THE RESULTS OF ANTERIOR INSTRUMENTATION IN VERTEBRAL TUBERCULOSIS

İ. Teoman BENLİ MD * Erbil AYDIN MD * Mahmut KIŞ MD *
Serdar AKALIN MD * Mert TÜZÜNER MD * A. Bülent BAZ MD *

ABSTRACT:

Classic procedure in the treatment of vertebral tuberculosis is drainage of the abcess, curetage of the devitalized vertebra and application of antituberculous chemotherapy regimen. Posterior instrumentation results are encouraging in the prevention or treatment of late kyphosis, however, a second stage operation is needed. In this study the results of 9 patients with a diagnosis of Mall de Pott treated by anterior drainage, anterior fusion and Z Plate anterior instrumentation at the same stage at the 1st Department of Orthopaedics and Traumatology of Ankara Social Security Hospital are presented. Mean age was 45.6. Mean follow-up is 28.4 months with a minimum follow-up 2 years. All patients had one year continued triple drug therapy. Partial motor and sensorial loss which was observed preoperatively in 6 patients totally improved postoperatively. All the patients had a solid fusion mass at the last controls. Also any implant failures or sagittal index correction loss were not observed. Reactivation was not seen, but in one patient a supurative infection developed and after three weeks of chemotherapy, the anterior implant was removed and a posterior fusion was added. In light of these findings it is thought that anterior instrumentation after anterior drainage and fusion at the same stage is a useful procedure in the prevention of late kyphotic deformities.

Key Words: *Spinal, tuberculosis, anterior instrument.*

INTRODUCTION

The most frequent for extrapulmonary localization of tuberculous infection is the vertebral column. Tuberculosis of the vertebral column was described by Percival Pott in 1877 as a kyphotic deformity of the spine associated with paraplegia (13). Pott's disease is now an infrequent spinal infection in the United States because of advancements in chemotherapy and preventive medicine (23). Developing countries such as Turkey are not as fortunate. Before 1950 spontaneous healing was expected in spinal tuberculosis. Mortality rate reduced dramatically when Bosworth began using streptomycine for bone and joint tuberculosis in 1950 (5). Hibbs and Albee added posterior fusion to chemotherapy without having any information about each other's studies (2, 10).

In 1960 Hodgson and Stock used anterior approach and drainage for the abscess formation with anterior fusion for the first time ever (11). This has been the most frequent method used since then. Medical Research Council Working Party reported 98% fusion rate with radical anterior debridement and anterior grafting (16, 17). The important problem with this method was postoperative progressive kyphotic deformity despite high fusion rate (7, 18). Sucessfull results have been reported with posterior intrumentation in the treatment of kyphotic deformities (9). Some authors are using both methods in the same session in recent years (4), but mortality and neurological deficite rates are higher as it can easily be expected. Kostuik performed anterior instrumentation in addition to anterior debridement and grafting (14).

In this study, surgical results of a new titanium instrumentation (Z-plate) is analyzed in 9 patients with spinal tuberculosis. The patients had radical anterior debridement, strut anterior grafting and anterior titanium plating after having triple chemotherapy for three weeks preoperatively.

MATERIALS AND METHODS

Hundred and thirteen patients diagnosed as Pott's disease clinically and radiographically have been operated in between January 1983 and January 1996. Nine of these patients have been included in the study. The patients have been complaining of backpain, motor deficits in lower extremities and urinary incontinance accompanying cardinal symptoms of tuberculosis for a changing period of time between three and twelve months. Computerized tomography and MRI techniques have been added to conventional radiographies.

* Ankara Social Security Hospital, Ankara - TURKEY

The mean age for patients with canal compromise and cold abscess formation was 45.6 years. Three patients were female and 6 patients were male.

The chemotherapy regimen consisted of 15 mg/kg rifampicin (max. 600 mg), isoniazid 6mg/kg (max. 300 mg) and streptomycine 1 g daily for 3 weeks preoperatively. The patients then had anterior debridement and drainage of the abscess (if present). Total corpectomy was performed in 6 patients with neurological deficits.

After correction of the deformity under distraction anterior fusion was performed with costal, fibular or iliac crest autogenous grafts and suitable titanium Z-plate was placed for fixation. No cast and bracing was used. Instead light corsets with steel bars were given for one month to encourage patients for mobilization.

Chemotherapy was continued for one year adding Ethambutol (25 mg/kg daily) instead of streptomycine after one month postoperatively. The patients had visits at 1, 3, 6, 12 and 24 months after the operation and were evaluated clinically, neurologically and radiologically. The fusion, recurrance, implant failure and the kyphotic deformity were analyzed at the last visit which averaged 28.4 months postoperative. Preoperative and postoperative local kyphosis angles were compared statistically by student's test.

RESULTS

Nine patients (6 male, 3 female) had a mean follow up of 28.4 months. One patient had multilevel infection (L2-3 and T7-8). The most frequent site of infection was L2 (3 patients) followed by L3, L1 and T12 (Table 1). One patient had infection in the thoracal column while, 5 had in the thoracolumbar junction and 4 had in the lumbar column. Cauda equina syndrome was observed in a patient with L3-4 infection and 5 patients with lumbar and thoracolumbar infections had partial sensorymotor deficits. These deficits were classified Frankel Grade D in 3 patients and Frankel Grade C in 2 patients. No deficits resisted postoperatively. Six patients (74.4%) had complete pain relief and 3 patients (25.6%) complained of minimal pain after the operation.

Local kyphosis angles before and after the surgical procedure are seen in Table 2. Normal sagittal contours were restored in all the patients. All the spinal column had sagittal contours in the physiological limits at the thoracolumbar junction (Less than 10 degrees) with a value of 2.0° ± 2.7° (correction rate 95.4 ± 6.1%) and in the lumbar column (normally less than −10°) with a value of −6.3 ± −4.8° (correction rate 128.4 ± 11.1). No loss of correction was observed at the last visit. All of the patients had solid fusion mass and no implant failure, nor reactivation was seen. The implants had to be removed because of deep infection at three months. The patient had posterior fusion and implantation after a three week chemotherapy. He had solid fusion at the last visit.

DISCUSSION

Tuberculosis of the vertebral column constitutes nearly 50% of all lesions of osteoarticular tuberculosis, the commonest site for the disease being in the paradiscal region. The classic lesion was narrowing of this place with erosion and fuzziness of the paradiscal margins of the vertebral body and varying degrees of localized osteoporosis with collaps of the involved

Table 1. The Site of Infection (one of the 9 patients had involvement on both T7-8 and L2-3 level).

Level	No. of patients	
	Number	%
T7-8	1	10
T12	2	20
L1	3	30
L2-3	3	30
L3-4	1	10
Total	10	100

Table 2. Preoperative (PR) and postoperative (PO) local kyphosis (LK) angles

	LK		
	PR	PO	Correction %
Thoracolumbar junction	20.4° ± 2.4°	2.0° ± 2.7°	95.5 ± 6.1 %
n : 5 patients			p < 0.05 t : 9.74
Lumbar	+ 8.8° ± 10.3°	6.3° ± 4.8°	128.4 ± 11.1 %
n : 4 patients			p < 0.05 t : −3.29

vertebral bodies. By the time a patient reports for specialized treatment in developing countries, 95% show a clinically detectable kyphosis or reversal of the normal lordosis (15, 21, 22).

For centuries the only available method of treatment for tuberculosis of the spine was prolonged recumbency and rest, usually in a frame or plaster bed, and improvement of patient's general condition by nourishing diets, correction of anemia, and exposure to fresh air and sunlight. Posterior approaches, such as laminectomy and posterior spinal fusion, were popular for a while (13). Hodgson and Stock appeared to be the first to popularize anterior spinal surgery in the management of tuberculosis of the spine (11). Their method aimed at the complete surgical excision of the disease focus and avascular tissue to allow free access for antituberculous drugs to the site of the lesion.

Medical Research Council Working Party on tuberculosis of the spine reported that the most successful chemotherapy regimen for spinal tuberculosis infection is anterior radical debridement and anterior strut grafting combined with chemotherapy also being called as Hong Kong procedure. The kyphosis rate with this method was reported to be as 3% (16, 17). Surat et al. also reported the best results with anterior fusion (19). Anterior fusion resulted in only 59% kyphotic deformity in the series of Rajasekaran and Soundarapandian (7, 18). Domaniç et al. also reported that the most increase in kyphotic deformity was in patients who had anterior fusion only (59 patients in a series of 85 patients). The best results had been obtained in patients who had anterior fusion combined with posterior Cotrel-Dubousset instrumentation and fusion (6). Güven et al. found that posterior fusion and implantation following chemotherapy had also the advantage of not interfering the site of the lesion (9).

This study evaluated the results of anterior radical debridement and strut grafting in addition to anterior titanium plating. Standard doses of Streptomycin, Rifampicin and INAH had been introduced three weeks preoperatively. One patient had wide anterior thoracolumbar approach for both thoracal and lumbar lesions. After thoracal and lumbar debridement anterior strut grafting with anterior implantation was done. The patients who had lesions at thoracolumbar junction had local kyphosis angles reduced from 24° to 2° postoperatively (correction rate 95.4%). The lumbar kyphosis angle was reduced from +8.8° to –6.3° (correction rate 128.4 %) in patients with lumbar lesions. The normal sagittal contours was restored in patients who had a statistically significant correction ($p<0.05$). This was thought to be resulting from the usage of a special distractor (designed for Z plating technique) which acted on the screws one below and one above corpuses of the vertebraes over the lesion.

In the active disease compression of the cord is usually due to tension of the abscess or edema of the abscess wall, to a posteriorly sequestrated intervertebral disc, or to bony sequestra (13). Sesli et al. reported 70% neurological deficite in a series of 21 patients (20). The incidance of neurological deficite was 37% according to Alvarez and McCaine and 2.5% according to Hsu and Leong (3, 12). Hsu and Leong also reported that it is essential to make suitable decompression if the patient is paraplegic and this is obtained best by anterior corpectomy. In our study all of the 6 patients with neurological deficits had anterior corpectomy and full neurological recovery was observed (12).

Titanium anterior plating was developed by Thomas Zdeblick when the advantages of an MR compatible implantation after spinal canal decompression was observed. According to Zdeblick Z plate is easily applicable, round edged, makes a stabile fixation, corrects kyphosis by distraction and can be safely used in vertebral fractures especially in thoracolumbar junction (24). Akalın et al. reported 47.6% healing rate in neurological deficits and 90.2% correction rate in kyphotic deformities in a series of 21 patients (1). Hsu and Leung reported that the most frequent complication in anterior fusion is the resorbtion and breakage of the graft (13). In this study Z plate was selected for implantation because of the easily application and rigid fixation of the system. High correction rate in kyphotic deformities was observed and all patients had solid fusion while none of them had loss of correction in an average follow up of 28.5 months.

Griffitis did not recommend instrumentation at anterior fusion level in the patients with Pott's disease (8). Our study shows that implantation is essential to avoid kyphotic deformity and radical debridement following a three week suppressive chemotherapy does not result any recurrence of the deformity and infection.

As a result we recommend anterior debridement or osteotomy with anterior strut grafting and posterior transpedicular fixation and fusion in one or two ses-

sions combined with chemotherapy as a treatment of choice especially in cases with less destruction and without canal compromise and neurological deficite. When the patient had severe destruction in adjacent vertebral corpuses, had canal compromise and neurological deficite, cannot tolerate a second or longer surgical intervention; anterior radical debridement, strut grafting and Z plate implantation following a 3 week suppressive chemotherapy is a good alternative of treatment because of the advantages of high correction rate, MR compatibility and the ease of application.

REFERENCES

1. Akalın S., Benli İ.T., Baz AB.: The results of Z-plate after anterior decompression in the treatment severe burst fractures and posttraumatic spinal deformities. SICOT Regional and XIV. Turkish National Congress of orthopaedic Surgery and Traumatology, September 29 October 4, İzmir, Turkey, 1995.
2. Albee FH.: Transplantation of a portion of the tibia in to the spine for Pott's disease. A preliminary report. Am Med Assoc 57: 885-891, 1991.
3. Alvarez S, McCabe WR: Extrapulmonary tuberculosis revisited. Medicine 63: 15-31, 1984.
4. Benson DR, Lonon WS: Granulomatous infections of the vertebral column. In: Operative Orthopaedics. Ed: Chapman MW, JB Lippincott Co., Philadelphia, pp: 2029-2034, 1988.
5. Bosworth DM, Pietra AD, Farrel RF: Streptomycin in tuberculous bone and joint lesions with mixed infection and sinuses. J Bone Joint Surg 32A: 103-107, 1950.
6. Domaniç Ü, Hamzaoğlu A, Şar C, Yavuzer Y: Posterior fusion and instrumentation after anterior radical debridement and fusion in the surgical treatment of Pott's disease. J Turk Spin Surg 4 (1): 16-19, 1993.
7. Fountain SS, Hsu LCS, Yau ACMC, Hodgson AR: Progressif kyphosis following solid anterior spine fusion in children with tuberculosis of the spine. J Bone Joint Surg 57A: 1104-1107, 1975.
8. Griffits DLI: The treatment of spinal tuberculosis. In: Recent advances in orthopaedics. Ed. McKibbin B. Churchill Livingstone, Edinburg, pp: 1-17, 1979.
9. Güven O, Kumuna K, Yalçın S, et al.: A single stage posterior approach and rigid fixation for preventing Kyphosis in the treatment of spinal tuberculosis. Spine 19 (9): 1039-1043, 1994.
10. Hibbs RA: An operation for progressive spinal deformities. Med J 21: 1013-1019, 1911.
11. Hodgson AR, Edin CB, Stock FE: The Classic. Anterior spinal fusion. Clin Orthop Rel Res 300: 16-23, 1994.
12. Hsu LCS, Cheng CL, Leong TY: Pott's paraplegia of late onset. J Bone Joint Surg 70 (B): 534-538, 1988.
13. Hsu LCS, Leong JCY: Tuberculosis of the spine. In: Surgery of the Musculoskeletal System. Ed. Evarts CM, 2nd Ed., Churchill Livingstone, New York, pp: 2299-2314, 1990.
14. Kostuik JP: Anterior spinal cord decompression for lesions of the thoracic and lumbar spine. Techniques, new methods of internal fixation, results. Spine 16: 67-68, 1992.
15. Martini MED: Tuberculosis of the bones and joints. Springer, New York, 1988.
16. Medical Research Council Working Party on tuberculosis of the spine: A 10 year assessment of controlled trials of impatient and outpatient treatment and plaster of Paris jackets for tuberculosis of the spine in children on standard chemotherapy. Studies in Pison and Masan, Korea. J Bone Joing Surg (Br) 67: 103-110, 1985.
17. Medical Research Council Working Party on tuberculosis of the spine: A 10 year assessment of controlled trials of impatient and outpatient treatment and plaster of Paris jackets for tuberculosis of the spine in children on standard chemotherapy in Hong Kong. J Bone Joint Surg (Br) 64: 393-398, 1982.
18. Rajasekaran B, Soundarapandian S: Progression of kyphosis in tuberculosis of the spine treated by anterior arthrodesis. J Bone Joint Surg (Am) 71: 1314-1323, 1989.
19. Surat A, Acaroğlu E, Özdemir N, et al.: Pott's Disease. Analysis of one hundred cases followed longer than twelve months. J Turk Spin Surg 2 (2): 16-18, 1991.
20. Sesli E, Özyalçın H, Özcan Z, et al.: The management in tuberculosis of the spine. J Turk Spin Surg 4 (1): 13-15, 1993.
21. Tuli SM: Current Concepts. Severe kyphotic deformity in tuberculosis of the spine. Int Orthop 19: 327-331, 1995.
22. Yau ACMC, Hsu LCS, O'Brain JP, Hodgson AR: Tuberculosis kyphosis: correction with spinal osteotomy halopelvis distraction and anterior and posterior fusion. J Bone Joint Surg (Am) 56: 1419-1434, 1974.
23. Wood GW: Infection of Spine. In: Campbell's Operative Orthopaedics. Ed: Crenshow E. 8th Ed., CV Mosby Company, St. Louis, pp: 3323-3345, 1992.
24. Zdeblick TA: Thoracolumbar Fractures. New anterior instrumentation. American Academy of Orthopaedic Surgeons Annual Meeting, February 22-26, Atlanta, Georgia, 1996.