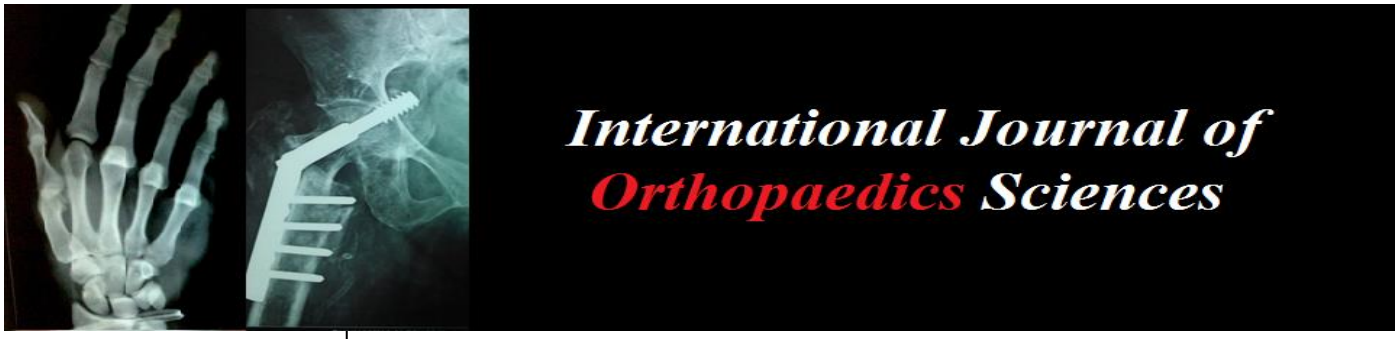


**E-ISSN:** 2395-1958
**P-ISSN:** 2706-6630
IJOS 2021; 7(1): 210-214

www.orthopaper.com
Received: 02-10-2020
Accepted: 05-12-2020

**Dr. Rohith Reddy Kasam**
Senior Resident, Department of Orthopaedics, Kakatiya Medical College, Warangal, Telangana, India

**Dr. Vemula Sandeep**
Orthopaedic Surgeon, Singareni area Hospital, Ramagundam, Telangana, India

**Dr. K Tarun Rao**
Orthopaedic Surgeon, Department of orthopedics, The Calcutta Medical Research Institute, Kolkata, West Bengal, India

**Dr. Dodda Prasad Reddy**
Assistant Professor, Department of Orthopaedics, MGM hospital, Warangal, Telangana, India

**Corresponding Author:**
**Dr. Rohith Reddy Kasam**
Senior Resident, Department of Orthopaedics, Kakatiya Medical College, Warangal, Telangana, India

# Brucellar, pyogenic and tubercular infections of spine: comparative study of haematological, radiological features and treatment outcome

**Dr. Rohith Reddy Kasam, Dr. Vemula Sandeep, Dr. K Tarun Rao and Dr. Dodda Prasad Reddy**

**DOI:** https://doi.org/10.22271/ortho.2021.v7.i1d.2480

**Abstract**
Spinal infections can also be described as pyogenic, granulomatous (tuberculous, brucella, fungal) and parasitic. Tubercular spondylodiscitis is the commonest. Although a wide range of organisms have been associated with spondylodiscitis, it remains primarily a monomicrobial bacterial infection. A detailed evaluation of clinical features- fever, back pain (Visual Analogue score), discharging sinus, swelling, deformity, neurological status (graded as per charting by Kumar and Tuli; ASIA scale (American Spinal Injury Association). In 7.6% of NTS and 9.1% of TS, the tissue specimen was obtained by closed vertebral biopsy and in 80.7% of NTS and 90.9% of TS by open biopsy at the time of surgery. The yield of culture of the biopsy specimen was 100% in PS and 21% In BS. AFB stain was positive in 32.1% and PCR was positive in 82.8% of TS. 119 (83.3%) patients were treated by anterior decompression, biopsy posterior spinal instrumentation and global fusion.13 (8.6%) patients were treated by debridement, abscess drainage +/-antibiotic bead application.

**Keywords:** Non-Tuberculous Infections of Spine, Spondylodiscitis, AFB Stain

## Introduction
In 1975 Ross and Fleming rightly pointed out "neither common enough to be readily recognizable, nor rare enough to be a medical curiosity, spinal infection represents a diagnostic challenge to the physician" [1]

Infectious Spondylodiscitis is destructive infection of spine or paraspinal structures. It encompasses vertebral osteomyelitis, spondylitis and discitis, which are considered different manifestations of the same pathological process [1, 2]

Although spondylodiscitis can be caused by many organisms, it can be broadly classified etiologically into

1. Tubercular spondylodiscitis (TS)
2. Pyogenic spondylodiscitis (PS)
3. Brucella spondylodiscitis (BS)

Spinal infections can also be described as pyogenic, granulomatous (tuberculous, brucella, fungal) and parasitic. Tubercular spondylodiscitis is the commonest. Although a wide range of organisms have been associated with spondylodiscitis, it remains primarily a monomicrobial bacterial infection [3, 4]

According to the origin of infection it can be endogenous or exogenous. Acute or Chronic as per the progress of the disease. Diagnosis is difficult and often delayed or missed due to the rarity of the disease and the high frequency of low back pain in the general population. Improvements in surgical and radiological techniques and the discovery of antimicrobial therapy have transformed the outlook for patients with this condition but morbidity remains same. Even though, classical features are described for Pott' s disease, they often mimic non-tubercular infections (NTS).

If not diagnosed early and treated appropriately, it can lead to irreversible complications and disability. Therefore, it is important to differentiate tubercular spondylodiscitis (TS) from other forms of infection for early diagnosis & proper management

## Methodology

**Study population:** One hundred and seventy three patients (173) who presented to this centre and had a diagnosis of spondylodiscitis.

**Study design:** Retrospective study

**Exclusion criteria**

- Patients who did not have a confirmed etiology
- Histopathologically proven malignant lesions.
- Patients with incomplete radiographic data
- Follow-up less than 2years were excluded from this study Of 173 patients, 15 patients with incomplete follow-up, incomplete radiographic data and 7 patients with inconclusive etiological diagnosis were also excluded. The remaining 151 patients formed the basis of the study
- A detailed evaluation of clinical features-fever, back pain (Visual Analogue score), discharging sinus, swelling, deformity, neurological status (graded as per charting by Kumar and Tuli; ASIA scale (American Spinal Injury Association).
- A detailed history of TB or TB contact, cattle stocking, previous surgeries (within 3 years), and associated co-morbidities was taken
- Local spine, Systemic and per abdominal examination was done to rule out other focus and cold abscess

All the patients were followed up for minimum two years. Postoperatively patients were immobilized in a polyethylene moulded body jacket with recumbency for 3 months. They were followed up at regular interval of 3 months, 6 months, 1 year 1 1/2years, 2 years and then at yearly intervals. At each follow up, the patients were evaluated as follows:

1. Clinical examination in terms of symptomatic improvement, general well-being and neurological status.
2. Hematological investigations involving liver function test and erythrocyte sedimentation rate.
3. Radiographs to determine the healing of the lesion (Sclerosis, bony fusion), deformity progression, implant failure if any and other complications. At 3 months follow up, the patients were mobilized

## Results

The mean (SD) number of involved vertebrae was 2.1 (0.8), significantly higher in TS (2.6 (1.2)) than in PS (2.1(0.8)) or BS (1.9 (0.5)) ($p<0.05$).Multilevel/multifocal involvement were involved in 16.1% patients of TS as compared to 5.7% of NTS

**Table 1:** Radiological evaluation

| | BS (%) | PS (%) | NTS (%) | TS (%) | P-Value |
|---|---|---|---|---|---|
| **Level** | **Lumbar (48)** | **Lumbar (41.6)** | **Lumbar (44.3)** | **Thoracic (41.4)** | **<0.05** |
| Lesion type (padadiscal) | 18(64.2) | 19(79.16) | 38(73.07) | 69(69.6) | >0.05 |
| Extent | 26(92.8) | 16(66.6) | 42(80.76)(SINGLE) | 10(10.1)(MULTI) | <0.05 |
| Paravertebral abscess | 10(35.71) | 16(66.6) | 26(50) | 83(85.7) | <0.05 |
| Prevertebral abscess | 10(35.71) | 17(70.8) | 27(51.9) | 84(83) | <0.05 |
| Epidural abscess | 9(32.14) | 17(70.8) | 22(42.3) | 76(78.6) | <0.05 |
| Psoas abscess | 3(10.7) | 7(23.5) | 10(19.2) | 25(25.2) | >0.05 |
| Abnormal disc signal | 2(7.1) | 16(66.6) | 18(34.6) | 12(12.1) | <0.05 |

Paravertebral signal abnormality was seen in 85.7/66.6/35.7% of TS /PS /BS respectively Epidural masses seen in 78.6/70.8/32.1% in TS /PS /BS respectively Psoas abscess was reported 25.2/23.5/10.7 of TS /PS /BS respectively, in our study Psoas abscess was seen in 25.2% of TS versus 19.2% of NTS ($p>0.05$) Lumbar spine was most commonly 48% and cervical spine least common in BS Lumbar spine was most commonly 41.6% and cervical spine was least commonly involved in PS and thoracic spine was most commonly 41.4%, cervical spine was least commonly affected by TS. Overall cervical spine was least commonly involved level seen in 6.6% patients Overall in 19.86%, evidence of disc involvement was present in one or more imaging. Significantly greater disc involvement was seen in NTS (34.6%) than TS (12.1%) Pedro Pons' sign, known as anterior superior end plate erosion, osteophyte formation (Parrot's beak appearance) is a characteristic radiologic finding of BS was Seen in 6/28(21.42%) of BS in our study.

Biopsy (open or closed) was performed in all the patients in this study and definitive histopathological diagnosis was obtained.

**Table 2:** Diagnosis and Management

| Diagnosis | BS (%) | PS (%) | NTS (%) | TS (%) |
|---|---|---|---|---|
| Blood Culture(Yeild) | 9(32) | 7(29.16) | 16(30.7) | 7(7.1) |
| Biopsy Culture/AFB For TS | 6(21) | 24(100) | 30(57.6) | 32(32.1) |
| Serology (Pcr, Bat) | 28(100) | 2(8.3) | 30(57.6) | 82(82.8) |
| Closed Vertebral Biopsy | 3(12.5) | 1(4.15) | 4(7.6) | 9(9.1) |
| **Management** | | | | |
| Decompression, Stabilisation & Fusion | 16(50) | 19(70.6) | 35(67.3) | 84(84.9) |
| Debridement/Abscess Drainge | 2(7.1) | 5(29.4) | 7(13.4) | 12(12.1) |
| Non-Op Management | 7(40) | 2(8.3) | 9(17.3) | 7(7.1) |

In 7.6% of NTS and 9.1% of TS, the tissue specimen was obtained by closed vertebral biopsy and in 80.7% of NTS and 90.9% of TS by open biopsy at the time of surgery.

The yield of culture of the biopsy specimen was 100% in PS and 21% In BS. AFB stain was positive in 32.1% and PCR was positive in 82.8% of TS.

119 (83.3%) patients were treated by anterior decompression, biopsy posterior spinal instrumentation and global fusion.

13(8.6%) patients were treated by debridement, abscess drainage +/-antibiotic bead application.

13.4% of NTS and 6.06% of TS were managed non operatively. In patients who did not consent for surgery, in patients who were not surgically fit and those who did not have an indication for surgery were managed non-operatively

Patients of TS (91%) needed surgery more frequently than those with other etiologies.

Healing of the disease was assessed by clinical, hematological and radiological parameters at regular follow up

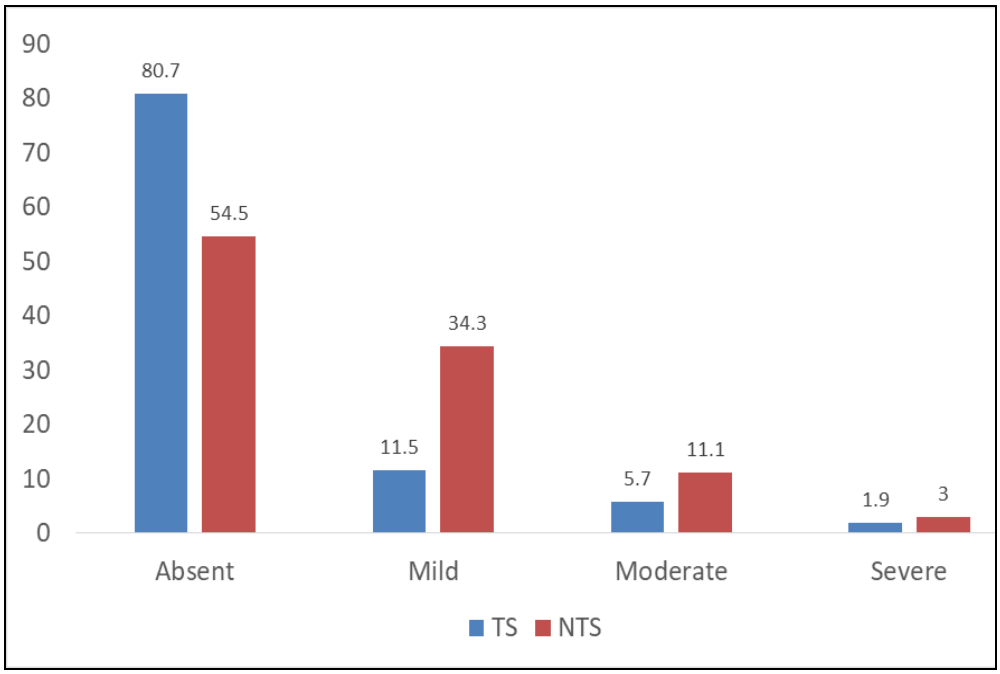


**Fig 1:** VAS scores at 3 months follow up

Visual Analogue Scale (VAS) used to assess the pain relief at regular intervals showed good pain relief in 80.7% of NTS and 54.5% of TS patients at 3 months follow up

Mean ESR was 55.24 at presentation, which was reduced to 45.53 with about 18% decline with 3 months of intensive drug therapy.

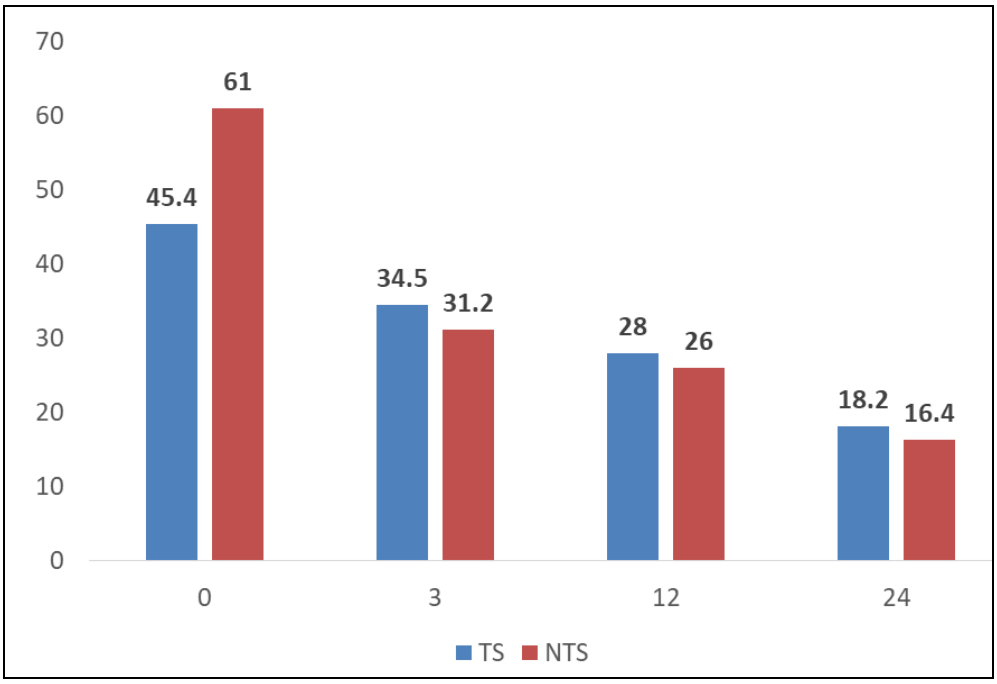


**Fig 2:** Follow up trend of mean ESR values

Though mean initial ESR was higher in NTS(61) group than TS (45.4),we have noted a rapid fall in mean ESR at 3 months in NTS(31.2) than in TS(34.5) (25% decline in NTS verses 18% decline in TS) Radiographs were evaluated at regular follow up.

The gold standard evidence for healing of the disease is sclerosis and bony fusion" of affected vertebral bodies.

In our study sclerosis was noted around 3 months and inter body fusion was peaked in 82.69% of NTS and 59.9% of TS at around 9 months

**Table 3:** Follow up clinical, laboratory and radiological parameters

| Follow UP | NTS | TS | p-value |
|---|---|---|---|
| Clinical (VAS Score) 3 months | 42/52 (80.70%) | 54/99 (54.5%) | <0.05 |
| Laboratory(ESR) 3 months | 38/52 (73.07%) | 47/99 (47.4%) | <0.05 |
| Radiological (Interbody fusion) 9 months | 43/52 (82.69%) | 59/99 (59.59%) | <0.05 |

Also radiological healing lagged behind clinical and laboratory healing (ESR) in our study

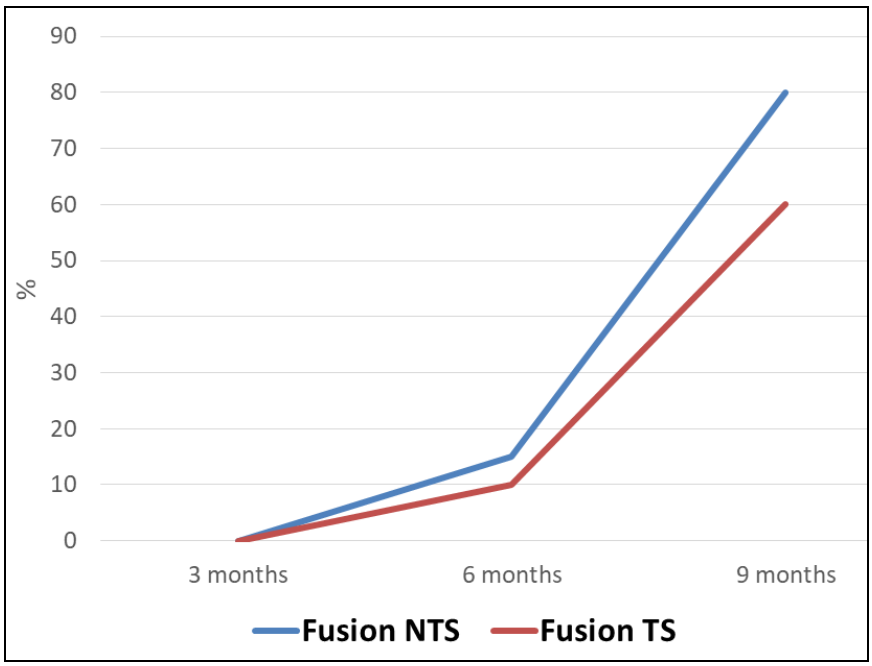


**Fig 3:** Line diagram showing inter body fusion in NTS and TS

**Table 4:** Treatment outcomes

| Outcome | BS-N (%) | PS-N (%) | NTS-N (%) | TS-N (%) | P-Value |
|---|---|---|---|---|---|
| Therapeutic Failure | 3.6 | 8.2 | 11.8 | 12.1 | >0.05 |
| Relapse | 7.1 | 4.1 | 11.2 | 16.1 | >0.05 |
| Functional Sequelae | - | 4.1 | 4.1 | 6.06 | >0.05 |

No significant differences in the treatment outcomes and function sequelae or relapses were seen between TS and NTS.

## Discussion

The mean (SD) number of involved vertebrae was 2.1 (0.8), significantly higher in TS (2.6 (1.2)) than in PS (2.1(0.8)) or BS (1.9 (0.5)) ($p$<0.05).The presence of paravertebral, epidural, psoas abscess was significantly more in TS Than NTS. Incidence of multilevel noncontiguous vertebral tuberculosis is generally reported to be between 1.1-16% which is found to10.1% of TS in our study.

Abscess formation has been reported in 7.1% patients with BS in the study by Gulnur Taşcı [5], much higher frequency of 35.7% was seen in our study. Psoas abscess was reported in 5.7%-9% of cases of BS in various series, seen in 10.7% patients of our study. We noted that, though lumbar spine involvement was seen more in NTS, presence of psoas abscess was frequently seen with TS, probably owing to its more destructive nature.

It has been reported in the literature that BS can be diagnosed without resorting to invasive diagnostic methods [6]. The sensitivity of blood culture in the diagnosis of brucellosis ranges between 17% - 85% and it decreases as the disease prolongs. In our study it was only 32%, which can be attributed to the fact that there were cases of chronic brucellosis and few patients received prior antibiotic therapy before presentation. Serological tests (BAT), may be negative in 1%–2% cases of brucellosis, however serology (SAT) was positive in all cases of BS in our study.

Yield of blood culture in PS was 29.16%, with *Staphylococcus* aureus being the most common causative organism of PS in our study which is consistent with all other studies. Spondylodiscitis is usually monomicrobial, but in our study it was polymicrobial in 8.1% of cases of PS.

Nested PCR for *Mycobacterium* used in this study has a high sensitivity of 88.5%. AFB staining was positive in 21% patients and PCR in 82% in our study where as it was 12% and 98% respectively in study done by Jain *et al*. Since osteoarticular tb is paucibacillary, it is difficult to isolate the organism.

The etiology of spondylodiscitis is difficult to determine, and vertebral specimens obtained through percutaneous biopsy or a surgical procedure have been reported to help in determining the causative agent in 30-70% of the patients. All the patients had a histopathological evidence in our study. Tissue was obtained by closed vertebral biopsy in 11 patients, and rest open biopsy at the time of surgery [7].

Unsuspected malignancy in proven or presumed cases of spondylodiscitis and vice versa is not uncommon. This emphasizes the need for both histological and microbiological analyses of biopsy samples

Surgical management was done in 11% of patients in study by Nisha jose *et al.* [8]. In our study surgery was required in 84% of patients. As ours being a tertiary care centre, most patients referred here were with high grade spondylodiscitis and complications. TS needed surgery more frequently than those with other etiologies. An only conservative treatment was an option for a low-grade spondylodiscitis and in patients who did not consent for surgery and who were not surgically fit.

Complications like pleural tear, worsening of neurological deficits, secondary infections, implant loosening, drug induced complications, relapse, etc. were seen overall 16.55% with no significant difference between TS and NTS patients. Immediate post-op period was relatively uneventful in TS

The Gold standard evidence for healing of the disease is sclerosis and ”bony fusion” of affected vertebral bodies[2].We noted that Radiological signs of healing lag behind clinical improvement, and abnormalities can persist post successful completion of treatment. Spondylodiscitis associated with an in-hospital mortality rate of about 5% in literature, and none reported in our study.

Lerner *et al*. [9] found that the rate of recurrence has been reported as lying between 0% and 7%. We did not find any significant differences in the treatment outcomes and function sequelae or relapse rates between TS and NTS, though patients of NTS had faster recovery, shorter disease course and fewer complications [10].

## Conclusion

Immediate post-op period was uneventful in TS when compared to NTS. In patients hailing from Brucella endemic areas, Brucella spondylodiscitis must be proactively looked for, as it has a favorable prognosis.

## References


1. Theodore Gouliouris, Sani H Aliyu, Nicholas M. Brown Spondylodiscitis: update on diagnosis and management J Antimicrob Chemother 2010;65(3):iii11-24
2. Tuli Sm. Tuberculosis of the Skeletal System (Bones, Joints, Spine, and Bursal Sheaths). jaypee brother’s medical publishers (p) ltd. 2010, 4th ed
3. Kulowski J. Pyogenic osteomyelitis of the spine: an analysis and discussion of 102 cases. J Bone Joint Surg Am 1936;18:343-64.
4. Colmenero JD, Jimenez-Mejias ME, Sanchez-Lora FJ *et al*. Pyogenic, tuberculous, and brucellar vertebral osteomyelitis: a descriptive and comparative study of 219 cases. Ann Rheum Dis 1997;56:709-15
5. Garron E, Viehweger E, Launay F *et al*. Nontuberculous spondylodiscitis in children. J Pediatr Orthop 2002;22:321-8.
6. Mylona E, Samarkos M, Kakalou E *et al*. Pyogenic vertebral osteomyelitis: a systematic review of clinical characteristics. Semin Arthritis Rheum 2009;39:10-7
7. Hadjipavlou AG, Mader JT, Necessary JT *et al*. Hematogenous pyogenic spinal infections and their surgical management. Spine (Phila Pa 1976) 2000;25:1668-79.
8. Nisha Jose, Ravikar Ralph *et al*. Infective spondylodiscitis –an Indian perspective. IJAR 2016;6:8.
9. Thomas Lerner *et al*. Anterior column Reconstruction using titanium ring cages in severe vertebral osteomyelitis. European journal of Trauma June 2006;32(3):227-237.
10. Frangen TM *et al*. Surgical management of spondylodiscitis. An analysis of 78 cases. Unfallchirurg. 2006;109(9):743-53.