

Organizing pneumonia: A great mimicker

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LEARNING OBJECTIVES

- To provide an imaging review of typical and atypical radiologic patterns of organizing pneumonia.
- To discuss the differential diagnosis of organizing pneumonia.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

Background

BACKGROUND

Organizing pneumonia is a non-specific response to various forms of lung injury and is the pathological hallmark of the distinct clinical entity termed **cryptogenic organizing pneumonia**, formerly referred to as *bronchiolitis obliterans organizing pneumonia (BOOP)*.

The term cryptogenic organizing pneumonia is preferred because its clinical, physiologic, and imaging features are unrelated to bronchiolar obliteration. Although the organizing pneumonia process is primarily intraalveolar, it was included in the classification of the interstitial pneumonias because of its idiopathic nature and because its appearance may overlap with that of the other interstitial pneumonias. For these reasons, COP is more appropriately classified as an idiopathic interstitial pneumonia (IIP) than as a small-airways disease.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

BACKGROUND

CLINICAL FEATURES

- The typical patient with COP has a mean age of 55 years.
- Women and men are equally affected.
- *Patients present with mild dyspnea, cough, and fever that have been developing over a few weeks.*
- Patients typically report a respiratory tract infection preceding their symptoms, and antibiotics were commonly prescribed at a previous consultation.
- There is no association with cigarette smoking; in fact, most patients are nonsmokers or ex-smokers.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

BACKGROUND

CLINICAL FEATURES

- Localized or widespread crackles on auscultation are frequent.
- Elevated levels of erythrocyte sedimentation rate, C-reactive protein, and peripheral blood neutrophils are common.
- Bronchoalveolar lavage fluid contains an increased number and proportion of lymphocytes.
- **The majority of patients recover completely after administration of corticosteroids, but *relapses* occur frequently within 3 months after corticosteroid therapy is reduced or stopped.**

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

BACKGROUND

HISTOLOGIC FEATURES

- The histologic hallmark of organizing pneumonia is the *presence of granulation tissue polyps in the alveolar ducts and alveoli*. These fibroblast proliferations result from organization of inflammatory intraalveolar exudates. The granulation tissue is all the same age and contains few inflammatory cells. Typically, there is patchy lung involvement with preservation of lung architecture.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

Imaging findings OR Procedure details

TYPICAL IMAGING FINDINGS

CHEST RADIOGRAPH

- The chest radiograph usually shows *unilateral or bilateral patchy consolidations* that resemble pneumonic infiltrates.



Figure 1. Radiograph showing predominantly mid- and lower zone air space opacities in a patient with cryptogenic organizing pneumonia.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

TYPICAL IMAGING FINDINGS

COMPUTED TOMOGRAPHY

- Typically, the appearance of the lung opacities varies *from ground glass to consolidation*; in the latter, *air bronchograms* and *mild cylindrical bronchial dilatation* are a common finding. They are of variable size, ranging from a few centimeters to an entire lobe.
- The lung abnormalities show a characteristic *peripheral or peribronchial distribution*, and the *lower lung lobes* are more frequently involved. In some cases, the outermost subpleural area is spared.

These opacities have a tendency to migrate, changing location and size, even without treatment.

Figure 2. Axial HRCT shows typical peripheral areas of consolidation with air bronchograms at both lung bases in a patient COP.



Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

- The most common CT findings of organizing pneumonia consist of bilateral areas of patchy air-space consolidation, often subpleural and/or peribronchial, with or without ground-glass opacities, typically in mid and lower lung zones. **However, these findings are seen in only approximately 60% of patients.**
- *Other less specific imaging patterns can be encountered and include “reversed-halo” sign, focal organizing pneumonia, a variety of nodular patterns, a bronchocentric pattern, a perilobular pattern, band-like opacities, and a progressive fibrotic form of organizing pneumonia.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

REVERSED HALO SIGN

- A central ground-glass opacity surrounded by more dense air-space consolidation of crescentic and ring shapes.
- The central ground-glass opacity corresponds histopathologically to the area of alveolar septal inflammation and cellular debris in the alveolar spaces, whereas the ring-shaped or crescentic peripheral air-space consolidation corresponds to the area of organizing pneumonia within the alveolar ducts.

- The reversed halo sign, although seen only in one fifth of patients with the disease, appears relatively specific to make a diagnosis of organizing pneumonia on CT.



Figure 3. Axial HRCT in patient with COP shows a central ground glass opacity surrounded by more dense crescentic air-space consolidation.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

FOCAL LESION

- Solitary pulmonary mass with spiculated or irregular margins.
- Focal OP can also present as multiple mass-like opacities.

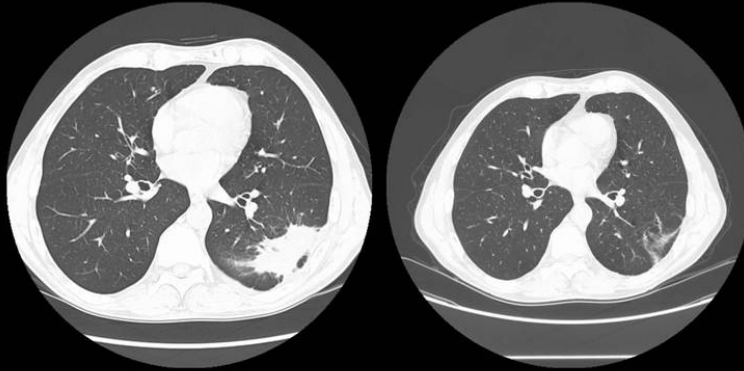


Figure 4. Axial HRCT shows a left lower lobe mass with spiculated margins (a). On biopsy this lesion proved to be organizing pneumonia. Axial HRCT of the same patient after treatment with corticosteroids (b) showing almost complete resolution of the lesion.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

FOCAL LESION

- *Focal organizing pneumonia can closely resemble **lung cancer** and the exclusion of malignancy cannot be made on the basis of the radiographic appearances alone. In most cases resection or biopsy is mandatory.*
- *Helpful, but not definitive, differentiating CT features from lung cancer include:*
 - *Location of the lesion in contact with the pleura (i.e. relatively broad pleural-based lesion) or along the bronchovascular bundle with some contraction and convergence of vessels;*
 - *The presence of flat, oval or trapezoidal-shaped masses instead of a rounded lesion;*
 - *The presence of satellite lesions.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

NODULAR PATTERN

- Nodules usually randomly distributed in lungs.
- Organizing pneumonia can present as one of two nodular patterns:
 - a well-defined "acinar" pattern with nodules of approximately 8 mm in diameter and randomly distributed;
 - a more subtle poorly defined (micro)nodular pattern.

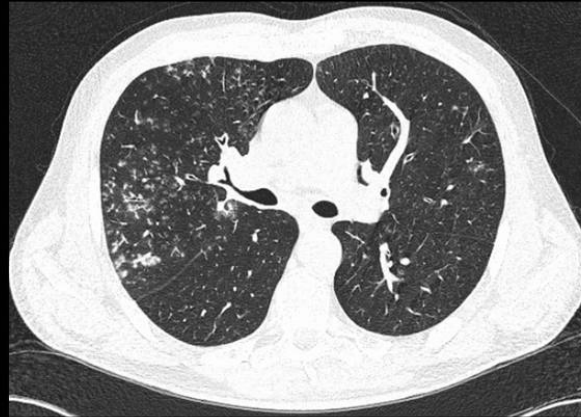


Figure 5. Axial HRCT showing combined pattern of peripheral "acinar" nodules and smaller nodules, some of which resemble a tree-in-bud pattern in the right upper lobe. Biopsy-proven organizing pneumonia.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

BRONCHOCENTRIC PATTERN

- In this pattern, the consolidation had a predominantly peribronchovascular distribution.



Figure 6. Axial HRCT showing areas of consolidation surrounding the broncovascular bundles in a patient with biopsy proven organizing pneumonia.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

PERILOBULAR PATTERN

- In perilobular pattern, there is opacification around the periphery of individual secondary lobules resembling poorly defined thickened interlobular septa.



Figure 7. Axial HRCT showing opacification around the periphery of individual secondary lobules resembling poorly defined thickened interlobular septa in a patient with biopsy proven organizing pneumonia.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

LINEAR AND BAND-LIKE PATTERN

- A linear or band-like pattern of OP is unusual and striking and has been described in isolation or in combination with other patterns.
- It is seen on CT as lines or bands longer than 2 cm, smooth or irregular sometimes forming arcades and/or containing air bronchograms. These lines or bands are usually at least 8 mm in width.
- These linear opacities are usually associated with multifocal areas of consolidation.

- *It is associated with increased risk of persistent or progressive disease.*

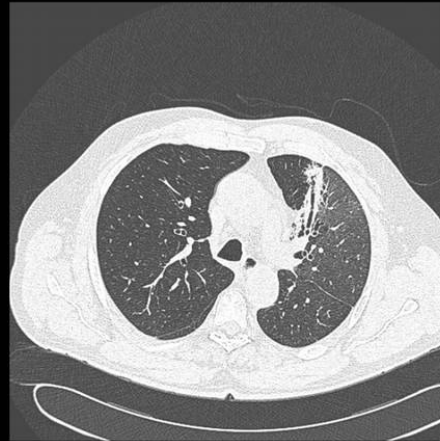


Figure 8. Axial HRCT shows a band-like opacity containing air-bronchogram in the left upper lobe.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

ATYPICAL IMAGING FINDINGS

PROGRESSIVE FIBROTIC FORM

- *A less distinct pattern encompasses those cases of "aggressive" OP in which there is supervening irreversible fibrosis.*
- *This pattern was initially described as a separate clinical-radiologic profile of OP having an overlap with usual interstitial pneumonia and consequently a worse prognosis than typical OP.*
- On CT a bibasal reticular pattern may be superimposed on a background of areas of frank consolidation or acinar nodules. It is the relative paucity of consolidation and ground-glass opacification together with the predominance of reticular elements with **architectural distortion** that distinguishes this pattern from typical OP. Other features of interstitial fibrosis, including *traction bronchiectasis*, *honeycombing*, with or without patchy areas of ground glass, may all be seen on CT in this "overlap" entity.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

- The organizing pneumonia patterns may be found in other lung disorders. The differential diagnosis includes chronic eosinophilic pneumonia, Churg-Strauss syndrome, desquamative interstitial pneumonia, bronchioalveolar carcinoma, lymphoma, sarcoidosis, pulmonary embolism, exogenous lipoid pneumonia, aspiration and alveolar proteinosis.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

CHRONIC EOSINOPHILIC PNEUMONIA

- Chronic eosinophilic pneumonia (CEP) is characterized clinically by chronic and ultimately life-threatening illness with a high fever, night sweats, weight loss, and severe dyspnea.
- *Approximately 50% of patients have a history of bronchial asthma.*
- The main histologic feature of CEP is a massive infiltration of eosinophils and lymphocytes in the alveoli and in the interstitium, with a thickened alveolar wall.
- *CEP is also characterized by showing prompt improvement with corticosteroid treatment.* Response to corticosteroid treatment is generally reported to be more dramatic in CEP than in OP, and a worse prognosis has been reported in patients with OP than in those with CEP. In general, dosage and duration of corticosteroid treatment differs between the two diseases.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

CHRONIC EOSINOPHILIC PNEUMONIA

- The characteristic radiographic finding is bilateral, non-segmental, homogeneous consolidation, with peripheral distribution and upper lung zone predominance.

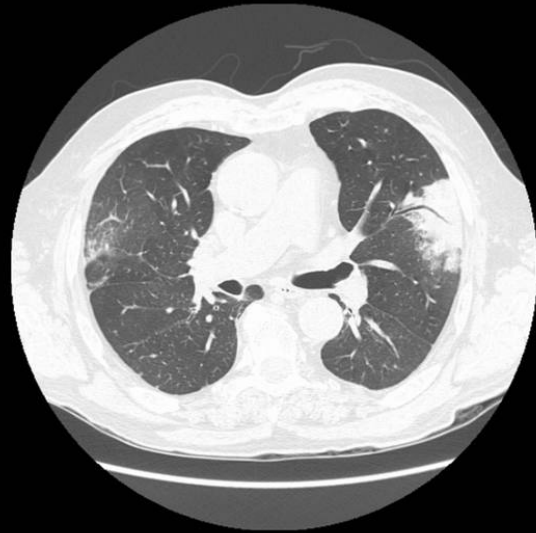


Figure 9. Axial HRCT showing peripheral areas of consolidation in the upper lobes in a patient with history of bronchial asthma and blood eosinophilia.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

CHRONIC EOSINOPHILIC PNEUMONIA

- In many cases, the discrimination between OP and CEP is possible on high-resolution CT scans; however, the distinction can be made with confidence in only a small percentage of cases.
- *The most important findings for differentiating OP and CEP are the presence or absence of a nodule or a mass followed by nonseptal linear or reticular opacities, which are more common in OP. The presence or absence of bronchial dilatation and septal line thickening may be other discriminating high-resolution CT findings.*
- *In clinical practice, the differential diagnosis can be readily made based on clinical history and laboratory tests: approximately 50% of patients with CEP have asthma, and most patients have peripheral eosinophilia.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

CHRONIC EOSINOPHILIC PNEUMONIA

- ❖ *Peripheral distribution of consolidation mimics OP, but CEP usually affects upper lung zones.*
- ❖ *Nodules, non-septal linear pattern, reticulation and peri-bronchiolar distribution more common in OP.*
- ❖ *Septal lines more common in CEP.*
- ❖ *Associated with asthma and eosinophilia.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

CHURG STRAUSS SYNDROME

- Churg-Strauss syndrome is characterized histologically by tissue infiltration by eosinophils, necrotizing vasculitis, and extravascular granulomas.
- *The diagnosis of Churg-Strauss syndrome can be made if four or more of the following six findings are present: asthma, eosinophilia greater than 10% of the white blood cell differential count, neuropathy, migratory or transient pulmonary opacities, paranasal sinus abnormalities, and extravascular eosinophils revealed at biopsy.*
- The lung is the most commonly involved organ, followed by the skin. However, any organ can be involved, including the central nervous system, heart, and gastrointestinal tract.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

CHURG STRAUSS SYNDROME

- At radiography, Churg-Strauss syndrome usually appears as bilateral nonsegmental consolidation or reticulonodular opacities.
- The most common thin-section CT findings include sub-pleural ground-glass opacity or consolidation with a lobular distribution, centrilobular nodules, bronchial wall thickening, and interlobular septal thickening.
- Less common findings include hyperinflation, mediastinal or hilar lymphadenopathy, and pleural or pericardial effusion.

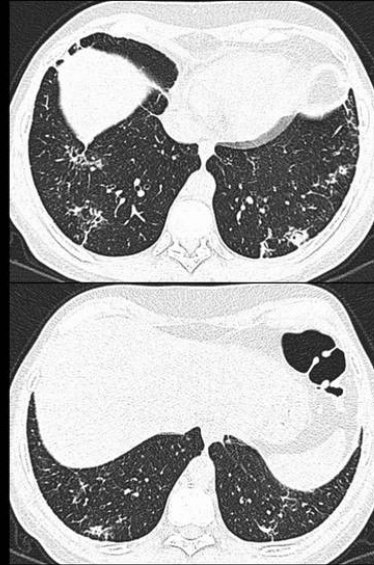


Figure 10. Axial HRCT shows subpleural focal lobular consolidation, centrilobular nodules and bronchial wall thickening in both lung bases in an asthmatic patient with arthralgias, skin rash and 43% peripheral eosinophilia.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

CHURG STRAUSS SYNDROME

- ❖ *Identical radiographic findings, but in Churg-Strauss syndrome, peripheral consolidation has a tendency toward lobular distribution and the presence of centrilobular nodules is frequent within the ground-glass opacity.*
- ❖ *May have adenopathy and pleural effusion.*
- ❖ *Associated with asthma, eosinophilia and systemic disease (abdominal pain, diarrhea, bleeding, heart failure, pericarditis, renal insufficiency, arthralgias).*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

DESQUAMATIVE INTERSTITIAL PNEUMONIA

- Chronic idiopathic interstitial pneumonia characterized by the accumulation of macrophages within alveolar spaces.
- *90% of patients are cigarette smokers.*
- The typical radiographic findings are diffuse ground-glass opacities, most often within the peripheral aspects of the bases. Bibasilar reticular opacities are also common.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

DESQUAMATIVE INTERSTITIAL PNEUMONIA



Figure 11. Axial HRCT shows diffuse ground-glass opacities in a smoker patient. Note that a small cyst with thin wall is seen in the left upper lobe.

DESQUAMATIVE INTERSTITIAL PNEUMONIA

- ❖ *Related to smoking.*
- ❖ *Superimposed emphysema common in older patients.*
- ❖ *May have cysts.*
- ❖ *Limited success with steroid treatment.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

BRONCHIOALVEOLAR CARCINOMA

- Bronchioloalveolar carcinoma represents 1,5%-6,5% of all primary pulmonary neoplasms.
- Bronchioloalveolar carcinoma is a subtype of *adenocarcinoma* and can be defined as a **peripheral** neoplasm, arising beyond a recognizable bronchus, with a tendency to spread locally using the lung structure as a stroma (*lepidic growth*). The key feature is preservation of the underlying lung architecture.
- Most patients are aged 40-70 years and the prevalence is relatively high in women.
- Only 25-50% of patients have a history of heavy smoking.
- Even with disseminated disease, the patient may remain asymptomatic. The most frequent symptoms and signs are cough, sputum, shortness of breath, weight loss, hemoptysis and fever.

Fig.

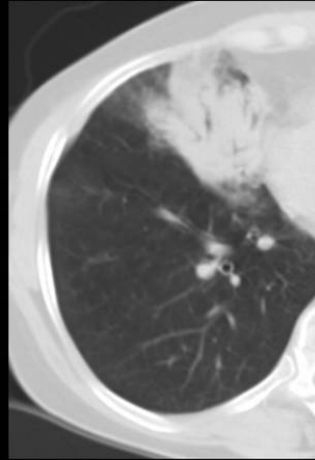
References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

BRONCHIOALVEOLAR CARCINOMA

- *Localized disease appears as a peripheral spiculated solitary pulmonary nodule or as a focal area of ground-glass opacity on CT scans.*
- *Diffuse disease, which represents either multifocal origin of disease or transbronchial spread of tumor, may present as airspace opacification or as diffuse bilateral nodular airspace opacities.*

Figure 12. Axial CT shows a middle lobe airspace opacity from bronchioloalveolar carcinoma.



BRONCHIOLOALVEOLAR CARCINOMA

- ❖ *Bronchioloalveolar carcinoma not predominately subpleural.*
- ❖ *OP tends to wax and wane and responds to steroid treatment; bronchioloalveolar carcinoma progressively worsens.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

LYMPHOMA

- Parenchymal involvement in Hodgkin disease is two to three times more common than in non-Hodgkin lymphoma.
- *Parenchymal involvement in Hodgkin disease does not occur in the absence of hilar and mediastinal nodal disease. Non-Hodgkin lymphoma may involve the parenchyma without concomitant nodal disease in up to 50%.*
- Parenchymal abnormalities in **Hodgkin lymphoma** usually produce linear and coarse reticulonodular opacities that extend directly into the lung from enlarged hilar lymph nodes. Extensive areas of parenchymal involvement can produce mass-like opacities and areas of airspace opacification.
- The parenchymal involvement in **non-Hodgkin** lymphoma most often appears as masses or airspace opacities.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

LYMPHOMA



Figure 13. Axial HRCT shows air-space opacification extending from the left hilum, with peribronchovascular distribution in a patient with a known Hodgkin lymphoma. Soft-tissue window images (not shown) show concomitant mediastinal and hilar adenopathy.

LYMPHOMA

- ❖ *Pulmonary lymphoma usually secondary to known disease.*
- ❖ *Usually associated with bulky lymphadenopathy.*
- ❖ *No peripheral predominance: more common in the central aspect of the lung, often centered on bronchi with air bronchograms.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

SARCOIDOSIS

- Sarcoidosis is a multisystem granulomatous disease of unknown etiology characterized histologically by noncaseating granulomas that may progress to fibrosis.
- Most patients are 20 to 40 years of age at the time of diagnosis.
- The clinical presentation may be dominated by pulmonary or extrapulmonary manifestations of the disease, but a considerable percentage of patients are asymptomatic and are identified by incidental findings on chest radiographs.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

SARCOIDOSIS

- Mediastinal and bilateral symmetric hilar lymph node enlargement is found in 80% of patients with sarcoidosis.
- The lung is involved radiographically in only 40 to 50% of patients with sarcoidosis. The most common parenchymal abnormality is bilateral symmetric reticulonodular opacities show a predilection for the mid and upper lung zones. The reticulonodular opacities represent the combination of granulomas and fibrosis. CT shows that most nodules lie predominantly in a peribronchovascular and subpleural location.
- *In approximately 10% of patients, these nodules grow to form large, well-defined masses or poorly marginated opacities that contain air bronchograms and simulate an airspace-filling process. In this alveolar form of sarcoidosis, the airspaces are not filled with material but compressed and obliterated by the exuberant granuloma formation within the surrounding interstitium. These airspace opacities are primarily seen in the peripheral portions of the midlung zone.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

SARCOIDOSIS



Figure 14. Axial HRCT shows an area of consolidation in the middle lobe and micronodules in both superior segments of the lower lobes. Soft tissue window images (not shown) show concomitant mediastinal and symmetric hilar adenopathy.

ALVEOLAR SARCOIDE

- ❖ *Presence of reticulonodular opacities elsewhere in the lung or concomitant symmetric hilar and mediastinal lymph node enlargement.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

PULMONARY EMBOLISM

- Less than 10% of all embolic episodes result in *lung infarction*. Collateral bronchial arterial and retrograde pulmonary venous flow prevent infarction in most patients. Infarction from embolism occurs with greater frequency in patients with underlying heart failure because of their limited collateral bronchial arterial flow to the ischemic region.

DIFFERENTIAL DIAGNOSIS

PULMONARY EMBOLISM

- Radiographic features that suggest infarction include the presence of a *small pleural effusion* and the development of a *pleura-based wedge-shaped opacity (Hampton hump)*. This opacity, typically found in the posterior or lateral costophrenic sulcus of the lung, is wedge-shaped, homogeneous, and lacks air bronchograms. The blunted apex of the wedge points toward the occluded feeding vessel, while the base is against the pleural surface.
- This wedge-shaped opacity is often obscured by surrounding areas of hemorrhage in the early phases following infarction and becomes more obvious with time as the peripheral areas of hemorrhage resolve (*melting snowball sign*).
- Infarcts resolve over the course of several weeks or months and usually leave a residual linear parenchymal scar (*Fleischner line*) and/or localized pleural thickening.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

PULMONARY EMBOLISM

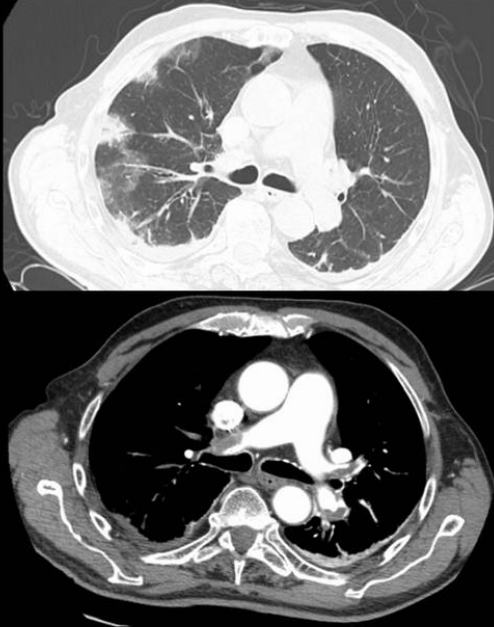


Figure 15. Lung window CT image in a patient with a recent orthopaedic surgery, shows infarcts peripherally located in the right upper lobe (a). Angio-CT (b) shows massive bilateral pulmonary embolism. Note there is concomitant small pleural effusion.

PULMONARY EMBOLISM

- ❖ *Multiple infarcts peripherally located in bases (identical to OP).*
- ❖ *Often wedge-shaped and usually associated with pleural effusions.*
- ❖ *Concomitant cardiac, pulmonary arterial and peripheral vascular changes of pulmonary embolism.*
- ❖ *Known risk factors for thromboembolism.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

EXOGENOUS LIPOID PNEUMONIA

- Exogenous lipoid pneumonia results from the aspiration or inhalation of fatty or oily substances (animal or vegetable oils, oral laxatives, oil-based nose drops, and liquid paraffin).
- The characteristic radiographic findings are mass-like or nodular lesion with irregular margins or uni or multifocal segmental areas of consolidation, predominantly in lower lobes. *Low CT attenuation areas (-30 and -150 HU) are seen in consolidated lung.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

EXOGENOUS LIPOID PNEUMONIA

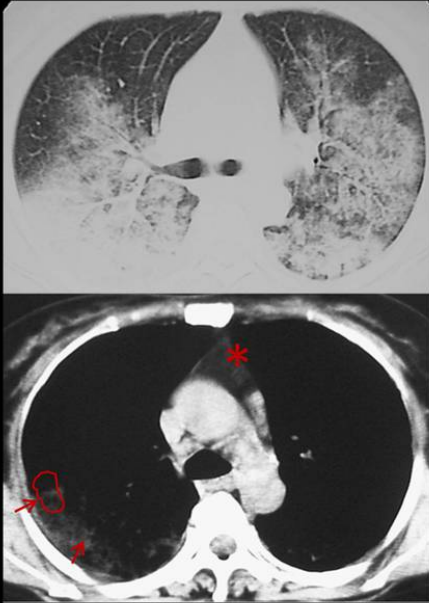


Figure 16. 47 year-old smoker, using oily nasal drops for his chronic sinusitis. Lung window CT image (a) shows ill-defined parahilar ground-glass opacity and areas of consolidation in the posterior lung. Soft-tissue window CT image at the same level (b) shows areas of low attenuation (arrows) within the consolidation. This low attenuation is similar to the mediastinal fat (*).

EXOGENOUS LIPOID PNEUMONIA

- ❖ *Lipoid pneumonia may have fat density in areas of consolidated lung at CT.*
- ❖ *History of lipoid ingestion: oily-nose drops, mineral oil laxative.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

ASPIRATION

- Aspiration of oropharyngeal or gastric secretions, with or without food particles, is not an uncommon event. It is seen in debilitated patients with chronic diseases, in patients with tracheal or gastric tubes, in unconscious patients, in those who have suffered strokes, seizures or trauma and in those with structural abnormalities of the pharynx and esophagus, neuromuscular disorders, and deglutition abnormalities.
- The characteristic radiographic finding is unilateral or bilateral air-space consolidation in *dependent distribution*: recumbent patients – superior segments of the lower lobes and posterior segments of the upper lobes; upright patients – basal segments of the lower lobes.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

ASPIRATION



Figure 17. Chest radiograph shows bilateral air-space consolidation with dependent distribution. An air-fluid level is seen in the upper thorax corresponding to a large esophageal diverticulum.

ASPIRATION

- ❖ *Opacities not as chronic or peripheral as OP.*
- ❖ *Predominantly dependent lung segments.*
- ❖ *Typical predisposing conditions: esophageal motility disorder, obtundation, alcoholism.*

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

PULMONARY ALVEOLAR PROTEINOSIS

- Pulmonary alveolar proteinosis (PAP) is a rare disease in which the lipoproteinaceous material surfactant deposits in abnormal amounts within the airspaces of the lung.
- PAP has a predilection for males in their 20s to 40s and has been associated with acute exposure to large amounts of silica dust and immunocompromised patients with lymphoma, leukemia, or AIDS.
- Diagnosis and treatment: bronchioloalveolar lavage and irrigation.
- The typical radiographic finding is bilateral symmetric perihilar airspace opacification (*central bat-wing pattern*). Airspace nodules are commonly seen at the periphery of the confluent opacities. CT and HRCT scans typically show geographic ground-glass opacities superimposed upon thickened interlobular and intralobular septa (*crazy paving pattern*).

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

DIFFERENTIAL DIAGNOSIS

PULMONARY ALVEOLAR PROTEINOSIS

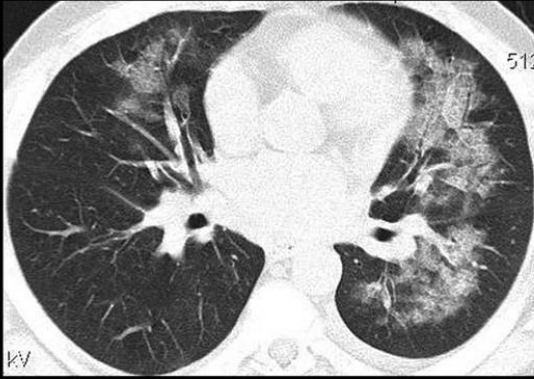


Figure 18. Axial HRCT shows geographic ground-glass opacities superimposed upon thickened interlobular and intralobular septa (crazy-paving pattern).

PULMONARY ALVEOLAR PROTEINOSIS

- ❖ Central “bat-wing” distribution.
- ❖ “Crazy paving” pattern.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

Conclusion

CONCLUSION

In the appropriate clinical context, that is, consolidation that increases over several weeks despite antibiotics, the CT features of OP are often suggestive. However, apart from the typical imaging pattern of OP, other less specific imaging patterns can be encountered.

The radiologic patterns of organizing pneumonia are protean and can mimic other lung disorders including malignant conditions. Knowledge of the imaging spectrum of organizing pneumonia allows accurate diagnosis and also provides salient features that can guide the diagnostic and therapeutic work-up.

Fig.

References: C. Paulino; Serviço de Imagiologia, Hospitais da Universidade de Coimbra, Coimbra, PORTUGAL

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References

What every radiologist should know about idiopathic interstitial pneumonias.

Mueller-Mang C, Grosse C, Schmid K, Stiebellehner L, Bankier AA.

Radiographics. 2007 May-Jun;27(3):595-615.

Idiopathic interstitial pneumonias: CT features.

Lynch DA, Travis WD, Müller NL, Galvin JR, Hansell DM, Grenier PA, King TE Jr.

Radiology. 2005 Jul;236(1):10-21.

Organizing pneumonia: perilobular pattern at thin-section CT.

Ujita M, Renzoni EA, Veeraraghavan S, Wells AU, Hansell DM.

Radiology. 2004 Sep;232(3):757-61.

CT-histologic correlation of the ATS/ERS 2002 classification of idiopathic interstitial pneumonias.

Wittram C, Mark EJ, McLoud TC.

Radiographics. 2003 Sep-Oct;23(5):1057-71.

Reversed halo sign on high-resolution CT of cryptogenic organizing pneumonia: diagnostic implications.

Kim SJ, Lee KS, Ryu YH, Yoon YC, Choe KO, Kim TS, Sung KJ.

AJR Am J Roentgenol. 2003 May;180(5):1251-4.

Organizing pneumonia: the many morphological faces.

Oikonomou A, Hansell DM.

Eur Radiol. 2002 Jun;12(6):1486-96. Epub 2001 Nov 13.

Bronchiolitis obliterans with organizing pneumonia versus chronic eosinophilic pneumonia: high-resolution CT findings in 81 patients.

Arakawa H, Kurihara Y, Niimi H, Nakajima Y, Johkoh T, Nakamura H.

AJR Am J Roentgenol. 2001 Apr;176(4):1053-8.

Linear opacities on HRCT in bronchiolitis obliterans organising pneumonia.

Murphy JM, Schnyder P, Verschakelen J, Leuenberger P, Flower CD.

Eur Radiol. 1999;9(9):1813-7.

Bronchiolitis obliterans organising pneumonia simulating bronchial carcinoma.

Murphy J, Schnyder P, Herold C, Flower C.

Eur Radiol. 1998;8(7):1165-9.

Bronchiolitis obliterans organizing pneumonia manifesting as multiple large nodules or masses.

Akira M, Yamamoto S, Sakatani M.

AJR Am J Roentgenol. 1998 Feb;170(2):291-5.

Cryptogenic organizing pneumonia: CT findings in 43 patients.

Lee KS, Kullnig P, Hartman TE, Müller NL.

AJR Am J Roentgenol. 1994 Mar;162(3):543-6.

Focal organizing pneumonia: CT appearance.

Kohno N, Ikezoe J, Johkoh T, Takeuchi N, Tomiyama N, Kido S, Kondoh H, Arisawa J, Kozuka T.

Radiology. 1993 Oct;189(1):119-23.

Bronchiolitis obliterans organizing pneumonia: CT features in 14 patients.

Müller NL, Staples CA, Miller RR.

AJR Am J Roentgenol. 1990 May;154(5):983-7.