Case Report

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Painless Acute Cholangitis, Hepatic Abscess, and Drug-Resistant Bacteremia following Microwave Ablation of a Metastatic Liver Tumor

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ABSTRACT

Image-guided microwave ablation has become a common treatment modality for both primary and metastatic liver tumors. The risk of serious infectious complications from this procedure is relatively low. Potential infections that can develop include hepatic abscess and cholangitis with resultant bacteremia. Previous biliary surgeries and/or manipulation may increase the risk of infectious complications. This article will describe a patient who developed acute cholangitis, two hepatic abscesses, and drug resistant bacteremia following microwave liver ablation. The challenges of diagnosing infectious complications of microwave ablation and best approach to management will also be discussed.

Keywords

Pancreatic neuroendocrine tumor, Acute Cholangitis, Hepatic Abscess.

Case Description

A 34 year old male with pancreatic neuroendocrine tumor (somatostatin receptor positive) initially treated with Whipple operation developed 2 metastases to the liver (somatostatin receptor positive) two years later. He underwent microwave ablation of a hepatic focus 1 x 1 cm in segment IV and 1.8 x 1.4 in segment VII at our institution. Accu2i microwave ablation probe was applied to both lesions with 140 watts for 3 minutes and 5 minutes, consecutively. The patient experienced no immediate post-procedural complications, including fever, chills, nausea, vomiting or abdominal pain. Transaminases were mildly elevated with AST 231 U/L & ALT 278 U/L. Total bilirubin and white blood cell (WBC) count remained normal. He was discharged on hospital day 2 with oral Cephalexin 1000 mg twice daily and oral Metronidazole 500 mg twice daily to complete a 7 day course. Three days later, the patient was admitted to an outside hospital with a fever of 102 OF and night sweats. Complete blood count (CBC) and comprehensive metabolic panel (CMP) were normal. Contrasted CT scan showed expected post-ablation lesion at segment IV and VII with no other abnormal findings. He was discharged home the following day with instructions to continue his previously prescribed antibiotics. Two days after discharge, he presented to our institution with fever of 103 OF and drenching night sweats. He denied abdominal pain, nausea, vomiting, flank pain, diarrhea, dyspnea, cough, or chest pain. Labs were remarkable for a total bilirubin of 2.2 mg/dL, Alk phos 217 U/L, AST 143 U/L and ALT 131 U/L. CBC was normal with WBC count of 7.42 k/uL. Procalcitonin was elevated to 10.36 ng/mL. Contrasted CT of the abdomen showed heterogeneous attenuation consistent with complex post ablation in hepatic segment IV and VII with no other abnormal findings.

He was started on empiric intravenous Piperacillin-Tazobactam 3.375 gm IV q 6 hrs. 2 out of 2 peripheral blood cultures returned positive for quinolone resistant E.coli sensitive to Trimethoprim-Sulfamethoxazole. After 2 days of Piperacillin-Tazobactam, the patient was switched to oral Trimethoprim-Sulfamethoxazole 800-160 mg oral three times daily. He again developed episodic fevers and rigors at night. Trimethoprim-Sulfamethoxazole was discontinued and Piperacillin-Tazobactam 3.375 gm IV q 6hrs was restarted.

2 out of 2 repeat peripheral blood cultures returned positive

for pansensitive Aeromonas hydrophilla. Despite resumption of intravenous antibiotics, the patient's fevers and rigors persisted, and he developed tachycardia and hypotension. Repeat procalcitonin was increased to 40ng/mL. Intravenous piperacillin-tazobactam was discontinued and intravenous meropenem 500 mg q 6hrs was started. The patient's blood pressure normalized with intravenous normal saline. Repeat blood cultures returned positive for E.coli now resistant to Piperacillin-Tazobactam but sensitive to Meropenem and Ceftriaxone. Transthoracic echocardiogram revealed a normal ejection fraction with no evidence of vegetations. Indium labeled WBC scan showed no scintigraphic evidence of abscess or localized infectious disease process however there was circumferential air found in segment VII of the liver. Subsequent 3 phase contrasted CT scan of the abdomen (liver protocol) showed the ablated lesion in segment VII with new internal air suggesting possible abscess with the second ablated lesion in the left hepatic lobe increased in size from 3.5 to 4.4 cm.

Interventional Radiology performed a CT-guided drainage with 10F catheter placed into segment IV and VII of the liver with purulent bilious fluid obtained. Cultures from segment VII returned positive for E coli resistant to Piperacillin-Tazobactam but sensitive to meropenem and ceftriaxone consistent with blood cultures. After the procedure, the patient remained clinically improved with no recurrence of fever, and blood cultures remained negative. He was discharged with home intravenous Ceftriaxone to complete a 6 week course. Both hepatic drains were removed 9 days after insertion.

One month later, the patient presented to our institution for follow-up. Repeat contrasted CT-scan showed decrease in size of the segment VII lesion from 4.5 to 3.1 cm with resolution of internal air. The second ablated lesion (segment IV) was also decreased in size from 4.4 to 2.5 cm. Patient was instructed to complete the remaining 2 weeks of intravenous Ceftriaxone. Repeat MRI of the abdomen 3 months later showed complete resolution of both hepatic abscesses.

Discussion

The treatment of primary and metastatic liver tumors with thermal ablation has become common practice and is gaining wide acceptance in clinical guidelines. The energy sources for thermal ablation include radiofrequency (RF) and microwave (MW). Newer MW ablation technology has the advantage over RF of achieving larger areas of necrosis. Regarding complications, there are no significant differences between RF and MW ablation therapy [1,2].

In one multicenter study, major complications reported following thermal ablation occurred in 2.9% of patients and included ulceration of the abdominal wall, hepatic infarction, peritoneal hemorrhage, bowel perforation, pneumothorax, pleural effusion, cholangitis and liver abscess [1]. In a recent study of early complications after percutaneous radiofrequency ablation for hepatocellular carcinoma by Park et al, the incidence of liver abscesses was 12%. The overall mortality rate was 0.3%, including 2 cases of sepsis both with unknown source of infection [3].

The most common minor complication after microwave ablation is post-ablation syndrome featuring abdominal pain and idiopathic fever. Fever has been reported in up to 70% of patients. Symptoms are typically transient and self-limiting [3]. Interestingly, our patient never experienced abdominal pain.

The timing of onset of symptoms following thermal ablation is crucial in determining the most likely etiology. Post-ablation syndrome and other minor complications, including thermal damage of the skin and surrounding soft tissue typically occur within days to 1 week after thermal ablation. Cholangitis, liver abscess and other infectious complications typically occur within 1 week to 1 month after the procedure. Late-complications including biloma formation, tumor seeding and late-onset biliary complications can present 1 month to 1 year after the procedure [3]. Given his new hyperbilirubinemia and normal CT scan of the abdomen on admission, our patient was felt to initially have early acute cholangitis which progressed to hepatic abscesses.

Post-ablation syndrome Thermal damages Hemorrhage (peritoneal, pleural) Bowel perforation Liver function decompensation	Cholangitis Cholecystitis Liver abscess	Biloma formation Tumor seeding Intraperitoneal dissemination
24 hours – 1 week	1 week – 1 month	1 month – 1 year

Depicting timeline for post-ablation syndrome, cholangitis, liver abscess [3-5].

For post ablation hepatic abscess, the mechanism of abscess formation is not fully understood. The most plausible explanation is bile duct contamination from colonization of the sphincter of Oddi [2]. Child-Pugh Class B and Class C cirrhosis, biliary tract disease, diabetes mellitus, and porta hepatis tumors are four significant risk factors for abscess formation [6]. The most frequent organisms found in these abscesses are Enterococcus, E. coli, Bacteroides fragilis, E. faecalis, C.perfringens and Klebsiella pneumonia [7].

Although prophylactic antibiotics are not recommended for every patient undergoing thermal ablation, they are recommended in high risk cases such as patients with abnormal function of sphincter of Oddi, history of Whipple operation or bilioenteric anastomosis and colonized bile ducts [2,3,8,9]. In our case, oral Cephalexin and Metronidazole were administered for a 7 day course. However, prophylactic antibiotic selection varies amongst institutions.

Despite compliance with his prophylactic antibiotics, our patient developed recurrent bacteremia with multiple organisms and hepatic abscesses. Interestingly, he developed E coli bacteremia twice, with the E coli initially piperacillin-tazobactam sensitive but then resistant. He did not have resolution of his fevers, clearance of bacteremia, or sustained clinical improvement until he was definitively treated with percutaneous drainage in combination with intravenous antibiotics. This highlights the fact

that percutaneous drainage combined with antibiotics is the first line and mainstay of treatment for most liver abscesses [10,11].

In conclusion, microwave ablation, a minimally invasive procedure that is effective for early-stage liver tumor, has gained wide use. In order to minimize procedural complications, particularly infection, which can lead to increased morbidity and mortality, clinicians must be aware of high risk patients. Prophylactic antibiotics should be used in such cases, but as illustrated by our case, may not prevent life threatening infection.

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