

Pathological Study of Percutaneous Image Guided Biopsy of Vertebral and Paravertebral Lesions; Our Experience

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How to cite this article:

Chaitra B, Inuganti Venkata Renuka, Kasula Lakshmi, et. al. Pathological Study of Percutaneous Image Guided Biopsy of Vertebral and Paravertebral Lesions; Our Experience. Indian J Forensic Med Pathol. 2020;13(3):425-431.

Abstract

Background: The presence of a spinal lesion whether symptomatic or not, presents a diagnostic challenge and is always a cause for concern. In Indian population common spinal pathologies include tuberculosis and malignancy. We aim to study the spectrum of vertebral and paravertebral lesions, analyse with regard to age, sex, site, pathological diagnosis and evaluate diagnostic utility of percutaneous image guided biopsy.

Methods: This was an Institutional Ethics Board approved retrospective study conducted in the Department of Pathology on vertebral and paravertebral biopsy specimens received from January 2014 to September 2019.

Results: A total of 152 cases of vertebral and paravertebral lesions were reviewed with age range of 2-80 years and majority of 42 cases among 61-70 years age group. Male predominance with male to female ratio of 1.62:1 was noted. Out of 152 cases, a majority of 62 cases were in lumbar region followed by 59 cases in thoracic region. Paravertebral involvement was noted in 24 cases. Among the 152 cases, 55 cases (36.2%) were non-neoplastic lesions, 84 cases (55.3%) were neoplastic. Among neoplastic lesions secondary deposits (60%) were common followed by primary malignancy (27%) and benign tumours (13%). Most common among, metastasis was Adenocarcinoma; primary malignancy was multiple myeloma; and benign tumour was schwannoma. Tuberculosis was seen in 17 cases and majority involving the thoracic segments.

Conclusion: CT guided biopsy is a valuable tool for evaluation of vertebral and paravertebral lesions. Metastatic lesions were common followed by multiple myeloma and schwannoma. Tuberculosis was second common among non neoplastic lesions.

Keywords: Image guided biopsy; Vertebral lesions.

Introduction

Vertebral region has a diversity of anatomic structures which challenges both the clinicians and pathologists with a heterogeneous array of

pathologic lesions. Vertebral lesions pertain to tissues of the spine and epidural space which includes vertebrae, meninges, spinal nerve roots and spinal cord.¹ The presence of a spinal lesion whether symptomatic or not, presents a diagnostic challenge and is always a cause for concern.²

In Indian population common spinal pathologies include tuberculosis and malignancy. While clinico-radiological diagnosis was considered to be sufficient to start anti-tubercular treatment in earlier days, with modern era of evidence based medicine, it is essential to establish the diagnosis by biopsy.³

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In the process of diagnosing a neoplastic lesion, or excluding a probable malignancy, the most important step is performing a biopsy which can provide an accurate diagnosis. Open biopsy, the traditional and gold standard method that gathers sufficient material for histological and immunohistochemical studies in musculoskeletal system lesions, is considered difficult procedure due to the risk of high complications.⁴ Recently percutaneous image guided needle biopsy is more popular as an alternative to open biopsy, as this is a less invasive procedure and proved to have higher accuracy rate.⁴

In the present study, we aim to study the spectrum of vertebral and paravertebral lesions, analyse with regard to age, sex, site, pathological diagnosis and evaluate diagnostic utility of percutaneous image guided biopsy of these lesions.

Materials and Methods

This was an Institutional Ethics Board approved retrospective study conducted in the Department of Pathology on vertebral and paravertebral biopsy specimens received from January 2014 to September 2019, in Department of Pathology, NRI

Medical College, Chinakakani, Guntur, Andhra Pradesh, India.

All vertebral and paravertebral lesions diagnosed on percutaneous image guided needle biopsies were included in the study. Biopsies with inconclusive diagnosis on histopathological evaluation were noted to calculate diagnostic accuracy of the procedure. Excision biopsies were excluded from the study.

Age, sex, site and histopathological diagnosis were retrieved from the records. These parameters were compared with the available data in the literature.

Frequency of various conditions leading to vertebral and paravertebral pathology were expressed in percentage and tabulated in relation to age, sex, and site.

Results

A total of 152 cases of vertebral and paravertebral lesions were reviewed. The age ranged from 2–80 years with a maximum number of 42 cases among 61–70 years age group. Male predominance was noted with male to female ratio of 1.62:1.

Table 1: Distribution of site involved in relation to histopathological diagnosis:

Pathology (n)	Cervical	Thoracic	Lumbar	Sacral
Non neoplastic				
1. Non Specific inflammation (27)	2	9	16	-
2. Tuberculosis (17)	2	11	4	-
3. Degenerative lesions (11)	0	4	7	-
Neoplastic				
1. Primary (34)	5	15	4	10
2. Secondary (50)	6	17	22	5
Myelofibrosis (4)	0	0	4	0
Inconclusive (9)	0	3	5	1
Total (152)	15	59	62	16

Table 2: Frequency and Sex distribution of Vertebral and Paravertebral Lesions:

Histopathological Diagnosis	Number (%)	Male	Female
A. Non Neoplastic	55 (36.2)	31	24
1. Acute/Chronic Non Specific inflammation	27 (17.8)	19	8
2. Tuberculosis	17 (11.2)	4	13
3. Degenerative lesions	11 (7.2)	8	3
B. Neoplastic	84 (55.3)	56	28
<i>I. Primary Benign Lesions:</i>			
	11 (7.2)	6	5
1. Schwannoma	4 (2.6)	3	1
2. Meningioma	3 (1.9)	1	2
3. Hemangioma	2 (1.3)	1	1
4. Neurofibroma	1 (0.7)	1	-
5. Osteoblastoma	1 (0.7)	-	1
<i>II. Primary Malignant lesions:</i>			
	23 (15.1)	18	5

Histopathological Diagnosis	Number (%)	Male	Female
1. Myeloma	14 (9.2)	12	2
2. PNET/ Ewings	4 (2.6)	2	2
3. Chordoma	3 (1.9)	2	1
4. Osteosarcoma	1 (0.7)	1	-
5. Chondrosarcoma	1 (0.7)	1	-
III. Secondary Deposits	50 (32.9)	32	18
1. Non Mucin secreting Adenocarcinoma	22 (14.5)	15	7
2. Poorly Differentiated carcinoma	8 (5.3)	6	2
3. Non Hodgkin Lymphoma	6 (3.9)	5	1
4. Mucin secreting Adenocarcinoma	4 (2.6)	1	3
5. Follicular thyroid carcinoma	3 (1.9)	1	2
6. Clear Cell Renal Cell Carcinoma	2 (1.3)	2	-
7. Squamous cell carcinoma	2 (1.3)	1	1
8. Ductal carcinoma (Breast)	1 (0.7)	-	1
9. Anaplastic carcinoma	1 (0.7)	-	1
10. Adenosquamous carcinoma	1 (0.7)	1	-
C. Myelofibrosis	4 (2.6)	4	0
D. Inconclusive	9 (5.9)	3	6
Total	152	94	58

Table 3: Age distribution in relation to histopathological diagnosis.

Age (years)	Non specific inflammation	Tuberculosis	Degenerative	Primary neoplasms	Secondary deposits
0-10	-	-	-	1	-
11-20	1	2	-	2	1
21-30	2	5	2	1	1
31-40	2	-	-	6	3
41-50	7	3	4	6	4
51-60	7	2	2	10	17
61-70	8	4	2	6	20
71-80	-	1	1	2	4
Total	27	17	11	34	50

Out of 152 cases, a majority of 62 cases were in the lumbar region followed by 59 cases in thoracic region among the vertebral lesions. Paravertebral involvement was noted in 24 cases. Among the 152 cases, 55 cases (36.2%) were non-neoplastic lesions, 84 cases (55.3%) were neoplastic, 4 cases showed myelofibrosis and 9 cases were inconclusive. Site wise distribution of all the lesions is shown in Table 1. The frequency and sex distribution of all vertebral and paravertebral lesions are depicted in Table 2. Age distribution among all the lesions is summarized in Table 3.

Discussion

A systematic approach is preferred to minimize the diagnostic errors in diagnosing diverse group of vertebral lesions and this can be done by initial clinical and radiological analysis followed by histopathological examination that helps us to arrive at a diagnosis which can help the clinician

in making further decision in management of patients.¹

In the present study among 152 cases of vertebral and paravertebral lesions with different histopathological patterns, maximum number of cases were seen in the age group of 61-70 years which was similar to study done by Aithala JP et. al.,³ whereas in studies done by Dikondwar AR et. al.⁵ and Nithin et. al.,⁶ 41-60 years and 21-30 years age group were involved respectively. There was male preponderance in the present study with male to female ratio of 1.6:1 which was correlating with the study done by Dikondwar AR et. al.,⁵ in contrast, female predominance was reported by Aithala PJ et. al.³

A majority of 62 cases (40.8%) involved the lumbar region, followed by 59 cases (38.8%) in thoracic segments which was in contrast to study done by Dikondwar AR et. al.⁵ where thoracic (33.3%) was common followed by lumbar (22%).

In the present study neoplastic lesions (55.3%) were more common than non-neoplastic lesions (36.2%), similar to study done by Dikondwar AR et. al.⁵ Neoplastic lesions were seen predominantly in 51-60 and 61-70 years age groups similar to study done by Hirano K et. al.⁷ The neoplastic lesions showed male preponderance which was similar to studies done by Hirano et. al.,⁷ Feroz I et. al.¹¹ and Jobanputra GP et. al.¹²

Vertebral tumours were divided into primary tumours which originate from the spine or its adjacent structures and secondary (metastatic) tumours from distant organs spread through haematogenous or lymphatic routes and are located

in the spine and its surrounding tissues. As the spine is well vascularized and has close relationship with regional lymphatic and venous drainage systems (especially Batson's venous plexus), it is generally susceptible to metastasis. Metastatic tumours are most common tumours of the spine.¹³

Among the 84 neoplastic lesions in the present study, a majority of 50 cases showed secondary deposits (50/84, 59.5%), followed by primary malignancy (23/84, 27.4%) and least being benign tumours (11/84, 13.1%), whereas in studies done by Dikondwar AR et. al.,⁵ Nithin et. al.,⁶ Hirano K et. al.,⁷ Schellinger KA et. al.⁸ benign tumours were more common.

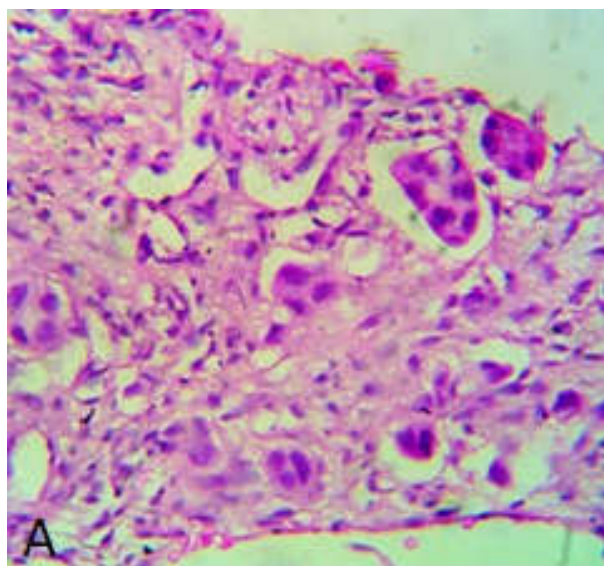


Fig. 1A: Adenocarcinoma deposits in vertebrae in which tumor cells arranged in gland patterns (H&E 400x).

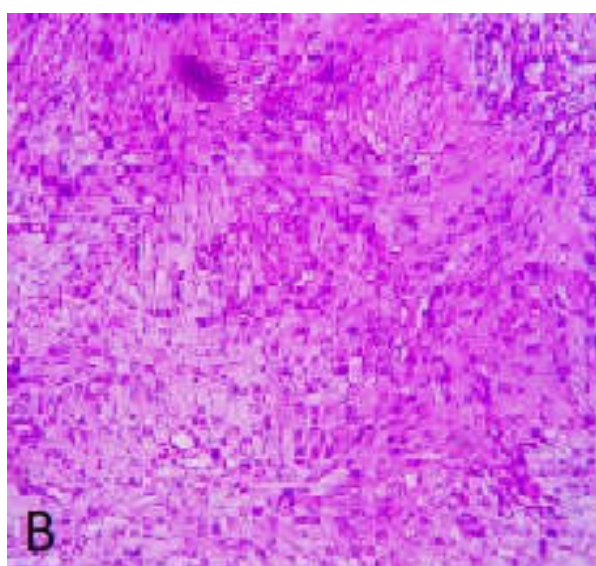


Fig. 1B: Schwannoma showing hypercellular and hypocellular areas with focal veruay body (H&E 400x).

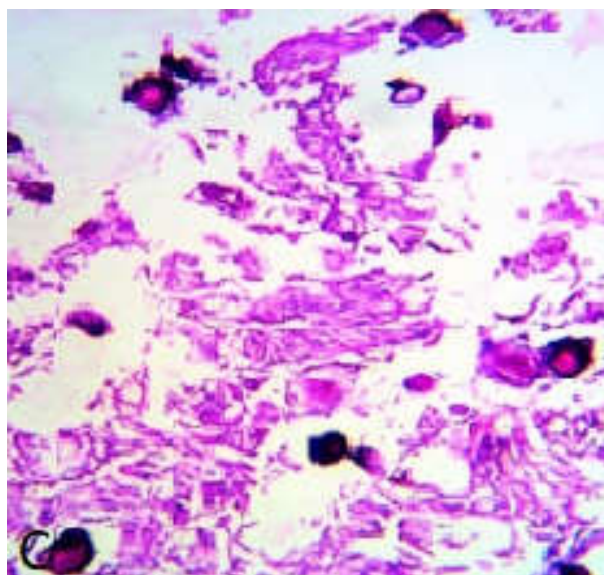


Fig. 1C: Meningioma with predominantly psammomatous calcifications (H&E 100x).

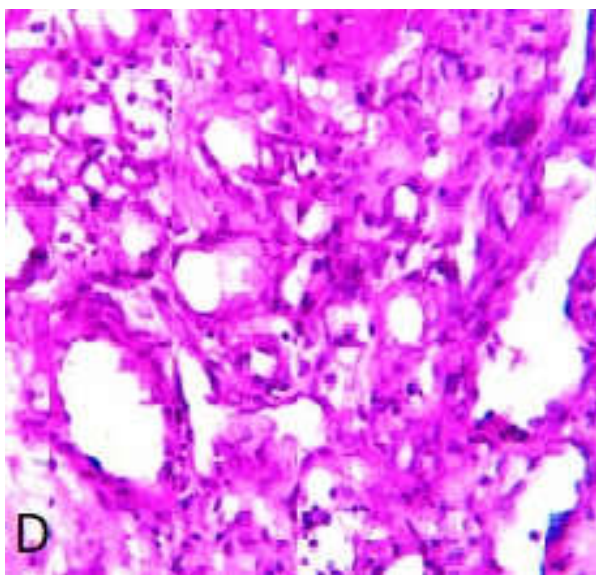


Fig. 1D: Hemangioma showing closely packed vascular spaces with endothelial lining and some showing RBC (H&E 400x).

Among the 50 cases of secondary deposits in the present study, the age ranged from 11–80 years and maximum number of cases was noted in the 61–70 and 51–60 age group which was similar to study done by Hirano K et. al.⁷ and Feroz I et. al.¹¹ Skeletal metastasis is second only to pulmonary and hepatic metastasis. The most frequently affected segment of skeleton is vertebral column.¹⁵

The secondary deposits were commonly seen in males and the most common metastasis was Adenocarcinoma (22/50) (Fig. 1A), similar to studies done by Dikondwar AR et. al.⁵ and Feroz I et. al.,¹¹ in contrast to study done by Bhat AR et. al.¹⁶ (24% 16/65) where non Hodgkin lymphoma was most common. In all these cases, the frequently involved site was lumbar level which was similar

to study done by Feroz I et. al.¹¹ whereas in studies done by Dikondwar AR et. al.⁵ and Nithin et. al.⁶ thoracic level was common.

Primary spinal cord tumours are one of the rarest categories of tumours, representing about 4–16% of all tumours arising from the central nervous system.¹⁷

Spinal schwannomas account for about 25% of intradural spinal cord tumours in adults.¹⁸ In this study among the 11 benign tumours a majority of 5 were peripheral nerve sheath tumours (5/11, 45.5%). These nerve sheath tumours were predominant in males and out of 5 cases, 4 were diagnosed as schwannoma (Fig. 1B) and 1 case was neurofibroma which is consistent with studies done by Dikondwar AR et. al.,⁵ Nithin et. al.,⁶ Hirano K et. al.⁷ and

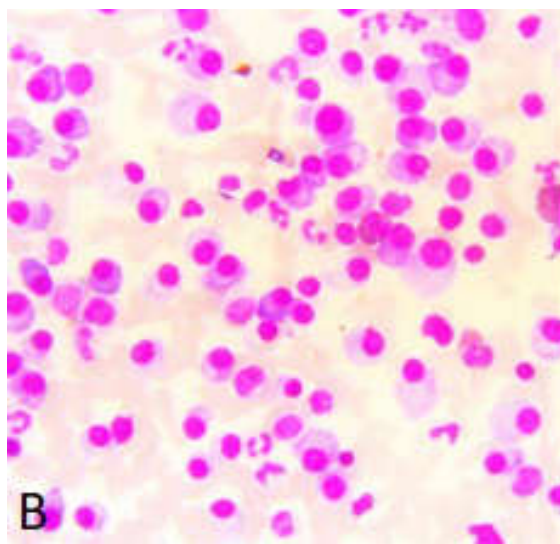
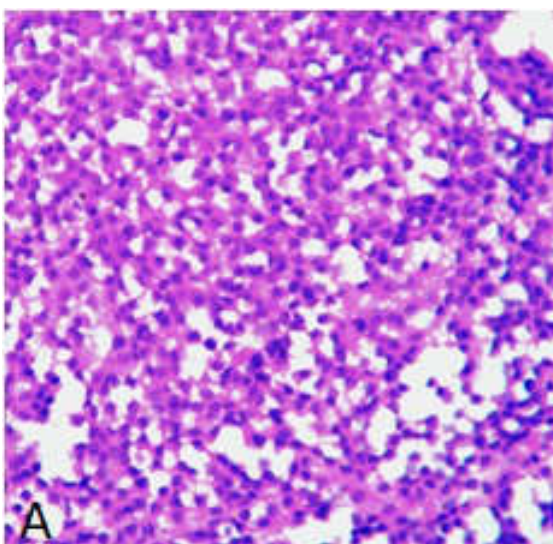


Fig. 2A&B: Multiple myeloma showing sheets of plasma cells having eccentrically placed nucleus with perinuclear hoff (H&E 100x & 400x)

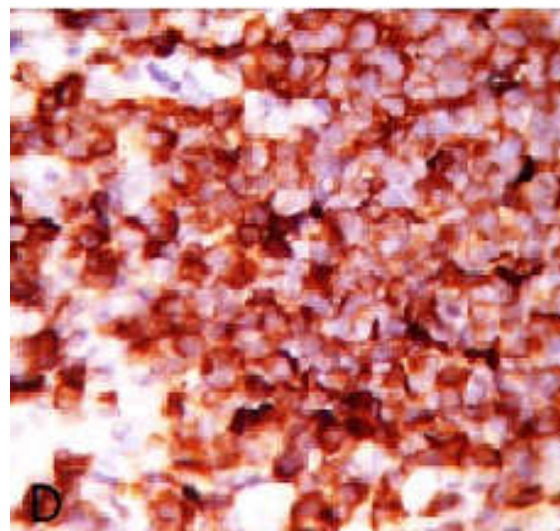
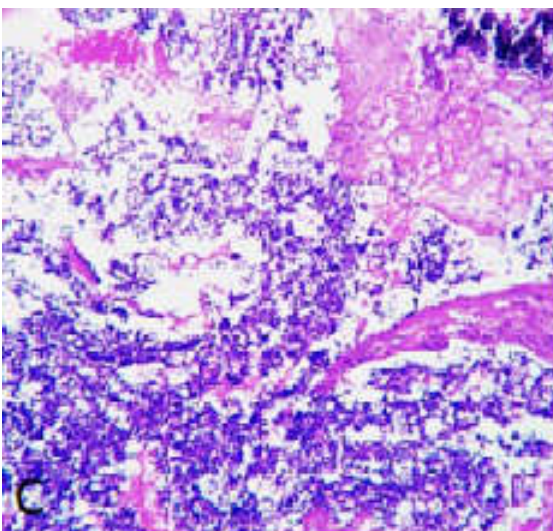


Fig. 2C&D: Peripheral neuroectodermal tumor (PNET) showing sheets of small blue round cells and IHC marker CD 99 showing positivity in cytoplasm of tumor cells (H&E 100x 400x).

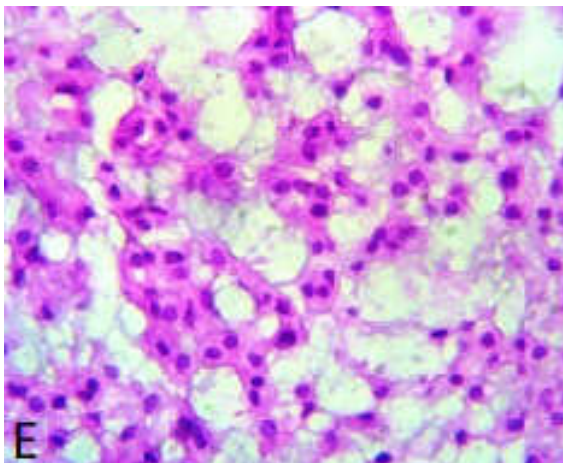


Fig. 2E: Chordoma with tumor cells arranged in cords, cells having abundant clear vacuolated cytoplasm (physaliferous cells) (H&E 400x)

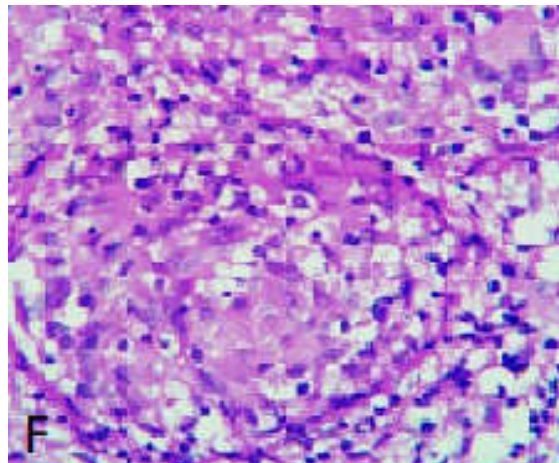


Fig. 2F: Granuloma with langhan giant cell in tuberculosis (H&E 400x)

Govada N et. al.¹⁹ The frequently involved vertebral level was cervical which is contrast to studies done by Moien P et. al.,⁹ Dikondwar AR et. al.,⁵ Hirano K et. al.⁷ and Govada N et. al.¹⁹ where lumbar, thoracolumbar and lumbosacral were common.

Three cases among 11 benign tumours were Meningioma (27.3%) (Fig. 1C) which was the second common tumour with female preponderance and thoracic segment was frequently involved, similar to studies done by Dikondwar AR et. al.⁵, Moien P et. al.,⁹ Nithin et. al.⁶ and Hirano K et. al.⁷ Two cases of hemangioma (Fig. 1D) were diagnosed which were located in thoracic segment similar to study done by Hirano K et. al.⁷

Among the primary malignancies multiple myeloma (14/23 cases, 60.9%) (Fig. 2A&B) was the most common type similar to study done by Feroz I et. al.¹¹ (12/15 cases) and Bhat AR et. al.¹⁶ (12/22 cases) and in contrast Moien P et. al.⁹ reported malignant astrocytomas (5/20 cases) to be more common followed by multiple myeloma (3/20 cases). The second common primary malignancy in this study was PNET/Ewings (4/23 cases) (Figure 2C&D) similar to study done by Bhat AR et. al.¹⁶ (5/22 cases, 22.7%) and in contrast to studies done by Dikondwar AR et. al.⁵ and Arora RK et. al.⁸ who reported only one case.

There were 3 cases of chordoma (Fig. 2E) in the present study, (2 males and 1 female) similar to study done by Dikondwar AR et. al.⁵ All the 3 cases were involving the sacral segments in contrast to lumbar predominance reported by Dikondwar AR et. al.⁵ study.

Among the 55 non-neoplastic lesions, 27 cases were of non specific inflammation followed by 17 cases of tuberculosis. Tuberculosis still remains

major public health problem in India. Tubercular meningitis and cerebral tuberculoma are the commonest manifestation of neuro-tuberculosis and involvement of spinal cord compared to that of the brain occurs in the ratio of 1:42.20 This study included 17 cases of tuberculosis (Fig. 2F) which was second common non neoplastic lesion frequently involving the thoracic segments with mean age of 30 years similar to studies done by Dikondwar AR et. al.⁵ and Jain AK et. al.²¹ Female preponderance was seen which is in contrast to above studies where male predominance was reported.^{5,21}

Conclusion

CT guided biopsy is a valuable tool for evaluation of vertebral and paravertebral lesions. In our study metastatic lesions were more in number in which adenocarcinoma was common. In primary tumours maximum cases were of multiple myeloma followed by PNET and schwannoma was common in benign tumours. Tuberculosis was second common cause for non neoplastic lesions.

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