Original Article

Diagnostic Yield and Safety of Ultrasound Guided Percutaneous Omental Biopsy: A Single Centre Experience

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Abstract

Objective: This study aims to evaluate the diagnostic yield of ultrasound-guided omental biopsy and its complications.

Methodology: This cross-sectional descriptive study was conducted in the Interventional Radiology Department of Rehman Medical Institute, Peshawar, Kpk. Data from February 2019 to December 2022 was retrospectively analyzed and interpreted in terms of diagnostic and inconclusive results, re-biopsies, and associated complications.

Results: A total of 29 ultrasound-guided omental cake and nodule biopsies were performed, and the diagnostic yield was 93%, with only 3% requiring a re-biopsy. The biopsies comprised metastatic ovarian carcinoma (25.9%), malignant mesothelioma (11.1%), tuberculosis (11.1%), metastatic carcinoma of an unknown primary (40.7%), Burkitt lymphoma (3.7%) and mixed tuberculous/mesothelial features (3.7%). Ascites was present in 28 patients, with no major complications observed. Minor bleeding occurred in 25 cases, but all patients remained hemodynamically stable.

Conclusion: Ultrasound guided percutaneous omental biopsy is a safe and effective procedure for diagnosing both neoplastic and non-neoplastic pathologies involving the omentum.

Keywords: Diagnostic imaging, Image-guided biopsy, Omentum, Ultrasonography.

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Introduction

Traditionally, paracentesis cytology has been used for the diagnosis of peritoneal malignancies, whether primary or secondary; but as a matter of fact, the diagnostic accuracy of omental biopsies is superior due to its higher sensitivity.[1] Omental biopsies have been performed surgically for decades but recently, ultrasound-guided biopsy has emerged as a critical tool for diagnosing patients with significant findings observed on CT or ultrasound.[2] This procedure is generally easy to perform, safe, and primarily conducted under local anesthesia, with general anesthesia reserved for pediatric and uncooperative patients. The greater omentum is often involved in disseminated malignancies, tuberculosis, and primary mesothelial pathologies, typically presenting as omental caking, thickening, and nodule formation.[3] These findings are frequently associated with ascites.[4] Although biochemical markers and ascitic fluid analyses can provide valuable insights, they usually do not lead to a definitive diagnosis, necessitating histopathological confirmation in most instances. CT imaging of the abdomen and pelvis plays a pivotal role in assessing omental thickening and nodularity and the presence of ascites, thereby guiding the selection of biopsy sites. Utilizing pre-biopsy CT to plan the procedure significantly improves diagnostic accuracy.[5] As a primarily fat-containing structure in the abdomen, its natural contrast on CT scans enhances the visibility of inflammatory, infectious, and neoplastic conditions.[4] US-guided biopsies allow visualization of the needle, the target, as well as the surrounding tissues, and added Doppler imaging helps to visualize vessels, reducing post-procedural complications like hemorrhage.

A thorough understanding of the anatomy of the omentum is necessary to understand the pathological process and to correlate the pre-procedural CT findings before carrying out an US-guided percutaneous omental biopsy.[6] While ultrasound-guided biopsy can yield high diagnostic results, challenges arise when dealing with a thickened, infiltrated omentum that may not compress or present a distinct focal target, partially explaining the limited use of omentum as a biopsy site. Nonetheless, once the characteristics of abnormal omental tissue and the sampling technique are mastered, ultrasound offers the advantage of conducting rapid real-time core tissue biopsies without the need for an introducer needle, keeping the total needle dwell time to just a few seconds.[5] Furthermore, ultrasound allows for real-time compression during the biopsy, which can minimize the movement and distance of the target omentum and facilitate the displacement of nearby vulnerable structures, such as the bowel.[5]

In this study, our key objectives were to evaluate the diagnostic yield of ultrasound-guided omental biopsy and assess the procedure's safety and associated complications.

Methodology

This cross sectional descriptive study involved patients who provided written consent for participation in research. The study was conducted in the Interventional Radiology Department of Rehman Medical Institute, Peshawar, Kpk, analyzing data using convenience sampling between February 2019 and December 2022. Procedure notes, CT reports, imaging findings, and histopathology results were thoroughly reviewed. The study included only cases exhibiting omental thickening, caking, and nodules, excluding instances of peritoneal thickening and patients with incomplete data. A total of 29 cases were analyzed. The sample included patients of age ranging from 25 to 76 years, of which 44.8% (n=13) were male and 55.1% (n=16) were female. All patients were referred to our Interventional Radiology Department from various specialties, including Gastroenterology, Oncology, and General Surgery. Pre-procedure CT scans were used to guide the biopsy planning based on the imaging results. In 28 cases, ultrasound-guided drainage of ascites was performed prior to the ultrasound-guided biopsy of the omentum, ensuring complete drainage of the ascitic fluid. The size of the drainage catheter was determined by the consistency of the fluid. After drain placement, patients remained in the hospital for 24 hours under the supervision of the referring physician for continued drainage of ascites. The ultrasound-guided biopsy was conducted the following day after complete drainage to minimize the risk of bleeding. The ultrasound machine used for the procedure was Mindray® DC 70. The procedure was performed with the patients in supine position. Omental biopsies were carried out using both coaxial and non-coaxial needles, typically utilizing 16 G or 18 G biopsy needles. When coaxial needles were used, they were larger in caliber than the standard Tru-Cut biopsy needles. The number of cores obtained ranged from 3 to 6, with samples preserved in formalin. The needle dwell time was less than 30 seconds and done in a single pass. If there was a clinical suspicion of tuberculosis, additional cores were collected in saline for culture purposes. The specific area of the omentum to be sampled was determined based on CT findings and pre-procedure ultrasound assessment, targeting any areas that appeared pathological. One operator and one assistant were present to perform the procedure.

Most patients presented with blood-tinged ascites, but none experienced a drop in hemoglobin levels or required blood transfusions. The patients were kept under observation in the day care unit of the interventional radiology department for 2 hours. Hospital stay of 24 hours was only limited to patients who required drainage of ascites prior to biopsy.

Results

A total of 29 ultrasound-guided biopsies were per-

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formed during the aforementioned period. All the biopsies included in this study were performed under local anesthesia. Of these, 93% (n=27) were diagnostic, whereas 6.8% (n=02) were inconclusive (Figure 3). Repeat biopsy was performed in 3% (n=1) of the cohort.

No major complication was reported in any of the patients, with no patients requiring blood transfusion or surgical intervention. There was minimal bleeding in the drain and blood-stained ascites in 86.2% (n=25).

The biopsy results revealed a diverse spectrum of pathologies among the cases analyzed. 40.7% (n=11) of the samples were diagnosed as metastatic with no identifiable primary origin, 25.9% (n=7) were identified as metastatic ovarian carcinoma, followed by malignant mesothelioma and tuberculosis, each diagnosed in 11% (n=3) of the cases. Burkitt's lymphoma and mesothelial cells were each detected in 3.7% (n=1) of the patients. Additionally, 3.7% (n=1) exhibited features of both TB and mesothelial cells but were lost to follow-up. Finally, 6.4% (n=2) were characterized as inconclusive (Figure 4).

Figure 1: Ultrasound guided biopsy image. Arrowheads: Biopsy needle, Arrows black: Omentum, Star: Bowel containing air

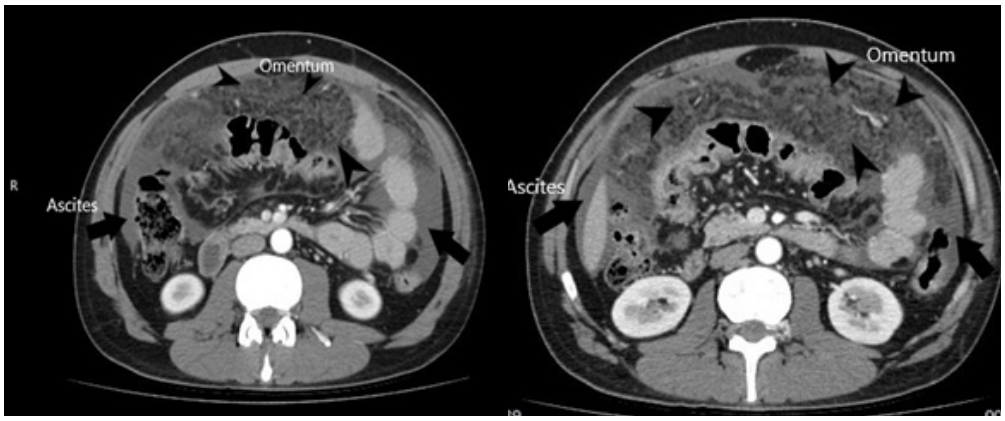

Figure 2: Two CT images showing omental thickening (Arrowheads) and ascites (Black arrows).

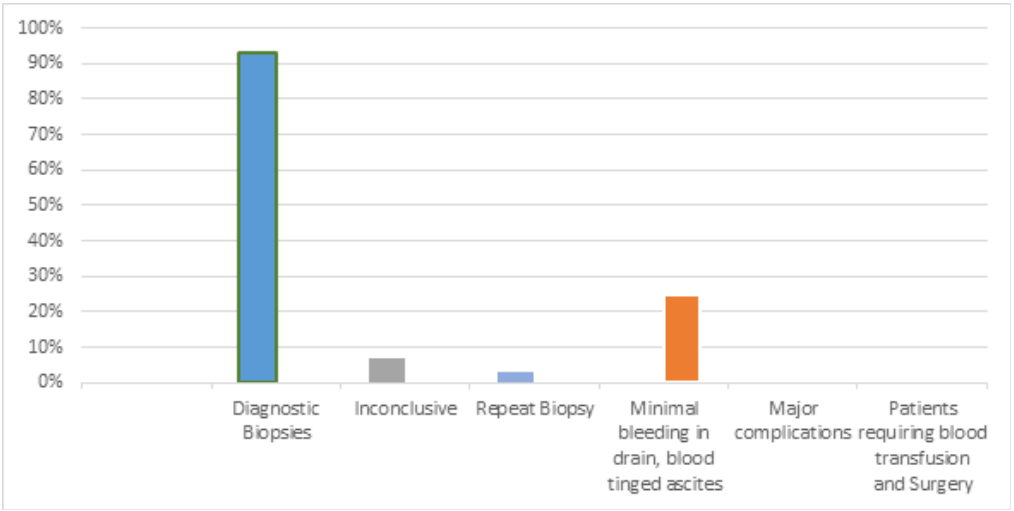

Figure 4: Showing the diagnostic yield of biopsies in percentages along with percentages of inconclusive cases, repeat biopsies, minor complications and major complications.

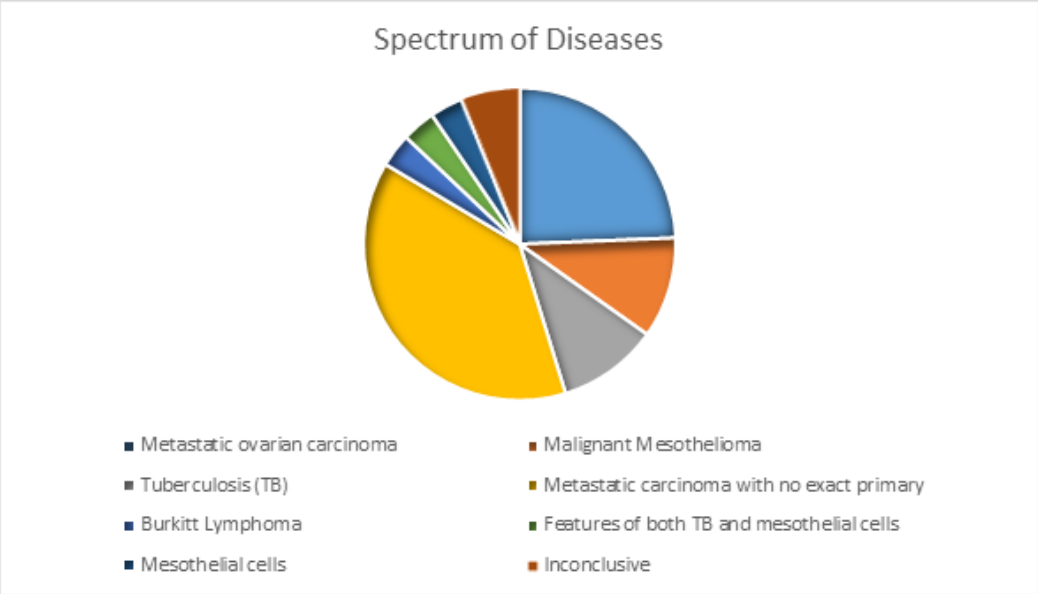

Figure 4: showing the spectrum of the disease seen in the studied population.

Discussion

Ultrasound-guided percutaneous biopsy has become a first-line approach for omental tissue sampling. It is a safe procedure, with no significant complications noted in our study. If ascites is absent, patients can be discharged the same day, helping to reduce hospital stays and ease the burden on healthcare facilities. Certain studies suggest that CT guidance may be more appropriate for patients with a high body mass index but in the general population, the diagnostic yield is comparatively low on CT as compared to US guidance.[7] Ultrasound offers real-time imaging and proves more effective when biopsy planning is based on prior CT scans. It also enhances safety by using the probe pressure to displace the bowel, reducing the risk of injury. In our observations, the more hypoechoic the omentum appears on ultrasound, the more likely it is to be pathological, resulting in a higher diagnostic yield. The diagnostic yield mentioned in Griffin et al.[7] is 87%, comparable to our study, where the diagnostic yield is 93%. Wang et al. reported 92.8% diagnosis in their study that they conducted on 153 patients.[8] Another study mentions the diagnostic yield to be 95%, which is consistent with ours.[5]

The incidence of primary peritoneal tumors in our study is low, at 11.11%. Metastatic involvement in tumors is more prevalent, as reported in other studies as well.[9,10,11] It is important to highlight that in patients with ascites and omental thickening, diagnosis is most often confirmed through omental sampling.[9] This procedure is safe, cost-effective, and requires a minimal hospital stay.[12] In our study, we observed no significant complications associated with the procedure. All biopsies were performed using ultrasound guidance under local anesthesia. Prior to the biopsy, CT scans are routinely reviewed, and the biopsy site on the omentum is marked using ultrasound guidance. Typically, targeted areas of the omentum that are distant from major vessels and appear relatively hypoechoic are selected for the biopsy.

The procedure is deemed safe across all studies and conforms to the standards established by the Society of Interventional Radiology. ACR recommends adhering to the established protocols to minimize complications by proper patient selection, taking precautions to prevent infections, and patient education.[13]

As the treatment for cancer advances, it incorporates precision medicine with the inclusion of whole genome sequencing (WGS). The advancements in WGS and improved sequencing abilities, such as third-generation long-read sequencing, have provided an entirety of the genome for reference, allowing ultra-rapid sequencing methodologies to be included in the clinical diagnostics, with information to be available in 4-5 hours in a hospital setting.[14]

Considering the complexity of WGS, a large sample size must be obtained by a safe, feasible method, for which US-guided percutaneous biopsy remains unmatched, as it is the safest and most effective method for diagnostic sampling.[15]

Conclusion

Ultrasound-guided biopsy of omental thickening, nodules, or caking, is a safe and cost-effective method for diagnosing ascites and omental thickening of unknown etiology. Ascites drainage prior to the biopsy facilitates early hemostasis at the biopsy site. Given these considerations, ultrasound-guided omental biopsy should be

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the preferred tool for diagnosing pathologically altered omentum.

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Authors' Contribution Statement

WF contributed to the conception, design, acquisition, analysis, interpretation of data, drafting of the manuscript, and critical review of the manuscript. SN contributed to the design, acquisition, analysis, interpretation of data, drafting of the manuscript, and critical review of the manuscript. MKK contributed to the conception, design, acquisition, drafting of the manuscript, and critical review of the manuscript. All authors are accountable for their work and ensure the accuracy and integrity of the study.

Confilct of Interest

Authors declared no conflict on interest

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None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.