Pulmonary nocardiosis presenting as bilateral pneumonia in an immunocompetent patient – An unusual host response

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Citation

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Abstract

Pulmonary nocardiosis (PN) is an infrequent and severe infection due to Nocardia spp., which may behave as both opportunistic and primary pathogens. The presentation of a Nocardia infection is quite variable. We report a case of pulmonary nocardiosis in an immunocompetent 24-year-old female, who was initially treated with meropenem without response. A chest radiograph revealed bilateral irregular nodules (cavitating) with indistinct areas of haziness, prominent broncho-vascular markings and mild effusion. Nocardia spp. was isolated from pleural fluid. Pleural biopsy showed a granulomatous lesion with branching filamentous bacilli. She improved after trimethoprim-sulfamethoxazole was added along with meropenem. Our report emphasizes that a high level of clinical suspicion is required in patients without risk factors. In a patient with pneumonia if the lung infection responds poorly to antimicrobial therapy for community acquired pneumonia, pulmonary nocardiosis should be considered and a careful search for evidence of the organism is necessary. Furthermore our case emphasizes that although pulmonary nocardiosis is usually suppurative in nature, rarely a granulomatous response may occur.

INTRODUCTION

Pulmonary nocardiosis is an infrequent but severe infection that commonly presents as a subacute or chronic suppurative disease, mimicking a lung carcinoma, abscess or pulmonary tuberculosis (Gillespie, 2006). Nocardia spp. are aerobic, gram positive bacteria belonging to Actinomycetes and are responsible for localized or disseminated infection in animals or humans (Winn et al., 2006). In humans, N. asteroides complex is the predominant pathogen (Gillespie, 2006; Winn et al., 2006). Pulmonary infection is usually caused by N.asteroides (85%), where as N.brasiliensis causes cutaneous and subcutaneous abscess (Beaman and Beaman, 1994; Gillespie, 2006). Nocardia most often enters through the respiratory tract and produce infection in both immunocompromised and immunocompetent hosts. These organisms are found worldwide in soil, decaying vegetable matter and water, although they have the propensity to become airborne, particularly in dust particles (Gillespie, 2006). Inhalation of the organism is considered the most common route of entry.

CASE REPORT

A 24-year-old female was brought to the casualty with complaints of breathlessness, abdominal pain and vomiting for six days. She had productive cough with purulent sputum mixed with blood for 12 days. She was apparently normal two weeks back. There was no evidence of immunocompromised status. On admission, she was conscious, oriented, febrile and tachypneic. Her pulse rate was 126/min, temperature 39.1°C (102.4°F), respiratory rate 32/min, and blood pressure 110/80 mmHg. Chest auscultation revealed bilateral crepitations. Her hemoglobin was 8.6 g/dL and the leukocyte count 16,000 cells/ cu mm with 2% bands, 74% neutrophils and 24% lymphocytes. Microbiological examination of the sputum failed to identify a pathogen. A chest radiograph revealed bilateral irregular nodules (cavitating) with indistinct areas of haziness, prominent broncho-vascular markings and mild effusion (Figure 1). Abdominal examination was normal. Based on clinical, laboratory and radiological investigations a provisional diagnosis of community-acquired pneumonia was made and the patient was put on meropenem. Despite broad-spectrum antimicrobial therapy, her condition deteriorated. A pleural tap was done. Cytological smears of the pleural effusion demonstrated numerous neutrophils and reactive mesothelial cells. Microbiological examination of

the drained fluid revealed Gram positive filamentous and branching bacilli, which was weakly acid fast by modified Ziehl Neelsen staining, suggestive of Nocardia spp (Figure 2). Computed tomography of the chest revealed thickening of the pleura with effusion in the right thorax. A pleural biopsy was done which showed a granulomatous tissue (Figure 3). She improved after sulfamethoxazole (1600 mg/day)/ trimethoprim (320 mg/day) was added to the meropenem she was already receiving. Her fever gradually subsided after 3 days, and the pneumonia improved significantly after 5 days.

Figure 1

Figure 1 – Chest radiograph showing bilateral irregular nodules with indistinct areas of haziness, prominent broncho-vascular markings and mild effusion

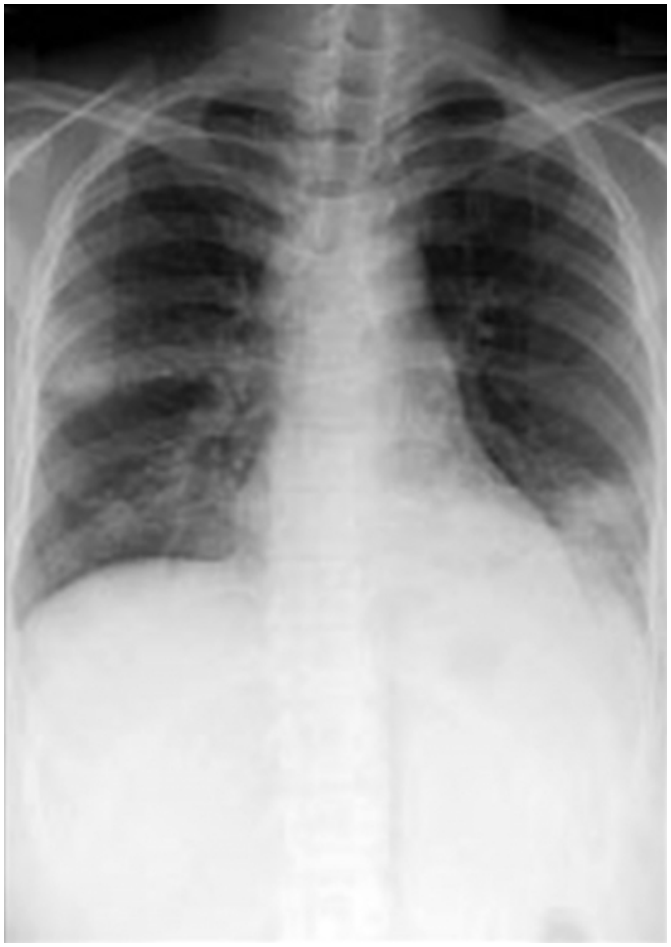


Figure 2

Figure 2 – Modified Ziehl Neelsen staining showing weakly acid fast branching, filamentous bacilli

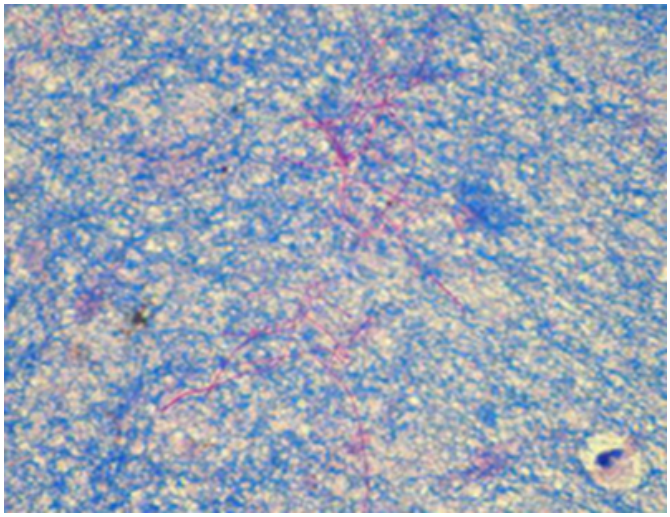
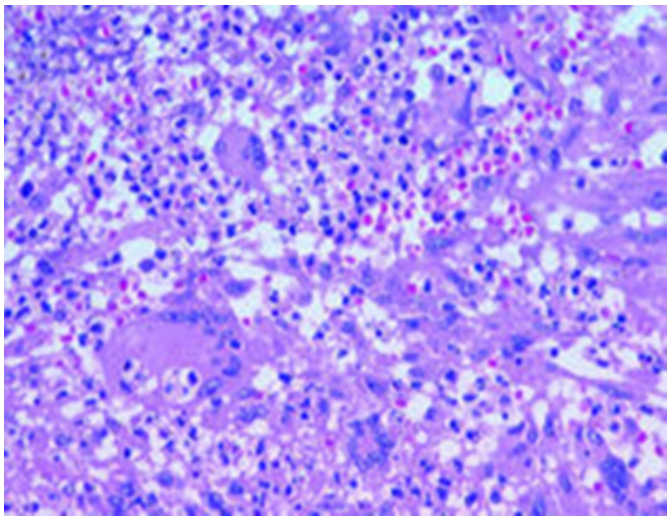


Figure 3

Figure 3 - (x 400) Haematoxylin and eosin stain showing granulomatous tissue with massive infiltration of lymphocytes, neutrophils, epithelioid cells and occasional giant cells



DISCUSSION

Nocardia is an uncommon pathogen in immunocompetent patients; however, it has been increasingly recognized as a significant opportunistic pathogen in immunocompromised individuals. Pulmonary disease is the predominant clinical presentation (more than 40% of reported cases), with almost 90% of these caused by members of N. asteroides complex (Beaman and Beaman, 1994).Pulmonary nocardiosis is usually suppurative in nature but granulomatous response as in our case or mixed response may occur. Chronic

granulomatous inflammation of the pleura caused by nocardia is rare, although up to a quarter of cases of pulmonary nocardiosis involve the pleura, often presenting as empyema (Scully, 1991; George et al., 2001). In immunocompetent subjects as in our case, the infection may run a chronic course and show a granulomatous reaction (Apisarnthanarak, 2002; Ben-Bassat, 1965; Rolfe et al., 1992). A careful differential diagnosis is required with the aid of histopathological staining because tuberculosis, fungal and bacterial infections, and mesothelioma also cause granulomatous lesions in the pleura. Clinical manifestations of established infection include endobronchial inflammatory masses, pneumonia, lung abscess, and cavitary disease with contiguous extension to surface and deep structures, including effusion and empyema. The clinical and radiological findings in nocardiosis are non-specific. Radiological manifestations include irregular nodules (usually cavitating when large) as in our case, reticulonodular or diffuse pneumonic infiltrates and pleural effusion. Uttamchandani et al. reported a series of 30 cases of pulmonary nocardiosis, noting that infiltrates in 23 patients were located in the upper lobe, mimicking tuberculosis (Uttamchandani et al., 1994). The importance of infection caused by nocardia is increasing because of the frequent use of immunosuppressive treatment and the emergence of AIDS. Kageyama et al found the most common predisposing factors for nocardia infection were treatment for systemic lupus erythematosus, cancer, diabetes, and AIDS (Kageyama et al., 2004). However, patients without obvious immune deficiency as in our case have also been reported (Smeal and Schenfeld, 1986). Some older series reported up to 50% of patients with nocardiosis had normal immunity (Palmer et al., 1974). Delayed diagnosis is not unusual. The organism grows very slowly in blood cultures and may be obvious after only 5 days, the point at which cultures are commonly reported as showing no growth and are discarded. Kontoyiannis et al recommended incubating blood 3 weeks if nocardia infection is suspected (Kontoyiannis et al., 1998). In a series of 35 cases of pulmonary nocardiosis, Hui et al. reported that the diagnosis was made based on sputum samples alone in half the cases (Hui et al., 2003). In 21 of the 35 cases reported in the above study, additional organisms were recovered as well, the most common one being Aspergillus (Hui et al., 2003). However in our case, S. pneumoniae ,and A. baumannii were isolated. Most patients are cured with appropriate antimicrobial therapy provided the diagnosis is made early and appropriate full- dose therapy is continued for an adequate period. In our case, once the diagnosis was made, the patient responded well to the addition of trimethoprim-sulfamethoxazole. Close collaboration between clinicians, medical microbiologists and pathologists is required for early diagnosis and therapy.

CONCLUSION

Pulmonary infection by this pathogen may thus be difficult to diagnose based on clinical and radiological features as these are not specific. Nocardiosis should always be considered in the differential diagnosis of indolent pulmonary disease even in immunocompetent patients. Our case illustrates the need for a high index of suspicion of pulmonary nocardiosis. Although pulmonary nocardiosis is usually suppurative in nature, an unusual granulomatous response may occur.

References

r-0. Apisarnthanarak A, Razavi B, Bailey T: Disseminated Nocardia asteroides presenting as pulmonary non-caseating granulomas in a patient with Waldenstrom macroglobulinemia. Infection; 2002; 30: 38-40.
r-1. Beaman BL, Beaman L: Nocardia species: host-parasite relationships. Clin Microbiol Rev; 1994; 7: 213-264.
r-2. Ben-Bassat M: Destructive granulomatous lesion of the lung due to Nocardia asteroides in a patient with leukemia. Dapim Refuiim; 1965; 24: 372-375.
r-3. George RB, Penn RL, Kinasewitz GT: Mycobacterial, fungal, actinomycotic, and nocardial infections of the pleura. Clin Chest Med; 1985; 6: 63-75.
r-4. Gillespie SH: Aerobic Actinomycetes. In: Gillespie SH, Hawkey PM, eds. Principles and Practice of Clinical Bacteriology, 2nd edn. West Sussex: John Wiley & Sons Ltd, 2006: 183-188.
r-5. Hui CH, Au VW, Rowland K, Slavotinek JP, Gordon DL: Pulmonary nocardiosis re-visited: experience of 35 patients at diagnosis. Respir Med; 2003; 97: 709-717.
r-6. Kageyama A, Yazawa K, Ishikawa J, Hotta K, Nishimura K, Mikami Y: Nocardial infections in Japan from 1992 to 2001, including the first report of infection by Nocardia transvalensis. Eur J Epidemiol; 2004; 19: 383-389.
r-7. Kontoyiannis DP, Ruoff K, Hooper DC: Nocardia bacteremia. Report of 4 cases and review of the literature. Medicine (Baltimore); 1998; 77: 255-267.
r-8. La CL, Battiloro R, Celano M: Nocardia pleural empyema complicating anti-Jo1 positive polymyositis during immunoglobulin and steroid therapy. J Rheumatol; 2001; 28: 215-217.
r-9. Palmer DL, Harvey RL, Wheeler JK: Diagnostic and therapeutic considerations in Nocardia asteroides infection. Medicine (Baltimore); 1974; 53: 391-401.
r-10. Rolfe MW, Strieter RM, Lynch JP: Nocardiosis. Semin Respir Med; 1992; 13: 216-233.
r-11. Scully RE, Mark EJ, McNeely WF: Case records of the Massachusetts General Hospital. Weekly clinicopathological exercises. Case 42-1991. A 63-year-old obese diabetic woman with a pleura-based mass in the right upper lobe. N.Engl.J Med; 1991; 325: 1155-1165.
r-12. Smeal WE, Schenfeld LA: Nocardiosis in the community hospital. Report of three cases. Postgrad Med;

1986; 79: 77-82.
r-13. Uttamchandani RB, Daikos GL, Reyes RR, Fischl MA, Dickinson GM, Yamaguchi E, Kramer MR: Nocardiosis in 30 patients with advanced human immunodeficiency virus infection: clinical features and outcome. Clin Infect Dis; 1994; 18: 348-353.
r-14. Winn WC, Allen SD, Janda WM, Koneman EW, Procop GW, Schreckenberger PC, Woods GL: Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 6th edn. Baltimore: Lippincott Williams & Wilkins, 2006.

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