CLINICAL STUDY

Image-Guided Percutaneous Omental and Mesenteric Biopsy: Assessment of Technical Success Rate and Diagnostic Yield

Harshna V. Vadvala, MD, Vanessa Fiorini Furtado, MD, Avinash Kambadakone, MD, Nathan E. Frenk, MD, Peter R. Mueller, MD, and Ronald S. Arellano, MD

ABSTRACT

Purpose: To assess biopsy technique, technical success rate, and diagnostic yield of image-guided percutaneous biopsy of omental and mesenteric lesions.

Materials and Methods: This retrospective study included 186 patients (89 men, 97 women; mean [SD] age, 63 [13.8] y) who underwent percutaneous image-guided biopsy of omentum and mesentery between March 2007 and August 2015. Biopsies were performed with computed tomography (CT) (n = 172) or ultrasound (US) (n = 14) guidance using coaxial technique yielding core and fine-needle aspiration (FNA) specimens. Biopsy results were classified as diagnostic (neoplastic or nonneoplastic) or nondiagnostic based on histopathology and cytology. Technical success rate and diagnostic yield of omental and mesenteric lesions were calculated.

Results: There were 186 image-guided percutaneous biopsies of omental (n = 95) and mesenteric (n = 91) lesions performed. Technical success rate was 99.5% for all biopsies, 100% for omental biopsies, and 98.9% for mesenteric biopsies. Overall sensitivity was 95.5%, specificity was 100%, negative predictive value was 78.3%, and positive predictive value was 100%, which was comparable for omental and mesenteric biopsies. Core biopsies had higher diagnostic yields compared with FNA: 98.4% versus 84% overall, 99% versus 88% for omental biopsies, and 97.7% versus 80% for mesenteric biopsies. Spearman rank correlation showed no correlation between lesion size and diagnostic yield ($P = .14$) and lesion depth and diagnostic yield ($P = .29$) for both groups. There were 5 complications.

Conclusions: Image-guided percutaneous omental and mesenteric biopsies have high technical success rates and diagnostic yield regardless of lesion size or depth from the skin for both omental and mesenteric specimens.

ABBREVIATION

FNA = fine-needle aspiration

The peritoneum is the largest serous membrane in the body and forms anatomic reflections that give rise to the omentum and mesentery. The greater and lesser omentum, small bowel mesentery, and mesocolon are frequently involved in neoplastic and nonneoplastic disease processes. The peritoneal spaces, such as subphrenic, subhepatic, lesser sac, paracolic gutter, and infracolic spaces, are potentially involved by ascites, hemorrhage, abscesses, and metastatic disease (1,2). In the current era of molecular cytogenetics and precision medicine, biopsy of peritoneal lesions is crucial to establish a correct diagnosis and determine appropriate clinical management. Image-guided percutaneous biopsy of omental and mesenteric lesions can be technically challenging owing to variable depth of lesions; proximity of omental and mesenteric lesions to vital structures, including vessels, gastrointestinal tract, or solid organs; and relative mobility of these lesions as opposed to lesions within solid organs. The purpose of this study was to assess the technique, technical success rate, and diagnostic yield of image-guided percutaneous biopsy of omental and mesenteric lesions.

MATERIALS AND METHODS

The institutional review board approved this study and waived informed consent. A retrospective review of an

From the Department of Radiology, Massachusetts General Hospital, Harvard Medical School, 55 Fruit Street, White 2 Suite 270, Boston, MA 02114. Received February 27, 2017; final revision received June 14, 2017; accepted July 3, 2017. Address correspondence to H.V.V.; E-mail: drharshna@gmail.com

None of the authors have identified a conflict of interest.

From the SIR 2016 Annual Scientific Meeting.

J Vasc Interv Radiol 2017; ■:1–8

http://dx.doi.org/10.1016/j.jvir.2017.07.001

institutional database to identify patients who underwent percutaneous biopsy of the omentum or mesentery guided by computed tomography (CT) scan and ultrasound (US) between March 2007 and August 2015 was done using keywords "peritoneal," "omental," and "mesenteric." The study cohort was divided into 2 groups: (*a*) omental group, which includes greater omentum and peritoneal spaces outside of the confinement of mesocolon and is inclusive of bilateral subphrenic, subhepatic, greater sac, lesser sac, and bilateral paracolic gutter, and (*b*) mesenteric group, which includes small bowel mesentery, mesocolon, and peritoneal spaces, inclusive of bilateral infracolic spaces (1). All patients referred to the Interventional Radiology service for image-guided peritoneal, omental, or mesenteric biopsy were included in the study cohort. Patients with deep pelvic and retroperitoneal lesions were excluded from the study.

Data Analysis

Between March 2007 and August 2015, 186 patients (89 men and 97 women) with mean age of 63 years (range, 23–88 y) underwent 186 image-guided percutaneous biopsies of omental (n = 95) or mesenteric (n = 91) masses. Patient demographics are presented in **Table 1**. In the omental group, the mean (SD) short axis diameter was 24.7 (17.4) mm (range, 7–98 mm), mean (SD) long axis diameter was 44.5 (36.4) mm (range, 11–267 mm), and mean (SD) lesion depth was 58 (25.4) mm. For the mesenteric group, the mean (SD) short axis diameter was 35.8 (21.6) mm (range, 13–108 mm), mean (SD) long axis diameter was 52.9 (33.9) mm (range, 15–156 mm), and mean (SD) lesion depth was 70 (29.3) mm. Complications were classified according to the Society of Interventional Radiology (SIR) guidelines for needle biopsy (3). Technical success was defined as completion of the planned biopsy by obtaining core and/or fine-needle aspiration (FNA) specimens. The diagnostic yield of a procedure (including core and/or FNA specimens) was determined based on diagnostic biopsy result of the procedure as a whole (core and/or FNA biopsy). Diagnostic yield was defined in terms of sensitivity, specificity, positive predictive value, and negative predictive value. The histopathology result obtained from the biopsy procedure was considered reference standard, and whenever possible additional pathology from surgery or endoscopy was correlated.

CT and US Biopsy Technique Review

Two radiologists (H.V.V., N.E.F.) fellowship trained in abdominal imaging and intervention with 3 years of experience interpreting abdominal imaging independently reviewed CT scans and US of biopsy procedures. Procedural images were reviewed on a picture archiving and communicating system workstation (IMPAX 6 software; AGFA HealthCare, Greenville, South Carolina). Biopsies were performed by 1 of 10 interventional radiology attending physicians with a range of 3–18 years of experience who supervised a radiology trainee fellow or a resident. All biopsies were scheduled as CT-guided procedures, with US machine available in the CT scanner. If preliminary US clearly identified the target lesion, the biopsy would be performed with US guidance. Otherwise, biopsies were performed with CT guidance. All biopsies were performed with coaxial technique using 17-gauge coaxial introducer system and an 18-gauge cutting needle for core specimens (Bard Mission Disposable Core Biopsy Instrument Kit; Bard Biopsy Systems, Tempe, Arizona). FNA specimens were obtained with a 22-gauge needle (Chiba biopsy needle; Cook, Inc, Bloomington, Indiana) that was advanced through the coaxial needle. CT guidance was achieved with a multidetector row 16-slice CT scanner (LightSpeed; GE Healthcare, Chicago, Illinois) using 5-mm slice thickness and a pitch of 1.375. Preliminary axial images were acquired to localize the target lesion. Using sterile technique, the 17-gauge coaxial introducer needle was advanced into the lesion. Repeat imaging after needle adjustments was limited to 10 slices, centered on the target lesion. The number of needle adjustments was determined from the number of CT scan acquisitions performed to confirm the needle tip position after each needle manipulation. Once the coaxial needle was satisfactorily within the target lesion, the 18-gauge cutting needle was advanced through the 17-gauge introducer needle, and 2–4 core specimens were obtained. The 18-gauge needle was then exchanged for a 22-gauge needle for FNA specimens. FNA specimens were obtained using a rapid to-and-fro excursion over 20 seconds. This was repeated 2–4 times. Ultrasound-guided procedures were performed with a 358-MHz curvilinear transducer (Aixplorer; Supersonic Imagine, Inc, Bothell, Washington) using the above-described biopsy techniques. The needle adjustment for US procedures was not taken into account. Procedure time in minutes was calculated from the time of acquisition of the preliminary images to the time of acquisition of images after the procedure.

Needle trajectories that traversed small bowel, large bowel, or solid organs were recorded. Periprocedural antibiotics were not routinely administered unless the biopsy needle traversed bowel, in which case a single intravenous dose of antibiotics selected for gram-negative coverage was administered.

Table 1. Patient Demographics

	Omental	Mesenteric	Total
Number of patients	95 (51.1%)	91 (48.9%)	186
Age, y, mean (SD)	64 (12.3)	62.5 (15.3)	63 (13.8)
Male sex	38/95 (40.0%)	51/91 (56.0%)	89/186 (47.8%)

Pathology Biopsy Results

The core and FNA biopsy results were recorded separately based on the pathology reports. Core biopsy results were classified as neoplastic and nonneoplastic; neoplastic lesions were further classified as malignant or benign. Results of