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Dr. Jacob Jose
Associate Professor,
Department of Radiodiagnosis,
Mount Zion Medical College,
Chayalode, Adoor Kerala,
India

Corresponding Author:
Dr. Jacob Jose
Associate Professor,
Department of Radiodiagnosis,
Mount Zion Medical College,
Chayalode, Adoor Kerala,
India

Correlation of the MRI findings with clinical assessment, intraoperative and biopsy findings: Osseous spine tumors

Dr. Jacob Jose

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Abstract
The annual incidence of primary spine neoplasms has been estimated at 2.5 per 1,00,000 per year.' The careful study of plain roentgenograms of spine is the first step for proper evaluation of diseases of the osseous spine. Not only the bone and joint structures of the vertebral column are important from the neurologic standpoint but also the contour and calibre of the vertebral canal and foramina of exit of the spinal nerve roots. In the case of a patient with clinical suspicion of osseous spine tumor, a complete clinical history with special reference to neurological symptoms was taken, followed by general physical examination and detailed central nervous system examination. Other systems were also examined and findings were noted. Next, the procedure for MRI was explained to the patient and consent was taken. In this study, 7 cases showed paraspinal soft tissue component. Contrast was given in all the cases. The paraspinal soft tissue component enhanced well on post contrast in all the cases.

Keywords: MRI findings, clinical assessment, osseous spine tumors

Introduction

The key to accurate diagnosis of osseous spine tumors is knowledge of clinical history especially patient age and localization of the suspected lesion. MRI is an ideal investigation for evaluating tumors of osseous spine. MRI detects marrow changes in both symptomatic and asymptomatic patients. By just changing the pulse sequence parameters, excellent characterization of the tumor is possible. Multiplanar imaging helps in better understanding of the location of the lesion. Moreover MRI is well suited for patients with suspected spinal cord compression [1].

MRI gives the most complete information on the extent of vertebral body involvement, presence/absence of cord compression, the length of cord compression, nature of lesion causing cord compression and extent of paravertebral disease in one examination.

For the patient, it is a quick well tolerated procedure which can be repeated frequently. Moreover the relative danger of rapid neurologic deterioration following lumbar puncture in patients with complete block is avoided in MRI [2].

Newer pulse sequences and paramagnetic contrast agents have improved the characterization of osseous spine tumors and surrounding structures [3].

The annual incidence of primary spine neoplasms has been estimated at 2.5 per 1,00,000 per year.' The careful study of plain roentgenograms of spine is the first step for proper evaluation of diseases of the osseous spine. Not only the bone and joint structures of the vertebral column are important from the neurologic standpoint but also the contour and calibre of the vertebral canal and foramina of exit of the spinal nerve roots [4].

Cervical spine examination includes films in frontal, lateral and each oblique projection. The atlas and axis can be satisfactorily visualised in films made though open mouth. Films made in subaxial projection depict the odontoid process to good advantage. Tomography in either coronal/sagittal plane can visualise the upper cervical area. To demonstrate the disc space between C7 and T1, lateral views may be taken while applying traction to arms if examination is made in supine position. The thoracic vertebrae can be properly identified in lateral projection by the attached ribs. Stereoscopic films in frontal projection are of value, when detailed examination of component parts of some vertebra is desired. Lumbosacral spine routine examination includes films in frontal and lateral projection and a film of

sacrum made with x-ray beam angled 30° cephalad [5].
Films in each posterior oblique projection complete the examination. Upright frontal films with lateral bending and upright lateral films in flexion and extension give a radiographic record of the continuity and extent of movement of vertebrae. Bending films are usually made to test the post operative status of spinal fusion [6].

Methodology
This was a prospective study of 42 cases with clinical suspicion of osseous spine tumors who had undergone Magnetic Resonance Imaging. The study was conducted in the Department of Radiodiagnosis & Imaging.

Selection of cases
The cases studied were those from our own hospital — inpatients, outpatients and those referred from other hospitals and clinics.

Screening population
All age groups of both sexes who were suspected to have osseous spine tumor were included.

Method followed
In the case of a patient with clinical suspicion of osseous spine tumor, a complete clinical history with special reference to neurological symptoms was taken, followed by general physical examination and detailed central nervous system examination. Other systems were also examined and findings were noted. Next, the procedure for MRI was explained to the patient and consent was taken.
A detailed history pertaining to the contraindications to MRI was taken. Ear plugs were provided to the patient to minimise noise within the gantry. The patient was then placed in supine position with head first inside the gantry. Proper positioning and immobilisation was done.

Equipment
This study used the MRI machine "SIGNA CONTOUR' (General Electric, USA).
It possesses a super conducting K4 magnet with a magnetic field strength of 0.5 Tesla.
Coils used: Phased array Cervical,- Thoracic, Lumbosacral

Pulse sequences
Coronal localiser was obtained first. Then, from this coronal localiser, sagittal localiser was obtained. This was done to apply saturation pulse anterior to the vertebral column to reduce motion artefacts.

Results

Table 1: Primary sources for metastasis

Primary source	No, of cases	Percentage
Bronchogenic Ca	7	31.82%
Prostate Ca	4	18.18%
Breast Ca	2	9.08%
Endometrial Ca	2	9.08%
Ewing's sarcoma	2	9.09%
Thyroid Ca	1	4.55%
Lymphoepithelioma of nasopharynx	1	4.55%
Liposarcoma of thigh	1	4.55%
Rectal Ca	1	4.55%
Renal cell Ca	1	4.55%

Metastasis was most commonly from bronchogenic carcinoma.

Table 2: Metastasis – Location

Site	No. of cases	Percentage
Cervical	1	4.55%
Thoracic	6	27.27%
Lumbar	2	9.08%
Sacro-coccygeal	3	13.67%
Cervico thoracic	1	4.55%
Thoraco-lumbar	2	9.08%
Lumbo-sacral	2	9.08%
Thoraco-lumbo-sacral	5	22.72%

Table 3: Age incidence of metastasis

Age	No. of cases	Percentage
0-10	0	0
11-20	1	2.38%
21-30	1	4.55%
31-40	8	36.36%
41-50	3	13.63%
51-60	1	4.55%
61-70	6	27.26%
71-80		4.55%
>80	1	4.55%

Table 4: Metastasis; Imaging patterns

Imaging patterns	No. of cases	Percentage
Focal lytic	9	40.9%
Focal sclerotic	2	9.09%
Diffuse homogenous	4	18.18%
Diffuse heterogenous	7	31.82%

Focal lytic pattern was the most common imaging pattern of metastasis on MRI.

Table 5: Imaging features of metastasis on MRI

Sequence	Hypointense	Isointense	Hyperintense	Heterogenous
T1W	15 (68.18%)	0	0	7 (31.82%)
T2W	2 (9.09%)	0	13 (59.09%)	7 (31.82%)

Discussion
Bronchogenic carcinoma was the commonest primary to invade the osseous spine. The other primaries were prostate carcinoma (4), breast carcinoma (2), endometrial carcinoma (2) Ewing's sarcoma (2). There was a case each of | metastasis from thyroid carcinoma, lymphoepithelioma of nasopharynx, ' liposarcoma of thigh, rectal carcinoma and renal cell carcinoma. According to Kricun ME carcinomas of lung, breast and prostate are the most frequent primary carcinomas that invade the spine in the adult. Other primary tumors include thyroid carcinoma, renal cell carcinoma and myeloma. Out of 22 case of metastasis in this study, the primary source in 13 cases (54.54%) was from lung, a breast and prostate. Hence in this Study also, as noted in literature, carcinomas of lung, breast and prostate were the most frequent primary carcinomas to invade the spine [7].
Spinal cord compression was observed in 15 out of 22 cases of metastasis in this study. Williams MP, Cherryman GR and Husband JE described the role of MRI in 55 patients with suspected metastatic spinal cord compression. Comparison with conventional myelography was done in 21 patients. They noted that conventional myelography has the disadvantage of providing indirect:

evidence of cord compression and in presence of a complete block, the extent of disease can only be demonstrated by a second intrathecal injection above presumed upper extent of disease. They further added that in CT myelography the full examination of spinal cord is impractical. They concluded in their study that MRI is the method of choice for investigation of patients with suspected metastatic spinal cord compression as it clearly shows the site, nature and extent of cord compression [8]. We also noted that MRI clearly depicted the exact extent and site of cord compression in all the cases in this study.

In this study, 7 cases showed paraspinal soft tissue component. Contrast was given in all the cases. The paraspinal soft tissue component enhanced well on post contrast in all the cases. According to Sze G *et al*. contrast enhancement delineates the exact site and extent of paraspinal soft tissue component.Similarly in this study, on post contrast, the exact extent of paraspinal soft tissue component was delineated in all the cases.

In this study, six cases of metastasis showed vertebral collapse too on MRI. All the six cases of vertebral collapse showed hypointensity on T1 WI and lh, ae hyperintensity on T2 WI. Baker LL *et al*. in their study concluded that in benign vertebral collapse the normal signal intensity of the vertebra is maintained whereas in malignant vertebral collapse it becomes hypointense on T1 WI and hyperintense on T2 WI [9]. Simalarly in this Study, all the six cases of metastasis which showed vertebral collapse too had similar signal intensity changes as noted by Baker LL *et al*. in their study.

In this study all the five cases were already on treatment. In spite of treatment as the symptoms were worsening, MRI was done to know the exact extent and progression of the disease. In this study, it was observed that on MRI, 3 cases showed diffuse involvement and 2 cases showed heterogenous involvement. Three cases showed large paravertebral soft tissue component causing cord compression. Hence MRI was very much helpful to know the extent of the disease and exact level of cord compression non-invasively [10].

According to Dwyer AJ *et al*. STIR sequences helps in delineating the myelomatous lesions better on MRI by combining both T1 and T2 effects. In this study, STIR was done in 3 out of 5 patients with multiple myeloma and was extremely helpful to delineate the lesions.

Conclusion

MRI is highly sensitive in detection of marrow changes.

Multiple tumors can be detected by MRI.

In case of complete block on myelography, MRI is useful to define cranial and caudal extent.

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