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Review Article

Imaging features of pulmonary infection in post renal transplant recipients: A review

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ABSTRACT

The renal transplant recipients are prone to the variety of infectious pathogens. The HRCT features could provide valuable information for differentiation diagnosis and treatment response. Findings in renal transplant recipients with manifestations of immune-compromised-related pulmonary diseases could be either pathogen-specific or -non-specific. It is particularly fundamental to recognize these imaging characteristics at suspicion of opportunistic infections in such patients. In this article, we present a review to refresh and update our knowledge of HRCT features of pulmonary infectious diseases in immune-compromised patients.

1. Introduction

Renal transplant recipients are susceptible to various infections because of depressed cellular and humoral immunity due to immunosuppressive therapy.[1] Most of these patients have associated disorders which will further suppress their immunity. Despite recent overall improvement in patient survival and the advances in the development of new antimicrobials, pneumonia continues to carry a high mortality and morbidity rate in immunocompromised patients.[2–5] There has been decline in the mortality of the renal transplant patients in the west,[6–11] but same does not hold true for Asian countries. It is difficult to estimate the epidemiology of infection in renal transplant because of lack of registry in tropical countries, but reported case series has shown that infections complicate the course of 50–75% of transplant recipients in tropical countries, with mortality ranging from 20 to 60%.[12,13] Unhygienic conditions, hot and humid climate, late presentation of the patient and lack of awareness are the some of the common causes of high infection rate in our region.

The causative agents of pulmonary infections in transplant recipients include bacteria, fungus, virus and many more, and their frequency of occurrence varies; however mixed infections, CMV and opportunistic infections are the commonest. Though uncommonly described in western literature, TB is the most common infection in the transplant patients in India, reflecting its high overall prevalence in the general population.[14] Initially the concept of time duration from transplantation was widely accepted, but nowadays the trend is changing. It is considered that any infection can occur at any time depending upon the degree of immunosuppression, not on the time duration.[15]

A specific diagnosis helps in early initiation of appropriate therapy in these patients. The radiologist plays an important role in defining the extent of the disease and recognizing any underlying pathology, thus narrowing the differentials in a case of pulmonary infection. Radiologist also helps in assessing the response to treatment and complications. The aim of this article is to give an overview of radiological (HRCT) findings of pulmonary infections in renal transplant recipient and thus helping the clinicians in effective management leading to better prognosis of these patients.

2. Imaging modalities

The imaging modalities useful for evaluation of the patients with suspected or known pulmonary infections are the chest radiography and high-resolution computed tomography (HRCT) of the chest.

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Chest radiography is the foremost modality for any suspected pulmonary infection, but it has its own limitations in detecting lung infiltrates.[16–18] It has also been estimated that up to 10% of immunocompromised patients with acute lung disease have normal chest radiography.[16]

High-resolution computed tomography (HRCT) is the most useful modality to detect early disease. It is superior in terms of sensitivity and specificity than conventional imaging, in high risk patients, especially in immunocompromised patients with poor treatment response or in complicated infections. In febrile neutropenia, Heussel et al. has shown that thin-section CT scan helps in early detection of pneumonia by 5 days and is sensitive enough to detect 20% more cases as compared to chest radiographs.[19]

HRCT chest scan can help in:

1. demonstrating abnormalities in patients with clinically suspected pulmonary disease but normal or questionable radiographic findings,
2. providing greater confidence in the diagnosis in patients with nonspecific radiographic findings,
3. determining the optimal type and site of biopsy

Certain CT findings help us in making confirmed diagnosis in some clinical conditions like septic emboli, tuberculosis, invasive aspergillosis, and *P carinii* pneumonia.[20,21]

Ultrasonography (USG) chest is not routinely used, but its use has increased in pulmonary infections mainly in emergency settings. USG gives excellent imaging and real time visualization of the pleural based pathology, mainly pleural effusion. Its use in quantifying, characterization of the fluid and associated consolidation is excellent. It also helps in aspirating pleural fluid with real time visualization mainly in minimal pleural fluid.

A meta-analysis showed that sensitivity and specificity of the microbiology of sputum range, respectively, from 15 to 100% and from 11 to 100%.[22] With such a high variability in sensitivity, specificity and delay in microbiological reports, the imaging findings are very crucial for early diagnosis and management of these patient. Thus clinical history with imaging features especially HRCT can narrow the diagnosis and help in improving the prognosis of these patients.

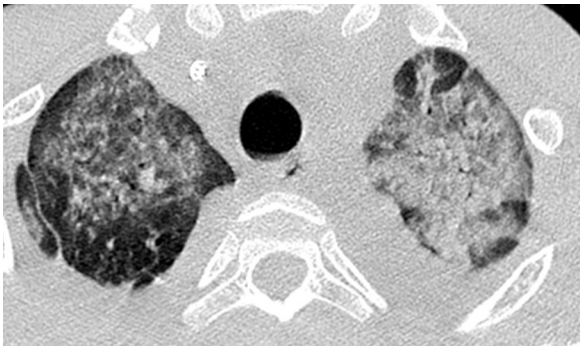

Fig. 1. HRCT shows diffuse ground glass opacities.

3. Radiological pattern

Identifying the correlation between radiological pattern and specific diseases helps in minimizing the differential diagnosis. Some of the radiological features are discussed in detail.

4. Ground glass opacities (GGO)

GGO is a common but non-specific finding. It represents filling of the alveolar spaces with pus, edema, hemorrhage, inflammation or thickening of the interstitial or alveolar walls. It can be secondary to drug-induced toxicity, alveolar hemorrhage, pulmonary edema, organizing pneumonia, or hypersensitivity. Pneumocystis, Mycoplasma and viral infections are the most common causes of GGO (Fig. 1). Incidence of pneumocystis infection has subsided after using empirical prophylaxis for each patient. Non-infectious causes can have similar radiological picture as infectious causes. Good clinical history and examination helps in such cases.

5. Consolidation

It can be differentiated from GGO by obscuration of underlying vessels. Causes of consolidation are almost similar to causes of GGO. Lobar air space or focal segmental consolidation is mostly seen in a community acquired bacterial pneumonia (Fig. 2a and b). Multifocal patchy consolidation can be seen in tuberculosis or

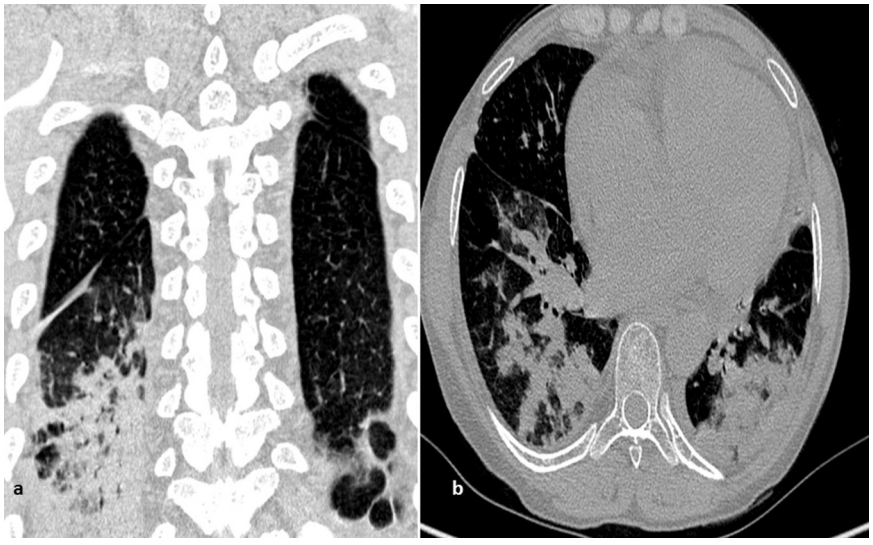

Fig. 2. HRCT shows (a) air space lobar consolidation in posterior segment of right lower lobe and (b) bronchopneumonia pattern in both lower lobes.