OUTCOME OF TREATMENT OF CERVICAL SPINE TUBERCULOSIS AT THE KING GEORGE V HOSPITAL SPINE UNIT

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ABSTRACT

Background: **Tuberculosis of the cervical spine is uncommon, constituting 3-9% of all cases of tuberculous spondylitis.**
Objective: **To document the results of treatment of cervical spine tuberculosis at the King George Spine Unit.**
Setting: **King George V Hospital Spine Unit, Durban, South Africa.**
Methodology: **This was a review of files of patients treated for cervical spine tuberculosis over a period of 20 years (December 1987 to August 2008).**
Results: **Sixty cases of cervical spine tuberculosis were identified over the study period. The sub-axial spine was affected in 86% of cases. Non-contiguous extra-cervical spinal lesions occurred in 24% of cases. Pulmonary tuberculosis was found in 13% of cases. Other areas of the musculoskeletal system were involved in 7% of cases. The results of treatment were good with 28 of 30 cases (93%) treated by anterior decompression, grafting and interbody fusion showing incorporation of the graft. There was improvement in neurological deficits too. Adjacent segment degeneration was seen in 15 of 35 cases (43%). Graft slippage occurred in four cases (10%). Pancervical ankylosis was seen in three cases (9%) and was symptomatic in one (3%) of these cases. Other complications included esophageal injury, graft fracture, screw loosening, screw malposition and plate fixation failure (2.5% in each case).**

Conclusion: **The results of treatment of cervical spine tuberculosis are good. The most common complication is adjacent segment degeneration, which when severe, presents as pancervical ankylosis. This needs long-term follow-up for clinical features of cervical stenosis. Graft slippage is the second most common complication and is prevented by plate fixation.**

INTRODUCTION

Cervical spine tuberculosis patients at the King George V Hospital Spine Unit are treated with a 4-drug anti-tuberculous regimen for 18 months. Patients with an abscess causing dysphagia, respiratory distress or pointing on the skin are offered incision and drainage. If there was evidence of cervical spine instability or spinal cord compression, decompression and fusion was done. In the 1990s, when cervical spine locking plates became available in the unit, additional buttress plating of the construct was done.

MATERIALS AND METHODS

This study was carried out at the King George V Hospital Spine Unit, Durban, South Africa. The records of 64 cases treated for cervical tuberculosis over the period December 1987 to August 2008 were retrieved and analyzed.

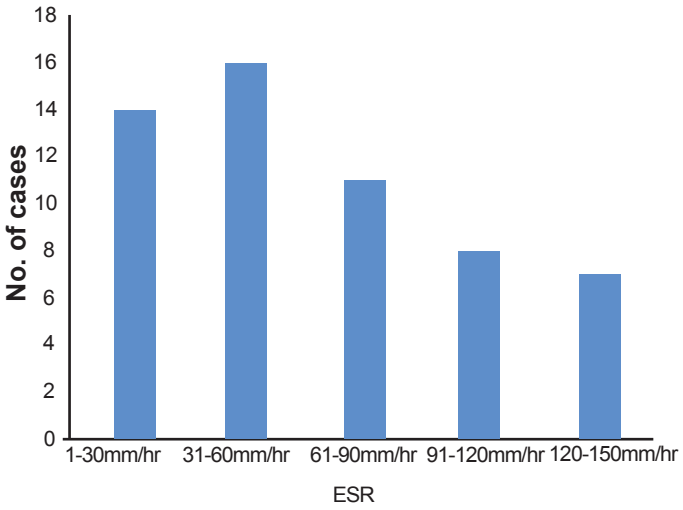
RESULTS

Between December 1987 and August 2008, 64 cases of cervical tuberculosis were seen at the King George V Hospital Spine Unit. Thirty three (52%) were males, 29 (45%) were females. The age range was 2 years to 70 years, with a mean age of 38 years.

The tuberculous lesion was in the upper cervical spine in nine cases (14%) and in the sub-axial spine in 55 cases (86%). Concomitant non-contiguous tuberculous lesions of the spine were found in 13 cases (24%). These lesions included: seven in the thoracic spine and seven in the lumbar spine. Tuberculous lesions were also found in other areas of the musculoskeletal system in four cases (7%) - the calcaneus, sternum, shoulder and sacroiliac joint. Concomitant pulmonary tuberculosis was diagnosed in seven cases (13%). Other co-morbidities occurred in 10 cases (18%) as follows: diabetes (4 cases), malnutrition (2 cases), Fourniers gangrene, discoid leprosy, meningitis, asthma, old gunshot wound to the head with epilepsy, psoriasis and schizophrenia.

Eleven cases (17%) were HIV positive, 25 cases (39%) were HIV negative; while the HIV status was undetermined in 28 cases (44%). The albumin level ranged from 14g/dl to 49g/dl. Hypo-albuminemia (serum albumin level below 35g/dl) was found in 40 cases (62.5% of cases) with 16 cases (25% of cases) demonstrating a serum albumin level below 25g/dl. The erythrocyte sedimentation rate ranged from 1mm/hr to 147 mm/hr (Figure 1).

Figure 1: Distribution of the ESR.



Upper cervical spine (C1C2) tuberculosis: Upper cervical spine tuberculosis was found in nine patients. Four were males and five were females. The age range was 2 years to 57 years. Neurologic examination was normal in three, abnormal in four and not documented in two.

Non-operative treatment using cervical traction and a cervical orthosis was instituted in six patients. Two of these non-surgically treated patients died (one due to chest infection and the other due to cardiac failure and sepsis). Follow-up was available in the remaining three cases as follows: one case healed uneventfully, one case needed posterior C1/C2 fusion later because of instability while the last case developed symptomatic pancervical ankylosis ten years later. Laminoplasty was done at C5/C7 for spinal stenosis in this latter patient.

Three patients were treated surgically by incision and drainage of the tuberculous abscess anteriorly. One of these healed uneventfully. In the second case, this initial drainage was followed by trans-oral release and posterior C1/C2 fusion. The third patient needed an initial tracheostomy for airway control. At 31 months of follow-up, this patient developed spontaneous posterior C1-C6 fusion without neurologic deficit (Figure 2).

Figure 2: Summary of the change in neurologic status in the course of treatment

Frankel Grade	No. of cases pre-operatively	No. of cases post-operatively
A	0	0
B	0	1
C	1	0
D	1	0
E	3	3
Spastic	2	2
Undocumented	2	3

One patient declined surgery and his neurologic status deteriorated by one frankel grade.

Sub-axial spine (C3-C7) tuberculosis: Sub-axial spine tuberculosis was found in 55 patients. Thirty were males and 25 were females. The age range was 5 years to 70 years. The duration of symptoms varied from 1 week to 24months. The average duration of symptoms was 5.5months.

The tuberculous lesion in the cervical spine occurred at a single level in 36 cases (65%), and at multiple contiguous levels in 19 cases (35%). The most common single level involved in the subaxial spine was C5/C6 seen in 13 cases (36%). Multiple contiguous level involvement in the subaxial spine most frequently affected the cervicothoracic junction as seen in 12 patients (63%). The levels of involvement varied from two to five motion segments; with the most frequent being 3 motion-segment-involvement occurring in 4 of these 12 cases (33%). Non-contiguous cervical spine tuberculous disease was seen in one case.

Anterior cervical decompression and fusion was done in 44 patients. A strut graft (iliac crest autograft or fibula allograft) was used in all these cases. Fourteen of these patients (32%) had a locking cervical plate added to the construct. These were patients treated later in the course of the study period when cervical plates became available in the unit. Incision and drainage of the abscess alone was done in one patient, while a biopsy alone was done in another one patient. Eleven patients (20%) were treated non-surgically with anti TB medication and a cervical orthosis.

Figure 3: Neurologic status

Frankel Grade	No. of cases pre-operative	No. of cases post-operative
A	5	1
B	6	3
C	7	0
D	8	4
E	29	35

Seven patients had spasticity while the neurologic status was not documented in two cases. The neurologic status did not deteriorate in any of these cases, except in one patient in whom the deterioration was attributed to a stroke.

At the last follow up, 20 patients (36%) were lost to follow-up. Five patients died during the index admission. The causes of death were pneumonia, thrombo-embolism, meningitis, malnutrition and diabetes-related complications (deep venous thrombosis, stroke) in one case each. In the remaining 35 patients follow up ranged from 8 months to 217 months. The average duration of follow-up was 59.3 months.

Surgery specific complications occurred in nine patients (23%). The most common complication was graft slippage in four cases (10%). All these patients did not have a cervical plate. This complication was not seen after the initiation of plate fixation. In one of these slipped grafts, the persistent pressure on the esophagus led to perforation of the esophagus. Repair of the esophagus and replacement of the graft was done. The patient went on to heal uneventfully. The graft fractured

in one patient. This had been harvested from the iliac crest which is not as strong as a fibula graft. The graft was not buttressed with a plate and therefore there was no load sharing between the plate and the graft. The increased stresses may have led to graft fracture. Screw malposition, screw loosening and plate fixation failure occurred in one case (2.5%) each.

Successful incorporation of the graft in the anterior cervical decompression and graft patients was noted in 93% of cases. There was asymptomatic non-union of one of the ends of the graft in two cases (7%). No further surgery was done in these two cases.

Adjacent segment degeneration and pan-cervical ankylosis: Thirty five patients with long term follow up (59.3 months) were assessed for adjacent segment degeneration. Adjacent segment degeneration was found in 15 cases (43%). The earliest changes were seen at nine months post-operatively. It was not established whether this was symptomatic adjacent disc degeneration or not. However, none of these patients needed surgery for this problem in the course of follow-up.

Three cases (9%) had extensive ankylosis of the cervical spine. The first patient was a 10 year-old female, presenting with C7-T1 tuberculosis. Anterior decompression and fusion was done. Spontaneous fusion (anteriorly and posteriorly) occurred from C2-T2. The second patient was a 15 year-old male presenting with C1-C2 disease. Incision and drainage (anterior) of the abscess was done. He developed spontaneous posterior fusion C1-C6. The third case was a 30 year-old female presenting with symptoms of cervical stenosis. Radiographs showed anterior and posterior fusion extending from C2-T1. She had healed sinuses in the neck and had been treated in childhood for C1-C3 tuberculosis. Laminoplasty was done at C5-C7 levels.

DISCUSSION

Tuberculosis of the cervical spine is uncommon, constituting only 3-9% of all spinal tuberculosis. It most commonly occurs in young adults and the most common site in the cervical spine is the subaxial spine (1-5). This study concurs with these studies. The mean age was 38 years and 86% of the lesions were in the subaxial spine. Other studies have also shown concomitant tuberculous disease in the thoracolumbar spine and other areas of the musculoskeletal system. This is consistent with the systemic nature of tuberculous infection.

Upper cervical spine: The initial treatment of upper cervical spine involves medical treatment with antituberculous drugs. Arora *et al* (6) has recently published good results with nonsurgical treatment and attendant recovery of neurologic function. A halo vest was used in patients without neurologic involvement, instability or basilar invagination. In the presence of the above, initial skeletal traction was used for 6 weeks, followed by halo vest application.

Surgical treatment is controversial. Fang *et al* (7) recommended drainage of the abscess when it is causing respiratory distress or dysphagia. In the presence of C1/C2 subluxation, cervical traction was done. If there are adhesions, cervical traction alone does not reduce the subluxation. In such cases, Fang *et al* (7) recommended trans-oral release and a subsequent posterior fusion. It has also been noted that trans-oral release, is associated with infection rates of up to 50% (8). Though it has been our practice to follow Fang's recommendation, the release has been increasingly done through an anterior retropharyngeal approach to avoid this complication (9).

Lifeso (10) classified upper cervical tuberculosis radiologically into: Stage I involvement, indicating minimal ligamentous or bone destruction with no displacement of C1 on C2; Stage II involvement, ligamentous disruption and minimal bone destruction with anterior displacement of C1 on C2; and stage III involvement, marked ligamentous and bone destruction with displacement of C1 forward on C2. Stage II and III disease was treated surgically in our series.

Sub-axial spine tuberculosis: Tuberculous spondylitis is usually part of a systemic disease as shown by the occurrence of tuberculous lesions in other parts of the body. The local presentation in the cervical spine can be isolated at one level or it could involve multiple contiguous levels. Multiple contiguous level involvement was seen in 35% of cases, with as many as five contiguous levels of involvement being found in one case in this study.

Graft slippage in our study could have been prevented by the use of an additional plate in these patients to buttress the construct. Plate fixation does also increase the success of bone incorporation (11). A slipped graft can cause injury of the esophagus. Esophageal injury is rare. Lu, Guo and Ni (12) reported one case in 1045 cases done over ten years. They also documented esophageal perforation as late as seven years after cervical surgery. Dysphagia, dysphonia, post-operative airway compromise, haematoma, vertebral artery injury, dural injury and spinal cord injury were not specifically documented in this retrospective study (13-15).

Anterior cervical decompression with allograft, combined with the use of tuberculous medication is highly successful in eradication of tuberculous spondylitis in the cervical spine. Successful incorporation of the bone graft is noted in this study. There is also improvement in the neurologic status of the patients with this treatment (16,17).

Adjacent segment degeneration and pan-cervical ankylosis: The occurrence of radiographic adjacent disc degeneration seems to be similar to that seen following anterior diskectomy and fusion in degenerative disease of the cervical spine. Adjacent disc degeneration occurs in 50-92% of patients that have had anterior interbody fusion. The incidence of radiographic adjacent segment degeneration in the cervical spine is estimated to be between 5% and 9% per year. However, symptomatic adjacent segment disease appears to occur at a rate of 2% to 3% per year following anterior cervical discectomy and fusion. This has been attributed to the increased stress on the adjacent joint as a result of elimination of a

motion segment by the fusion (18). The use of a needle in localization of the pathology during fluoroscopy is a possible cause of adjacent segment degeneration (19).

Extensive fusion of the cervical spine following tuberculosis of the cervical spine has been reported in one case by Lukoschek and Niethard (20). It is the opinion of the authors of this article that these three cases fusion was similar to Lukoshek and Niethard's case (20). Given the presence of adjacent segment degeneration and the presence of multiple contiguous levels of involvement noted in this study, plus the frequent occurrence of an extensive abscess in tuberculosis; this rare occurrence of pancervical ankylosis following cervical spine tuberculosis is conceivable. In our series, the onset of tuberculosis was in childhood. These patients need to be followed up for cervical stenosis later in life.

This study has long follow-ups spanning 20 years and a large number of cases of this rare disease. The derivation of conclusions is hampered by its retrospective nature, the absence of certain elements of data and loss of patients in the course of follow-up. It, however, acts as a good reference point of the expected results and complications encountered in the treatment of cervical spine tuberculosis.

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