TUBERCULOSIS OF THE UPPER CERVICAL SPINE
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Six patients, aged between 3 and 51 years, with tuberculosis of the upper cervical spine were studied. Prominent features of the disease included pain and stiffness, paralysis, swelling of the retropharyngeal soft tissue, osteolytic erosions, and atlanto-axial subluxation. Cure was obtained with antibiotics, transoral decompression and C1–2 fusion.

Tuberculosis is still common in underdeveloped countries. Its occurrence in the upper cervical spine is rare but the consequences are very serious. Bright (1837) described a case of spinal caries with insidious paralysis beginning in the hand and spreading to the whole body. Necropsy revealed extensive abscess formation in the upper cervical vertebrae and compression of the medulla from the "processus dentatus". Smith (1871) reported 15 post-mortem cases of fractures of the dens, at least three of which resulted from spinal caries. Death was due to atlanto-axial dislocation causing compression of the cord in each case. Recently, Wang (1981) reported 15 cases of atlanto-axial involvement in 5393 cases of tuberculous spondylitis. Good results were obtained with antibiotics, transoral debridement and prolonged recumbence in 14 patients. We would like to present our experience with the management of this difficult problem.

MATERIAL AND METHODS

In Hong Kong we have seen an incidence of 42 cases of cervical involvement among 587 consecutive cases of tuberculous spondylitis over a period of two years (1957–59). The total number of cervical vertebrae involved was 99 and of these, 18 were either C1 or C2. We have followed up a group of six patients treated for atlanto-axial tuberculosis for at least one year and for an average of nine years and three months.

Four of the group were male and two female, their ages ranging from 3 to 51 years. Four patients were below the age of 16 years.

Clinical presentation. All patients complained of neck pain and stiffness lasting three to eight weeks. Five had moderate to severe torticollis and one patient held his neck in flexion. One patient had occipital headache and another had hoarseness followed by acute dysphagia.

Cervical lymphadenopathy was present in every case and a discharging sinus in the neck was seen in two patients. Three patients had constitutional symptoms of fever, anorexia and loss of weight.

Neurologically two patients were normal. Two had objective weakness (MRC Grade II–IV) and hypoaesthesia of an upper limb. One patient was hemiparetic (Grade III–IV) and one had severe tetraparesis (Grade I–II).

Blood investigations revealed moderate leucocytosis (11 300–11 600 cells per microlitre) in three patients and raised erythrocyte sedimentation rate in four patients (40–90 millimetres in the first hour).

Two patients had previously received irregular drug therapy for pulmonary tuberculosis.

Radiology. The radiological finding common to all cases was increased width of the retropharyngeal soft-tissue space on the lateral view. According to Wholey, Bruwer and Baker (1958) this space should normally measure less than seven millimetres at the lower margin of the axis (focus to film distance of 1.5 metres). In our cases the space measured at least 12 millimetres and at the most four centimetres (Fig. 1). Surgical exploration through

Fig. 1

Retropharyngeal abscess of four centimetres in a man aged 22 years with tuberculous atlanto-axial subluxation (focus to film distance 1.5 metres).
the mouth revealed the cause of enlargement to be mainly fluid pus in two cases, caseous material in one case and granulation tissue in two cases.

Anterior atlanto-axial dislocation was present in four patients in whom the atlantodental interval exceeded five millimetres. Rotary fixation of the atlas on the axis was seen in one patient in whom all movements of the cervical spine failed to alter the rotary relationship. Anterior rotary subluxation of one lateral atlantal mass was confirmed at transoral surgery.

Osteolytic erosions were present in all cases. In the axis the lytic lesion involved the body and the dens. The latter structure was either fractured just above the base or largely destroyed by the disease (Fig. 2). Destruction in the atlas was located in the anterior arch and lateral masses in four cases, but in one of these the posterior arch was also partly destroyed. Erosions involved the C3 body in one case, and the bodies of both C3 and C4 in another. Intervertebral disc narrowing was very evident in these cases.

Chest radiographs showed unmistakable pulmonary tuberculosis in four cases. One patient had tuberculosis of the left hip and intravenous pyelography showed bilateral renal involvement as well.

Proof of tuberculosis. Human Mycobacterium tuberculosis was isolated in only two patients from material obtained at transoral debridement. In two others the histopathology showed epithelioid cells, Langhans' giant cells and caseation but no acid-fast bacilli could be isolated. A fifth patient showed neither bacteriological nor histopathological proof. Diagnosis was based on the radiologically demonstrated presence of pulmonary tuberculosis, on the macroscopic nature of pus from a large retropharyngeal abscess, the involvement of four cervical vertebrae and the good response to antituberculous drugs.

The sixth patient had previously had tuberculous spondylitis and L2-3 anterior fusion. He also presented with erosions of three cervical vertebrae and responded to antituberculous drugs.

Treatment before operation. Antituberculous drugs were started in all patients once the disease had been diagnosed radiologically. Two patients received halo traction and atlanto-axial subluxation was reduced in one of them, one patient received head-halter traction for five weeks and the rest were treated by bed rest alone for one to six months.

Operative treatment. Operation was undertaken for anterior debridement of the diseased area in five patients, and for stability by atlanto-axial fusion in all patients (Fig. 3). Debridement was by the transoral route as described by Fang and Ong (1962).

In four patients all diseased bone, synovium and granulation tissue was excised and atlanto-axial subluxation reduced by an assistant exerting traction on the skull. Anterior fusion was then performed by the insertion of homologous iliac or rib grafts into oblique troughs across the lateral facet joints (Fig. 4).

A fifth patient underwent transoral drainage of a large tuberculous abscess without formal bone debridement. The disease had extended to C3 and C4 vertebral bodies and the transoral exposure was inadequate for radical excision. This patient underwent a standard posterior C1–2 fusion eight weeks later.

The sixth patient had posterior C1–3 fusion alone.
**After-care.** Three patients were given bed rest with sandbags guarding the head and one patient’s neck was extended over a shortened mattress. These patients were allowed up after three months and were then given a soft collar. The other two patients were nursed on a turning frame with halo traction for three months and then given a Minerva jacket or a collar for another two months.

Antituberculous drugs were given for at least nine months and for an average of 15 months. In one patient the bacilli were found to be primarily resistant to the standard drugs streptomycin, isoniazid and aminosalicylic acid. These were therefore replaced with ethambutol and cycloserine which controlled the infection.

**RESULTS**

Complications. Anterior bone grafts became displaced in two patients who were treated solely by bed rest after their operation. One of these grafts presented in the oropharynx at seven months and was removed. Reduction of atlanto-axial subluxation was partially lost in this patient.

Neurological status. Three patients with neurological symptoms were completely relieved of them immediately after transoral decompression. Before operation they had suffered from monoparesis, hemiparesis and tetraparesis. At the final follow-up all three were free from any focal neurological sign. (However, the one with tetraparesis had a history of epilepsy and was mentally subnormal). A fourth patient presenting with mild monoparesis deteriorated and three months after operation he was found to have triparesis involving an arm and both legs. There was a gradual recovery over the next nine months. This patient had undergone posterior C1–3 fusion alone after a prolonged course of halo traction.

Neck symptoms. Five patients had no complaints whatever but a slight torticollis was noticed in two of them.

The sixth patient, who had undergone posterior fusion only, complained of persistent neck pain and stiffness despite radiological evidence of disease healing and posterior fusion. The symptoms were probably accounted for by the unreduced anterior subluxation (Figs 5 to 7).

**Fusion rate.** Solid bony fusion was achieved in all cases. Anterior fusion was achieved at 8 to 17 weeks while the posterior fusions took 12 to 16 weeks. Fusion was maintained at the final follow-up in all cases.

Quality of life. Four patients resumed normal activities but a mentally subnormal child had to attend special school. A 51-year-old watchman could not return to work because of persistent neck pain and stiffness.

**DISCUSSION**

The spinal cord at the medullary cervical junction is threatened by tuberculosis in one of three ways: by atlanto-axial subluxation or upward translocation of the dens; by compression by a tuberculous abscess; and by direct tuberculous invasion. Tuberculous atlanto-axial subluxation should be treated urgently by skull traction; we recommend the halo device for its control of rotation and convenience of after-management. Traction alone may be sufficient in reducing an early subluxation but when adhesions have already formed reduction can only be achieved after excision of the disease focus together with overlying parts of the lateral atlantal masses. However, from our experience with transoral surgery in other conditions causing severe upper cervical myelopathy we caution against routine open reduction.

Besides compressing the cord a large retropharyngeal abscess may cause acute dysphagia and asphyxia. Treatment of a tuberculous abscess in this strategic area by drugs alone is hazardous even in the absence of myelopathy. Although transoral reduction of chronic
subluxations is a major surgical undertaking, transoral debridement, which gives access to the median and both lateral atlanto-axial joints, has proved to be a straightforward and safe procedure with low morbidity. Material obtained for biopsy will give valuable proof of disease which is important whenever the clinical diagnosis is in doubt.

One should aim at early healing and stability by fusion. Wang (1981) reported good results after transoral debridement and prolonged recumbence with the neck extended. We prefer anterior fusion at the time of surgical debridement. Alternatively one can perform posterior fusion at a second stage. Patients may be allowed to get up soon after the operation but in the case of transoral fusion external immobilisation in a halo jacket is necessary until radiological union has occurred.

REFERENCES