Intrathoracic Lymphadenopathy in Hospitalized Patients With Pneumococcal Pneumonia*

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Purpose: Pneumococcal pneumonia is the most common etiology for community-acquired pneumonia. The prevalence of lymphadenopathy seen on CT scans in these patients is uncertain. The purpose of this series was to assess the prevalence of intrathoracic lymphadenopathy in hospitalized patients with pneumococcal pneumonia.

Materials and methods: We retrospectively identified 35 hospitalized patients with pneumococcal pneumonia who had been evaluated with CT scanning between January 1998 and April 2002. There were 18 men and 17 women with a mean age of 56 years. The study inclusion criteria were as follows: blood culture positive for Streptococcus pneumoniae, clinical diagnosis of pneumonia, and chest CT scan. The study exclusion criteria were known causes of lymphadenopathy. Charts were reviewed for HIV status, smoking history, and comorbidities. CT scans were reviewed for the presence and degree of lymphadenopathy, and the characteristics of pneumonia. The number of enlarged lymph nodes was graded as few (one to two), moderate (three to five), or many (six or more). Pneumonias were described by location, the number of involved lobes, the presence of cavitation, and the presence of pleural effusion. Patients with different comorbidities and different imaging characteristics of pneumonia were compared.

Results: Among the 35 patients with pneumococcal pneumonia, intrathoracic lymphadenopathy was present on CT scans in 54% of patients (19 of 35 patients). The lymphadenopathy was ipsilateral to the pneumonia in 100% of patients (19 of 19 patients). One patient also had contralateral lymphadenopathy. The lymphadenopathy was graded as few in 37% of patients (7 of 19 patients), moderate in 37% of patients (7 of 19 patients), and many in 26% of patients (5 of 19 patients). The pneumonia was right-sided in 26% of patients (9 of 35 patients), left-sided in 17% of patients (6 of 35 patients), and bilateral in 57% of patients (20 of 35 patients). Comorbidities included the following: HIV infection (n = 15); smoking (n = 21); emphysema (n = 5); hepatitis C (n = 5); and diabetes (n = 3). The characteristics of pneumonia included the following: multilobar (n = 25); pleural effusion (n = 25); and cavitation (n = 5). The prevalence of lymphadenopathy according to comorbidities and characteristics of pneumonia ranged from 40 to 100%. None of the differences in prevalence of lymphadenopathy among the subgroups was statistically significant.

Conclusion: Lymphadenopathy is a common CT scan feature of pneumococcal pneumonia in hospitalized patients, in a variety of settings. Therefore, when a patient with pneumococcal pneumonia has lymphadenopathy seen on a CT scan, other etiologies for the lymphadenopathy need not be suspected.

Key words: CT; lymphadenopathy; pneumonia; Streptococcus pneumoniae

*S. pneumoniae is the most common pathogen causing pneumonia. The radiographic features of pneumococcal pneumonia have been described as lobar consolidation or parenchymal opacities, sometimes associated with a pleural effusion. Lymphadenopathy is not regarded as a typical chest radiographic feature of pneumococcal pneumonia.
pneumonia. Although bacterial lung abscess has been described to manifest with lymphadenopathy on chest radiographs, the presence of lymphadenopathy in a patient with parenchymal consolidation suggests alternative diagnoses including tuberculosis, fungal infection, and malignancy. CT is more sensitive in depicting lymphadenopathy than chest radiography. Hence, the presence of lymphadenopathy on CT suggests a broader spectrum of diagnostic possibilities, including bacterial infections. Empyema, anaerobic pneumonia, and bacterial pneumonia in HIV-infected patients have each been associated with lymphadenopathy on CT.

We have noted lymphadenopathy on CT in patients with pneumococcal pneumonia, in a variety of settings. Since lymphadenopathy has not been described, to our knowledge, as a feature of pneumococcal pneumonia, this finding presented a dilemma. The goal of the present study was to describe the prevalence and significance of lymphadenopathy on CT in a group of hospitalized patients with pneumococcal pneumonia.

**Materials and Methods**

We retrospectively identified 35 hospitalized patients with pneumococcal pneumonia from January 1998 to April 2002 at a large urban academic hospital (Montefiore Medical Center, Bronx, NY). Patients were included in the series if they had a blood culture positive for *S pneumoniae*, a clinical diagnosis of pneumonia, a medical chart available for review, and a chest CT within 30 days after the positive blood culture. Each chart was reviewed to confirm the diagnosis of pneumonia, as opposed to another source of infection with *S pneumoniae* that may have been responsible for the positive blood culture finding. The chart was also reviewed to exclude from the series all patients with comorbidities known to cause intrathoracic lymphadenopathy, such as malignancy, active tuberculosis, and sarcoidosis. Information was collected regarding the patients’ immune status, smoking history, underlying pulmonary disease, and other relevant medical information. The series comprised 18 men and 17 women with a mean age of 56 years (range, 22 to 91 years).

Two cardiothoracic radiologists and a senior radiology resident jointly reviewed the initial and follow-up CT scans, when available (n = 7), for each patient, with differences resolved by consensus. Each CT scan was evaluated for the number, size, and location of enlarged intrathoracic lymph nodes, using American Thoracic Society regional nodal stations. Lymph nodes were considered to be enlarged if they measured ≥ 1 cm on the short axis, or ≥ 1.5 cm for the subcarinal lymph nodes. Patients were grouped according to the number of enlarged lymph nodes as follows: none; few (one to two); moderate (three to five); or many (six or more). Lymphadenopathy was characterized as being ipsilateral or contralateral to the pneumonia. Subcarinal lymph nodes were considered to be ipsilateral. In patients with bilateral pneumonia, the lymphadenopathy, when present, was characterized as ipsilateral. Pneumonia was described according to laterality, the number of involved lobes, and for the presence or absence of cavitation and associated pleural effusion.

The CT scan techniques used varied. Slice thickness ranged from 3 to 10 mm. Thirty-one CT scans were unenhanced, and 11 were enhanced with IV contrast medium. Calculations were performed using the Fisher exact test. Institutional review board approval was obtained.

**Results**

Among the 35 patients with pneumococcal pneumonia, 54% of patients (19 of 35 patients) had intrathoracic lymphadenopathy seen on a CT scan. The lymphadenopathy was ipsilateral to the pneumonia in 100% of patients (19 of 19 patients). One patient also had contralateral lymphadenopathy. The mean size of the largest lymph node for the 19 patients with lymphadenopathy was 1.6 cm (range, 1 to 2.1 cm). The number of enlarged lymph nodes was graded as few in 37% of patients (7 of 19 patients), moderate in 37% of patients (7 of 19 patients), and many in 26% of patients (5 of 19 patients). Forty-three percent of patients (15 of 35 patients) were infected with HIV, and 60% of patients (21 of 35 patients) were smokers.

The pneumonia was right-sided in 26% of patients (9 of 35 patients), left-sided in 17% of patients (6 of 35 patients), and bilateral in 57% of patients (20 of 35 patients). The parenchymal disease was multilobar in 71% of patients (25 of 35 patients), and lobar or sublobar in 29% of patients (10 of 35 patients). Cavitation was present in 14% of patients (5 of 35 patients). Pleural effusions were present in 71% of patients (25 of 35 patients).

An analysis of the subgroups showed the prevalence of intrathoracic lymphadenopathy to range between 40% and 100%, depending on the risk factor and imaging pattern evaluated. Sixty-seven percent of HIV-infected patients (10 of 15 patients) had lymphadenopathy (Fig 1) compared with 45% of HIV-negative patients (9 of 20 patients) (Fig 2). Sixty-two percent of smokers (13 of 21 patients) had lymphadenopathy compared with 43% of nonsmokers (6 of 14 patients) (Fig 3). Lymphadenopathy was present in 100% of patients with diabetes (3 of 3 patients), in 80% of those with hepatitis C infection (4 of 5 patients), in 75% of patients with a history of tuberculosis (6 of 8 patients), and in 40% of patients with emphysema (2 of 5 patients).

Sixty percent of patients with multilobar pneumonia (15 of 25 patients) had lymphadenopathy compared with 40% of patients who had pneumonia (4 of 10 patients) that was lobar or sublobar. Eighty percent of patients with cavitation (4 of 5 patients) (Fig 4) had lymphadenopathy compared with 50% of patients without cavitation (15 of 30 patients). Forty-eight percent of patients with pleural effusions (12 of 25 patients) had lymphadenopathy compared with...
70% of patients without pleural effusion (7 of 10 patients). None of these differences reached statistical significance.

Follow-up CT scans were available for 7 patients. Four of these patients had intrathoracic lymphadenopathy seen on the initial CT scan. The follow-up CT scan demonstrated a decrease in the size and/or number of enlarged lymph nodes in all 4 patients.

**Discussion**

The present series demonstrates that intrathoracic lymphadenopathy is a common CT scan feature of pneumococcal pneumonia in hospitalized patients, and was present in 54% of the overall study population (19 of 34 patients). To the best of our knowledge, lymphadenopathy has not been previously described as a frequent manifestation of pneumococcal pneumonia. The dearth of literature describing the CT scan finding of lymphadenopathy in patients with pneumococcal pneumonia is surprising, given the fact that *S. pneumoniae* is the most common pathogen causing community-acquired pneumonia.1

The classic chest radiographic appearances of pneumococcal pneumonia have been described as sublobar, lobar, or multilobar opacities, often homogeneous with air-bronchograms, and a lower lobe predominance.1,3 Irregular linear interstitial opacities may also be present.4 Pleural effusions are common. Severe atelectasis, cavitation, and lymphadenopathy are not typical.1,3,4 However, there have been studies3,5 suggesting that the presence of lymphadenopathy on a chest radiograph should prompt the consideration of diagnoses other than pneumonia, such as malignancy, tuberculosis, or fungal infection.

We found lymphadenopathy to be present in the majority of patients in this series and was common in every analyzed subgroup. Depending on the setting, the prevalence of lymphadenopathy ranged from 40 to 100%. Among the four patients with lymphadenopathy for whom follow-up CT scans were avail-
able, all showed a decrease in the size or number of enlarged intrathoracic lymph nodes. Although the numbers were small, this finding supports the relationship of the lymphadenopathy to the diagnosis of pneumococcal pneumonia.

Jasmer et al. described the etiologies of intrathoracic lymphadenopathy on the chest CT scan of HIV-infected patients. The most common diagnosis associated with lymphadenopathy was mycobacterial infection. Bacterial pneumonia, due to unspecified organisms, was second in frequency and lymphoma was third. In that series, 21% of patients with bacterial pneumonia (26 of 122 patients) had intrathoracic lymphadenopathy seen on chest CT scans. In the present series, we noted lymphadenopathy in 67% of HIV-infected patients (10 of 15 patients) with pneumococcal pneumonia. This discrepancy may be due to exclusive infection with S pneumonieae in the present series, which is in contrast to the various etiologies of bacterial pneumonia found in the series by Jasmer et al.,

to differences in disease severity, or to other unknown differences between the two study populations.
The limitations of this study include a relatively small sample size. A larger patient population may have allowed some of the differences among the subgroups to achieve statistical significance. In addition, our patient population included only bacteremic patients who had CT scans performed within 30 days after a positive blood culture finding, thus selecting for a group of patients with a greater severity of illness than the general population with community-acquired pneumonia. It has been estimated that positive blood culture findings identify only one in four patients with *S. pneumoniae* infection. Not all patients with pneumococcal pneumonia are bacteremic, and not all patients with pneumonia are evaluated with CT scanning during diagnosis, thus the prevalence of intrathoracic lymphadenopathy in a community setting may differ. Fraser et al. and Simberkoff et al. have reported that pneumococcal bacteremia is more likely to occur in patients with HIV than in the general hospitalized population. This may partially account for our study including proportionally more patients with HIV than are found in our local population.

In conclusion, although lymphadenopathy is generally not considered to be a feature of pneumococcal pneumonia, we noted lymphadenopathy on CT scans in the majority of our study population. Thus, we have shown that, in a variety of clinical settings, lymphadenopathy is a common CT scan feature of pneumococcal pneumonia in hospitalized patients.

**References**