



## RETROSPECTIVE ANALYSIS OF THE TREATMENT OF TUBERCULOSIS SPONDYLITIS IN GROWING SPINE

### BÜYÜYEN OMURGADA TÜBERKÜLOZ SPONDİLİTİN TEDAVİSİNİN RETROSPEKTİF DEĞERLENDİRİLMESİ

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#### SUMMARY:

**Objectives:** The aim of this study to evaluate the results of the tuberculosis at growing spine

**Material and Method:** Eighteen children under 12 years old were evaluated retrospectively in our study. The mean age at the treatment was 8 (3-12) years old. Patients treated with different treatment modalities as conservative (2 pts), anterior approach (5 pts), anterior approach with instrumentation and anterior-posterior combined approach (7 pts). The number of infected vertebra were 3,2 (1-7) at thoracic area. The complaints of the patients were instability (16 pts), pain (18 pts) and paraparesis (2 pts). Patients was diagnosed with culture and histopathological evaluation of biopsy.

**Results:** The mean follow-up 15 (2-20) years. Patient latest kyphosis angle after prior surgery or conservative follow up was 61° (130-25) (p<0.01). Anterior debridement without instrumentation (84° ± 21°) have significant increase on kyphosis measurement compare with instrumentation (33° ± 6,3°) (p<0,001). Patients treated with only anterior approach without instrumentation or conservative were healed with excessive kyphotic deformity.

**Conclusion:** Although the main treatment of the tuberculosis is chemotherapy, in growing spine surgical treatment is mandatory to prevent further deformity. Combined surgical treatment is reliable with high success for serious lesion.

**Key words:** Tuberculosis spondylitis, childhood, treatment, kyphosis, growing spine.

**Level of evidence:** Retrospective clinical study, Level III.

#### ÖZET:

**Amaç:** Bu çalışmanın amacı büyüyen omurgada tüberküloz tutulumu sonrası tedaviye rağmen ortaya çıkan değişiklikleri değerlendirmektir.

**Materyal-Metot:** Çalışmamızda 12 yaş altı 18 çocuk değerlendirildi. Ortalama tedavi yaşı 12-3) 8) idi. Hastalardan 2'si konservatif, 5'i sadece anterior apse drenajı ve debridman, 4'ü anterior drenaj ve anterior enstrümantasyon ve geri kalan 5'i antero-posterior yaklaşımla tedavi edilmişlerdir. Ortalama tutulan omur sayısı 3,2 (1-7) olduğu belirlenmiştir. Hastaların tamamında ağrı, 2'sinde ise ilaveten parapleji mevcut olduğu saptanmıştır. Kesin tano biopsi sonrası patolojik ve mikrobiyolojik yöntemlerle konulmuştur.

**Sonuçlar:** Ortalama takip süresi minimum 2 yıl olup en uzun takip 20 yıldır (Ortalama 15 yıl). Hastaların tamamı dâhil edildiğinde ortalama kifoz açısı 61° (25°-130°) olduğu saptanmış, oluşan artışın istatistiki olarak anlamlı olduğu belirlenmiştir (p<0.01). En fazla artış konservatif ve sadece anterior debridman yapılan hastalarda olmuştur (84° ± 21°). Anterior veya Posterior enstrümantasyon anterior debridmana eklenen hastalarda ise istatistiki olarak anlamlı olacak şekilde daha az bir artış olmuştur (33° ± 6,3°) (p<0,001). Sonuç olarak; 12 yaş altı cerrahi yapılan hastaların tamamında istatistiki olarak önemli bir kifotik artış olduğu belirlenmiş, ancak enstrümantasyonla tedavi edilen grupta çok daha yüksek kifoz deformitesi geliştiği saptanmıştır.

**Sonuç:** Bu verilerin ışığı altında, 12 yaş altı çocuklarda anterior debridman ile cerrahi yapılan hastalarda ciddi kifotik deformitenin oluşumunun kaçınılmaz olduğu, enstrümantasyonla tedavi edilen hastalarda bu artışın nispeten daha az olduğu fikri elde edilmiştir.

**Anahtar Kelimeler:** Tüberküloz spondilit, çocukluk çağı, tedavi, kifoz, büyüyen omurga.

**Kanıt Düzeyi:** Retrospektif klinik çalışma, Düzey III.

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## INTRODUCTION:

Spinal tuberculosis, also known as Pott's disease, is frequently encountered extra-pulmonary form of the tuberculosis. Pott's disease has a growing prevalence in the endemic underdeveloped countries and responsible from the 1-2 % of all global tuberculosis cases, 5 % of which involves children<sup>5,7,12</sup>.

While bone tuberculosis responds well to antibiotherapy, advanced cases may have kyphosis deformity and associated neurological symptoms followed by bone destruction. Although tuberculosis can be treated with chemotherapy, conservative treatment averagely increases in kyphosis of 15 degrees in all patients, and 3 % to 5 % of patients have high risk for further kyphotic deformity greater than 60 degrees<sup>4-8,16</sup>.

Although, there is no consensus on modalities of the treatment. Debridement and stabilization with anterior or combined anterior-posterior approaches are recommended. Although, high successful treatment outcomes were reported without complication, literature have lack of comparative studies to evaluate better surgical approaches<sup>1-4,12-13,16</sup>.

In our study, we assessed clinical and radiological outcomes of the treatment in the growing spine of children under 12 years old.

## MATERIAL AND METHODS:

Patients with spinal tuberculosis were retrospectively evaluated. The followed-up patients were 25 children under 12 years with spinal tuberculosis. The clinical diagnosis, sedimentation rates (ESR) reactive protein (CRP) and white blood cell (WBC) counts of patients were evaluated. Standard AP and lateral x-ray radiographs and computed tomography (CT) was obtained in order to evaluate the abscess formation. Magnetic Resonance imaging was performed to determine abscess spreading at medullary canal.

Eighteen patients without no deficiency in radiological and clinical findings were included in this study. The mean age 8 (3-12) years old during the treatment. Patients treated with different treatment modalities as conservative approach (2 pts), anterior approach (5 pts), anterior approach with instrumentation and anterior-posterior combined approach (7 pts). The number of infected vertebrae were 3,2 (1-7) at thoracic and thoracolumbar area (Table-1). The complaints of the patients were instability (16 pts), pain (18 pts) and paraparesis (2 pts).

Diagnoses of patients were performed with culture and histopathological evaluation of biopsy samples.

Ambulation with a brace was allowed beginning on the fourth or fifth postoperative day (depending on neurologic status).

All patients received three-drug chemotherapy including isoniazid, rifampicin and ethambutol for 2 months. This was followed by two-drug chemotherapy including isoniazid and rifampicin for another ten months.

Long cassette standing X-ray was evaluated to determine improvement of kyphosis. Measurement was performed by one surgeon according to Cobb measurement.

## RESULTS:

All patients were followed-up for 15 (2-20) years. All neurological pathologies were recovered after the surgery. Infection was eradicated after one year starting chemotherapy successfully in all patient without recurrence.

We realized that when conservative treatment was failed, patient was operated again with posterior instrumentation and osteotomy for sharp kyphosis. One patient, operated with anterior debridement was re-operated with posterior instrumentation for increasing kyphosis at the two years after initial operation.

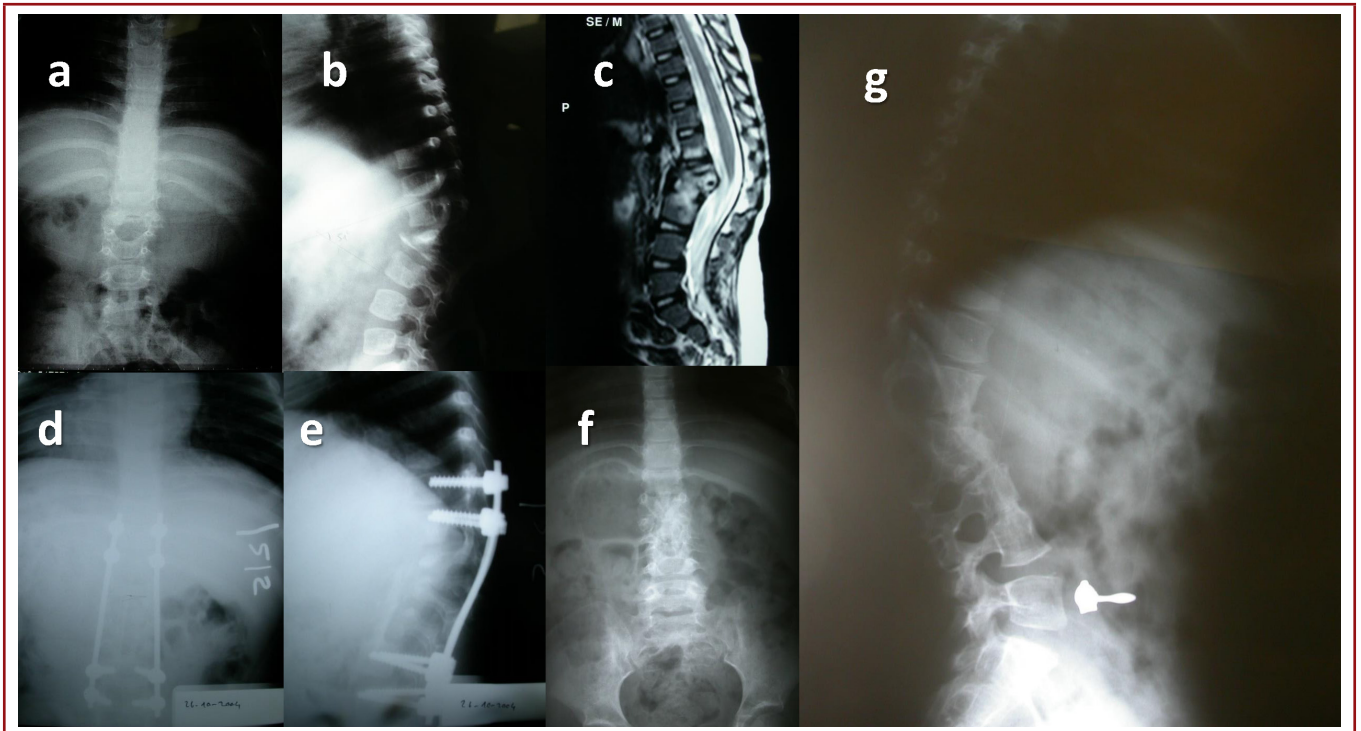
Recurrence of kyphosis was seen in another operated with combined approach after removal of pedicle screw for non-fusion surgery and operated again with posterior instrumentation (Figure-1). Severe kyphosis developed in one patient, operated with anterior debridement where the lesion is in thoracolumbar junction (Figure-2).

Patient latest kyphosis angle after prior surgery or conservative follow up was 61 (25-130) degree. Anterior debridement without instrumentation (84+/-21 degree) have significant increase on kyphosis measurement compare with instrumentation (33+/-6,3 degree) ( $p < 0,001$ ).

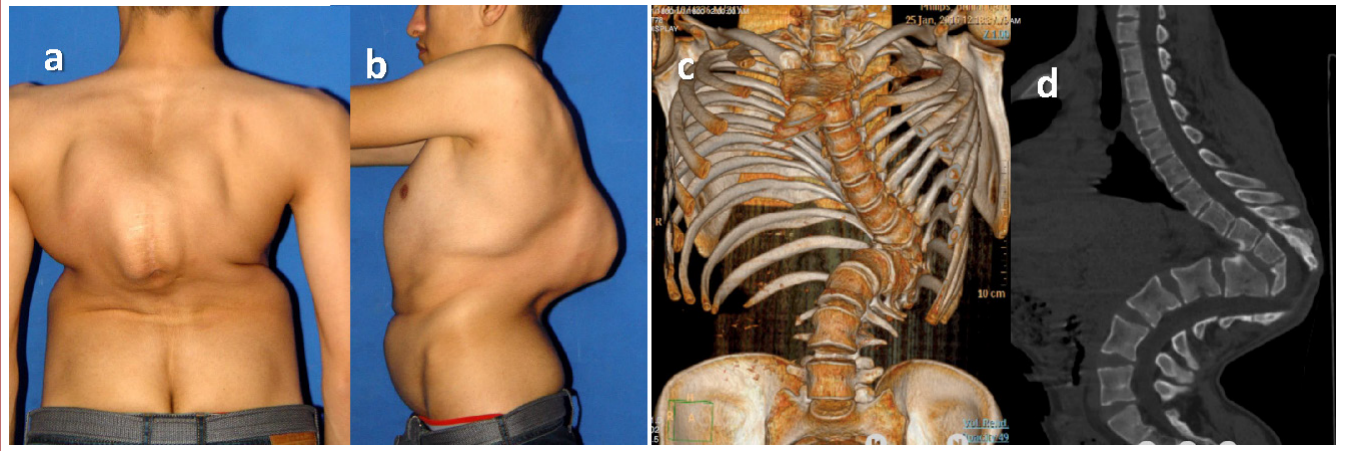
Thoracic lesion operated with anterior approach with anterior instrumentation have adequate success rate if the lesion is on the thoracic spine above T10 and the number of the infected vertebra was less than 3 and with only one is collapsed. Combined approach has high success rate to restore sagittal alignment (Figure-3,4).

**Table-1.** Data of the patients.

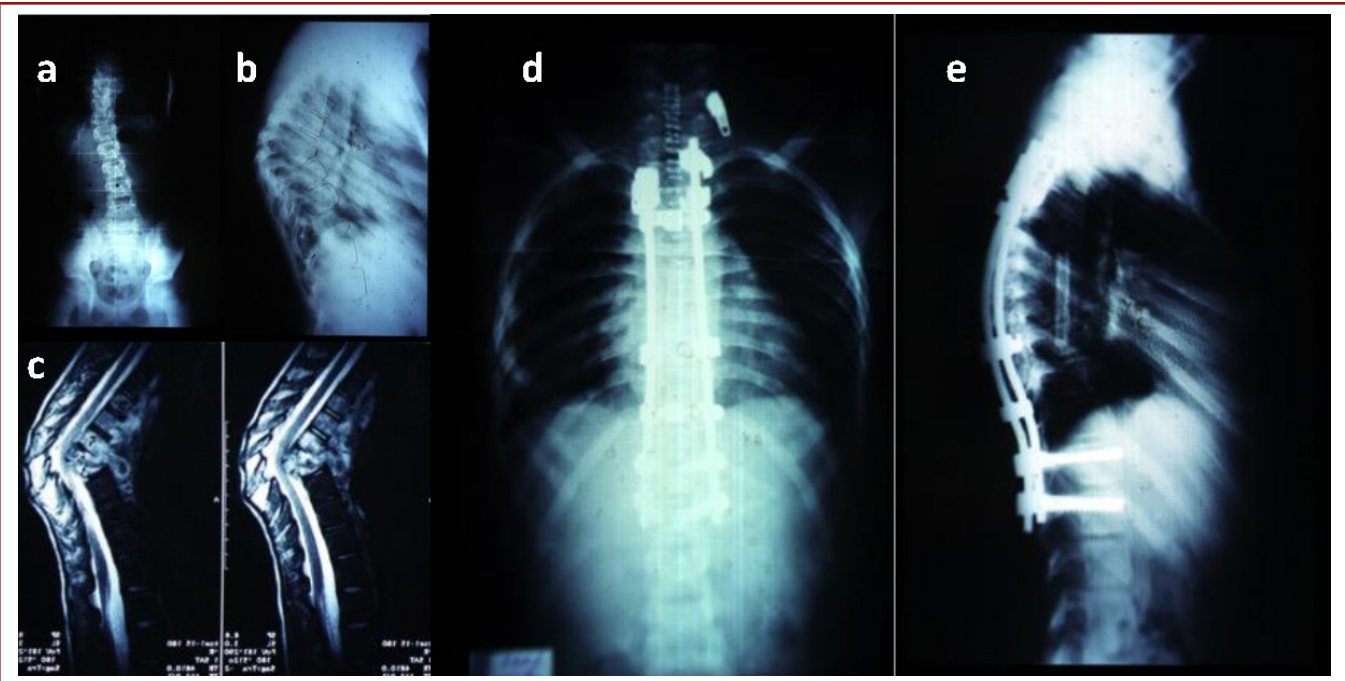
Patient	Age (Year)	Follow-up (Year)	Treatment	Infected area	Infected Number of vertebra	Results	Second surgery	Latest Kyphosis
N.Ç.	6	20	Anterior	T8-10	3	Kyphosis	None	74
S.A.	12	20	Anterior	T9-11	3	Kyphosis	None	60
B.U.	7	19	Anterior	T6-8	3	Kyphosis	None	60
E.Ç.	6	19	Anterior	T6-9	4	Kyphosis	Posterior	114
Ö.Ç.	7	18	Ant+post	T5-10	5	Kyphosis	None	95
C.Y.	12	18	Anterior+inst.	T8-9	2	Good	None	36
U.B.	12	18	Anterior+inst	T8-9	2	Good	None	30
E.T.	9	17	Anterior	T5-7	3	Kyphosis	None	60
O.I.	10	17	Anterior+inst	T12-11	3	Good	None	40
G.D.	5	16	Ant+post	T9-12	4	Good	None	35
A.K.	8	14	Anterior+inst	T12-11	3	Good	None	45
A.D.G.	8	15	Ant+post	T5-6	2	Good	None	32
Y.A.	10	14	Ant+post	T7-9	3	Good	None	30
S.Ö.	4	13	conservative	T3-9	7	Kyphosis	None	110
B.T	3	3	Post+ant	T10-12	3	Good	None	25
S.K.	10	2	conservative	L1-2	2	Kyphosis	posterior	60
F.K.	3	17	Anterior	T10-L1	4	Kyphosis	None	130
A.T.	4	13	Ant+Post	T12-L3	3	Kyphosis	posterior	60



**Figure-1.** Recurrence of Kyphosis was seen in patient whom operated with combined approach after removal of pedicle screw for non-fusion surgery and operated again with posterior instrumentation.



**Figure-2.** Severe kyphosis was developed in patient treated with anterior debridement for Pott's disease.



**Figure-3.** Combined approach in treatment of spine tuberculosis (Anterior debridement and autologous fibulae graft with posterior instrumentation)



**Figure-4.** Combined approach in treatment of spine tuberculosis (Anterior debridement and titanium cage with posterior instrumentation)

## DISCUSSION:

Spine tuberculosis is the most common type of osteoarticular tuberculosis. It was well known that the antibiotherapy and surgery are the mainstay treatment modalities and cannot be replaced with chemotherapy in management of patients with spinal tuberculosis. The indications for surgery are reported as; neurological deficits, instability, severe, progressive kyphosis and unsuccessful antibiotherapy for adult and pediatric patients with spinal tuberculosis<sup>1-8,12-13,16</sup>.

Anterior vertebral collapse due to vertebral body involvement by the disease results kyphotic deformity. The expectation for the of development of kyphotic deformity in growing spine is controversial. Rajasekaran reported that there is a decreasing and an increasing angle of the deformity in 44 % and 39 % of the children, respectively. The state of the growing spine responding to the anterior vertebral collapse varies and actually related to the damage of the anterior vertebral growth plate which was known as an intrinsic factor. The other main factor known as an extrinsic factor is mechanical stress. The success

of the treatment depends on the eradication of mycobacterium and obtaining natural sagittal alignment without coronal deformity<sup>5,7-8</sup>.

Deformities may develop in growing spine of children as different than spine of adults after the treatment. Rajasekaran reported that to have an initial kyphotic deformity higher than 30 degrees with multiple vertebrae invasion especially at junctional area of the spine is a risk factors for further kyphotic deformity for younger children under 10 years old. The other radiological criteria are “spine at risk” view reported as the separation of the facet joint, retropulsion, lateral translation and toppling<sup>5,7-8</sup>.

In the advanced kyphotic deformity cases, instability, abscess formation, spinal cord pressure, delayed cases or doubt in diagnosis, medical treatment should be considered also with surgery as well. At the same time, as kyphotic deformity may cause atrophic and myelomalasia changes in the spinal cord, serious care needs to be taken for the correction of advanced

deformity. Not enough information exists regarding how to plan tuberculosis treatment for growing spines.

Moon et al. reported in their retrospective study that deformities were rarely seen after the posterior spinal instrumentation in pediatric patient and recommended to add anterior surgery for patients with significant abscess formation and severe deformities<sup>4</sup>. Upadhyay et al.<sup>13</sup> indicated that deformities increased for the pediatric group as different from adult group who underwent only to the anterior surgery for the first 6 months after the surgery but deformities were decreased after the 5-years follow-up of this pediatric patients. In the study of Schultz et al.<sup>10</sup>, anterior remodeling ability was lost and an increase in the deformity was observed for patients who underwent anterior surgery after the destruction of anterior growth plate. After the announcement for the usage of pedicle screw is being effective and safe for growing spine by Harms et al.<sup>9</sup>, successful outcomes were reported after the reconstructions performed with pedicle screw. Huang et al.<sup>3</sup>, reported that in the cases which underwent anterior debridement and posterior instrumentation with the usage of short level fusion, there was a decrease in kyphosis from 36 degrees to 22 degrees and 4 degrees' correction loss in the follow-up the patients.

Yin et al.<sup>15</sup> compared isolated posterior instrumentation with the combined approaches and decided that both approaches had successful outcomes but concluded that only posterior instrumentation may be useful in patients without severe bone destruction kyphosis because of high morbidity. Wang et al.<sup>14</sup>, performed interbody graft with posterior instrumentation and posterior approaches and reported that kyphosis angle was decreased from 29.7° (range 12–42°) to 5.5° (range 2–10°). Hu et al.<sup>2</sup> performed anterior debridement and posterior instrumentation with a posterior approach with significant decrease in kyphotic angle. The mean preoperative angle of kyphosis was found to be 35.2° ± 6.8° that reduced to 9.7° ± 1.8°) respectively.

In our study, we observed a development of kyphosis deformity in cases which have tuberculosis specifically in thoracolumbar area and underwent conservative therapy or isolated anterior surgery. Sagittal alignment was resulted in cases who underwent fusion with anterior and posterior surgical approaches. Also, isolated posterior instrumentation may be successfully resulted in these cases in order to decrease the morbidity.

Tuberculous spondylitis is a serious disease which is rare but dangerous for pediatric patients as it may cause progressive deformity and neurological problems. Successful outcomes in growing spines with advanced instability may be obtained by a combined approach involving graft and titanium cages for anterior support and posterior pedicle screw rod combination fusion.

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