

Safak Ekinci<sup>1</sup>, Oner Tatar<sup>2</sup>, Serkan Akpancar<sup>3</sup>, Serkan Bilgic<sup>4</sup>  
and Omer Ersen<sup>3</sup>

<sup>1</sup>Department of Orthopaedic Surgery, Gümüşsuyu Military Hospital, Istanbul, Turkey. <sup>2</sup>Department of Orthopaedic Surgery, Kasımpaşa Military Hospital, Istanbul, Turkey. <sup>3</sup>Department of Orthopaedic Surgery, Gulhane Military Hospital, Ankara, Turkey. <sup>4</sup>Department of Orthopaedic Surgery, Haydarpaşa Gulhane Military Hospital, Istanbul, Turkey

**ABSTRACT:** Spinal tuberculosis (TB) is a significant form of TB, causing spinal deformity and paralysis. Early diagnosis and treatment are crucial for avoiding multivertebral destruction and are critical for improving outcomes in spinal TB. We believe that appropriate treatment method should be implemented at the early stage of this disease and that the Gulhane Askeri Tıp Akademisi classification system can be considered a practical guide for spinal TB treatment planning in all countries.

**KEYWORDS:** spinal tuberculosis, Pott's disease, abscess, treatment

**CITATION:** Ekinci et al. Spinal Tuberculosis. *Journal of Experimental Neuroscience* 2015;9:89–90 doi:10.4137/JEN.S32842.

**TYPE:** Short Commentary

**RECEIVED:** August 27, 2015. **RESUBMITTED:** October 4, 2015. **ACCEPTED FOR PUBLICATION:** October 5, 2015.

**ACADEMIC EDITOR:** Lora Talley Watts, Editor in Chief

**PEER REVIEW:** Four peer reviewers contributed to the peer review report. Reviewers' reports totaled 867 words, excluding any confidential comments to the academic editor.

**FUNDING:** Authors disclose no funding sources.

**COMPETING INTERESTS:** Authors disclose no potential conflicts of interest.

**COPYRIGHT:** © the authors, publisher and licensee Libertas Academica Limited. This is an open-access article distributed under the terms of the Creative Commons CC-BY-NC 3.0 License.

**CORRESPONDENCE:** safakekinci@yahoo.com

Paper subject to independent expert blind peer review. All editorial decisions made by independent academic editor. Upon submission manuscript was subject to anti-plagiarism scanning. Prior to publication all authors have given signed confirmation of agreement to article publication and compliance with all applicable ethical and legal requirements, including the accuracy of author and contributor information, disclosure of competing interests and funding sources, compliance with ethical requirements relating to human and animal study participants, and compliance with any copyright requirements of third parties. This journal is a member of the Committee on Publication Ethics (COPE). Provenance: the authors were invited to submit this paper.

Published by Libertas Academica. Learn more about this journal.

## Introduction

Spinal tuberculosis (TB) is one of the oldest human diseases; it has been found in Egyptian mummies dating back 5000 years; the first case of spinal TB was described by Percival Pott in 1779.<sup>1,2</sup> In the developing countries, spinal TB is one of the primary causes of spinal deformity and paralysis. According to the latest global (TB) report by the World Health Organization, an estimated 9.0 million people developed TB and 1.5 million died from TB in 2013 alone.<sup>3</sup> TB affects the spine in 3%–5% of patients,<sup>4</sup> and spinal TB is also known as Pott's disease. Spinal TB is the most common and worst form of TB lesion.<sup>5</sup>

## Diagnosis and Treatment

Early diagnosis is crucial for treating spinal TB. If patients are diagnosed early, they can be treated with the proper pharmaceutical drugs, such as antibiotics only. Early and definite diagnosis of this disease is not easy, as the disease progression is slow and insidious. Due to this difficulty, many patients in the early stages of the disease receive treatments, such as nonsteroidal anti-inflammatory drugs, physical therapy, or a corset (spinal support), prior to correct diagnosis.<sup>6,7</sup>

A positive skin test and elevated erythrocyte sedimentation rate (ESR) may be useful for diagnosing spinal TB, biopsy evaluation and DNA amplification techniques (polymerase chain reaction) may also facilitate the diagnosis. For histopathological examination, formalin-fixed and paraffin-embedded tissue blocks of biopsied specimens are stained with hematoxylin-eosin.<sup>8</sup> Conventional radiography methods are used as first-step

diagnostic methods, providing a good overview. Advanced imaging methods, such as magnetic resonance imaging (MRI), play an important role in detecting spinal TB earlier than other techniques and provide the possibility of earlier and more effective treatment before significant defects develop.<sup>9</sup> Three-dimensional computed tomography (CT) scans and MRI reveal the involved vertebrae and attachments clearly.<sup>10</sup> They can also exhibit the degree of intervertebral disk destruction, the scope of central lesions, the locations and number of cavities and abscesses, and spinal cord compression.<sup>11</sup> MRI and CT facilitate and allow the diagnosis of spinal TB, but histopathological diagnosis remains essential.<sup>12,13</sup>

Pharmacological therapy usually consists of triple-drug antituberculous chemotherapy (*p*-aminosalicylic acid, streptomycin, and isoniazid) and plays a main role in TB treatment,<sup>12</sup> if the lesion is without complications and limited to the vertebrae. Some studies<sup>14,15</sup> have reported the worsening of existing symptoms or the appearance of new lesions in patients who initially responded well to antituberculous therapy. However, with the appropriate indications, surgery is considered superior for preventing neurological deterioration, maintaining stability, and early recovery.<sup>16–18</sup> Surgical treatment of spinal TB aims at abscess debridement, which involves removing purulent necrotic tissues from normal tissue, spinal cord decompression, permanent spinal stabilization, and preventing or correcting deformity. Considering the serious burden caused by the high cost of medical treatment and surgical trauma, early diagnosis and treatment to avoid multivertebral destruction are critical to improve the outcomes in spinal TB.<sup>11</sup>

**Table 1.** GATA classification system.

TYPE	LESION
Type IA	The lesion is limited to the vertebrae
Type IB	Abscess formation occurs; one or two-level disc degeneration
Type II	Collapse of vertebrae; abscess formation occurs; kyphosis; stable deformity with or without neurologic deficit; sagittal index (SI) is less than 20 degrees
Type III	A more severe vertebral collapse; abscess formation; severe kyphosis; deformity instability with or without neurologic deficit; SI is more than 20 degrees

## Classification Systems

Spinal TB is one of the most challenging diseases for surgeons to treat, and some guidelines are needed for appropriate decision making and treatment. Currently, there are few widely accepted classification systems based on objective data that can guide the selection of the proper treatment approach for patients with spinal TB. In 2008, Oguz et al<sup>19</sup> developed a classification system (Gulhane Askeri Tip Akademisi [GATA]) for spinal TB based on seven clinical and radiological criteria (abscess formation, disk degeneration, vertebral collapse, kyphosis [unnatural curvature of the upper back that creates a hunchback appearance], sagittal index, instability, and neurological problems). They also recommended specific techniques for each type.

Per the GATA classification system, spinal TB is divided into three types (IA/B, II, and III) using the abovementioned criteria (Table 1). Surgery is recommended for Type IB (abscess formation, one or two level disk degeneration, no collapse, and no neurologic deficit), Type II, and Type III patients with or without neurological deficit. They emphasize that if there is a cold abscess, antibiotic–analgesic therapy alone cannot prevent the extensive destruction of vertebral bone and disk material. After cold abscess and two-level disk degeneration, immediate drainage along with medical therapy can protect the patient from vertebral collapse. As long as the treatment plan is fully prepared, the surgical option can achieve a satisfactory curative effect in treating spinal TB, despite some complications. We believe that the appropriate treatment method should be implemented at the early stage of this disease and that the GATA classification system can be considered as a practical guide for spinal TB treatment planning in all countries.

## Conclusion

Current treatment modalities (medical and surgical) have improved outcomes in the management of spinal TB, even in patients with neurological deficits and spinal deformities. However, there are various surgical or conservative treatment options, and heterogeneous outcomes have been described, which render the decision-making and selection of specific treatment options by surgeons difficult. Future investigations and publications require clear definitions of spinal TB to help guide the appropriate decisions and treatment by surgeons.

## Author Contributions

Conceived and designed the experiments: SE. Analyzed the data: OE. Wrote the first draft of the manuscript: SE. Contributed to the writing of the manuscript: OT. Agree with manuscript results and conclusions: SB. Jointly developed the structure and arguments for the paper: SA. Made critical revisions and approved final version: SE. All authors reviewed and approved of the final manuscript.

## REFERENCES

- Taylor GM, Murphy E, Hopkins R, Rutland P, Chistov Y. First report of *Mycobacterium bovis* DNA in human remains from the Iron Age. *Microbiology*. 2007; 153(4):1243–1249.
- Sai Kiran NA, Vaishya S, Kale SS, Sharma BS, Mahapatra AK. Surgical results in patients with tuberculosis of the spine and severe lower-extremity motor deficits: a retrospective study of 48 patients. *J Neurosurg Spine*. 2007;6:320–326.
- Global Tuberculosis Report 2014: xi.
- Cheung WY, Luk KD. Clinical and radiological outcomes after conservative treatment of TB spondylitis: is the 15 years' follow-up in the MRC study long enough? *Eur Spine J*. 2013;22(suppl 4):S594–S602.
- Boachi-Adjei O, Squillante RG. Tuberculosis of the spine. *Orthop Clin North Am*. 1996;27:95–103.
- Mehta JS, Bhojraj SY. Tuberculosis of thoracic spine. *J Bone Joint Surg Br*. 2001; 83:859–863.
- Moon MS, Moon YW, Moon JL, Kim SS, Sun DH. Conservative treatment of tuberculosis of the lumbar and lumbosacral spine. *Clin Orthop Relat Res*. 2002; 398:40–49.
- Patwardhan SA, Joshi S. Laboratory diagnosis of spinal tuberculosis: past and present. *Argo Spine News J*. 2011;23(3):120–124.
- Desai SS. Early diagnosis of spinal tuberculosis by MRI. *J Bone Joint Surg Br*. 1994;76(6):863–869.
- Jain AK, Sreenivasan R, Saini NS, Kumar S, Jain S, Dhammi IK. Magnetic resonance evaluation of tubercular lesion in spine. *Int Orthop*. 2012;36:261–269.
- Gao Z, Wang M, Zhu W, Zheng G, Meng Y. Tuberculosis of ultralong segmental thoracic and lumbar vertebrae treated by posterior fixation and cleaning of the infection center through a cross-window. *Spine J*. 2015;15(1):71–78.
- Al Muhlim F, Ibrahim E, Hassan EL. Magnetic resonance imaging of tuberculous spondylitis. *Spine*. 1995;20:2287–2292.
- Jain R, Sawhney S, Berry M. Computed tomography of vertebral tuberculosis: patterns of bone destruction. *Clin Radiol*. 1993;47:196–199.
- Cheng VC, Ho PL, Lee RA, et al. Clinical spectrum of paradoxical deterioration during antituberculosis therapy in non-HIV-infected patients. *Eur J Clin Microbiol Infect Dis*. 2002;21:803–809.
- Park JH, Kim YH, Kwon CH, Shin HI. Paralysis developing as a paradoxical response during the treatment for tuberculous spondylitis: a case report. *Ann Rehabil Med*. 2014;38(3):405–409.
- Rezaei AR, Lee M, Cooper PR. Modern management of spinal tuberculosis. *Neurosurgery*. 1995;36:87–97.
- Ghadouane M, Elmansari O, Bousalmame N, Lezrek K, Aouam H, Moulay I. Role of surgery in the treatment of Pott's disease in adults. Apropos of 29 cases. *Rev Chir Orthop Reparatrice Appar Mot*. 1996;82:620–628.
- Zou MX, Li J, Lv GH, Wang B, Deng YW. Treatment of thoracic or lumbar spinal tuberculosis complicated by resultant listhesis at the involved segment. *Clin Neurol Neurosurg*. 2014;125:1–8.
- Oguz E, Sehirlioglu A, Altinmakas M, et al. A new classification and guide for surgical treatment of spinal tuberculosis. *Int Orthop*. 2008;32:127–133.