Clinical Imaging 40 (2016) 535–540

Contents lists available at ScienceDirect

Clinical Imaging

journal homepage: http://www.clinicalimaging.org

Original Article

# Acute and delayed bleeding requiring embolization after image-guided liver biopsy in patients with cancer

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ARTICLE INFO

*Article history:*
Received 14 July 2015
Received in revised form 8 November 2015
Accepted 10 November 2015

*Keywords:*
Image-guided biopsy
Hemorrhage
Embolization, Therapeutic
Radiology, Interventional

ABSTRACT

**Purpose:** To report incidence of acute versus delayed presentations of bleeding requiring embolization after focal liver biopsy, in correlation with angiographic findings and treatment success rates. The available literature will be reviewed as well.

**Materials and methods:** Health Insurance Portability and Accountability Act-compliant institutional review board approved retrospective review of 2180 consecutive patients undergoing 2335 targeted liver biopsies at a tertiary-care cancer center. Hepatic arterial embolization episodes within 30 days from biopsy were identified via radiology PACS. Electronic medical record review was performed for indication of embolization and postembolization clinical course.

**Results:** The incidence of postbiopsy bleeding requiring embolization was 0.5% (12/2335 biopsies). In those with bleeding, 1/12 (8%) had no hepatic arterial findings at angiography. Angiographic hepatic arterial findings resolved after embolization in 11/11 patients (100% technical success). Bleeding ceased after embolization in 10/12 patients (83% clinical success). Complications were seen in 2/12 (17%) patients: cholecystitis and hepatic infarct, respectively. Delayed presentation of bleeding (defined as >24 h postbiopsy) occurred in 5/12 (42%) patients; the longest latency was 12 days.

**Conclusion:** The overall incidence of bleeding requiring embolization in our population was 0.5%. This complication rate compares favorably to the 0–4.2% (median: 0.29%) rate quoted in the available, heterogeneous, literature on this topic. Delayed presentation occurred in almost half of patients. Arterial embolization carries excellent technical and clinical success rates.



## 1. Introduction

Patients with cancer in the United States are living longer [1,2]. Surveillance imaging performed during survivorship will detect suspicious liver lesions prompting biopsy for diagnostic and prognostic purposes. Additionally, as "personalized medicine" becomes a reality, tumor biopsy is becoming increasingly important to allow molecular analysis of tumor cells. Bleeding is the main clinically significant complication of this procedure. Significant bleeding may necessitate arterial embolization. An understanding of the risks associated with image-guided needle biopsy is essential for medical and surgical oncologists to weigh the costs and benefits in deciding whether or not to recommend a biopsy, for interventional radiologists to present accurate risk estimates to their patients, and for patients to determine whether or not to proceed with a recommended procedure. We hope that our experience will help provide data useful in those pursuits.

## 2. Materials and methods

### 2.1. Patient population

Institutional review board approval was obtained. All patients were contained within a single electronic medical record system belonging to the institution, a tertiary-care-dedicated cancer hospital providing longitudinal patient care. The electronic medical record and PACS systems were retrospectively queried for all patients who underwent image-guided percutaneous liver biopsy followed within 30 days by arterial embolization between January 2004 and December 2010. Demographic and laboratory data were obtained. Tumor biology, number of passes, and needle gauge were not consistently documented in the retrospective cohort and this information could not be ascertained for all patients. Patients in whom embolization was performed to treat a tumor or to

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http://dx.doi.org/10.1016/j.clinimag.2015.11.004
0899-7071/

**Table 1a**
Clinical/interventional debriefing analysis for all patients with major hemorrhage after focal liver biopsy

| Patient | Age (years) | Gender | Biopsy indication (resulting diagnosis) | Underlying liver disease | Hgb/Hct/Plt/PTT/INR | Tumor size (cm) | Couinaud segment |
|---|---|---|---|---|---|---|---|
| 1 | 55 | F | Leukemia, new liver lesion (no malignant cells) | None | 8.9/26.5/276/34.2/1.1 morning of procedure | 1.2 | VIII |
| 2 | 44 | F | Lymphoma, enlarging liver lesion (lymphoma) | None | 13.5/40/107/45.4/1.09 morning of procedure | 6.1 | VIII |
| 3 | 45 | F | Remote history of breast cancer, new liver lesions (breast cancer metastasis) | Diffuse liver metastases with pseudocirrhosis | 12.1/36.9/151/31.9/1.05 4 days before procedure | 6.1 | II |
| 4 | 59 | M | Hepatitis B, cirrhosis with multiple liver lesions (granulomatous process) | Hepatitis B and cirrhosis | 12.7/39.1/138/31.4/1.33 22 days before procedure | 3 | V |
| 5 | 63 | F | Breast cancer with liver lesions (breast cancer metastasis) | None | 9.0/27/140/24.1/0.99 12 days before procedure | 1.5 | IVa |
| 6 | 65 | F | Lymphoma with multiple diffuse liver lesions (HCC) | Hepatitis C, idiopathic thrombocytopenic purpura | 8.6/27.8/37/29.8/1.0 morning of procedure | 11 | V |
| 7 | 56 | M | Rectum cancer, liver lesions (rectum cancer metastasis) | None | 8.8/28.9/344/26.2/1.12 16 days before procedure | 10.2 | III |
| 8 | 68 | F | Breast cancer, ovary cancer, multiple liver lesions (ovary cancer metastasis) | None | 11.3/32.7/234/28.7/0.94 2 days before procedure | 1.7 | VI |
| 9 | 65 | M | Prostate cancer, liver lesions (prostate cancer metastasis) | Diffuse liver metastases | 12.9/39.4/244/30.2/0.96 17 days before procedure | 8.3 | VI |
| 10 | 51 | F | Liver lesions, diagnosis (HCC) | Fatty liver | 10.8/35.4/314/24.8/0.94 13 days before procedure | 6.8 | V |
| 11 | 22 | M | Adrenal cancer, liver lesions (adrenal cancer metastasis) | None | 14.9/45.7/456/31.5/0.99 3 days before procedure | 1.8 | VIII |
| 12 | 61 | F | Hepatitis B, liver lesion indeterminate at imaging (well-differentiated hepatic neoplasm, likely adenoma) | Hepatitis B, cirrhosis, portal vein thrombus | 10.2/31.1/152/30/15 1 day before procedure | 3.5 | V/VI |

HCC, hepatocellular carcinoma.

**Table 1b**
Clinical/interventional debriefing analysis for all patients who underwent ultrasound-guided focal liver biopsy and developed hemorrhage requiring embolization

| Patient | Needle size (coaxial) | Needle passes | Tissue samples | Minimal transparenchymal trajectory (mm) | Imaging guidance | Anesthesia | Imaging findings at completion of study | Time to postbiopsy hemorrhage diagnosis (h/days) | Symptoms leading to hemorrhage diagnosis | Hemoglobin drop before embolization performed | Imaging findings at hemorrhage diagnosis |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20-22G | 3 | 2 | 26 | CT | MAC | No bleeding | 1 day | Dyspnea | 1.9 | CECT: intrahepatic and subcapsular hematoma; hemoperitoneum; right pleural effusion |
| 2 | 19.5G | 1 | 1 | 22 | CT | MAC | No bleeding | 5 days | Pain | 4.1 | CECT: perihepatic hematoma, intratumoral bleeding; hemoperitoneum |
| 3 | 18G | 1 | 1 | 0 | CT | MAC | No bleeding | 3 h | Pain, hypotension | 4 | NECT: perihepatic hematoma, hemoperitoneum |
| 4 | 19.5G | 4 | 3 | 30 | CT | MAC | No bleeding | 8 days | Fever, pain | 0.2 | CECT: subcapsular hematoma, right pleural effusion and ascites |
| 5 | 20G (19G) | 5 | 3 | 12 | US | MAC | Subcapsular hematoma | Immediate | Pain, hypotension | 2.3 | NECT: large subcapsular hematoma |
| 6 | 20G | 1 | 1 | 3 | CT | MAC | No bleeding | 5 h | Hypotension | 2.9 | CECT: Intrahepatic and perihepatic hematoma, pseudoaneurysm, hemoperitoneum |
| 7 | 18G (17G) | 2 | 1 | 18 | CT | MAC | Subcapsular hematoma | Immediate | Orthostatic hypotension | 1.3 | NECT: perihepatic hematoma, hemoperitoneum |
| 8 | 22G (20G) | 4 | 4 | 43 | CT | MAC | Subcapsular hematoma | Immediate | Pain, hypotension | 3.6 | NECT: subcapsular and intrahepatic hematoma; hemoperitoneum |
| 9 | 19.5G | 1 | 1 | 15 | CT/US | MAC | Free fluid in pelvis | Immediate | Hypotension | 2.7 | NECT: hemoperitoneum |
| 10 | 18G | 2 | 1 | 0 | CT | MAC | Subcapsular hematoma | 4 days | Pain | 3.7 | NECT: hemobilia in the gallbladder |
| 11 | 22G | 2 | 2 | 3 | CT | MAC | No bleeding | 12 days | Pain | 5.7 | NECT: subcapsular and intrahepatic hematoma |
| 12 | 18G (17G) | 1 | 2 | 26 | CT | MAC | No bleeding | 10 days | Abdominal distension, hypotension | 3.5 | CECT: hemoperitoneum, extravasation, pleural effusion |

MAC, monitored anesthesia care; CECT, contrast-enhanced computed tomography; NECT, nonenhanced computed tomography; US, ultrasound.