A Small Outbreak of Pulmonary Tuberculosis in Non-close Contact Patrons of a Bar

Yoichi NAKAMURA, Yasushi OBASE, Naofumi SUYAMA*, Yoshitsugu MIYAZAKI, Hideaki OHNO, Mikio OKA, Mitsuyoshi TAKAHASHI** and Shigeru KOHNO

Abstract

Four habitual drinking and smoking patients with pulmonary tuberculosis who were thought to have had no contact with one another were admitted to our hospital. During admission, we found that they were regular visitors of the same bar. To investigate the possibility of outbreak, we analyzed the tuberculosis isolates from them by restriction fragment length polymorphism. Such analysis showed identical chromosomal DNA restriction patterns of these 4 culture isolates. We concluded that these patients were considered to represent a mini-outbreak of pulmonary tuberculosis, although there was little, if any, contact among them while in or out of the bar.

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Key words: outbreak, pulmonary tuberculosis, contact investigation

Introduction

Tuberculosis is one of the most serious infectious diseases of the lung. Data from the World Health Organization (WHO) indicate that there are about 7 million incident cases and 2 million deaths of tuberculosis annually worldwide, and the incidence of tuberculosis has increased recently in certain developed and developing countries (1–4). As tuberculosis often causes outbreaks even in developed countries, it is extremely important to survey individuals who have close contact with patients with tuberculosis to prevent transmission of the disease. Previous studies recommended the extension of screening for tuberculosis to include household contact and close friends, however, there is no clear definition of "close contact" (5, 6).

Recently, a number of outbreaks of tuberculosis were reported, which occurred after nonresidential exposure to index patients in bars, aircraft and churches (7–15). However, it is often difficult to confirm that an outbreak of tuberculosis occurred in such places because individuals who had contact with the index patient do not realize such contact. We describe an outbreak of pulmonary tuberculosis among very chance patrons of a bar. This outbreak illustrates the problem related to detection and control of tuberculosis outbreak.

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Case Report

Case 1

A 58-year-old doorman presented with a 6-month history of progressive general weakness and productive cough in December 1999. A chest X-ray film showed extensive bilateral infiltrates and cavities in both upper lobes (Fig. 1A; according to The Japanese Society for Tuberculosis Classification bI_3.) and the sputum smear was graded Gaffky 7. The patient had been admitted to our hospital with pulmonary tuberculosis from March to July 1997 and treated with 0.4 g of isoniazid, 0.45 g rifampicin, and 0.75 g ethambutol per day. During that admission, compliance with treatment was very good and sputum culture became negative. Accordingly, the patient was discharged from the hospital with the aim of treatment in the outpatient clinic. However, he did not visit the clinic after discharge and was lost to follow-up. Thus, first line anti-tuberculosis treatment was provided for only 4 months.

From the Second Department of Internal Medicine, Nagasaki University School of Medicine, Nagasaki, *the Nagasaki Municipal Medical Center, Nagasaki and **the Research Institute of Tuberculosis, Japan Anti-Tuberculosis Association, Tokyo

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Reprint requests should be addressed to Dr.Yoichi Nakamura, the Second Department of Internal Medicine, Nagasaki University School of Medicine, 1-7-1 Sakamoto, Nagasaki 852-8501.

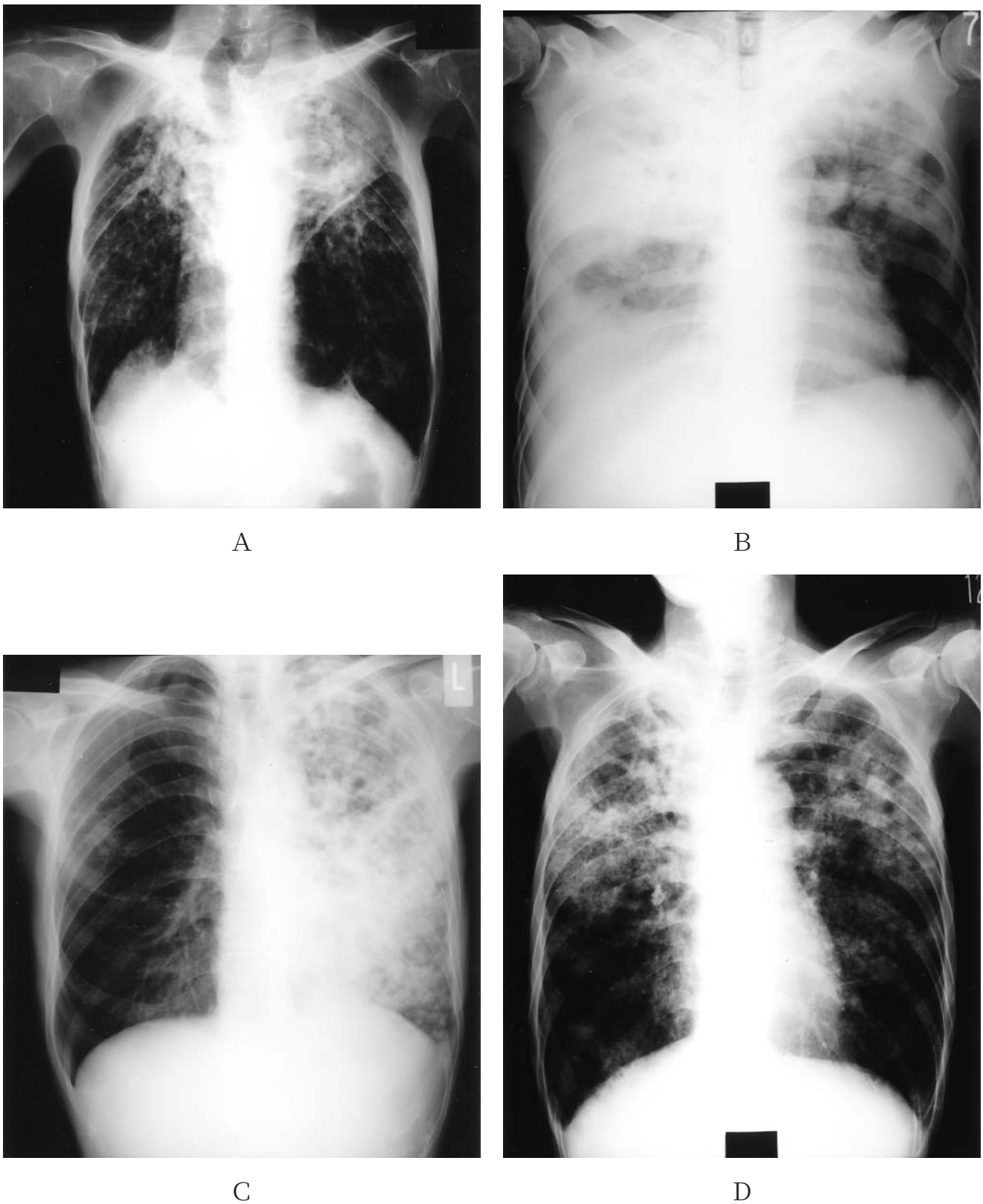

Figure 1. A: Chest X-ray film of Case 1 showing extensive bilateral infiltrates and cavities in both upper lobes. B: Case 2. Chest X-ray film showing extensive bilateral infiltrates in both upper lobes and a massive pleural effusion in the right lung field. C: Case 3. Chest X-ray film showing extensive infiltrates in the left lung field. D: Case 4. Chest X-ray film showing extensive bilateral infiltrates and cavities in both upper lobes.

Case 2

A 54-year-old unemployed man presented with a 2-week history of increasing dyspnea and productive cough in May 1999. A chest X-ray film showed extensive bilateral infiltrates in both upper lobes and a massive pleural effusion in the right lung field (Fig. 1B; according to The Japanese Society for Tuberculosis Classification bI_3.). A sputum smear was graded Gaffky 7.

Case 3

A 48-year-old carpenter presented with a 6-week history of increasing dyspnea, productive cough and left chest pain in November 1999. A chest X-ray film showed extensive infiltrates in the left lung field (Fig. 1C; according to The Japanese Society for Tuberculosis Classification bI_3.) and a sputum smear was graded Gaffky 2.

Case 4

A 61-year-old unemployed man presented with a 7-month history of progressive generalized weakness and productive cough in May 2000. A chest X-ray film showed extensive bilateral infiltrates and cavities in both upper lobes (Fig. 1D; according to The Japanese Society for Tuberculosis Classification bI_3.). A sputum smear was graded Gaffky 8.

The above four cases were usual drinkers [≥3 drinks/day or on average ≥5 drinks per drinking session (1 drink=one bottle of beer, glass of wine, or shot of spirits)] (16) and smoked more than one package per day. Case 2 had diabetes mellitus (hemoglobin A_{1C} was 6.8%.) and developed alcoholic hepatitis in 1992. None of the patients had any other immunological deficiency diseases.

The above four cases lived and worked in different parts of the same city and initially no close contact was reported among these patients. While hospitalized, however, further questioning indicated that all four were patrons of the same bar. At first, we thought that there was no possibility of an outbreak of tuberculosis among these patients because there was no history of close contact. All of them visited the same bar, one at a time, only three or four times per month and spent two hours or less in the bar. There was no conversation among them even if one of them happened to sit next to another patient. However, analysis of restriction fragment length polymorphism (RFLP), using IS6110 probe, showed that the four culture isolates from these patients had identical chromosomal DNA restriction patterns (Fig. 2). Accordingly, these four patients were considered as a mini outbreak of pulmonary tuberculosis. In clinical history, we considered Case 1 as the index patient in this outbreak. Contact investigations (tuberculin skin test and chest X-ray film) were performed in all employees of the bar, co-workers and family. We surveyed a total of 15 contacts, however, 8 of them refused tuberculin skin tests, chest X-ray films, or providing drinking history. The remaining 7 had negative skin tuberculin tests and had normal chest X-ray films, and none was a usual drinker. To date, all 7 remain free of pulmonary tuberculosis. In this outbreak, only 15 contacts underwent medical examinations, mainly because current law did not allow further surveillance in Japan. Mandatory surveillance is legal only if an employee in the bar had active tuberculosis.

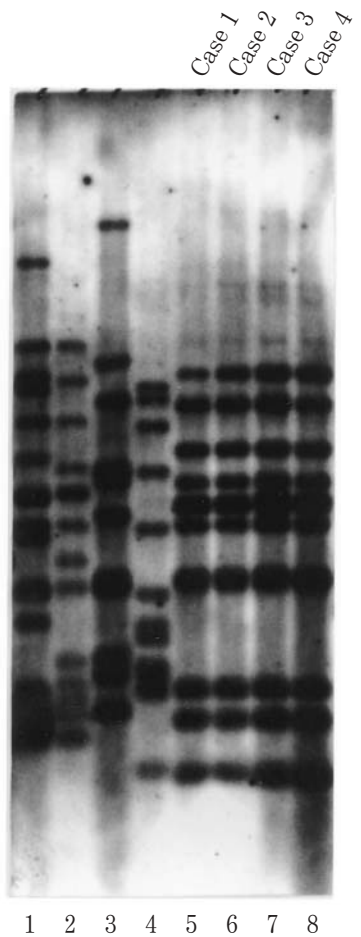

Figure 2. Fingerprints of isolates obtained by RFLP analysis, which revealed that all *M. tuberculosis* strains from the four TB patients were identical, while four other control strains of *M. tuberculosis* showed different patterns. Lanes 1–4 are control strains. Lanes 5–8 are isolate strains from patients 1–4, respectively.

Table 1 shows the clinical features of the four patients and the outcomes of treatments. All *M. tuberculosis* stains isolated from these patients showed no resistance to any of antituberculosis agents used. Case 3 died of massive hemoptysis due to tuberculosis. His primary focus of tuberculosis was located in the hilum of the left lung, thus we considered that it inflicted damaged the pulmonary artery. The others were treated successfully.

Discussion

An outbreak of tuberculosis caused by exogenous infection often occurs in groups or adjacent areas, even in developed countries. To prevent the spread of tuberculosis within the community as soon as possible, it is important to initiate

Table 1. Clinical Course of Each Patient

Case no.	Age/Sex	Grade of Gaffky	Treatment	Prognosis
1	58/M	7	HRE for 7 months HR for 5 months	alive
2	54/M	7	HRSZ for 2 months HRS for 1 month HR for 9 months	alive
3	48/M	2	HRE for 3 months	deceased
4	61/M	8	HREZ for 2 months HRE for 10 months	alive

HR: 0.4 g isoniazid+0.45 g rifampicin, HRE: HR+0.75 g ethambutol, HRS: HR+1.0 g streptomycin, HREZ: HRE+1.2 g pyrazinamide, HRSZ: HRS+1.2 g pyrazinamide.

surveillance for tuberculosis particularly in individuals with a history of close contact to infected persons to find and treat those who have acquired the disease, in addition to hospitalization of the index patient to provide immediate treatment. On the other hand, there is no clear consensus on the exact definition of "close contact" with respect to the transmission of tuberculosis (5, 6). Therefore, contact investigation is practically conducted in those individuals who are part of a group such as immediate family members, office personnel, or students at school.

Recently, RFLP analysis has been used for the diagnosis of outbreaks of tuberculosis following exposure at bars (7–9), churches (10, 11), and aircrafts (12–15). However, it is impossible to investigate all people who have had contact with the index patient. Nevertheless, it is necessary to select as many as possible of these individuals for investigation.

Alcohol drinking and smoking contribute to an increased risk of pulmonary tuberculosis. Buskin et al (16) reported that the risk of acquiring tuberculosis is 2.6 times higher in smokers of 20 years or more compared with nonsmokers, and is 2.0 times higher in alcohol drinkers compared with nondrinkers. They also demonstrated that even after adjustment for age and alcohol consumption, the risk was 1.3 times higher in current smokers who were heavy drinkers compared to none or light to moderate drinkers. However, in that study, the number of heavy drinkers who were nonsmokers was too small to allow analysis of smoking status within the separate categories of alcohol consumption. In addition, Rosenman et al (17) indicated that smoking and drinking were also significantly associated with the risk of tuberculosis; increased risk of tuberculosis was the highest in heavy drinkers (odds ratio=3.33). However, in these case-referred studies, no distinction could be made between endogenous reinfection and exogenous reinfection. With regard to exogenous reinfection and daily life habits, Kline and colleagues (9) reported the results of screening an outbreak of tuberculosis among regular patrons of a neighborhood bar. In their report, the index patient infected 41 cases of 97 contacts, resulting in 14 cases of active tuberculosis and 27 cases of infected but no disease. All 12 culture isolates tested in that study had the same chromosomal DNA restriction pattern. They reported that initial infection might progress to active disease more frequently in heavy alcohol users, and that the high infectivity of the index patient was the only factor that contributed to the high incidence of infection and active disease.

In the present series, all patients were usual drinkers and smokers, and had little or no contact with each other while in the bar. On the other hand, none of the immediate family members and close friends of each patient, and employees of the bar had pulmonary tuberculosis. Based on these results, we conclude that, to rule out and prevent outbreaks of tuberculosis, it is important to carry out contact investigation in heavy alcohol users/smokers who had been around the index patient even if they had only a few direct communications with the index patient.

References

1) Raviglione MC, Snider DE Jr, Kochi A. Global epidemiology of tuberculosis: morbidity and mortality of a worldwide epidemic. JAMA **273**: 220–226, 1995.
2) Dye C, Scheele S, Dolin P, Pathania V, Raviglione MC. Consensus statement. Global burden of tuberculosis: estimated incidence, prevalence, and mortality by country. WHO Global Surveillance and Monitoring Project. JAMA **282**: 677–686, 1999.
3) Netto EM, Dye C, Raviglione MC. Progress in global tuberculosis control 1995–1996, with emphasis on 22 high-incidence countries. Global Monitoring and Surveillance Project. Int J Tuberc Lung Dis **3**: 310–320, 1999.
4) Global tuberculosis control. WHO report, 2000. Geneva. WHO, 2000.
5) American Thoracic Society. Control of tuberculosis in the United States. Am Rev Respir Dis **146**: 1623–1633, 1992.
6) Freudenstein U, Monk P. Limitations of national guidelines in the management of an outbreak of tuberculosis. Commun Dis Public Health **3**: 184–187, 2000.
7) Ishibatake H, Onizuka R. A report of outbreaks of pulmonary tuberculosis in two bars. Kekkaku **72**: 623–628, 1997 (in Japanese, Abstract in English).
8) Bock NN, Mallory JP, Mobley N, DeVoe B, Taylor BB. Outbreak of tuberculosis associated with a floating card game in the rural south: lessons for tuberculosis contact investigations. Clin Infect Dis **27**: 1221–1226, 1998.
9) Kline SE, Hedemark LL, Davies SF. Outbreak of tuberculosis among

regular patrons of a neighborhood bar. N Engl J Med **333**: 222–227, 1995.
10) Cook SA, Blair I, Tyers M. Outbreak of tuberculosis associated with a church. Commun Dis Public Health **3**: 181–183, 2000.
11) Mangura BT, Napolitano EC, Passannante MR, McDonald RJ, Reichman LB. Mycobacterium tuberculosis miniepidemic in a church gospel choir. Chest **113**: 234–237, 1998.
12) Miller MA, Valway S, Onorato IM. Tuberculosis risk after exposure on airplanes. Tuber Lung Dis **77**: 414–419, 1996.
13) Kenyon TA, Valway SE, Ihle WW, Onorato IM, Castro KG. Transmission of multidrug-resistant Mycobacterium tuberculosis during a long airplane flight. N Engl J Med **334**: 933–938, 1996.
14) Exposure of passengers and flight crew to Mycobacterium tuberculosis on Commercial Aircraft, 1992–1995. MMWR Morb Mortal Wkly Rep **44**: 175, 1995.
15) Driver CR, Valway SE, Morgan WM, Onorato IM, Castro KG. Transmission of Mycobacterium tuberculosis associated with air travel. JAMA **272**: 1031–1035, 1994.
16) Buskin SE, Gale JL, Weiss NS, Nolan CM. Tuberculosis risk factors in adults in King County, Washington, 1988 through 1990. Am J Public Health **84**: 1750–1756, 1994.
17) Rosenman KD, Hall N. Occupational risk factors for developing tuberculosis. Am J Ind Med **30**: 148–154, 1996.