

Efficacy of Percutaneous Transpedicular Needle Biopsy in Vertebral Pathologies Under Fluoroscopic Guidance

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ABSTRACT

Objective: To evaluate the efficacy of positive findings on Transpedicular needle biopsy under fluoroscopic guidance in clinically identifiable cases of vertebral pathologies.

Methodology: A total of 55 patients were included in the study, from February 2009 to August 2009, at Shaikh Zayed Hospital, Lahore. 37(67.3%) were male and 18(32.7%) were female. Patients with bleeding diathesis, decreased platelet count (< 75,000), suspected vascular lesion & unco-operative patient were excluded from the study. Patients were followed up till the arrival of biopsy report. Outcome was classified as positive or negative. Positive result was suggested by patient's clinical course. Insufficient material for reporting was labeled as negative result.

Results: The age ranged from 18–80 years. Mean age of patients was 53.54 ± 16.99 years. Positive diagnosis was obtained in 38 out of 55(69.1%) patients. The result was negative in 17(30.9%) patients. Out of 38 positive results, 28(50.9%) were of Tumor/Mets, 8(14.5%) of Infection, 2(3.6%) of Osteoporosis.

Conclusion: Our results show that image-guided percutaneous transpedicular needle biopsy is 69.1% effective and safe and had no complications.

Key words: Positive finding, Negative finding, and Percutaneous transpedicular biopsy

INTRODUCTION

Early infiltrating lesions of the spine in which pathological changes are confined to the vertebral bodies frequently present a considerable diagnostic problem, despite improved radiological and laboratory techniques. Only by obtaining evidence by biopsy can a sound pathological diagnosis be made and the appropriate treatment instituted^{1,2,3}.

Open biopsy is considered to be the gold standard for the diagnosis of bone lesions, with 98% accuracy. Shortcomings associated with open biopsy include skin, bone, and soft-tissue problems (with a prevalence of as high as 17%), the risk of a diagnosis error (with a prevalence of as high as 18%), and the risk of missing a small lesion.² Percutaneous biopsy is becoming increasingly common.³ Local anesthesia & an outpatient setting contribute to enhance cost-effectiveness. Local anesthesia also allows nerve root monitoring during biopsy^{4,5,6}. The first report of percutaneous spine biopsy was in 1935 by Robertson and Ball^{4,5}. Their procedures, however, did not utilize imaging guidance.

Siffert and Arkin⁷ utilized a posterolateral approach for spine biopsy using radiographic guidance. Fluoroscopy-guided spine biopsy was subsequently reported in 1969, and CT-guided spine biopsy was reported in 1981^{6,7}.

Although the location and type of lesion as well as the type of needle system have been mentioned as determinants of accuracy, there is still controversy regarding the size of the needle and whether a computed tomography scan or fluoroscopy should be used as guidance for spine biopsy. We conducted a prospective study to evaluate the frequency of positive findings on Transpedicular needle biopsy under fluoroscopic guidance in vertebral pathologies.

METHODOLOGY

The study population consisted of patients attending the inpatients as well as emergency Department of Shaikh Zayed hospital. Fifty-five patients fulfilling the selection criteria were identified were taken about their inclusion in the study. Risks and benefits of the procedure were discussed with the patients. The demographic profiles (i.e. age, sex) were recorded. The following laboratory parameters were assessed: hematocrit, hemoglobin, platelet count, Prothrombin Time (PT), Partial Thromboplastin Time (PTT), International Normalized Ratio (INR), Blood Urea Nitrogen (BUN) and creatinine.

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Radiographs and MRI of the spine were carried out according to clinical findings.

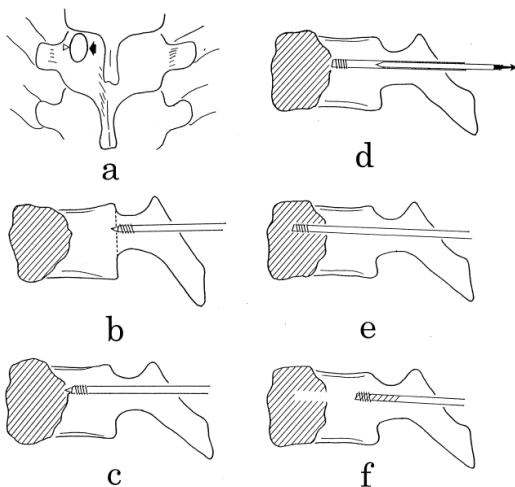
All patients were kept nil per mouth for six hours before procedure. All patients received single dose of 2nd generation cephalosporin preoperatively. Patients kept prone. After all aseptic measures, pathological lesion was identified under image intensifier.

a) The needle (Osteo-site Bone Biopsy Needle; Cook Inc.) tip was advanced to the outside of the pedicle (open arrowhead). Care was taken that the needle tip does not exceed the inside cortex of the pedicle (closed arrow in **a**) until the needle tip was seen to pass through the pedicle on the lateral image (**b**). The obturator was not withdrawn until biopsy needle had reached a point just before the target site (**c-f**).

Biopsy was taken and sent to laboratory for histopathological examination. All procedures were performed under supervision as in-patients

POST-OPERATIVE CARE

Patients were nursed in supine position, keeping spine in extension for 24 hours. Patients were mobilized with the help of hyperextension brace on second post-operative day. Post-operatively patients were assessed for respiratory distress, hypotension, nerve injury, and wound infection.



Transpedicular biopsy technique at author's institution

RESULTS

In this study a total of 55 patients were observed in which 8(14.5%) patients were in age range 21-30 years, 5(9.1%) patients were in age range 31-40 years, 5(12.7%) patients were in age range 41-50

years, 12(21.8%) patients were in age range 51-60 years, 14(25.5%) patients were in age range 61-70 years and 9(16.4%) patients were in age range 71-80 years. Mean age was 55 years with SD \pm 14.92. Among 55 patients, 37 (67.3 %) were male and 18

Table 1: Age Distribution (n = 55)

Age Groups (In Years)	Frequencies	Percentage
18-20	0	0
21-30	8	14.5
31-40	5	9.1
41-50	7	12.7
51-60	12	21.8
61-70	14	25.5
71-80	9	16.4
Total	55	100

Graph: Gender Distribution (n = 55)

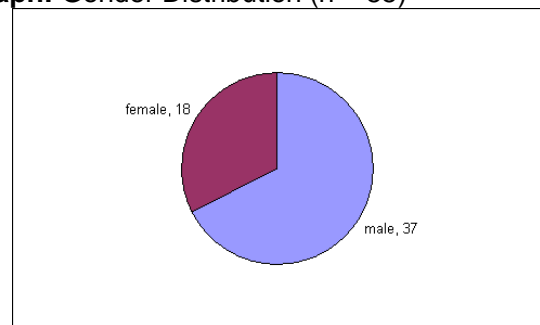


Table 2: Diagnosis of pathological lesions

Diagnosis	Percentage
Infection	8 (14.5 %)
TB	6
Eosinophilic granuloma	1
Brucellosis	1
Tumor / mets	28 (50.9 %)
Metastasis	19
Lymphoma	5
Myeloma	4
Osteoporosis	2 (3.6 %)
Negative result	17 (30.9 %)

(32.7 %) were female. Maximum no. of patients, 14 patients (25.5%), were in age group of 61-70 years with positive diagnosis made in 11 patients. Positive diagnosis was made in 38 out of 55 patients (69.1%). The result was negative in 17 (30.9 %) patients. Out of 38 positive cases, 28 (50.9 %) were of tumor / mets, 8(14.5 %) of infection, 2(3.6 %) of osteoporosis. No single

patient had bleeding, infection, nerve / cord injury, fracture, pneumothorax. The pathological lesions were localized to thoracic spine in 41 cases and lumbar spine in 14 cases.

Table 4: Complications of Transpedicular Biopsy

Complication	Percentage
Infection	0
Nerve/cord injury	0
Pneumothorax	0
Retained drain	0
Bleeding	0

DISCUSSION

Spine lesions are frequently secondary to disease processes elsewhere in the body. Infections, primary tumors, and metastases are the most common lesions of the vertebrae. Adequate treatment of these lesions depends on an accurate histological diagnosis. The most common approach to biopsy of the vertebral bodies is posterolateral. However, different approaches have been described as an alternative to the classic posterolateral approach because of the technique-related difficulties and the risk of complications. Renfrew et al.²³ described the percutaneous transpedicular biopsy technique in 1991, however, only recently this method has been widely taken up, owing to advances in percutaneous vertebroplasty, done via transpedicular technique^{2, 12}.

In our study, mean age of the patients at the time of procedure was 53.54 ± 16.99 (Range 18 – 80 years). Similar results were found in other studies like Sucu HK et al.⁶, had shown mean age at the time of procedure was 57 years (Range 11–81 years) while Ashizawa R et al.³², had shown mean age at the time of procedure was 61 years (Range 29 –85 years).

In present study, 37 patients (67.3 %) were male and 18 (32.7 %) were female. Similar results were found in other studies like Dave BR et al.¹⁶, had shown 51 patients (71.83 %) were male and 20 (28.16 %) were female while Hadjipavlou AG et al.⁴², had shown 41 patients (60.29%) were male and 27 (39.70 %) were female. So there is no significant difference regarding the number of male and female patients.

In our study, positive diagnosis was established in 70.3% of male patients and 66.7 % of female patients. The mean age in non-diagnostic group was 45.76 years, compared to

57.02 years in diagnostic group. Inferior results in female patients may be due in part to the fact that most of the patients when assessed clinically and radiographically were categorized as having an infectious etiology, the pathogen of which biopsy could not confirm. Reasons of which may be:

- 1) Biopsy of infectious spondylitis in patients who are already on broad-spectrum antibiotics.
- 2) Improper specimen handling,
- 3) Failure to perform microbiologic testing, or failure to follow specific cultures (e.g., *Mycobacterium tuberculosis*) for an extended period of observation.

In present study, diagnosis was established in 38 out of 55 patients (69.1 %). In study by Dave BR et al.¹⁶, diagnosis was established in 63 of 71 patients (88.7 %). In study by Ashizawa R et al.³², diagnosis was made in 24 out of 26 patients (92 %). In study by Stoker DJ et al.⁴¹, diagnosis was made in 120 out of 135 biopsies (88.9 %). In study by Hadjipavlou AG ET al.⁴², diagnosis was made in 67 out of 71 biopsies (94.36 %). In study by Ottolenghi CE¹¹, diagnosis was made in 73 % of biopsies. In study by Chauhan V et al.²², positive diagnosis was made in 76 out of 103 patients (73.8 %). The inferior results of the present study can be explained as: First the selection of a needle is dependent on lesion type (soft tissue or osseous), location (vertebra, disc, paraspinal soft tissues), and method of specimen acquisition. In a meta-analysis by Nourbakhsh A et al.², the conclusion was that in situations in which the use of a needle with a small inner diameter is highly effective (for example, in cases of metastatic lesions), the clinician should first consider using a needle with a smaller inner diameter to obtain the biopsy specimen because of the higher complication rate associated with large-bore needles. However, in cases of sclerotic lesions, in which obtaining an adequate sample can be difficult, the use of a needle with a larger inner diameter is desirable. Secondly, we did not follow -up on negative biopsies. Most of the studies in literature went on to have open biopsy to confirm the diagnosis and compare the finding with that of percutaneous technique. Third, aspiration biopsy was not performed in the present study; the two techniques of core / cutting and aspiration biopsy have been shown to be complementary and to increase the diagnostic accuracy of the procedure. Fourth, there are procedural pitfalls to the transpedicular technique. If the lesion is located predominantly in the disk space, as in cases of infectious disease,

the posterolateral approach should be used. This approach is also mandatory when a lesion is located in the lower part of the vertebral body; however, if the lesion is located in the posterior half of the vertebral body or if the pedicle is involved, the transpedicular approach is an effective method of biopsy. In case of lesions of the entire vertebral body, transpedicular approach is preferred.

Present study showed that transpedicular biopsy technique is a safe procedure, as no patient reported any complication like bleeding, nerve / cord injury, infection, pneumothorax. In study by Dave BR et al., no complications were identified. In study by Sucu HK et al.⁶, 1 out of 201 patients had retroperitoneal hematoma, which required surgery. In study by Moller S et al.¹⁹, there were 2 complications out of 34 biopsies (32 patients). Both developed hematoma and one of them needed surgery. In study by Hadjipavlou AG et al.⁴², 1 out of 68 patients had the complication of retained drainage tube, which required removal at a subsequent setting. Majority of the studies including the present study prove the safety of transpedicular biopsy technique.

In the present study, there were 8 cases of infection, 21 of metastasis, 7 of primary tumor, and 2 of osteoporosis. In study by Dave BR et al., there were 25 cases of infection, 8 of metastasis, 7 of primary tumor, and 21 of osteoporosis. In study by Sucu HK et al.⁶, infectious etiology was reported in 73 cases, metastasis in 40 cases, and primary tumor in 22 cases. In study by Moller S et al.¹⁹, infection was present in 9 cases, metastasis in 7, 5 had primary tumor and 3 had osteoporosis. The incidence of infection is much less as compared to other studies. This is partly due to the fact that tuberculosis is endemic in subcontinent, and as such most of the patients are started on empirical therapy; and same is the case with osteoporotic patients.

However the increased incidence of osteoporosis in rest of the literature can also be explained by the fact that minimally invasive methods of treating the symptoms of spinal compression fractures have attracted the attention and interest of both surgeons and patients over the past two decades. Percutaneous vertebral body injection procedures currently are used to stabilize and reinforce weakened or fractured bone resulting from metastatic disease and severe osteoporosis.

Subjecting a patient to anti-tuberculosis treatment on a presumptive diagnosis without

tissue diagnosis not only exposes him to the side effects of toxic drugs but also adds onto the financial burden and is considered a social stigma in our society. Similarly a presumptive diagnosis of metastasis to the spine if treated without tissue diagnosis would have an adverse psychological impact. Biopsy is a necessarily before commencing any therapy. The transpedicular technique has not been previously reported in Pakistan, and as more expertise is gained with this technique, results may get better.

CONCLUSION

We conclude that image-guided percutaneous transpedicular needle biopsy is effective, safe. The information obtained from the biopsy procedure can be used to guide patient management. Performing both a core needle and fine needle aspiration biopsy are complementary techniques, with the optimal approach resulting in high diagnostic accuracy and a low complication rate.

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