Conservative & Operative Management of Tuberculous Spondylitis in Children

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Abstract

Background: Tuberculosis is a deadly disease worldwide. Tuberculosis usually occurs in the lung, but there are other tuberculosis most commonly afflicted by the patient and involves the spine and is called tuberculosis of bones and joints. Management of tuberculous spondylitis is conservative and operative.

Aim: This study aimed to compare the results of conservative and operative therapy in the management of tuberculous spondylitis in children.

Methods: The sample used was teaching with tuberculous spondylitis in Dr. Soetomo General Hospital who underwent operative and conservative therapy that became group 1 and group 2. Inclusion criteria included patients aged <18 years old, suffering from tuberculous spondylitis by conservative or operative therapy in Dr. Soetomo Hospital.

Results: In patients receiving conservative therapy, the Visual analog scale (VAS) decreased significantly ($p = 0.001$), while frankle improved but not significantly ($p = 0.157$). Cobb's angle of patients receiving conservative therapy increased significantly ($p = 0.007$). Patients who received operative therapy showed significant improvement of VAS and Frankle ($p = 0.001$ and $p = 0.011$). The patient's Cobb's angle after surgery decreased but it was not significant ($p = 0.575$).

Conclusion: The role of surgical action has an important role in the treatment of tuberculous spondylitis and gives better results than conservatives in patients with pain, neurological deficits and Cobb's angle progression.

***Keywords**: Cobb's angle, neurological deficits, tuberculosis, spondylitis, VAS*

Introduction

Tuberculosis is still one of the most deadly diseases in the world. According to the world health organization (WHO) in November 2010, one-third of the world's population is estimated to be infected with tuberculosis germs. Tuberculosis manifestations are usually confined to the lung. However, it can affect any organ such as bone, genitourinary tract and central nervous system known as extra-pulmonary tuberculosis [1]. Tuberculosis of bones and joints accounts for 35% of all extrapulmonary tuberculosis cases and most often involves the spine of about 50% of all cases of bone tuberculosis. Spinal involvement is usually a result of hematogenous spread of the pulmonary lesion or from infection of the genitourinary system [2].

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Spinal involvement differs in both children and adults because the adult spine is already static because it is not in the growth phase, whereas the spine in the child is dynamic which means that the child's bones are cartilagous. Moreover, in the growth phase, if it is exposed to tuberculous spondylitis, it will have an impact morbidity; thus, it can affect the growth of course [2]. Both conservative and operative management actions have distinct handling and are still controversial [3].

The average incidence rate of tuberculous spondylitis in children is not known for certain, but it is estimated that 5%−10% of children under 5 years are infected with tuberculosis and half of it occurs in the spine as a secondary manifestation with its primary manifestation usually originating from the lung or urogenital tract [4]. A patient's history and clinical symptoms are important, but it was not always reliable for early diagnosis.

Neurological deficits in tuberculous spondylitis result from the formation of cold abscesses, granulation tissues, necrotic tissue and sequestra of bone or intervertebral disc tissue and occasionally vascular thrombosis of the spinal artery [5]. Tuberculous spondylitis is a chronic disease and slow to progress with long-lasting symptoms [1]. Management of tuberculous spondylitis is still much difference of opinion between conservative and operative. Some authors recommend the administration of drugs only, while others recommend drugs with surgical intervention. Aggressive decompression, 12 months of anti-tuberculosis drug delivery and spinal stabilization can maximize the preservation of neurological function. However, anti-tuberculosis drugs have a major role in their treatment, but surgical procedures also have their own role in the treatment of tuberculous spondylitis. Conservative treatment cannot prevent the risk of progressivity from khyfotic deformity. Surgery is indicated if there are spinal deformities, neurologic deficits, tuberculosis abscesses and conservative treatment failure. Then, the aim of this study to compared the results of conservative and operative therapy in the management of tuberculous spondylitis in children.

Method

This study used an observational analytic research design. The research design used was pre and posted tested controlled group design. Researchers only evaluated the results of conservative therapy and operative action in the management of tuberculous spondylitis in children performed at SMF Orthopedic Dr. Soetomo Teaching Hospital Surabaya. The study was conducted in January 2010 until December 2012.

The sample used was all patients with tuberculous spondylitis who underwent conservative or operative therapy in Dr. Soetomo Teaching Hospital. The samples were divided into two groups. Inclusion criteria included patients aged <18 years old, suffering from tuberculous spondylitis by conservative or operative therapy in Dr. Soetomo Teaching Hospital and willing to participate in this research. The exclusion criteria included no other neuromuscular disease disorders, neurological disorders both central and peripheral, and patients who refused to participate in the study.

The procedure of sampling were patients with tuberculous spondylitis visited to orthopedic unit or patients who were consulted from other inpatients to orthopedic hospitalization at Dr. Soetomo Teaching Hospital Surabaya, the patients underwent clinical, laboratory and radiological examination to diagnose tuberculous spondylitis.

All the data collected were in tabular and statistically processed using SPSS 20.0 (SPSS. Inc. Chicago IL). To compare the pain threshold value (VAS), neurological deficits (Frankle) and Cobbs angle before and after in conservative therapy and operative action in the management of child tuberculous spondylitis used paired t-test. To compare the change of pain threshold value VAS neurological deficit (Frankle) and Cobb's angle between conservative therapy and operative action in the management of child tuberculous spondylitis used independent sample t-test and the significance level (α) was set at 0.05. It was statistically significant if $p < 0.05$.

Result

Patient Distribution Based on Treatment Action

The distribution of conservative and operative patients found that the number of patients was 15 cases with 54% percentage for conservative and 13 operative cases with the percentage of 46% of the total treatment of 28 patients. Its showed that operative action was conducted at one stage of operation. The most action was debridement with bracing installation of 6 cases with 46% percentage. Action with cast, fibular graft and posterior stabilization were 2 cases each with 15% percentage and debridement action with anterior stabilization was 1 case with 7% percentage on table 1.

Patient Distribution Based on Gender and Age

Gender distribution was found that the number of male patients was 16 cases with the percentage of 57% for conservative and 12 operative cases with the percentage of 43% of the total treatment of 28 patients. Then, Distribution of patients by age group found that the number of age group of 6−10 years old mostly suffered from tuberculous spondylitis with the amount of 11 cases with percentage of 39%, followed by the number of age group 0−5 years old with the number of 9 cases with the percentage of 32%, age 11−15 years old of 5 cases with percentage 18% and age group 16−18 years old of 3 cases with percentage 11% from total treatment of 28 patients on the table 2.

Patient Distribution Based on Pain Scale (VAS)

Distribution of patients based on the pain scale (VAS) found that most patients with 7−8 pain scale were 12 cases with a percentage of 43%. The pain scale of 4−6 was 10 cases with percentage of 36%, 4 cases with pain scale of 9−10 with percentage of 13% and 1 case each with pain scale of 0−1 and 2−3 with percentage of 4% (Table 2). From 28 subjects, 15 cases were categorized as conservative therapy groups and 13 cases were categorized as operative group (Table 1).

Table 1. Group Distribution

Group Distribution	**Conservative**	**Operative**
Visual Analog Scale		
0 – 1	1 (7%)	0
2 – 3	0	1 (8%)
4 – 6	6 (40%)	4 (31%)
7 – 8	7 (46%)	5 (38%)
9 – 10	1 (7%)	3 (23%)
Frankle Classification		
A	1 (7%)	4 (31%)
B	0	0
C	6 (40%)	3 (23%)
D	7 (46%)	2 (15%)
E	1 (7%)	4 (31%)
Cobb's Angle (Kaplan Classification)		
Mild <300	6 (40%)	4 (31%)
Severe 30 – 600	7 (47%)	6 (46%)
Moderate >600	2 (13%)	3 (23%)

From that table, its showed, distribution of patients based on neurological deficits found that patients with no neurological deficit (Frankle E) were 11 cases with a percentage of 39%. There were 17 cases with neurological deficit (Frankle A, B, C and D) wiSth details of 8 cases of Frankle D with percentage of 29%, 4 cases of Frankle C with percentage of 14% and 5 cases of Frankle A with percentage of 18%. From 28 cases evaluated, 15 cases were categorized as conservative therapy group and 13 cases were grouped as operative group (Table 1).

Patient Distribution Based on Cobb's Angle

Distribution of patients based on neurological deficits found that patients with no neurological deficit (Frankle E) were 11 cases with a percentage of 39%. There were 17 cases with neurological deficit (Frankle A, B, C and D) with details of 8 cases of Frankle D with percentage of 29%, 4 cases of Frankle C with percentage of 14% and 5 cases of Frankle A with percentage of 18%.

Infected Vertebrae Characteristic

Distribution of patients based on the affected vertebrae level was found that the thoracic and lumbar vertebrae sites were most affected by tuberculous spondylitis with an amount of 8 cases each with a percentage of 28.6%, followed by thoracolumbal and lumbosacral levels of each 4 cases with the percentage of 14.3%, while the cervicothoracic level area with the number of 3 cases with the percentage of 10.7% and the cervical area of 1 case with 3.6% percentage and not found one case in the sacral area of the total treatment of 28 patients (Table 1).

Characteristics of patients studied based on gender, age and level of pathological vertebrae, found that patients who received operative and conservative therapy were not significantly different in terms of gender (p = 0.477), age at diagnosis (p = 0.756), age at study (p = 0.788), and pathology level (p = 0.539). Due to the uniform sample, the analysis of the patient's surgical or conservative results was valid for comparison (Table 2).

Table 2. Research Analysis

Analysis	**Therapy**		**P**
Characteristics of Research Sample	**Conservative (n=15)**	**Operative (n=13)**	
Gender			0.477
Male	10 (66.7)	6 (46.2)	
Female	5 (33.3)	7 (53.8)	
Age at diagnosis (years)	8.0±5.3	7.5±3.9	0.756
Present Age (year)	9.3±5.3	8.8±4.3	0.788
Location			
Cervical	2 (11.8)	2 (20.0)	
Thoracal	6 (35.3)	5 (50.0)	
Lumbal	9 (52.9)	3 (30.0)	
Level	3.2±1.4	3.5±1.5	
Characteristics of VAS, Frankle and Cobb's Angle			
Before treatment			
VAS	7 (1 - 9)	7 (3 - 9)	0.489
Frankle	4 (1 - 5)	3 (1 - 5)	0.091
Cobb's Angle	38.7±26.3	46. 1±35.9	0.539
After treatment			
VAS	-4 (-8 – (-1))	-5 (-8 – (-1))	0.377
Frankle	0 (0 - 1)	1 (0 - 4)	0.004
Cobb's Angle	6.5±8.0	-3.4±21.1	0.134

From table 2, it was found that before the treatment of VAS and Frankle, there was no significant difference in patients' condition (p = 0.489 and p = 0.091). The patients' VAS who received the same medication therapy was the same as those who received conservative therapy.

In other side, age, location and number of affected segment vertebrae were not correlated with outcomes to visual analog scale (VAS), frankle improvement and Cobb's angle. Its show on table 3

Table 3. The Correlation Analysis between Age, Location and Number of Segments with Outcome (Visual Analoque Scale, Frankle Improvement and Cobb's Angle)

Variable	VAS (n=28)		Frankle (n=28)		Cobb's(n=28)	
	Pearson	Sig (2-tailed)	Pearson	Sig (2-tailed)	Pearson	Sig (2-tailed)
Age	-0.057	0.772	-0.039	0.842	0.077	0.698
Segments	-0.033	0.867	0.028	0.888	0.132	0.504
Location	-0.345	0.072	-0.362	0.058	-0.237	0.225

Correlation is significant at the 0.01 level (2-tailed)

From the table there is correlation that significant about age, location, and number. There is some segments that give outcome. Pathology affected by 2 segments upwards may make the cut of point for operative action (Table 3).

There was a significant difference in both the conservative and operative group of subjects in which subjects who underwent operative therapy experienced significant pain relief compared to subjects who underwent conservative therapy. This is consistent with several studies conducted in Indonesia. Another result stated that pain can be healed in tuberculous spondylitis which is undergoing surgery. Pain in the tuberculous spondylitis decreased at week four after undergoing operative therapy with debridement [6].

Comparative assessment of conservative and operative therapy in this study used a pain scale assessment with VAS, neurological deficits assessed by the Frankle classification and assessment of destruction of corpus vertebrae damage used Cobb's angle. Assessment of the pain scale corresponds to the most frequent complaints in children who suffer from tuberculous spondylitis in daily life such as during sleep, sitting, standing and walking. Assessment of neurological deficits using the Frankle classification scale assessed by sensory and motor examination is also common in children with tuberculous spondylitis[7].

Not all tuberculous spondylitis has a neurological deficit. Neurological deficits can occur because of the active phase of the inflammatory edema, extra-dural compression to the posterior side of the abscess (pus, the caseous material/granulation, connective tissue granulation, sequester), the gibbus due to collapse of the infected vertebrae. Neurological deficits cant be recovered due to spinal stenosis, direct compression of the gibbus itself or fibrosis contraction from epidural [8].

The pathology of tuberculous spondylitis is anterior to the destructive vertebral corpus. This destruction will cause the collapse of the anterior portion of the corpus vertebrae resulting in a sharp angle known as gibbus. Cobb's angle assessment is important because it can be one of the prognostic factors in children. Moreover, it is appropriate to say that kyphosis is more common in children than in adults because its deformity in children is dynamic with progressive variation through growth, whereas in adults the deformity of kyphosis is static and it depends on the number of levels of the destructive vertebra [9]. This is also supported by previous studies which suggest that conservative-treated tuberculosis spondylitis increases the deformity of kyphosis 10−150 with late kyphosis deformity[10].

Previous studies have suggested that the status of the posterior colum and the type of fixation is a major factor in determining this kyphosis deformity [11]. Kaplan's classification method for assessing the severity of this Cobb's angle is mild with angle <300, moderate with angle of 30−600 and severe with angle >600. Tuberculous spondylitis with severe kyphosis is very difficult to return to the normal value of kyphosis and required an operative recontruction after healing process [11]. Other studies suggest that at Cobb's angle of >600, anterior decompression action, shortening posterior and stabilization with posterior instrumentation are required [12]. In this study, there are differences in subjects who receive conservative and operative therapy if it is evaluated based on evaluation of pain, neurological deficit and Cobb's angle. The results of this study provide information on the importance of operative role in the treatment of tuberculous spondylitis.

Conclusion

The operative action gives better results than the operative actions of the assessment of visual analog scale (VAS), Frankle and Cobb's angle. There was no correlation/difference in age, location and number of infected segments with conservative and operative action based on visual analytical scale (VAS) measurement, Frankle and Cobbs angle.

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