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Posterior instrumentation without fusion but with selective decompression in early active cases of Pott's spine with or without neurological deficit

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Abstract

Introduction: Spinal tuberculosis the most common site of skeletal TB affects predominantly the thoracolumbar spine. Rest and anti-tubercular drugs remain the mainstay treatment of Pott's spine. Early instrumentation serves as adjunct to ATT by providing stability and pain relief thereby assisting in early mobilization and overall improvement in quality of life.

Material and methods: 20 cases of active Pott's spine early in the course of disease with excruciating pain and functional restrictions on ATT were included in our study. They were subjected to posterior stabilization with pedicle screws and connecting rod system without fusion. Few cases were subjected to direct decompression because of large abscess causing compression. All patients were followed up for a minimum duration of 12 months.

Results and observation: All patients had significant pain relief in the early postoperative period. Mobilization was started as early as one week following surgery. The mean kyphotic angle improved from 28° to 10.5° following surgery in 9 cases. Also, there was no progression of kyphotic deformity or neuro-deficit in any of the cases.

Conclusion: Early mobilization can be provided by posterior stabilization in cases of active spinal TB which improves the quality of life as well as the psychological state of the patients. Deformity correction is significant enough with posterior stabilization. Instrumented stability not only helps better penetration of drug delivery, also prevents the progression of deformity and relieves pain helping in better nursing care. This surgery also helps in confirmation of diagnosis by biopsy.

Keywords: Pott's spine, Posterior instrumentation, instrumented stability, Pain relief

Introduction

Spinal Tuberculosis is the most common site for musculoskeletal TB accounting for 50% of cases of skeletal and 15% of cases of extrapulmonary TB^[1]. Spinal TB is usually secondary to lung or abdominal involvement^[2]. Lower thoracic and lumbar vertebra are the most common sites of spinal TB^[3]. The modern Antitubercular Chemotherapy has revolutionized the treatment of patients with spinal tuberculosis. Most of the patients with early disease without extensive bony destruction, sequestration, neurological deficit can be treated successfully only with ATT, supportive braces and prolonged bed rest^[4-6]. Some of the cases of early active Pott's spine experience excruciating pain and functional restrictions which makes them confine to bed and dependent on others for even basic nursing care. Also, cases treated only by conservative methods have an average increase of 15° in deformity^[7-9]. The advancements in spinal instrumentation have enabled the principles of posterior stabilization which is commonly done in trauma patients to be applied to symptomatic Pott's spine cases early in the course of disease. The aim of our study to assess the functional and radiological outcome in terms of pain relief, early mobilization and radiological changes in kyphotic angle following Posterior instrumentation without fusion in early active cases of Pott's spine.

Materials and Methods

The study was conducted in our institute from 2011 to 2015. This prospective study was conducted on 20 patients diagnosed with Pott's spine involving dorsal, dorsolumbar junction and lumbar spine. Anti-tuberculosis chemotherapy was started in all confirmed cases of Pott's

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spine according to DOTS protocol. All cases were having excruciating pain confining themselves to bed and were dependent on family members for basic nursing care.

Inclusion criteria

1. Single level or two-level disease
2. Excruciating pain restricting mobility and function
3. Kyphotic deformity less than 60 degree
4. Pan-vertebral involvement
5. Minimum 3 to 4 weeks of ATT prior to surgery.

Multiple level disease, severe kyphotic deformity more than 60 degrees, late-onset paraplegia with internal gibbus and those who did not consent for surgery were excluded from the study.

Kumar and Tuli clinico-radiological classification^[10] was used to classify the lesions. 10 cases belonged to Stage III, 4 cases belonged to Stage IV while 6 cases belonged to stage II. There were 8 male patients and 12 female patients in our study. The age distribution was from 21 years to 53 years of age in our patients. The average duration of symptoms was 5 months to 1 year prior to surgery. The dorsolumbar junction was involved maximally in 10 cases followed by 6 cases of dorsal and 4 cases of lumbar spine involvement. The mean kyphotic deformity was 28° ranging from 10° to 40°. (Figures 1-3) The mean preoperative VAS score was 8.9.

There was neurological involvement in 6 cases. Grading was done according to Kumar, Tuli, Goel and Jain classification of tuberculous paraplegia^[11]. 4 cases belonged to Stage II (Mild-aware of neuro-deficit but managed to walk) while 2 cases belonged to stage III (Moderate- Non-ambulatory because of paralysis in extension with sensory deficit less than 50%)

Pre-operative evaluation was done by laboratory – Routine blood counts, Mantoux, ESR, CRP, LFT and Plain X-Rays was the first line radiological investigation, MRI was done to

look for skip lesions, status of cord compression and paravertebral abscess.

Posterior open approach was used and in-situ pedicle screw fixation with connecting rods with crossbar was done. Most of the kyphosis deformity gets corrected because of prone positioning of the patient. Direct decompression by laminectomy was done in 7 cases along with abscess drainage to relieve cord compression. Short segment fixation was done for cases with single level involvement while 4 cases with two-level disease were treated by long segment fixation comprising two vertebrae above and 2 below the lesion. Crossbar interconnecting the rods were used for additional stability. (Figures 4&5)

Postoperatively the patients were continued with ATT for the remaining duration of regimen. Taylor's brace was applied for support. Patients were encouraged to turn in bed on the first post-operative day and made to sit with support from day 2 or 3 depending upon tolerance of the patient. Physiotherapy with back extension and core muscle strengthening exercise for 10 minutes 3 to 4 times a day. Early assisted ambulation was patient-specific. Patients with low BMI, single-level involvement, early destructive lesions or stable fixation confirmed by post-operative radiographs were allowed ambulation as early by 2 to 3 weeks post-operatively. Patients were followed up monthly for the first 6 months and then once in 3 months for the next 6 months clinically and radiologically. (Figures 6 & 7)

Statistical analysis was performed using SPSS version 20. Results were expressed as mean \pm standard deviation for continuous variables and as number (%) for categorical data. Comparison between two quantitative variables between two groups using student's t-test (paired). A p-value less than 0.05 were considered significant.

Clinical illustrations



Fig 1 & 2: Pre-op radiographs showing lesion in D8-D9 vertebra



Fig 3: Pre-op MRI of the same patient

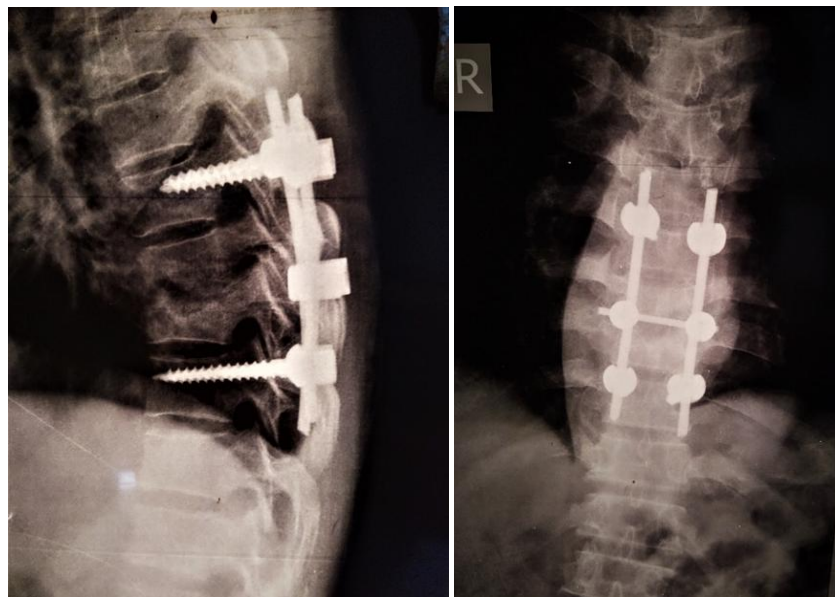


Fig 4 & 5: Immediate Post-operative images showing

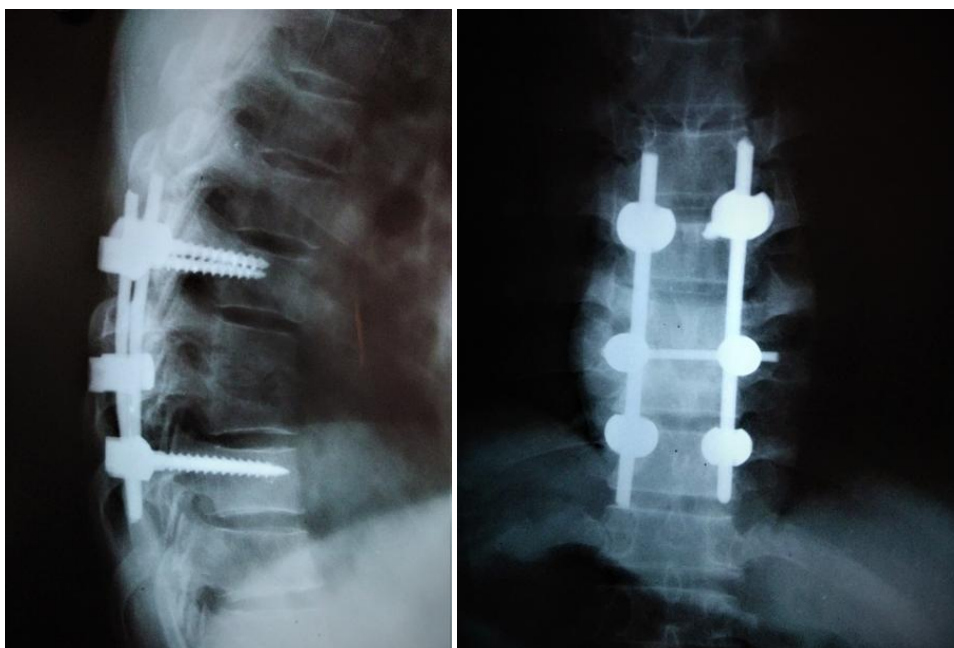


Fig 6 & 7: 6 months follow -up radiographs of the same patient

Results and Observation

Table 1: Pre-Operative Parameters & comparison of kyphotic deformity

Sl. No	Age	Sex	Site	Single/multiple level	Clinico radiological stage	Kyphotic deformity (pre-op)	Tuli grade (neuro deficit)	Duration of disease	Duration of surgery (mins)	Kyphotic deformity (post-op)
1	34	M	L	S	III	10°	-	6 M	78	5°
2	35	M	DL	S	II	-	-	5 M	65	-
3 ¥	23	F	DL	S	II	-	-	6 M	105	-
4	46	M	D	S	III	-	-	10 M	80	-
5 ¥	39	M	D	M	IV	36.8°	II	1 Y	110	16.4°
6	53	M	DL	S	II	21.8°	-	7 M	75	12.4°
7	25	F	DL	S	III	-	-	5 M	72	-
8	28	F	L	S	III	-	-	6 M	68	-
9 ¥	30	M	DL	S	IV	25.6°	III	8 M	130	10°
10	31	M	L	M	II	32°	-	10 M	70	12°
11	23	F	DL	S	II	-	-	11 M	75	-
12	39	F	D	S	III	25.6°	II	1 Y	72	8°
13	52	F	DL	M	II	-	-	8 M	80	-
14 ¥	32	F	D	S	IV	-	-	9 M	110	-
15 ¥	39	F	D	S	IV	40°	II	8 M	125	15°
16	49	F	DL	S	III	-	-	5 M	75	-
17	45	F	DL	M	III	-	-	6 M	70	-
18 ¥	24	M	D	S	IV	32.4°	III	10 M	105	10°
19	21	F	L	S	III	-	-	5 M	68	-
20 ¥	48	F	DL	S	III	28.6°	II	7 M	125	6°

¥- cases treated with associated posterior decompression by laminectomy

M- duration in months

Y - duration in years

Average duration of disease- 7.8 months

Mean kyphotic deformity pre-op -28°

Mean kyphotic deformity post-op – 10.5°

P value - 0.000022 (significant)

Mean duration of instrumentation alone- 72.92 mins

Mean duration of instrumentation & decompression by laminectomy- 115.71 mins

much less than the mean duration required for other procedures like isolated posterior instrumentation with decompressive laminectomy (Kumar MN *et al.* 2013) [27] with 156 min, extra-pleural anterolateral decompression was 2.45 hours to 3.15 hours (A.K Jain *et al.* 2004) [12], combined anterolateral decompression and fusion with posterior instrumentation which is usually performed as a two-stage procedure (Wen-Jer C *et al.*) [13-14] or single-stage procedure with two separate approaches by experienced surgeons (Oga M *et al.* 1993) [15].

The mean kyphotic deformity improved from 28° to 10.5° following surgery in 9 cases. (p-value - 0.000022) which is statistically significant. (Table 1)

The mean pre-operative VAS was 8.9 whereas at the final follow at 12 months the VAS score dropped to 1.9 which was statistically significant. (P-value <0.05) (Table 2)

The neurological deficit which was present pre-operatively in 6 cases either persisted in the same grade or there was one-grade improvement during final follow up but there was no progression in neurological deficit.

In our series the main complications encountered were implant failure following trivial trauma in a case and persistence of discharge compelling to remove the implant in 2 cases whereas the anterior or anterolateral procedures are associated with a high rate of complications like serious vascular injuries, retrograde ejaculation, etc. (Campbell *et al.*) [16] (McDonnell *et al.*) [17].

Discussion

The most common site of skeletal TB is the spinal TB comprising 50% of the cases [18]. Although the dorso-lumbar junction is the most common site of involvement in spinal TB, any part of the spine can be affected. 19) Spinal TB if not treated properly can lead to the destruction of vertebral body, spinal deformity and neurological deficit making the patient bedridden and affects productivity. Advancements in diagnostic imaging especially MRI has enabled early diagnosis of Pott's spine feasible before significant deformity occurs. The discovery of effective anti-tuberculous chemotherapy has revolutionized the treatment of spinal TB.

Table 2: Changes in VAS/Pain Intensity

Case	Pre-op VAS	Immediate post-op (1 week)	1-month post-op	12 months post-op
1	8	6	4	2
2	10	5	3	3
3	9	5	3	1
4	9	6	4	2
5	10	6	3	1
6	8	4	4	2
7	9	5	4	2
8	9	6	5	1
9	10	5	3	3
10	8	6	4	2
11	9	4	4	2
12	10	4	3	1
13	10	5	3	2
14	7	4	2	2
15	8	5	3	3
16	9	4	3	1
17	8	4	3	1
18	9	5	3	3
19	8	4	4	2
20	10	5	4	2
Mean	8.9	4.9	3.4	1.9
P-value		<0.05	<0.05	<0.05

The mean duration of surgery for pedicle screw fixation alone was 72.92 minutes while for cases treated with additional decompressive laminectomy was 115.71 minutes which was

(20) ATT, Rest and spinal braces form the mainstay of treatment according to “middle path regimen” as proposed by Tuli which is accepted universally. (11) Excruciating pain leading to functional restrictions occurs due to mechanical instability and this makes the patient bedridden. Tuli has recommended surgical fusion for symptomatic mechanical instability which occurs after healing however no proper guidelines are still proposed regarding how to address the symptomatic mechanical instability which occurs early in the course of the disease. The patients of early active pott’s spine managed with ATT under DOTS therapy face the following challenges like dependency on family members for basic nursing care which is troublesome to both the patient and family members in the current nuclear family set up. Also, the long-term compliance of the patients in orthoses is poor as they tend to remove it on and off. The recent trend of resistance to ATT and the emergence of MDR-TB as well as XDR-TB prolongs the treatment duration as well as decreases the chances of bony ankylosis. Immunocompromised patients like HIV-TB coinfection, Diabetes mellitus also have unpredictable chances of bony fusion with ATT alone.

ATT in spite of providing complete cure does not prevent the progression of deformity if used alone. Many studies have shown ta average increase of 15 degrees in kyphotic deformity in patients treated conservatively with ATT alone [7, 8] and 3-5% cases developed deformities greater than 60 degrees [20-22]. This lead to the evolution of surgical management of Pott’s spine.

Anterior approach and anterolateral approaches were conventionally preferred as they provided direct access to the affected vertebra to remove granulation tissue and tubercular debris allowing direct decompression. Also, the internal gibbus which can impinge upon the cord can be removed by anterior approach. Traditionally the belief was that posterior decompression removes the healthy posterior structures in the setting of an already damaged anterior column can lead to spinal instability [23].

The development of spinal instrumentation solved the problem of instability following posterior decompression. Oga *et al.* in 1993 proved that a slower rate of division of tubercle bacilli, lower bacillary count, lack of production of bio-film by tubercle bacilli making instrumentation safe even in active phase of the disease [15]. The danger of implanting a foreign material into a TB focus is found to be much smaller than that of pyogenic focus since the mechanism of Tuberculous abscess is by delayed cellular hypersensitivity rather than the proteolytic destruction by pyogenic organism [24]. Anterior approach is highly invasive violating pleural or peritoneal cavities. Even extra-cavitary approaches like anterolateral decompression by Costo-transversectomy need technical expertise and also associated with high complications [25]. All the factors make anterior approach unnecessary for early active pott’s spine as the basic pathology is granulation tissue, edema and abscess formation which are main factors causing cord compression are shown to regress following adequate chemotherapy. Also, there is no internal gibbus formation in early cases warranting compulsory anterior decompression. Chemotherapy alone helps in spontaneous bony fusion without anterior surgery [26]. Posterior instrumentation without direct decompression without bone grafting alone is sufficient in adults with early-onset pott’s spine with or without paraplegia if deformity is not severe [27]. This could be attributed to the following reasons like availability of effective anti-tuberculous chemotherapy which has good penetration even in the caseous

material achieving effective sterilization not warranting debridement in all cases. Posterior instrumentation even though not effective alone to correct severe deformity can prevent deformity progression in early cases “prevention of deformity” and also can correct mild to moderate kyphosis. Helps in pain relief by providing stability and early mobilization of the patient. Also, since instrumentation provides better stability and early mobility this can help the patient to return to his professional activity” better productive life” and decreased dependency on family members for daily living “independency”.

Conclusion

The goals of treatment in pott’s spine are to cure the disease, to prevent the development of paraplegia and kyphotic deformity, to correct existing deformity and to allow early ambulation and bring back the patient to productive life [28].

Early posterior instrumentation provided excellent pain relief by improved stability enabling early ambulation of the patient. Spinal stabilization prevents progression of deformity and neuro-deficit. Isolated posterior instrumentation without fusion is relatively easy surgery than debridement and fusion with bone graft in terms of duration of surgery, blood loss during surgery and complications. Excellent pain relief, early mobilization, and prevention of deformity progression are the main advantages of instrumented stability.

Conflict of interest: Nil

Informed consent: Was obtained from the patients prior to inclusion in the study.

Ethical clearance: Was obtained from the Institutional Ethical committee prior to the study.

Source of support: Nil

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