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Research Article

Diagnostic Accuracy and Safety Of Ultrasound Guided Omental Biopsy: Single Center Experience

Ultrason Kılavuzluğunda Omental Biyopsinin Diagnostik Doğruluğu ve Güvenliği: Tek Merkez Sonuçları

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Abstract

Aim: Omental biopsy has conventionally been performed using a surgical approach. The thickened omentum can serve as a useful target for ultrasonography guided percutaneous biopsy, in clinical practice. The objective of our study was to determine the diagnostic value and safety of ultrasound guided percutaneous biopsy of omental thickening. Additionally, we aim to investigate the correlation of biopsy results with the paracentesis fluid cytology.

Material and Methods: This retrospective study included 49 patients (33 women and 16 men; mean age, 64 ± 13.9 [SD] years) who underwent ultrasound guided omental biopsy between 2014 and 2022 at a single institution at which US served as the first-line modality for omental biopsy guidance. Post-biopsy clinical follow-up were reviewed for each patient. We compare the outcomes of biopsy and paracentesis fluid cytology results.

Results: Total 49 patients were included in our study. US-guided biopsy was diagnostic in 46/49 (93.8%) of patients. There were total 36 (73.4%) malignant cases, 5 (10.2%) chronic inflammation suggestive of tuberculosis, while 2 (4.1%) were chronic peritoneal infection. In 3 patients, the result of core biopsy was benign and reported as Ig4-related inflammatory pseudotumor, desmoid fibromatosis and fat necrosis-foreign body reaction. Out of 36 malignant cases, majority 17 (47.2%) had ovarian cancer. There were no major complications. In 21 of 25 patients (%84) who underwent paracentesis fluid sampling, cytology results (malign or bening cytology) were found to be consistent with omental biopsy results. The ascitic cytological evaluation was favourable for malignancy in 16/25 (64%) patients.

Conclusions: Ultrasound-guided percutaneous biopsy of omentum is less expensive, safe and effective method with a high diagnostic accuracy. Paracentesis fluid cytology results are highly sensitive in patients with omental thickening.

Keywords: Biopsy, Ultrasonography, Omental thickening

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Öz

Amaç: Omental biyopsi geleneksel olarak cerrahi bir yaklaşım kullanılarak yapılmaktadır. Kalınlaşmış omentum, klinik pratikte tanı koyulabilmesi için ultrasonografi eşliğinde perkütan biyopsi yapılabilir bir hedeftir. Çalışmamızın amacı, omental kalınlaşmanın ultrason eşliğinde perkütan biyopsisinin tanısal doğruluğunu ve güvenliğini incelemektir. Ek olarak, biyopsi sonuçlarının parasentez sıvısı sitolojisi ile ilişkisini araştırmayı amaçlıyoruz.

Gereç ve Yöntemler: Bu retrospektif çalışma, 2014-2022 yılları arasında ultrasonun kılavuz olarak kullanıldığı omental biyopsi yapılan 49 hastayı (33 kadın ve 16 erkek; ortalama yaş, 64 ± 13.9 [SD] yıl) içermektedir. Hastaların biyopsi sonrası klinik takip ve patoloji sonuçları değerlendirilmiştir. Ayrıca kor biyopsi ve parasentez sıvı sitolojisi sonuçları karşılaştırılmıştır.

Bulgular: Çalışmamıza toplam 49 hasta dahil edildi. Ultrason kılavuzluğunda biyopsi 49 hastanın 46'sında (%93,8) tanı koydurucuydu. Toplam 36 (%73,4) malign olgu, 5 (%10,2) tüberkülozu düşündüren kronik inflamasyon, 2 (%4,1) kronik periton enfeksiyonu vardı. 3 hastada kor biyopsi sonucu benign idi ve bunlar; Ig4 ilişkili inflamatuar psödotümör, desmoid fibromatoz ve yağ nekrozu-yabancı cisim reaksiyonu olarak rapor edildi. 36 malign vakanın 17'si (%47,2) ovaryen kanser olarak raporlandı. İşlemlerin hiçbirinde yakın dönem majör komplikasyon görülmedi. Parasentez sıvı örneklemesi yapılan 25 hastanın 21'inde (%84) sitoloji sonuçları (malign veya benign sitoloji) omental biyopsi sonuçları ile uyumlu bulundu. Sitolojik değerlendirmede 25 hastanın 16'sı (%64) malign sitoloji olarak raporlandı.

Sonuç: Ultrason eşliğinde perkütan omentum biyopsisi ucuz, güvenli ve etkili, tanısal doğruluğu yüksek bir yöntemdir. Omentum kalınlaşması olan hastalarda parasentez sıvısı sitolojisi sonuçları oldukça duyarlıdır.

Anahtar Kelimeler: Biyopsi, Ultrasonografi, Omental kalınlaşma

Introduction

The omentum is a multi-layered fold of the peritoneum. Because the peritoneal cavity contains a small amount of fluid, infections and cancer spread easily to the omentum.Numerous primary and metastatic neoplastic diseases frequently manifest in the peritoneum and omentum. Gastrointestinal and ovarian malignancies are the most common sources of metastasis to omentum[1]. Involvement of the omentum and peritoneum by non-neoplastic conditions, such as granulomatous diseases, hematomas, infections, or inflammatory disorders, occurs less frequently.

Conventional imaging techniques, such as ultrasound and CT scans, have low specificity and sensitivity for determining the etiology. As a result, a biopsy is frequently needed to confirm the diagnosis. The greater omentum is a frequently affected site for malignant peritoneal metastasis and can be a target for percutaneous biopsy [2].

Radiologists commonly conduct image-guided biopsies, which play a crucial role in clinical decision-making. These biopsies offer a high level of diagnostic accuracy, reliability, and are generally well-tolerated. Image-guided percutaneous biopsies have largely replaced excisional biopsy and surgery as primary diagnostic methods. In the context omental diseases, image-guided biopsies have also supplanted exploratory laparoscopy and laparotomy.

Among various guidance tools such as US, computed tomography (CT), and magnetic resonance (MR) imaging, US has a number of advantages for guiding percutaneous biopsy for intraabdominal lesions. These advantages include accessibility, portability, absence of ionizing radiation, shorter procedure duration, real-time visualization of the biopsy needle and target lesion during the entire procedure, capability to guide the procedure in nearly any anatomical plane, reduced occurrence of false-negative biopsies, and lower cost [3,4].

Traditionally, ultrasound (US) has been utilized for percutaneous biopsy guidance of solid abdominal organs, including the kidney, liver, and spleen [5–7]. While US remains a common method for guiding paracentesis to drain peritoneal fluid, CT is more frequently employed for guiding biopsies of peritoneal soft-tissue infiltrations and masses in clinical practice [2]. A correct diagnosis directs patient care and provides information on the prognosis. US-guided Core Biopsy can quickly and safely deliver the diagnosis.

The purpose of this study is to evaluate diagnostic accuracy and safety of ultrasound-guided percutaneous biopsy of omental thickening and to determine its underlying etiology. Furthermore, we aim to investigate the correlation between biopsy results and cytological analysis of paracentesis fluid.

Material and Methods

The institutional ethics review board approved this study and patient informed consent was waived for this retrospective study. The hospital database was used to analyze patients who underwent US-guided percutaneous biopsy for omental thickening over an eight-year period, from 2014 to 2022. We reviewed radiology database and medical records for pathology and cytology results. Patients with uncorrectable bleeding parameters and patients with missing pathology results were excluded from the study. The final study population included 49 participants (33 women and 16 men; a mean age of 64 years; an age range of 15–85 years).

Prior to the biopsy, all patients had a US examination to determine the omental thickness and feasibility of the biopsy. If the omentum was thicker than 10 mm, it was considered thickened. All patients' bleeding parameters, including prothrombin time (PT) and platelet count, were recorded. A platelet count of more than $50x10^9$/L was considered adequate for carrying out the procedure. For patients on oral anticoagulants, any PT value with an international normalized ratio (INR) less than 1.5 was considered acceptable and consistent with existing literature [8].

The procedure was carried out in supine position. Appropriate ultrasound probe depending on the lesions depth and patient habitus is used to identify the area of maximum thickness, determine the amount of ascites, and evaluate adjacent bowel loops. Color Doppler imaging was also used to assess vascularity in the omental lesions and nearby large vessels. We routinely tap before a biopsy if there is a large amount of ascites present.

Procedure site in the skin and the surrounding area was scrubbed with povidone iodine solution before administering 10 ml of local anesthetic (2% prilocaine hydrochloride) subcutaneously through the abdominal wall with a 22-gauge needle. A small incision was made in the skin (2–3 mm wide), and a biopsy needle was inserted directly into the deep layer of the abdominal wall. The biopsy was performed using semi-automatic biopsy guns and 18-gauge biopsy needles (TSK Laboratory, Japan) under real-time USG guidance using a free hand technique. The needle was advanced into the thickened omentum using real-time US guidance. As the needle tip reached the omentum under ultrasound guidance, two to four cores of tissue were routinely taken from each patient. The biopsy specimen was retained in formalin and sent for histopathological examination. Patients were observed for possible complications 4-6 hours following the procedure.

We compared the outcomes of US-Guided Core Biopsy to the results of primary malignancy, omental pathology following surgical excision, and preoperative paracentesis fluid analysis. Complications were categorized based on the guidelines provided by the Society of Interventional Radiology (SIR) for needle biopsy [9]. Technical success was determined by the successful collection of core specimens.

Results

In this study we included 49 patients who had undergone omental biopsy. An adequate sample was obtained in 100% of the cases. Positive histopathological results were obtained in 46 (93.8%) patients. In the other 3 patients, the biopsy result were reported as adipose tissue. Malignant involvement in the omentum was detected in 2 of these 3 patients as a result of surgery (excisional biopsy proven ovarian carcinoma involvement, gastric mucinous adenocarcinoma involvement). In the other 1 patient, no malignancy was detected in the follow-up.

There were 36 (73.4%) malignant cases, 5 (10.2%) cases of chronic inflammation suggestive of tuberculosis, and 2 (4.1%) cases of chronic peritoneal infection. In 3 patients, the result of core biopsy was benign and reported as Ig4-related inflammatory pseudotumor, desmoid fibromatosis and fat necrosis-foreign body reaction. Out of 36 malignant cases, 17 had ovarian 4 had uterine-cervical cancer, 4 had primary peritoneal carcinoma, 5 had gastrointestinal system cancer, 3 had breast and 2 had lung cancer. In 1 patient, the biopsy result was reported as hepatocellular carcinoma metastasis. There were no procedural complications reported.

Postoperative excisional biopsy results for 16 patients were obtained. Out of 16 cases, 7 (43.7%) had ovarian cancer, and 2 (12.5%) had chronic inflammation. Preoperative omental biopsy results were consistent with postoperative excisional biopsy results in 13 out of the 16 patients who had surgery. In 2 patients, no viable tumor cells were found in the excisional biopsy due to the regression of omental soft tissues secondary to treatment. In one patient, the excisional biopsy revealed adenocarcinoma, whereas the preoperative omental biopsy result indicated fibroadipose tissue without evidence of malignancy.

Paracentesis fluid samples were taken simultaneously with omental biopsies from 25 patients. The cytological evaluation was favorable for malignancy in 16 (64%) patients. When paracentesis fluids and omental biopsy results were compared, omental biopsy was positive for malignant cells in 15 of 16 patients. The omentum biopsy result was in favor of malignancy in 3 of the patients who have no malignant atypical cells in the paracentesis fluid.

Discussion

There is still limited literature available on the use of US guidance for omental biopsy [2,10–12]. Govindarajan et al. in their series of 173 patients, obtained diagnostic biopsy results in 140 (81%) patients [11]. In their study, Perez et al. reported that US-guided biopsy was diagnostic in 95% of their patients' group[2]. This study presents our institutional experience of utilizing US as the first-line method for guiding omental biopsy. The US-guided biopsy provided a diagnosis in 46 (93.8%) out of 49 patients, with no observed complications. These results demonstrate the safety and effectiveness of using ultrasound guidance for omental biopsy to obtain adequate tissue samples for diagnosis.

Omental thickening is a warning sign for abdominal pathologies such as malignancy and chronic inflammation. After tumor cells are seeded in the omentum, they spread intraperitoneally via the peritoneal reflection and ligaments, as well as hematogenously. The greater omentum, being a superficial and easily accessible intraabdominal structure, is well-suited for image-guided biopsy when it is affected by pathological processes resulting in infiltration and enlargement. Nevertheless, performing ultrasound-guided biopsy of the omentum typically necessitates a comprehensive understanding of its anatomy and the ability to correlate earlier CT findings, as certain details may be less distinct on ultrasound imaging. [2]. These factors, coupled with institutional preferences, may partially explain why the omentum is not a common target for biopsy and why CT guidance continues to be the preferred approach for omental biopsy in many medical practices [13–15]. However, with a thorough understanding of the sonographic appearance of abnormal omentum and the sampling technique is established, US-guided biopsy offers several advantages. It enables rapid real-time core tissue biopsy without the requirement of an introducer needle, with minimal needle traverse times lasting only a few seconds. Additionally, US provides the benefit of real-time compression during biopsy, which can help reduce the mobility and distance of the omental target and allow for the displacement of vulnerable structures such as the bowel [16].

The effectiveness of US guidance for omental biopsies appears to have been underreported thus far. This study emphasizes the value and usefulness of US guidance in performing omental biopsies. Based on our findings, we suggest that US should be considered as the primary choice for guiding omental biopsies in the majority of cases.

Although surgical biopsy is the gold standard in the diagnosis of omental thickening, US-guided core biopsies are becoming increasingly common because they can be performed quicker and are less expensive. Anterior peritoneal location and easy visibility make percutaneous ultrasound-guided omental biopsy feasible. It can be performed as a day-care procedure under local anesthesia without significant complications. These advantages make US-guided biopsy a preferable option compared to the conventional laparoscopic or laparotomy route [15].

In addition, it has advantages such as being able to see the omental thickening throughout the procedure in US-guided biopsies and not being exposed to radiation, although similar results are obtained in CT-guided biopsies. During these procedures, multiple CT scans are typically conducted to aid in procedure planning, instrument placement, and intra- and postprocedural assessments. Because of the longer scan times and increased number of scans performed, CT-guided interventional procedures often have a higher radiation dosage than conventional diagnostic scans [17,18].

Core biopsy is of greater diagnostic value than ascitic cytology, which has a reported sensitivity of 60% [19]. In this study, the ascitic cytological evaluation of patient with omental thickening was favourable for malignancy in 16/25 (64%) patients. Salman et al. reported the malignancy rate as 56% in a series of 100 patients with omental thickening as well as ascites [20]. In our study, we compared US-guided omental biopsies with paracentesis fluid samples in addition to surgical excision material. In 21 of 25 patients (%84) who underwent paracentesis fluid sampling, cytology results (malign or benign cytology) were found to be consistent with omental biopsy results. Although 3 of remaining 4 patients were defined as benign with cytological analysis, core biopsy results were malignant. Despite the presence of malignant atypical cells in the last patient, the omental biopsy result was reported as chronic inflammation. In woman we found 50% (n = 5) of all the positive cytology results were ovarian in origin. Other studies vary in this percentage from 7%–85% [21–24].

Conclusion

US-guided core biopsy is feasible, safe, and quicker method for the diagnosis of omental thickening. Paracentesis fluid cytology results are highly sensitive in patients with omental thickening.

Conflict of interest

The authors have no financial interest in the materials presented herein.

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