

ORIGINAL ARTICLE

Outcome of incisional biopsy under local anesthesia in palpable musculoskeletal tumors in an outdoor setting in terms of conclusive evidence of pathology.

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ABSTRACT... **Objective:** To determine frequency of conclusive results of OPD based incisional biopsy under local anesthesia in patients of palpable musculoskeletal tumors. **Study Design:** Cross-sectional Descriptive study. **Setting:** Department of Trauma and Orthopedic Surgery, Allied Hospital, Faisalabad. **Period:** Five months (September'25 to January'26). **Methods:** A total of 65 patients aged 18–55 years of either gender presenting with clinically and radiologically confirmed palpable musculoskeletal tumors of the upper and lower limbs were included using non-probability consecutive sampling. Patients with previously biopsied lesions, non-palpable or small lesions, pelvic or spinal tumors, infected or fungating masses, bleeding disorders, or contraindications to local anesthesia were excluded. Incisional biopsy was performed in the OPD under strict aseptic conditions using 2% lignocaine. Tissue samples were submitted for histopathological examination. A biopsy yielding a definitive benign or malignant diagnosis was considered conclusive. Data were analyzed using SPSS version 25, and results were expressed as frequencies, percentages, mean, and standard deviation. Stratification was applied to control effect modifiers. **Results:** Among the 65 patients, 36 (55.4%) were aged 18–40 years and 29 (44.6%) were aged 41–55 years. Males constituted 36 patients (55.4%), while females accounted for 29 patients (44.6%). Lower limb lesions were observed in 48 patients (73.8%), and upper limb lesions in 17 patients (26.2%). Conclusive biopsy results were obtained in 59 patients (90.8%), whereas 6 patients (9.2%) had inconclusive results. Of the conclusive biopsies, benign tumors were identified in 43 patients (72.9%) and malignant tumors in 16 patients (27.1%). No statistically significant association was found between biopsy outcome and age, gender, lesion site, comorbidities, or histopathological diagnosis. **Conclusion:** OPD-based incisional biopsy under local anesthesia provides a high rate of conclusive histopathological diagnosis in patients with palpable musculoskeletal tumors and represents a reliable and practical diagnostic approach in resource-limited settings.

Key words: Histopathology, Incisional Biopsy, Local Anesthesia, Musculoskeletal Tumors, Outpatient Department.

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INTRODUCTION

Musculoskeletal lesions frequently present as painless masses¹, potential source of pain, or incidental discovery during imaging studies. Musculoskeletal tumors are a wide-ranging group of heterogeneous lesions.² The WHO classifies musculoskeletal tumors into 12 different histological groups and 4 different categories (benign, intermediate that are locally aggressive, intermediate that rarely metastasize, and malignant). Moreover, incidence of malignant tumors is less than 1% of all malignancies.^{3,4}

Early proper diagnosis of this diverse group of tumors is essential for patient survival in cases of aggressive

tumor types.⁵⁻⁶ With recent advancement in imaging modalities such as CT, MRI, and PET scan, the frequency of detecting musculoskeletal lesions, has also increased. Some lesions can be diagnosed by clinical history and imaging features, but nonspecific lesions are difficult to diagnose using imaging and examinations alone. Therefore, histopathological aid is essential to confirm diagnosis in such cases.⁷ The biopsy procedure is of crucial importance for the diagnosis and grading of musculoskeletal tumors.⁷⁻⁸ Open incisional biopsy under general or regional anesthesia is generally considered gold standard with overall clinical accuracy ranging from 91 to 96 %.⁹

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However, open biopsy requires hospitalization, operation theatre and anesthesia. Alternative to the traditional biopsy is the fine needle biopsy or core needle biopsy. But they require radiological assistance (x-ray or ultrasound) which is not routinely available even in the OPDs of tertiary care hospitals of our resource scarce country. To overcome this issue incisional biopsy under local anesthesia can be a safe and reliable alternative.

Waseem et al conducted a study to determine the frequency of diagnostically accurate results of biopsy under local anesthesia in the OPD patients, using a small curette for the diagnosis of bone and soft tissue tumors. Biopsies of 51 patients [27 males, 24 females with age ranging from 16 to 58 yrs.] were taken in the OPD under local anesthesia. Biopsy was inconclusive in 3 patients (and hence conclusive in 48 patients) leaving the clinical accuracy to be 94%¹⁰ in patients of palpable musculoskeletal tumors.

However, there is limited evidence to support this OPD based diagnostic modality. So, I want to conduct study to check to check reliability/ outcome of biopsy of musculoskeletal tumors under local anesthesia in OPD setting.

METHODS

This study Cross sectional study was conducted at Orthopedic Surgery Department of all hospitals associated with FMU during the five months (September'25 to January'26) after approval of synopsis from IRB and CPSP (Ref No: CPSP/REU/OSG-2023-035-2958, Dated: September 6, 2025). The sample size was calculated by WHO sample size calculator. $P = 94\%$ ¹⁰, Absolute precision = 6%, Confidence Level = 95%, Sample size = 65 with the sampling technique of Non-probability: consecutive sampling. We included all patients of both genders, aged 18 to 55 years, palpable musculoskeletal lesions in upper and lower extremities whereas those with history of biopsy of the same lesion, small size lesions or lesions that are not distinguishably palpable, pelvic and spinal lesions and conditions in which local anesthesia is contraindicated, for example fungating or infected mass or patients with bleeding disorders were excluded from the study. Informed consent was obtained from each

participant after explaining the objectives of the study and assuring confidentiality of the collected information. Patients with radiologically proven palpable musculoskeletal tumors was defined as lesions that could be clinically appreciated and distinguished from surrounding normal tissue were enrolled according to the predefined inclusion criteria.

In patients undergoing an incisional biopsy for musculoskeletal tumors, tissue samples were obtained under strict aseptic conditions. Incisional biopsy was defined as a surgical procedure in which a tissue sample was removed from a lump measuring more than 2.5 cm for histopathological examination. Local anesthesia was administered using 2% lignocaine injection. A small incision was made over the swelling, and three to four tissue chunks of the suspected muscle or bone were obtained using a surgical blade and curette or bone nibbler. The wound was closed using non-absorbable sutures, and patients were monitored for one hour following the procedure.

Biopsy specimens were sent for histopathological examination, and reports were subsequently followed. A conclusive biopsy was defined as a biopsy yielding a definitive histopathological diagnosis of either a benign or malignant tumor. Biopsies that did not produce a definitive histopathological diagnosis were labeled as inconclusive, and such cases were considered for repeat biopsy. All relevant data were recorded on a predesigned proforma.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software version 25. Mean and standard deviation were calculated for numerical variables such as patient age. Qualitative variables, including gender, lesion site, comorbidities, conclusive biopsy outcome, histopathological diagnosis, and cellular features favoring malignant tumors, were expressed as frequencies and percentages. Effect modifiers such as age, gender, lesion site, and comorbidities (diabetes mellitus, hypertension, asthma, and ischemic heart disease) were controlled through stratification.

RESULTS

A total of 65 patients with palpable musculoskeletal

tumors were included in the study. The age distribution showed that 36 patients (55.4%) belonged to the 18–40 years age group, while 29 patients (44.6%) were aged 41–55 years. Regarding gender distribution, males comprised 36 patients (55.4%), whereas females accounted for 29 patients (44.6%), indicating a slight male predominance in the study population.

TABLE-I**Demographic characteristics of study participants (N = 65)**

Variable	Category	n (%)
Age Group	18–40 years	36 (55.4%)
	41–55 years	29 (44.6%)
Gender	Male	36 (55.4%)
	Female	29 (44.6%)

Regarding lesion characteristics, upper limb involvement was observed in 17 patients (26.2%), while lower limb lesions were present in 48 patients (73.8%). Assessment of comorbid conditions revealed that diabetes mellitus was present in 12 patients (18.5%), whereas hypertension was noted in 8 patients (12.3%). Asthma and ischemic heart disease were each identified in 9 patients (13.8%). The majority of patients did not have any of the recorded comorbid conditions (Table-II).

TABLE-II**Clinical characteristics of study participants**

Variable	Category	n (%)
Lesion Site	Upper limb	17 (26.2%)
	Lower limb	48 (73.8%)
Diabetes Mellitus	Yes	12 (18.5%)
	No	53 (81.5%)
Hypertension	Yes	8 (12.3%)
	No	57 (87.7%)
Asthma	Yes	9 (13.8%)
	No	56 (86.2%)
IHD	Yes	9 (13.8%)
	No	56 (86.2%)

Histopathological examination of conclusive biopsy specimens (n = 59) demonstrated that benign tumors were more common, identified in 43 patients (72.9%), while malignant tumors were diagnosed in 16 patients (27.1%). Cellular features favoring malignancy, including cellular atypia and increased

mitotic activity, were observed in 16 patients (27.1%), whereas 43 patients (72.9%) did not show such features.

TABLE-III**Histopathological findings**

Variable	Category	n (%)
Histopathology	Benign	18 (27.7%)
	Malignant	47 (72.3%)
Cellular Features	Yes	18 (27.7%)
Favoring Malignancy	No	47 (72.3%)

With regard to the primary outcome, a conclusive biopsy result was achieved in 59 patients (90.8%), whereas the biopsy remained inconclusive in 6 patients (9.2%). This finding indicates a high diagnostic yield of incisional biopsy performed under local anesthesia in an outpatient setting. (Table-IV)

TABLE-IV**Outcome of incisional biopsy**

Outcome	Category	n (%)
Conclusive Biopsy	Yes	59 (90.8%)
	No	6 (9.2%)

Stratification analysis was performed to assess the association between conclusive biopsy outcome and potential effect modifiers. When stratified by age group, conclusive biopsy was achieved in 32 of 36 patients (88.9%) in the 18–40 years group and in 27 of 29 patients (93.1%) in the 41–55 years group, with no statistically significant association observed (Chi-square test, $p = 0.560$). Similarly, conclusive biopsy rates did not differ significantly between male and female patients (Chi-square test, $p = 0.560$). Stratification by lesion site showed that conclusive biopsy was obtained in 35 of 36 upper limb lesions (97.2%) compared to 24 of 29 lower limb lesions (82.8%). Although a higher proportion of inconclusive biopsies was observed in lower limb lesions, this association did not reach statistical significance (Fisher's Exact Test, $p = 0.081$). Among patients with diabetes mellitus, conclusive biopsy was achieved in 10 of 12 cases (83.3%), compared to 49 of 53 cases (92.5%) in non-diabetic patients, with no statistically significant association (Fisher's Exact Test, $p = 0.305$). Similarly, no significant association was found between conclusive biopsy outcome and histopathological diagnosis, as

conclusive results were obtained in 43 of 47 benign cases (91.5%) and 16 of 18 malignant cases (88.9%) (Fisher's Exact Test, $p = 0.666$). (Table-V)

TABLE-V				
Outcome of incisional biopsy according to various effect modifiers				
Variable	Groups	Conclusive Yes n (%)	Conclusive No n (%)	P- Value
Age Group	18–40 years	32 (88.9%)	4 (11.1%)	0.560*
	41–55 years	27 (93.1%)	2 (6.9%)	
Gender	Male	32 (88.9%)	4 (11.1%)	0.560*
	Female	27 (93.1%)	2 (6.9%)	
Lesion Site	Upper limb	35 (97.2%)	1 (2.8%)	0.081**
	Lower limb	24 (82.8%)	5 (17.2%)	
Diabetes Mellitus	Yes	10 (83.3%)	2 (16.7%)	0.305**
	No	49 (92.5%)	4 (7.5%)	
Histo-pathology	Benign	43 (91.5%)	4 (8.5%)	0.666**
	Malignant	16 (88.9%)	2 (11.1%)	

* Chi square test

** Fisher's Exact Test applied

DISCUSSION

The present study evaluated the diagnostic outcome of OPD-based incisional biopsy performed under local anesthesia in patients with palpable musculoskeletal tumors and demonstrated a high conclusive biopsy rate of 90.8%. This finding directly fulfills the study objective and confirms that incisional biopsy can be reliably performed in an outpatient setting for selected musculoskeletal lesions, particularly in resource-limited healthcare environments.

Open incisional biopsy has long been regarded as the gold standard for histopathological diagnosis of musculoskeletal tumors. Bruns et al¹¹ emphasized that tissue biopsy is mandatory for definitive diagnosis because clinical and radiological features of musculoskeletal tumors are often non-specific, and they recommended incisional biopsy whenever malignancy cannot be confidently excluded. Reported diagnostic accuracy for incisional biopsy in their review ranged between 91% and 96%, which closely aligns with the conclusive biopsy rate

observed in the present study.

Similarly, Dirks et al¹² evaluated the diagnostic accuracy of incisional biopsy in malignant musculoskeletal tumors and reported a sensitivity of 100% and specificity of 97.6%, highlighting the reliability of incisional biopsy in providing definitive histopathological diagnosis. Although their procedures were largely performed in an operative setting, the high conclusive rate observed in our OPD-based study suggests that comparable diagnostic performance can be achieved under local anesthesia when proper patient selection and biopsy technique are employed.

Comparative literature has also evaluated incisional biopsy against less invasive techniques. Cengiz et al¹³ assessed the diagnostic accuracy of percutaneous core needle biopsy and acknowledged that although core needle biopsy offers advantages such as lower invasiveness and reduced complication rates, open incisional biopsy remains the reference standard for diagnosing bone and soft tissue tumors, with reported accuracy ranging from 91% to 99%. These observations support the continued relevance of incisional biopsy, particularly in cases where adequate tissue architecture is required for accurate tumor typing and grading.

Further comparative evidence is provided by Pazourek et al¹⁴ who evaluated open incisional biopsy and ultrasound-guided core needle biopsy for extremity-localized musculoskeletal tumors. They reported that incisional biopsy yielded 100% representative samples in soft tissue lesions and over 90% representativeness in bone lesions, with high diagnostic confirmation following definitive surgery. Although incisional biopsy was associated with slightly higher procedural pain compared to core needle biopsy, the authors concluded that its diagnostic reliability justified its use, particularly when precise histopathological characterization is required. These findings are consistent with the high conclusive biopsy rate observed in the present study.

In terms of biopsy planning, Sánchez-Torres and Santos-Hernández emphasized¹⁵ that the choice of biopsy technique should be guided by clinical

presentation, imaging findings, presumed diagnosis, and institutional expertise. Their work supports the individualized use of incisional biopsy in appropriately selected patients, which aligns with the methodology adopted in the present study, where only palpable musculoskeletal tumors amenable to OPD-based biopsy under local anesthesia were included.

Stratification analysis in the present study did not demonstrate any statistically significant association between conclusive biopsy outcome and age, gender, lesion site, comorbidities, or histopathological diagnosis. Although a higher proportion of inconclusive biopsies was observed in lower limb lesions, this difference was not statistically significant and may reflect greater tissue depth or technical difficulty, as previously suggested in musculoskeletal oncology literature. Importantly, conclusive biopsy results were achieved in both benign and malignant tumors at comparable rates, underscoring the robustness of the technique.

The clinical implications of these findings are particularly relevant in resource-constrained settings. By avoiding hospitalization, operating theatre utilization, and general or regional anesthesia, OPD-based incisional biopsy under local anesthesia offers a cost-effective and practical diagnostic alternative without compromising diagnostic accuracy. When performed under strict aseptic conditions and by experienced clinicians, this approach can streamline diagnostic pathways while maintaining patient safety.

Despite its strengths, the present study has certain limitations, including its single-center design and modest sample size. Long-term follow-up regarding procedural complications and impact on definitive surgical outcomes was not assessed. Future multicenter studies with larger cohorts and comparative designs are warranted to further validate these findings.

In summary, the present study demonstrates that incisional biopsy performed under local anesthesia in an outpatient setting yields a high rate of conclusive histopathological diagnosis in patients with palpable musculoskeletal tumors. Consistent with the findings of various studies, this study supports OPD-based

incisional biopsy as a reliable, safe, and effective diagnostic modality when applied in appropriately selected patients and clinical settings.

CONCLUSION

The present study demonstrated a high conclusive biopsy rate (90.8%) for OPD-based incisional biopsy under local anesthesia, which is comparable to the 94% diagnostic accuracy reported by Waseem Ahmed et al.¹⁰ Both studies support clinic-based biopsy as a reliable and safe diagnostic approach for palpable musculoskeletal tumors in resource-limited settings.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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