Extrapulmonary Tuberculosis Presenting as Pott's Disease with Associated Paraesophageal Fistula

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Back pain is the third leading cause of immobility in patients aged 45 to 64 years and accounts for 30% to 50% of presenting complaints to outpatient primary care physicians.[1] Rarer etiologies of back pain are often overlooked due to the vast list of potential causes. One such rare etiology is spinal tuberculosis, which may not be suspected as a cause of back pain in nonendemic areas. Missing this diagnosis can lead to unnecessary or ineffective treatments along with severe physical complications. This article discusses the case of a man who presented with back pain of 9 months' duration that became increasingly more severe over time. Initially diagnosed with and treated for idiopathic esophageal rupture that was believed to have led to the development of a paraspinal abscess, he was subsequently diagnosed with spinal tuberculosis, or Pott's disease, after cultures for *Mycobacterium tuberculosis* were returned positive. The case is followed by a brief discussion of the diagnosis and management of spinal tuberculosis.

CASE PRESENTATION

Initial Presentation and Evaluation

A 28-year-old man presented to the emergency department of a local community hospital due to back pain. The patient had been in his usual state of health until he developed an insidious onset of progressive fatigue, malaise, and back pain over a 9-month period. He described the pain as dull, without radiation, and as localized to the midthoracic area without any exacerbating factors or associated symptoms. The patient self-treated the pain with over-the-counter medications, but the pain eventually became refractory to these medications, leading him to present to medical care. The patient had no significant past medical history and denied previous surgeries or recent trauma. Except for an 11-lb weight loss over the previous 4 months, his review of systems was negative. Routine blood work was normal, but computed tomography (CT) revealed a thoracic paraspinal abscess. He was subsequently transferred to the regional academic medical center for further management.

Admission and Further Evaluation

Upon admission, the patient's vital signs were normal, and physical examination, including a full neurologic evaluation, was significant only for tenderness along the left thoracic spine. A complete blood count and metabolic panel were unrevealing; however, gadolinium-enhanced magnetic resonance imaging (MRI) confirmed a paraspinal abscess adjacent to the thoracic spine with enhancement of T3 through T10 consistent with osteomyelitis (**Figure**). In addition, an esophageal fistula appeared to communicate with the abscess and was postulated to be the source of the spinal abscess. An interventional radiologist placed an accordion drain and evacuated the abscess, and aspirate was sent for stains and culture evaluation.

Diagnosis and Management

After a discussion of available options between the patient, orthopedic surgeons, and cardiothoracic surgeons, the patient declined an open surgical procedure. Consequently, a gastroenterologist débrided the esophageal opening of the fistula and closed the defect with several endoscopic clips. The cultures were positive

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for viridans streptococcus, and the patient was discharged on a 6-week course of piperacillin/tazobactam. The paraspinal abscess was thought to be secondary to an idiopathic esophageal rupture. However, 3 weeks after discharge, aspirate cultures returned positive for *M. tuberculosis*. The patient was contacted at home, where directly observed antituberculous drug therapy was initiated followed by screening of all close contacts. Upon further questioning, his risk factors for tuberculosis included being born and raised in an urban area, exposure to tuberculosis in a friend diagnosed 3 years prior, and having multiple sex partners as a risk factor for HIV infection. The patient responded well to therapy and had complete resolution of his back pain over the next 4 to 6 weeks. Reevaluation of the MRI images in conjunction with the final microbiology cultures resulted in the diagnosis of Pott's disease.

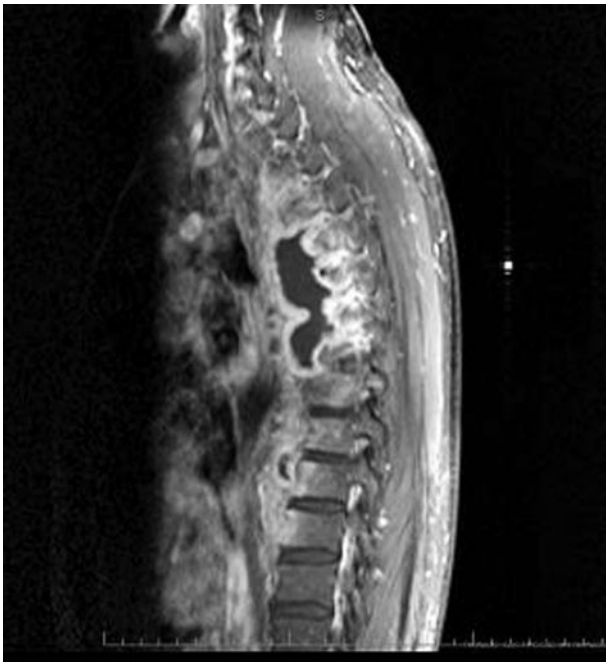

Figure. Gadolinium-enhanced magnetic resonance image showing a fluid-filled mass with rim enhancement and surrounding inflammation consistent with a paraspinal abscess.

EXTRAPULMONARY TUBERCULOSIS

Approximately one third of the world's population is infected with *M. tuberculosis,* and 8 million individuals develop active disease each year, resulting in 2 million deaths from tuberculosis annually.[2] In the United States, the prevalence of tuberculosis reached its nadir in the 1970s. The rising incidence during the late 1980s and early 1990s was primarily due to the HIV epidemic, and by the late 1990s, the incidence of tuberculosis was declining, reaching the 1970s level in 2005. This downward trend has been attributed to improved tuberculosis control programs created following increased funding.[3,4] However, while the rates of tuberculosis have declined nationally, tuberculosis continues to be diagnosed in urban regions at an alarming rate. This contrast was demonstrated by a study of metropolitan Atlanta during the years 1993 to 1997 in which tuberculosis was diagnosed at a significantly higher rate in the inner city population (14.1 cases/100,000 persons) as compared with the US national average (8.7 cases/100,000 persons). [5]

Active tuberculosis most commonly presents with pulmonary symptoms, but extrapulmonary tuberculosis may occur as a result of hematogenous and lymphatic spread of the mycobacterium.[6–8] Skeletal disease accounts for 10% to 20% of all tuberculosis infections.[9] The spine is most frequently involved, accounting for 50% of all cases of skeletal tuberculosis, 15% of extrapulmonary cases, and 3% to 5% of all cases of active tuberculosis.[9]

Pathogenesis

Pott's disease, or spinal tuberculosis, classically involves at least 2 adjacent vertebral bodies with associated breakdown of the intervertebral disc space.[9] The lesion in spinal tuberculosis is most often a mixture of osteomyelitis and arthritis. Mycobacteria spread from the surrounding tissue or through the blood supply to the disc space and are able to seed the metaphyses on the vertebral endplate, causing disc erosion and surrounding osteomyelitis. This infectious process is associated with an inflammatory reaction in the synovium, which results in the development of a neighboring effusion of fluid and fibrin precipitates. Granulation tissue is then able to erode through bone, leading to demineralization and caseating necrosis.[10] The infection most often involves the thoracic spine beginning in the anterior-inferior portion of a vertebral body and progressing to affect the intervertebral discs before moving on to adjacent vertebrae. Unlike osteomyelitis of the spine, tuberculous infections typically involve the entire vertebral body. Spinal fusion is a rare complication because the disc space is preserved until the final stages of destruction. Also, because the disc space is preserved, spinal tuberculosis can have the same appearance as a cancerous process on radiograph.[10]

Clinical Presentation

Typical manifestations of spinal tuberculosis are shown in **Table 1**.[10–14] The classic presentation of spinal tuberculosis is nonspecific back pain progressing over weeks to months to include muscle spasms, weight loss,

Table 1. Presenting Symptoms of Spinal Tuberculosis

Progressive localized back pain	Cold abscess
Muscle spasms/rigidity	Constitutional symptoms
Neurologic manifestations	Fever
Paresthesia	Night sweats
Sensory loss	Weight loss
Weakness	
Paraplegia (Pott's paraplegia)	

Table 2. Questions to Determine Tuberculosis Exposure

Is the patient an immigrant from a developing country, or has the patient visited or had guests from a country with a high prevalence of tuberculosis?
Is the patient homeless or has the patient spent any time in a correctional facility?
Is there a history of intravenous drug abuse or alcoholism?
Is there a history of immunosuppressed state (HIV infection, organ transplant, chemotherapy)?

Data from Gautam MP, Karki P, Rijal S, Singh R. Pott's spine and paraplegia. JNMA J Nepal Med Assoc 2005;44:106–15.

Table 3. Diagnostic Criteria for a Positive Tuberculin Skin Test

Findings Considered Positive in the Following Patients:		
> 5-mm Induration	**> 10-mm Induration**	**> 15-mm Induration**
Those infected with HIV	Recent immigrants from endemic region	Anyone without risk factors for tuberculosis
Immunosuppressed individuals, including those on the equivalent of prednisone 15 mg daily for > 1 mo	Employees and residents of nursing homes, prisons, homeless shelters	
Individuals with known contact with someone infected with tuberculosis	Intravenous drug user	

Adapted with permission from Blumberg HM, Leonard MK Jr, Jasmer RM. Update on the treatment of tuberculosis and latent tuberculosis infection [published erratum appears in JAMA 2005;294:182]. JAMA 2005;293:2781.

fever, and a cold abscess (swelling without erythema or increased heat). The presence of a cold abscess should greatly increase suspicion for musculoskeletal tuberculosis.[10,12] Back pain is the most common presenting symptom of spinal tuberculosis, followed by neurologic symptoms (eg, weakness, paresthesia) and constitutional symptoms (eg, fever, night sweats, weight loss).[13] A palpable spinous process known as a gibbus, or hump, can often be found on examination. This physical finding is produced by the anterior wedging and angulation of adjacent vertebral bodies that occur as the disc space deteriorates.[6] In a retrospective review of 709 cases of tuberculosis, 23 patients had spinal tuberculosis; of these, 100% had back pain, 29% had neurologic symptoms, and 48% had constitutional symptoms consistent with tuberculosis.[13] It should be noted that only one third of individuals who present with extrapulmonary tuberculosis will have a known history of pulmonary tuberculosis.[10]

Diagnosis

The diagnosis of spinal tuberculosis can be made by taking a detailed history, including an evaluation for risk factors for tuberculosis, performing a purified protein derivative (PPD) test, and obtaining a chest radiograph. The importance of a thorough history in a patient with suspected tuberculosis cannot be overstated. Routine questions used to assess a patient's risk for tuberculosis exposure are presented in **Table 2**.[14] Preexisting tuberculosis, reactivation of a latent infection, or rapid progression of a new infection are modes by which immunosuppressed patients can present with tuberculosis.[15] The PPD test has been the mainstay for diagnosis of tuberculosis exposure for the better part of the last century; however, this screening method is limited by reader variability, false-positive results due to cross-reactivity with bacille Calmette-Guérin vaccination or environmental mycobacteria, and false-negative results due to anergy in immunosuppressed individuals. **Table 3** includes the criteria for a positive PPD tuberculin skin test.

Skeletal tuberculosis should be considered in the differential diagnosis of a patient with signs or symptoms suggestive of tuberculosis and an indolent course of osteomyelitis involving the thoracic spine with negative bacterial cultures.[6] If suspicion of tuberculosis is high, an appropriate specimen should be sent for acid-fast staining, mycobacterial culture, cytology, and histology.[6,13] There is a need for more rapid diagnostic testing methods as culture results for tuberculosis take an average of 6 to 8 weeks to return. A study by Berk et al[16] showed that biopsy specimens can be tested by polymerase chain reaction (PCR) with high sensitivity (94.7%) and specificity (83.3%). PCR testing could be a useful tool in smear-negative patients when suspicion of tuberculosis is high. At present, the US Food and Drug Administration has approved PCR testing only for pulmonary specimens despite some promising results produced on extrapulmonary specimens.[14,16,17]

Although early lesions may not be seen, radiographic images are an important modality for the diagnosis of spinal tuberculosis as well as for monitoring response

to treatment. CT imaging can be helpful for investigating the degree of bone destruction and for visualizing soft tissue masses with rim enhancement. An additional benefit of CT is the ability to perform interventional biopsy and drainage.[6,13] In nonendemic regions, biopsy is needed to make the diagnosis and to assess the antibiotic sensitivities of the offending organism.[10] MRI is the superior approach for evaluating the extent of the infection and assessing for evidence of cord compression. While there is no formal recommended approach for follow-up imaging, both CT and MRI are useful to assess response to chemotherapy.[9,13,14]

Typical Complications

A tuberculous infection of the spine allowed to follow its natural course will progress to severe kyphosis and neurologic deficits.[14] Kyphosis occurs as a result of the condition's preference to affect the anterior portion of the vertebral body while typically sparing the posterior section.[10] Bony destruction leads to vertebral instability and eventual neurologic impairment ranging from numbness and paresthesia to frank paralysis.[14,18] In general, motor function is affected to a greater extent than sensory function since the anterior portion of the spine lies in closer proximity to the motor tracts.[14] Lack of awareness of tuberculosis in nonendemic areas along with the vague initial symptoms of tuberculosis often lead to a delay in diagnosis and patients presenting with advanced disease.[19] The development of an associated esophageal fistula in Pott's disease is exceedingly rare, with only one other reported case found by literature search; however, cases complicated by bronchial and colonic fistulas have been reported.[20–22]

Treatment

Since the advent of directly observed therapy, during which a health professional observes the consumption of the medication, the rates of successful treatment of tuberculosis have increased. A review of multiple studies that evaluated the treatment of pulmonary tuberculosis showed a completion rate of 61.4% for unsupervised therapy and an 85.7% average completion rate for directly observed therapy.[23] Antibiotic chemotherapy remains the basis for treatment in individuals with tuberculosis (**Table 4**). It was originally presumed that skeletal tuberculosis would require treatment for 12 to 18 months due to the poor penetration of the antituberculous agents into osseous structures; however, newer research suggests that skeletal tuberculosis may be amenable to shorter courses of treatment.[14] For an uncomplicated spinal tuberculosis infection, both the British and American Thoracic Societies recommend a 6-month course of treatment.[13] Treatment response can be assessed by radiography, improvement of back pain, and reversal of neurologic deficits, if present. If the patient is not fully responsive to therapy, the treatment course should be extended to 9 to 12 months.[6,15]

Treatment for individuals with drug-susceptible tuberculosis is comprised of 2 phases: a 2-month initiation or intensive phase with 4-drug therapy followed by a 4- to 7-month continuation or sterilization phase. Treatment regimens for all adults with previously untreated tuberculosis should consist of 2 months of therapy with isoniazid, rifampin, pyrazinamide, and ethambutol due to the frequency of isoniazid-resistant tuberculosis. After 2 months, culture results should be reviewed along with susceptibility testing. If drug susceptibility is confirmed, ethambutol and pyrazinamide can be discontinued while isoniazid and rifampin are continued for 4 months to complete a 6-month course. This course can be lengthened for an additional 3 months if the patient is deemed to be at high risk of relapse. Evidence of a cavitary lesion on chest radiograph and/or continued positive cultures after the initiation phase of treatment would also be a basis for the 9-month treatment regimen. If a poor response to chemotherapy is found, then consideration of patient noncompliance, drug malabsorption, and a drug-resistant infection should be investigated.[6,19]

Medical management is the mainstay of treatment for spinal tuberculosis, while the role of surgical intervention in spinal tuberculosis has been somewhat controversial. There are numerous case reports in which surgical intervention was found to increase the effectiveness of chemotherapy; conversely, there are studies that indicate that chemotherapy is superior to surgery.[9,13] The absolute indications for surgical intervention include progressive neurologic deficits related to kyphosis or bone fragments in the spinal canal, large abscess in a patient who has developed respiratory obstruction, a neurologic deficit that has worsened despite chemotherapy, pain refractory to conservative therapy, worsening kyphosis, or spinal instability despite appropriate treatment.[10,18] Placing the patient in an orthotic support device as adjuvant therapy also has provided some additional benefit to the treatment regimen.[14]

CONCLUSION

For decades, tuberculosis has been referred to as the "great masquerader" as it may mimic many other conditions leading to unnecessary or ineffective treatments. In this case, the patient presented with back pain, a nonspecific presenting complaint that has a wide range of causes. With a careful history, review of typical risk

Table 4. Drug Regimens for Culture-Positive Pulmonary Tuberculosis Caused by Drug-Susceptible Organisms

Initial Phase			Continuation Phase			Range of Total Doses (minimal duration)	Rating‡ (Evidence)	
Regimen	Drugs	Interval and Doses* (minimum duration)	Regimen	Drugs	Interval and Doses*† (minimum duration)		HIV–	HIV+
1	INH RIF PZA EMB	7 days/wk for 56 doses (8 wk) or 5 days/wk for 40 doses (8 wk)§	1a	INH/RIF	7 days/wk for 126 doses (18 wk) or 5 days/wk for 90 doses (18 wk)§	182–130 (26 wk)	A (I)	A (II)
			1b	INH/RIF	Twice weekly for 36 doses (18 wk)	92–76 (26 wk)	A (I)	A (II)‖
			1c¶	INH/RPT	Once weekly for 18 doses (18 wk)	74–58 (26 wk)	B (I)	E (I)
2	INH RIF PZA EMB	7 days/wk for 14 doses (2 wk), then twice weekly for 12 doses (6 wk) or 5 days/wk for 10 doses (2 wk),§ then twice weekly for 12 doses (6 wk)	2a	INH/RIF	Twice weekly for 36 doses (18 wk)	62–58 (26 wk)	A (II)	B (II)‖
			2b¶	INH/RPT	Once weekly for 18 doses (18 wk)	44–40 (26 wk)	B (I)	E (I)
3	INH RIF PZA EMB	3 times weekly for 24 doses (8 wk)	3a	INH/RIF	3 times weekly for 54 doses (18 wk)	78 (26 wk)	B (I)	B (II)
4	INH RIF EMB	7 days/wk for 56 doses (8 wk) or 5 days/wk for 40 doses (8 wk)§	4a	INH/RIF	7 days/wk for 217 doses (31 wk) or 5 days/wk for 155 doses (31 wk)§	273–195 (39 wk)	C (I)	C (II)
			4b	INH/RIF	Twice weekly for 62 doses (31 wk)	118–102 (39 wk)	C (I)	C (II)

Adapted with permission from Blumberg HM, Burman WJ, Chaisson RE, et al. American Thoracic Society/Centers for Disease Control and Prevention/Infectious Disease Society of America: treatment of tuberculosis. Am J Respir Crit Care Med 2003;167:605. © American Thoracic Society.

EMB = ethambutol; INH = isoniazid; PZA = pyrazinamide; RIF = rifampin; RPT = rifapentine.

*When directly observed therapy is used, drugs may be given 5 days/wk and the necessary number of doses adjusted accordingly. Although there are no studies that compare 5 with 7 daily doses, extensive experience indicates this would be an effective practice.

†Patients with cavitation on initial chest radiograph and positive cultures at completion of 2 months of therapy should receive a 7-month (31 wk; either 217 daily doses or 62 doses twice weekly) continuation phase.

‡Definitions of evidence ratings: A = preferred; B = acceptable alternative; C = offer when A and B cannot be given; E = should never be given; I = randomized clinical trial; II = data from clinical trials that were not randomized or were conducted in other populations; III = expert opinion.

§5-day-a-week administration is always given by directly observed therapy. Rating for 5 day/wk regimens is A(III).

‖Not recommended for HIV-infected patients with CD4+ cell counts < 100 cells/μL.

¶Options 1c and 2b should be used only in HIV-negative patients who have negative sputum smears at the time of completion of 2 months of therapy and who do not have cavitation on initial chest radiograph. For patients started on this regimen and found to have a positive culture from the 2-month specimen, treatment should be extended an extra 3 months.

factors for tuberculosis, a PPD test, and chest radiograph, most cases of tuberculosis can be effectively diagnosed and treated if this entity is considered. **HP**

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REFERENCES

1. Abou-Raya S, Abou-Raya A. Spinal tuberculosis: overlooked? J Intern Med 2006;260:160–3.
2. Dye C, Scheele S, Dolin P, et al. Global burden of tuberculosis: estimated incidence, prevalence and mortality by country. JAMA 1999;282:677–86.
3. Centers for Disease Control and Prevention (CDC). Trends in tuberculosis —United States, 2005. MMWR Morb Mortal Wkly Rep 2006;55:305–8.
4. Chin DP, DeRiemer K, Small PM, et al. Difference in contributing factors to tuberculosis incidence in US-born and foreign-born persons. Am J Respir Crit Care Med 1998;158:1797–803.
5. Sotir MJ, Parrott P, Metchock B, et al. Tuberculosis in the inner city: impact of a continuing epidemic in the 1990s. Clin Infect Dis 1999;29:1138–44.
6. Golden MP, Vikram HR. Extrapulmonary tuberculosis: an overview. Am Fam Physician 2005;72:1761–8.
7. Yilmaz MH, Kantarci F, Mihmanli I, Kanberoglu K. Multifocal skeletal tuberculosis. South Med J 2004;97:785–7.

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8. Ozol D, Koktener A, Uyar ME. Active pulmonary tuberculosis with vertebra and rib involvement: case report. South Med J 2006;99:171–3.
9. Pertuiset E, Beaudreuil J, Liote F, et al. Spinal tuberculosis in adults. A study of 103 cases in a developed country, 1980–1994. Medicine (Baltimore) 1999;78: 309–20.
10. Watts HG, Lifeso RM. Tuberculosis of bones and joints. J Bone Joint Surg Am 1996;78:288–98.
11. Davidson PT, Horowitz I. Skeletal tuberculosis. A review with patient presentations and discussion. Am J Med 1970;48:77–84.
12. Maron R, Levine D, Dobbs TE, Geisler WM. Two cases of Pott disease associated with bilateral psoas abscesses: case report. Spine 2006;31:E561–4.
13. Cormican L, Hammal R, Messenger J, Milburn HJ. Current difficulties in the diagnosis and management of spinal tuberculosis. Postgrad Med J 2006; 82:46–51.
14. Gautam MP, Karki P, Rijal S, Singh R. Pott's spine and paraplegia. JNMA J Nepal Med Assoc 2005;44:106–15.
15. Tali ET. Spinal infections. Eur J Radiol 2004;50:120–33.
16. Berk RH, Yazici M, Atabey N, et al. Detection of *Mycobacterium tuberculosis* in formaldehyde solution-fixed, paraffin-embedded tissue by polymerase chain reaction in Pott's disease. Spine 1996;21:1991–5.
17. Cheng VC, Yam WC, Hung IF, et al. Clinical evaluation of the polymerase chain reaction for the rapid diagnosis of tuberculosis. J Clin Pathol 2004; 57;281–5.
18. Pappou IP, Papadopoulos EC, Swanson AN, et al. Pott disease in the thoracolumbar spine with marked kyphosis and progressive vertebral column resection and anterior reconstruction with a cage. Spine 2006;31:E123–7.
19. Blumberg HM, Leonard MK Jr, Jasmer RM. Update on the treatment of tuberculosis and latent tuberculosis infection. JAMA 2005;293:2776–84.
20. Saletra A. [A case of gravitation abscess (Pott's disease) associated with esophageal fistula.] [Article in Polish.] Pol Przegl Radiol Med Nukl 1965;29:7–12.
21. Johnson AD, McIntosh WJ. Tuberculous fistula between the 5th lumbar vertebra and the colon presenting as a left thigh abscess. Br J Surg 1978;65:186–7.
22. Auregan G, Chakib S, Etienne B, et al. [Bronchial fistula caused by Pott's abscesses. Report of 3 cases.] [Article in French.] Rev Pneumol Clin 1989;45: 175–8.
23. Chaulk CP, Kazandjian VA. Directly observed therapy for treatment completion of pulmonary tuberculosis: Consensus Statement of the Public Health Tuberculosis Guidelines Panel. JAMA 1998;279:943–8.
24. Blumberg HM, Burman WJ, Chaisson RE, et al. American Thoracic Society/Centers for Disease Control and Prevention/Infectious Disease Society of America: treatment of tuberculosis. Am J Respir Crit Care Med 2003; 167:603–62.