1. Introduction

Tuberculosis is an ancient and emerging disease worldwide despite advances in the methods of diagnosis and therapy. Pulmonary tuberculosis is still the most common form but extrapulmonary tuberculosis also contributes to significant morbidity and mortality. Osteoarticular TB comprises 1–3% of all tuberculosis cases and 10–15% of all extrapulmonary tuberculosis cases. The most common symptom of osteoarticular TB is pain, and occasionally there is swelling of the joints. Symptoms are usually not obvious and do not often have a fever, so the disease are usually very severe when diagnosed. It is important to note that when spinal tuberculosis is diagnosed too slowly, it can cause serious and irreversible nerve damage, such as paraplegia.

According to the guidelines for the diagnosis and treatment of tuberculosis in Taiwan, short-course TB chemotherapy is the most important treatment factor for the treatment of spinal tuberculosis. It is not necessary to surgery, but surgery is required if (1) chemical treatment failure; 2) reduce spinal cord compression; and (3) when the spine is unstable.

Several studies have reported osteoarticular TB in a significant number of cases, but in Taiwan only few studies on spinal TB have been reported. Hence, we conducted a retrospective study to collect information on the clinical presentation, mycobacteriology and outcomes of patients with osteoarticular TB.

2. Method

From MacKay Memorial Hospital, January 2009 through December 2013, consecutive patients who were older than 18 years of age and registered with the Centers for Disease Control (Taiwan, R.O.C.) with a tentative diagnosis of osteoarticular TB were screened for inclusion in this study. These patients are divided into two groups: 65 years or older (elderly group) and less than 65 years old (adult group). The thoracic and lumbar spine (elderly 7, 38.9% vs. adult 9, 42.8%) was the most common involved site. Abscess formation occurred more frequently in the elderly group than adult group (72.2% vs. 38.1%; p = 0.033). The mean treatment duration of the elderly and adult groups were 11.4 months and 12.6 months, respectively (p = 0.129).

Conclusion: For geriatric patients with osteoarticular TB, compared to non-geriatric adults, the time from symptoms onset to diagnosis is longer, and abscess formation is more frequently seen. However, the treatment course, including drug resistance and complications, is similar. Osteoarticular TB should be considered for differential diagnosis in geriatric people with joint pain and local abscess formation in order to make early diagnosis and start treatment.
(3) bone tissue histopathology compatible with TB (e.g., granulomatous inflammation, caseous necrosis with Langhans giant cells, epithelioid cells, and the presence of lymphocytes or acid-fast bacilli); (4) tissue specimens TB polymerase chain reaction (PCR) positive finding. Patients were excluded if they were younger than 18 years of age.

We collected details of demographics, clinical features associated with medical illness, and past history of TB. We recorded data on laboratory tests, chest and bone imaging, histopathology, surgical record, acid-fast bacilli stain, culture, and PCR.

2.1. Statistical analysis

Statistical analyses were performed using SPSS (version 17.0; SPSS Inc., Chicago, IL, USA) for Windows. Two groups (elderly and adult) were compared using χ² tests for categorical data. All continuous data are expressed as mean ± standard deviation, normally distributed and analyzed using one-way analysis of variance. Categorical data are expressed as a percentage. A p value of < 0.05 was considered to be statistically significant.

3. Results

Between January 2009 and December 2013, a total of 39 patients older than 18 years of age and diagnosed with osteoarticular tuberculosis were included in this study. Of these patients, 18 belonged to elderly group and 21 belonged to adult group. The demographic data of these patients with osteoarticular tuberculosis are summarized in Table 1.

The mean age of the elderly and adult groups were 76.8 ± 7.8 years and 44.5 ± 11.4 years, respectively. The most common comorbidities in the elderly group were heart failure (77.8%), followed by diabetes mellitus (50%), chronic kidney disease (44.4%) and old cerebrovascular accident (CVA) (33.3%). In contrast, in the adult group, heart failure (23.8%) is most common.

The main clinical presentations, microbiological, histological and PCR findings of two groups are summarized in Table 2. We found that there was a statistically significant difference of the period of time from symptom onset to diagnosis, 35.56 ± 25.3 days in the elderly group and 19.76 ± 17.4 days in the adult group (p = 0.03). In addition, mortality was higher in the elderly group (16.7% vs. 0%; p = 0.05).

Twelve of 39 patients (30.8%) were positive for acid fast stain, but no statistically significant difference was noted between the elderly and adult groups. The positive TB PCR rate was 81.0% in the elderly group and 75.6% in the adult group. Granuloma formation occurred in 27 (69.2%) patients, but no statistically significant difference was noted between the elderly and adult groups. There was no significant difference between the two groups in positive TB PCR rate.

Image finding and location of osteoarticular tuberculosis are summarized in Table 3. The spine was the most common site (16, 41%), and the percentage of affected lumbar, thoracic spine, knee and ankle was 23%; 18, 23 and 13%, respectively. But there were no statistically differences between the elderly and adult groups. The majority of patients (90%) underwent surgery, however, there was no significance between the elderly and adult groups. The 21 patients (54%) had abscess formation. The elderly group had a positive TB PCR rate.

Body weight loss means 10% loss of previous body weight in 6 months. AFS = acid-fast stain; AFB = acid-fast bacillus; TB = tuberculosis; PCR = polymerase chain reaction.

### Table 1
Demographic characteristics of 39 osteoarticular tuberculosis patients.

<table>
<thead>
<tr>
<th>Co-morbidities</th>
<th>Elderly (%) (N = 18)</th>
<th>Adult (%) (N = 21)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignancy</td>
<td>4 (22.2%)</td>
<td>1 (4.8%)</td>
<td>0.104</td>
</tr>
<tr>
<td>Diabetes</td>
<td>9 (50%)</td>
<td>2 (9.5%)</td>
<td>0.005</td>
</tr>
<tr>
<td>COPD</td>
<td>4 (22.2%)</td>
<td>0 (0)</td>
<td>0.023</td>
</tr>
<tr>
<td>Heart failure</td>
<td>14 (77.8%)</td>
<td>5 (23.8%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>8 (44.4%)</td>
<td>1 (4.8%)</td>
<td>0.003</td>
</tr>
<tr>
<td>PAOD</td>
<td>3 (16.7%)</td>
<td>0 (0)</td>
<td>0.052</td>
</tr>
<tr>
<td>Liver cirrhosis</td>
<td>1 (5.6%)</td>
<td>0 (0)</td>
<td>0.274</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>0 (0)</td>
<td>2 (9.5%)</td>
<td>0.179</td>
</tr>
<tr>
<td>Old CVA</td>
<td>6 (33.3%)</td>
<td>1 (4.8%)</td>
<td>0.020</td>
</tr>
<tr>
<td>Old TB history</td>
<td>3 (16.7%)</td>
<td>2 (9.5%)</td>
<td>0.506</td>
</tr>
<tr>
<td>Hepatitis B/C</td>
<td>1 (5.6%)</td>
<td>4 (19.0%)</td>
<td>0.209</td>
</tr>
<tr>
<td>Steroid use</td>
<td>2 (11.1%)</td>
<td>5 (23.8%)</td>
<td>0.303</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Elderly (%) (N = 18)</th>
<th>Adult (%) (N = 21)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukocyte count (cells/μl, mean ± SD)</td>
<td>7256 ± 2033</td>
<td>7567 ± 3203</td>
<td>0.506</td>
</tr>
<tr>
<td>Hemoglobin (g/dl, mean ± SD)</td>
<td>11.0 ± 1.6</td>
<td>11.7 ± 1.9</td>
<td>0.453</td>
</tr>
<tr>
<td>C-reactive protein (mg/l, mean ± SD)</td>
<td>6.0 ± 5.7</td>
<td>3.4 ± 3.1</td>
<td>0.057</td>
</tr>
</tbody>
</table>

COPD = chronic obstructive pulmonary disease; PAOD = peripheral artery occlusion disease; HIV = human immunodeficiency virus; AIDS = acquired immunodeficiency syndrome; CVA = cerebrovascular accident; SD = standard deviation.

### Table 2
Clinical presentation and diagnostic specimens among the elderly and adult groups.

<table>
<thead>
<tr>
<th>Specimens</th>
<th>Elderly (%) (N = 18)</th>
<th>Adult (%) (N = 21)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>4 (22.2%)</td>
<td>7 (33.3%)</td>
<td>0.442</td>
</tr>
<tr>
<td>Bone pain</td>
<td>18 (100%)</td>
<td>21 (100%)</td>
<td></td>
</tr>
<tr>
<td>Limb weakness</td>
<td>6 (33.3%)</td>
<td>4 (19.0%)</td>
<td>0.308</td>
</tr>
<tr>
<td>Cough</td>
<td>2 (11.1%)</td>
<td>4 (19.0%)</td>
<td>0.4936</td>
</tr>
<tr>
<td>Body weight loss</td>
<td>3 (16.7%)</td>
<td>2 (9.5%)</td>
<td>0.506</td>
</tr>
<tr>
<td>Death</td>
<td>3 (16.7%)</td>
<td>0 (0)</td>
<td>0.05</td>
</tr>
<tr>
<td>Time to diagnosis (day, mean ± SD)</td>
<td>35.56 ± 25.3</td>
<td>19.76 ± 17.4</td>
<td>0.03</td>
</tr>
<tr>
<td>Positive AFS</td>
<td>5 (27.8%)</td>
<td>7 (33.3%)</td>
<td>0.496</td>
</tr>
<tr>
<td>Positive AFB culture</td>
<td>10 (55.6%)</td>
<td>12 (57.1%)</td>
<td>0.921</td>
</tr>
<tr>
<td>Positive TB PCR</td>
<td>18 (100%)</td>
<td>17 (81.0%)</td>
<td>0.051</td>
</tr>
<tr>
<td>Positive granuloma</td>
<td>13 (72.2%)</td>
<td>14 (66.7%)</td>
<td>0.708</td>
</tr>
</tbody>
</table>

Body weight loss means 10% loss of previous body weight in 6 months. AFS = acid-fast stain; AFB = acid-fast bacillus; TB = tuberculosis; PCR = polymerase chain reaction.
loss14 and this was clearly observed in our study. Neurological in-

Presented symptom, followed by weakness. Unlike pulmonary TB, 

That osteoarticular TB formed the third most common type of 

Often leads to delayed diagnosis of osteoarticular TB. Therefore, 

Elderly (%) (N = 18) Adult (%) (N = 21) p value

Thoracic 2 (11.1%) 5 (23.8%) 0.303

Lumbar 5 (27.8%) 4 (19.0%) 0.519

Hip 2 (11.1%) 0 (0) 0.117

Knee 4 (22.2%) 5 (23.8%) 0.907

Ankle 4 (22.2%) 1 (4.8%) 0.104

Other 1 (5.6%) 6 (28.5%) 0.016

Operation 17 (94.4%) 18 (85.7%) 0.424

Imaging findings

Abscess formation 13 (72.2%) 8 (38.1%) 0.033

Spine 6 (33.3%) 7 (33.3%) 0.231

Non-spine 7 (38.9%) 1 (4.8%) 0.019

Vertebra involved 7 (38.8%) 9 (42.8%) 0.521

≤ 3 vertebra 4 (22.2%) 5 (23.8%) 0.907

4–6 vertebrae 3 (16.6%) 4 (19.0%) 0.374

Cord compression 4 (22.2%) 5 (23.8%) 0.907

higher percentage of abscess formation than the adult group (p = 

Of the 39 patients with osteoarticular tuberculosis, five (12.8%) 

had concomitant pulmonary TB as indicated by AFS or AFB in the 

sputum. Two (5.1%) had concomitant lymph node TB. One (2.6%) 

had concomitant urogenital TB.

Treatment course are summarized in Table 4. There were no 

significant differences in mean treatment duration between the 

two groups (p = 0.129). Most patients completed the TB treatment 

course (83.3% elderly vs. 90.4% adult). The two groups of patients 

with a relative lower proportion of complications such as skin rash 

and hepatotoxicity caused by TB drugs.

4. Discussion

TB is one of most important infectious disease worldwide, 

especially in Asian and African countries.9 Yoon HJ et al., found out 

that osteoarticular TB formed the third most common type of 

extrapulmonary TB, after pleural and lymph node TB. A similar to other studies,2,13 back pain was the most commonly 

presented symptom, followed by weakness. Unlike pulmonary TB, 

osteoarticular TB is seldom accompanied by fever and body weight 

loss14 and this was clearly observed in our study. Neurological in-

volvement in spinal TB has been reported in 23–76% of patients, 

with differences in severity.13,15 In the present study, ten of 39 pa-


tients (25.6%) have limbs weakness (33.3% elderly vs. 19.0% adult).

In our study, ten of 39 patients (25.6%) have limbs weakness (33.3% elderly vs. 19.0% adult). 

In the present study, ten of 39 patients (25.6%) have limbs weakness (33.3% elderly vs. 19.0% adult).

in our study, we found that the average diagnosis time in the elderly 

group was longer than in the adult group (35.56 vs. 19.76 days; 

p = 0.03). This may explain the significant difference of abscess for-

mation between elderly group (thirteen patients (72.2%) and adult 

group (38.1%; p = 0.033) seen in the present study.

Osteoarticular TB often seed to marrow cavity occurring via 

hematogenous route. History of pulmonary disease was available in 

one third of cases reviewed by Watts and Lifeso.1 Jutte et al., found a 

concurrent pulmonary TB in 15% of cases.11,17 In our study, con-

current rate of pulmonary TB is 12.8% (5/39).

According to the Taiwan guidelines for TB diagnosis and treat-


treatment for osteoarticular TB is at least 9 months and the treat-

ment time for severe infections can be extended. According to the 

 medical records, the clinician determines the entire treatment 

schedule based on the clinician’s personal experience, the patient’s 

clinical symptoms, side effects and related blood or imaging exa-

minations.

The TB drugs treatment duration of average time is 11.7 months 

(6–18 months) in elderly group and 12.2 months (9–21 months) in 

adult group. Although the mean duration of treatment did not differ 

statistically between the two groups, it seemed that clinicians 

tended to have longer TB medications, particularly those with 

abscenses, which were treated for more than 9 months. Most clinicians 

choose a treatment period of 9 to 12 months. In the elderly group, a 

patient treated for 18 months because of rifampicin allergy. In the 

adult group, two patients were treated for 20 months and 21 

months, respectively, because these patients had RA and SLE, re-

spectively, and the immunosuppressive agents were used. The 

rheumatologist extended the TB treatment time.

Except for two patients who lost track of patients who did not 

complete treatment and 3 death patients, no recurrence or treat-

ment failure or other complications occurred in the remaining pa-


tients.

All patients completed the TB treatment course (83.3% elderly 

vs. 90.4% adult), except three elderly patients who die and two adult 

patients lose clinical follow up. In all patients who completed TB 

treatment, regardless of the length of treatment, no recurrence of 

tuberculosis or treatment failure or other complications occurred.

Though most patients suffered varying degree of gastroin-

testinal discomfort, most of which can endure or improved after 

use symptomatic drugs. There are a few complications. In elderly 

group, one had rifampin allergy (received other anti-TB drugs 18 

months); one suffered paradoxical tuberculosis reaction, need 

steroid and NSAID for symptomatic control. In addition, four pa-


tients in both groups developed hepatotoxicity caused by TB drugs 

of liver toxicity. (1 elderly vs. 3 adult; p value = 0.614).

Both groups were initially treated with standard treatment TB 

regimen (Isoniazid, Rifampicin, Pyrazinamide, Ethambutol or fixed-

dose formulations, rifampin 120 mg/isoniazid 50 mg/pyrazinamide 

300 mg (Rifater; sanofi-aventis). When the TB drug sensitivity test
for INH/RIF is positive, EMB (5, 27.8% vs. 8, 38.1%; p = 0.73) can be stop immediately and discontinuation of pyrazinamide is recommended after two months of treatment. This shows that most clinicians like to use EMB to increase the therapeutic effect, even though susceptibility to all TB drug is sensitive. Most patients (35, 89.7%) underwent surgery in two group for abscess drainage and pain relief.

In addition, two are AIDS patients, both of whom use Rifatubin and do not use Rifampicin. Considering that patients have been received highly active antiretroviral therapy, TB drugs (especially Rifampicin) have a considerable potential for drug-drug interactions.

There are several limitations in this study. First, it was a retrospective study, diminishing their evidence level. Although the case number was small, it may serve as a substantial reference value for further clinical practice and investigations.

In conclusion, the diagnosis of osteoarticular TB with abscess in the elderly is more difficult and often delayed, compared to non-elderly adults. Taiwan is a high prevalence areas of TB. Suspected clinical symptoms and follow-up radiology, microbiology and biopsy results are important for the diagnosis of TB. Early suspicion of osteoarticular TB in elderly who had abscess formation should be listed in the differential diagnosis, and should be kept in mind for management of these patients.

References