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## Brief report

## Infection control for extrapulmonary tuberculosis at a tertiary care cancer center



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## Key Words:

Extrapulmonary disease  
Airborne precautions  
Isolation failure rate

Extrapulmonary tuberculosis (TB) can be infectious when diagnostic or therapeutic procedures are performed on infected lesions. We retrospectively describe infection control and evaluate isolation failure rates during the manipulation of active extrapulmonary TB lesions at a comprehensive cancer center over a 5-year period. Among patients with a high suspicion of cancer, extrapulmonary TB was not suspected, and airborne precautions often were not used when manipulating infected lesions.

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People with extrapulmonary tuberculosis (TB) are usually not infectious; however, they can be infectious when they have concomitant pulmonary disease, extrapulmonary disease located in the oral cavity or the larynx, or extrapulmonary disease that includes an open abscess or lesion with a high concentration of organisms, particularly if the drainage is extensive or if the drainage fluid is aerosolized.<sup>1</sup> Epidemiologic data indicate that the manipulation of extrapulmonary lesions, such as tissue irrigation or autopsy, can result in nosocomial transmission of TB.<sup>2-4</sup> Thus, extrapulmonary TB can be infectious when diagnostic or therapeutic procedures are performed on infected lesions.

We recently recognized several failures in applying airborne precautions when manipulating open abscesses or lesions in patients with extrapulmonary TB. Here we review the infection control measures used for extrapulmonary TB disease at a tertiary care cancer center.

## METHODS

We retrospectively examined infection control and evaluated isolation failure rates during the manipulation of active extrapulmonary TB lesions at a comprehensive cancer center between January 2008 and December 2012. Extrapulmonary TB is defined as TB disease occurring in places other than the lungs.<sup>1</sup> In this study, patients were considered to have active extrapulmonary disease if *Mycobacterium tuberculosis* was isolated in cultures from any part

**Table 1**

Characteristics of the patients with active extrapulmonary TB disease (n = 14)

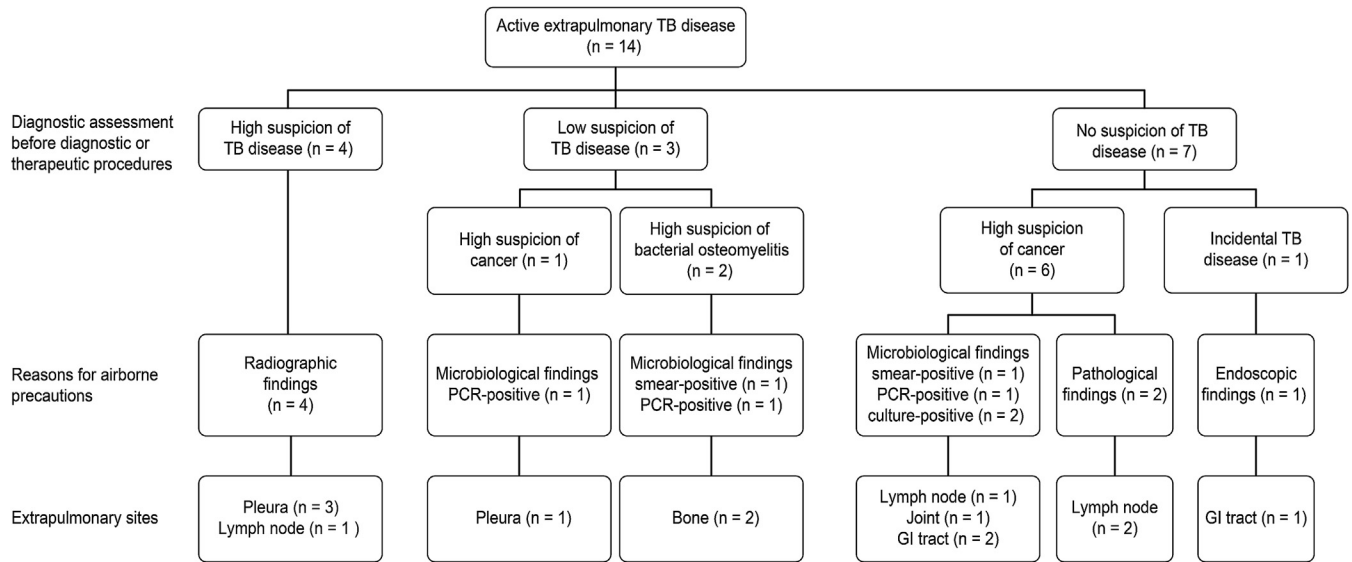
Characteristic	Value
Age, y, median (range)	65 (39-79)
Male/female ratio, n (%)	8 (57)/6 (43)
Previous TB, n (%)	2 (14)
Exposure to an individual with TB, n (%)	3 (21)
Homeless or shelter resident, n (%)	0 (0)
HIV infected, n (%)	0 (0)
Diabetes mellitus, n (%)	5 (36)
Neutropenia, n (%) <sup>*</sup>	2 (14)
Lymphocytopenia, n (%) <sup>*</sup>	4 (29)
Systemic steroid use, n (%) <sup>†</sup>	0 (0)
Underlying cancer, n (%)	7 (50)
Lung, n	2
Liver, n	1
Esophagus, n	1
Stomach, n	1
Colon/rectum, n	2
Symptoms, n (%)	
Fever (>37.8°C or 100°F)	3 (21)
Weight loss	7 (50)
Night sweats	3 (21)
Cough	5 (36)
Hemoptysis	1 (7)
Swollen lymph nodes	4 (29)
Abdominal pain	3 (21)
Back pain	1 (7)
Extrapulmonary sites, n (%)	
Pleura	4 (29)
Lymph nodes	4 (29)
Bone/joint	3 (21)
Gastrointestinal tract	3 (21)
Isolation failure cases	10 (71)

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Conflict of interest: None to report.

\* <500/μL at the time the samples that grew *M tuberculosis* were obtained.† >1 mg/kg/day of prednisone or an equivalent dose of another corticosteroid administered during the 7 days before the samples that grew *M tuberculosis* were obtained.



**Fig 1.** Flow diagram of the decision making process for instituting airborne precautions for active extrapulmonary TB, 2008-2012, Shizuoka Cancer Center. PCR, polymerase chain reaction.

of the body other than the lungs. Pleural TB was considered a form of extrapulmonary TB.

During the study period, the microbiology database was reviewed to identify 32 consecutive patients with culture-positive TB. *M tuberculosis* was isolated from respiratory samples (18 patients), nonrespiratory samples (11 patients), and both respiratory and nonrespiratory samples (3 patients); thus, 14 patients were identified with active extrapulmonary TB. Based on the patients' medical records, an isolation failure case was defined as a patient with extrapulmonary TB for whom airborne precautions were not instituted at the time of diagnostic or therapeutic procedures on infected lesions.

According to diagnostic evaluations performed before diagnostic or therapeutic procedures, the patients with active extrapulmonary TB were classified into 3 categories: high suspicion of TB, low suspicion of TB, and no suspicion of TB. Airborne precautions were instituted at the time of biopsy or surgery for the patients with high suspicion, but precautions were not instituted for those in the other 2 groups. For the patients with low suspicion, TB was included in the differential diagnosis of the extrapulmonary lesions, and a TB culture was scheduled before the procedure. For the patients with no suspicion, TB cultures were obtained during or after the procedure because of pus-like findings, endoscopic findings, or pathology results revealing epithelioid granulomas characteristic of TB.

At our institution, airborne precautions are considered when performing procedures on a lesion that is highly suspicious for extrapulmonary TB. Even after these procedures are performed, patients remain isolated until concurrent TB of the lungs, airway, or larynx is excluded. In the present study, 3 sputum specimens also were obtained from all patients with extrapulmonary TB.

## RESULTS

During the study period, active extrapulmonary TB was identified in 14 Japanese patients in the microbiology database. Table 1 summarizes the baseline patient characteristics. Seven patients were referred for a suspicious mass that was erroneously presumed to be cancer.

Isolation failure occurred in 10 of the 14 patients (71%). Fig 1 shows the decision making flow diagram used to select airborne precautions for active extrapulmonary TB. Four patients were highly suspicious for TB based on radiographic findings by a pulmonologist or radiologist, and 3 of these patients had pleural TB concurrent with pulmonary TB. Extrapulmonary TB was included in the differential diagnosis of the 3 patients with low suspicion for TB, although malignant pleural effusion or bacterial osteomyelitis was more strongly suspected in these patients. Among the 7 patients with no suspicion of TB, 6 were highly suspicious for cancer. Four patients were isolated because of a microbiological examination suggesting TB, and 2 patients were isolated based on a pathological examination. In 1 patient, an ileocecal TB lesion was discovered incidentally during diagnostic endoscopy for rectal cancer.

## DISCUSSION

At our referral cancer center, extrapulmonary disease was a frequent complication in patients with active *M tuberculosis* infection, and a substantial number of these patients were initially misdiagnosed with primary or metastatic cancer. Among the patients with a high suspicion of cancer, extrapulmonary TB was not suspected, and airborne precautions often were not used when manipulating infected lesions.

Our study suggests that most patients with only extrapulmonary TB are not isolated at the time of diagnostic or therapeutic procedures involving TB-infected lesions. Extrapulmonary TB often is not considered because it is a rare disease, and thus it is not included in the differential diagnosis.<sup>5</sup> In addition, at a referral cancer center, physicians may tend to evaluate patients exclusively from an oncologist's viewpoint. Conversely, the existence of concurrent pulmonary TB supported the early diagnosis of extrapulmonary TB. In our study, 3 of 4 patients with high suspicion for TB disease had concurrent pulmonary TB. According to Wisnivesky et al,<sup>6</sup> chest radiographic findings can accurately identify patients who require respiratory isolation.

A limitation of the present study is its descriptive study design. Although we described the difficulty of achieving infection control in patients with extrapulmonary TB, we did not identify the causes

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