Pneumonia among Travelers Returning from Abroad

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Background: Although respiratory tract infections represent a frequent cause of morbidity in travelers, and pneumonia a frequent cause of medical consultation among febrile travelers returning home, the etiologic spectrum of pneumonia in travelers has not been specifically studied.

Methods: We reviewed the medical charts of all travelers hospitalized during a 12-month period in our department with pneumonia after returning home.

Results: Seventeen patients (nine men, eight women, mean age 44 years, range 26 to 67 years) were included in this study. The etiology of pneumonia was established in 13 patients. Bacterial pneumonia was documented in 10 cases and was due to *Streptococcus pneumoniae* ($n = 2$), *Mycoplasma pneumoniae* ($n = 2$), *Legionella pneumophila* ($n = 1$), *Coxiella burnetti* ($n = 1$), *Leptospira* sp. ($n = 1$) or *Mycobacterium tuberculosis* ($n = 3$). Other etiologies included histoplasmosis, invasive schistosomiasis and dengue fever (one case each).

Conclusion: These results show the wide range of causes of pneumonia among travelers returning from abroad.

The coronavirus-induced severe acute respiratory syndrome (SARS) has focused attention on severe respiratory tract infections among returning travelers.

Pneumonia is a rare cause of health care-seeking among travelers. In a study of 838 sick French tourists in Nepal, the prevalence of respiratory tract infections was 17.55%, but pneumonia only accounted for 0.46% of consultations.[1]

Nevertheless, pneumonia is a frequent cause of fever among returning travelers. In an Australian study of 232 febrile travelers, lower respiratory tract infection was the second most common cause of fever after trips to tropical zones (24%), just after malaria (27%).[2] In a study of 195 febrile British travelers, respiratory tract infections represented the fourth most common cause of fever, after malaria, viral infections and gastrointestinal disorders.[3] Mortality from pneumonia among travelers is far from negligible; for example, it was estimated at 1% (3/309 deaths) of global mortality in a Canadian study.[4]

No previous studies have focused specifically on pneumonia among returning travelers, and the etiologic spectrum is thus unknown in this setting. The purpose of this study was to evaluate causes of pneumonia in a short series of hospitalized travelers returning from abroad and to discuss these etiologies.

Patients and Methods

We reviewed the medical files of all patients who had pneumonia on returning from abroad and who were admitted to the Infectious and Tropical Diseases Unit of Groupe Hospitalier Pitié-Salpêtrière, Paris, France, over a 12-month period, from August 2001 to July 2002. Patients were included if they were admitted for pneumonia less than 1 month after returning to France, whatever the purpose of the trip. The diagnosis of pneumonia was established if at least two of the following clinical criteria were present: fever >38.5°C, cough, expectoration and/or auscultatory abnormalities, together with compatible chest radiographic

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findings (alveolar condensation, interstitial syndrome or miliary abnormalities).

The following data were recorded for each patient: age, gender, country of birth, country of residence, co-morbidity (splenectomy, underlying respiratory disease, smoking, alcoholism, intravenous drug use, viral hepatitis, HIV seropositivity), the type of travel (destination, purpose, length of stay, type of accommodation, number of accompanying persons), and the interval between the beginning of the trip and both symptom onset and presentation. The following respiratory and extrarespiratory signs were recorded: cough, dyspnea, chest pain, expectoration, crepitations, ronchi, wheezing, pleural syndrome, arthralgias, general health impairment, and hepatic, gastrointestinal, neurologic, cutaneous, ophthalmologic or upper respiratory tract disorders. Biological data included blood cell counts, plasma ionogram, liver function tests, thin and thick blood smears, urinanalysis, and routine stool tests. These tests were done in every patient. In addition, serologic tests for *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, *Legionella pneumophila*, *Coxiella burnetti*, leptospirosis, brucellosis, dengue fever, typhoid fever, schistosomiasis and histoplasmosis were done according to clinical presentation and biological data. Viral testing was not done. The following radiographic abnormalities were recorded: alveolar or interstitial opacities, signs of bronchitis, and pleural effusion. All data were recorded in Microsoft software Excel and analyzed with SPSS 9.0.

Results

Seventeen patients (nine men and eight women) were included in this study. Twelve were born in France, four were immigrants from Africa (Algeria and Djibouti in one case each, Cameroun in two cases), and one was from Korea. All the patients lived in France, 15 for more than 10 years, one for 2 years and one for 4 years. The mean age was 44 years (range 26 to 67 years, standard deviation 12.73).

All patients had traveled abroad during the month preceding hospital admission, 10 (58.8%) to sub-Saharan Africa, one (5.9%) to Asia, two to South America (11.8%), and one each (5.9%) to French Polynesia, Mauritius, the French West Indies, and Spain. The mean duration of the stays was 26.4 days (2 to 120 days). Twenty-nine percent of the patients had traveled for more than 4 weeks. Thirteen patients (76.5%) had traveled as tourists, three for business, and one on a humanitarian mission. Most had traveled by air (88.2%), one by boat and one by road (5.9%). The accommodation consisted of airconditioned hotels in seven cases (41.2%), a local inhabitant's house in six cases (35.3%), a cruise ship in one case (5.9%), and nonurban accommodation in three cases (17.6%). Three patients traveled alone (17.6%).

Symptoms occurred during travel in nine cases (53%) and after return to France in eight cases (47%). Among the nine patients who developed symptoms during the trip, five (56%) had consulted a doctor in the country of travel. One patient required medical evacuation. The other eight patients developed symptoms a mean of 9 days (1 to 15 days) after their return. In one case, the symptoms occurred within 15 days after a short business trip in Burkina Faso, but the final diagnosis of tuberculosis was linked to a previous humanitarian mission in the Calcutta slums, India, 8 years before. One patient was HIV-infected but was not on antiretroviral therapy (CD4 cell count 116/mm^3, viral load 36,000 copies/mL); he was diagnosed with tuberculosis. The third patient with tuberculosis had a history of primary tuberculosis. Seven patients had no relevant medical history. Four patients smoked, and two of them had complications (chronic respiratory failure in one case, and chronic bronchitis in the other).

Thirteen patients were febrile. The mean body temperature at admission was 38.4°C (range 36.7°C to 39.7°C, standard deviation 1.07). Sixteen of the patients (94%) had both thoracic and extrathoracic signs. Cough, dyspnea, chest pain, expectoration and chills were observed in, respectively, 17 (100%), nine (52.9%), two (11.8%), three (17.6%) and 11 (64.7%) of our patients. Alveolar pneumonia was diagnosed in 11 patients, and interstitial pneumonia in two cases. Pleuritis was noted in two cases. Four patients (three with tuberculosis and one with histoplasmosis) had mediastinal opacities. None of the patients died, and no complications occurred after hospital admission. The mean duration of hospital stay was 6.4 days (range 2 to 15 days).

The cause of pneumonia was established in 13 patients (table). Bacterial pneumonia was documented in 10 cases, and involved *Streptococcus pneumoniae*, *Mycoplasma pneumoniae*, *Legionella pneumophila*, *Coxiella burnetti*, *Leptospira* sp. and *Mycobacterium tuberculosis*. "Exotic" causes consisted of histoplasmosis (return from South America), invasive schistosomiasis (return from Benin) and dengue fever (return from French West Indies) in one case each.

Discussion

These results show the wide range of causes of pneumonia among returning travelers. It is of note that an etiologic diagnosis was made in 13 (76.5%) of 17 patients. This high percentage is explained by the sole inclusion of hospitalized patients, the criteria for hospitalization being either a severe disease or an unexplained cause.

The range of etiologies is wider than in other studies, which were biased by the inclusion of febrile patients. In a study of 232 febrile travelers, influenza and bacterial pneumonia represented respectively 20% and 25% of the 56 respiratory admissions, but microbiological

Table Final Diagnoses in 17 Patients Returning from Travel with Pneumonia

Diagnosis	*Number*	*Deciding Factors (Including Destination of Travel)*
Bacterial pneumonia without microbiological documentation	4	French Polynesia (1), Mauritius (1), Mali (2)
Bacterial pneumonia with microbiological documentation	10	
Streptococcus pneumoniae	2	Sub-Saharan Africa (1) and Spain (1)—Blood cultures positive
Mycoplasma pneumoniae	2	Sub-Saharan Africa (2)—seroconversion
Legionella pneumophila	1	Asia—Urinary test negative—serology positive
Coxiella burnetti	1	French Guyana—serology positive
Leptospira sp.	1	Sub-Saharan Africa—serology positive
Mycobacterium tuberculosis	3	Sub-Saharan Africa (3)[a]—2 bullous tuberculin skin test—1 sputum positive
Viral pneumonia	1	
Dengue fever	1	French West Indies—serology positive (IgM)
Fungal infections	1	
Histoplasma capsulatum	1	South America—exposure (cave), tomodensitometric aspect, response to antifungal treatment
Helminthic infections	1	
Invasive schistosomiasis	1	Sub-Saharan Africa—serology positive

[a]In one case, tuberculosis was linked to a previous humanitarian mission in the Calcutta slums, India, 8 years before.

documentation was only obtained in 50% of the 14 cases of bacterial pneumonia.[2] In a study of 195 febrile British travelers, pneumonias were diagnosed in eight patients, and comprised four cases of bronchopneumonia, three of pulmonary tuberculosis and one of atypical pneumonia.[3] In a prospective 2-year study of 281 adults living in Kenya for more than 3 months (both travelers and residents), Gram-positive bacteria (mainly *Streptococcus pneumoniae*) represented 47.4% of identified etiologic agents of pneumonia, followed by Gram-negative bacilli in 7.1% (*Salmonella* sp. in 2.1%), mycobacteria in 12.5%, *Mycoplasma pneumoniae* in 2.5%, and influenza virus in 5%.[5]

We observed only one case of Legionnaire's disease, although this is the type of pneumonia most frequently reported in travelers. Interestingly, 23% of cases of *Legionella pneumophila* pneumonia in the US and 45% of cases in the UK involve patients who have made a sea cruise in the 10 days preceding symptom onset.[6,7] Outbreaks of Legionnaire's disease are frequent after sea cruises.[8]

Although the risk of tuberculosis is lower, we observed three cases. This overrepresentation of tuberculosis in our population is explained by the inclusion of two migrants (one HIV-infected, one with a history of primary tuberculosis infection) in whom pulmonary tuberculosis was diagnosed shortly after their return from their country of origin. The third patient, a woman, was diagnosed with tuberculosis 8 years after a trip to India. She was included in our study because the symptoms started 15 days after her return from a professional trip to Burkina Faso. In a cohort of Dutch travelers, the estimated incidence rate of tuberculosis was 2.8 cases/1,000 personmonths among non-health care workers and 9.8 cases/1,000 personmonths among expatriate health care workers. According to the authors, the risk of latent *Mycobacterium tuberculosis* infections in this cohort of travelers (overall incidence rate = 3.5 cases/1,000 personmonths) was similar to that of hepatitis A in holidaymakers or of malaria in tourists to Kenya, and was several-fold higher than the incidence rates of most other preventable infections.[9] The risk of acquiring tuberculosis while traveling in a developing country is therefore high. It has thus been suggested that this risk is similar to that for the local population.[9] In addition, the risk of acquiring tuberculosis while traveling near a contagious patient varies according to the means of transportation. Cases of transmission during air travel have been reported, whereas the risk seems to be very low on train and bus journeys.[10,11] Thus, among 240 travelers exposed to a highly contagious patient during two long journeys in a train (29 h) and in a bus (5.5 h), only four passengers (2%) were shown to have become intradermic tuberculin positive. Two of these four patients had no other risk factors for tuberculin test conversion.[12]

We observed one case of Q fever (due to *Coxiella burnetti*). Other cases have been reported in travelers returning from sub-Saharan Africa, Syria, the Persian Gulf and French Guyana.[13]

We observed one case of dengue fever pneumonia. Dengue fever is frequent in travelers, accounting for 8% of causes of fever in a study of 232 febrile Australian travelers returning home.[2] In contrast, pulmonary manifestations of dengue fever are rare. A few cases of dengue fever associated with pleuropneumonia and hemoptysis revealing pulmonary hemorrhage have been reported.[14]

Other potential causes of viral pneumonia include Hantan virus, measles and influenza. Hantan virus is

cosmopolitan and can cause a variety of clinical manifestations. Hemorrhagic forms predominate in Asia, and renal forms in Europe. Recently, respiratory forms were described in the US (Hantan virus pulmonary syndrome, HPS).[15] Small outbreaks of influenza have been reported during boat cruises and after air travel.[16] The more recent report described an outbreak occurring on the same boat during three successive cruises to Australia and North America. It probably started during the first cruise, in a group of Australian travelers. Among the 1,284 passengers on board during the second cruise, 215 (17%) described acute respiratory signs, and influenza virus was isolated from some. The boat staff probably comprised the reservoir, and could be a source of transmission to populations at risk, such as elderly people, in enclosed spaces.[17] The incidence of influenza in travelers is probably underestimated. It was recently estimated at 0.03/personmonth of travel in a cohort of 1,483 travelers returning home; in this study, seroconversion for influenza virus infection was demonstrated in 3% of the 1,483 travelers and in 23% of the 205 feverish travelers tested.[18] This diagnosis should therefore be considered in all febrile travelers, keeping in mind that the virus circulates mainly from May to September in the southern hemisphere. The coronavirus pneumonia pandemic has focused attention on travelers returning from endemic areas with fever and respiratory signs,[19] but our study took place before that period of time.

One of our patients probably acquired pulmonary histoplasmosis while visiting a cave in Colombia. *Histoplasma capsulatum* histoplasmosis is endemic in South and Central America, Africa and eastern Asia. Entry to a basement or cave may lead to a risk of exposure to bat faeces, and short exposure is sufficient for contraction of the disease. Outbreaks have been reported in groups of travelers, especially after underground expeditions, excavations, or simple passage through caves or tunnels housing bats, as recently described among 13 members of a trekking trip to Martinique (French West Indies).[20]

Other possible diagnoses in patients returning from the tropics with pulmonary symptoms include fungal infections (*Blastomyces dermatitides*, *Coccidioides immitis*, and *Paracoccidioidomycosis immitis*).[21] Helminthic infections can also cause respiratory symptoms, during the invasive phase of schistosomiasis, Loeffler's syndrome of ascaridiasis, ankylostomiasis and strongyloidiasis, and during the course of trichinosis, gnathostomiasis and toxocariasis.[22] Pulmonary symptoms occurred in 60% of 15 patients with acute schistosomiasis acquired in Mali.[23] In this Dutch cohort, schistosomiasis was mainly due to *Schistosoma mansoni*. It is noteworthy that the invasive stage of schistosomiasis is more often clinically relevant in patients with *Schistosoma japonicum* and, to a lesser extent, *Schistosoma mansoni* infection.[24] Protozoal diseases due to *Plasmodium falciparum* and *Entamoeba histolytica*, and infections with *Echinococcus granulosus*, *Dirofilaria immitis* or *Paragonimus westermanii*, are less likely to be complicated by pneumonia.[22]

Finally, beside an infectious origin, the possibility of pulmonary embolism must be taken into account in a returning traveler with pulmonary symptoms, even though the importance of the link between thrombosis and air travel is controversial.[25]

In conclusion, "exotic" causes of pneumonia in travelers are rare in comparison to common community-acquired infections and tuberculosis. Nevertheless, the increase in intercontinental air travel and the emergence of new respiratory diseases such as SARS may alter this situation.

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