Acute Necrotizing Pneumonia in a Previously Healthy Young Adult

(See pages 266–7 for the Photo Quiz)

Figure 1. Chest radiograph demonstrates diffuse alveolar lesions in the right lung with patchy infiltration of left lower lobe

Diagnosis: chronic granulomatous disease (CGD) presenting with severe pulmonary nocardiosis.

After 6 days of aerobic incubation, culture of a tissue sample obtained from the patient’s lung (figures 1 and 2) revealed rough, yellowish colonies. Modified acid-fast bacilli stain (figure 3) demonstrated filamentous, partially acid-fast, gram-positive bacteria with the characteristic branching and beaded appearance of Nocardia species (the isolate was further characterized as Nocardia asteroides). Because we were faced with the diagnosis of nocardiosis in a previously healthy young adult, we tested for CGD. The Nitroblue tetrazolium test (Orpagen Pharma) demonstrated <5% neutrophil color conversion. This was confirmed with flow cytometry, which failed to demonstrate any neutrophils with respiratory-burst activity, and the glucose-6-phosphate dehydrogenase level was normal (severe glucose-6-phosphate dehydrogenase deficiency can cause abnormal respiratory burst activity).

CGD is a rare phagocytic disorder in which phagocytic cells are unable to kill certain bacteria and fungi after ingesting them [1, 2]. The disease is mainly recognized in children; however, there are a number of reports describing its initial presentation in adults [3–5]. The specific defect in CGD is the absence of superoxide formation; that is, a defect in the nicotinamide adenine dinucleotide phosphate oxidase enzyme. The nicotinamide adenine dinucleotide phosphate oxidase enzyme is responsible for producing $O_2^{−}$, which is converted to a number of bactericidal oxidants, including hydrogen peroxide. Although the X-linked and autosomal recessive patterns of in-
inheritance have been well known for a considerable time, the specific mutations leading to CGD have only been described in recent years [6].

Because the host can use the endogenous hydrogen peroxide produced by infecting microorganisms (rather than those generated through the nicotinamide adenine dinucleotide phosphate oxidase enzyme), and because the catalase enzyme leads to the breakdown of hydrogen peroxide, the majority of organisms that cause the characteristic infections seen in CGD are catalase positive. Thus, the diagnosis of CGD should be considered in any patient with infection due to catalase-positive organisms that are either recurrent or in an unusual location [7]. In addition, there are certain infections that are rarely seen in immunocompetent individuals, and the occurrence of disease caused by any of the following microorganisms in a child or adult patient without any known immunodeficiency should lead the clinician to search for underlying CGD: Aspergillus species, Nocardia species, Burkholderia cepacia, Serratia marcescens, Chromobacterium violaceum, Staphylococcus aureus in the setting of a liver abscess, and the recently described Granulobacter bethesdensis [7, 8]. Interestingly, up to one-third of patients with CGD with nocardiosis in one series had concomitant fungal infections, whereas our patient had isolated Nocardia species infection [9].
Figure 3. Modified acid-fast bacilli stain of a culture sample obtained from lung tissue demonstrates partially acid-fast, gram-positive bacteria with characteristic branching and beaded appearance, compatible with *Nocardia* species.

Our patient was treated with a combination of intravenous imipenem and oral cotrimoxazole, which resulted in rapid improvement, and he was discharged after 2 weeks. After 3 months of treatment with oral cotrimoxazole, he was asymptomatic, and his chest radiograph findings had significantly improved. The plan of treatment was an additional 3 months of cotrimoxazole therapy, followed by prophylaxis with cotrimoxazole and itraconazole. IFN-γ has also been shown to be beneficial in patients with CGD; however, this agent was not used in treating our patient because of its high cost [10].

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References
