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TUBERCULOSIS OF SPINE

By

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Skeletal tuberculosis is one of the disappearing problems of the advanced countries in the West. They have been able to achieve it because of universal pasturization of milk, eradication of pulmonary, glandular and visceral tuberculosis and segregation of open cases in sanatorium. All these facilities do not exist in India and presumably in other economically under developed countries of the world. Tuberculosis of bones and joints still remains one of the major problems to any Orthopaedic service in our country. Spinal caries is the most common and is the most dangerous form of skeletal tuberculosis. Caries spine constitutes about 50 per cent of all cases of skeletal tuberculosis in any series.

M A T E R I A L

The present paper is based upon the observations made on 270 cases of tuberculosis of spine who attended the Orthopaedic service of the College of Medicine Sciences Banaras Hindu University between February 1965 to February 1966. Table 1 shows the incidence of skeletal tuberculosis and that of spinal caries in our series during this period of one year.

Table 1. Showing Incidence of Skeletal Tuberculosis and that of Spinal Caries.

Patients attending Orthopaedic Out Patient Department	8020
Patients with skeletal tuberculosis	580 (7.2% of all Orth. cases)
Patients with spinal tuberculosis (excluding sacroiliac and sacrum)	270

Age and Sex. What is true of osteoarticular tuberculosis in general is also true of spinal tuberculosis. It is most common during first three decades. Table 2 shows the age distribution. Out of a total of 270 patients 124 were males and 146 were females. The figures of other workers are almost similar (*Konstam 1962, Friedman 1966, Wilkinson 1949*).

Table 2. Age Distribution (at the Time of Onset of the Disease), Amongst Spinal Tuberculosis Patients.

Age	Number	Percentage
Below 11	85	31.5
11 - 20	75	27.4
21 - 30	67	24.8
31 - 40	17	6.3
41 - 50	14	5.2
51 - 60	7	2.6
61 - 70	4	1.5
Above 70	1	0.4

CLINICAL AND RADIOLOGICAL FEATURES

The majority of the patients reach the hospital late when the disease is fairly advanced. The duration of symptoms of the illness at the time of presentation in the hospital in the present series is given in Table 3. The duration varied between a few months to a few years. Less than 20 per cent of patients attended within first three months of the onset of the symptoms. The delay may be due to socioeconomic factors and due to ignorance regarding the gravity of their ailments. A large number of patients seek advice only when there is severe pain, marked deformity or when the patient has developed neurological complications. Ninety four per cent of the patients in the present series had varying degree of kyphosis at the time of presentation.

Table 3. Duration of Illness at the Time of Presentation.

Duration in months	Number	Percentage
Less than 3	52	19.3
Between 4 to 6	58	21.5
Between 7 to 9	41	15.2
Between 10 to 12	30	11.1
Between 13 to 18	27	10.0
Between 19 to 24	20	7.4
More than 24	42	15.5

Spinal segments involved. The various regions of the spine involved are shown in Table 4. The order of frequency has been dorsal, lumbar, cervical and lumbo-

sacral junction. There were 25 patients (9.2 per cent) who had involvement of more than one region of the spine, each region being separated by two or three normal vertebrae. For Table 4 they have been included under the region which had the more advanced lesion. *Friedman* (1966) described 84 spinal lesions in 64 of his patients of tuberculosis of spine. Our figures give a rather higher incidence for involvement of cervical spine. It is suggested that this may be explained on the basis of the large number of children suffering from spinal tuberculosis in our series, cervical spine tuberculosis being more common in children.

Table 4. Distribution of Tuberculosis in Spine.

Sites of lesion	Number	Percentage
Cervical	38	14.0
Dorsal	118	43.7
Lumbar	106	39.3
Lambo-sacral L ₅ -S ₁	8	3.0

N.B. 25 cases (9.2 per cent) had isolated lesion in more than one region of spine.

Relation between spinal lesion and other visceral and skeletal lesions. Like osteo-articular tuberculosis spinal tuberculosis is always the result of a haematogenous dissemination from a primary focus. The primary focus may be active or quiescent, apparent or latent, either in the lungs or lymph glands of mediastinum, mesentery or neck, or there may be involvement of other viscera. The detection of the primary focus or an associated visceral lesion greatly depends upon the degree of effort put in this direction. In the present series a pulmonary lesion could be detected in five per cent of the cases and cervical lymphadenitis in seven per cent of the cases. The detection of associated visceral lesions in the series of other workers (*Konstam* 1962, *Friedman* 1966, *Wilkinson* 1949 and *Sanchis-Olmos* 1948) has been reported to be rather high, between 40 and 50 per cent. 56 out of 270 patients with spinal tuberculosis (21 per cent) had disseminated skeletal lesions either as multiple foci in isolated regions of the spine or with involvement in other regions of the skeleton (Table 5). Ten out of 64 patients with spinal tuberculosis in *Friedman's* series (1966) had tuberculous osteomyelitis of other bones in addition to the vertebral focus.

Vertebral lesion. In the majority of the patients there were the typical paradiscal lesions characterised by destruction of the adjacent bone and end-plates of the bodies and the intervening intervertebral disc. The following uncommon varieties were also encountered which may show radiologically intact disc spaces. These were the anterior type in two cases (involvement of anterior surface only (Figure 1), posterior spinal disease in one (involvement of pedicles, laminae or spinous processes) and the central cystic type of tuberculosis of body of the vertebrae in two cases.

Abscesses and Sinuses. Tuberculous abscesses were diagnosed on the basis of the characteristic roentgenographic evidence, or detection of pus on aspiration or evacuation and clinical examination of palpable abscess. There were 103 cases (*i.e.*

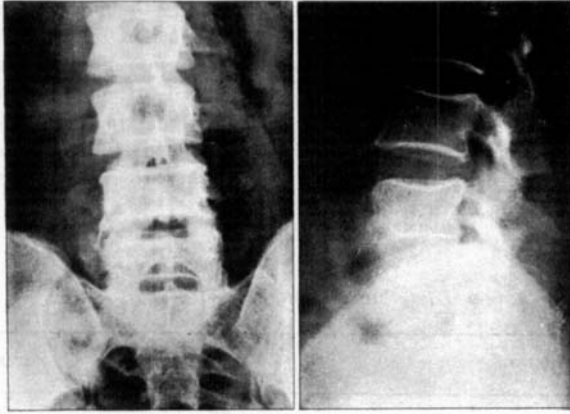


Figure 1. Involvement of anterior part of vertebral body associated with psoas abscess shown by moderate bulging of left psoas shadow. Intervertebral disc space seems to be uninvolved.

about 38 per cent) in the present series who had abscesses or discharging sinuses; 63 had abscesses, 30 had sinuses and 10 had abscesses and sinuses.

Cervical spine abscess. Pus from tuberculous cervical spine usually comes to lie in front of the vertebral bodies thus pushing the prevertebral fascia and pharynx and trachea anteriorly (Figure 2).

Thoracic spine abscess. The upper thoracic abscess casts a V-shaped shadow stripping the lung apices laterally and downwards or when it is small the superior mediastinum shows only squaring of its borders. Abscess in the region of 7th cervical to 4th dorsal vertebrae requires good quality X-rays to be diagnosed at an early stage. Abscesses lower down produce typical fusiform shape (Figure 3) (bird-



Figure 2. Tuberculosis of cervical spine (C₄-C₅) with a large prevertebral abscess.

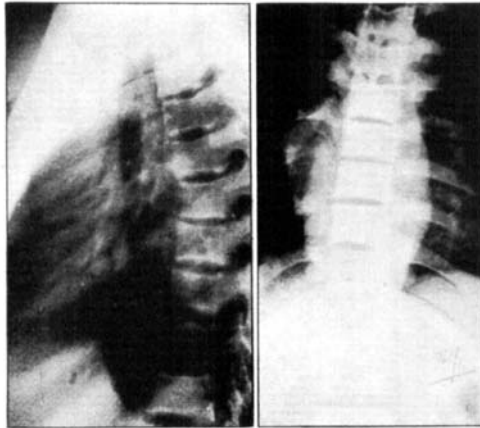


Figure 3. Typical fusiform paravertebral abscess (bird nest appearance). Note minimal involvement of vertebral bodies and intervening disc space (D₆-D₇).

Table 5. Distribution of Various Regions Involved in 56 Cases of Spinal Tuberculosis (Besides Their Major Region of Spinal Involvement).

Other region of spine	25
Sacrum and sacroiliac joints	8
Hip joints	9
Knee	3
Foot	4
Hand	3
Elbow	2
Skull	2
Ribs	1
Shoulder	1
Pubis	1

(The difference between the total of above figures (59) and the total number of spinal tuberculosis patients having disseminated skeletal foci (56) is because some of these patients had the disease in multiple regions.)

nest appearance), however when the size of the abscess is too large it may take the shape of a generalised broadening of the mediastinum. Abscesses or sinuses from cervical or dorsal regions can present themselves far away from the vertebral column along the fascial plains or course of neurovascular bundles.

Lumbar spine abscess. Abscesses from the lumbar spine follow the well known pattern of tracking down the psoas sheath. Radiological manifestation of psoas abscess is unilateral or infrequently bilateral widening of the psoas shadows however it needs an excellent quality picture to detect any bulging of the psoas border.

Table 6. Usual Causes of Neurological Complications in Caries Spine.

1. Inflammatory oedema.	Recovers by conservative therapy.
2. Tuberculous granulation tissue.	Recovers by conservative therapy.
3. Tuberculous abscess.	Recovers by conservative therapy: Rarely requires drainage.
4. Tuberculous caseous tissue.	May subside by conservative therapy: Sometimes requires evacuation.
5. Tubercular debris.	Solid debris requires operative removal.
6. Sequestra from vertebral body and disc.	Requires operative removal.
7. Constriction of cord due to narrowing of vertebral canal.	Requires operative decompression.
8. Localised pressure due to salient (Internal Gibbus) along anterior wall of vertebral canal.	Requires operative decompression.
9. Prolonged stretching of the cord over a severe deformity.	i) Stretched cord may be more vulnerable to other causes, then decompression and release of cord may lead to recovery. ii) Rarely stretching leads to inter-stitial fibrosis (difficult to prove/disprove) which does not recover.
10. Infective thrombosis/end-arteritis of spinal vessels.	Difficult to prove/disprove, does not recover.
11. Pathological dislocation of spine.	Rare complication, usually results from rough manipulation by massour/or indiscriminate laminectomy for caries spine, irreparable severence of cord.

N.B. More than one cause may be acting in the same case.

Spinal cord involvement. This is the most dreaded complication of spinal tuberculosis. 57 patients (21.1 per cent) in the present series of 270 cases had some degree of neurological involvement at the time of presentation in our department. We had:

Tuberculosis cervical spine	Quadriparesis	5
- - -	Quadriplegia	2
- dorsal -	Paraparesis	21
- - -	Paraplegia	29
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	Total	57

Patients who had neurological complications but were able to walk have been labelled as quadriparesis or paraparesis whereas those unable to walk due to advanced paralysis have been included under the heading of quadriplegia or paraplegia.

Pathology of neurological involvement. Based upon the clinical behaviour and response to conservative therapy, radiological observations, and the operative findings of the cases who were decompressed we feel that the usual causes of neurological complications in caries spine in order of frequency are as shown in Table 6. The observations in our group are in general agreement with those reported by *Seddon 1956, Garceau 1950, Griffiths et al. 1956, Friedman 1966, Konstam 1962, Hodgson 1960*. It may be pointed out that the apparent deformity of spine has not been a significant cause of paraplegia in the present series. There are many patients with an extreme degree of deformity without any neurological involvement.

TREATMENT AND RESULTS

Over the past few years total extirpation and excision of tuberculous foci in the spine has been practised and advocated by many workers (*Hodgson and his team 1956, 1960, Masalawala 1963, Donaldson 1965*). However because of a large number of patients of osteoarticular tuberculosis, lack of availability of hospital beds, operating time and the medical staff we have been mostly treating our patients on conservative lines by anti-tubercular chemotherapy, rest and ultimately spinal braces. A large majority of the present series have been treated as outdoor patients out of sheer necessity. Such facilities presumably do not exist in other under developed countries of the world either, and orthopaedic surgeons working in those places facing similar problems have to resolve to simple methods of treatment (*Konstam 1962*). In our series hospitalisation and surgery has been restricted to paraplegics unable to walk and some patients who require drainage of abscesses and other patients who agreed to fusion of the spine for an unstable or painful spinal lesion.

Usual principles of treatment. The basis of our treatment consists of:

a) Rest in hard bed or plaster-of-Paris bed for 9 months to 12 months. Plaster-of-Paris bed is not essential, however it is necessary for the majority of our patients who do not realise the value of rest. When a patient is made to lie down in the plaster-of-Paris bed the patient and his attendants do realise that something grave has happened to the patient and thus they become more cooperative in having the full course of the treatment.

b) Drugs. An adult is prescribed. Inj. Streptomycin Gramm 1 I.M. daily for 100 Gms (3 months). PAS 12 Gms daily in divided doses for 18 months. INH 300 mgs daily in divided doses for 24 to 30 months. Supportive therapy with multi-vitamins, haematinics if necessary and high protein diet is advised throughout the treatment. Doses are modified according to the age.

c) Radiographs and E.S.R. are taken and patients are called for check up at 3 to 6 months intervals.

d) Gradual mobilisation of patients is encouraged with the help of spinal braces after 9 to 12 months of bed rest. Spinal brace is continued for about 18 months to 2½ years when it is gradually discarded.

The majority of the patients during this period get stable fibrous or bony ankylosis. We are still working on the final results of our line of treatment on the vertebral lesion itself. Patients who have unstable or painful lesions are advised to have spinal-arthrodesis. Five patients agreed to spinal fusion, posterior spinal arthrodesis was performed and all of them are doing well after the operation.

e) Abscesses are aspirated when near the surface and one gramm of streptomycin in solution is instilled at each aspiration. Open drainage of the abscess is performed if aspiration fails to clear them. All para-vertebral abscesses were not drained; drainage was incidental whenever a decompression was performed for Pott's paraplegia. Prevertebral abscesses in the cervical region have been drained under local anaesthesia when complicated by neurological involvement or difficulty in deglutition and respiration.

RESULT

Sinuses in a large majority of cases healed within six weeks to twelve weeks from the onset of the treatment. A small number healed with longer treatment and curettage of the tract.

Spinal cord involvement and its response to treatment is shown in Table 7.

Table 7. Behaviour of 57 Cases of Neurological Involvement in Caries Spine.

Vertebral level	Degree of neurological involvement	Mode of treatment	Results and remarks
Cervical spine	Quadripareisis 5	Conservative therapy	Complete recovery
		Conservative + skull traction	Complete recovery
		Conservative + traction + drainage prevertebral abscess	Complete recovery
Cervical spine	Quadriplegia 2	Conservative + traction	Complete recovery
		Conservative + traction + drainage of prevertebral abscess	Complete recovery
		Plaster-of-Paris bed + conservative	Complete recovery
Dorsal spine	Paraparesis 21	POP bed + conservative	16 recovered—Majority younger group and early onset paraplegia. 13 did not respond
Dorsal spine	Paraplegia 29	Operative decompression performed in 13	11 complete recovery 1 fair recovery 1 no recovery

N.B. 21.1 per cent or 57 cases had neurological involvement out of 270 cases of spinal tuberculosis.

21.1 per cent of our patients had neurological involvement. Over all incidence of this complication given by *Girdlestone* (1952) and *Griffiths* (1952) is 10 per cent and 11 per cent respectively, in all cases of spinal caries.

DISCUSSION

Treatment of spinal tuberculosis in different parts of the world ranges from sophisticated sanatorium treatment under drug cover (*Kaplan* 1959, *Friedman* 1966) to varying degrees of radical surgery combined with anti-tuberculous drug treatment (*Seddon* 1956, *Roaf* 1958, 1959, *Hodgson* 1960, *Mukopadhya* 1956, 1957, *Masalawala* 1963, *Donaldson* 1965). Introduction of judicious combination of Streptomycin, PAS and INH has revolutionised the treatment of spinal tuberculosis and has markedly improved the results of conservative treatment and less radical surgical approach. The ability of antituberculous drugs to reach the actual site of tuberculous lesion has long been doubted. However recent studies by various workers (*Barclay et al.* 1953) using radioactive tagged isoniazid, showed that this drug is freely diffusible into all tissues including bone as well as into tuberculous abscess cavities and caseous material. It may be presumed that besides INH other anti-tubercular drugs also reach the site of tuberculous lesions. Moreover the clinical response of spinal disease under anti-tubercular chemotherapeutic agents leads one to infer that these drugs indeed reach the site of infection. Many cold abscesses treated by anti-tubercular agents in the series of various workers have been proved to be sterile to the usual methods of culture and guinea-pig inoculation.

The use of these drugs has permitted major excisional surgery with greater safety. However, universal total extirpation of tuberculous lesions in the spine has been practised and advocated by many workers (*Hodgson & Stock* 1956, *Hodgson et al.* 1960, *Wilkinson* 1950, *Mukopadhya* 1956) on the supposition that drugs are unable to reach the site of a tuberculous lesion.

It is revealing to study the behaviour of neurological complications in our present series. The majority of our cases recovered on conservative therapy and surgical decompression in them was unnecessary. It must be pointed out that the majority of these patients who made a progressive recovery by conservative therapy alone were patients with neurological complications of early onset and they belonged to a younger age group. We have been performing decompression of cord only for those cases of tuberculous paraplegia who did not show signs of

progressive recovery to a satisfactory level after a fair trial of conservative therapy for a few weeks (4 to 6 weeks), or the cases in which the patients developed neurological complications during the conservative therapy or in which paraplegia became worse while the patient was undergoing treatment with anti-tubercular drugs and bed rest. In other words we have performed decompression for "absolute indications of Pott's paraplegia". We have not performed this procedure only for excisional therapy of tuberculous spine. In the cervical spine drainage for prevertebral abscess was performed in two cases and skull traction was applied in four patients of neurological involvement; in the upper dorsal spine we prefer anterior spinal decompression through a trans-thoracic transpleural approach, as anterolateral decompression does not provide a wide exposure; from 4th dorsal to 12th dorsal region anterolateral decompression has been performed. Operative decompression was performed in 13 cases of Pott's paraplegia; 11 of them recovered completely, one recovered enough to be able to walk with residual spasticity and one unfortunately did not recover. Fortunately we did not have any operative or postoperative mortality in the operated cases.

We feel that a judicious combination of anti-tubercular drugs has decreased the indications for universal surgical excisional therapy of tuberculous lesions. The majority of the patients can be safely treated on domiciliary regime. Spinal tuberculosis is only a localised manifestation of a systemic infection and thus no local surgical procedure is a substitute for adequate and prolonged systemic anti-tuberculous drug therapy. In the light of the present observations and those of *Konstam* (1962) and *Friedman* (1966) the use of a judicious combination of anti-tubercular drugs should reduce the indications of surgery in spinal tuberculosis to the following: (i) Pott's paraplegia not showing signs of progressive recovery to a satisfactory level after a fair trial of conservative therapy (4-6 weeks), (ii) cases of caries spine who developed paraplegia during the conservative treatment, (iii) those cases where paraplegia becomes worse while patient is undergoing therapy with anti-tubercular drugs and bed rest, (iv) patients who have unstable spinal lesions or have painful ankylosis of spine, (v) cases of prevertebral cervical abscesses with neurological signs and difficulty in deglutition and respiration, (vi) accessible abscesses not clearing with repeated aspiration and anti-tubercular drugs, and tubercular sinuses not responding to conservative therapy.

SUMMARY

Osteoarticular tuberculosis in general and spinal tuberculosis in particular still remains one of the major problems to be dealt with in any orthopaedic centre in our country. We have treated the majority of our cases as out-door patients with anti-tubercular drugs and rest at home under conditions far from sanatoria. Surgery and admissions to the hospital have been restricted out of necessity, to cases whose abscesses were not resolving by repeated aspiration or cases of neurological complications due to caries spine requiring an operative decompression or rarely for those patients who had painful or unstable lesions in the spine who agreed to spinal arthrodesis. The results obtained in our present series are to be compared favourably with those reported in series treated by radical surgery and a more elaborate sanitorium regime.

RESUME

La tuberculose ostéoarticulaire en général et la tuberculose vertébrale en particulier, restent toujours les problèmes majeurs dont il faut s'occuper dans chaque centre orthopédique de notre pays. Nous avons traité la majorité de nos cas avec des médicaments antituberculeux à la maison dans des conditions loin de ressembler à celles des sanatoria. Les interventions chirurgicales et l'hospitalisation se sont bornées aux cas où des complications neurologiques provoquées par des caries vertébrales nécessitaient une opération de décompression ou plus rarement chez des malades ayant des lésions douloureuses et instables de la colonne vertébrale et décidés à accepter une arthrodèse vertébrale. Les résultats obtenus dans nos présentes séries sont favorables par comparaison à ceux rapportés dans les séries traitées par chirurgie radicale et un régime plus étudié de sanatorium.

ZUSAMMENFASSUNG

Gelenks- und Knochentuberkulose im allgemeinen und Wirbelsäulentuberkulose im besonderen verbleibt noch immer eines der grösseren Probleme in jedem orthopädischen Zentrum in unserem Lande. Wir haben die Mehrzahl der Fälle ausserhalb des Krankenhauses mit anti-tuberkulösen Mitteln und Ruhe daheim behandelt. Chirurgie und Aufnahme ins Krankenhaus wurden aus Gründen der Notwendigkeit auf Fälle mit neurologischen Komplikationen wegen Karies der Wirbelsäule, die eine operative Dekompression erforderten, oder in seltenen

Fällen auf jene Patienten, die schmerzvolle oder un stabile Schädigungen der Wirbelsäule hatten und mit einer spinalen Arthrodesis einverstanden waren, beschränkt. Die Ergebnisse, die wir bei unserem vorliegenden Material erzielten, lassen sich in vorteilhafter Weise mit denen, die nach radikaler chirurgischer Behandlung und sorgfältigerer Überwachung im Sanatorium berichtet werden, vergleichen.

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