

Original Research Article

Fluoroscopic guided percutaneous transpedicular biopsy of vertebral body lesion: a safe and effective procedure

Puneet Chamakeri, Anil Bulagond*, Srikant Kulkarni, Sharad Shirol, Vijay Patil

Department of Orthopaedics, BLDEU'S Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapur, Karnataka, India

Received: 11 August 2017

Revised: 29 August 2017

Accepted: 30 August 2017

*Correspondence:

Dr. Anil Bulagond,

E-mail: puneethchamakeri@gmail.com

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ABSTRACT

Background: Vertebral biopsy is suitable for patients with intractable back pain and vertebral body lesions that are detected with noninvasive imaging modalities. Histologic confirmation is necessary for correct diagnosis and subsequent clinical management. Percutaneous biopsy is less invasive and cost-effective.

Methods: Twenty three patients with history of severe back pain with vertebral body lesion identified by any of computed tomography (CT) or magnetic resonance imaging (MRI) were taken up for percutaneous biopsy. Lesion level was determined under fluoroscopy. Biopsy was taken with trephine needle under local anesthesia. Accuracy and effectiveness analyzed after histologic reports.

Results: Among 23 patients, 2 were having malignant primary lesions (8.6%), 8 were having vertebral metastasis (35%), 10 were having infectious etiology (43.4%) and 3 were osteoporotic fractures. There were no complications. One unsuspected secondary malignancy was detected. True positive cases were 19; true negative cases were 3 and one false negative case. Overall accuracy is 95%.

Conclusions: This minimal invasive technique is simple, safe and effective in diagnosis of malignancy and infection aiding the treating surgeon in their further management. It is also useful in detecting unsuspected malignancy.

Keywords: Fluoroscopic, Percutaneous transpedicular, Vertebral body lesions

INTRODUCTION

Vertebral biopsy is suitable for patients with intractable back pain and vertebral body lesions in the form of unusual foci of vertebral bone marrow that are identified with noninvasive imaging modalities, such as magnetic resonance imaging (MRI) or computed tomography (CT). Malignant lesions are strongly suspected on Imaging when there is presence of convex contour of the posterior vertebral border, epidural or paravertebral masses and infiltration of the vertebral posterior elements.^{1,2} These imaging modalities have high sensitivity but low specificity.

Histologic confirmation is necessary for correct diagnosis and alter line of treatment such as surgery, chemotherapy, radiation therapy, and antibiotic therapy. The gold standard method is open biopsy with 98% of accuracy.³ However, it has disadvantage of additional morbidity.⁴

Percutaneous biopsy is less invasive and cost-effective.⁵ Image-guided spine biopsy procedures are typically implemented to diagnose suspected primary or secondary vertebral neoplasms or to evaluate for the presence of infectious spondylitis.⁶ The first percutaneous spine biopsy was reported in 1935 by Robertson and Ball.⁷ The first percutaneous transpedicular vertebral biopsy was

done by Stringham et al.⁸ Complications include active hemorrhage, hematoma, vascular injury, neural injury (spinal cord or nerve), pneumothorax, infection, and meningitis.

The purpose of this study is to evaluate the effectiveness in detecting malignancy and infection of vertebral lesions through transpedicular biopsy.

METHODS

Study was done in Department of Orthopedics, Shri B M Patil Medical College Hospital and Research Centre, Vijayapur. Twenty Three patients (9 males and 14 females, age between 30-70 years) with history of severe back pain with vertebral body lesion detected by either Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) were taken up for percutaneous biopsy. Study period was from November 2014 to January 2017. A prospective study was done after taking informed written consent from the patients.

All patients with severe back pain with or without neurological deficits with vertebral body lesion (thoracic and lumbar) evaluated on either MRI or CT, were included in this study. Two cases are shown here with their MRI of lumbosacral spine (Figure 1a, 1b, 2a and 2b). Patients with bleeding diathesis and suspected vascular lesions were excluded from the study.

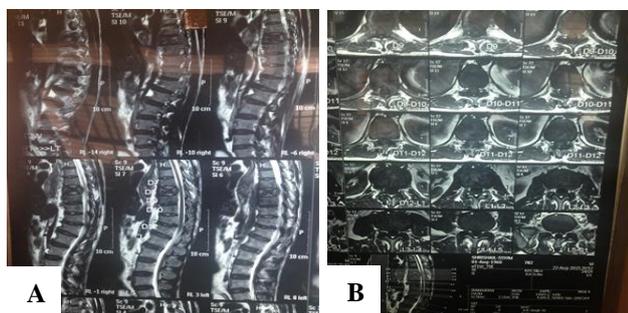


Figure 1: A case of D8 burst fracture following trivial trauma with severe pain, suspecting pathological fracture. (A) MRI LS spine sagittal view, (B) MRI LS spine axial view.

Procedure was performed both on an inpatient basis and outpatient basis. Patient was evaluated with routine blood investigations including coagulation profile, MRI, kept nil by mouth for a minimum of 6 hours prior to the procedure. All biopsies were performed with fluoroscopic guidance, and using the trephine biopsy kits under local anesthesia with/without intravenous sedation.

As all patients had lesions over thoracic and lumbar region, patients were positioned in prone. Lesion level was determined under fluoroscopy. Part painted, draped aseptically. After local anesthesia with 1% lidocaine, small incision of 0.5-1 cm was made and the thin needle of the trephine set was advanced under guidance of

biplanar fluoroscopy until it reached the periosteum over the pedicle. Again, 1% lidocaine is injected to anaesthetize deeper structures including the periosteum. The fine needle was exchanged with the guidewire. Over the guidewire, the external sheath was introduced till the pedicular periosteum (Figure 3). The guidewire removed and aspiration was done first with 10 cc syringe followed by biopsies using the cutting cannula after confirming under fluoroscopy (Figure 4).

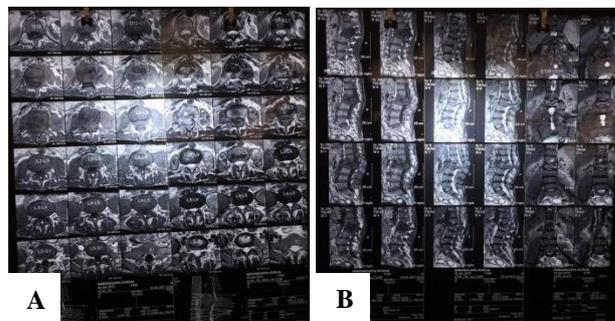


Figure 2: A case of severe backache with bilateral lower limb weakness with fever, suspecting tuberculosis. (A) MRI LS spine axial view, (B) MRI LS spine sagittal view.



Figure 3: Intraoperative fluoroscopic view.



Figure 4: Biopsy specimen.

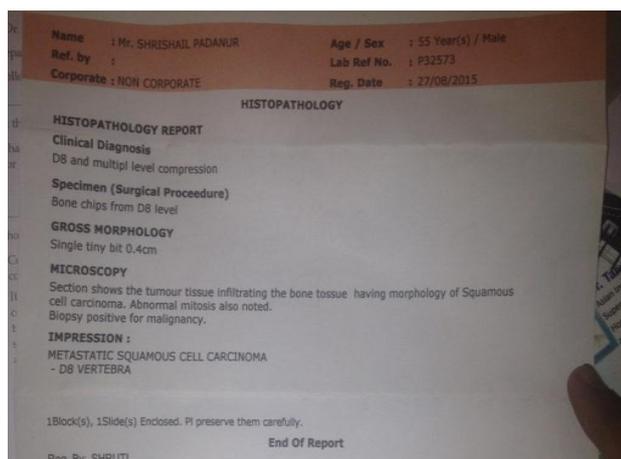


Figure 5: Histopathology report.

For histocytologic evaluation, two to three core biopsy samples were preserved in 10% formalin solution; and for culture and sensitivity, samples were collected in sterile dry tubes. The average procedure time was 30 min. A sterile dressing was placed over the skin entry site. The procedure was well tolerated by all patients and there were no neurological and pulmonary complications. The postoperative hospital stay lasted at least 24 hours.

RESULTS

Among 23 patients taken for percutaneous transpedicular biopsy, all specimens were adequate. After histopathological evaluation, 2 were having malignant primary lesions (8.6%), 8 were having vertebral metastasis (35%), 10 were having infectious etiology (43.4%) and 3 were osteoporotic fractures. Table 1 shows distribution of our diagnosis. Table 2 shows gender distribution. Table 3 shows anatomic level distribution in our study.

Table 1: Distribution of cases by diagnosis.

S. no	Diagnosis	No.	Percentage (%)
1	Osteoporotic fracture	3	13.0
2	Primary malignancy	2	8.6
3	Secondary malignancy	8	35.0
4	Infection	10	43.4

Table 2: Gender distribution.

Gender	No. of patients	Percentage (%)
Male	9	39.1
Female	14	60.9

Table 3: Anatomic level distribution.

Anatomic level	No. of patients	Percentage (%)
Thoracic spine	15	65.2
Lumbar spine	8	34.8

There was no necessity for repeat procedure. Complications regarding procedure were not present. All lesions were predominantly situated in thoracolumbar and lumbar region.

Of two primary lesions, both were diagnosed with multiple myeloma. Metastasis include adenocarcinoma of lung in 1, adenocarcinoma of breast in 2, squamous cell carcinoma of lung in 1, squamous cell carcinoma of esophagus in 2 and prostate cancer in 1. There was 1 unsuspected case (4.7%) which was diagnosed with squamous cell carcinoma of esophagus.

Among 10 infectious conditions, 6 were diagnosed with Tuberculosis, 3 with acute nonspecific infection which required culture reports for confirmation and 1 with chronic nonspecific inflammation. In the view of clinical and radiological findings of tuberculosis, anti-tuberculosis treatment was started for the one diagnosed with chronic nonspecific inflammation. Symptoms subsided with consequent follow up. Hence, it was considered as false negative.

True positive cases were 19, 3 osteoporotic fractures were considered as true negative cases and one false negative case. Overall accuracy is 95%.

DISCUSSION

There is often overlap in the imaging features of malignant and non-malignant lesions on MRI.⁹ The knowledge of pathology of these lesions will help in subsequent treatment. The rates of unsuspected malignancy on percutaneous biopsy range from 0.4% to 7.3%.¹⁰⁻¹² Our study detected one unsuspected secondary malignancy (4.7%).

There have been studies which have evaluated the efficacy of percutaneous biopsy in the management of spinal lesions. To avoid pulmonary complications from posterolateral approach in thoracic, the transpedicular approach under fluoroscopic guidance gives best results.^{13,14} The most common complications are pulmonary, neurologic, and infective disorders in these orders respectively. There were no such complications in our study.

With increasing use of MR imaging, vertebral lesions are being identified frequently. However, specificity of MR images is often less to determine an adequate strategy of treatment. Therefore, vertebral biopsies are performed increasingly. Fluoroscopy allows instantaneous control of the position of the needles in all directions.^{15,16}

Two approaches- the posterolateral and transpedicular approach depending on the location of the lesion are used. The posterolateral approach is used if the lesion is in the disk space or if it is located in the lower part of the vertebral body.¹⁷ The transpedicular approach is favorable if the lesion is located in the posterior half of

the vertebral body or in the pedicle or in the entire vertebral body. In our study group, predominantly thoracolumbar and lumbar vertebral bodies were involved and transpedicular approach used.

Osteoporotic compression fractures occur especially around thoracolumbar junction as it is transition for thoracic kyphosis and lumbar lordosis. Moreover vertebral bodies at this junction are smaller compared to lower lumbar vertebral bodies and upper thoracic vertebrae are supported with rib cage. Our study detected 3 osteoporotic compression fractures at T11-L1 vertebrae.

The most common primary vertebral tumor is multiple myeloma (26% of primary vertebral tumors).¹⁸ Spinal lesions occur in the vertebral body and lower thoracic and upper lumbar spine most frequently.¹⁹ The thoracic spine is the most common site of spinal metastases because of its greater vertebral volume and venous drainage.

CONCLUSION

This minimal invasive technique under local anaesthesia is simple, safe and effective in diagnosis of malignancy and infection aiding the treating surgeon in their further management. It is also useful in detecting unsuspected malignancy.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Chamakeri P, Bulagond A, Kulkarni S, Shirol M, Patil V. Fluoroscopic guided percutaneous transpedicular biopsy of vertebral body lesion: a safe and effective procedure. *Int J Res Orthop* 2017;3:1088-91.