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Diagnostic Value of Image-Guided Percutaneous Biopsy of Omental and Peritoneal Lesions

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ABSTRACT

Introduction: The peritoneum and omentum are frequently involved in both malignant and inflammatory conditions, many of which demonstrate overlapping imaging features. Image-guided percutaneous biopsy has emerged as a minimally invasive alternative to surgical sampling for histopathological confirmation.

Methods: A prospective observational study was conducted in the Department of Radiology at Nobel Medical College Teaching Hospital, Biratnagar, Nepal. Adults (≥18 years) undergoing image-guided percutaneous biopsy of peritoneal or omental lesions with available histopathology were included. Forty-three patients were enrolled consecutively. Procedures were performed under ultrasound or CT guidance using core needle biopsy or fine-needle aspiration cytology. Data were analyzed in SPSS v27 and expressed as mean ± standard deviation and frequency.

Results: The mean age of participants was 52.40 ± 13.20 years, with females comprising 58.1% of the study population. The average lesion size was 4.20 ± 1.60 cm. Peritoneal involvement was observed in 58.1% of cases, while 41.9% involved the omentum. Computed Tomography guidance was utilized in 72.1% of procedures, and core biopsy was performed in 86.0%. Technical success and diagnostic yield were both 97.7%. Malignancy was the most common diagnosis (67.4%), followed by tuberculous peritonitis (23.3%). Minor complications occurred in 7.0% of cases, with no major adverse events reported.

Conclusions: Image-guided percutaneous biopsy of omental and peritoneal lesions is a safe and reliable diagnostic method with high yield. It should be considered a first-line approach for tissue diagnosis, particularly in settings with a high burden of malignancy and infectious diseases.

Keywords: *Communicable Diseases; Cytology; Neoplasms; Peritonitis*

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INTRODUCTION

Peritoneal and omental diseases include a wide spectrum of pathological conditions involving the serosal lining of the abdominal cavity and the fatty omental structures. These abnormalities may arise from malignant, infectious, or inflammatory processes and can occur either as primary disease or secondary involvement due to dissemination from intra-abdominal or extra-abdominal malignancies. Such conditions are clinically significant because they frequently influence disease staging, prognosis, and therapeutic decision-making. Imaging modalities, particularly ultrasound and computed tomography (CT), play a central role in detecting these abnormalities in routine clinical practice. Common radiological manifestations include omental thickening or caking, peritoneal nodularity, soft tissue infiltration of the mesentery or omentum, and associated ascites. However, despite their high sensitivity in detecting abnormalities, cross-sectional imaging findings often lack specificity, and definitive differentiation between malignant and benign etiologies may not be possible based on imaging alone.[1,2]

In this context, image-guided percutaneous biopsy has emerged as an important minimally invasive diagnostic technique that allows direct tissue sampling for histopathological and cytological evaluation. This approach reduces the need for diagnostic surgical exploration and enables the timely initiation of appropriate management strategies. The procedure is widely used in clinical practice due to its relatively low complication rate and high diagnostic utility.[2,3]

Previous studies have demonstrated that both ultrasound-guided and CT-guided biopsies are effective for evaluating peritoneal and omental lesions. Among different sampling techniques, core needle biopsy is generally considered to provide higher diagnostic accuracy compared to fine-needle aspiration alone, as it preserves tissue architecture and allows more definitive histopathological assessment. Nevertheless, factors such as lesion size, depth, anatomical location, consistency (solid versus necrotic), and proximity to vital structures may influence the success of tissue acquisition and overall diagnostic yield. Despite these challenges, reported complication rates remain low when appropriate technique and patient selection are applied.[4,5,6,7]

No similar studies have been conducted in our country, specifically evaluating image-guided percutaneous biopsy or FNAC of omental and peritoneal lesions. Existing research is limited to general intra-abdominal masses, leaving a gap in understanding diagnostic accuracy, technical success, and safety for these specific lesions in the local population. This study addresses that unmet need.

This study aimed to evaluate the diagnostic value of image-guided percutaneous biopsy and fine needle aspiration cytology (FNAC) in omental and peritoneal lesions by assessing its technical success, diagnostic yield, and safety profile.

METHODS

This prospective observational study was carried out in the Department of Radiology at Nobel Medical College Teaching Hospital, Biratnagar, Nepal, over a one-year period from January to December 2024. Ethical approval was obtained from the Institutional Review Committee (IRC Ref: 909/2023), and written informed consent was obtained from all participants prior to enrollment. Patients aged 18 years and above who presented with clinically suspected or radiologically detected peritoneal or omental lesions and subsequently underwent image-guided percutaneous biopsy were included in the study. Patients with uncorrectable bleeding disorders, hemodynamic instability, or lesions considered unsafe or inaccessible for percutaneous sampling were excluded from participation. A total of 43 cases were referred for biopsy during the study period.

Prior to biopsy, all patients underwent a standardized pre-procedural evaluation that included complete blood count and coagulation profile testing. Any abnormalities in coagulation parameters were corrected before proceeding

with the intervention. Patients on anticoagulant or antiplatelet therapy were advised to discontinue these medications 3 to 5 days before the procedure, based on standard clinical guidelines and individual risk assessment. A structured checklist was used in every case to ensure procedural readiness and patient safety.

Image-guided biopsies were performed by a consultant Interventional radiologist using either ultrasound or CT guidance depending on lesion accessibility, size, and anatomical location. Ultrasound guidance was preferred for superficial lesions that were well visualized, while CT guidance was used for deep-seated or poorly defined lesions, particularly those in the mesentery or deep omentum. Patient positioning was individualized, with most patients placed in the supine position, while oblique or lateral decubitus positions were used when required to optimize access and ensure a safe needle trajectory.

All procedures were performed under strict aseptic precautions using local anesthesia with 2% lignocaine infiltrated into the skin, subcutaneous tissue, and along the anticipated needle path. A coaxial biopsy technique was used for core sampling, employing a 17-gauge introducer needle and an 18-gauge automated cutting needle. Once accurate placement of the introducer within the lesion was confirmed, multiple core samples, typically three to four, were obtained by adjusting the needle direction to sample different areas of the lesion, thereby improving diagnostic adequacy. In selected cases involving deep mesenteric lesions, hydrodissection with normal saline was utilized to create a safer access route and minimize the risk of injury to adjacent structures.

Fine-needle aspiration cytology (FNAC) was performed in selected cases where lesions were small, adjacent to critical vascular or visceral structures, or when transgression of intervening tissues was required, making core biopsy relatively risky. In such cases, a 22-gauge spinal needle attached to a 10 mL syringe was used. After confirming needle placement within the lesion, negative pressure was applied while performing controlled to-and-fro movements. Suction was released before needle withdrawal to reduce contamination of the needle tract. The aspirated material was immediately expressed onto clean glass slides, with both air-dried and alcohol-fixed smears prepared for cytological evaluation.

Following the procedure, all patients were monitored for immediate complications such as pain, bleeding, or vasovagal reactions during a defined observation period. Both cytology and histopathology specimens were appropriately preserved, with core tissue fixed in 10% formalin and cytology smears fixed in 95% ethanol before being sent to the Department of Pathology for evaluation. Reports were collected prospectively and recorded in a structured database for analysis.

Data were entered and analyzed using SPSS version 27. Descriptive statistical methods were applied to summarize demographic, procedural, and outcome variables. Technical success was defined as the successful acquisition of adequate material suitable for pathological assessment, while diagnostic yield was defined as the proportion of procedures that resulted in a definitive histopathological or cytological diagnosis.

RESULTS

A total of 43 patients underwent the procedure during the study period. The mean age of the study population was 52.4 ± 13.2 years. Females slightly predominated, accounting for 25 patients (58.1%), while 18 patients (41.9%) were male.

Abdominal distension was the most frequent presenting symptom, observed in 23 patients (53.5%). This was followed by weight loss in 14 patients (32.6%) and abdominal pain in 11 patients (25.6%), with some patients presenting with overlapping clinical features.

The mean lesion size was 4.2 ± 1.6 cm. Peritoneal involvement was observed in 25 patients (58.1%), while omental lesions were identified in 18 patients (41.9%). Computed tomography (CT)

guidance was used in 31 cases (72.1%), whereas ultrasound guidance was utilized in 12 cases (27.9%), depending on lesion accessibility and visualization. Core needle biopsy was the primary sampling technique in 37 patients (86.0%), while fine-needle aspiration cytology (FNAC) was performed in 6 patients (14.0%) where lesion characteristics or anatomical constraints limited the use of core biopsy.

Technical success, defined as adequate acquisition of tissue for histopathological evaluation, was achieved in 42 of 43 procedures (97.7%). The overall diagnostic yield was also 97.7%, as only one case was considered non-diagnostic due to insufficient FNAC material due to low cellularity.

Histopathological evaluation revealed malignant disease as the predominant diagnosis, observed in 29 patients (67.4%). Tuberculous peritonitis was identified in 9 patients (23.3%), while benign or reactive inflammatory changes were seen in 3 patients (7.0%). One case (2.3%) remained non-diagnostic. Among malignant lesions, ovarian carcinoma (52%) was the most common primary source, followed by gastrointestinal (28%), hepatobiliary and pancreatic (17%), and breast (3%) malignancies. (Figure 1, 2 & 3)

Procedure-related complications were observed in 3 patients (7.0%), all of which were minor in nature. These included small localized hematoma and transient post-procedural pain. No major complications such as significant hemorrhage, visceral injury, or procedure-related mortality were encountered.

The findings are summarized in Tables 1-3, which detail demographic distribution, lesion characteristics, procedural parameters, and diagnostic outcomes.

Table 1: Demographic characteristics and clinical presentation (N = 43)

Variable	Value
Age (years)	52.4 ± 13.2
Male	18 (41.9%)
Female	25 (58.1%)
Abdominal distension	23 (53.5%)
Weight loss	14 (32.6%)
Abdominal pain	11 (25.6%)

Table 2: Lesion and procedural characteristics (N = 43)

Variable	Value
Mean lesion size (cm)	4.2 ± 1.6
Peritoneal lesions	25 (58.1%)
Omental lesions	18 (41.9%)
CT-guided biopsy	31 (72.1%)
USG-guided biopsy	12 (27.9%)
Core needle biopsy	37 (86.0%)
FNAC	6 (14.0%)

Table 3: Diagnostic outcome and complications (N =43)

Variable	Value
Technical success	42 (97.7%)
Diagnostic yield	42 (97.7%)
Malignancy	29 (67.4%)
Tuberculous peritonitis	10 (23.3%)
Benign/reactive	3 (7.0%)
Non-diagnostic	1 (2.3%)
Minor complications	3 (7.0%)
Major complications	0 (0%)

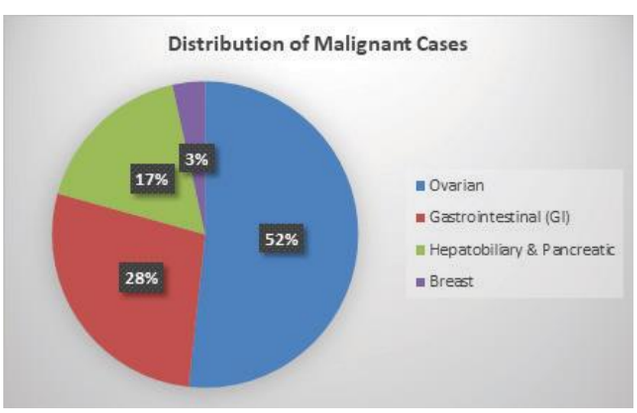

Figure 1: Distribution of primary malignancies (n = 29)

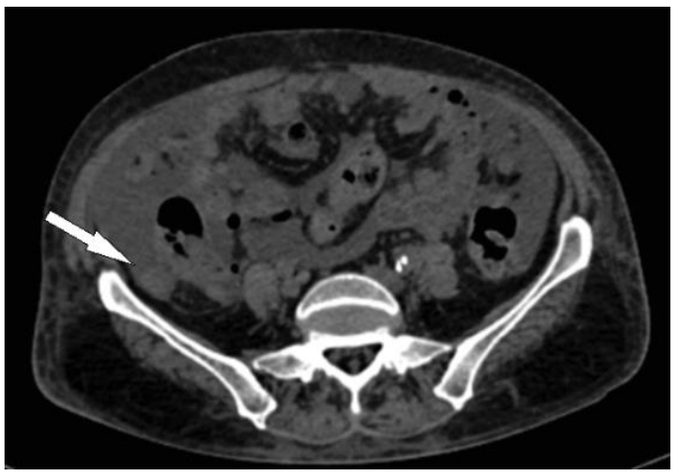

Figure 2

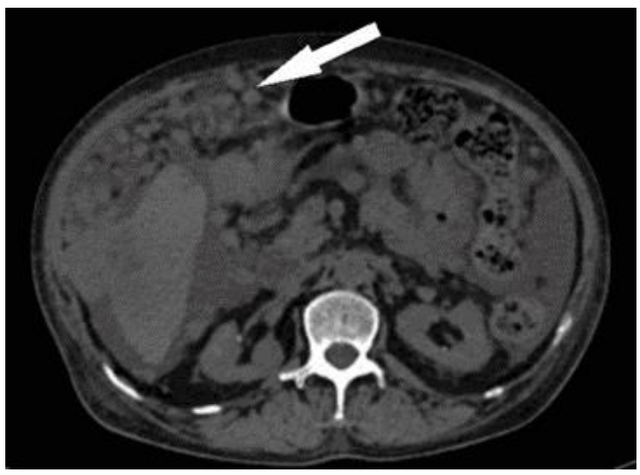

Figure 3

Figure 2 and 3: NCCT abdomen showing peritoneal deposit and nodular omental thickening

DISCUSSION

This study demonstrated high technical success (97.7%) and diagnostic yield (97.7%) for image-guided percutaneous biopsy of omental and peritoneal lesions. Malignancy was the predominant diagnosis, while tuberculous peritonitis represented a significant proportion of cases.

The high technical success and diagnostic yield observed in this study are consistent with previously published results, supporting the reliability of image guided percutaneous biopsy for omental and peritoneal lesions. Prior large series have reported similarly high rates of technical feasibility and diagnostic performance. Vadvala et al. found a technical success rate of 99.5% with overall sensitivity of 95.5% and specificity of 100% for CT and US guided percutaneous biopsy of omental and mesenteric lesions, with core biopsy yielding higher diagnostic rates than FNAC. Sugawara et al. also reported a 100% technical success rate and a diagnostic yield of 93.9% in a large retrospective cohort of peritoneal/omental core biopsies, with minimal complications. Additionally, ultrasound guided core needle biopsy studies have shown high technical feasibility and substantial diagnostic yields (~89.9-92.8%) for peritoneal lesions.[5,5,8,13]

Lesion size is considered a factor influencing diagnostic yield, as smaller lesions pose technical challenges and a higher risk of inadequate sampling, while larger lesions allow easier targeting and better tissue acquisition. However, with core needle biopsy and precise image guidance, some studies suggest that lesion size may not significantly affect diagnostic accuracy.[5,6,14,15]

In our study, the mean lesion size was 4.20 ± 1.60 cm, a range favorable for image-guided biopsy, which may have contributed to the high diagnostic yield. The predominance of larger lesions likely reflects selection of radiologically conspicuous and accessible targets, as well as presentation at advanced stages, particularly in malignant or tuberculous peritoneal disease. As no subgroup analysis by lesion size was performed, its independent effect on diagnostic yield could not be assessed.[15,16]

Tuberculous peritonitis is an important differential diagnosis of peritoneal disease in endemic regions, with reported proportions ranging from 10% to 30% in Asian biopsy series. In the present study, it accounted for 23.3% of cases, which is within the reported range. This is supported by a study done by Chow et al, who highlighted that peritoneal tuberculosis commonly mimics peritoneal carcinomatosis and requires histopathological confirmation for definitive diagnosis.[12]

The complication rate observed was low and limited to minor events, consistent with existing literature. The absence of major complications further supports the safety of this minimally invasive approach.[3,9]

This study has several limitations, including a relatively small sample size and a single-center design, which may affect the generalizability of the results. Furthermore, operator-related factors and detailed imaging characteristics were not comprehensively analyzed. As surgical excision followed by histopathological examination (HPE) / clinical and radiological follow up was not available as a gold standard in the study population, the true sensitivity and specificity of the technique could not be established.

Future studies should include larger, multicenter patient populations to enhance generalizability. The impact of operator experience and technique should be assessed, and imaging features should be more thoroughly correlated with cytological and histopathological findings. Incorporating surgical specimens as a reference standard would help determine the true sensitivity, specificity, and overall diagnostic accuracy of image-guided percutaneous biopsy.

CONCLUSION

Image-guided percutaneous biopsy of omental and peritoneal lesions is a safe, minimally invasive, and highly effective diagnostic modality. Given its high diagnostic yield and low complication rate, it can be considered the preferred first-line method for tissue diagnosis, particularly in resource-limited settings.

CONFLICT OF INTEREST

None

SOURCES OF FUNDING

None

REFERENCES

1. Miguez González J, Calaf Forn F, Pelegrí Martínez L et al. Primary and secondary tumors of the peritoneum: key imaging features and differential diagnosis with surgical and pathological correlation. *Insights Imaging* 2023;14(1):115. https://doi.org/10.1186/s13244-023-01417-6
2. Spencer JA, Weston MJ, Saidi SA et al. Clinical utility of image-guided peritoneal and omental biopsy. *Nat Rev Clin Oncol* 2010;7(11):623-31. https://doi.org/10.1038/nrclinonc.2010.155
3. Souza FF, Mortelé KJ, Cibas ES et al. Predictive value of percutaneous imaging-guided biopsy of peritoneal and omental masses: results in 111 patients. AJR *Am J Roentgenol* 2009;192(1):131-6. https://doi.org/10.2214/AJR.08.1283
4. Perez AA, Lubner MG, Pickhardt PJ. Ultrasound-guided omental biopsy: diagnostic yield and association with CT features based on a single-institution 18-year series. *AJR Am J Roentgenol* 2021;217(4):898-906. https://doi.org/10.2214/AJR.21.25545
5. Sugawara S, Sone M, Itou C et al. Factors affecting diagnostic yield of image-guided percutaneous core needle biopsy for peritoneal and omental lesions. *Abdom Radiol* 2021;46(9):4499-4508. https://doi.org/10.1007/s00261-021-03088-7
6. Vadvala HV, Furtado VF, Kambadakone A, Frenk NE, Mueller PR, Arellano RS. Image-guided percutaneous omental and mesenteric biopsy: assessment of technical success rate and diagnostic yield. *J Vasc Interv Radiol* 2017 ;28(11):1569-76. https://doi.org/10.1016/j.jvir.2017.07.001
7. Montilla MP, Galera SL, Herrero JE, Sastoque JM, Tendero LZ. Diagnostic performance of imaging-guided core needle biopsy of the mesentery and peritoneum. *Radiologia (Engl Ed)* 2018;60(2):128-35. https://doi.org/10.1016/j.rx.2017.12.003
8. Wang J, Gao L, Tang S et al. A retrospective analysis on the diagnostic value of ultrasound-guided percutaneous biopsy for peritoneal lesions. *World J Surg Oncol* 2013;11(1):251. https://doi.org/10.1186/1477-7819-11-251

9. Govindarajan P, Keshava SN. Ultrasound-guided omental biopsy: Reviewof 173 patients. *Indian J Radiol Imaging* 2010;20(04):307-9. https://doi.org/10.4103/0971-3026.73533

10. Farman W, Nazeem S, Khan MK. Diagnostic Yield and Safety of Ultrasound Guided Percutaneous Omental biopsy. A Single Centre Experience. *J Postgrad Med Inst* 2024;38(4). https://doi.org/10.54079/jpmi.38.4.3402

11. Patidar Y, Chalamarla LK, Mukund A, Rastogi A, Sharma MK. Comparative study of ultrasound-guided percutaneous omental biopsy in cirrhotics and noncirrhotics. *J Clin Exp Hepatol* 2020;10(3):194-200. https://doi.org/10.1016/j.jceh.2019.10.003

12. Chow KM, Chow VC, Szeto CC. Indication for peritoneal biopsy in tuberculous peritonitis. *Am J Surg* 2003;185(6):567-73. https://doi.org/10.1016/s0002-9610(03)00079-5

13. Arslan M, Aslan HS, Utebey AR et al. Reliability, diagnostic value, and diagnostic yield of ultrasound-guided percutaneous core needle biopsy for peritoneal lesions. *Cancer Med* 2024;13(14):e7467. https://doi.org/10.1002/cam4.7467

14. Mammen T, Keshava S, Eapen CE et al. Intrahepatic collateral recanalization in symptomatic Budd-Chiari syndrome: a single-center experience. *J Vasc Interv Radiol* 2010;21(7):1119-24. https://doi.org/10.1016/j.jvir.2010.03.008

15. Lipnik AJ, Brown DB. Image-guided percutaneous abdominal mass biopsy: technical and clinical considerations. *Radiol Clin North Am* 2015;53(5):1049-59. https://doi.org/10.1016/j.rcl.2015.05.007

16. Schiavon LHO, Tyng CJ, Travesso DJ, et al. Computed tomography-guided percutaneous biopsy of abdominal lesions: indications, techniques, results, and complications. *Radiol Bras* 2018;51(3):141-6. https://doi.org/10.1590/0100-3984.2017.0045