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RESEARCH ARTICLE

Decompression and Posterior Stabilization Spine Tuberculosis Surgical Treatment via Transpedicular Approach: a Retrospective Study

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Abstract

Clinical intervention has a central role in the outcome of spondylitis tuberculosis cases. Surgical procedures indicate to prevent neurological collapse, preservation of stability, and early mobilization. The study aims to analyze the outcome of surgical intervention in spinal tuberculosis by using a transpedicular approach. This research was a retrospective study on the Department of Orthopaedics and Traumatology in Dr. Hasan Sadikin General Hospital, Bandung, Indonesia, during 2016–2018. There were 64 subjects in this study; 35 were male, and 29 were female, ages ranged 21–60 years with a follow-up period of 12 months to 18 months. A more common site of tubercular lesion was at the thoracal lesion (44%). In this research, the patients were preoperatively categorized by the American Spinal Injury Association (ASIA) Impairment Assessment. Among them four were ASIA-A, 10 were ASIA-B, 30 were ASIA-C, 15 were ASIA-D, and five were ASIA-E. After the operative procedure, two patients were ASIA-B, five patients were ASIA-C, 17 patients were ASIA-D, and 40 were ASIA-E. Maximum patients (62%) had bony fusion grade 1. Greater than 80% of subjects had a satisfactory result. In conclusion, posterior decompression and preservation of stability with transpedicular fusion are an excellent surgical way of posterior lumbar spinal tuberculosis treatment.

Key words: Kyphotic angle, transpedicular decompression, tuberculosis

Tindakan Operasi Dekompresi dan Stabilisasi Posterior Melalui Pendekatan Transpedikular pada Tuberkulosis Tulang Belakang: Studi Retrospektif

Abstrak

Tindakan medis berperan penting pada manajemen akhir kasus tuberkulosis tulang belakang. Prosedur operasi dilakukan untuk mencegah perburukan defisit neurologis, menjaga kestabilan tulang belakang, dan mobilisasi dini. Tujuan penelitian ini adalah menganalisis luaran hasil tindakan operatif pada tuberkulosis tulang belakang dengan pendekatan transpedikular. Penelitian ini merupakan studi retrospektif pada Departemen Orthopaedi dan Traumatologi RSUP Dr. Hasan Sadikin, Bandung, Indonesia, periode tahun 2016–2018. Terdapat 64 subjek dalam penelitian ini yang terdiri atas 35 laki-laki dan 29 perempuan, serta usia berkisar 21–60 tahun dengan masa tindak lanjut 12–18 bulan. Pada penelitian ini, lesi tuberkuler paling banyak terjadi di regio torakal (44%). Subjek penelitian dikategorikan menurut *Impairment Assessment* dari American Spinal Injury Association (ASIA). Preoperatif terdapat empat pasien ASIA-A, 10 pasien ASIA-B, 30 pasien ASIA-C, 15 pasien ASIA-D, dan lima pasien ASIA-E. Setelah tindakan operasi terdapat dua pasien ASIA-B, lima pasien ASIA-C, 17 pasien ASIA-D, dan 40 pasien ASIA-E. Mayoritas pasien memiliki fusi tulang grad 1 (62%). Lebih dari 80% subjek penelitian menyatakan puas setelah operasi dilakukan. Simpulan, tindakan operatif dekompresi dan stabilisasi dengan fusi transpedikular merupakan metode yang unggul dalam manajemen tuberkulosis tulang belakang.

Kata kunci: Dekompresi transpedikular, sudut kifotik, tuberkulosis

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Introduction

Osseous tuberculosis (TB) comprise about 50% of all cases of skeletal tuberculosis.[1] Osseous tuberculosis rates approximately 15–38% of extrapulmonary tuberculosis and 1–5% of TB cases.[2]

Spinal tuberculosis was initially described by Sir Percival Pott (1779) as an aching gibbus accompanied by the paraplegic condition.[3] Any part of the spinal column may be affected by tuberculosis, but most cases are commonly found in the lower thoracic and thoracolumbar regions. The order of frequency has been dorsal (42%), lumbar (26%), dorso-lumbar (12%), cervical (12%), and sacral (3%).[1]

Anti-TB drugs promote the healing of patients.[4] They may succeed in treating spine TB if there is no disease complexity or limited to the vertebrae.[2] The most popular protocol for anti-TB chemotherapy is to use isoniazid (INH), rifampicin (R), pyrazinamide (Z), and ethambutol (E) oral drugs for the first two months followed by a maintenance phase of rifampicin and isoniazid for six, nine, twelve, or eighteen months.[5,6]

The essential surgical procedure is spinal cord decompression by eliminating the necrotic tissue, voiding of any pus, and followed by immobilization. The infected spine is susceptible to deformity so that we must preserve the stability.[6,7]

There are four indications in determining surgical intervention. Those are intractable pain with abscess formation and marked bone destruction, neurological deficit related to severe kyphosis, retropulsion bone, or disc, neurological deteriorate, and progression of kyphotic angle.[7,8] The study aims to analyze the outcome of surgical intervention in spinal tuberculosis by using a transpedicular approach.

Methods

It is a retrospective study at the Department of Orthopedics and Traumatology of Universitas Padjajaran, in Hasan Sadikin General Hospital, Bandung, Indonesia. The subjects were 64 having spondylitis TB in the thoracic and lumbar regions. They received decompression posteriorly and fusion by transpedicular screws and rods. Among them, 35 were male, and 29 were female, age ranged from 21–60 years with a follow-up period of 12 months to 18 months.

One surgeon operated all subjects—the posterior midline approach used in all cases. Pedicle screws set down by the C-arm fluoroscopic procedure, two levels beyond and beneath the lesion. If the superior part of the spinal column was excellent, the affected spinal column incorporated in the instrumentation. Temporary stabilization of the spine was done by connecting the pedicle screws on the left side to prevent collapse during debridement and permit a transpedicular procedure from the right one. Laminectomy was done on the affected level focusing on the infected tissues, pus, sequestrum, and disc through the transpedicular approach. All Screws connected with the connecting rods. After all, the wound was closed by suturing.

In this research, the subjects preoperatively categorized by the American Spinal Injury Association (ASIA) Impairment Assessment (Table 1).[9] Among them, four were ASIA-A, ten were ASIA-B, 30 were ASIA-C, 15 were ASIA-D, and 5 were ASIA-E. After the operative procedure, two patients were ASIA-B, five patients were

Table 1 American Spinal Injury Association (ASIA) Impairment Assessment Tools

Grade A	Complete. The function of motoric and sensory is not preserved in the sacral segments S4–S5.
Grade B	Incomplete. Sensory but not motoric is conserved below the neurologic level, including the sacral segments S4–S5.
Grade C	Incomplete. Motoric is conserved distal the neurologic level, and more than half of key muscles below the neurologic level have a muscle grade lower than 3.
Grade D	Incomplete. Motoric is conserved distal the neurologic level and at least half of key muscles below the neurologic level have a muscle grade of 3 or upper
Grade E	Normal. Functions of motor and sensory are normal.

Source: Roberts et al.[9]

ASIA-C, 17 patients were ASIA-D, and 40 patients were ASIA-E.

Inclusion criteria were 1) all patients were having spinal tuberculosis of the thoracic or lumbar region, 2) paraplegic vertebral spine, 3) instability of spinal TB, and 4) age between 21–60 years.

Exclusion criteria were 1) pre-destructive stage of spondylitis TB, 2) spinal TB, which response to anti-TB chemotherapy within 3–4 weeks, and 3) spondylitis TB took place in the cervical region.

Ethical approval for this study has obtained from the Health Research Ethics Committee of Dr. Hasan Sadikin General Hospital Bandung with the letter number: LB.04.01/A05/EC/365/XII/2016.

Results

Socio-demographic variables, including distribution of clinical presentation, lesion, and level of involvement, are presented in Table 2.

Modified Macnab criteria evaluated postoperative clinical outcome.[9] Among 64 patients, 48 (75%) cases were excellent, 9 (14%) cases were good, 6 (9%) case was fair, and 1 (2%) case was poor. The overall result was assessed by grading satisfactory (excellent and good) 57 (89%) cases and unsatisfactory 7 (11%) cases.

Discussion

Spondylitis TB usually occurs at first for three decades.[10] In this research, the subjects' age varied from 20–60 years, most within 21–30 years. Here 55% of cases were male, and 45% of cases were female.

This study showed that most of the clinical finding was a pain (31%) followed by gibbus (23%), weakness (14%), paraplegia (13%), spinal deformity (9%), the difficulty of walking (5%) and stiffness (2%). A study done by Polley and Dunn[11] revealed 53% of subjects had back pain, and Garg et al.[12] also reported that spinal TB's clinical features were localized pain, tenderness, stiffness, cold abscess, gibbus, and prominent spinal deformity. According to Issack and Boachie-Adjei,[13] surgery should be considered when a kyphotic angle is more than 500. In childhood, the vertebral destruction was more accentuated and progressive than in adults, where kyphosis is stable after healing.[14]

Regarding the distribution of lesion, 44% were thoracal, 37% were lumbar, and 19% were thoracolumbar. Research from Godlwana et al.[15] reveals that the thoracal region was involved in 42% of cases, the lumbar region in 30% of cases, and the dorso-lumbar in 10% cases. In this research, the preoperative kyphotic angle was compared with postoperative follow up. All patients showed a decrease in kyphotic angle in

Table 2 Distribution of Age, Sex, Occupation, Clinical Presentation, Lesion, and Level of Involvement

Variables	n=64	%
Age (years)		
<20	5	8
21–30	25	39
31–40	15	23
41–50	14	22
51–60	5	8
Sex		
Male	35	55
Female	29	45
Occupation		
Day laborer	20	31
Shopkeeper	3	5
Serviceman	5	8
Businessman	4	6
Housewife	15	23
Farmer	12	19
Jobless	5	8
Clinical presentation		
Weakness	9	14
Gibbus	15	23
Pain	20	31
Weight loss	2	3
Stiffness	1	2
Paraplegia	8	13
Kyphoscoliosis	6	9
Difficulty in walking	3	5
Lesion		
Thoracal	28	44
Lumbal	24	37
Thoracolumbar	12	19
Level of involvement		
Th9–Th10	6	9
Th10–Th11	2	3
Th11–Th12	20	31
Th12–L1	12	19
L1–L2	4	6
L2–L3	4	6
L3–L4	6	9
L4–L5	10	16

Table 3 Pre- and Postoperative Kyphotic Angle, Pre- and Postoperative ASIA Grade, Postoperative Complications, and Posterior Fusion Grades

Variables	n=64	%
Preoperative kyphotic angle		
≤10°	5	8
11–20°	15	23
21–30°	28	44
31–40°	10	16
≥40°	6	9
Postoperative kyphotic angle		
≤10°	50	78
11–20°	10	16
21–30°	4	6
31–40°	0	0
≥40°	0	0
Preoperative ASIA grade		
Grade A	4	6
Grade B	10	16
Grade C	30	47
Grade D	15	23
Grade E	5	8
Postoperative ASIA grade		
Grade A	0	0
Grade B	2	3
Grade C	5	8
Grade D	17	27
Grade E	40	62
Posterior fusion grade		
Grade 1	40	62
Grade 2	15	23
Grade 3	8	13
Grade 4	1	2

the final follows up.

At the time of the surgery should be done, accompanying medical drugs are essential.[16] The approach for the surgical procedure of tuberculosis TB has always been debatable. The approach for vertebral TB surgery may be anterior fusion, combined anterior-posterior approach, posterior approach, or extrapleural approach.[17] Instrumentation in spondylitis TB is the latest idea. Vanti et al.[18] analyzed the attachment function of *Mycobacterium tuberculosis* bacteria to stainless steel and supposed that attachment was insignificant. The application of implants in spondylitis TB patients may be safe.

In 1960, AR Hodgson said that the anterior approach had been considered the primary procedure for treating Pott's tetraplegia because it permits an excellent exposure to debride the infected tissue.[12,19–21] It also gives an excellent zone for fusion.[21] Empirical and rational thinking had long been used an anterior surgical approach to drain out an abscess. It is also used to excise the abnormal tissues, decompress the neural component, give a bone graft, get a rigid union, and reduce disease recurrence.[22] Many surgeons favor the anterior approach as it discerns the lesion and permits a sight for debridement. Many studies have demonstrated a high corrective rate of deformity and maintenance using anterior instrumentation in active thoracolumbar tuberculosis.[23–29] However, the anterior surgical procedure has many disadvantages, such as extended time immobilization, a progression of kyphotic angle, and graft failure.

The posterior transpedicular surgical procedure is an efficient way to preserve stability and promote healing.[20] This approach could prevent kyphotic angle worsening and graft problems.[12] The credible reason for this may be that pedicle screws inserted through the pedicle, the most substantial component of the vertebral body, giving three-dimensional build up and reinforcing the three Dennis column stability, which is more potent than anterior instrumentation.[17] The security provided by posterior fixation, particularly transpedicular fixation, protects the vertebral correction, and patients can return to normal activities within a brief interval of time.[30] Transpedicular screws could be set down at an affected vertebra if the superior part of the spinal column was in a good state, allowing lowering the surgical exposure and the area of fixation. Since the approach is extrapleural, this approach can also be used in patients with low lung reserve, which is a contraindication for the anterior approach. The posterior approach also has less bleeding as compared to the anterior approach.

The transpedicular fixation also decreases the morbidity and gives satisfactory clinical results by shorter operative duration, early mobilization, and perfect exposure for the decompression.[21,31] In this study, postoperative state 3% were ASIA grade B, 8% were ASIA grade C, 27% were ASIA grade D, and 62% were ASIA grade E. This variance was statistically remarkable. In respect to the posterior fusion, grade I fusion was found in 62%, grade II fusion in 23% and grade III fusion in 13%, and grade IV fusion in 2% case.

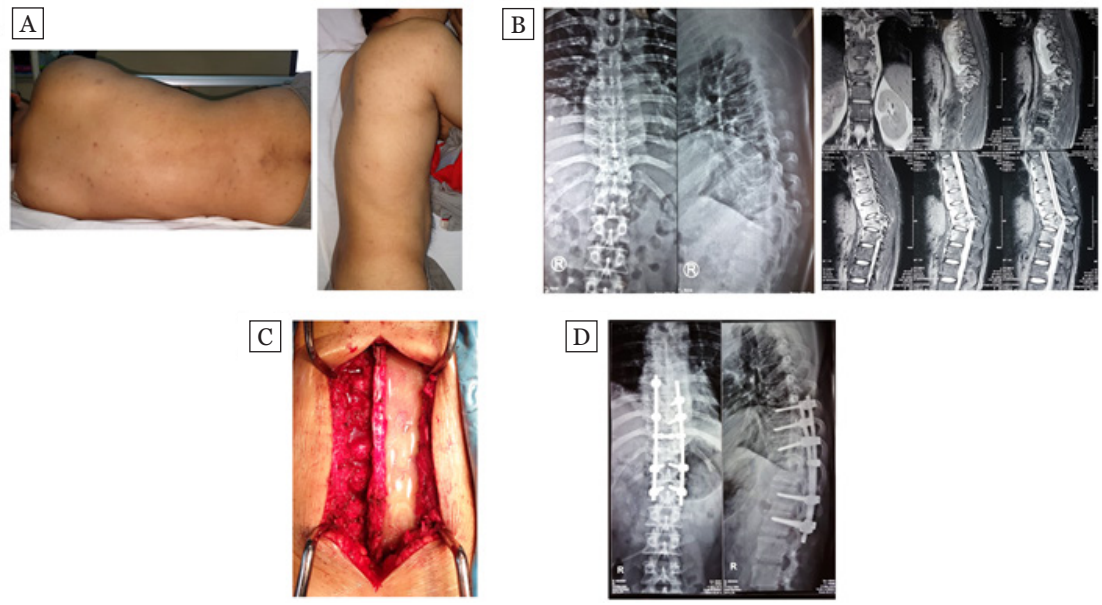

Figure A. A 32-years-old Labor with Gibbus Deformity. On Admission, He Had ASIA Scale Grade D. B. Radiologic View of Vertebral Th6–Th11 Showed a Paravertebral Mass with 48° Kyphotic Curve. C. Intraoperative: Abscess, Necrosed Tissue, and Cord Compression were Found. D. Kyphotic Angle Postoperatively was 21°

Our result is unvarying compared to Sahoo et al.[32] Posterior fusion was recorded in 55% of subjects, and neurological improvement happened in 94% of subjects. All subjects alleviated of pain, with the last VAS score ranging from 0 to 2. The disadvantage of the posterior approach is that debridement is not direct exposure. The posterior approach also requires the fixation of more vertebrae as compared to the anterior approach.[5]

Regarding the subjective assessment of this series, it was observed that (75%) patients had excellent functional outcome, 14% patients had good, 6 (9%) patients had fair, and 1 (2%) patients had a poor functional outcome. In this study, overall, a satisfactory (excellent and good) result was found in 57 (89%) patients and unsatisfactory (fair and poor) effect in 7 (11%) patients.

Conclusion

The operative procedure is the pillar of treatment along with chemotherapy for advanced cases. The posterior transpedicular approach gives long-term neurological improvement. Because the pathology is on anterior, excellent stability via the posterior elements could be achieved. It also gives excellent exposure for decompression and offers the surgery instrumentation to be extended for multiple levels beyond and beneath the lesion level. Furthermore, it corrects sagittal alignment and attains the goals for treating spondylitis TB.

Conflict of Interest

All authors have nothing to disclose.

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