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Conservative treatment of tuberculosis of the thoracic and lumbar spine in adults and children

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Summary. *We have treated 75 cases of spinal tuberculosis with chemotherapy as outpatients. The drugs used were INH, rifampicin and ethambutol for the 48 adults, and INH, rifampicin and PAS for the 27 children. No operations, apart from the evacuation of large abscesses, were carried out. Every patient was followed up for at least three years and the outcome was judged to be favourable in 95%. This is better than in some series in which radical surgery has been used. Although we recognize the advantages of operation in certain circumstances, we believe that our conservative regimen can be confidently recommended for use in less privileged countries, where adequate facilities for hospital treatment may not be available.*

Résumé. *Nous avons traité médicalement, en malades externes, 75 cas de tuberculose rachidienne. Les médicaments utilisés ont été INH, Rifampicine et Ethambutol chez les 48 adultes, et INH, Rifampicine et PAS chez les 27 enfants. Aucune intervention, hormis l'évacuation d'abcès volumineux, n'a été réalisée. Tous les malades ont été suivis au moins trois ans et le résultat a été jugé bon dans 95% des cas. Ceci est meilleur que certaines séries où l'on a eu recours à une chirurgie radicale. Bien que nous reconnaissions les avantages du traitement chirurgical dans certains cas, nous pensons que notre traitement conservateur peut être recommandé en toute confiance dans les pays tels que la Corée qui ne disposent pas des moyens nécessaires pour soigner ces malades en milieu hospitalier.*

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Tuberculosis of the spine is still prevalent in many parts of the world and is an important orthopaedic problem in Korea. Spinal tuberculosis is the most common and dangerous form of skeletal tuberculosis, because it is liable to cause destruction and deformity. With the availability of very effective antituberculous drugs, two divergent methods of management of tuberculosis of the spine have been reported. A large group of surgeons have advocated radical excision of the tuberculous focus and replacement of the defect with autogenous bone grafts under cover of antituberculous chemotherapy. A conservative regime is recommended by Freidman [13], Konstam [20] and others who have treated a large number of patients with spinal tuberculosis using antituberculous drugs alone.

This report concerns a group of adult and child patients with tuberculosis of the thoracic and lumbar spine, who were treated with antituberculous drugs alone because of the patients' general and socio-economic conditions, and their refusal to be operated on. The only surgical procedure used was the evacuation of large cold abscesses.

Material and methods

This study was based on observation of 27 children and 48 adults who were treated as outpatients at the Catholic Medical Centre, Kang-Nam St. Mary's Hospital, Seoul, from 1972 to 1982. The cases included were those with active spinal tuberculosis from the first thoracic to the first sacral vertebra. Patients

were excluded if they had neurological complications, a history of previous antituberculous chemotherapy for six months or more, active tuberculosis in a lower limb requiring bedrest, or any other contraindications to this method of conservative treatment.

Treatment regimen

Bedrest or bracing was recommended for the adult patient who had severe pain with advanced vertebral destruction. Plaster-of-Paris jackets were not used routinely, except in children who had muscle spasm and weakness, or pain. Gradual mobilization was encouraged after three months' bedrest, and when back pain and spasm had been relieved.

Bacteriological study

In most of the cases, bacteriological investigation of the lesion was not done.

Antituberculous chemotherapy

A combination of isoniazid (INH), ethambutol and rifampicin were used in adults, but para-aminosalicylic-acid (PAS) was used in children instead of ethambutol. The dosage of INH was 10 mg/kg/day, and that of PAS varied according to the age, but most of the children under the age of 10 were given 0.2 mg/kg/day (maximum 10 mg). The dose of ethambutol was 15 mg/kg, and rifampicin 10 mg/kg/day. This triple chemotherapy was given for one and a half years. General supportive treatment was given throughout. No serious complications arose from this therapy during the period of follow-up.

In some cases non-steroidal anti-inflammatory drugs were given to inhibit bone resorption.

Time of observation

Patients were followed up regularly for at least three years. Serial radiographs were taken, and the sedimentation rate was checked at intervals of 3–6 months. Severity of the kyphosis was measured radiologically using the internal gibbus angle (Fig. 1).

Paravertebral abscess

Abscesses were aspirated when they became subcutaneous and were very large. Open drainage was performed when aspiration failed. Drainage of a paraspinal abscess was also considered when it became larger in spite of continuous treatment.

Age and sex

Patients over the age of 15 were classed as adults. Of the 75 patients, 48 were adults and 27 children. Twenty-one of the adults were men and 27 women. Thirteen of the children were boys and 14 were girls. The disease was most prevalent in the first decade (30.6%) and in the third decade (30.7%). The age group with the highest prevalence in children was 6–10 years of age (Table 1).

The pattern of spinal tuberculosis in children differed from that in adults. In children the disease was characterized by a more diffuse and extensive involvement with osteolysis, while the lesions in adults were more localised and less likely to form pus or sequestra.

The children had a mean involvement of 1.94 vertebral bodies at the start of treatment, compared with 1.78 in the adults. The mean additional involvement of the bodies were 0.54 in the children and 0.36 in adults in the first eighteen months, but showed no changes in the later periods.

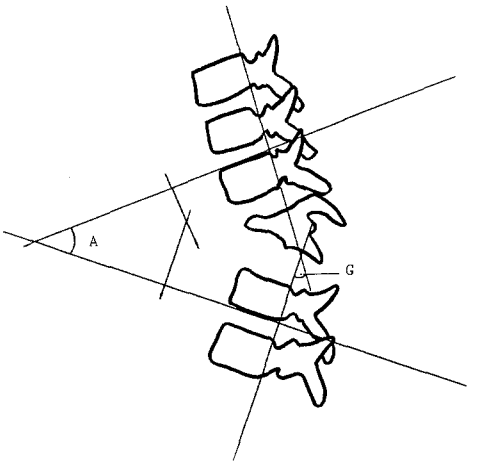

Fig. 1. Measurement of kyphosis. *Angle A*: Salter's Angle; *Angle G*: Internal Gibbus Angle

Table 1. Age and sex distribution (N: 75 cases)

Age	No. of patients		Total (%)	
	Male	Female		
1– 5	4	3	7 (9.3)	
6–10	7	9	16 (21.3)	27 (36.0)
11–15	2	2	4 (5.4)	
16–20	3	3	6 (8.0)	
21–30	10	13	23 (3.7)	
31–40	4	6	10 (13.3)	48 (64.0)
41–50	3	4	7 (9.3)	
51–60	1	1	2 (2.7)	
	34	41	75	

Children: Patients under the age of 15 years

The relation of the patients' age and the number of involved vertebrae to the increase in the degree of kyphosis is summarized in Table 4.

Distribution of lesions and measurement of the kyphosis

The lesions were common in the lumbar spine (56%) and the involvement of L3 was most frequent. The site of the lesions in the 75 patients is shown in Table 2.

As a part of the assessment the internal gibbus angle was measured at the start of treatment and at the eighteenth and thirty-sixth month.

Table 2. Location of tuberculous lesion in 75 cases

Location	No. of patients		Total (%)
	Child	Adult	
Thoracic	10	15	25 (33.3)
Thoracolumbar	3	4	7 (9.4)
Lumbar	13	29	42 (56.0)
Lumbosacral	1	–	1 (1.3)
	27	48	75

Associated tuberculous lesions

Eight patients had radiological evidence of pulmonary tuberculosis and five had a pleural effusion. One patient had involvement of the sternoclavicular joint and another had intestinal tuberculosis.

Results

Seventy-one patients (95%) were classified as having a favourable response to triple drug therapy; they had no evidence of neurological involvement, a draining sinus, an abscess, impairment in normal working capacity or of radiographic changes of active disease at the three year follow-up. The remaining four patients were classified as having an unfavourable response. They had an additional longer period of chemotherapy and/or had surgery for persistent active disease.

Erythrocyte sedimentation rate

Sixty-three patients (84%) had an increased sedimentation rate (more than 16 mm/hr) before treatment. In 29 patients the sedimentation rate became normal within 3 months of treatment, and in 41 it became normal after 6 months. In 7 patients the sedimentation rate remained raised during the entire course of treatment. Of these one still had an active focus, but in 6 the lesions had become inactive.

Vertebral involvement

The number of vertebral bodies involved before and at 18 months after treatment is shown in Table 3. Seventeen patients (23%) had one vertebra involved and 50 (67%) had two, 7 (9%) had three, and one had four at the start of treatment.

Twenty-six patients (35%) had new involvement of the adjacent vertebral body within 18 months of treatment.

Abscesses and sinuses

At the start of treatment twenty-six patients (34.7%) had a paravertebral or psoas abscess associated with a flexion contracture of the hip. Eight (10.7%) had sinuses. Abscesses in 10 patients were aspirated or evacuated surgically, and one large psoas abscess recurred and was evacuated a second time.

Abscesses which were neither evacuated surgically nor aspirated followed one of two courses. Most frequently the radiographic density disappeared in from 3 to 12 months, but this was observed mainly within 8 months of treatment. The other pattern was a gradual diminution in size to a constant persistent density which represented the calcified wall of the abscess. By 24 months all the abscesses and sinuses present initially had disappeared.

Table 3. Involvement in each vertebrae by the end of treatment

Initial number of involved vertebrae	No. of patients (%)	No. of involved vertebrae at the end of treatment				
		1	2	3	4	5
1	17 (22.7)	8	7	2	–	–
2	50 (66.7)	–	36	12	2	–
3	7 (9.3)	–	–	4	2	1
4	1 (1.3)	–	–	–	1	–
	75	8 (10.7)	43 (57.3)	18 (24.0)	5 (6.7)	1 (1.3)

Table 4. Amount of increase in the kyphotic angle and number of involved vertebrae at the end of treatment in children and adults (18 months)

Increase in kyphotic angle	No. of cases %			No. of involved vertebrae	
	Child	Adult		Child	Adult
Unchanged or less than 6	8 (29.6)	21 (43.7)	29 (38.7)	2.1	2.2
6° – 10°	6 (22.2)	12 (25.0)	18 (24.0)	2.0	2.1
11° – 15°	5 (18.6)	7 (14.6)	12 (16.0)	2.4	2.3
16° – 20°	3 (11.1)	5 (10.4)	8 (10.7)	2.7	2.3
21° – 25°	1 (3.7)	2 (4.2)	3 (4.0)	4.0	3.0
26° – 30°	2 (7.4)	1 (2.1)	3 (4.0)	4.0	3.0
31° – 35°	2 (7.4)	0	2 (2.6)	3.0	–
Total	27 (100)	48 (100)	75 (100)	2.48	2.14

Radiological activity and bony fusion rate

The radiological activity of the spinal lesion was assessed before and at 18 and 36 months after treatment, according to the criteria of the Medical Research Council (MRC) Working Party on Tuberculosis of the Spine.

Before treatment began all cases were assessed as having active disease. At 18 months the lesion in 62 patients became inactive, and at 36 months only one patient still had active disease which was subsequently treated by currettage and operative fusion. Bony fusion was not detectable in any patient before treatment. However, it was evident in 18 patients (24%) at 18 months, and in 27 patients (36%) at 36 months.

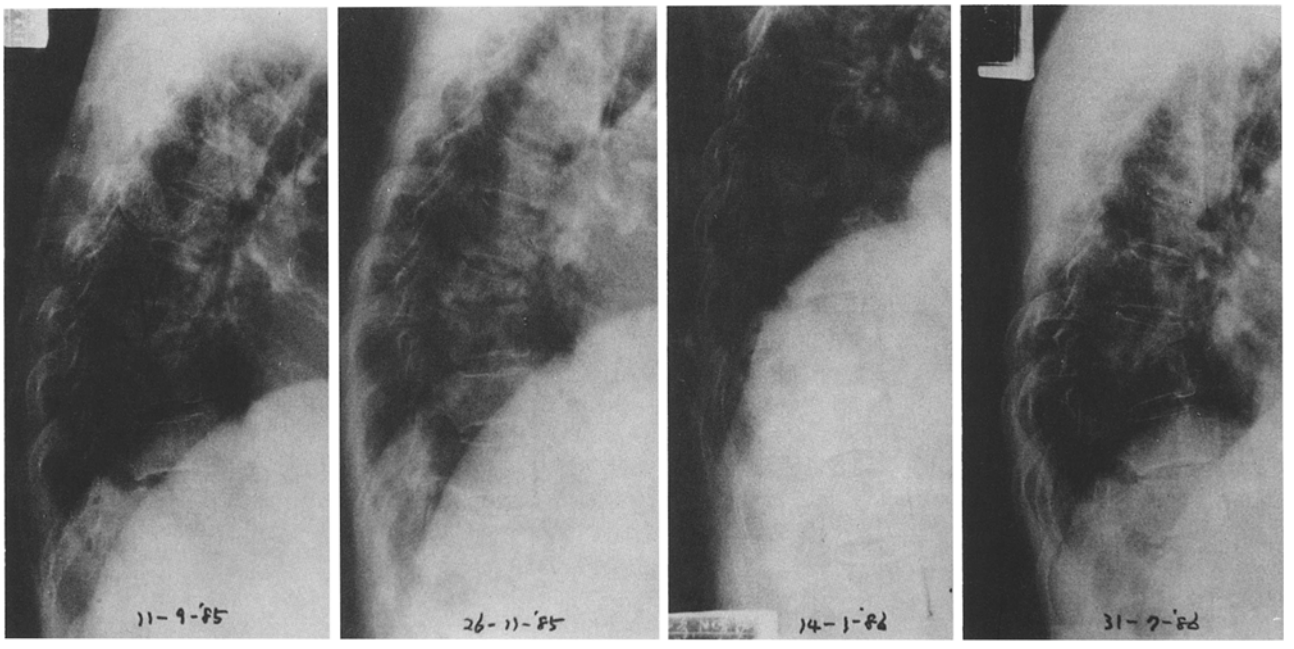

Fig. 2. Lateral views of the thoracic spine of a 59-year-old patient who had ambulant treatment for D8–9 tuberculous spondylitis show spontaneous bony fusion without residual kyphosis at one year follow-up

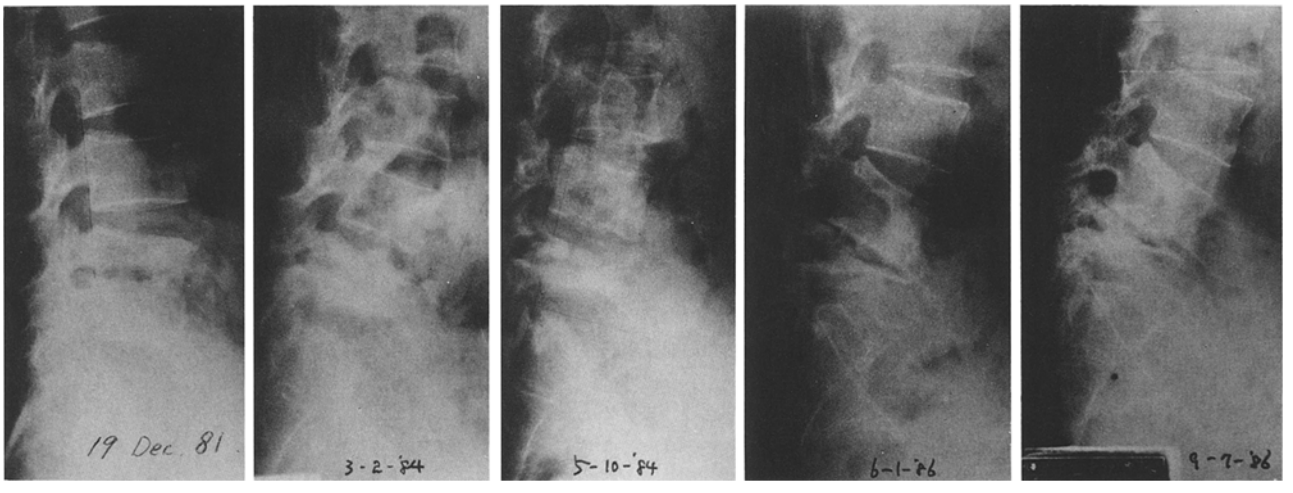

Fig. 3. A 53-year-old patient with L4–5 tuberculous spondylitis, who neglected to have treatment for 3 years. When she was seen on October 5, 1984, she had severe L4 and 5 vertebral body resorption and L3–4 disc involvement. Ambulant chemotherapy was started and thereafter there was no further collapse of the vertebral bodies. Bony fusion had been obtained between L3–4–5 vertebral bodies when she was lastly seen in July 1986

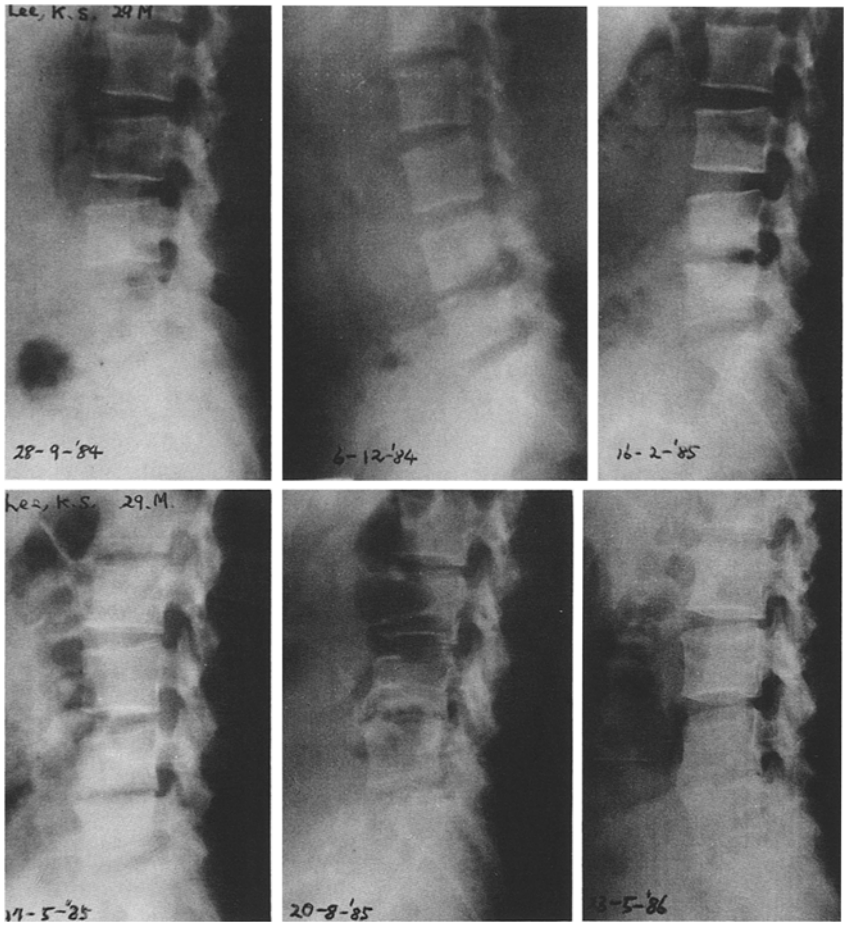

Fig. 4. Lateral view of the L4–5 tuberculous spine of a 29-year-old patient taken on September 28, 1984, shows no abnormalities in the spine. Further X-rays taken on December 6, 1984 disclosed L4–5 disc narrowing and destruction of the lower plate of L4. Tuberculosis was diagnosed and chemotherapy started. The last follow-up X-ray taken in May 1986 disclosed solid fusion of L4–5 without residual kyphosis

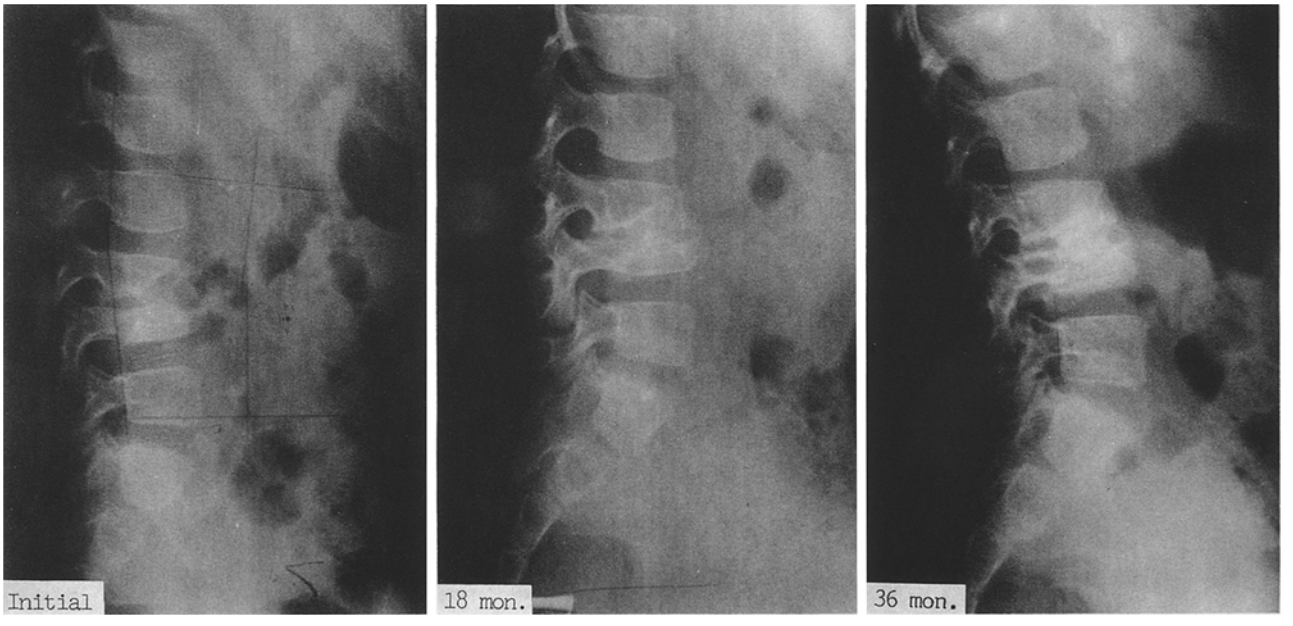

Fig. 5. Lateral views of the L3–4 tuberculous spine of a 12-year-old child show bony union with decreased kyphosis angle at 36 months follow-up

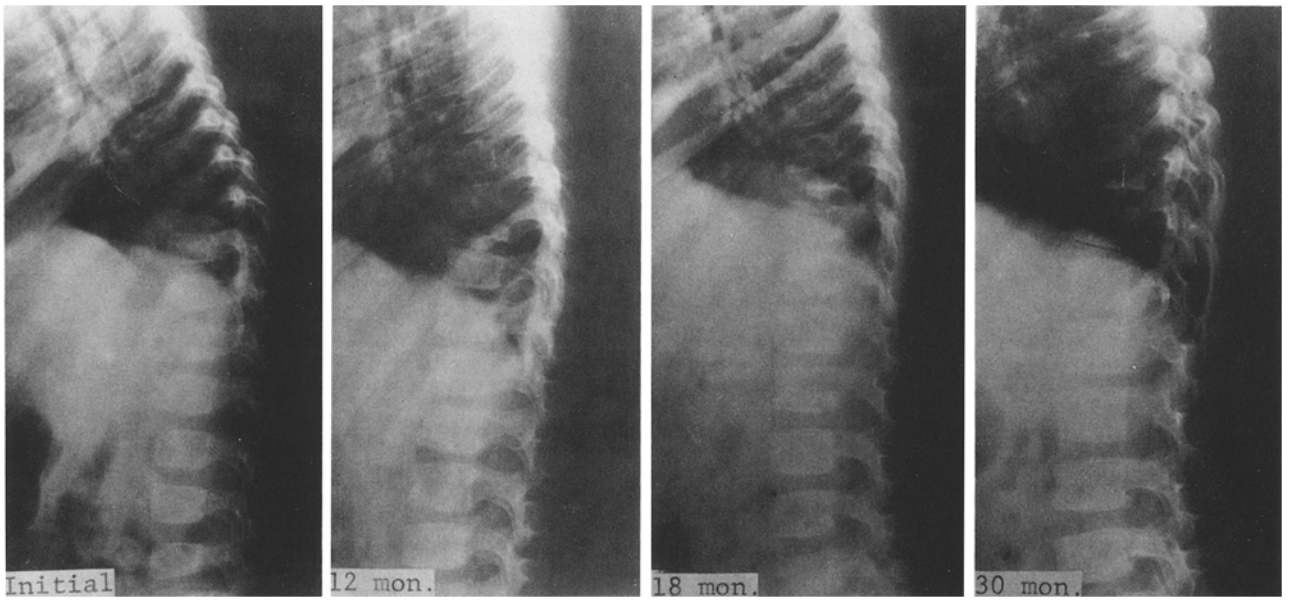

Fig. 6. Lateral views of the thoracic spine of a 5-year-old boy who had ambulant treatment for D10 tuberculosis show a decreased kyphosis angle at 12 months follow-up and no further changes in later

Changes in kyphosis

The mean internal gibbus angle at the start of treatment was 25.6 degrees in children and 17.1 degrees in adults. In the first 18 months the mean change of the kyphosis angle was 9.3 and 6.6 degrees, respectively, and 11 and 7.3 degrees over the 36 months period (Table 5).

Among the 29 patients in whom the kyphotic angle increased by 5 degrees or less, 8 were children and 21 were adults. An increase over 20 degrees was seen in 8 patients, 5 of whom were children, and all had involvement of more than three vertebral bodies.

Lumbar kyphosis in a child decreased after 18 months of treatment.

Discussion

The management of spinal tuberculosis in different parts of the world ranges from bedrest or immobilization with antituberculous chemotherapy to various forms of operative treatment combined with drug therapy.

Recently it has been shown that two short-course regimes, streptomycin plus rifampicin plus isoniazid or streptomycin plus pyrazinamide plus isoniazid, each administered daily for six months, are highly effective in the treatment of extensive pulmonary tuberculosis (East African/British Medical Research Councils 1972, 1973).

With the availability of effective antituberculous drugs, a group of patients with tuberculosis

Table 5. Summary in changes of the mean kyphosis angle in children and adults

Stage / Location	Initial		18 months		36 months	
	Child	Adult	Child	Adult	Child	Adult
Thoracic	40.4°	26.1°	51.9°	34.9°	54.7°	36.0°
Thoracolumbar	31.7°	27.5°	39.3°	34.8°	38.7°	34.8°
Lumbar	15.2°	11.0°	23.1°	16.2°	24.4°	16.9°
Lumbosarcral	−5.0°	–	5.0°	–	5.0°	–
	25.6°	17.1°	34.9°	23.7°	36.5°	24.4°
Average	20.2°		27.7°		28.8°	

of the spine were treated conservatively using a triple drug regime because of their poor socio-economic and general conditions, and their refusal of surgery at our clinic. Isoniazid, ethambutol and rifampicin were the drugs used as a triple chemotherapy in this study, but para-aminosalicylic-acid (PAS) was used for the children instead of ethambutol.

In most cases, treatment was started without bacteriological investigation, particularly as this is not readily available in our clinic. There are two types of cases in which it is essential to begin drug therapy early; firstly, when the patients have already had irregular courses of previous chemotherapy, especially when there is reason to doubt whether the previous treatment was satisfactory or its supervision efficient, and secondly, when it is likely that there is a high level of initial resistance to standard drugs in the country concerned, with the possibility that the organisms in spinal lesions may be resistant.

At the end of three years 95% of patients in our study had a favourable response to the prescribed triple drug regime. These findings are even better than those of the Hong Kong and Bulawayo studies, which showed 85–87% favourable results in both the ambulant and the radical series at three year follow-up (MRC Working Party on Tuberculosis of the Spine, [22]).

All abscesses in the present series, however treated, had absorbed, or become smaller or calcified in from 3 to 12 months. By 24 months all the abscesses and sinuses had disappeared. Our observations agree with those of other authors [13, 19, 20]. The presence of an abscess does not seem to affect the process of healing. We therefore suggest that a less aggressive attitude should be adopted towards paravertebral abscess. Drainage may be considered in cases with neurological complications and when the abscesses become larger despite adequate therapy. It is evident that the clinical course of abscesses and sinuses has been radically changed by triple chemotherapy. When our results are compared with those which used isoniazid and PAS for 18 months, plus 3 months streptomycin, in Bulawayo [22], we had 95% favourable results with rapid resorption of the abscesses or sinuses, while they had 83–85% favourable results and slower resorption.

The ability of the antituberculous agents to reach the site of infection has been questioned. Roaf suggested that avascular scar tissue may serve as a barrier behind which the tubercle bacilli may live protected from the chemotherapeutic drugs [32], and they have been found in excised tissue after a year of chemotherapy. However, their presence does not necessarily result from the failure of the drugs to reach them. Studies using radioactive-tagged isoniazid have shown that this drug freely diffuses into all tissues including bone, abscess cavities and even dried caseous material. The bony healing and abscess resorption produced by chemotherapy in our cases of spinal tuberculosis is more rapid and consistent than that in preceding reports, which leads us to believe that the antituberculous drugs are indeed reaching the site of infection.

Our results in relation to the number of vertebrae involved initially and the progression of kyphosis, suggest that even with appropriate chemotherapy more vertebral destruction develops in children than adults. We therefore suggest that measures such as posterior instrumentation should be taken to prevent kyphosis in children.

In almost all the patients who had severe kyphosis the site of the lesions was in the thoracic or thoracolumbar spine where the physiological kyphosis was present, and the disease had involved more than three vertebrae. This agrees with the observations of Freidman [13] and Tuli [37]. In adults, the deformity developed during the active phase of the tuberculosis. In children, however, kyphosis progressed even after the healing of the disease, due to disproportionate growth between anterior and posterior elements of the vertebrae.

Intercorporal bony fusion has long been accepted as the best indication of healing in tuberculosis, and it was present in 24% of our patients at 18 months and in 36% at 36 months. The cause of this low incidence of bony fusion compared with that of the ambulant series in Bulawayo [22] is not clear.

The results of our study support the views expressed previously by the MRC Working Party on Tuberculosis of the Spine [21–24]. In the long run, the prognosis in our series appears to be much the same as that of the modified Hong Kong radical operation, even though radical treatment produced earlier bony fusion and arrest of the progress of kyphosis. When appropriate facilities are available, radical excision of the tuberculous focus with bone grafting under the cover of antituberculous chemotherapy has definite advantages, but where these facilities are lacking, reliance should be placed on ambulant chemotherapy alone to save life and to eradicate the disease, even though some patients were not satisfied with the appearance of their kyphosis after healing had occurred.

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