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Role of image intensified fluoroscopy guided closed vertebral biopsy in perplexed lesions of spine: A retrospective study

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Abstract

Background: The percutaneous image-guided procedure is faster and more cost-effective and has an overall lower risk of complications. Despite considering image intensified fluoroscopy guided biopsy of spine as one of the valuable diagnostic procedure, favorable diagnostic yield of this method in Indian population has not been convincingly proved. Hence this study was undertaken to determine the diagnostic yield of this procedure comparing with the available literature.

Materials and Methods: A record based retrospective study was conducted at hospitals affiliated to Kasturba Medical college, Manipal. 134 patients who underwent image intensified fluoroscopy guided closed vertebral biopsy were included in the present study. Data was collected by using a semi structured questionnaire and was analyzed by statistical package for social sciences 11.5. The results were expressed as percentages.

Results: The diagnostic yield taking all reports into consideration is 98.5%. Fifth lumbar vertebra was most commonly biopsied level in 32(23.8%). Complications occurred only in 3 (2.2%) out of 134 patients.

Conclusion: Image intensified fluoroscopy guided closed vertebral biopsy can be considered as first modality of invasive investigation for all perplexed lesions of lumbar spine. Simplicity and cost effectiveness of the procedure makes it a reasonable option.

Keywords: fluoroscopy, vertebral biopsy, perplexed

Introduction

Percutaneous needle biopsy of lumbar vertebrae was first described by Robertson and Ball ^[1] in 1935. Siffert and Arkin ^[2] initially published their study of closed vertebral biopsy using radiographic assistance and later it was Lalli ^[3]. Who simplified the procedure by using image intensified fluoroscopy. Led by the innovations in the imaging modalities, interventions and instruments, the advantages of closed vertebral biopsy have improved significantly. Providing a histopathological diagnosis for a radiological lesion in the vertebra is the current demand in the era of evidence based medicine. Bony tuberculosis, pyogenic spondylitis, primary and secondary malignancies of spine are to be proven histopathologically after subjecting the patient through any mode of tissue sampling technique so that appropriate treatment can be started ^[4, 5]. Hence, implementing a biopsy procedure to the vertebra will not only ameliorates the probability of accomplishing a diagnosis but also effectuates early diagnosis. The percutaneous image-guided procedure is faster and more cost-effective and has an overall lower risk of complications ^[6]. Despite considering image intensified fluoroscopy guided biopsy of spine as one of the valuable diagnostic procedure, favorable diagnostic yield of this method in Indian population has not been convincingly proved. Hence this study was undertaken to determine the diagnostic yield of this procedure comparing with the available literature.

Material and methods

Study design and participants

The present study was conducted in 2012 among 134 patients who underwent image intensified fluoroscopy guided closed vertebral biopsy at tertiary care teaching hospital of Kasturba medical college, Manipal during a span of seven years (April 2005-March 2012).

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Patients with lesions involving the cervical vertebra and first to eleventh thoracic vertebra were not involved in the study as it was not feasible by this approach.

Study instrument

A questionnaire was developed after doing an extensive search of literature and by consulting experts in respective field. Alterations were done to the proforma based on the feedback obtained after pilot study. The questionnaire consisted of four sections. The first section consisted of demographic profile. The second section consisted of clinical details. The third and the final section consisted of radiological and biopsy findings.

Ethical consideration

During data collection for the current study the ethical principles were followed. The protocol of the present study was submitted to the Institutional Ethics Committee of Kasturba medical college, Manipal (Manipal University). Permissions were also sought from Medical Superintendent of the hospital attached to our medical college. The researcher visited the record section and after reviewing the records carefully a detailed information was obtained as per the proforma. Confidentiality of the patient details were maintained

Statistical analysis

Data collected was entered and analyzed using Statistical Package for Social Sciences (SPSS version 11.5; SPSS Inc., 233 South Wacker drive, 11th floor, Chicago, IL 60606-6412). The results obtained were expressed in the form of percentages, means and standard deviations.

Results

Table 1: Baseline characteristics of the study participants (n=134).

Characteristics	Number	Percentage
Gender		
Males	80	59.7
Females	54	40.3
Age(years)		
Young adults(<30)	11	08.2
Adults(30-50)	41	30.6
Elderly(>50)	82	61.2

Table 1 shows that male predominates females in the ratio of 3:2 in the present study. Most of the patients in the current study belonged to age group of more than 50yrs (61.2%). The mean age of the patients was 53.43(14.43) yrs (range 13-84yrs). Erythrocyte Sedimentation Rate was elevated in 122 (91%) patients and it was more than 50 in 82 (61.2%) patients. Eight patients (6%) with definite pathology had normal erythrocyte sedimentation rate.

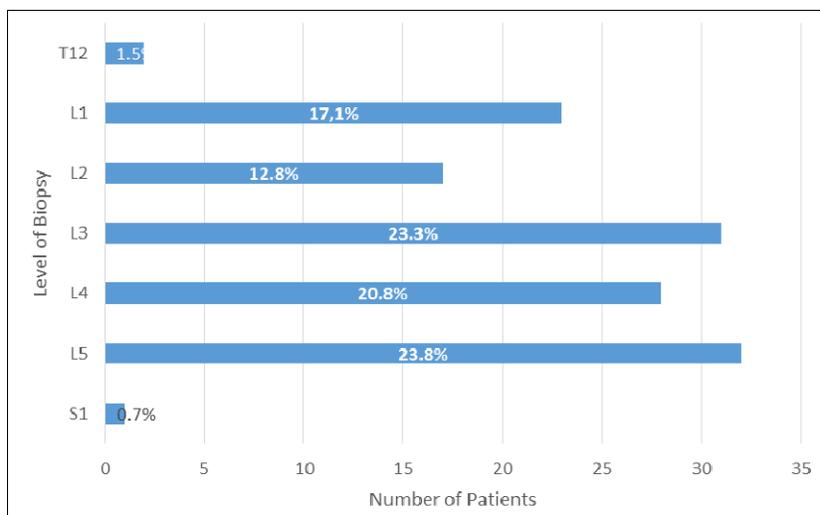


Fig 1: Distribution of level of biopsy (N=134)

The procedure was performed in 131 lumbar, two thoracic and one sacral lesions as shown in figure 1.

Fifth lumbar vertebra was most commonly biopsied level in 32(23.8%).

Complications occurred only in 3 (2.2%) out of 134 patients (1 secondary bacterial infection, 1 neurological complication, 1 persistence of biopsy tract as a sinus).

Table 2: Final diagnosis achieved by close vertebral biopsy (n=134)

Diagnosis	Number	Percentage
Tuberculosis	40	29.9
Malignancies(primary/secondary)	34	25.4
Osteomyelitis	08	06.0
Others (systemic mastocytosis and Spinal Brucellosis)	02	01.5
Inconclusive	02	01.5
Ruled out any pathology	48	35.8

The diagnostic yield taking all reports into consideration is 98.5% as observed in table 2. Conclusive diagnosis was not obtained in two patients since samples obtained were inadequate.

Discussion

A biopsy method should be simple enough for the surgeon to perform without causing much harm to the patient and at the same time it should have rewarding outcome with an acceptable diagnostic yield. Extensive research has been conducted on approaches, instruments and imaging modalities used for closed vertebral biopsy [2-3, 6-15]. Posterolateral approach is the most widely used approach for lumbar spine biopsy [15]. The accuracy of vertebral biopsy using the posterolateral approach in various studies ranges from 50-91% as cited by Pierot and Boulin [15]. Posterolateral approach at thoracic levels might lead to pulmonary

complications^[15] hence in our set up we performed this procedure mainly for lumbar segments. Transpedicular approach may be preferred in thoracic region under CT guidance with thinner needles^[8, 9, 15-17]. There is not much of difference in accuracy of either posterolateral or transpedicular approach^[15, 17]. The outcomes of computed tomography and fluoroscopy assisted biopsy did not show any significant difference^[17]. The decision on which imaging modality and approach are to be used, requires the consideration of various factors, such as type of lesion, level of lesion, and vertebral location of the lesion and the expertise of the physician. Biopsy needles with larger internal diameter provide ideal samples for histopathology^[7] and diagnostic rate increases when the internal diameter of the biopsy trephine is larger^[7, 18]. We used the Craig's trephine with internal diameter of 3mm.

All our patients were subjected to image intensified fluoroscopy guided closed vertebral biopsy under intravenous sedation and local anesthesia by the posterolateral approach.

In the present study which includes 134 participants, the diagnostic yield was 98.5% and in two patients diagnosis was not obtained. This is in congruence with the study findings conducted at different parts of the globe. (Murphy, *et al* 94%; Moller, *et al* 93.8%; Pierot and Boulin 89% Stoker, *et al* 88.9%; Dave, *et al* 88.7%^[6, 15, 18-20], whereas a lower yield was observed in studies conducted by Tehranzadeh *et al*^[21], 72%; and Kumar, *et al* 56%^[22].

Rimondi *et al.*^[8] concluded that computed tomography guided closed vertebral biopsy can be considered as gold standard technique for spinal biopsy in their study of 430 patients achieving a diagnostic accuracy of 93% in lumbar spine. The diagnostic yield of our study was comparable to a computed tomography guided biopsy.

Out of 134 patients, majority of our diagnosis included tuberculosis (29.9%) and metastasis (17.9%) which is in accordance with incidence of another Indian study conducted at Chennai^[22]. Pyogenic spondylitis, myeloma, non-Hodgkin's lymphoma, acute lymphoblastic leukemia and systemic mastocytosis were the other diseases proven by closed vertebral biopsy in our study. We were also able to accomplish a diagnosis of certain rare conditions such as spinal brucellosis and primitive neuroectodermal tumor. It establishes the fact that a specific diagnosis can be achieved by this percutaneous technique.

Complications of the procedure was noted Only in 3 (2.2%) patients, In the first patient, diagnosis was not achieved by closed vertebral biopsy, but in view of persistent symptoms he was considered for open biopsy after few days. Histopathology and Polymerase Chain Reaction reports were negative after open biopsy but microbiological culture grew Methicillin Resistant *Staphylococcus aureus* (MRSA). This can be viewed in two perspectives. *i*) As a secondary bacterial infection complicating the percutaneous biopsy. *ii*) False negative result of closed vertebral biopsy.

The second patient was subjected to closed vertebral biopsy of T12 vertebra. Histopathology was confirmatory of tuberculosis. However, he developed progressive neurological deficit after the procedure and had to undergo emergency decompression.

The third patient who had the complication was confirmed to be tuberculosis by closed vertebral biopsy and was started on anti-tubercular treatment. She came back with persistence of the biopsy tract with active discharge. Repeat Magnetic Resonance Imaging showed showed destruction of L1 vertebra with psoas abscess. She had to undergo definitive

surgical procedure for the same. Material obtained on this occasion also confirmed the diagnosis to be tuberculosis.

Complication rate in our study group is at par with the existing literature^[6, 15, 18, 21, 23, 24]. Fyfe *et al* observed complications in one fourth of his study cases^[7].

Since the procedure was restricted to lumbar spine, the diagnostic yield achieved and complications noted in this study may not be applied to all the segments of the spine.

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Nil

Conflict of interest

There are no conflicts of interest

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