Chest computed tomography findings in organizing pneumonia

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Abstract

Background: Organizing pneumonia (OP) is a non-specific clinicopathological entity characterized by intra-alveolar buds of granulation tissue consisting of fibroblasts and connective tissue. OP is often secondary to infections, drug reactions, autoimmune diseases, or radiation therapy. Chest computed tomography (CT) is pivotal in the evaluation of suspected OP, often demonstrating characteristic findings. Our study aimed to illustrate major imaging characteristics and patterns of OP.

Methods: We conducted a prospective study including all patients hospitalized in the infectious disease department for OP between 2018 and 2024. The diagnosis of OP was based on histopathology (lung biopsy).

Results: We encountered 35 cases of OP, including 19 women and 16 men. The mean age of patients was 76±18 years. Chest X-ray showed multiple alveolar opacities, which were often migratory, in 20 cases, a heterogeneous excavated nodule in one case, and an invasive alveolar opacity in 14 cases. The thoracic CT scan showed multifocal parenchymal condensations in 34% of the cases, single or multiple nodules in 11% of the cases, and "reversed halo sign" in 25% the cases. Arciform condensations (40%), crazy paving (3%), and fibrosis (6%) were reported. The migratory aspect of the lesions and the regression under steroids were specific and present in 49% of the cases.

Conclusion: Organizing pneumonia is a heterogeneous condition with diverse clinical and imaging presentations. Chest CT plays a crucial role in detecting typical radiological features that aid in diagnosis. Recognizing these imaging patterns, along with clinical correlation, can facilitate early diagnosis and appropriate management, improving patient outcomes.

Keywords: Organizing pneumonia; Computed Tomography; Lung diseases; Diagnostic imaging

INTRODUCTION

Organizing pneumonia (OP) is a non-specific clinicopathological entity characterized by intra-alveolar buds of granulation tissue consisting of fibroblasts and connective tissue, typically resulting from an aberrant healing response to lung injury [1,2]. Although it can be idiopathic, referred to as cryptogenic

organizing pneumonia (COP), OP is often secondary to infections, drug reactions, autoimmune diseases, or radiation therapy [3,4]. Clinically, patients present to the emergency department for subacute symptoms including cough, dyspnea, fever, and malaise, often leading to initial misdiagnosis as bacterial pneumonia [5].

Chest computed tomography (CT) is pivotal in the evaluation of suspected OP, commonly demonstrating characteristic findings such as patchy peripheral or peribronchial consolidations, ground-glass opacities, and the classic “reverse halo” sign (also known as the atoll sign) [6,7]. While these radiologic features are not pathognomonic, they can strongly support the diagnosis and guide further diagnostic or therapeutic decisions, particularly in differentiating OP from other interstitial and infectious lung diseases [8]. Our study aimed to illustrate major imaging characteristics and patterns of OP.

METHODS

We conducted a prospective study including all patients hospitalized in the infectious disease department for OP between 2018 and 2024. Some patients underwent a chest X-ray, and others had a chest CT.

The diagnosis of OP was based on histopathology (lung biopsy). Cryptogenic origin was confirmed after negative immune serologies, bronchoalveolar lavage searching the infectious agents, environmental surveys, and a precise questionnaire about drug and toxic consumption.

RESULTS

In total, 35 cases of OP were identified, including 19 women and 16 men. The mean age of patients was 76±18 years. The most common symptoms were dyspnea, cough, anorexia, fever, and occasional hemoptysis. OP was cryptogenic in 12 cases, infectious in 14 cases, toxic in 2 cases, associated with systemic pathology in 4 cases, post post-therapy in 3 cases.

Chest X-ray showed multiple alveolar opacities, which were often migratory, in 20 cases, a heterogeneous excavated nodule in one case, and an invasive alveolar opacity in 14 cases (Figures 1 and 2).

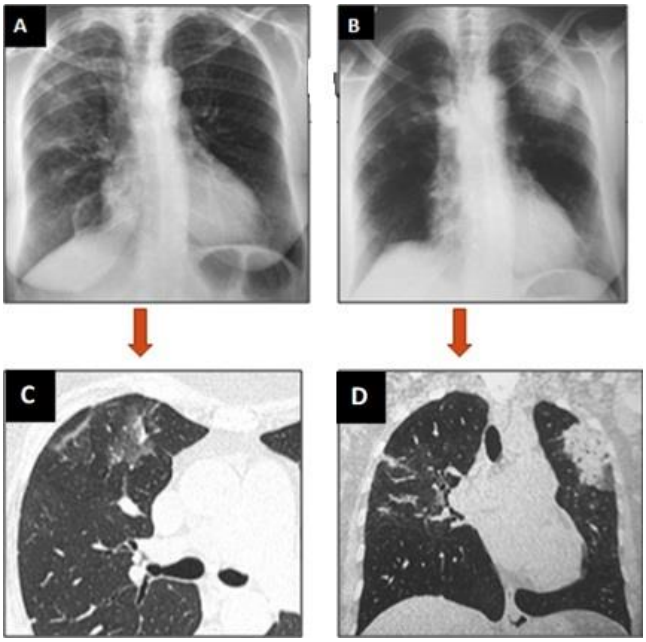

Figure 1: Patient's X-ray (A, B) and chest computed tomography scan (C, D) demonstrating ground-glass hyperdensity and migratory pulmonary condensations.

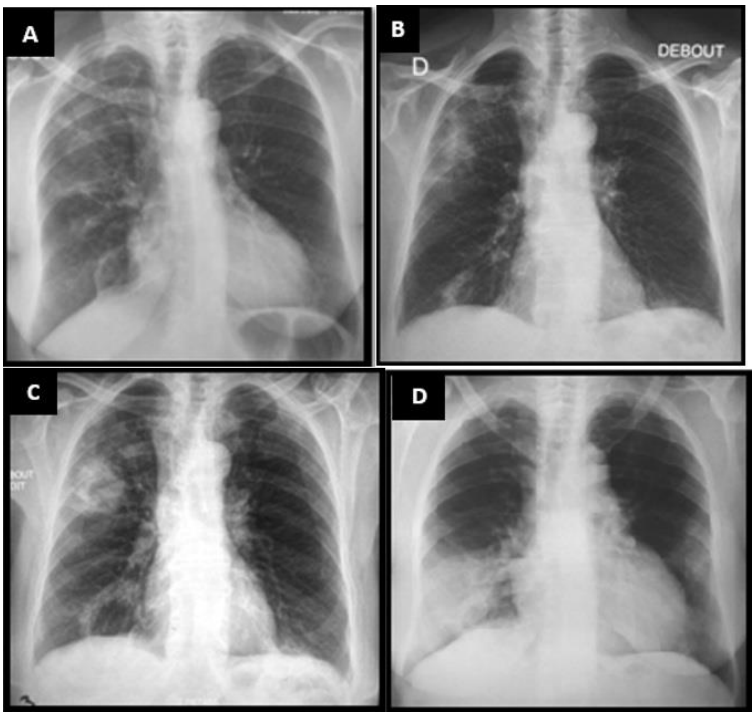

Figure 2: Different radiological patterns of organising pneumonia on chest X-ray: Migrating alveolar opacities (A, B), excavated nodular opacity (C), and invasive alveolar opacity (D)

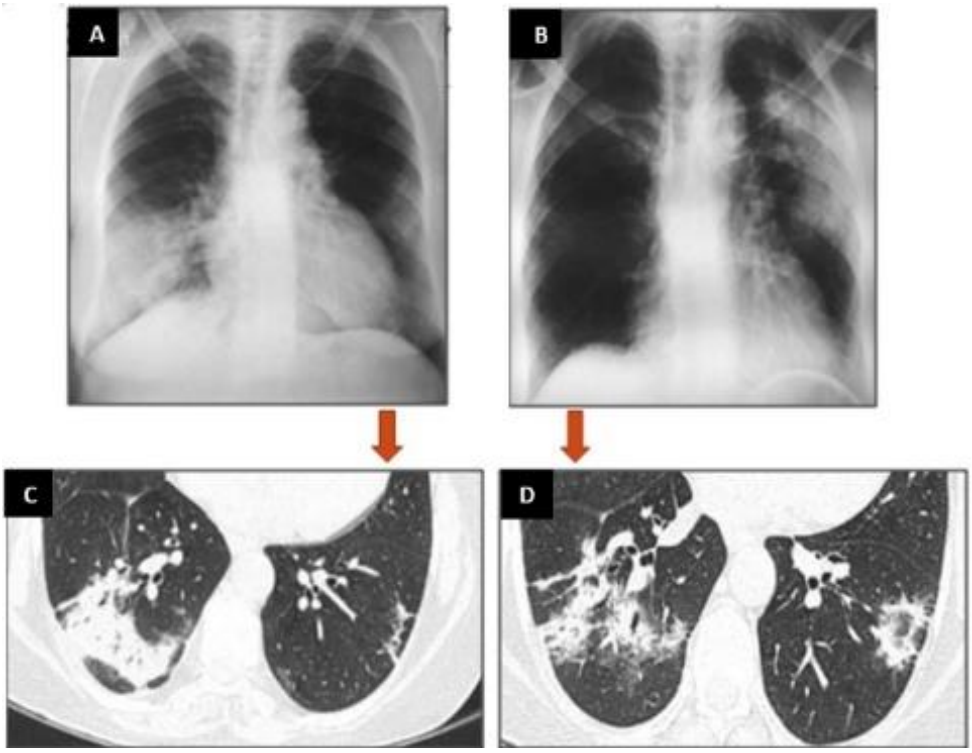

Figure 3: Chest X-ray and computed tomography scan demonstrating curved condensations and reversed halo sign.

The thoracic CT scan showed multifocal parenchymal condensations in 34% of the cases, single or multiple nodules in 11% of the cases, and "reversed halo sign" in 25% the cases (Figure 3).

Arciform condensations (40%), crazy paving (3%) (Figure 4), and fibrosis (6%) were reported. The ground-glass hyperdensity was the most common sign in 51% of cases.

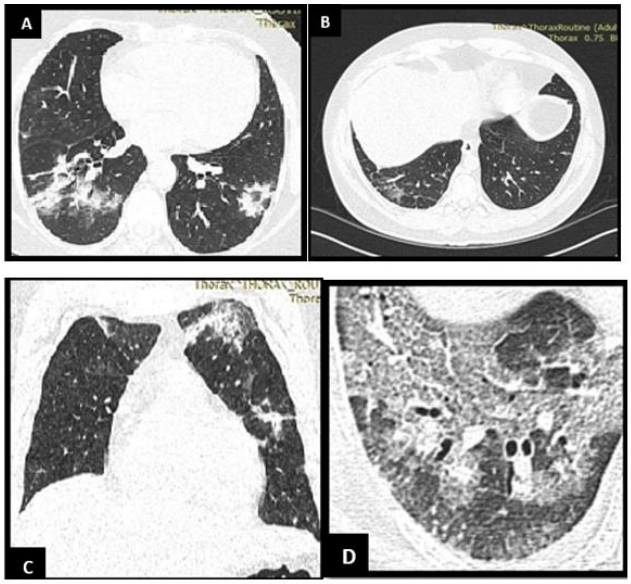

Figure 4: Different radiological patterns of organizing pneumonia on chest computed tomography scan: Multifocal parenchyma condensations (A), frosted glass hyperdensity (B), arciform condensations (C), and crazy paving (D)

Condensation's distribution was generally sub-pleural or peribronchial. The migratory aspect of the lesions and the regression under steroids (Figure 1) were specific and present in 49% of the cases.

DISCUSSION

Our study provides valuable insight into the clinical and radiological variability of organizing pneumonia, emphasizing the diagnostic importance of chest CT in conjunction with histopathological confirmation. The demographic and clinical characteristics of our cohort are consistent with previously published data, with a slight female predominance and a mean age above 70 years [1,4]. The most frequent symptoms, dyspnea, cough, anorexia, and fever, reflect the non-specific and subacute nature of OP, often leading to initial diagnostic confusion with infectious or neoplastic lung diseases [9]. In our series, COP accounted for 34% of cases, while the remaining forms were secondary to identifiable causes such as infections, systemic diseases, drugs, or post-therapy complications. This distribution aligns with previous reports indicating that secondary OP may be more frequent in hospital-based populations due to referral bias or underlying comorbidities [5].

Radiologically, chest X-ray findings in our cohort were variable and often misleading, underlining the limited specificity of plain radiography in OP. Migratory alveolar opacities were frequent, a hallmark feature that should raise suspicion of OP when present in a compatible clinical context [8]. However, the more heterogeneous presentations, including excavated nodules or invasive-looking consolidations, highlight the importance of advanced imaging.

High-resolution computed tomography was significantly more informative, revealing a broad spectrum of abnormalities. The most common findings were ground-glass opacities (51%), arciform/subpleural condensations (40%), and reversed halo sign (25%), consistent with classical imaging patterns described in OP [6,7]. Although the "crazy paving" pattern and fibrosis were less common in our study, their presence has been

previously documented, especially in chronic or evolving forms of OP [10].

The subpleural and peribronchial distribution lesions seen in our patients reflect the pathophysiological tendency of OP to follow the small airways and alveolar ducts. The migratory nature of lesions, observed in nearly half of the cases, as well as their favorable response to corticosteroids, are highly characteristic features of OP and can be diagnostically helpful in differentiating it from infections, malignancies, or vasculitides [2].

Histological confirmation through lung biopsy remains the gold standard for diagnosis, especially in atypical or non-responsive cases, as was the case for all patients in this cohort. The systematic exclusion of secondary causes, through immunologic testing, bronchoalveolar lavage, environmental and drug exposure history, allowed us to accurately distinguish COP from secondary forms [4].

CONCLUSION

OP is a heterogeneous condition with variable clinical and radiological presentations, often mimicking other pulmonary diseases. This study reinforces the value of chest CT scanning as an essential diagnostic tool in suspected OP in the emergency setting. The CT scan provides specific patterns that, in the right clinical context, can strongly suggest the diagnosis even before histopathological confirmation. However, biopsy remains indispensable, especially when radiologic features are atypical. A multidisciplinary approach is crucial for accurate diagnosis and appropriate management.

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