



## Original Article

## Evaluation of Therapeutic Efficacy of Surgical Intervention in Dorsal Spinal Tuberculosis

 Muhammad Muzaffer Uddin<sup>1</sup>, Muhammad Munwar Ali<sup>2\*</sup>, Muhammad Ali Jamali<sup>3</sup>, Farrukh Zulfiqar<sup>4</sup>, Ramesh Kumar<sup>4</sup> and Qazi Muhammad Zeeshan<sup>4</sup>
<sup>1</sup>Memon Medical Institute Hospital, Karachi, Pakistan<sup>2</sup>Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Pakistan<sup>3</sup>Peoples University of Medical and Health Sciences, Nawabshah, Pakistan<sup>4</sup>Neurosurgery Department, Dow University of Health Sciences, Karachi, Pakistan

## ARTICLE INFO

## Key Words:

Tuberculosis, Mycobacterium and Paraparesis

## How to Cite:

Muzaffer uddin, M. ., Munwar Ali, M. ., Ali Jamali, M. ., Zulfiqar, F. ., Kumar, R. ., & Muhammad Zeeshan, Q. . (2022). Evaluation of Therapeutic Efficacy of Surgical Intervention in Dorsal Spinal Tuberculosis: Therapeutic Efficacy of Surgical Intervention in Dorsal Spinal Tuberculosis. *Pakistan Journal of Health Sciences*, 3(04).  
<https://doi.org/10.54393/pjhs.v3i04.159>

## \*Corresponding Author:

Muhammad Munwar Ali  
 Memon Medical Institute Hospital, Karachi, Pakistan  
[munwardr@yahoo.com](mailto:munwardr@yahoo.com)

Received Date: 15<sup>th</sup> September, 2022Acceptance Date: 22<sup>nd</sup> September, 2022Published Date: 30<sup>th</sup> September, 2022

## ABSTRACT

Tuberculosis (TB) is an infectious disease. The mycobacterium tuberculosis is the causative agent of TB. The prevalence of TB is influenced by the economic, sanitary, and medical conditions of the area. Although TB has the worldwide prevalence but it is most common in underdeveloped and developing nations like Pakistan, China, and several African nation. The every 24 to 32 people out of 100,000 in developed countries are suffering from TB. **Objective:** To analyze the surgical intervention for active dorsal spinal tuberculosis at early stage in patients suffering from paraparesis and paraplegia. **Methods:** This retrospective study was conducted at the neurosurgery department of the tertiary care hospital for the duration of four years and six months from January 2017 to June 2021. The study was carried out on 138 patients. There were 85 male and 53 female candidates. Written consent was taken from the patients. In order to determine the therapeutic effects of surgery, the neurological status on ASIA grading and NASCIS scores were examined. **Results:** Majority of the patients healed after single posterior procedure. The average time of surgery was 193 minutes approximately, and the mean blood loss was found to be 874 ml. The average motor improvement in NASCIS score for paraplegia was 78±13.1 and for paraparesis; it was 100 ± 0.0. **Conclusions:** In this study, it was concluded that early surgical intervention can prove to be beneficial in case of active dorsal spinal TB patients with cord compression.

## INTRODUCTION

Tuberculosis (TB) is an infectious disease. The mycobacterium tuberculosis is the causative agent of TB. The prevalence of TB is influenced by the economic, sanitary, and medical conditions of the area. It is a malignant form of tuberculosis. It accounts for nearly half of all cases of TB of the musculoskeletal system. It is more frequent in children and adults. Although TB has the worldwide prevalence but it is most common in underdeveloped and developing nations like Pakistan, China, and several African nations. The incidence of TB was reported to be between 24 to 32 per 100,000 people in developed countries, and 35 and 866 per 100,000 people in underdeveloped countries. The organ most commonly

affected by MTB is the lung. The symptoms such as thoracalgia, hemoptysis, fatigue, cough, expectoration and fever are indicative of lungs disease. Other organs may be also affected if the lung lesion is not effectively treated [1, 2]. One of the most prevalent extrapulmonary kinds of TB, spinal TB results from an initial lung lesion caused by MTB. It spread via the Batson plexus. The patients diagnosed with Tb can be treated with anti-TB medication treatment. The severe kyphotic deformity and an irreparable impairment are the results of pursuit of anti-TB drug treatment while ignoring surgical interventions. The surgical interventions are recommended to the spinal TB patients with compressed spinal cord, spinal instability,

and sinus formation [3]. The one of the most prevalent disease among top ten is spinal TB that results in disability in Pakistan. In Pakistan the number of new cases of spinal TB has been consistently high, harming individuals' physical and mental health and putting a tremendous strain on the healthcare system, affecting the patients' families and add to society's overall financial burden [4, 5]. The dorsal spine is more typically damaged in children and teenagers whereas, the lumbar spine is the most commonly effected in the adults. The underlying cause is the dorsal spinal canal's narrowness with inadequate dorsal spinal cord blood flow. Patients with dorsal spinal conditions may get paralysis fast. In dorsal spine due to relatively smaller canal space, the presence of excessive abscess causes direct compression on the spinal cord due to which neurological deficit takes place. This is considered as one of the worst complications of TB. There are two distinct stages of neurological deficit; paraparesis and paraplegia [6, 7]. Paraplegia is the complete loss of motor strength. Strength impairment distinguishes paraparesis from paraplegia, the loss of strength and both conditions impact the motor function with or without affecting sensory function. This study compares the effects of neurological improvement between paraparesis and paraplegia. The study aimed to analyze the surgical intervention for active dorsal spinal tuberculosis at early stage in patients suffering from paraparesis and paraplegia [8, 9].

## METHODS

The study was carried out on 138 patients. There were 85 male and 53 female candidates. Written consent was taken from the patients. The patients were asked to follow-up for 12 months and then data was collected for analysis. The ethical and review board committee of the hospital approved the study. In order to determine the therapeutic effects of surgery, the preoperative and postoperative neurological assessment was analyzed on the basis of ASIA grading and on NASCIS score improvement. The range of neurological decline was from 1 to 21 days on average. To make a diagnosis, tests for erythrocyte sedimentation rate (ESR) were performed. Patients who met the following inclusion criteria were included in the study;

- (1) Presented with confirmed spinal TB by Infectious Disease (ID) team on radiological and laboratory tests' basis.
- (2) They had underwent surgery within twenty-one days of the beginning of paraparesis and paraplegia
- (3) The 12 months follow-up was done.

The choice of surgical approach posterior versus anterolateral was on the radiological findings of epidural abscess size and number of involved vertebral levels. It was decided by the same surgical team for all the patients

included in the study. Both approaches focused on decompression of neural structure and fixation of spinal instability according the set guidelines in the department. All the patients were gradually mobilized with thoracolumbar corset and followed to 12 months at least. The standard four drugs TB chemotherapy was started and followed by the ID team.

The patients with impaired hepatic functioning and systematic TB were excluded from the study. The demographic and clinical data of every patient was recorded and the statistical analysis was performed. The data was stratified. Different statistical test was performed for the analysis. The SPSS tool was used.

## RESULTS

The study was carried out to analyze the surgical intervention for active dorsal spinal tuberculosis at early stage in patients suffering from paraparesis and paraplegia. The study was carried out on 138 patients. There were 85 male and 53 female candidates as shown in the table 1. Written consent was taken from the patients. The patients were asked to follow-up for 12 months and then data was collected for analysis.

Features of patients.	Values
<b>Gender</b>	
Male	85 (61.6%)
Female	53 (38.4%)
Age (years)	34 ± 9.8
<b>Location of the lesion</b>	
Upper dorsal D1 – 4	34 (24.6%)
Mid dorsal D5 – 8	47 (34%)
Lower dorsal D9 – 12	57 (41.3%)
<b>Affected Levels</b>	
Single	84 (60.8%)
Multiple	54 (39.1%)
Duration of leg weakness	11.7 ± 5.1

**Table 1:** Basic features

Without any vascular or neural injury, all the surgeries were accomplished. There were five patients that were reported went through revision surgery, it was needed in four because of the prolonged presence of paravertebral abscess, while in one patient there was misplaced screw. Majority of the patients healed after single posterior procedure. The average time of surgery was 193 minutes approximately, and the blood loss was found to be 874 ml. The thoracostomy tube was inserted in 26 cases due to breach of pleura during surgery and all were removed in 72 to 96 hours after full inflation of lung on post op x-ray chest as shown in table 2. During stay at the hospital after surgery, there were no major complications, except CSF leak in six patients and superficial wound infection in four cases. All of them managed conservatively without any further sequelae. The signs and symptoms that indicated

towards TB vanished after about 3 months of the operation.

Pre-operative			Follow-up (12months)				
			A	B	C	D	E
Paraplegia	A	19		5	1	9	4
	B	54					
Paraparesis	C	65			4	40	10
	D						

**Table 2:** ASIA grading for the assessment of neurological state

There were no symptoms of dissemination of perioperative TB was found among the patients. The values improved with every follow-up and the average score at the last follow up was quite lower than the post-operative scores. There was a significant improvement in neurological status ( $p < 0.05$ ). Out of 73 paraplegic patients, 68 (93%) gained the motor power to at least ASIA C. Those with pre-operative weakness of grade C showed a more profound benefit with neurological recovery to grade E in 97% (63 out of 65 cases) over a period of 12 months follow up. The average motor improvement in NASCIS score for paraplegia was  $78 \pm 13.1$  and for paraparesis; it was  $100 \pm 0.0$  as shown in the table 3. The signs and symptoms that indicated towards TB vanished after about 3 months of the operation.

	Pre-operative	Final follow-up	Neurological improvement
Paraplegia A,B	$51 \pm 0.0$	$78 \pm 13.1$	$54.3\% \pm 28.1\%$
Paraparesis C,D	$71 \pm 4.5$	$100 \pm 0.0$	$59.1\% \pm 7.8\%$

**Table 3:** NASCIS values for rate of motor improvement

## DISCUSSION

In dorsal spine due to relatively smaller canal space, the presence of excessive abscess causes direct compression on the spinal cord due to which neurological deficit takes place. This is considered as one of the worst complications of TB [10-12]. There are some other mechanisms as well like meningitis and infection in the thrombosis of spinal vessels that lead to complications leading to neurological deficit. The instability in the strength of spinal cord function is known as paraparesis in which there is impairment in the motor functioning of spinal cord [13, 14]. Here in this study the patients with TB were analyzed for early surgical intervention in case of active dorsal spinal TB. 138 patients were taken and study was carried out after taking written consent from the patients. According to previous the studies, as paraplegia is the complete loss of motor strength so the A and B grade of ASIA scores should be considered as both cases include patients with and without loss of sensory function. Likewise, the patients with grade C and D scores should be considered in category paraparesis. Because in this case there is loss of motor functions ignoring the sensory status. Conditions like pus, tuberculous granuloma becomes the cause of early on-set of paraplegia and paraparesis. The symptoms of these conditions include slow repeated and gradual compression

[15, 16]. However, the late-onset takes place because of rigid pressure conditions like granulomatous scar, kyphotic bone ridge etc. In our study the all the cases were the patients suffering from early onset paraplegia and paraparesis. The diagnosis was made after radiological analysis and laboratory studies. The main cause that was reported in our study that led to spinal cord compression was soft tissue materials like formation of pus like fluids and proliferation of granuloma. Our findings were consistent with the previous results where similar results were derived. In case of our study the compression on spinal cord was applied to a small amount of time so MRI was unable to find malacia or spinal cord denaturation. But in this study there were cases where epidural adhesion was found in the patients. According to the literature review it was found that paraparesis and paraplegia are some of the complications produced as a result of TB, that can be improved with by taking right measures. According to studies conducted by different researchers it was concluded that by making use of anti-TB drugs one can manage such complications [17, 18]. As only soft pressure is exerted and it can be absorbed by anti-TB drugs. As per studies it was found that delaying decompression and keeping patients on just prolonged usage of anti-TB drugs can also have negative and irreparable loss of neurological function. Therefore, it is important to have surgical procedure involved to avoid long term use of anti-TB drugs. In case of this study, a course of 2 weeks was suggested to the patients, they used drugs for fourteen days, but in certain cases where there is sudden and acute sort of collapse in the neurological function the duration of drugs is reduced to less than 2 weeks because of the emergency surgery. The main aim of surgical intervention is to make patient get rid of excessive neural pressure, as a result there is a decrease in the infectious burden [19, 20]. As per studies, it was found that a 2-3-week anti-TB drug treatment is carried before proceeding for operation so that progression in the impairment of neurological can be avoided. As surgery can only be done if there is a significant lowering of CRP and ESR values. In this study early operation was considered as the operation that is done within 3 weeks of the occurrence of paraplegia and paraparesis. A combination of streptomycin and levofloxacin is given to the patients before operation. If the hepatic function is severely damaged or there is disturbed CRP and ESR values, then drug treatment is given. In this study there was a significant improvement in the neurological function after the early surgery. Thus it was supported that the early surgical intervention is beneficial for the recovery of patients suffering from paraplegia and paraparesis. In our study it was found that MRI is very important to estimate that whether an anterolateral

surgery is needed or a posterior approach surgery would be enough. Because if the pus from the paravertebral region is not cleared yet then an additional surgery is required to drain it completely.

## CONCLUSIONS

In this study, it was concluded that early surgical intervention can prove to be beneficial in case of active dorsal spinal TB patients with cord compression. This is true not only for cases of paraparesis but also for even paraplegia; although the outcome is more good for the former than the later.

## Conflicts of Interest

The authors declare no conflict of interest.

## Source of Funding

The author(s) received no financial support for the research, authorship and/or publication of this article

## REFERENCES

- [1] Li W, Liu Z, Xiao X, Xu Z, Sun Z, Zhang Z, et al. Early surgical intervention for active thoracic spinal tuberculosis patients with paraparesis and paraplegia. *BMC Musculoskeletal Disorders*. 2021 Feb; 22(1):213. doi: 10.1186/s12891-021-04078-y
- [2] Hristea A, Constantinescu RV, Exergian F, Arama V, Besleaga M, Tanasescu R. Paraplegia due to non-osteous spinal tuberculosis: report of three cases and review of the literature. *International Journal of Infectious Diseases*. 2008 Jul; 12(4):425-9. doi: 10.1016/j.ijid.2007.12.004
- [3] Batirel A, Erdem H, Sengoz G, Pehlivanoglu F, Ramosaco E, Gülsün S, et al. The course of spinal tuberculosis (Pott disease): results of the multinational, multicentre Backbone-2 study. *Clinical Microbiology and Infection*. 2015 Nov; 21(11):1008.e9-1008.e18. doi: 10.1016/j.cmi.2015.07.013
- [4] Agrawal V, Patgaonkar PR, Nagariya SP. Tuberculosis of spine. *Journal of craniovertebral junction and spine*. 2010 Jul; 1(2):74. doi: 10.4103/2F0974-8237.77671
- [5] Hernández-Albújar S, Arribas JR, Royo A, González-García JJ, Peña JM, Vázquez JJ. Tuberculous radiculomyelitis complicating tuberculous meningitis: case report and review. *Clinical Infectious Diseases*. 2000 Jun; 30(6):915-21. doi: 10.1086/313821
- [6] Fan J, Lan T, Tang K, Wang G, Dong W, Li D, et al. The Comparative Influence of 2 and 4 Weeks Preoperative Antituberculosis Treatment on Spinal Tuberculosis Surgery: A Multicenter, Prospective, Randomized Clinical Trial. *Infectious Disease and Therapy*. 2021 Sep; 10(3):1451-1463. doi: 10.1007/s40121-021-00462-2
- [7] Jain AK and Kumar J. Tuberculosis of spine: neurological deficit. *European Spine Journal*. 2013 Jun; 22 Suppl 4(Suppl 4):624-33. doi: 10.1007/s00586-012-2335-7
- [8] Gautam MP, Karki P, Rijal S, Singh R. Pott's spine and paraplegia. *Journal of Nepal Medical Association*. 2005 Sep; 44(159):106-15
- [9] Pattisson PR. Pott's paraplegia: an account of the treatment of 89 consecutive patients. *Paraplegia*. 1986 Apr; 24(2):77-91. doi: 10.1038/sc.1986.11
- [10] Jain AK, Dhammi IK, Prashad B, Sinha S, Mishra P. Simultaneous anterior decompression and posterior instrumentation of the tuberculous spine using an anterolateral extrapleural approach. *Journal of Bone and Joint Surgery*. 2008 Nov; 90(11):1477-81. doi: 10.1302/0301-620X.90B11.20972
- [11] Khoo LT, Mikawa K, Fessler RG. A surgical revisit of Pott distemper of the spine. *The Spine Journal*. 2003 Apr; 3(2):130-45. doi: 10.1016/s1529-9430(02)00410-2
- [12] Kumar R. Spinal tuberculosis: with reference to the children of northern India. *Childs Nervous System*. 2005 Jan; 21(1):19-26. doi: 10.1007/s00381-004-1029-9
- [13] Khanna K and Sabharwal S. Spinal tuberculosis: a comprehensive review for the modern spine surgeon. *Spine Journal*. 2019 Nov; 19(11):1858-1870. doi: 10.1016/j.spinee.2019.05.002
- [14] Ansari S, Amanullah MF, Ahmad K, Rauniyar RK. Pott's Spine: Diagnostic Imaging Modalities and Technology Advancements. *North American Journal of Medicine and Science*. 2013 Jul; 5(7):404-11. doi: 10.4103/1947-2714.115775.
- [15] Ukunda UNF and Lukhele MM. The posterior-only surgical approach in the treatment of tuberculosis of the spine: outcomes using cortical bone allografts. *The Bone and Joint Journal*. 2018 Sep; 100-B(9):1208-1213. doi: 10.1302/0301-620X.100B9.BJJ-2017-1326.R2
- [16] Cottle L and Riordan T. Infectious spondylodiscitis. *Journal of Infection*. 2008 Jun; 56(6):401-12. doi: 10.1016/j.jinf.2008.02.005
- [17] Kaul R, Chhabra HS, Kanagaraju V, Mahajan R, Tandon V, Nanda A, et al. Antepartum surgical management of Pott's paraplegia along with maintenance of pregnancy during second trimester. *European Spine Journal*. 2016 Apr; 25(4):1064-9. doi: 10.1007/s00586-015-4045-4
- [18] Thwaites G, Fisher M, Hemingway C, Scott G, Solomon T, Innes J, et al. British Infection Society guidelines for the diagnosis and treatment of tuberculosis of the

- central nervous system in adults and children. *Journal of Infection*. 2009 Sep; 59(3):167-87. doi: 10.1016/j.jinf.2009.06.011
- [19] 19.Luk KD. Tuberculosis of the spine in the new millennium. *European Spine Journal*. 1999; 8(5):338-45. doi: 10.1007/s005860050185
- [20] 20.Kotil K, Alan MS, Bilge T. Medical management of Pott disease in the thoracic and lumbar spine: a prospective clinical study. *Journal of Neurosurgery: Spine*. 2007 Mar; 6(3):222-8. doi: 10.3171/spi.2007.6.3.222