Spinal Tuberculosis

Introduction

Tuberculosis of the spine is one of the oldest demonstrated diseases of humankind. Evidences of spinal tuberculosis have been found in Egyptian mummies dating back to 3,400 BC. The descriptions in the Rigveda, Atharvaveda, and Charak Samhita are the oldest known texts in the world literature relating to this disease. Percival Pott presented the classic description of spinal tuberculosis in 1779. Since the advent of antituberculous drugs and improved public health measures, spinal tuberculosis has become rare in industrialised countries, although it is still a significant cause of diseases in developing countries. Tuberculous involvement of the spine has the potential for serious morbidity, including permanent neurologic deficits and severe deformity. Medical treatment alone, or combined medical and surgical strategies, can control the disease in most patients.

Pathology

The spinal tuberculosis is a result of haematogenous dissemination from a primary focus in the lungs or the lymph nodes. The central type of vertebral tuberculosis spreads along with Batson’s plexus of veins, while paravertebral infection spreads through the arteries. The anterior type of vertebral body tuberculosis results from the extension of the abscess beneath the anterior longitudinal ligament and periosteum. Lower thoracic and lumbar vertebrae are the most common sites of spinal tuberculosis followed by middle thoracic and cervical vertebrae. Two distinct patterns of spinal tuberculosis can be identified, the classic form, called spondylodiscitis, and an increasingly common atypical form characterised by spondylitis without disk involvement. The basic lesion is a combination of osteomyelitis and arthritis. The number of the vertebrae involved varies from a single vertebra to 14 vertebral segments, average being 3.8 vertebral segments. Typically, more than one vertebra is involved. The area usually affected is the anterior aspect of the vertebral body adjacent to the subchondral plate. In adults, disk disease is secondary to the spread of infection from the vertebral body. In children, because the disc is vascularised, it can be a primary site. Abscess formation is more common in children; granulation formation is more in adults. Progressive bone destruction leads to vertebral collapse and kyphosis which is commonest in the thoracic spine.

Demography

Skeletal tuberculosis accounts for 2% - 20% of all extrapulmonary cases in various studies and spinal tuberculosis is the most common form of skeletal involvement by tuberculosis (about half the cases of skeletal tuberculosis). The prevalence of spinal tuberculosis is likely to rise as the numbers of those infected with HIV rises in the population. Spinal tuberculosis is predominantly a disease of the young, the usual age of presentation being the first three decades of life, while reports from developed countries indicate a much older patient population.

Clinical features

Presentation depends upon the stage of the disease, site of the disease, and presence of complications such as neurologic deficit, abscesses, or sinus tracts. Constitutional symptoms such as weakness, loss of appetite and weight, evening rise of temperature, and night sweats generally occur before the symptoms related to the spine manifest. There may be evidences of associated extra-skeletal tuberculosis like cough, expectoration, lymphadenopathy, diarrhoea, and abdominal distension. Although both the thoracic and lumbar spinal segments are nearly equally affected, the thoracic spine is frequently reported as the most common site of involvement. Together, these comprise 80 – 90% of spinal tuberculosis sites. The remaining cases correspond to the cervical spine. Spine deformity (kyphosis) of some degree occurs in almost every patient. Back pain (spinal or radicular) is the earliest and most common symptom. This pain may worsen with activity. Relaxation of muscles during sleep permits movements which are very painful and wake-up the patient. As the infection progresses, pain increases, and paraspinal muscle spasm occurs. Muscle spasm dilates the normal spinal curves, and all spinal movements become restricted and painful. Physical examination of the spine reveals localised...
tenderness and paravertebral muscle spasm. A kyphotic deformity due to prominence of spinous process may be evident due to collapse and anterior wedging of vertebral bodies. Tuberculous necrotic material from the dorso-lumbar spine may lead to cold abscess in the rectus sheath and lower abdominal wall along the intercostal, ilioinguinal, and iliohypogastric nerves; in the thigh along the psoas sheath; in the back along the posterior spinal nerves; in the buttock along the superior gluteal nerve; in the Petit’s triangle along the flat muscles of abdominal wall, or, in the ischiorectal fossa along the internal pudendal nerve. Disease involving the upper cervical spine though less common, can cause dangerous and rapidly progressive symptoms. In the form of retropharyngeal abscesses, the abscess may track down the mediastinum to enter trachea, oesophagus, or pleura; may spread to sternomastoid muscle. Clumsiness in walking, and spontaneous twitching of muscles are early signs of neurological involvement which can progress to a single nerve palsy, to hemiplegia, or paraplegia with spasticity, sensory impairment, bladder/bowel involvement. Paraplegia is very rarely a presenting manifestation.

**Differential diagnosis**

- Actinomycosis
- Blastomycosis
- Brucellosis
- Candidiasis
- Cryptococcosis
- Histoplasmosis
- Metastatic cancer, unknown primary site
- Multiple Myeloma
- Nocardiosis
- Paracoccidioidomycosis
- Septicarthritis
- Spinal cord abscess, spinal tumours
- Hemivertebra, Calve’s disease, Scheuermann’s disease
- Syphilis, Hydatid disease
- Diagnostic Workup

**Skin test and haematological investigations**

These are in the form of CBC with ESR. Erythrocyte sedimentation rate may be markedly elevated. Mantoux demonstrates a positive finding in 84 – 95% of patients who are non-HIV-positive 1 to 3 months after infection. Co-existent infection by human immunodeficiency virus and other immune deficiency conditions can give a false negative skin test. The enzyme-linked immunosorbent assay (ELISA) has a reported sensitivity of 60 to 80 per cent. PCR though very sensitive is not readily available in different clinical settings.

**Imaging studies**

Plain radiographs: Plain radiographs are the first line of investigations in our country. Earliest radiological features are narrowing of the joint space and indistinct paradiscal margin of vertebral bodies. Gradually, the disc space narrows due to either atrophy or prolapse into the vertebral body of the disc tissue. The collection of tuberculous granulation tissue and necrotic material leads to formation of paravertebral abscess. In the region of thoracic spine it is visible on plain radiographs as a fusiform or globular radiodense shadow called the bird nest appearance. Long standing abscesses may produce concave erosions around the anterior margins of the vertebral bodies producing a scalloped appearance called the aneurysmal phenomenon. Wedging of vertebral bodies leads to a kyphotic deformity. Less commoner radiological presentations of spinal tuberculosis are central type, anterior type, and appendiceal type. Central disease presents as destruction, ballooning of vertebral bodies, and concentric collapse. Anterior type is more common in the paediatric dorsal spine and appears as erosion of anterior margin of vertebral bodies. Appendiceal disease is involvement of the posterior arches. CT scan examination and MR scanning are increasingly being used to diagnose various types of bony and soft tissue involvement and presence of associated abscess and granulation tissue.

**CT scanning and MRI**

For a radiolucent lesion to be seen on a plain radiograph, 30% of mineral loss must be there. CT and MRI detect lesions at an earlier stage. CT scanning provides much better bony detail of irregular lytic lesions, sclerosis, disc collapse, and disruption of bone circumference. Low-contrast resolution provides a better soft tissue assessment, particularly in epidural and paraspinal areas. CT is more effective for defining the shape and calcification of soft tissue abscesses. CT is useful in assessing bone destruction, but is less accurate in defining the epidural extension of the disease, and
therefore, its effect on neural structures.

MRI is the gold standard for evaluating disc space infection and osteomyelitis of the spine, and is most effective for demonstrating the extension of disease into soft tissues and the spread of tuberculous debris under the anterior and posterior longitudinal ligaments. MRI is most effective for demonstrating neural compression. MRI with contrast is helpful in differentiating from non-infectious causes and delineating the extent of disease. Serial MRI can be used to assess the response to treatment and regression of the disease.

Bone scan with Tc-99m is considered to be highly sensitive, but nonspecific. It may only aid to localise the site of active disease and to detect multilevel involvement. Patients with active disease have an increased uptake, whereas in avascular segments and abscesses it may show decreased uptake.

**Histopathology and microbiology**

Because of high prevalence, microbiological diagnosis is not mandatory to start chemotherapy in our country. However, a biopsy/aspiration may be needed in cases of doubtful clinicoradiological findings, lack of proper response to drug therapy, and suspicion of drug-resistant strains.

Biopsy: Bone tissue or abscess samples are obtained to stain for acid-fast bacilli (AFB), and isolate organisms for culture and sensitivity. These study findings may be positive in only about 50% of the cases. The method most widely used is CT-guided needle biopsy and/or aspiration. Percutaneous needle aspiration and/or biopsy is a newer method with comparable bacteriologic and histologic yields as for surgical biopsy. The tissue should be sent for culture, antibiotic sensitivity, and histopathology.

**Treatment**

General supportive measures include prolonged, complete bed rest, external bracing, nutritious diet, vitamins, calcium supplementation as required, care of bladder, bowels, good nursing care is very essential.

**Medical treatment**

Medical treatment is in the form of ATT. There is a lot of discordance among experts on the duration of anti-tuberculous treatment. Studies performed by the British Medical Research Council indicate that tuberculous spondylitis of the thoraco-lumbar spine should be treated with combination chemotherapy for 6 - 9 months. According to a 1994 US Centers for Disease Control and Prevention recommendation, this is the treatment of choice. However, British Medical Research Council studies did not include patients with multiple vertebral involvement (which is
commoner in our country), cervical lesions, or major neurologic involvement. WHO/RNTCP guidelines consider spinal tuberculosis with neurological deficit to be severe extrapulmonary (category 1) and should receive treatment for 6 months. In rare and exceptional cases of relapse or treatment failure, it should be given treatment according to category 2, i.e., for 9 months (should be supported by current tubercular activity by culture or histology). The currently recommended regime is four-drug therapy. These include isoniazid, rifampicin, pyrazinamide, and ethambutol. In children, ethambutol is replaced by streptomycin. In view of multiple vertebrae involvement, extensive disease, and often neurological involvement, most of the authorities in India prefer to give ATT for 18 months – HRZE 4 + HR14. Treatment protocol of HIV positive patients is same as of HIV negative. Patients with lower CD4 counts have poor prognosis.

Surgical treatment

Opinion varies regarding the operative indication for Pott’s spine. A large group of surgeons perform debridement and decompression in all cases, irrespective of neurological involvement. Others perform operative decompression only in those patients who do not respond to chemotherapy. Resources and experience are key factors in the decision to use a surgical approach. Indications for surgery are neurological deficit, spinal deformity with instability, severe or progressive kyphosis, retropulsed bone fragments in the canal, large abscess causing respiratory embarrassment, and no response to medical therapy. Post-operatively the patient is advised absolute bed rest for three months, and then gradually mobilised in a spinal brace. A lower threshold for surgery is recommended in case of cervical spine involvement as it is more commonly associated with higher incidence and severity of neurological deficits and abscess compression.

Prognosis

Poor prognostic factors include neurological deficit of more than one year duration, myelopathic changes in the cord, and increased pre-treatment kyphotic angle, poor compliance, drug resistance. Newer techniques such as sensory and motor evoked potentials are being studied as a prognostic marker of outcomes of Pott’s paraplegia. Current treatment modalities are highly effective and if not complicated by severe deformity or established neurologic deficit results, are usually good.

References

3. Pott P. Remarks on that kind of palsy of the lower limbs which is frequently found to accompany a curvature of the spine, and is supposed to be caused by it, together with its method of cure. Med Classics 1936-1937; 1: 281-97.

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Pentology of Cantrell

A 12-year-old boy born out of a non-consanguineous marriage was referred with history of dyspnoea, recurrent lower respiratory tract infections, and a reducible mass in the upper abdomen since birth. There was no family history of similar complaints or exposure to teratogenic substances. The pregnancy itself was uneventful.

Physical examination revealed a midline supra-umbilical abdominal wall defect extending almost up to the umbilicus, and also a midline defect of the sternum. The cardiac pulsations could be both visualised and felt very