SPINAL TUBERCULOSIS: A RETROSPECTIVE CHART REVIEW

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ABSTRACT

Aims: Background and objectives: This study aimed to investigate the clinical characteristics, diagnostic methods, and therapeutic outcomes in patients with spinal tuberculosis (TB) in Southeastern Turkey

Methods: Patients diagnosed with spinal TB at Dicle University Hospital, Diyarbakir, Turkey, between October 2005 to December 2010 were enrolled in the study retrospectively. Patients were evaluated for the following: Clinical presentation, underlying diseases, laboratory results, imaging findings, medical therapies, and treatment outcomes

Results: A total of 23 patients including 14 men and 9 women with spinal TB, also known as Pott’s disease, were enrolled. The study subjects’ ages ranged from 17 to 69 years with a mean age of 38.4 years. Patients most often presented with back pain (69.5%, n=16) and fever (56.5%, n=13), and the most frequent physical finding was spinal tenderness (91.3%). Only 17.4% of the patients demonstrated neurological deficits and no paraplegia was observed. The time interval between onset of symptoms and treatment initiation was 3.2 months. Of all the patients, 47.8% exhibited Pott’s disease in the thoracolumbar region while 34.8% only had thoracic involvement. On average, 2.5 vertebrae were diseased in this cohort. Furthermore, 82.6% of the patients had paraspinal and psoas abscesses. All patients were treated with anti-TB therapy. However, 26.1% required additional surgery, and one patient with miliary TB died. The mean treatment course lasted for 12.3 months.

Conclusions: It may be possible to refine methods of spinal TB detection and diagnosis by studying thoracolumbar pathology in young adults with Pott’s disease in endemic countries such as Turkey. By studying the clinical progression of this disease, the delay between symptom onset and diagnosis may be decreased so that complications such as paraplegia and surgical interventions are avoided

Key words: Spinal tuberculosis, delay time, clinical characteristics, diagnostic methods.

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Introduction

Tuberculosis (TB) is the most common cause of spinal granulomatous bacterial infection and is associated with significant morbidity and mortality, especially in developing countries. Spinal TB, which is also called Pott’s disease, usually occurs secondarily to pulmonary TB as Mycobacterium tuberculosis spreads hematogenously or disseminates via the lymphatic circulation. For patients with extrapolunmonary TB, bone and joint infection is observed in 15-35% of patients, which accounts for 1-5% of all extrapolunmonary TB cases.

Patients with spinal TB present with various signs and symptoms including back or leg pain, kyphosis, palpable paraspinal masses, and neurological complications such as paraplegia if treatment is delayed. Constitutional symptoms such as night sweats and weight loss are not as commonly observed in Pott’s disease as compared to pulmonary TB. Despite the use of magnetic resonance imaging (MRI) and computed tomography (CT) the diagnosis of spinal TB remains difficult due to its nonspecific clinical presentation and slow progression. Due to the insidious nature of spinal TB there may be a delay of several months between the
onset of symptoms and the appropriate medical intervention\(^6\).

Pott’s disease is the most common manifestation of skeletal TB and is observed in 50% of osteoarticular TB cases\(^8,9\). However, spinal tuberculosis is not routinely observed and most studies regarding this disease are merely case reports. To our knowledge, this is the largest retrospective chart review for Pott’s disease that aimed to evaluate the clinical characteristics, diagnostic methods, and therapeutic outcomes in Southeastern Turkey.

**Methods**

This study was a retrospective chart review of patients diagnosed with spinal TB who were admitted to Diyarbakir Dicle University Hospital between October 2005 and December 2010. Diyarbakir Dicle University Hospital, located in Diyarbakir province, is the main center for the diagnosis, treatment, and follow-up for patients with spinal TB in Southeastern Turkey. Data obtained from this study reflect the clinical features of spinal TB in this area.

Spinal TB was diagnosed if at least one of the following criteria was met:

- Mycobacterium tuberculosis or acid-fast bacilli (AFB) in spinal tissue, paraspinal tissue, or a psoas abscess;
- Histopathological evidence of TB in spinal tissue including caseating granulomas with or without a positive AFB smear;
- Highly probable diagnosis of spinal TB supported by radiological findings via X-ray, CT, and MRI or clinical features correlating with spinal TB including a pronounced response to anti-TB therapy\(^6\).

General demographics were collected including age and sex. A comprehensive chart review was performed to determine how the disease presented and if there was a history of previous TB infection. Components of each patient’s clinical workup were also investigated and consisted of laboratory results, imaging results, histopathological findings, and microbiological results. Lastly, the quality of treatment was assessed by determining the interval of time between onset of symptoms and diagnosis, the types of treatment modalities that were utilized, and treatment outcomes.

All patients received standard anti-TB treatment including 25 mg/kg/day of pyrazinamide, 15 to 25 mg/kg/day of ethambutol, or 15 mg/kg/day of streptomycin for two months in the initial treatment phase. In addition, 5 mg/kg/day of isoniazid and 10 mg/kg/day of rifampicin were prescribed over 9 to 12 months or longer, until symptoms regressed and laboratory and radiological tests showed signs of resolution of disease\(^6\). Data entry and analysis were performed with SPSS 12.0 for Microsoft Windows (SPSS Inc., Chicago, IL, USA).

**Results**

There were 1,269 patients diagnosed with TB over a 6-year period in Diyarbakir Dicle University Hospital and 18.7% (n=237) had extrapulmonary TB. An even smaller group demonstrated Pott’s disease at 1.8% (n=23), which comprised the patient population for this study. The study population was 60.9% (n=14) male and 39.1% (n=9) were female with a mean age distribution of 38.4 ± 5.6 years. Diagnosis by microbiological findings was achieved in twelve patients (52.2%) (one patient by a positive AFB smear, five patients by a positive culture of M. tuberculosis, and six patients by both positive AFB and TB culture from spine or paraspinal site). Of the 12 patients with positive microbiological findings, five also had histological evidence (caseating granuloma). Six patients (26.1%) were diagnosed based on histological findings alone, and seven patients (30.4%) were diagnosed with clinical features and findings on imaging but were not confirmed by histological or microbiological studies.

The demographics and clinical characteristics of patients diagnosed with spinal TB are shown in Table 1. A minority of patients had a previous history of TB at 13.1% (n=3). There were several patients that demonstrated spinal TB and further organ system involvement including cervical lymphadenitis in 13.1% of patients, 4.3% of patients had miliary TB, and another 4.3% demonstrated pulmonary TB. Only three patients had a chronic underlying disease (type 2 diabetes, hepatitis B, and chronic renal failure). None of the patients was infected by HIV. The time interval between symptom onset and treatment initiation ranged from 1 to 7 months with a mean distribution of 3.2 ± 2.4 months. The most frequent symptoms were spinal tenderness at 91.3%, back pain at 69.5%, and fever at 56.5% of patients (Table 1). Patients that exhibited neurological deficits such as limb weakness and numbness without paraplegia amounted to 17.4%, and a palpable mass was detected in each case.
Laboratory tests were drawn from each subject upon admission. The mean serum white blood cell count was $8.229 \pm 3.113 \times 10^9/L$ and ranged from $3.128$ to $19.420 \times 10^9/L$. The mean C-reactive protein (CRP) level was averaged at $5.9 \pm 1.4 \text{ mg/L}$, and erythrocyte sedimentation rate (ESR) that had a mean level of $59.4 \pm 21.3 \text{ mm/hr}$. Other laboratory workup was not helpful.

Every subject received two types of imaging including a spinal X-ray in addition to a spinal MRI or CT. Radiological imaging showed multifocal lesions in 21 patients (91.3%), and the mean number of diseased vertebrae was $2.5 \pm 0.8$ (Figures 1,2). Patients that demonstrated thoracolumbar involvement amounted to eleven (47.8%) and eight (34.8%) only had thoracic spine involvement (Figures 1,2). The most commonly affected vertebra was T-12 in eight cases (34.8%), followed by L-1 in six cases (26.1%).

<table>
<thead>
<tr>
<th>Characteristics</th>
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<tr>
<td>Patient number</td>
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<tr>
<td>Sex</td>
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<tr>
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<td>14 (60.9%)</td>
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<tr>
<td>Female</td>
<td>9 (39.1%)</td>
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<tr>
<td>Duration of symptoms to diagnosis (mos.)</td>
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<tr>
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<tr>
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<td>13 (56.5%)</td>
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<tr>
<td>Leg pain</td>
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<tr>
<td>Neurological deficits</td>
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<tr>
<td>Limb weakness</td>
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<tr>
<td>Limb numbness</td>
<td>2 (8.7%)</td>
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<tr>
<td>General signs</td>
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<tr>
<td>Fever</td>
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<tr>
<td>Weight loss</td>
<td>12 (52.2%)</td>
</tr>
<tr>
<td>Fatigue</td>
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<tr>
<td>Other sites of tuberculosis</td>
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<td>Miliary TB</td>
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<tr>
<td>Pulmonary TB</td>
<td>1 (4.3%)</td>
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<tr>
<td>Location of spinal TB</td>
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<tr>
<td>Thoracic</td>
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<tr>
<td>Thoracolumbar</td>
<td>11 (47.8%)</td>
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<tr>
<td>Lumbar</td>
<td>6 (26.1%)</td>
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<tr>
<td>Laboratory</td>
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<tr>
<td>WBC ($\times 10^9/L$)</td>
<td>$8.229 \pm 3.113$</td>
</tr>
<tr>
<td>CRP (mg/L)</td>
<td>$5.9 \pm 1.4$</td>
</tr>
<tr>
<td>ESR (mm/hr)</td>
<td>$59.4 \pm 21.3$</td>
</tr>
<tr>
<td>Duration of treatment (months)</td>
<td>$11.4 \pm 3.7$</td>
</tr>
</tbody>
</table>

**Table 1:** The demographics and clinical characteristics of subjects with spinal TB.

*WBC: white blood cell count, CRP: C-reactive protein level, ESR: erythrocyte sedimentation rate.*

Laboratory tests were drawn from each subject upon admission. The mean serum white blood cell count was $8.229 \pm 3.113 \times 10^9/L$ and ranged from 3.128 to $19.420 \times 10^9/L$. The mean C-reactive protein (CRP) level was averaged at $5.9 \pm 1.4 \text{ mg/L}$, and erythrocyte sedimentation rate (ESR) that had a mean level of $59.4 \pm 21.3 \text{ mm/hr}$. Other laboratory workup was not helpful.

Every subject received two types of imaging including a spinal X-ray in addition to a spinal MRI or CT. Radiological imaging showed multifocal lesions in 21 patients (91.3%), and the mean number of diseased vertebrae was $2.5 \pm 0.8$ (Figures 1,2). Patients that demonstrated thoracolumbar involvement amounted to eleven (47.8%) and eight (34.8%) only had thoracic spine involvement (Figures 1,2). The most commonly affected vertebra was T-12 in eight cases (34.8%), followed by L-1 in six cases (26.1%).

**Fig. 1:** T1-weighted magnetic resonance image showing, narrowing of the intervertebral space of T10-11, destruction in intervertebral disc and end plates.

**Fig. 2:** Magnetic resonance image in a male patient with spinal tuberculosis. Narrowing of the intervertebral space of L 2-3, destruction in the intervertebral disc and end plates, heterogeneous contrast enhancement and edema are shown.

There were 82.6% of patients that had paraspinal and psoas abscesses. Three patients (13%) had kyphosis. All patients received medical therapy, but six patients (26.1%) required additional surgery mainly due to spinal cord compression, a spinal deformity, or the risk of spinal instability. One patient who had miliary TB died despite treatment. However, the remaining patients completed their medical therapy regimens, which lasted on
average for 12.3 ± 4.7 months. No serious side effects were noted that required the discontinuation of medical treatment.

Discussion

Pott’s disease is observed more commonly in developing nations where TB is endemic such as Turkey. In impoverished regions of developing countries spinal TB is more commonly observed in young adults, which contrasts with industrialized nations where spinal TB is diagnosed more often in older patients\(^{11-14}\). It has been reported that the average ages in which spinal TB is diagnosed ranges from 39 to 40 years\(^ {12-14}\). In a meta-analysis of the Turkish literature, Turgut at al. evaluated 694 spinal TB patients and found that their mean age was 32 years\(^7\). In this study, the mean age was 38 years, which corresponds with data from previous Turkish reports and studies performed in other developing countries.

There have been significant decreases in TB-associated complications ever since the Bacille-Calmette-Guerin mass vaccination program was started in 1953. Although, with sensitive imaging techniques such as MRI and CT that better detect spinal TB, there has been a recent increase in the number of diagnoses since 1990. In previous, larger studies in the world it was found that the proportion of spinal TB makes up 0.5-5.4% of all TB cases\(^ {6,15,16}\). Specifically from 2006 to 2009, the incidence of spinal TB was 2.6-3.3% in Turkey\(^7\). In our study, patients with spinal TB comprised 1.8% of all TB cases, which is compatible with these previous investigations.

In this study it was found that 13.1% of patients had a medical history of a prior TB diagnosis. In other investigations, a previous TB diagnosis was found in 7.2% to 100% of spinal TB patients\(^ {18-20}\). These differences in rates of prior TB diagnosis are due to geographic variations in TB prevalence and discrepancies in the general health among the different communities in which these studies took place. There have been reports that the rate of spinal TB with concomitant active pulmonary TB was 10% to 28%\(^ {12,22,23}\). However, in another study, the rate of concurrent spinal and active pulmonary TB was only reported to be 2.3%\(^7\).

In this study, only one patient (4.3%) had evidence of active pulmonary TB in addition to spinal TB. As such, active pulmonary TB should be suspected when spinal TB is diagnosed. In order to rule out the presence of concurrent active pulmonary TB, the patient must be subjected to the appropriate clinical workup, which includes deep-induced sputum testing for mycobacteria and chest radiograph. In this study TB lymphadenitis co-occurred with spinal TB even more frequently at 13.1%. For this reason a detailed clinical workup to rule out extrapulmonary TB in patients with spinal TB is highly recommended.

A number of studies have reported that ESR increases in more than 90% of patients diagnosed with spinal TB\(^ {13,14,24}\). Similarly, many studies indicated that over 85% of patients present with CRP positivity\(^ {13,14,26}\). In the present study, 89.7% had an elevated ESR and 82.4% tested positive for CRP, which is consistent with these previous studies. In contrast, Maeda et al. reported CRP positivity in only 26% of cases\(^ {17}\). However, this discrepancy may be explained by the older patient population that Maeda et al. investigated. From this and previous studies, CRP and ESR tests may be useful in diagnosing Pott’s disease in patients with spinal abnormalities in TB endemic areas.

A chronic tuberculosis infection can be manifested by vertebral involvement, which clinically presents as back and waist pain\(^ {6,13,14,16,25}\). Back pain was the most common symptom as 70-100% of patients in our and other studies expressed this complaint\(^ {6,13,14,25}\). On the other hand, constitutional symptoms are not commonly reported in comparison. In previous reports, the incidence of systemic symptoms such as fever, weight loss, and fatigue have been reported at 25% to 50%\(^ {13,14,24,25}\).

In the present study 50% of patients had systemic signs, which is in agreement with these prior investigations. Different studies revealed that neurological deficits occurred in 23-76% of patients with spinal TB\(^ {6,16,23,25,26}\). Neurological manifestations of spinal TB occurred in 17.4% of patients in our study, which is somewhat less than observed in these studies. However, these studies reported that such neurological complications occurred when there was a delay in the diagnosis of spinal TB ranging from 4.2 to 6.8 months. In all, these studies suggest that longer delays in diagnosing spinal TB are associated with increased vertebral damage and neurological deficits.

Typically more than one vertebra is involved in spinal TB. In the present study, the mean number of diseased vertebrae was 2.4 ± 0.8 with a range of 1 to 4 vertebral segments. In terms of the location of vertebral disease, Turgut’s study demonstrated...
that 55.8% of patients had thoracic disease, 25% of patients had lumbar involvement, 16.9% had thoracolumbar involvement, and 25% of patients had cervical involvement. Watts showed that in patients with spinal TB, 50% had thoracic disease, 25% had cervical disease, and 25% had lumbar disease.

In a study by Kontil et al. the diseased portions of the spine were thoracolumbar at 41%, thoracic at 36%, and lumbar at 23%. In our study 44.4% of the cases had thoracolumbar involvement, 33.3% had thoracic involvement, and 22.2% had lumbar spine involvement. Together these studies demonstrated that the thoracic and thoracolumbar vertebrae were most commonly involved in spinal TB with cervical disease being rarer. No cervical disease was found in our study.

Previous studies indicated that the mean delay to treatment and diagnosis for spinal TB ranged from 3 to 6 months. A similar figure was obtained in the present study, as the mean delay between symptom onset and diagnosis was 3.2 months. Although, there are other studies that have reported even longer delays from clinical presentation to the time of diagnosis. An Iranian study demonstrated that the mean time interval from symptom onset to health center presentation (patient delay) was 1.8 ± 1.1 and the delay between symptom onset to the attainment of a doctor’s appointment (doctor delay) was 6.8 ± 4.3 months. A Taiwanese study reported that delays to treatment varied widely from 15 days to 24 months. These studies revealed that there can be postponements that can last for years until spinal TB is diagnosed or treated in developing nations. Furthermore, the insidious nature of tuberculosis spondylitis contributes to delays in care as symptoms progress slowly and leads to devastating neurological deficits. It is imperative that health care providers are more cognizant of spinal TB in countries where TB is endemic so that patients who have early clinical and laboratory manifestations are quickly diagnosed to prevent future spinal deformities and health complications.

Medical management for spinal TB involves a drug regimen that lasts for 9 to 12 months. Patients are to take a drug combination comprised of isoniazid, rifampicin, pyrazinamide, and ethambutol for two months followed by four or more months of additional treatment as is necessary. In our study the median treatment duration lasted for 12.3 months. Indications for surgery included spinal deformities, neurological deficits, pseudarthrosis, chemotherapy failure, and continued pain. Surgical intervention may be limited to debridement and drainage or entail radical resection and grafting.

Anterior, posterior or a combination of both approaches may be utilized during surgery. In the present study, 26.1% of patients required surgery in addition to medical management. Specifically, anterior debridement and spinal fusion were performed in four patients with either progressively worsening spinal deformities (n=2) or neurological deficits (n=2).

Our study demonstrated that spinal TB affects younger adults and commonly presents as fevers and lower back pain. If Pott’s disease is suspected a clinical workup that includes ESR, CRP and white blood count is recommended in addition to spinal imaging, which may likely reveal lesions in the thoracolumbar region. In regions where TB is endemic such as Turkey, health care providers must have high clinical suspicion for this disease and tailor their medical management so to minimize misdiagnosis. By ensuring a relatively short period of time between the onset of symptoms and disease diagnosis, surgical intervention and complications such as paraplegia may be reduced.

References


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