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Original Article

Utility of Computed Tomography-guided Biopsy in Evaluation of Metastatic Spinal Lesions

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Abstract

Introduction: Computed tomography (CT)-guided biopsy of spine is currently a valuable diagnostic tool and effective technique for diagnosing and planning a proper therapeutic strategy for certain spinal lesions. The reported diagnostic accuracy of core biopsy ranges from 77% to 97%. **Materials and Methods:** We included all patients with spinal lesions suspicious of metastasis on magnetic resonance imaging, who presented between May 2012 and April 2014 and underwent CT-guided biopsy in our study. A total of thirty patients with spinal lesions were evaluated. **Results:** Majority presented in the seventh decade of their life (average age = 53.93; age range = 10–72 years). Male:female ratio was 1.5:1. Pain was the most common presenting symptom (100%). Lumbar spine was the most common site of lesion followed by dorsal spine. Biopsy is the gold standard in histopathological evaluation of spinal lesions. Metastatic lesion was diagnosed in 12 (40%) cases, plasmacytoma in 12 (40%) cases, non-Hodgkin's lymphoma in 2 (6.66%) cases, small round cell tumor in 1 (3.33%) case, nonspecific chronic inflammation in two patients, and necrosis with no viable cells in one patient. The most common malignancy to metastasize to spine was adenocarcinoma. The most common primary tumor of spine was plasmacytoma - multiple myeloma. **Conclusion:** CCT-guided biopsy is a safe procedure, and no procedure-related complication was seen in any patient.

Keywords: *Computed tomography-guided biopsy, metastatic carcinoma, plasmacytoma*

Introduction

The incidence of skeletal metastasis is second only to pulmonary and hepatic metastasis.[1] The most frequently affected segment of skeleton is the vertebral column. It is estimated that more than 10% of tumor patients develop symptomatic spinal metastasis.[2,3] The vertebral bodies are seeded largely through the bloodstream, and neoplastic substitution of bone tissue causes progressive structural destruction leading to loss of stability and compression of spine.[4]

Spinal metastasis can occur in three locations, namely, (1) extradural, (2) intradural extramedullary (IDEM), and (3) intramedullary (IM).[5]

More than 98% of spinal metastasis are extradural because dura mater provides a relative barrier for metastatic disease. IDEM and IM disease accounts for <1% of spinal metastasis.[6,7] Both IDEM and IM disease most commonly originate from drop metastasis in patients with either primary or metastatic brain disease.[5] Extradural metastasis is believed to occur through three mechanisms, namely, (1) direct local extension into the extradural space, (2) retrograde spread through the valveless extradural venous channels of the spine (Batson's plexus), and (3) arterial emboli with subsequent spread through the cortical veins.[5]

Paralleling vertebral body size, metastasis occurs most frequently in the lumbar spine followed by thoracic and then cervical spine.[8]

However, thoracic lesions (70%) are most often symptomatic due to smaller space available for the spinal cord in this region, followed by lumbar (20%) and cervical (10%).[8,9] Lung cancer is the most frequent neoplasm to metastasize to spine followed by breast cancer, other metastatic neoplasms include myeloma, prostate cancer, lymphoma, and leukemia.[10] Neuroblastoma is the most common tumor to metastasize to spine in pediatric population.[11]

Computed tomography (CT)-guided biopsy of spine is currently a valuable diagnostic

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tool and effective technique for diagnosing and planning a proper therapeutic strategy for an extradural spinal lesion. Specimen may be from vertebral body, intradiscal area, or paravertebral tissue.[12] The reported diagnostic accuracy of core biopsy ranges from 77% to 97%.[13]

In case of metastatic spinal lesion, if the primary site of cancer is known, biopsy is usually not required.[14] When the site is unknown, biopsy is necessary for an accurate diagnosis.[15,16] Cancer of unknown primary accounts of 3%–5% of all cancer.[17] In order to evaluate the utility of CT guided biopsy in metastatic spinal lesions we undertook this study to diagnose such lesions and hence to spare the patient of an open biopsy.

Materials and Methods

We endeavored to study the utility of CT-guided biopsy in evaluation of patients with metastatic spinal lesions of unknown primary over a period of 2 years in a tertiary care hospital of Kashmir valley. The study was conducted over a period of 2 years from May 2012 to May 2014. The main indications for the biopsy were clinical symptoms/signs and/or radiological evidence of spinal lesions suggestive of metastasis, and biopsy was indicated to establish the tissue diagnosis. A complete disease staging with plain radiography, CT, magnetic resonance imaging (MRI), and bone scan was carried out. CT scan was done in all patients to see the extent and pattern of bone involvement in patients. All cases with a known primary were excluded from the study. In case of multiple lesions, the biopsy was taken from the site which was most approachable. At least two samples were obtained. We used coaxial bone biopsy needle of 18-gauge in all the patients. For thoracic, lumbar, and sacral biopsy, the patients were placed in a prone position, whereas for cervical spinal biopsy, patients were placed supine or lateral. The lesion selected for biopsy was localized using 2.5–5 mm thick axial images through the vertebral body in question. A single axial CT image depicting the lesion was selected. The best biopsy approach was determined and traced back to the skin using the cursor on the CT console. The depth of the lesion and cutaneous entry point were determined. The point of entry was then estimated on the patient's skin. The overlying skin and soft tissues were then anesthetized with 1% lidocaine.

Under CT guidance, the best insertion point was selected and marked on skin. The trocar was introduced, either over a K-wire or parallel to a spinal needle and the needle was inserted. In case of coaxial technique, the trocar was left inside the lesion. The needle positioning was done under sequential scans. The bone biopsy needle had the dual advantage of having the strength to be advanced through normal bone or overlying intact cortex to provide access and also the capability to obtain a core specimen. Samples were harvested and taken for histopathology examination. Two or three core specimens were obtained and placed in 10% formalin. The biopsy received was processed, and blocks were made, 2–3 μ sections were cut, stained with hematoxylin and eosin stain. Special stains were used wherever indicated, and some cases were subjected to immunohistochemistry. All patients were discharged after an observation period of 2 h. There was no procedure-related complication in our study.

Observations/Results

This was a prospective study of 2 years where a total of thirty cases of spinal lesions suspected to be metastatic lesions were analyzed. Malignant lesions were seen in 27 cases, of which 12 were metastatic lesions, 12 cases were those of a plasmacytoma, one patient had small round cell tumor, two patients had non-Hodgkin's lymphoma, chronic nonspecific inflammation was seen in two cases, and necrosis in one patient. The diagnostic accuracy of CT-guided biopsy in evaluation of malignant lesions was 96.6%.

Demographic characteristics/clinical features

The age range for our patients was 10–72 years with a mean age of 53.93 years and a median age of 56 years. The predominant age group was patients with age of >60 years. Twelve patients belonged to this group. Out of a total of thirty patients, 18 were males and 12 females with a male to female ratio of 1.5:1.

The duration of symptoms in our patients was from 3 to 6 months; pain was the predominant symptom present in all patients with neurological deficit in the form of weakness of limbs seen in 21 (70%) patients and urinary incontinence seen in 6 (20%) patients [Table 1].

Site

Lumbar spine was the predominant site of involvement in 14 (46.66%) followed by dorsal spine in 10 (33.33%) patients [Table 2].

Lumbar 3rd and 4th (L3, L4) was the most common vertebral segment involved.

Table 1: Clinical symptoms

Symptoms	No. of patients	Percentage
Pain	30	100
Weakness of limbs	21	70
Urinary incontinence	6	20

Table 2: Site distribution of spine lesions

Site	No. of patients	Percentage
Cervical	2	6.66
Cervicodorsal	1	3.33
Dorsal	10	33.33
Dorsolumbar	2	6.66
Lumbar	14	46.66
Sacral	1	3.33
Total	30	100

The disease involved a single vertebral segment in 12 (40%) patients and multiple vertebral segments in 18 (60%) patients.

Radiology

Magnetic resonance imaging

Twenty-three patients had a mass lesion which was hypointense on T1-weighted imaging and hyperintense on T2-weighted imaging involving the vertebral body, lamina, and pedicles at various levels and compressing neural foramina. Biopsy was obtained from posterior column of spine in these patients. Out of these, eight patients had a lesion extending into paravertebral tissue and soft tissue compartment as well [Figure 1].

Five patients had lesions iso-hypointense on T1- and T2-weighted imaging, hyperintense on short-tau-inversion-recovery (STIR) imaging involving multiple segments of spine and extending into paravertebral tissue and soft tissue compartment at various levels and compressing neural foramina. In one patient, lesion was extending from cervical 6th to 2nd thoracic vertebrae on left side within the spinal canal over a length of 5.8 cm displacing cord to the right, lesion was extending into the intervertebral neural formation on left side at cervical 6–7, cervical 7 - thoracic 1, thoracic 1–2 levels, and intrathoracic extension was seen in the left paraspinal region measuring 3.4 cm. The lesion was seen to involve

the roots and trunks of lower brachial plexus. Compression fractures of thoracic 1st vertebral body were also seen. Features were suggestive of lymphoma? Plasmacytoma. Biopsy was obtained from paraspinal tissue on left side. In another patient, the lesion was extending from cervical 3–4 vertebra within the spinal canal over a length of 2.8 cm on left side and displacing the cord to the right side. The lesion was compressing the neural foramina at the level of cervical 3–4. There was compression fracture of cervical 4th vertebra, and the lesion was extending into the paravertebral tissue.

Computed tomography scan impression

Lesions were grouped into lytic, sclerotic, or blastic lesions or mixed lytic and sclerotic [Table 3]. On CT lytic lesions were detected in 18 patients, histopathological examination revealed plasmacytoma in 12 patients, one was metastatic malignant melanoma, and one was metastatic squamous cell carcinoma from lung [Figure 2]. Seven patients had blastic lesion, in which two patients had a primary prostatic carcinoma, one had metastatic hemangiopericytoma, and one had small round cell tumor. Five patients had mixed lytic and blastic lesions on CT. In this group, two patients had primary breast carcinoma and two patients had non-Hodgkin's lymphoma. Primary tumor could not be assessed in five patients, two patients were diagnosed as inflammatory lesion, and in one patient, biopsy revealed necrosis only [Table 3].

Histopathological examination of biopsies

Histopathological examination of CT-guided biopsy revealed a malignant lesion in 27 (90%) patients out of a total of thirty patients. Out of 27 patients, 12 (40%) patients were diagnosed as metastasis, 12 (40%) patients

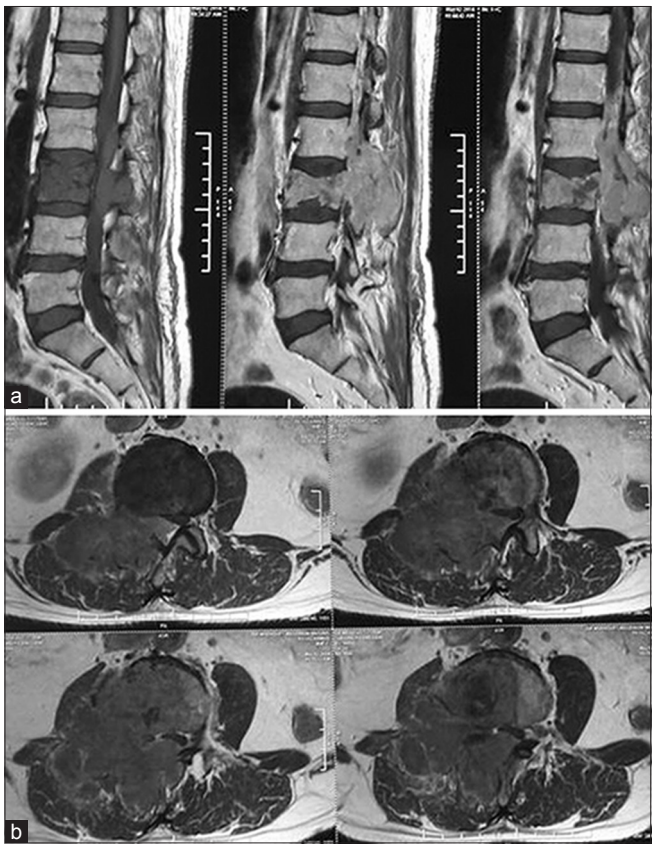

Figure 1: Magnetic resonance imaging sagittal sections (a) showing iso to hyperintense mass lesion involving 3rd lumbar vertebrae with extradural component on axial sections (b) involving the body, pedicles, lamina, and paravertebral soft tissue

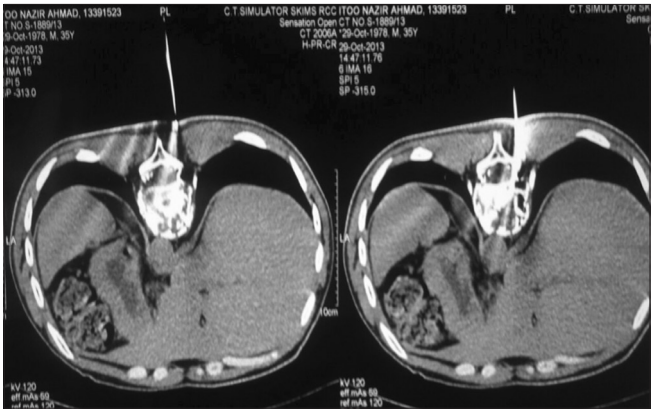

Figure 2: Computed tomography scan axial sections showing the needle biopsy being done of a mass involving one of the lumbar vertebrae involved by metastatic adenocarcinoma

Table 3: CT appearance and histopathological impression

Lesion appearance on CT (no. of patients)	Histopathological diagnosis	Primary site
Lytic (18)	Plasmacytoma-12 patients	
	Metastatic malignant melanoma-1 patient	Skin
	Metastatic squamous cell carcinoma-1 patient	Lung
Blastic (7)	Metastatic adenocarcinoma-2 patients	Prostate
	Metastatic hemangiopericytoma-1 patient	Brain
	Small round cell tumor-1 patient	
Mixed lytic and blastic lesion (5)	Metastatic poorly differentiated carcinoma-2 patients	Breast
	Non-Hodgkins lymphoma	

as plasmacytoma, 2 (6.66%) patients as non-Hodgkin's lymphoma, and 1 (3.33%) patient as small round cell tumor. The biopsy revealed nonspecific chronic inflammation in two (6.66%) patients who had a suspicion of metastatic tumor on MRI.

Metastatic lesions

Metastatic lesions were common in the sixth and seventh decade of life – ten patients belonged to this category and among males. A 26-year-old male with xeroderma pigmentosum had a CT-guided biopsy done with biopsy showing malignant melanoma. Most commonly involved site was lumbar region in five patients, followed by dorsal region in four patients, dorsolumbar region in two patients, and cervical region in one patient. CT scan revealed lytic lesion in six patients, blastic or sclerotic lesion in four patients, and mixed (lytic and blastic) lesion in two patients as shown in Table 4. The break-up of metastatic tumors is given in Table 5.

Follow-up

All patients who were diagnosed as cases of metastatic carcinoma were followed up and screened for the primary site. Various biochemical tests were done, i.e., PSA and CEA. Endoscopy, colonoscopy, and mammography were also performed.

Discussion

Siffert and Arkin in 1949 first performed percutaneous biopsy of spine under radiographic control.[18] In 1981, Adapon *et al*. used CT guidance for spinal percutaneous biopsy and reported its safety and accuracy.[19] The development of CT and more recent addition of faster image acquisition and multiplanar reconstruction capabilities have allowed safe and accurate biopsy at virtually all segments of spine.[20] The most frequent indication for biopsy of vertebral and paravertebral region is to evaluate patients with radiographically suspicious lesions but no documented history of carcinoma and patients with a history of cancer and suspicious vertebral lesions. Biopsy can also be helpful in finding an occult primary malignancy after an initial diagnosis of metastatic disease is made.[21] The incidence of skeletal metastasis is second only to pulmonary and hepatic metastasis. The most frequently affected segment of the skeleton is the vertebral column.[4]

Table 4: Morphology of metastatic tumors

Morphology	Number of patients (*n*=12)
Metastatic adenocarcinoma	6
Metastatic squamous cell carcinoma	1
Metastatic malignant melanoma	1
Metastatic hemangiopericytoma	1
Metastatic poorly differentiated carcinoma	3

Table 5: Statistical significance

Values	Number of patients
True positive	27
True negative	2
False negative	1
False positive	0

The sensitivity, specificity and overall diagnostic accuracy were 96.45%, 100%, and 96.6%, respectively

Age

The age range in our study was 10–72 years with a mean age of 53.93 years. The predominant age group was more than 61 years with 12 patients (40%). In a study done by Lis *et al*., the age range was 7–90 years, with a median age of 61 years.[20] In the study done by Rimondi *et al*., the age group was 5–86 years with a median age of 45.5 years.[22] In a study done by Kornblum *et al*., age range was 4–91 years with mean age equal to 60 years.[23] Most of the patients belong to elderly age group as malignant lesions are common in this age group.

Gender

In our study, the male to female ratio was 1.5:1. Males constituted 60% of cases and females accounted for 40% of cases. In a study done by Rimondi *et al*., 57.6% patient were males and 42.3% were females.[22] Dave *et al*. had 70.42% male patients in their study which was slightly higher than in our study.[24]

Location

In our study, majority of lesions were located in lumbar spine (46.66%), followed by dorsal spine in 33.33%, dorsolumbar spine in 6.66%, cervical spine in 6.66%, cervicodorsal spine in 3.33%, and sacral spine in 3.33%

patients. The result was similar to study conducted by Lis *et al*. where lumbar spine was involved in 42% cases, dorsal spine in 31%, and cervical spine in 2% cases; however, sacral spine was involved in 25% of cases.[20] This difference may be because of the large sample size (410 cases) taken in their study. In a study done by Kornblum *et al*., lumbar spine was involved in 51.45%, dorsal spine in 27.18%, cervical spine in 7.76%, and sacral spine in 13.59%.[23] In a study done by Rimondi *et al*., lumbar spine was involved in 41.39% cases followed by dorsal spine in 28.83% cases.[22]

Clinical features

The most common symptom was back pain in all patients (100%), followed by weakness in 21 (70%) patients and urinary incontinence in 6 (20%) patients. Pain was severe in nature, radiated to limbs, worst at night, and relieved by the intake of analgesics. Rybak and Rosenthal mention bone pain as the most common symptom of metastatic spine lesions. The bone pain may be because of the release of chemical mediators, elevated intraosseous pressure, periosteal elevation, and bone fractures. These pathological fractures are difficult to manage and often fail to heal.[25]

Multiplicity

In case of multiple lesions, we always took the biopsy at the most easily approachable site and always tried to get multiple samples at least two from multiple sites. In our study, multiple vertebral segments were involved in 18 (60%) patients and single vertebral segment was involved in 12 (40%) patients.

In a study done by Rimondi *et al*., multiple lesions were approached in the same way, biopsy was taken from the easily approachable site and always tried to get at least two samples.[22]

Radiology

In our study, lesions were classified as lytic lesions in 18 (60%) patients, sclerotic or blastic lesions in 7 (23.33%) patients, mixed lytic and sclerotic lesions in 5 (10.55%) patients on CT scan. In a study conducted by Lis *et al*., CT appearances of the lesions were lytic in 60% patients, sclerotic in 22%, and mixed lytic and sclerotic in 3%.[20] It was comparable to our study. In the study conducted by Yaffe D *et al*. on 19 patients, osteolytic lesion was seen in 11 patients and osteoblastic lesion was seen in 3 patients.[25]

Primaries with predominantly osteoblastic metastasis (sclerotic extradural bone lesions) include prostate carcinoma, osteosarcoma, and medullary thyroid carcinoma. Primaries with predominantly osteolytic metastasis that may rarely become osteoblastic (mixed sclerotic and lytic extradural bone lesions) include breast cancer, lymphoma, and urothelial carcinoma.[26] Primaries with osteolytic metastasis include lung cancer, gastrointestinal cancer, renal cell carcinoma, malignant melanoma, and multiple myeloma.[26]

MRI was done in all thirty patients and detected lesions in all thirty (100%) patients in terms of altered signal intensities on T1- and T2-weighted imaging. Multiple vertebral bodies were involved in 18 (60%) patients and 13 (43.33%) patients had involvement of soft tissue compartment also. MRI had high sensitivity in picking up lesion in all thirty (100%) patients.

MRI is highly sensitive in detecting skeletal metastasis T1-weighted images generally reveal metastasis as focal areas of low signal intensity because of fat content of the red marrow. On T2-weighted images, metastasis usually appears brighter than the normal marrow due to high water content. Whole body MRI utilizing whole body fast STIR sequences has significantly better sensitivity and specificity.[25] Weerakkody and Dawes mention that MRI is sensitive to metastatic disease and is able to assess cord compression. The signal intensity of the metastatic deposits will vary according to degree of mineralization.[26]

Osteoblastic metastasis are hypointense on both T1- and T2-weighted sequence whereas mixed sclerotic and lytic extradural bone lesions are hypointense on T1 and hypo- or/and hyperintense on T2. Lytic extradural bone lesions are hypointense on T1 and hyper- or isointense on T2.[26] In our patients, T1- and T2-weighted imaging was done in all thirty patients whereas T1- and T2-weighted imaging along with STIR was done in 5 (16.66%) patients only.

Histopathological examination

The diagnostic accuracy of the procedure was equal to 96.66%. Out of thirty patients, 27 were true positive for malignancy, two were true negative, and one patient was false negative. For malignancy out of 27 patients, 12 (40%) had metastasis, 12 (40%) had plasmacytoma [Figure 3a], 2 (6.66%) had non-Hodgkin's lymphoma, 1 had a small round cell tumor, in two patients, there was only chronic nonspecific inflammation, and one patient had necrosis which on open biopsy showed metastatic carcinoma. Out of 12 patients with metastatic disease, six patients had metastatic deposits of adenocarcinoma [Figure 3b], one patient had metastatic squamous cell carcinoma [Figure 3c], one patient had metastatic malignant melanoma [Figure 3d], one patient had metastatic hemangiopericytoma [Figure 3e], and three patients had metastatic deposits of poorly differentiated carcinoma.

Our results were similar to the study conducted by Lis *et al*., in which the diagnostic accuracy was equal to 89%. The most common osseous lesion in his study too was plasmacytoma (54%). The most common cause of metastatic carcinoma in males in his study was lung carcinoma (12%) followed by prostate carcinoma in 7%. In women, the most common metastasis was breast carcinoma.[20] In

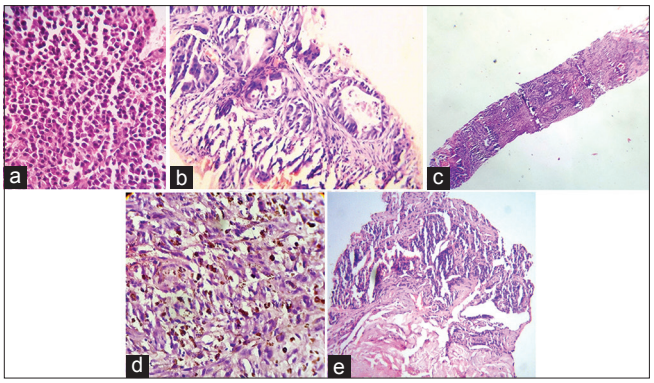

Figure 3: (a) Photomicrograph showing tissue infiltration by sheets of plasma cells and plasmablasts in a case of plasmacytoma (H and E, ×40), (b) photomicrograph showing the infiltration of the tissue by tumor cells arranged in glands. Features are suggestive of metastatic well-differentiated adenocarcinoma (H and E, ×10), (c) photomicrograph showing scan view of adequate tissue obtained from computed tomography-guided spinal biopsy, which on further examination revealed metastatic squamous cell carcinoma (H and E, ×4), (d) photomicrograph showing tissue infiltration by cells with large nuclei with irregular contours, clumped chromatin, and a prominent red (eosinophilic) nucleoli. The melanin pigment is seen extracellularly as well as intracellularly in a patient of metastatic malignant melanoma (H and E, ×40), (e) photomicrograph showing the numerous branching capillary channels and gapping the sinusoidal spaces enclosed within the nests of spindle-shaped to round cells in a patient of hemangiopericytoma (H and E, ×20)

our patients, the most common tumor to metastasize to spine was prostate carcinoma in two patients and lung carcinoma in two patients. One patient had malignant melanoma. In females, breast metastasis to spine was seen in two patients and one patient had hemangiopericytoma. However, the most common primary malignancy seen in our study was plasmacytoma in 12 (40%) patients. In a retrospective study of 15 years conducted on 430 patients by Rimondi *et al*., the CT-guided needle biopsy resulted in a histological diagnosis of tumors or pseudotumor lesions in 385 of 430 cases (89.5%). In 291 of these, the biopsy was followed by surgical treatment, in which the findings on needle biopsy were confirmed, 211 primary malignant, 56 benign tumors, 24 other conditions (i.e., simple bone cyst, histiocytosis X, etc.) were diagnosed. This is an extensive, retrospective study, in which a sizeable number of cases were helped who were not subject to open biopsy on surgery.[22]

Dave *et al*. published a study on transpedicular percutaneous biopsy of vertebral body lesions in a series of 71 cases. The pathological examinations revealed infections in 25 (35.21%), osteoporotic wedging in 21 (29.57%), metastasis in 8 (11.8%), plasmacytoma and multiple myeloma in 7 (9.8%), and non-Hodgkin's lymphoma in 1 (1.4%). Diagnosis was established in 63 of 71 patients (88.7%).[24] In a study by Serdar *et al*. on percutaneous biopsy of spine on 84 patients, primary tumors were seen in 17 (20.23%) patients and metastatic in 24 (28.57%) patients. Spondylodiscitis was seen in 32 (38.09%) patients. Eleven biopsies were nondiagnostic. Lumbar spine was the most common location for infection and metastatic tumors (13/24).[27] We followed up all the patients and evaluated the patients with carcinoma of unknown primary to find the primary site. Mammography was done in females. Chest X-ray and contrast-enhanced computer tomography chest and abdomen were done in all patients. Upper and lower gastrointestinal endoscopy was done.

Two patients had elevated PSA levels, and on transrectal ultrasonography, the lesion was detected in prostate. Two patients had a small lesion in breast detected on mammography – which were evaluated and found to be ductal carcinoma – these are the tumors which were reported as poorly differentiated cancers. One patient had squamous cell carcinoma of lung. One patient who had metastatic deposits of malignant melanoma was a known case of xeroderma pigmentosum (XP). XP was first described in 1874 by Von Hebra and Kaposi.[28] It is a rare, genetically heterogeneous, autosomal recessive disorder characterized by photosensitivity, cutaneous pigmentary changes, premature skin aging, and the development of various cutaneous and internal malignancies at an early age. The basic defect underlying the clinical manifestations is a nucleotide excision repair defect leading to the defective repair of DNA damaged by ultraviolet radiation.[29] In addition; these patients also exhibit enhanced sensitivity to ionizing radiation.[30,31] Its incidence in the Indian context is not significant. Individuals with XP develop multiple cutaneous neoplasms at a young age.[32] Two important causes of mortality are metastatic malignant melanoma and squamous cell carcinoma.[33]

Malignant melanoma arises in only about 3% of patients with XP.[34,35] Patient of hemangiopericytoma had a past history of hemangiopericytoma of cerebellum 5 years back, for which she was operated then, biopsy was done to confirm the diagnosis. In three patients, primary tumor could not be assessed till the end of our study period. Three patients died within 3 months of the diagnosis of disease. The patients whose biopsies were negative for malignancy were subjected to various investigations to rule out tuberculosis. These two patients were positive for polymerase chain reaction for tuberculosis, and both patients were treated with antitubercular drugs and responded well to the treatment. The patient with small round cell tumor did not have a primary anywhere. The patient whose biopsy revealed only necrosis was subjected to open biopsy which revealed a poorly differentiated carcinoma. All patients were given palliative chemotherapy and radiotherapy.

The most common primary malignancy seen in our study was plasmacytoma (40%) patients. These patients were followed up in the Department of Haematology. In our study, the patients who had a lesion suspicious of malignancy on radiology were included in the study and the patients who were diagnosed as lesions suspicious of infective etiology were excluded from the study. The diagnostic accuracy was

equal to 96.6%. In a retrospective study done by Rimondi *et al*. on 430 patients, the diagnostic accuracy of 93.3%.[22] The study done by Lis *et al*. shows diagnostic accuracy of CT-guided spinal biopsy equal to 89%.[20] In a study of 71 cases by Dave *et al*., the diagnosis was established in 88.7% of cases.[23] In our study, CT-guided biopsy was done in patients radiologically suspicious of metastasis as it helped us in diagnosing the metastatic lesion and evaded the complications of surgery and open biopsy. Open biopsy was done in only one patient. In addition to CT-guided biopsy, fluoroscopy-guided biopsy is another method of image-guided spine biopsy. Advantage of fluoroscopic biopsy is that it can be done in operation theater since in case of a major complication, the patient can be treated surgically and immediately. However, CT-guided biopsy gives more details in anatomy. Complication rates in a meta-analysis did not show a statistical difference between these techniques and also the percentages of negative biopsy are similar.[27]

Conclusion

CT-guided biopsy is a very important diagnostic tool for evaluation of patients with suspected metastatic lesions of spine with unknown primary. The diagnostic accuracy of the procedure in our study on thirty patients was 96.66%. This procedure saved unnecessary surgical exploration of patients. Forty percent of patients had plasmacytoma, 40% had metastatic carcinomas, 6.66% had non-Hodgkin's lymphoma, and 3.33% had small round cell tumor.

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Conflicts of interest

There are no conflicts of interest.

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