

ANTERIOR RADICAL SURGICAL INTERVENTION AND INTERNAL FIXATION WITH HARRINGTON ROD-SLEEVE METHOD ON TREATMENT OF SPINE TUBERCULOSIS (A PROSPECTIVE STUDY OF THREE CASES)

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*On beginning of calender year 1988, in Ministry of Health Taksim Hospital, in addition anterior radical resection and fusion, posterior stabilization with Harrington rod-sleeve method at the same stage has been performed to three patients which were diagnosed as spine tuberculosis. When choosing theses patients, we paid attention that the cases are being typical ones with no neurological deficit, intact middle and posterior column but damaged the anterior part of vertebral body.*

*After one week damaged the anterior part of vertebral body, with corset and followed them 2 years, on three patients fusion was has been formed and clinical and radiological improvement obtained. While deformity corrected on two ones, on the other patients it has been unsuccessful! due to our technical fault.*

*At the end of this study, we came to the conclusion that:*

*Surgical treatment of spine tuberculosis affects the improvement rate only 10 percent. Spine tuberculosis must be considered as a burst fracture which causes chronic instability. Instead of patient, surgery must correct deformity and biomechanics of vertebral column, fix the affected area, prevent excessive loading of graft and facilitate fusion. It must also abolish the need of posterior fusion which is carried out by destroying of intact posterior column. According to us, because of all these reasons, management of spine tuberculosis is anterior radical resection and adding it one of the posterior stabilization methods which are choosed in accordance with the patient status.*

On recent years, spine tuberculosis had been one of the frequently seen diseases again. In the light of biomechanical principles and recent advances on spine surgery, we have planned posterior internal fixation in addition to anterior radical surgical intervention at the same stage and performed it to three patients who were choosen by us specially. It has been performed with Harrington rod-sleeve instrumentation and patients were followed, for 2 years. In this article, we want to present our prospective study and characteristics of our patients.

Up to the end of 19th century, surgery was being recommended only for drainage of palpable cold abscess on the treatment of spine tuberculosis, but frequently, there was a belief as "cold abscess isn't opened, because fistule is never closed."

In 1910s Albee and Hibbs had begin to perform

posterior fusion.

But after the World War II, chemotherapeutics had begun to be used extensively and surgical interventions focused on diseased area, had developed. Costovertebral resection, focal debridment, radical resection and anterior fusion are important steps of these efforts (1,2,3,6,7,8,9,10,11,12,21).

**MATERIAL AND METHOD :**

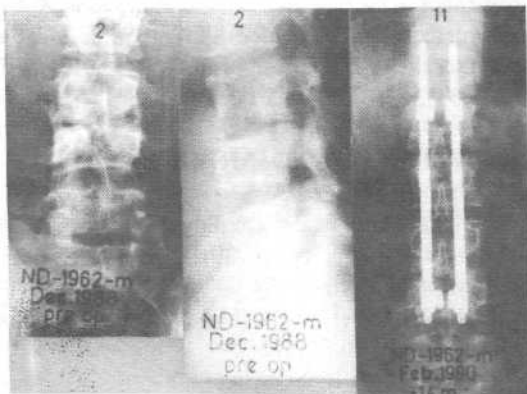
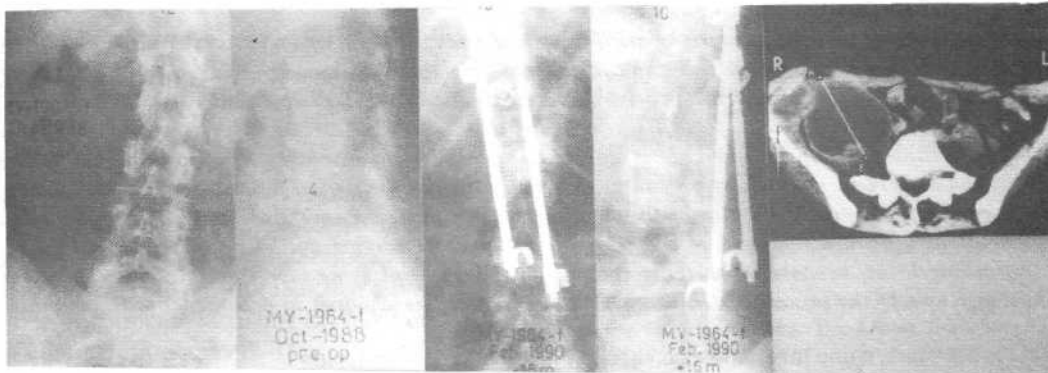
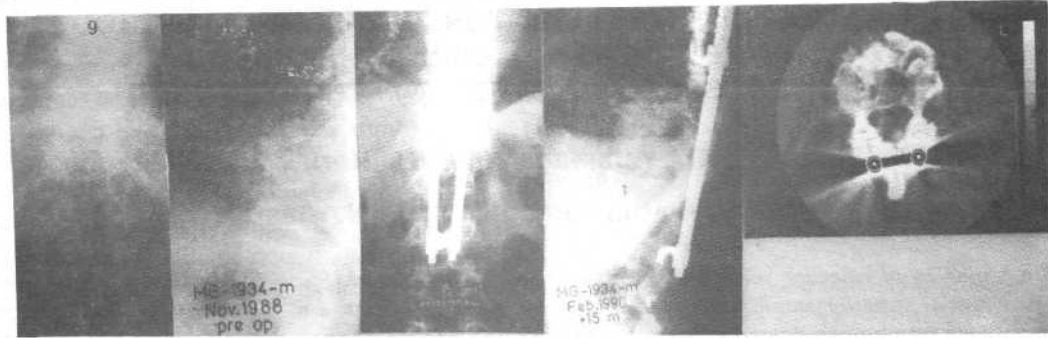
Three patients who were diagnosed as spine tuberculosis in Ministry of Health Taksim Hospital had been included to this study.

Age, sex and site of lesion distribution of patients are as follows : (Table I)

Table 1

Name	Age	Sex	Site of Lesion
M.G.	54	Male	Anterior part of D11-D12 vertebral bodies.
N.B.	28	Male	anterior and left side of L3-L4 vertebral bodies
M.Y	24	Female	Anterior and right side of L1 vertebral body.

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Measurements on films of patients were made pre-operatively and postoperatively with respect to deformity. Loss of vertebral body and angle of local kyphosis were measured, in addition, on AP and lateral films, superior and inferior edges of two diseased vertebrae were measured. From antero-posterior and right-left sides in order to assess the loss (benefit of height and changes on kyphotic and scoliotic curves.

Study of the tables show that on two patients, deformity had been resolved consequentially and in this status fusion had been formed, while on one patient, fusion had been formed in a deformed position.

As a result, in all of three patients, improvement were realized, but one of these, we couldn't gain our object.

During the operations, it was paid attention especially not to damage to the interspinous and supraspinous ligaments and other posterior stability elements. Posterior fusion wasn't considered.

Patient were discharged at third week and controls were made on one and half, third months and then once every three months as clinical, laboratorial and radiologically.

For all of three patients, fusion and clinical improvement had been completey formed.

## DISCUSSION :

Surgical treatment of spine tuberculosis had been initiated from the idea of "Cold abscess isn't opened, because fistula is never closed" and then stages of drainage of abscess, posterior fusion, costotransversectomy, focal debridment and anterior radical surgical intervention had been attained.

Clinical and radiological characteristics of patient are as follows : (Table II)

Name	Clinical Characteristics	Radiology and Cat
M.G.	Pain on dorsal zone, no neurological deficit, fatigue appearance, patient continuously in bed for two months.	Destruction of anterior part of D11-D12 vertebral corpuses dissecant abscess, middle and posterior columns intact, neural channel normal.
N.D.	Lomber pain, no neurological deficit, palpable abscess mass on left inguinal area.	Destruction of anterior part of L3-L4 vertebral bodies, present of abscess, middle and posterior columns, neural channel intact.
M.Y.	Lomber pain and deformity, no neurological deficit.	Right-anterior side of L1 vertebral body lost it's height 70 percent, right curve, dissecant abscess are present. Middle and posterior column intact, neural channel normal.

Treatment regime of patients are shown on Table III.

Name	Preoperative	Operation	Postoperative
M.G.	Simple bed-rest, application of corset for three weeks with streptomycin + INH + PAS chemotherapy.	Reposition of deformity with Harrington rod-sleeve instrumentation, fusion with anterior radical surgical intervention.	After one week mobilization with corset, six months three-way one year two-way chemotherapy.
N.D.			
M.Y.			

Operation technique characteristics of our patients are shown on Table IV :

Name	Incision and Technique	Graft	Early Postoperative Follow-up
M.G.	First, patient on prone position posterior longitudinal incision were used. Rod-sleeve were placed. Middle size of sleeves were used. Graft has been obtained. Wound were closed in routine manner. Then patient on lateral decubitus position, at level of D10 was entered from left side. Dissection was carried out retroperitoneally and diaphragm was splitted out from insertion site. Then resutured again. Abscess aspirated, debridment, radical resection and grafting were performed.	Corticalcancellous grafts from posterior iliac crest and thoracal 12th rib.	Closed thorax suction tube were put on place. Ruptures which were formed on pleura were sutured. Aspirative suction tube were applied on abscess site. Tube, drain nasogastric tube on second day, urine catheter on third day were removed. Sutures removed on tenth day. After one week patient was mobilized.
N.D.	First, patient on prone position posterior longitudinal incision were used. After placement of hooks between lamina of L4 and facet of L1 with elliptic big sleeves, reposition of deformity were carried out. Graft obtained and wound were closed. Then patient on lateral decubitus position, on level of left	Cortical-cancellous grafts from posterior iliac crest.	Aspirative drain, nasogastric tube on second day, urine catheter on third day were removed. Sutures removed on 10th day. At the end of first week patient were mobilized.

Name	Incision and Technique	Graft	Early Postoperative Follow-up
	12th rib, lomboty incision were used. Dissection was carried out retroperitoneally. Abscess aspiration, radical resection and grafting were performed.		
M.Y.	Patient on prone position posterior longitudinal incision were used. Using big sleeves between L3-D9, rod-sleeve were applied. Rods fixed to the spinous process of D12 vertebrae with cerclage wire. Wound were closed. Patient were put on lateral decubitus position. Let 12th rib were removed and dissection was carried out retroperitoneally. Abscess aspiration, resection and grephonage were performed.	12th rib, cortical-cancellous grafts from posterior iliac crest.	Same

These measurements are shown on Table VI:

Name	Preoperatively	Postoperatively
M.G.	Lateral Film : Anterior 40 mm, Posterior 60 mm. AP Film : Right 40 mm, Left 38 mm. Local kyphosis angle : 25° Loss of vertebral body : % 28	Lateral Film : Anterior 50 mm, Posterior 62 mm. AP Film : Right 50 mm, Left 50 mm. Local kyphosis angle : 10°
N.D.	Lateral Film : Anterior 60 mm, Posterior 70 mm. AP Film : Right 62 mm, Left 58 mm.	Lateral Film : Anterior 65 mm, Posterior 70 mm. AP Film : Right 65 mm, Left 65 mm.
M.Y.	Lateral Film : Anterior 70 mm, Posterior 70 mm. AP Film : Right 45 mm, Left 70 mm.	There is not change, same with preoperative measurement. Improvement of deformity is not present.  Same one and half year later.

Time needed for fusion are shown on Table V:

Name	Time needed for fusion	
M.G.	Between 3-6 months.	On follow up at 6th months fusion had been completed.
N.D.	Between 3-6 months.	On follow up at 6th months fusion had been completed.
M.T.	Between 6-9 months.	On follow up at 9th months fusion had been completed.

full reports had begun to publishing.

Since the beginning of treatment, immobilization like bed resting, plaster-bed and corset had been included to the management.

While Dickson, Jones, Konshom support conservative treatment, the others like Beriley, Arct, Hodgson, Chu Khali suggest surgical management. There are many reports about the success of the effective antituberculosis chemotherapeutic agents had been a great

milestone in the treatment. (3,11,2,6)  
treatment of spine tuberculosis and then many succes-

Konston, Dickson had reported high improvement

rates on patients who had been treated conservatively, but angle of local kyphosis had increased mean 15 degrees. (3,11)

In 1973, the conservative treatment results of Medical Research Council Working Party on Tuberculosis of The Spine had been found 82-90 percent successfully, but angle of kyphosis had shown an increase approximately 8-16 degrees, in Korea and Rhodesia, five year term results of this group are also well around 90 percent. (14)

Hodgson and Stock had reported 93 percent and Khali 97 percent good results with anterior surgical intervention.

Without performing fusion, there are also good results with focal debridement and costotransversectomy.

In 1974, 1976, 1978, 1982 and 1965 MRCWPTS's long term results about conservative and surgical treatment are well 80-90 percent with a 10 percent difference, but less increase on angle of local kyphosis is at anterior surgical intervention; on the other treatment groups and especially conservative treatment, this increase is much more and had been pointed out in the other series. (15,16,17,18,19). It had been also seen from the study of these series that mean factor which affects the duration of this disorder is the use of antituberculosis chemotherapeutic drugs. Surgery has a second role and affects improvement rates as much as 5-10 percent, in addition type of surgery like anterior radical intervention, focal debridement is less effective. At this point we thought that surgical intervention which can be a vital risk for the patient, must be performed to bring columna vertebralis to an anatomical and physiological position as much as possible, to support this status and maintain it.

In the article of Rajosekoren, it had been also reported the reasons of graft failures. These are a fracture on graft, partial absorption and slipping of graft from its bed and all of these had been shown that excessive forces which load graft and this area affect this site and graft during the months needed for forming of fusion. (20)

Transposition of load from this site to the internal fixation material is also so important of this point and probably the most important reason for not being constituted of fusion.

It is also well known the importance of rest in all infections and especially in tuberculosis and had been advised bed-plaster corset resting for long times. (14) According to us, internal fixation is also necessary of this point.

Spine tuberculosis when starts to form abscess,

strips periosteum, makes a big mass under the anterior longitudinal ligament and damages to the circulation of vertebral body. In addition to this destruction it causes collapse of vertebral body and loss of height of it. (7)

One of the reasons of increase on local kyphosis angle is vertebral collapse.

Internal fixation also gains importance from the point of view; both not to increase and to make it to decrease of local kyphosis angle, to protect the vertebral body during the healing period from excessive loadings because of the crushing of body due to avascular necrosis.

Concept of chronic instability which develops especially after burst fractures is suggested by Denis. (5)

Tuberculosis affects vertebral body like a burst fracture which proceeds slowly.

We met this idea when planning our study on the doctorate thesis of Kaygusuz about place of anterior radical surgical intervention on treatment of spine tuberculosis. (7)

According to us, tuberculosis which begins to develop from vertebral body is like a slow proceeding burst fracture and will cause chronic instability; of this point, importance of internal fixation also comes into view.

Internal fixation has importance of those points :

Rigid internal fixation of affected area instead of patient, preventing of chronic instability which forms or will be formed on columna vertebralis, stabilization of affected area after surgical intervention which will be performed, helping and speeding up of fusion by keeping the forces which act on the grafts physiologically.

Just as, posterior fusion combined to anterior fusion which is performed by Albee and Hibbs is a matter of internal fusion effect but here intact posterior column destroyed and immobilization must be needed up to the time which fusion has been formed.

On 1987 in Pretoria Louw had applied anterior vascular rib graft to ten patients with tuberculosis and two weeks later had carried out posterior fusion with Harrington compression instrumentation to facilitate the fusion. (13)

According to us, still when performing surgery on columna vertebralis, vertebrae must be brought to an anatomico-physiological position which in present before the disease, as much as possible and at this position must be left to heal. To obtain it, internal fixation is also necessary.

Choice of internal fixation instrumentation :

We planned this study prospectively from the end of calendar year 1987.

To include a patient into this study, following criteria were necessary:

Disease must be kept two vertebrae without neurologic deficit. Abscess formation must be shown both clinically and with computerised axial tomography. Middle and posterior columns must be intact and spinal cord is not to be infected.

One can easily see, we paid attention that the patients have to be slight ones.

Using of Rod-Sleeve method on these patients is our thought about spine tuberculosis. Which we think of it a slowly progressing burst fracture.

When biomechanical principles of rod-sleeve method studied, one notices that anterior collapse due to infection enhances the flexion force that acts on diseased area, rod and hooks that gain a support from the facet and laminae push the vertebral body anteriorly by the help of sleeve and by this way an extension forces is formed and this force compensates pathological flexion force.

In addition, by using the upper hook and upper sleeve on fracture like a lever and placing the rod into lower hook by bending it withing the elasticity ranges, energy which is formed on the rod behaves like a bow and tightens the anterior longitudinal ligament and disc interspace. This means dynamic reposition unless internal fixation is spoilt.

Besides, power system which is formed on one side by upper and lower hooks of rod and on the other side by sleeve secures three point fixation and this produces rigid fixation against to lateral angulation combination of three points loading on anteroposterior and lateral planes also prevents the spinal rotation (4,5)

Of our patients in M.G., local kyphosis angle was 25 degrees and loss of vertebral body was 28 percent preoperatively. In addition D11-D12 vertebral height on lateral radiography was 40 mm anteriorly and 60 mm posteriorly, while on the AP radiography it was 40 mm on the right side and 38 mm on the left side.

Postoperatively at one and half year, local kyphosis angle decreased 15 degrees and preserved thin status and at this time D11-D12 vertebral height on lateral radiography was measured 50 mm anteriorly, 62 mm posteriorly and on the AP radiography 50 mm on the right side and 48 mm on the left side. Vertebral height was increased both AP and lateral radiographs 10 mm and at this position fusion confirmed.

While in our patient N.A., L3-L4 vertebral height on AP radiography was 58 mm on the left side 62 mm on the right side and on lateral radiography was 60 mm anteriorly and 70 mm posteriorly.

Postoperatively, on AP radiography both on the right and left sides it was 65 mm and on the lateral radiography it was 65 mm anteriorly and 70 mm posteriorly. At this position fusion confirmed an preserved is position at one and half year postoperatively. At follow up on sixth months, fusion had taken place radiologically in those two patient.

When the operation pain subsides, made the patients get out of bed and with reclination corset mobilized. In those two patient of ours, according to us our study attained it's object.

Because instead of patient, the affected area made immobilized and the patient had remained mobile. Deformity of patients had been corrected completed with fusion and at follow up on one and half year it had been maintained.

However, in our third patient M.Y., postoperatively first hooks of a rod separated, reduction disconcerted and later other rod and hooks also separated. In this patient we couldn't reach our goal by the reason of technical insufficiencies.

We couldn't correct deformity and make the patient mobilized early.

Fusion had been formed lately in this patient. At one and half year postoperatively rods and sleeves had been removed and it had observed that fusion had been formed in a deformed position.

In the light of our this study, according to us, spine tuberculosis should have been thought as a slowly progressing burst fracture.

Possibility of chronic instability development should be kept on mind. Mean treatment of disease is chemotherapy, surgery is an assistant procedure. According to us mean goal of surgery must have been to correct the deformity, to prevent the deformity which will be able to develop, to make ready a ground for forming of fusion early, to fix the diseased area rigidly instead of patient.

In addition, it should balance the spoilt biomechanical load distribution of vertebral column again and abolish the necessity of posterior fusion which will have been done by destroying the posterior elements.

To supply all of these, we conclude, internal fixation was necessary.

For choice of internal fixation, according to us, one must decide to the assesment of patient both clinically and radiographically.

When we plan this study, we choosed patients according to the above mentioned criteria.

If there is infection on posterior and middle columns and decompression needed, in these type patients

according to us stabil spinal instrumentation like Cotrel-duboussset, Harry-Luke, internal fixator could have been planned.

As a result it is convicted that on patient of spine tuberculosis which needed surgery. In addition to anterior radical surgical intervention, posterior internal fixation is also required and after this stage. This is a forward step both studied and put forward to.

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