

The Pattern of Spinal Tuberculosis in Sarawak General Hospital

A H Rasit, MD*, M Razak, MS Ortho.*, F S S Ting, FRCS**, *Department of Orthopaedics and Traumatology, Hospital Universiti Kebangsaan Malaysia, Jalan Tenteram, Bandar Tun Razak, Cheras, 56000 Kuala Lumpur, **Department of Orthopaedics, Sarawak General Hospital, 93586, Kuching, Sarawak

Summary

This is a retrospective study of 53 patients with spinal tuberculosis treated in Sarawak General Hospital from 1994 until 1998. The study showed that the mean age in patients with spinal tuberculosis was 40.2 years, and was more common in male (70%) and in Iban population (50%). The clinical presentation included backache (94%), abscess (45%), neurological deficit (44%), and gibbus deformity (22%). The percentage of patient without BCG scar was 82% and 18% had evidence of pulmonary tuberculosis. The most common vertebra involved was the ninth thoracic vertebra and the least common was the third cervical vertebra. The average number of vertebra affected per patient was three. The most common radiological type of lesion was paradiscal (47%). The percentage of patients diagnosed by histological examination was 43%. All patients were given chemotherapy for 12 months' duration; 57% were treated surgically and 43% were treated conservatively. Twenty-four of patients (40%) had an excellent and good results and 28 of patients had a fair result and only one patient had poor result. In 23 of patients treated conservatively showed increment of 8 degrees of kyphosis angle and 22 of patients had a fair result and only one patient had poor outcome after 6 months of treatment. In 30 of patients treated surgically showed correction of 4 degrees of kyphosis angle and 24 of them had excellent and good outcome, where 6 of them had fair outcome after 6 months of treatment.

Key Words: Tuberculosis, Spine, Kyphosis, Chemotherapy, and Surgery

Introduction

Spinal tuberculosis is the most dangerous form of musculoskeletal tuberculosis because of its ability to cause bone destruction, deformity and paraplegia. According to World Health Organization, tuberculosis has become the world's most deadly infectious disease, killing nearly 3 million people per year¹. Each year there are 8 million new cases of tuberculosis, and 50% of them are infectious. There are approximately 20 million active cases, and 1.7 billion (one third of the world's population) are, or have been, infected

with the tuberculosis bacillus. Most tuberculosis related deaths are in the developing world, with 1.8 million occurring in Asia annually. In some eastern and central African countries, reported cases of tuberculosis have nearly doubled in the last 4 to 5 years; one of the reasons for the resurgence of tuberculosis being the spread of human immunodeficiency virus (HIV) infection².

The incidence of Tuberculosis in Malaysia for 1995 was 58.00 per 100000 populations as compared with 59.80 per 100000 populations in 1994. The mortality rates (medically certified and

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inspected) for 1995 were 3.3 per 100000 populations. This was an increase from 1994 when it was 1.7 per 100000 populations³. In Sarawak a total number of 1603 cases of tuberculosis (all forms) were registered in 1995, an incidence rate of 85.8 per 100,000 population in 1995, which is the second highest in Malaysia.

The aims of the study were to determine the epidemiology and outcome of treatment of spinal tuberculosis in Sarawak General Hospital.

Materials and Methods

During the period from January 1994 to December 1998, 53 patients was diagnosed and treated as spinal tuberculosis in Sarawak General Hospital. The main criteria for admission to the study were clinical or radiologically evidence of tuberculosis infection of spine from the first cervical to the fifth sacral. In each patient the data was collected from the following sources; the medical record, state antituberculosis center, orthopaedic clinic, radiology department and histopathology department.

The sex distribution was 37 and 16 of patients for male and female respectively. The race distribution for this series was 27, 10, 4, and 12 of patients for Iban, Malay, Chinese and Bidayuh respectively. The total number of patients presenting with backache was 50 and another 3 patients presented with neurological deficit without backache. The average duration of the presenting symptom was 6.9 months. The total number of patients presenting with neurological deficit was 28 patients and the average duration of neurological deficit before referral was 3.2 weeks.

All patients had sputum examination for acid-fast bacilli and plain film of spine and chest. The technetium bone scan, CT scan and MRI were performed in patients with neurological deficit only. The histopathology examination of the tissue obtained and biopsy was done in all the 30 surgically treated patient.

All patients were treated with standard 12 months chemotherapy according to one of three regimes as recommended by Ministry of Health, Malaysia. A total number of 30 patients were treated surgically and 23 patients were treated conservatively. The criteria for operative intervention were progression neurological deficit, large paravertebra abscess and severe kyphosis. In 30 patients treated surgically 20 had radical anterior decompression and strut grafting and another 10 (main pathology at posterior element of spine) had posterior decompression and drainage of paravertebra abscess.

All patients were evaluated postoperatively for graft complication, persistent sinuses, degree of spine deformity, sign of inactive infection and status of fusion, radiologically and clinically.

The disease activity was classified as either active or quiescent disease. Active disease was radiologically characterized by the presence of rarefaction of the affected vertebral body or loss of thin cortical outline. Quiescent disease was radiologically characterized by bony fusion of the affected vertebral bodies, or sclerosis of the affected vertebrae with reduction or disappearance of the intervening disc space⁵.

The bony fusion was characterized by continuity of trabeculae between the vertebral bodies. It is usually best seen in the anteroposterior view, projecting up to 20mm wide of the vertebral bodies and showing evidence of trabecular continuity. Presence of even a hairline gap means no trabecular continuity, therefore no bony fusion.

The angle of kyphosis was measured by a technique similar to that described by Konstam and Blesovsky⁶. Two lines are drawn, one through the superior surface of the first normal vertebral body cephalad to the lesion and another through the inferior surface of the first normal vertebral body caudad to the lesion. Perpendiculars are then drawn from these lines and the angle is measured at their intersection.

The severity of the kyphosis was classified according to the criteria proposed by Kaplan⁷, with kyphosis of less than 30 degrees considered mild; 30 to 60 degrees, moderate; and more than 60 degrees, severe.

The method of evaluating the outcome of treatment and the prevention of progression of the kyphosis was based on modified Rajasekaran classification⁸: Excellent, when there is sign of fusion with some correction of the angle as compared with the preoperative kyphosis angle. Good, when there is sign of fusion with no progression of the kyphosis angle. Fair, when there is sign of fusion with an increase in the kyphosis angle of less than 20 degrees. Poor, when there is no sign of fusion with an increase of the kyphosis angle of more than 20 degrees (Table I).

The statistic analysis was done with SYSTAT version 2.0 and data comparison done with student t-test.

Results

The number of patients with spinal tuberculosis diagnosed and treated at Sarawak General Hospital has increased from 1994 until 1998. The number of patients with spinal tuberculosis treated at the hospital in 1994, 1995, 1996, 1997 and 1998 were 5, 8, 12, 16 and 12 respectively (Figure 1).

Table I
Modified Rajasekaran Classification Outcome of Treatment

	Progression of Kyphosis	Signs of Fusion
Excellent	Correction of kyphosis	Yes
Good	No progression of kyphosis	Yes
Fair	Progression of kyphosis < 20 degrees	Yes
Poor	Progression of kyphosis > 20 degrees	No

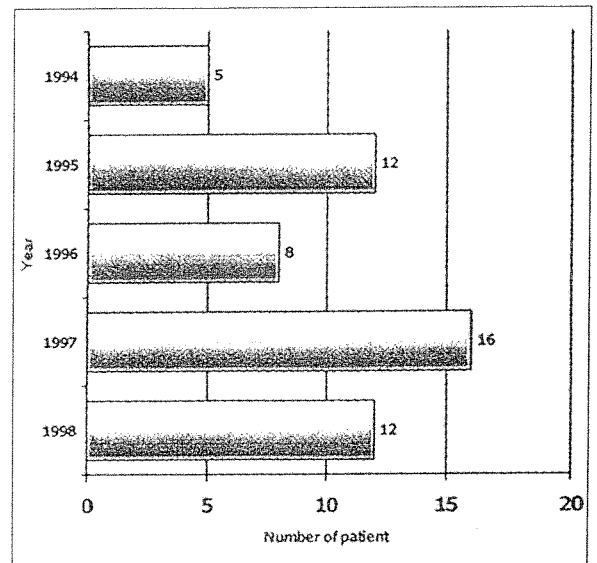


Fig. 1: Distribution of patient according to year.

The mean age at presentation of spinal tuberculosis patients was 40.2 years. The most common presenting complaints were backache (94%), abscess (45%), neurological deficit (44%), constitutional symptoms such as low grade fever and night sweet (38%), and gibbus deformity (22%). Of the 53 patients in this series only 7 had a BCG scar, 7 had history of contact with tuberculosis patient and 18 had history of pulmonary tuberculosis.

The mean of Mantoux tuberculin test reading was 11.5 mm and the mean erythrocyte sedimentation rate was 73.0-mm/first hour, in the 53 patients.

The total numbers of vertebra involved in this series were 163 vertebrae. The average number of vertebrae radiologically involved were three per patient (range, 1 to 9). The most common vertebra affected was the ninth thoracic vertebra and the least was the third cervical vertebra (Figure 2).

The commonest type of radiological lesion in spinal tuberculosis was paradiscal, which accounted for 25 patients followed by anterior,

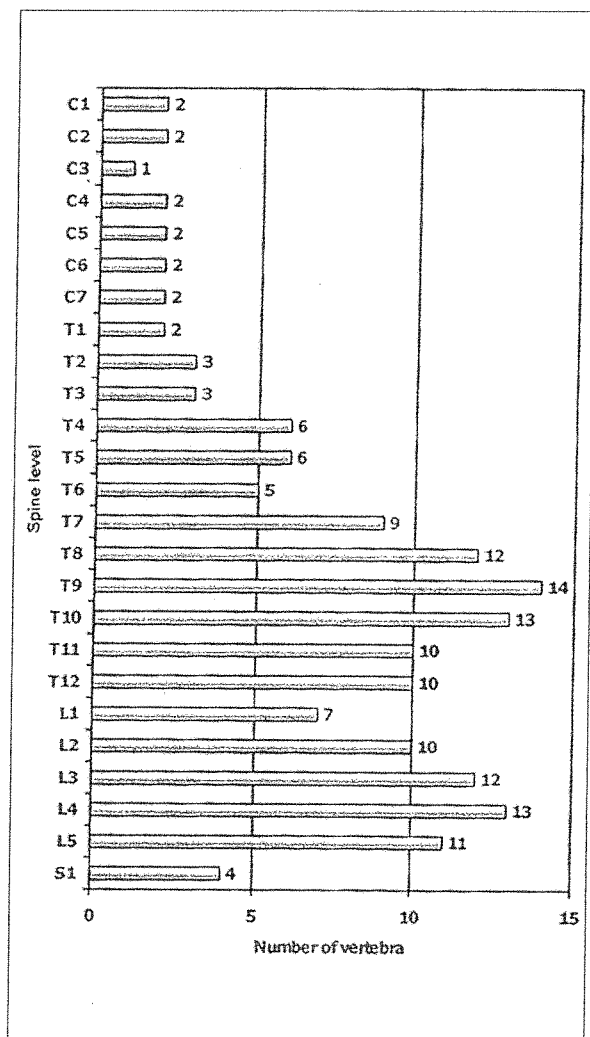


Fig. 2: Distribution of number of vertebra affected according to spine level.

undetermined and central lesion seen in 14, 11 and 3 of the patients respectively. Five patients had skip lesions (9%).

In 49 patients with thoracic and lumbar spinal tuberculosis, the mean angle of kyphosis on admission was 22.5 degrees and increased to 25 degrees after 6 months treatment. Out of 49 patients, 28 were treated surgically and 21 were treated conservatively. The mean angle of

kyphosis on admission for patients treated surgically and conservatively was 22.5 degrees and 21.0 degrees respectively. However after 6 months of treatment, the mean angle of kyphosis in surgically and conservatively treated patients were 18.4 degrees and 29.5 degrees respectively. This makes the correction of 4.1 degrees in surgically treated patient, whereas there is increment of 8.5 degrees of kyphosis angle in conservatively treated patient (Table II). There is significant different of the progression of kyphotic angle in conservative compare to surgical group (t - test , $p = 0.0001$, $df = 20$).

Preoperatively there were 49 patients with the kyphosis angle, 41 of them were classified as mild kyphosis, 8 moderate kyphosis. In conservative group, there were 17 patients with mild kyphosis, 4 with moderate kyphosis. In surgical group, there were 24 of patients with mild kyphosis and 4 of them with moderate kyphosis. Six months after treatment 8 patient with mild kyphosis in conservative group worsened to moderate kyphosis, whereas one of patient in moderate kyphosis in surgical group improved to mild kyphosis (Table III). There is significant different of worsening of kyphotic angle in conservative group from mild into moderate kyphosis (t - test, $p = 0.002$, $df = 8$). There is no significant different of the improvement of kyphotic angle in surgical group from moderate into mild kyphosis (t - test, $p = 0.018$, $df = 3$).

Table II
Kyphosis Angle According to Treatment Group

Mean	Surgical Group (n=28)	Conservative Group (n=21)
Pre-treatment	22.481 degrees	21.000 degrees
Post-treatment	18.370 degrees	29.445 degrees
Difference †	- 4.110 degrees*	+ 8.455 degrees**

* negative value means correction of kyphosis deformity

** positive value means increment or progression of kyphosis deformity

† t - test, $p = 0.0001$, $df = 20$

Table III
Severity of Kyphosis According to Treatment Groups

Kyphosis	Pre-treatment	Post-treatment
Surgical Group		
Mild (0° - 30°)	23	24
Moderate (31° - 60°)	4	3
Severe ($>60^{\circ}$)	0	0
Conservative Group		
Mild (0° - 30°)	18	10
Moderate (31° - 60°)	4	12
Moderate ($>60^{\circ}$)	0	0

In 4 patients with cervical spinal tuberculosis, 2 patients with atlas and axis vertebra involvement were treated with posterior fusion and wiring. Another 2 lower cervical spinal tuberculosis was treated conservatively with chemotherapy, Holter traction for 6 weeks and followed by cervical collar for 3 months. There were no changes of kyphosis angle in this 4 cases after 6 months treatment.

The chemotherapy used in this series was three-regime method. Forty-one of them were given 2 months combination of Ethambutol, Isoniazid, Rifampin and Pyrazinamide followed by 10 months of intermittent Rifampin and Isoniazid regime. Eleven of them were given 2 months combination of Streptomycin, Isoniazid, Rifampin and Pyrazinamide and followed by 10 months of intermittent Rifampin and Isoniazid regime. Only one pediatric patient was given 2 months combination of Isoniazid and Rifampin followed by 10 months intermittent Rifampin and Isoniazid regime.

In 28 patients presented with neurological deficit improved at least one Frankel grade after surgical decompression. All anterior strut grafts incorporated and fused at 6 months postoperatively. In 30 patients treated surgically, 24 had excellent to good results, 7 had fair result. Whereas, in 23 of patients treated conservatively, 22 of them had fair result and only one had poor result (Table IV).

Table IV
Outcome of Treatment According to Groups

Outcome	Surgical Group (n=30)	Conservative Group (n=23)
Excellent	23	0
Good	1	0
Fair	6	22
Poor	0	1

Discussion

The incidence of spinal tuberculosis has increased from 5 cases in 1994 to 12 cases in 1998. The average age of patients in this series was 40.2 years. This is similar to North America, Europe, and Saudi Arabia where the disease primarily affects adults. This changing patterns, a decrease in the incidence of infection in infants and young children has been noted in Hongkong⁷.

Bone and joint involvement develops in approximately 10% of patients with tuberculosis, and half of these affected patients have tuberculosis of the spine affecting 5% in the cervical spine, 25% in the thoracic spine, and 20% in the lumbar and lumbarsacral spine. In this series the most common vertebra involved was the ninth thoracic vertebra and the least common was the third cervical vertebra. The average number of vertebra bodies involved was three per patient (range, 1 to 9). Quahes in 1988 reported, mostly from high-disease areas, the average patient has two or three vertebra involved and lesion of the atlas and axis are the least common⁹.

A neurologic deficit is reported in most series^{5,6,7,9,10,11,12,13} in 10 to 47% of those with tuberculous spondylitis. In this study the incidence of paraplegia in spinal tuberculosis was 44%, which is nearly similar that reported by Lifeso *et al.*¹⁶.

The most common pattern of involvement in the adult is the paradiscal lesion, which accounts for over one-half of cases, however the disease was too widespread at presentation for identification of the primary focus.(Bullough in 1988)¹⁷. In this

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form of disease, the primary infectious focus begins in the vertebral metaphysis and erodes through the cartilaginous end plate with resulting disc space narrowing. In this series the most common pattern was the paradiscal which was 47% as nearly similar to series reported by Bullough¹⁷. Skip lesions may be seen in 10% of patient and may appear in different stages of development (Bullough in 1988)¹⁷. In this series, 9% of patients had skip lesions detected by technetium bone scan.

Abscesses are a common finding in spinal tuberculosis. Abscesses in the lumbar region may descend down along the psoas sheath to the region of the femoral triangle. Sacral lesions may travel into either the perineum or the gluteal region via the greater sacral foramen (Tuli in 1967)¹⁴. In this series the evidence of abscess in the spinal tuberculosis was found clinically and radiologically in 45% of patients.

Although the diagnosis of spinal tuberculosis could be made on the basis of history, clinical and serial radiological findings, current knowledge depends on positive culture and acid-fast bacilli detected on direct smear. In this series, only 44% were diagnosed based on histology. This was due to the specimen taken only in surgically treated patients. In all patients treated conservatively, a biopsy was not performed.

TB culture and AFB stains were done in all patients treated surgically and the chemotherapy was given at least 3 weeks before surgery, this may explain the negative cultures in all cases even after 6 weeks of incubation. Direct microscopy and Ziehl-Nielsen staining of clinical specimen lack sufficient sensitivity and specificity and a relatively large number of bacteria (10^4) should be present in the clinical sample for detection. Although culture is more specific than is direct microscopy, isolation of mycobacteria from clinical samples takes several weeks for culture on solid medium and 10 - 20 days by the BACTEC system (Johnson Laboratory, Inc.), which is based on the measurement of carbon dioxide

released during growth in liquid medium. Still, culture is growth-dependent and needs at least 10 - 100 viable mycobacteria. A recent report by Daniel¹⁹ estimates that the sensitivity of culture can be as low as 50%. Thus, chances of positive culture of material obtained from spine are obviously low.

The Mantoux tuberculin skin test was done in half of the patients. It is known that positive protein pure derivative reaction indicates either past or present exposure to mycobacterium and predictive in 86% of cases, whereas a negative reaction usually excludes the diagnosis unless there is no evidence of atopy.

Upadhyay and co-workers reported that a 6-month chemotherapeutic regimen combined with surgical excision and bone grafting is adequate for management of tuberculosis of the spine, as it produced clinical and radiologic results comparable with the 18-month chemotherapeutic regimen²⁰.

Results at five years of such favorable status was obtained in 100% of patients in radical operation group with chemotherapy, but was only achieved in 89% of patients in conservative group with chemotherapy alone. Nevertheless, these two groups yielded the best overall results. Bony fusion rate was 92% in the radical operation group, but only 50% in the chemotherapy alone group, at five years follow-up. Kyphotic deformity was not evident with the radical operation group compared to an increase of 10 degree in non-surgical group at five years follow-up⁵. In this series, there was a decrease in kyphosis angle of 4 degrees in surgically treated patients compared to the increase of 12 degrees in conservatively treated patients after 6 months treatment.

Medical Research Council Party (MRC) study of spinal tuberculosis after 10 years of follow-up showed that, a mean decrease in kyphosis of 1.4 degrees in the thoracic and thoracolumbar region in radical operation group, compared to an increase of 9.8 degrees in debridement group⁵. However, after 15 years of follow-up of their study

concluded that outpatient chemotherapy with standard short-course regimes should be the main management of uncomplicated spinal tuberculosis. The advantages of radical operation over debridement in terms of deformity persist, but the overall clinical outcome was equally good²¹.

Upadhyay reported that the mean changes in kyphosis angle at the 6-months postoperative evaluation compared to their preoperative values were significantly different between radical and debridement surgical groups. However the difference in kyphosis angle at final 17 years follow-up compare to their 6-months' postoperative values were not significantly different¹⁵.

Conclusion

This study shows that there is an apparent increase in the incidence of spinal tuberculosis diagnosed and treated in the Sarawak General Hospital. There is significant difference of progression of kyphotic angle in conservative compare to surgical group. There is significant

different of worsening in kyphotic deformity in mild into moderate kyphosis in conservative group. There is no significant different of improvement of kyphotic deformity in moderate into mild kyphosis in surgical group. The role of surgery in management of spinal tuberculosis is to eliminate the lesion, to drain the abscess, to correct the kyphosis deformity, to decompress any neurological compression and to achieve early fusion of affected vertebrae. The indication of surgery in the management of spinal tuberculosis are deteriorating neurological deficit despite conservative treatment, more than two level vertebral involvement with moderate and severe kyphotic deformity.

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