Original Research Article

Spinal infections in adult Indian population: clinical study and management of various spectrums- An Institutional Experience

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Abstract

Background: Spinal infection (SI) by definition is an infectious disease affecting the vertebral body, the intervertebral disc, and/or adjacent paraspinal tissue.In this observational study, we describe patient distribution, etio-pathogenesis, clinical presentation of spinal infections in adults and their best possible management, that is conservative/ surgical along with follow up in a tertiary care hospital attached to a medical college in India. **Materials and Methods**: This study was carried out from July 2017 to March 2020 in the Neurosurgery department of a tertiary care hospital attached to a medical college in India. We enrolled 90 patients for our study. Outcome and complications assessments were carried out for all patients over a period of two years. **Results** Out of 90 cases 57(63.3%) were male & 33(36.6%)were female, 58(64.4%) were in the age group of 30-40yrs, 74(82.2%) were from lower socio economic status(as per modified Kuppuswamy scale). Location wise, 21 (23.3%) were in the cervical region, 18 (20%) in dorsal, 34 (37.7%) in dorsolumbar and 17(18.8%) in the lumbo sacral region. 56 (62.2%) patients underwent surgery, out of which 24 (26.6%) patients were diagnosed as tuberculosis on biopsy, 11 patients grew *staphylococcus aureus*,03 were positive for fungi, rest showed no growth/no organisms on microscopy. 34 patients were managed conservatively with CT guided biopsy and antibiotics /ATT. of the 90 patients, 16(17.77%) were lost to follow up, of the remaining 74, 17(18.88%) came in category (a) 23(25.5%) in category (b) and 34(37.77%) came in category (c).**Conclusion:** We conclude by saying that Tuberculosis remains the most common cause of spinal infection in India even now. Detailed workup helps to decide treatment strategy either Conservative and surgical.

Keywords : Spinal Infection, Tuberculosis, Spinal instability.

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Introduction

Spinal infection (SI) by definition is an infectious disease affecting the vertebral body, the intervertebral disc, and/or adjacent paraspinal tissue[1]. The infection can be caused by either a contiguous source (by trauma, surgery) or by dissemination by blood[2]. SI is seen in 2–7% of all musculoskeletal infections. Distribution is bimodal, one peak seen below 20 years and the other between 50 and 70 years of age[3,4]. Male/female ratio ranges between 2:1 and 5:1[5]. The incidence varies between 1:20,000 and 1:100,000 and mortality rates range between 2 and 20% in developed countries[6].Spinal infection includes three entities, that is discitis, spondylitis and spondylodiscitis. By definition discitis is infection of the intervertebral discs. Vertebral osteomyelitis or spondylitis is when the infection invades the endplate. When the infection involves both, its called spondylodiscitis[7], which is usually seen at the time of presentation. Pus can drain into the epidural space from the spondylodiscitis and lead to spinal epidural abscess.Etiology of SI include bacteria which causes pyogenic infections, granulomatous infections, caused by tuberculosis/fungi and parasitic infections[8].Contributing factors of SI include advanced age, immune status, co morbidities and spinal interventions, sometimes surgical interventions /procedures on pre-existing infections as discussed later and also socioeconomic status in our setup. Management of SI depends on the location of the infection (i.e intraspinal, intervertebral, paraspinal), and the neurological status, the progression of the disease, patient's general condition which includes age, co morbidities and performance status.Our study & review intends to offer a comprehensive overview and critical analysis of the literature on Spinal infections by prospective analysis with respect to epidemiology, co morbidity factors, symptomatology, causative infectious agents, diagnostic and therapeutic procedures, and outcome of treatment at our centre.

Material and Method

This study was carried out between July 2017 to March 2020 in the Neurosurgery department of a tertiary care hospital attached to a medical college in India, after obtaining ethical clearance from the institutional ethical committee. We included all adult patients (age more than 18 years) either previously diagnosed or newly diagnosed with SI, admitted our department of Neurosurgery during the study period. Exclusion criteria were paediatric spinal infection & recurrent cases. Any patients with suspicion of malignancy/ metastasis were also excluded. All patients signed informed consent and agreed to participate in this study.Written informed consent was obtained from all the patients.

Clinical Presentation

Pain and paraspinal stiffness were the most common presenting symptom, although pain is present in other spinal conditions as well, what we found in our series is the severity of paraspinal spasm, we found it to be quite severe among the spinal infections. Eliciting subtle neurological deficits can be quite a challenge among the patients with significant paraspinal spasm, gross deficits especially cauda equina signs and signs of myelopathy were elicitable.

Investigations

All patients underwent routine blood investigations including ESR,CRP, Xrays, blood sugar, LFT, RFT, viral marker. CT & MRI contrast study of spine was done in all cases. Follow up imaging was done after four weeks in all cases to look for response to treatment and among patients with TB again after three months before converting to maintenance phase and one week prior to stopping antibiotics in all patients of spinal infection. Chest Xrays, Sputum examination and Mantoux test was done in suspicious cases of tuberculosis. Diagnostic CT guided biopsy was done for those patients who were placed on conservative management and those who were unfit for surgery.

Management considerations

Conservative vs. surgical options were carefully chosen based on their clinico radiological assessment and the general condition and performance status of the patient. In cases of surgical intervention, the infected material was sent for gram staining, AFB, fungal & bacterial cultures and CBNAT as a routine. Based on these further management was planned accordingly.

Follow up

16 patients were lost to follow up, none were operated cases. All underwent CEMRI of the spine on 3, 6 and 12 months post stopping of medications. Simple follow up protocols were made based on the following factore:- (a) bed bound/incapacitated to the extent of requiring an attendant at all times, (b) ability to look after himself/herself but unable to resume work to earn a livelihood as before, (c) able to earn a livelihood with or without pain. In ladies who are a home maker, return to her previous household work is considered the best

result. We made these simple scores to help in follow up study of patients at a suburban centre who, most of the time are erratic in their follow up due to their various responsibilities/commitments at their home front.

Results

Out of 90 cases 57(63.3%) were male & 33(36.6%)were female, 58(64.4%) were in the age group of 30-40yrs, 74(82.2%) were from lower socio economic status(as per modified Kuppuswamy scale). Location wise, 21 (23.3%) were in the cervical region, 18 (20%) in dorsal, 34 (37.7%) in dorsolumbar and 17(18.8%) in the lumbo sacral region. 56 (62.2%) patients underwent surgery, out of which 24 (26.6%) patients were diagnosed as tuberculosis on biopsy, 11 patients grew *staphylococcus aureus*,03 were positive for fungi, rest showed no growth/no organisms on microscopy. We did not have any parasitic infections. No biopsy showed any evidence of malignancy/metastasis. We had 7 HIV positive,4 had AIDS, 4 post transplant on immunosuppressive drugs, the fungal infections were all among the AIDS patients and all were Candida albicans. 34 patients were managed conservatively with CT guided biopsy and antibiotics /ATT.Of the remaining 34 (37.7%) patients, 7(7.7%) patients were unfit for surgery due to poor general condition, rest underwent conservative management, among these 14 (15.5%) showed evidence of tuberculosis on CT guided biopsy, rest showed no growth. We had no confirmed cases of pyogenic/fungal/parasitic infections among the conservative management group.Patients who did not show any confirmed organisms on evaluation were empirically treated with ATT as per protocol followed at our institute. If there was no clinical or radiological improvement after 4 weeks of intensive therapy, a fresh CT guided biopsy was done; if again inconclusive an open biopsy was done. In our study however, none reached this stage. 3(3.33%) patients were positive for fungal, all were Candida albicans and all were in immunocompromised state. 17(18.88%) had pyogenic infection. Among these 7(7.77%) were post-op discitis. *Staphylococcus aureus* was the bacterial agent isolated in all the cases. Treatment of ATT was instituted in TB proven cases continued for 18 months. There were a total of 09(10%) fatalities. There were 5(5.55%) among the pyogenic infection group. 4(4.44%) deaths among the spinal TB group due to disseminated TB and organ dysfunction.16(17.7%) patients were lost to follow up and there were 10(11.11%) drug defaulters, these two aspects are a major impediment in the management of spinal infections especially tuberculosis. The only way ahead is to give a proper counselling and make the health care facility and the medications accessible. After one year follow up we had about 13(14.44%) patients who required continuation of ATT and who's imaging, although showed reduction in the lesions but did not show clearance of infection.Of the 24(26.6%) patients of TB spinal infection who underwent surgery we had 04(4.44%) patients who had wound issues in the form of surgical site infections and wound dehiscence. They were re-admitted and managed with daily dressing, which later healed; we had no instances of persistent sinuses or implant failure among our patients. This would be due to the fact that, all our operated patients were regular on follow up and there were no non compliance/drug defaulters in this group of patients.

Follow up

Of the 90 patients, 16(17.77%) were lost to follow up, of the remaining 74, 17(18.88%) came in category (a) 23(25.5%) in category (b) and 34(37.77%) came in category (c)

Surgical considerations

19(21.1%) patients underwent decompression and pus evacuation with biopsy. 37(41.11%) patients underwent stabilization/fusion procedures. ACDF was done in 8 cases, Posterior stabilization for dorsal and lumbar infections were carried out in 29(32.2%) cases.

Discussion

As mentioned earlier Spinal infection (SI) by definition is an infectious disease affecting the vertebral body, the intervertebral disc, and/or adjacent paraspinal tissue[1]. It can be caused by infection due to a contiguous source (trauma, surgery) or through haematogenous dissemination[2]. SI represents 2–7% of all musculoskeletal infections. There is a bimodal distribution in patients suffering from SI, one peak seen below 20 years and the other between 50 and 70 years of age[3,4]. Male/female ratio ranges between 2:1 and 5:1[5].The incidence varies between 1:20,000 and 1:100,000 and mortality rates range between 2 and 20% in developed countries[6].Etiology of SI include bacteria which causes pyogenic infections, granulomatous infections caused by tuberculosis/fungi and parasitic infections[8]. In our study, we did not have any parasitic infections.Mode of infecton of SI can be caused by hematogenous spread from a distant site, by dissemination from contiguous tissues or by direct external inoculation as in post-op discitis. In

adults, discitis is mostly comes from one of the neighbouring endplates,which are necrotized by a septic embolus, therefore the disc is infected secondarily[9].In infants, the disc is supplied by anastomoses of the intraosseous arteries and small vessels that penetrate the disc. Therefore, a septic embolus does not cause prior bone infarction, but leads to infection of the disc directly. Hematogenous spread is the most common route for vertebral osteomyelitis in children and adults. Any situation that results in circulation of microorganisms into the blood stream (bacteraemia) such as surgery or even benign events such as tooth brushing or intravenous access, can lead to hematogenous spondylodiscitis. Infection in the urinary tract, following genitourinary procedures, is the most common source of transient bacteraemia and subsequent spinal infection[10,11]. Other common sources for hematogenous spondylodiscitis include gastrointestinal infections, otitis media, oral cavity infections, infective endocarditis, skin and soft tissue infections, respiratory tract infections, and infected intravenous catheter sites. In 50% of cases, the primary source of infection is not identifiable[12].Secondary spinal infections due to direct inoculation can occur after spine surgery or minimally invasive spinal procedures such as chemonucleolysis or after penetrating trauma in the spinal area. Contiguous spread to the spine from an infection in an adjacent structure such as the aorta, oesophagus, or the bowel have been also reported[13].The same vascular pedicle bifurcates and supplies two adjacent vertebral end plates; these blood vessels near the disc-bone junction of the vertebral body supply the nucleus pulposus and inner annulus by diffusion[14]. Thus, in most cases infection involves two adjacent vertebral bodies and their intermediate disc. The end plates are the first to be infected, and then later infection spreads to the adjacent disc or to the vertebral body. Also the slow blood flow in these vessels, the absence of valves, and convoluted arterial and venous supply make vertebral column more susceptible to develop an infection in patients with bacteraemia. In children, as opposed to adults, the infection can spread more easily since the blood vessels in the end plates extend to supply the intervertebral discs as explained earlier[15].Among all pathogens, *Staphylococcus aureus* is the most common; it is responsible for 20% to 84% of all spinal infections. 5% to 20% of spinal infections are caused by Streptococci and Enterococci. Enterococci are common causes of urinary tract or gastrointestinal infections, especially in diabetic or immunosuppressed patients[16]. Salmonellosis is frequently seen in children with sickle-cell disease[17]. Although Pseudomonas aeruginosa is common in intravenous drug users, *Staphylococcus aureus* remains the most common microorganism in this group of patients as well[18]. In patients with implants, risk of *Staphylococcus* epidermidis infection is higher. Coagulase-negative Staphylococci such as *Staphylococcus* viridans can cause low-grade infections due to their lower virulence.The incidence of extrapulmonary TB is low at 3%, but there has been no significant reduction in incidence of extrapulmonary TB when compared to pulmonary TB[19]. Skeletal TB contributes to around 10% of extrapulmonary TB, and spinal TB has been the most common site of skeletal TB, accounting half of skeletal extrapulmonary TB. Dorsolumbar junction remains to be the most affected region of the spinal column followed by lumbar spine and then the cervical spine[20-22].Fungal infections of the spine are uncommon. They frequently occur in immunocompromised hosts and mean age of patients is 50 years[23,24]. The incidence of fungal infections has risen markedly in recent years. Factors contributing to this increase are; immuno-suppressive drugs, prolonged use of broad-spectrum antibiotics, wides pread use of indwelling catheters, and AIDS. Comorbidities like diabetes are also relevant. Once after reaching bloodstream it reaches the vertebral body by the subcondral vessels, where it adheres due to slow blood flow [25,26]. Fungal infections of the spine are mainly caused by Candidiasis and Aspergillosis [27]. Most common parasitic infection of the CNS is caused by Taenia solium, it's caused by ingestion of embryonated parasite eggs, the parasite traverses through the small bowel into the bloodstream to reach a various sites which include skeletal muscles, eyes, and neural structures. This affects 50 million people worldwide and carries a prevalence of 3%–6%. Intracranial involvement is more common with this pathology and spinal cysticercosis has an incidence of only 1.5%–3%.Spinal infection can be seen in 1%–6% of patients diagnosed with neurocysticercosis [28]. Other parasitic infections include Ecchinococcus granulosus, Schistosomiasis, Toxoplasmosis,Spinal infections often require long-term antibiotic /antifungal /anti parasitic therapy, irrespective of the fact that the patient is operated or on conservative management [29].Nonsurgical treatment should be considered first in patients with poor general condition/performance status and the morbidity and mortality rate of surgical intervention is high. Otherwise surgery is considered when any of the following situations are present.[29] Spinal instability caused by significant bone destruction.

Conclusion

Tuberculosis remains the most common cause of spinal infection in India even now and also shown in our study, nearly 2/3 case were positive for TB in this study. A MRI gives more information regarding the extent of infection; a CT scan can give good information regarding the status of the vertebra especially if surgery and fixation is planned. We followed simple procedures using ACDF/ Laminectomy for cervical spine TB and laminectomy only or along with posterior stabilization for dorsal, dorsolumbar and lumbar TB. Results were gratifying and satisfactory even with these simple procedures as seen during our follow up.We didn't find any reason for trying extensive anterior/anterolateral procedures for these cases. We had 16 patient who were lost to follow up and had 10 patients who had defaulted on the drugs, all of them from the tuberculosis group. In our country, Spinal infections has a devastating effect on the patient and his/her dependents or caregivers. It limits mobility, occurs among the active age groups, and adds to the social and economic burden on the patient and his/her next of kin since it affects mostly the lower socio economic status. Many default on the drugs either due to ignorance/lack of support to collect the drugs/non availability of drugs thereby adding to the burden. The fact that it requires long term treatment, non compliance is a major issue. Proper counseling of not only the patient but also the caregiver is of utmost importance.

Short comings of the study

This study assesses only two year follow up of patients, long term follow up is required to assess the functional outcome among both the conservative and the operated cases of all types of spinal infections. Also long term follow up is required to assess the operated group of patients as well.

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