**

**- Imaging Features:** Chest X-ray or CT may reveal a well-defined or irregular opacity in the left lung. It may have associated features such as spiculations, cavitations, or lymphadenopathy. A contrast-enhanced CT can provide additional information on vascularity and staging.

**103. Discuss various types of aortic aneurysms. Described various modalities to investigate such patients with advantages and disadvantages of each. Discuss briefly role of interventional procedure. [2+6+2 Dec 14]**

**Types of Aortic Aneurysms:**

**Aortic aneurysms can be classified into various types, including:**

**1. Abdominal Aortic Aneurysm (AAA):** Involves the abdominal aorta.

**2. Thoracic Aortic Aneurysm (TAA):** Affects the thoracic aorta.

**3. Aortic Dissection:** A separation of the layers of the aortic wall.

**4. Aortoiliac Aneurysm:** Involves the aorta and iliac arteries.

**Investigation Modalities and Their Advantages/Disadvantages:**

**1. CT Angiography (CTA):**

**- Advantages:** Provides detailed anatomical information, including size, location, and involvement of branch vessels. It is the imaging modality of choice for aortic aneurysms.

**- Disadvantages:** Involves radiation exposure and iodinated contrast, which may be a concern for some patients.

**2. Magnetic Resonance Angiography (MRA):**

**- Advantages:** Radiation-free and provides excellent soft tissue contrast. Can be used in patients with contraindications to contrast agents.

**- Disadvantages:** May not be as readily available as CT, and some patients with claustrophobia may find it challenging.

**3. Ultrasound (Doppler):**

**- Advantages:** Non-invasive, widely available, and cost-effective for screening and follow-up.

**- Disadvantages**: Operator-dependent and limited by body habitus or bowel gas interference.

**Role of Interventional Procedure:**

Interventional procedures, such as endovascular aortic repair (EVAR), play a crucial role in the treatment of aortic aneurysms. EVAR involves the placement of a stent graft within the aneurysm to exclude it from the circulation, preventing rupture. It offers advantages such as reduced surgical morbidity, shorter hospital stays, and faster recovery compared to open surgical repair. However, patient selection and follow-up imaging are critical for the success of these procedures.

**104. a) Takayasu‘s arteritis b) Role of RFA in chest tumors. [5+5 Dec 14]**

**a) Takayasu's Arteritis:**

Takayasu's arteritis is a rare autoimmune disease that primarily affects large arteries, including the aorta and its branches. It can lead to stenosis, occlusion, and aneurysm formation. Imaging modalities such as CT angiography and magnetic resonance angiography are used for diagnosis and monitoring.

**b) Role of Radiofrequency Ablation (RFA) in Chest Tumors:**

RFA is a minimally invasive technique used in the treatment of lung tumors. It involves the use of thermal energy delivered through a needle-like probe to destroy tumor cells. RFA is especially useful in cases where surgery is not an option, and it offers advantages such as shorter hospital stays, quicker recovery, and reduced morbidity compared to surgery. It can be used for both primary lung cancer and metastatic lesions in the lung.

**105. Etiopathogenesis, clinical forms, complications and radiological features of silicosis. [June 15].**

**Silicosis:** Etiopathogenesis, Clinical Forms, Complications, and Radiological Features

**Etiopathogenesis:**

Silicosis is a type of pneumoconiosis caused by inhalation of fine silica dust particles. These particles, primarily crystalline silica (quartz), are deposited in the lung tissue and trigger an inflammatory response, leading to fibrosis. Exposure to silica dust commonly occurs in industries like mining, construction, and sandblasting.

**Clinical Forms:**

**1. Chronic Silicosis:** This is the most common form, typically resulting from long-term, low-level exposure to silica. It presents with gradual onset of symptoms after several years of exposure.

**2. Accelerated Silicosis:** This form develops over a shorter period of high-intensity exposure to silica.

**3. Acute Silicosis:** Occurs due to intense, short-term exposure to very high levels of silica dust. Symptoms develop rapidly.

**Complications:**

**1. Progressive Massive Fibrosis (PMF):** A severe complication characterized by extensive fibrotic nodules in the lung, leading to significant respiratory impairment.

**2. Tuberculosis (TB):** Silicosis increases the risk of TB infection, as the damaged lung tissue becomes more susceptible to Mycobacterium tuberculosis.

**3. Lung Cancer:** Silica exposure also raises the risk of lung cancer development.

**Radiological Features:**

**- Chest X-ray:** Common findings include small, rounded opacities predominantly in the upper lung zones. PMF appears as large, rounded opacities with a diameter exceeding 1 cm. Eggshell calcifications around lymph nodes may also be seen.

**- CT Scan:** CT can provide more detailed information, showing small nodules and larger areas of fibrosis. CT is especially useful for identifying PMF and complications such as TB or lung cancer.

**106. a) Causes of mediastinal lymphadenopathy. b) Role of imaging in their differentiation. [June 2015]**

**a) Causes of Mediastinal Lymphadenopathy:**

Mediastinal lymphadenopathy can be caused by various conditions, including infections (tuberculosis, histoplasmosis), malignancies (lymphoma, lung cancer), inflammatory diseases (sarcoidosis), and autoimmune diseases (rheumatoid arthritis).

**b) Role of Imaging in Differentiation:**

Imaging plays a crucial role in differentiating the causes of mediastinal lymphadenopathy. CT and PET-CT can help assess the size, shape, distribution, and metabolic activity of lymph nodes, aiding in the diagnosis. For example, tuberculosis often presents with calcified lymph nodes, while lymphoma may show hypermetabolic nodes on PET-CT.

**107. An adult male presents with recurrent chest infections and a cavitating lung lesion in left lower zone in a chest radiograph. Discuss the differential diagnosis and imaging features in two most likely causes. [June 2015]**

**Differential Diagnosis of Cavitating Lung Lesion with Recurrent Infections:**

**1. Pulmonary Tuberculosis:** Tuberculosis can lead to cavitary lung lesions, especially in the lower zones. It often presents with recurrent infections, cough, and weight loss.

**2. Lung Abscess:** Abscess formation can result from infection with bacteria like Staphylococcus aureus or Klebsiella pneumoniae, leading to cavitary lesions.

**3. Bronchogenic Carcinoma:** Certain types of lung cancer, such as squamous cell carcinoma, can present with cavitary lesions.

**4. Fungal Infections:** Fungal infections like aspergillosis or histoplasmosis can cause cavitary lung lesions, particularly in immunocompromised individuals.

**Imaging Features in Two Likely Causes:**

**Pulmonary Tuberculosis:**

**- Radiological Features:** Chest X-ray may show cavitary lesions, often in the upper lobes, with thick, irregular walls. CT can provide detailed information, showing cavities, necrosis, and associated lymphadenopathy.

**Lung Abscess:**

**- Radiological Features:** Chest X-ray may reveal a cavitary lesion with an air-fluid level. CT can demonstrate a thick-walled cavity with surrounding inflammation. Contrast-enhanced CT may reveal peripheral enhancement.

**108. Causes of pleural masses and their imaging features. [June 2015]**

**Causes of Pleural Masses and Their Imaging Features:**

**1. Mesothelioma:** Arises from pleural mesothelial cells due to asbestos exposure. Imaging shows pleural thickening, pleural masses, and pleural effusion.

**2. Metastatic Tumors:** Tumors originating elsewhere can metastasize to the pleura, forming pleural masses. Imaging features depend on the primary tumor type.

**3. Benign Fibrous Tumors (e.g., Solitary Fibrous Tumor):** Appear as well-defined pleural masses with variable enhancement on CT scans.

**4. Empyema:** Infected pleural effusion can lead to thickening and loculated collections within the pleura.

**5. Pleural Hemangioma:** Rare vascular tumors of the pleura, appearing as well-defined masses on imaging.

**109. a) Anatomic location and patterns of diaphragmatic rupture. b) Role of imaging in its evaluation. [June 2015]**

**a) Anatomic Location and Patterns of Diaphragmatic Rupture:**

Diaphragmatic rupture can occur in different locations, including the left hemidiaphragm, right hemidiaphragm, or central tendon. Patterns of rupture include:

**- Bochdalek Hernia:** Postero-lateral herniation through the left diaphragm, often congenital.

**- Morgagni Hernia:** Anterior herniation through the diaphragm, typically on the right side.

**- Traumatic Rupture**: Due to blunt or penetrating trauma, resulting in tears in various diaphragmatic regions.

**b) Role of Imaging in Evaluation:**

Imaging, especially CT scans, plays a critical role in diagnosing diaphragmatic rupture by demonstrating diaphragmatic discontinuity, herniation of abdominal organs into the thorax, and associated injuries to other structures. MRI can also provide valuable information, particularly in non-traumatic cases.

**110. a) Enumerate pulmonary manifestations in patients with HIV. b) Chest X-ray and CT features in Pneumocystis carinii pneumonia. [3+(3+4) Dec 15]**

**a) Pulmonary Manifestations in Patients with HIV:**

Pulmonary complications in HIV-infected individuals can include opportunistic infections (Pneumocystis carinii pneumonia, tuberculosis), non-infectious conditions (lymphocytic interstitial pneumonitis), and HIV-related lung diseases (HIV-associated pulmonary hypertension).

**b) Chest X-ray and CT Features in Pneumocystis Carinii Pneumonia:**

**- Chest X-ray:** Typically shows bilateral, diffuse, fine reticular or granular opacities, sometimes described as a "ground-glass" appearance.

**- CT Scan:** CT may reveal ground-glass opacities, often with a perihilar or diffuse distribution. Consolidation, cysts, and pneumothorax can also occur.

**111. Radiological features of: a) McLeod‘s Syndrome b) Vanishing Lung Syndrome c) Scimitar syndrome. [3+3+4 Dec 15]**

**Radiological Features of:**

**a) McLeod's Syndrome:** This is a rare X-linked disorder affecting muscles and the nervous system. Radiological findings may include muscle atrophy, especially in the lower limbs, and signs of neurodegeneration.

**b) Vanishing Lung Syndrome:** This rare condition involves progressive loss of lung volume without apparent cause. Radiologically, it presents as severe lung hyperinflation with a marked decrease in lung density.

**c) Scimitar Syndrome:** A congenital heart defect where one or more pulmonary veins drain into the inferior vena cava. Radiologically, it shows anomalous pulmonary venous return and may

resemble a "scimitar" on imaging.

**112. Pathophysiology, imaging features, complications and differential diagnosis of Respiratory Distress Syndrome of New born. [2+3+2+3 Dec 15]**

Respiratory Distress Syndrome (RDS) of Newborn: Pathophysiology, Imaging Features, Complications, and Differential Diagnosis

**Pathophysiology:**

RDS, also known as hyaline membrane disease, primarily affects premature infants due to inadequate lung development. It is characterized by a deficiency of pulmonary surfactant, which leads to decreased lung compliance, atelectasis, and impaired gas exchange.

**Imaging Features:**

**- Chest X-ray:** Initial findings include diffuse, fine granular opacities, classically described as "ground-glass" appearance. Over time, it progresses to a "reticular" pattern with air bronchograms.

**- CT Scan:** Not routinely used in neonates due to radiation concerns, but it can provide more detailed information about the extent of lung involvement.

**Complications:**

**- Pneumothorax:** Due to barotrauma.

**- Pulmonary Hemorrhage:** Can occur secondary to the fragile lung tissue.

**- Bronchopulmonary Dysplasia (BPD):** May develop in severe cases.

**- Patent Ductus Arteriosus (PDA):** Due to the infant's stress response.

**- Intraventricular Hemorrhage (IVH):** Common in preterm infants with RDS.

**Differential Diagnosis:**

Differential diagnosis includes other causes of neonatal respiratory distress, such as transient tachypnea of the newborn, meconium aspiration syndrome, and congenital pneumonia.

**113. Role of CT and MRI in staging of lung cancer. [5+5 Dec 15] [Repeat from June 11]**

**Role of CT and MRI in Staging of Lung Cancer:**

**CT and MRI play essential roles in the staging of lung cancer:**

**- CT (Computed Tomography):**

**- Advantages:** CT provides high-resolution images of the lungs and mediastinum, making it suitable for evaluating primary lung tumors, lymph node involvement, and distant metastases. It is often used for initial staging.

**- Disadvantages**: CT uses ionizing radiation, limiting its use in some populations, and may not provide detailed soft tissue characterization compared to MRI.

**- MRI (Magnetic Resonance Imaging):**

**- Advantages:** MRI is excellent for evaluating soft tissue structures, making it valuable for assessing the chest wall, diaphragm, and mediastinal structures. It does not involve ionizing radiation.

**- Disadvantages:** MRI may be less sensitive than CT for detecting small lung nodules. It can be less well-tolerated by some patients due to the need for breath-holding and longer scan times.

**114. a) Antenatal diagnosis of congenital. diaphragmatic hernia. b) Imaging findings in gestational trophoblastic disease. [5+5 Dec 15]**

**a) Antenatal Diagnosis of Congenital Diaphragmatic Hernia (CDH):**

Antenatal diagnosis of CDH can be made using prenatal imaging techniques, including ultrasound and fetal MRI. On ultrasound, a diaphragmatic defect can be visualized, often in the left posterolateral region, with herniation of abdominal organs (typically the stomach) into the thorax. Fetal MRI can provide additional details.

**b) Imaging Findings in Gestational Trophoblastic Disease:**

Gestational trophoblastic disease encompasses a group of conditions, including molar pregnancies and choriocarcinomas. On imaging, findings may include a "snowstorm" appearance on ultrasound, characterized by multiple cystic spaces of varying sizes within the uterus. Elevated beta-hCG levels are typically seen.

**115. a) Enumerate various pathologies which can be found in posterior mediastinum. b) Imaging findings of posterior medistinal tumors in children. [3+7 Apr 16]**

**a) Pathologies in the Posterior Mediastinum:**

Pathologies in the posterior mediastinum can include neurogenic tumors (neurofibromas, schwannomas), lymphomas, esophageal lesions (achalasia, diverticula), and paravertebral abscesses.

**b) Imaging Findings of Posterior Mediastinal Tumors in Children:**

Imaging findings vary depending on the tumor type but may include:

**- Neurogenic Tumors:** Typically well-defined, lobulated masses that displace adjacent structures. Neuroblastomas may show calcifications.

**- Lymphomas:** Enlarged lymph nodes or a homogeneous soft tissue mass in the posterior mediastinum.

**- Esophageal Lesions:** Barium swallow may show narrowing or outpouchings of the esophagus.

**- Paravertebral Abscesses:** Loculated fluid collections adjacent to the vertebral bodies with surrounding soft tissue inflammation.

**116. a) Chest radiographic findings of pulmonary edema. b) Radiological differences between cardiogenic and non-cardiogenic pulmonary edema. [6+4 Apr 16]**

**a) Chest Radiographic Findings of Pulmonary Edema:**

**Chest radiographic findings of pulmonary edema include:**

**- Bat's Wing Appearance**: Bilateral diffuse opacities in the upper and middle lung zones.

**- Kerley B Lines**: Linear opacities perpendicular to the pleura, indicating interstitial edema.

**- Cardiomegaly:** Enlargement of the cardiac silhouette.

**- Pleural Effusions:** Due to increased hydrostatic pressure, pleural effusions may develop.

**b) Radiological Differences Between Cardiogenic and Non-Cardiogenic Pulmonary Edema:**

Cardiogenic pulmonary edema is typically associated with cardiomegaly and vascular redistribution (cephalization), where vessels in the upper lobes are more prominent. Non-cardiogenic pulmonary edema, such as in acute respiratory distress syndrome (ARDS), lacks cardiomegaly and vascular redistribution and often has a more diffuse ground-glass appearance on imaging.

**117. a) Enumerate etiologies of diffuse cystic lesions of lung. b) Radiological findings in any two of them. [2+4+4 Apr 16]**

**a) Etiologies of Diffuse Cystic Lesions of the Lung:**

Diffuse cystic lung lesions can be caused by various conditions, including:

**1. Lymphangioleiomyomatosis (LAM):** A rare lung disease characterized by the proliferation of smooth muscle cells, leading to cyst formation.

**2. Langerhans Cell Histiocytosis (LCH):** Involves the accumulation of Langerhans cells, leading to cystic changes in the lung.

**3. Cystic Bronchiectasis:** Resulting from chronic infections, such as cystic fibrosis or prior infections like tuberculosis.

**4. Pneumocystis Jirovecii Pneumonia (PCP):** An opportunistic infection that can cause diffuse cystic lesions in immunocompromised individuals.

**b) Radiological Findings in Two of Them:**

**Lymphangioleiomyomatosis (LAM):**

**- Imaging Findings:** CT typically shows numerous thin-walled cysts distributed throughout the lungs, often with normal lung tissue in between. Pneumothorax can be a complication.

**Cystic Bronchiectasis (e.g., Cystic Fibrosis):**

- Imaging Findings: CT may reveal cystic spaces in association with bronchiectasis, which appears as dilated, thick-walled bronchi. Mucus plugging can be seen within these bronchi.

**118. a) Enumerate the causes of hemoptysis. b) Role of interventional radiology in its management. [2+8 Apr 16]**

**a) Causes of Hemoptysis:**

Hemoptysis can have various causes, including:

**1. Bronchitis:** Inflammation of the bronchial tubes.

**2. Bronchiectasis:** Abnormal widening and scarring of the bronchi.

**3. Lung Infections:** Such as tuberculosis or pneumonia.

**4. Lung Cancer:** Malignant tumors in the lung.

**5. Pulmonary Embolism:** Blood clots in the pulmonary arteries.

**6. Trauma:** Injury to the chest or airway.

**7. Vascular Lesions:** Such as arteriovenous malformations or aneurysms.

**8. Anticoagulant Use:** Medications that interfere with blood clotting.

**b) Role of Interventional Radiology in Hemoptysis Management:**

Interventional radiology can play a crucial role in the management of hemoptysis, especially in cases where bleeding is severe or difficult to control surgically. Techniques such as bronchial artery embolization involve the selective occlusion of bleeding vessels using catheters and embolic agents. This minimally invasive procedure can effectively control hemoptysis and avoid the need for more extensive surgery.

**119. Causes and imaging findings in a neonate presenting with respiratory distress. [10 Apr 16] (Repeat from Dec 15)**

**Causes and Imaging Findings in a Neonate Presenting with Respiratory Distress:**

**Common causes of respiratory distress in a neonate include:**

**1. Respiratory Distress Syndrome (RDS):** Characterized by surfactant deficiency, with imaging showing a ground-glass appearance.

**2. Transient Tachypnea of the Newborn (TTN):** Often associated with retained fetal lung fluid, with imaging showing perihilar streaking ("wet lung" appearance).

**3. Meconium Aspiration Syndrome (MAS):** Due to aspiration of meconium into the airways, with imaging showing patchy opacities and hyperinflation.

**4. Pneumonia:** Infection of the lungs, with imaging revealing infiltrates and consolidation.

**5. Congenital Diaphragmatic Hernia (CDH):** A defect in the diaphragm, with imaging showing abdominal contents in the thoracic cavity.

The specific imaging findings depend on the underlying cause and can be assessed through chest X-rays or other imaging modalities.

**120. a) Define solitary pulmonary nodule and enumerate its causes. b) Role of dynamic CT in the evaluation of solitary pulmonary nodule. [1+4+5 Apr 16]**

**a) Define Solitary Pulmonary Nodule and Enumerate Its Causes:**

A solitary pulmonary nodule (SPN) is a single, well-defined, rounded lesion in the lung that measures less than 3 centimeters in diameter. Causes of SPNs include:

**1. Benign Lesions:** Such as granulomas, hamartomas, or infectious nodules.

**2. Malignant Tumors:** Including primary lung cancer or metastases from other cancers.

**3. Infectious Lesions:** Fungal or bacterial infections.

**4. Vascular Lesions:** Pulmonary artery aneurysms or varices.

**5. Inflammatory Lesions**: Rheumatoid nodules or sarcoidosis.

**b) Role of Dynamic CT in the Evaluation of Solitary Pulmonary Nodule:**

Dynamic CT scans, including perfusion CT and contrast-enhanced CT, play a crucial role in characterizing SPNs. They help assess the vascularity of the nodule and can provide information about the likelihood of malignancy. Features such as rapid contrast enhancement, washout, and irregular margins may suggest malignancy. Dynamic CT aids in distinguishing between benign and malignant SPNs and helps guide further management decisions, including biopsy or surgical resection.