Original Article

Correlation between Degree of Gibbus Angulation, Neurological Deficits, and Pain in Spondylitis Tuberculosis Patients

Rizkiditia Nugraha Hadian,[1] Renaldi Prasetia,[2] Ahmad Faried[3]

[1]Faculty of Medicine, Universitas Padjadjaran
[2]Department of Orthopedics and Traumatology, Faculty of Medicine, Universitas Padjadjaran-Dr. Hasan Sadikin General Hospital, Bandung
[3]Department of Neurosurgery, Faculty of Medicine, Universitas Padjadjaran-Dr. Hasan Sadikin General Hospital, Bandung

Abstract

Objective: To analyze the correlation between the degree of angulation and neurological deficits as well as pain in spondylitis tuberculosis (TB) patients.

Methods: This observational-analytic study included bivariate analysis on data collected from the medical records of patients with presented with spondylitis TB to Dr. Hasan Sadikin General Hospital, Bandung outpatient clinic from January 2014 to December 2015. The variables were the degree of gibbus angulation, neurological deficits, and pain.

Results: The study showed significant positive correlation between gibbus angulation and sensory neurological deficits (r=0.375; p=0.009) and there was significant positive correlation between gibbus angulation and pain (r=0.638, p=0.000). The study showed an insignificant correlation between gibbus angulation and motoric neurological deficits (r=0.125; p=0.525).

Conclusions: There is a significant correlation between the degree of gibbus angulation and pain as well as sensory neurological deficits. Meanwhile, no significant correlation is found between the degree of gibbus angulation and motoric neurological deficits.

Keywords: Gibbus angulation, neurological deficits, pain, spondylitis tuberculosis

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Introduction

Tuberculosis (TB) is an infectious disease that is caused by *Mycobacterium* tuberculosis. Tuberculosis primarily affects the lungs (pulmonary TB); however, it can also affect other organs (extra pulmonary TB).[1] Since 1993, the World Health Organization (WHO) has stated TB as a global emergency for humanity. It is estimated that a third of the world population is afflicted by TB.[2]

Tuberculosis mostly affect people living in crowded areas with poor environmental and sanitation condition as well as malnourished patients. Bone and joint tuberculosis comprise 35% of all extrapulmonary TB cases with the majority of the case affect the spine (spondylitis) which is about 50% of all bone and joint TB cases. Spondylitis TB has higher prevalence in developing countries compared to the rest of the world. Common symptoms of spondylitis TB include symptoms of chronic diseases and fatigue, sub-febrile fever especially during night time, nocturnal hyperhidrosis, anorexia, weight loss, tachycardia, and anemia. Local symptoms caused by spondylitis TB include pain and stiffness of the back, which are also commonly the first symptoms to occur.[3]

The worst complications of tuberculosis of the spine are neurological deficits that may take the form of para- or tetraplegia, hemiplegia or monoplegia.[4] These neurological deficits occur in 15–42.5% of patients with spondylitis TB.[5] Spondylitis TB is usually accompanied with a deformity of the spine, which occurs in 80% cases, along with the occurrence of gibbus

Correspondence:
Rizkiditia Nugraha Hadian, Faculty of Medicine, Universitas Padjadjaran
Jl. Raya Bandung-Sumedang KM 21 Jatinangor, Indonesia
e-mail: rizkiditianugrahahadian@gmail.com

angulation, that is a form of structural kyphosis where one or more adjacent vertebrae become wedged. The primary cause of the deformity of gibbus is unstable lesion and its progressive development.[6] This study aimed to evaluate the correlation between the degree of gibbus angulation and neurological deficits as well as pain.

Methods

This study was an analytical study to evaluate the relationship between the independent and dependent variables. The dependent variables were the motoric and sensoric neurological deficits while the independent variable was gibbus. Ethical clearance was obtained from the Health Research Ethics Committee Faculty of Medicine Universitas Padjadjaran as stated in ethical exemption letter number 575/UN6. C1.3.2/KEPK/PN/2016.

Population in this study was all patients with spondylitis TB who received treatment in Dr. Hasan Sadikin General Hospital, Bandung during 2014–2015. Minimum sample size in this study was 48 patients. The subject selection was performed consecutively based on the fulfilment of the inclusion criteria. The inclusion criteria were patients diagnosed with spondylitis TB whom developed gibbus and received treatment at the outpatient clinic of the Department of Orthopedics and Traumatology at Dr. Hasan Sadikin General Hospital, Bandung. Patients were excluded from the study if their medical records were not complete. There were 49 patients who fulfilled the criteria and evaluated in the study.

This study used secondary data obtained from patient's medical records. Variables in this study were degree of gibbus angulation, neurological deficits and Wong-Baker faces pain rating scale for pain. The degree of gibbus angulation and neurological deficits was further classified into several groups. Gibbus angulation were classified into: 1) severe, >60°; 2) moderate, 30–60°; and 3) mild, <30°.[7] The gibbus was measured with cobb angle (the angle was made by drawing a line through the superior surface of the first normal vertebrae cephalad at upper-end plate to the lesion and a line through the inferior surface of the first normal caudal, lower end plate, to the lesion). Perpendiculars were drawn from these line and cobb angle was measured at their section (Fig.).[8–10]

Neurological deficits were identified based on the assessment of the motoric and sensory functions. The results of the motoric function assessment were classified into: (1) 5 as full ROM, able to move against gravity with full strength (normal), (2) 4 as full ROM, able to move against gravity with moderate strength, (3) 3 as full ROM, able to move against gravity only, (4) 2 as full ROM, unable to move against gravity, (5) 1 as visible muscle contraction without joint movement, and (6) 0 as without muscle contraction.

The sensory function assessment results were then classified into several groups: (1) normal, (2) hyperesthesia, (3) hypoesthesia, (4) anesthesia. Wong-Baker faces pain rating score scale were classified into: (1) severe, pain from 7–10, (2) moderate pain from 4–6, (3) mild pain from 1–3. After clustering, the data were analyzed using statistical analysis software to determine p and r value and the correlation between variables were observed.

Results

Total samples included in this study were 49 patients, which consisted of 18 male patients and 31 female patients. The characteristics of patients with spondylitis TB in Dr. Hasan Sadikin General Hospital, Bandung were described based on the age, sex, neurological deficits and Wong-Baker faces pain rating scale (Table 1). The results showed that there were more spondylitis TB patients who were >35 years old (51%); females (63%); with mild degree of gibbus angulation (67.3%); with normal motoric neurological functions (79.6%); with normal sensory neurological functions (87.8%), and with moderate Wong-Baker faces pain rating scale (65.3%).

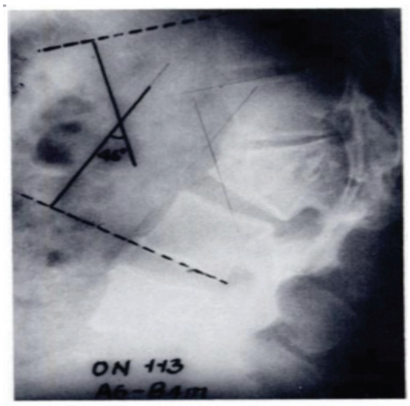

Fig. Radiograph Showing Measurement of Cobb Angle

Table 1 Subject Characteristics

Characteristics	n	%
Age (yrs.)		
<35	24	49
>35	25	51
Gender		
Male	18	37
Female	31	63
Degree of gibbus angulation		
Mild	33	67
Moderate	14	28
Severe	2	4.1
Neurological deficits		
Motoric	39	79
Normal	10	20
Not normal		
Sensory	43	88
Normal	6	12
Not normal		
Wong-Baker faces pain rating scale		
Mild	12	24
Moderate	32	65
Severe	5	10
Total	49	100

Note: yrs.= years

There was no correlation found between the degree of gibbus angulation and neurological deficits (motoric) based on lambda analysis method, with r value = 0.125 and p 0.525 (>0.05) (Table 2). Meanwhile, there were correlation between gibbus angulation and neurological deficits (sensory), also using lambda analysis method, with r value = 0.375 and p = 0.009 (p <0.05). There were also a correlation between gibbus angulation and Wong-Baker faces pain rating scale after analysis using Spearman's method; with r=0.638 and p=0.000 (<0.05).

Discussion

Distribution of the patients' characteristics are described (Table 1). There were 49 patients with spondylitis TB in Dr. Hasan Sadikin General Hospital, Bandung during the period analyzed in this study with the majority of the patients aged 35 years old and older (51%). This disease seems to occur more often in women than in men (63%). The finding on age is in agreement with the result from a previous study on the prevalence of patients with spondylitis TB.[11] However, in the previous study it is stated that spondylitis TB occur more frequently in men (62%).

Based on the degree of gibbus angulation that had been previously classified into mild, moderate, and severe, more patients suffered from mild gibbus angulation degree (67%). This agrees with the result from a previous study which stated that, on average, the pre-operative spondylitis TB patients were still classified as mild. Most patients still maintain the normal motoric and sensory functions. Although neurological deficits are recognized as the complications of spondylitis TB, most patients in this study had not experienced complications.[12]

In this study, patients experiencing sensory neurologic deficits were assessed for their sensory function through the use of the light touch stimuli. The degree of gibbus angulation was found as having a significant positive correlation with sensory neurological deficits, correlation coefficient of r value = 0.375 and p value = 0.009 (p <0.05). This is in line with other study, which suggested that spondylitis TB patients experienced paraparesis with sensory neurological deficits.[13] This is caused by compression due to cold abscess, resulting in vascular thrombosis.[3]

On the other hand, with motoric function assessment via the muscle strength assessment in patients, the correlation coefficient of r value was 0.125 and the p value was 0.525 (>0.05), resulting in no correlation between the degree of gibbus angulation and motoric neurological deficits.[5] The finding is supported by the result

Table 2 Correlation between Dependent and Independent Variables

Variable	r	p Value
Correlation between gibbus and neurological deficits (motoric)	0.125	0.525 (>0.05)
Correlation between gibbus and neurological deficits (sensory)	0.375	0.009 (<0.05)
Correlation between gibbus and VAS score	0.638	0.000 (<0.05)

of a previous study stating that the lesion in patients with spondylitis TB developed slowly, thus causing spinal cord to gradually adapt with the progressive compression caused by TB lesion.[13] Due to this spinal cord adaptation, no correlation is found between degree of gibbus angulation and motoric neurological deficits.

In this study, all patients who experienced pain, were evaluated for their facial expression when withholding pain. Results of the data analysis show that degree of gibbus angulation correlates significantly with Wong-Baker faces pain rating scale, coefficient r value = 0.638 and p=0.000 (<0.05). These findings are in line with those of a previous study, which mentioned that a significant positive correlation is seen between Wong-Baker faces pain rating scale and the degree of gibbus angulation due to cold abscess as well as other inflammatory responses affecting spinal cord in patients infected with TB.[14]

A study limitation include a high number of incomplete medical records in terms of the data on the measurement of degree of gibbus angulation. Patients' examination data should be included completely in the medical record in the future because neat and complete medical records will improve the quality of the study.

In summary, there is a correlation between the degree of gibbus angulation and sensory neurological deficits as well as pain. However, there is no correlation between the degree of gibbus angulation and motoric neurological deficits.

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