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Role of Mr Imaging in Differentiating Tuberculous Spondylodiscitis from Non-Tuberculous Spondylodiscitis with Ct Guided Biopsy as a Gold Standard

Dr.R.Rajakumaran, Dr.V.Nirmala , Dr.Athul.D

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I. INTRODUCTION

Spondylodiscitis is the infection affecting intervertebral disc and the adjacent vertebral bodies. Osteomyelitis of the spinal column is the infection primarily affecting the vertebral bodies with secondary involvement of intervertebral disc. At the time of diagnosis, inflammatory changes are evident in both vertebral bodies and the intervertebral discs.So, osteomyelitis of spine and spondylodiscitis both terms are used interchangeably.[1]

Spondylodiscitis can be caused by a variety of microorganisms like bacteria, fungi and parasites. Thecommonest cause of spinal infection is Mycobacterium tuberculosis.More than half of the non-tuberculous spondylodiscitis is caused by Staphylococcus aureus.

Computed tomography (CT) is useful in delineating the bony abnormalities such as early endplate destruction, sequestra or involucra formation,and pathological calcification. Also,CT is used for a radiological guidance of spinal biopsy. But CT lacks the soft tissue contrast in the imaging of spondylodiscitis.

Compared to CT, MRI is superior in detection of lesions at the early stages, assessment of the whole lengthof the spinal column and provides better soft tissue resolution in the detection of spread of the inflammation to the paravertebral orspinal space

With the early diagnosis, morbidity and mortality of the disease can be reduced by appropriate management. Hence differentiating tuberculous spondylodiscitis from non-tuberculous spondylodiscitis is mandatory for the better outcome of the patient.The objective of our study is to differentiate tuberculous spondylodiscitis from non-tuberculous spondylodiscitis in MR imaging with CT guided biopsy as a gold standard.

II. MATERIALS AND METHODS

This is a prospective cohort study done between August 2018 – May 2019, for a period of 10 months with 55 patients. Study population included Patients of both sexes attending the outpatient department and those admitted in the wards in Government Kilpauk medical college and Government Royapettah hospital, Chennai.

Patients with clinical and MR imaging findings suggestive of spondylodiscitis and patients who have been subjected to CT guided biopsy for suspected spondylodiscitis were included in our study population.

Pregnant patients, Patients with skin infection at Biopsy site, Patients who were already biopsy proven case / Treated for the same, Patients with abnormal coagulation Indices and Patients who refuse to participate in the study were excluded from our study.

Data collection was performed in the included study group using a standard questionnaire/ proforma that includes the basic patient details such as name, age, sex, address, education status, occupation, previous history of Tuberculosis, duration of the illness and history of previous Antitubercular therapy.

All the included cases were subjected to MR imaging and Ct guided biopsy after obtaining written consent. After the initial history taking and clinical examination, the patients were subjected to Magnetic resonance imaging.

MRI was done using SIEMENS Healthcare, 1.5 Tesla machine. T1 & T2 Weighted Turbo spin echo sequence in Sagittal plane.T2 Weighted Turbo spin echo sequence in axial plane.T2 TIRM sequence in Sagittal and coronal planes.T2Weighted HASTE sequence for myelography in sagittal and coronal planes.

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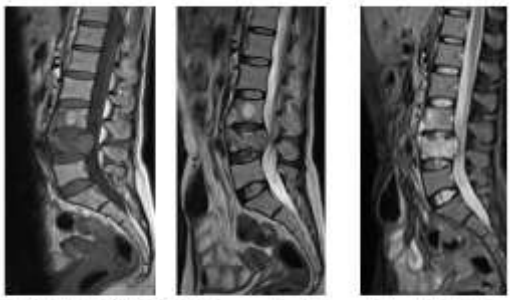
CASE NO 1

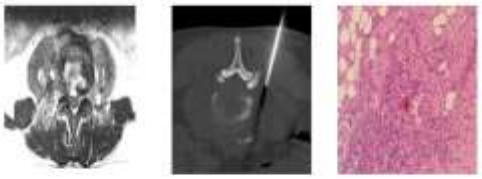


Sagittal T1W, T2W AND STIR images show Collapse of L4 vertebral body and hyperintensity in L4 and L5 levels with paravertebral soft tissue and collection with significant epidural component causing compression of spinal canal.

Axial MIP and VR image shows CT guided biopsy of the paravertebral infiltration at the level of L4 vertebra and pus was aspirated. The histology revealed the caseous granuloma and in CBNAAT MTB was detected.

CASE NO 2

Sagittal T1W, T2W AND Coronal STIR images show destruction of L3 & L4 vertebral bodies and altered signal intensity in L3-L4 intervertebral disc, paravertebral & bilateral psoas collection.



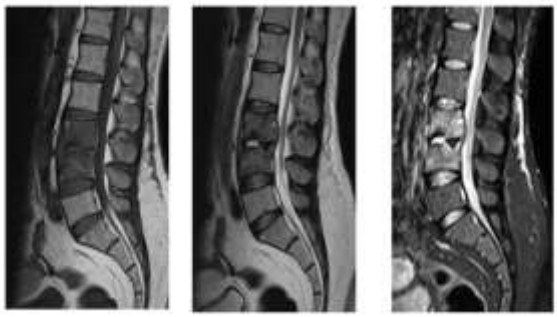
Axial T2W image shows bilateral psoas collection in the same patient. Axial MIP image shows CT guided biopsy of the paravertebral infiltration at the level of L3 vertebra and pus was aspirated. Histopathological examination shows the non specific inflammatory cells and culture was positive for Staphylococcus aureus growth.

CASE NO 3

Sagittal T1W, T2W AND STIR images show Destruction of D6 & D7 vertebral bodies with obliteration of D6-D7 intervertebral disc space, collection in paravertebral & epidural with subligamentous spread and spinal canal narrowing.

Axial MIP and VR image shows CT guided biopsy of the paravertebral infiltration at the level of D6 vertebra and pus was aspirated. Histopathological examination shows the caseous granuloma and in CBNAAT, MTB was detected.

CASE NO 4



Sagittal T1W, T2W AND STIR images show altered signal intensity in the L3 & L4 vertebral bodies and L3-L4 intervertebral disc with relative sparing of intervertebral disc. Minimal paravertebral soft tissue component and subligamentous spread are seen.

Axial T2W image shows right psoas collection in the same patient. Axial MIP image shows CT guided biopsy of the paravertebral infiltration at the level of L3 vertebra and pus was aspirated. Histopathological examination shows the non specific inflammatory cells and culture was positive for Staphylococcus aureus growth.

III. STATISTICAL ANALYSIS & RESULTS

Among the 55 patients 27 patients had non tuberculous spondylodiscitis and 28 had tuberculous spondylodiscitis. All the 28

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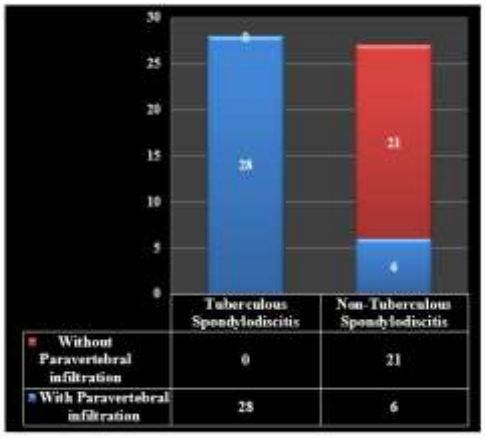
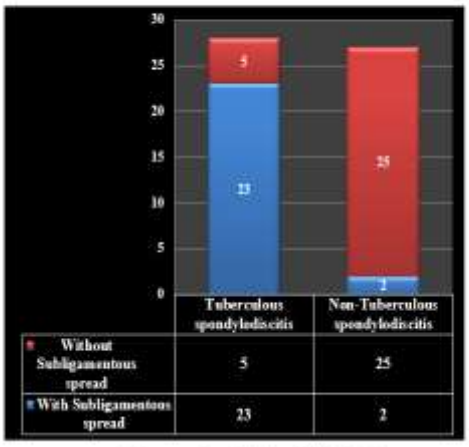
tuberculous patients had paravertebral infiltration where as only 6/27 patients with non-tubercular spondylodiscitis had paravertebral infiltration. (figure 5). Chi square value = 28.947 and the P=0.000. There is statistical significance exists between Tuberculous spondylodiscitis and with paravertebral infiltration. 23/28 tuberculous patients showed subligamentous spread of infection where as on 2/27 non-tubercular patients had subligamentous spread. [Chi square value = 30.965 and the P=0.000 with a statistically significant correlation] (fig 6). 18/28 patients with tuberculosis had intervertebral disc involvement and 20/27 patients with no-tuberculous spondylodiscitis had disc involvement. [Chi square value = 0.617 and the P=0.432, There is no statistical significance exists between Tuberculous spondylodiscitis and with intervertebral disc involvement] (Figure 7). Only 10/28 patients with tuberculous spondylodiscitis had epidural involvement and 8/27 patients with non-tuberculous spondylodiscitis had epidural involvement [Chi square value = 0.231 and the P=0.63, There is no statistical significance exists between Tuberculous spondylodiscitis and with epidural involvement.] (Figure 8). All 28 patients with tuberculous spondylodiscitis had paravertebral abscess whereas only 8/27 patients with non-tuberculous spondylodiscitis had paravertebral abscess. [Chi square value = 30.103 and the P=0.000, There is statistical significance exists between Tuberculous spondylodiscitis and with paravertebral abscess]

Figure 5: PARAVERTEBRAL INFILTRATION in patients with Tuberculous and Non-Tuberculous spondylodiscitis



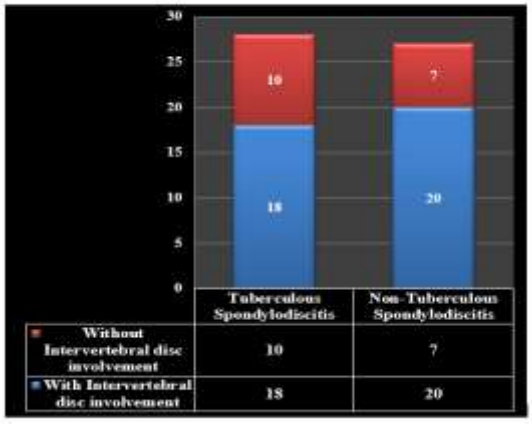
Chi square value = 28.947 and the P=0.000

Figure 6: SUBLIGAMENTOUS SPREAD in patients with Tuberculous and Non-Tuberculous spondylodiscitis



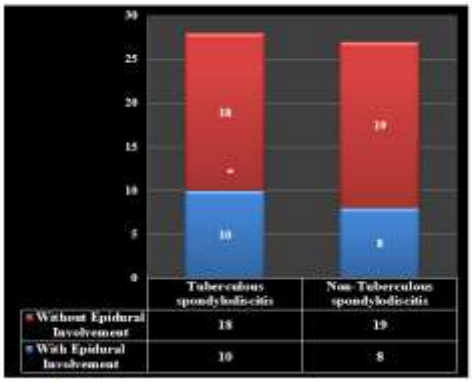
Chi square value = 30.965 and the P=0.000

Figure 7: INTERVERTEBRAL DISC INVOLVEMENT in patients with Tuberculous and Non-Tuberculous spondylodiscitis



Chi square value = 0.617 and the P=0.432

Figure 8: EPIDURAL INVOLVEMENT in patients with Tuberculous and Non-Tuberculous spondylodiscitis



Chi square value = 0.231 and the P=0.631

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Table 1: BINARY LOGISTIC REGRESSION- Classification Table

OBSERVED	PREDICTED	
	Granuloma in HPE	Other than Granuloma in HPE
Granuloma in HPE	22	3.6099 to 185.3483
Other than Granuloma in HPE	2	1.9097 to 246.5392

Table 2: BINARY LOGISTIC REGRESSION- Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)-odds
PARAVERTEBRAL INFILTRATION	3.221	1.216	7.02	1	0.008	25.042
SUBLIGAMENTOUS SPREAD	3.031	0.987	9.423	1	0.002	20.709
Constant	-3.464	1.136	9.302	1	0.002	0.002

LOG IT = -3.464+3.221(PARAVERTEBRAL INFILTRATION)

+3.031(SUBLIGAMENTOUS SPREAD)

IV. DISCUSSION

In our study, the mean age of the study population is **48.67 years**, ranging from 17 years to 81years.Among **55** patientswith spondylodiscitis, causative agents were identified in **49** patients. Out of which, **27** patients were infected by tuberculosis,**18** patients had pyogenic spondylodiscitis caused by Staphylococcus aureus, **two** patient had Escherichia coli growth, one patient had Streptococci viridansand **one** patient had Enterobacter cloacae in routine culture.In our study among **55** spondylodiscitis patients, **34** patients had paravertebral infiltration. In tuberculous spondylodiscitis, out of **28** patients, all patients had paravertebral infiltration. In **27** cases of non-tuberculous spondylodiscitis, 6 patients had paravertebral infiltration. Thus, paravertebral infiltration has sensitivity of **100%** and specificity of **77.8%** in detection of tuberculous spondylodiscitis and diagnostic accuracy of

89.1%. In our study among **55** spondylodiscitis patients, **25** patients had subligamentous spread. In tuberculous spondylodiscitis, out of **28** patients, **23** patients had subligamentous spread. In **27** cases of non-tuberculous spondylodiscitis, **2** patients had subligamentous spread. Thus,subligamentous spread has sensitivity of **82.1%**and specificity of **92.5 %**in detection of tuberculous spondylodiscitis and diagnostic accuracy of **87.2%.** A study by **Stäbler& Reiser** showed that the pyogenic and tuberculous spondylodiscitis are differentiated by the presence of paravertebral and epidural abscess.A study by **Friedman and Hills**, showedthat cervical spine infection is more commonly associated with epidural abscess formation. In our study among **55** spondylodiscitis patients, **38** patients had intervertebral disc involvement. In tuberculous spondylodiscitis, out of **28** patients, **18** patients had intervertebral disc involvement. In **27** cases of non-tuberculous spondylodiscitis, **10** patients had intervertebral disc involvement. Thus,subligamentous spread has sensitivity of **64.3%** and specificity of **25.9 %**in detection of tuberculous spondylodiscitis and diagnostic accuracy of **45.5 %.**Among **55** spondylodiscitis patients, **18** patients had epidural involvement. In tuberculous spondylodiscitis, out of **28** patients, **10** patients had epidural involvement. In **27** cases of non-tuberculous spondylodiscitis, **8** patients had epidural involvement. Thus,epidural involvement has sensitivity of **35.71%**and specificity of **70.37 %** in detection of tuberculous spondylodiscitis and diagnostic accuracy of **52.73%.** In our study, intervertebral discs were involved in **38** cases of spondylodiscitis, out of which only 18 were tuberculous spondylodiscitis. This reflects the characteristic relative sparing of intervertebral disc in tuberculous spondylodiscitis. This was supported by a study by **Ledermann et al.**In our study paravertebral abscess was seen in 36 patients, out of which 28 cases were tuberculous spondylodiscitis. This was supported by the study by **Frel et al**, which indicates that paravertebral abscess were highly associated with tuberculous spondylodiscitis.**Na-Young Jung et al**., showed the higher association of tuberculous spondylodiscitis with several vertebral body'sinvolvement.

V. CONCLUSION

MR imaging is the diagnostic procedure of choice for evaluating the patients with suspected spondylodiscitis.

MRI features of paravertebral infiltration, paravertebral abscess formation and subligamentous spread aids in differentiating tuberculous spondylodiscitis from non-tuberculous spondylodiscitis.

CT guided biopsy in suspected spondylodiscitis is an accurate method for the pathogen detection with high degree of accuracy.

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