

Clinical Outcomes Of Posterior Spinal Fusion Technique Based On Degree Of Kyphosis, Neurological Deficit And Corpus Vertebrae Fusion In Tuberculous Spondylitis Patients

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Abstract

Tuberculous Spondylitis is a secondary infectious disease of the spine that often occurs, from some literature it is found that almost half of all skeletal tuberculosis sufferers are Tuberculous Spondylitis. Until now, the management of Tuberculous Spondylitis is still controversial due to the high clinical variation of Tuberculous Spondylitis. The Medical Research Council of the United Kingdom (MRC, London) recommends using a 6-month regimen of isoniazid and rifampicin as standard therapy for tuberculous spondylitis, but this study did not include patients with three or more spinal cord injuries. This study aims to assess the clinical outcome of the posterior spinal fusion technique on the degree of kyphosis, neurological deficits and vertebral body fusion in tuberculous spondylitis patients. This type of research is an observational analytic, cross-sectional approach to analyze the effect of the posterior spinal fusion technique on the degree of kyphosis and neurological deficits in tuberculous spondylitis patients before and after intervention. Overall, in this study there were significant clinical outcome differences in tuberculous spondylitis patients who underwent posterior spinal fusion techniques with a p value <0.05 , except for vertebrae corpus fusion 1 month postoperatively, there were no significant differences between preoperative and postoperatively. posterior spinal fusion with p value = 1.000 ($p > 0.05$) and there was no relationship between loss of correction and vertebral body fusion 1 month postoperatively tested with Pearson statistics where $p = 0.451$.

Keywords: posterior spinal fusion; tuberculous spondylitis; vertebral body fusion

1. Introduction

Tuberculous spondylitis is the most dangerous disease of all musculoskeletal tuberculosis because it can cause bone destruction, bone deformity, serious morbidity and severe neurological disorders and deficits. The spinal area most often affected by Tuberculous Spondylitis is the thoracic area around 40-50%, followed by the lumbar area around 35-45% and the cervical area around 10% of cases, however this figure varies in several other publications (Laksana, 2022).

Bone and joint tuberculosis comprises 35% of all extrapulmonary TB cases with the majority of cases affecting the spine (spondylitis) with a prevalence of approximately 50% of all bone and joint TB. Tuberculous spondylitis has a higher prevalence in developing countries compared to other countries of the world (Hadian, 2017).

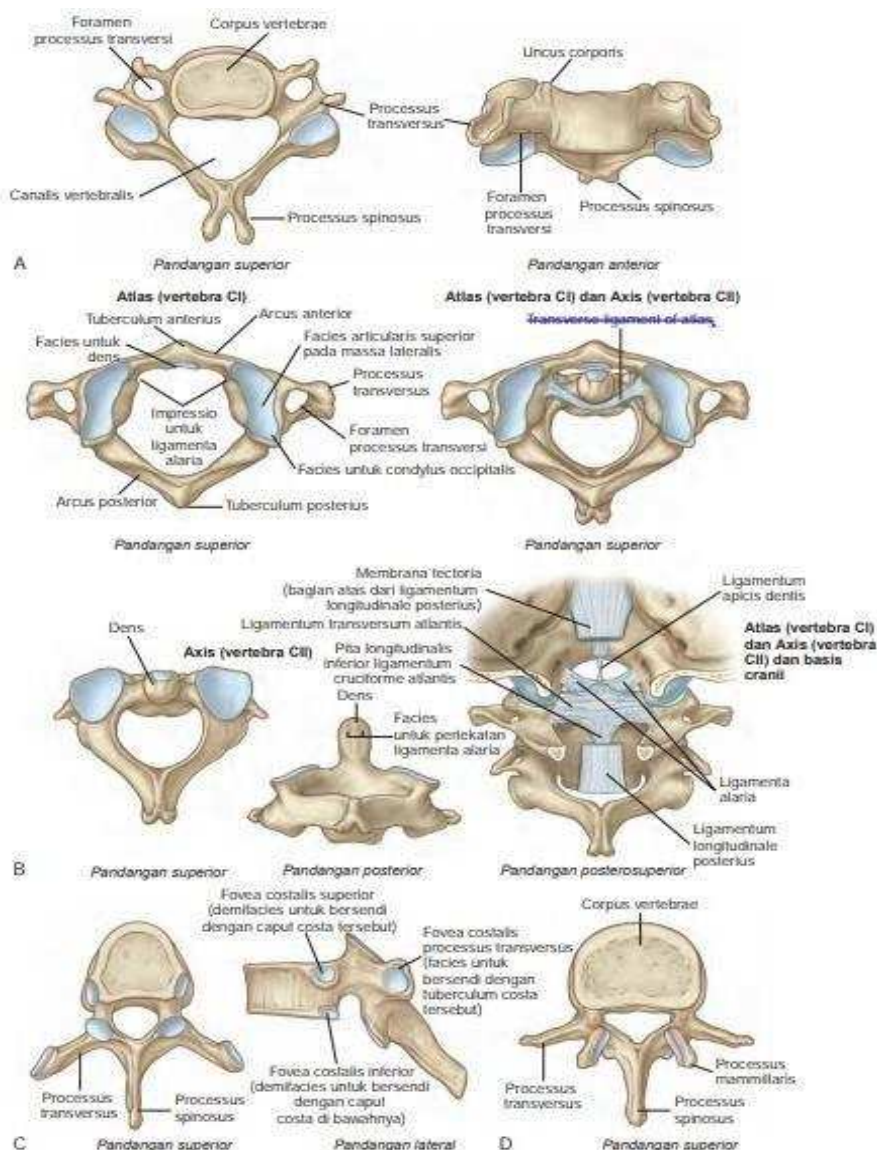


Figure 1. (A) General view of the cervical vertebrae. (B) Atlas and axes. (C) General view of the thoracic vertebrae. (D) General view of the lumbar vertebrae

Tuberculous Spondylitis is a secondary infectious disease of the spine that often, from some literature it is found that almost half of all skeletal tuberculosis sufferers are Tuberculous Spondylitis. The spread of Tuberculous Spondylitis when viewed from gender does not significantly differ between men and women, although from several studies it is stated that men are more often by Tuberculous Spondylitis. In this study, more men (61.1%) had tuberculosis spondylitis than women (38.9%), with an average age of patients being young adults (27.89 ± 2.48). The location of the spine that is often affected by Tuberculous Spondylitis in general there is no clinically significant difference between cervical, thoracic and lumbar but according to some literature the thoracic is a location that often experiences destruction due to ST. In this study, the most common spinal locations were thoracic (55.6%) followed by thoracolumbar (27.8%) and lumbar (16.7%) (Azharuddin, 2016).

As a result of the destruction of the spine, almost all patients with tuberculous spondylitis who have damaged the spine can find kyphosis at the affected site. Kyphosis arises due to the destruction of the infected spinal cord in the anterior area, from several studies it was also found that the thoracic region has a greater tendency to develop kyphosis than other locations. In this study, the average angle of kyphosis that occurred

in ST patients before the research intervention was 23.06 ± 2.42 (Tian, 2018).

Classification Tuberculous spondylitis is classified based on Gulhane Askeri Tip Academician (GATA) into 5 groups. This classification system was created based on clinical and radiological criteria including: abscess formation, disc degeneration, vertebral collapse, kyphosis, sagittal angulation, vertebral instability, and neurological deficits. Meanwhile, to assess the degree of severity, monitor clinical improvement, and predict the prognosis of TB spondylitis patients in the presence of spinal cord injury, the American Spinal Injury Association (ASIA) modified Frankle's classification system.

Until now, the management of Tuberculous Spondylitis is still controversial due to the high clinical variation of Tuberculous Spondylitis. The Medical Research Council of the United Kingdom (MRC, London) recommends using a 6-month regimen of isoniazid and rifampicin as standard therapy for tuberculous spondylitis, but this study did not include patients with three or more spinal cord injuries. Several other studies have shown that the risk of progressive deformity, instability and neurological deficits is related to the number of vertebrae damaged. The existence of multiple spinal damage with neurological complications in some literature is an indication for operative management of Tuberculous Spondylitis to maintain spinal stability. Therefore, even though MRC-London states that drug therapy is a standard treatment for Tuberculous Spondylitis, this cannot be applied to all cases of Tuberculous Spondylitis. One of the operative measures for tuberculous spondylitis is the installation of instrumentation with the Posterior Spinal Fusion Technique. Installation of instrumentation with the Posterior Spinal Fusion Technique in addition to correcting the degree of kyphosis that occurs is also expected to improve the neurological deficits that arise due to compression of the spinal cord by spinal fragments.(5,6) One of the operative measures for tuberculous spondylitis is the installation of instrumentation with the Posterior Spinal Fusion Technique. Installation of instrumentation with the Posterior Spinal Fusion Technique in addition to correcting the degree of kyphosis that occurs is also expected to improve the neurological deficits that arise due to compression of the spinal cord by spinal fragments. One of the operative measures for tuberculous spondylitis is the installation of instrumentation with the Posterior Spinal Fusion Technique. Installation of instrumentation with the Posterior Spinal Fusion Technique in addition to correcting the degree of kyphosis that occurs is also expected to improve the neurological deficits that arise due to compression of the spinal cord by spinal fragments (Phalak, 2019;Bryder, 2014).

One manifestation Spinal damage arising from tuberculous spondylitis is a neurological deficit. The emergence of neurological deficits can be found in almost all cases of tuberculous spondylitis with various manifestations such as paraplegia, paresis, reduced sensibility, pain in the nerve roots or cauda equina syndrome. Complaints of neurological deficits that arise also depend on the location of the damage that occurs. In this study, it was found that 83.3% of patients experienced neurological deficits in the form of limb weakness and/or lack of sensory sensibility (Srivastava, 2020).

Instrumentation with the posterior approach is the installation of a support device on the posterior vertebral segment. The posterior approach can be performed on all vertebral segments, from cervical, thoracic to lumbar (Bryder, 2014).

From the background explanation above, the researcher wanted to analyze the effect of the posterior spinal fusion technique on the degree of kyphosis, neurological deficits and vertebral body fusion in tuberculous spondylitis patients.

2. Methods

This type of research is an observational analytic, cross-sectional approach to analyze the effect of the posterior spinal fusion technique on the degree of kyphosis and neurological deficits in tuberculous spondylitis patients before and after intervention. The minimum sample size required in this study was 18 patients. In order to facilitate inferential analysis, the sample size will be increased to 25 patients. The results of the research were processed using statistical software, the data on the characteristics of the research subjects (gender and age) were carried out using descriptive analysis. Categorical scale data is presented in percentage form, while numerical data is presented in average and standard deviation form. The analysis was carried out to analyze differences and neurological deficits before and after the intervention using the chi square test, or an alternative test if the chi square does not meet the requirements. Meanwhile, for the analysis of differences in kyphosis angles, the data will be tested for normality first using the Shapiro Wilk test (for samples <50). Then the analysis will be continued with the Paired T-test if the data is normally distributed, or the Wilcoxon test if the data is not normally distributed. The results of the study were declared significant

with a p value $<0.05.44$

3. Ethical Clearance

Prior to carrying out the research, this proposal will be submitted to the Health Ethics Commission of the University of North Sumatra for ethical approval. It is intended that this research can be ethically justified and ethically legitimized. After obtaining approval from the ethical commission, the researcher will provide notification and explanation to the subjects selected as samples regarding the description of this research, both orally and in writing, namely through informed consent.

Informed consent also is a consent form stating that the subject is willing to take part in this research. Subjects who are not willing to participate in this study have the right to refuse. If the subject is willing to take part in this study, the subject will be asked to sign a consent form as a sign of subject approval. This research will be carried out after informed consent is approved by the research subjects.

4. Results and Discussion

The goals of treatment of tuberculous spondylitis are eradication of infection and prevention or treatment of neurological deficits and spinal deformities. Treatment of tuberculous spondylitis can be carried out conservatively/ medically and surgically. 2 The first line of treatment is medical, surgery is considered to decompress patients with neurological deficits that fail conservative therapy, posterior spinal lesions, no response after 3-6 months of conservative therapy, dubious diagnosis, instability after recovery, or recurrence of disease or neurological complications.

Patients with neurologic deficits may improve spontaneously without surgery or with medication alone, but in general the prognosis improves rapidly when surgery is performed. 7 In this study, patients with preoperative and postoperative neurologic deficits showed that there was a significant difference between Preoperative and postoperative neurological deficits were tested using Wilcoxon statistics where p value = 0.001 (<0.05) with a mean preoperative neurological deficit of 3.12 ± 1.39 and postoperatively 4.04 ± 1.71 . Patients with 6 months postoperative neurological deficits had a p value = 0.001 (<0.05) indicating a significant relationship with a 6 month postoperative mean neurologic deficit of 4.04 ± 1.71 .

Progressive kyphosis is a significant cosmetic deformity, but more importantly, kyphosis can lead to neurologic deficits, respiratory compromise or heart failure due to restricted pulmonary function. Research conducted by Lacerda C, 2017 revealed that patients undergoing nonoperative therapy had a higher degree of kyphosis than those undergoing surgical therapy. In this study, there was a significant difference after surgery with p value = 0.000 ($p < 0.05$) with an average postoperative kyphosis angle of $12.44^\circ \pm 8.10^\circ$. this is due to the fact that there is a significant difference between the angle of kyphosis before surgery with an average of $28.04^\circ \pm 9.31^\circ$.

The role of vertebral body fusion has been generally accepted for the management of spinal instability due to infection, tumor, fracture or progressive spinal deformity. 12 Bosworth et al said spinal fusion is very important for permanent recovery from tuberculous spondylitis. 10 Statistically there is no significant difference There was a significant difference between preoperative vertebral body fusion and 1 month postoperative vertebral body fusion where p value = 1.000 (<0.05) with the average preoperative vertebral body fusion equal to the 1 month postoperative vertebral body fusion mean. Preoperative Vertebrate Corpus Fusion – 3 Months Post Operation showed that there was a significant difference between preoperative vertebrate corpus fusion and 3 months postoperative vertebrate corpus fusion where p value = 0.000 (<0 ,

In this study, there was no relationship between loss of correction and vertebral body fusion 1 month postoperatively tested with Pearson statistics where $p = 0.451$ (<0.05). Meanwhile, the relationship between Loss os Correction and Vertebrate Corpus Fusion 3 Months Post Operation shows that there is a relationship tested with Pearson statistics where $p = 0.000$ (<0.05). And there is a relationship between loss of correction and vertebrate corpus fusion 6 months postoperatively which was tested with Pearson statistics where $p = 0.000$ (<0.05).

5. Conclusion

The majority of tuberculous spondylitis patients who underwent posterior spinal fusion techniques were male by 56%. Overall, there were significant clinical outcome differences in tuberculous spondylitis patients undergoing posterior spinal fusion techniques at Haji Adam Malik General Hospital, Medan, 2020-2022 with a p value <0.05, except for vertebral body fusion 1 month postoperatively, there was no significant difference between preoperatively and after the posterior spinal fusion technique was performed with p value = 1.000 (p > 0.05) and there was no relationship between loss of correction and vertebral body fusion 1 month postoperatively tested with Pearson statistics where p = 0.451.

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