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Radiofrequency Ablation Treatment in Proximity to the Gallbladder Without Subsequent Acute Cholecystitis

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Abstract

Initial reports have suggested that proximity of liver tumors to the gallbladder may increase the risk for cholecystitis after radiofrequency ablation. A colon adenocarcinoma metastasis to the liver in contact with the gallbladder was successfully treated with radiofrequency ablation without subsequent cholecystitis.

Keywords

Cholecystitis; Radiofrequency ablation; RFA; Gallbladder; Liver

Radiofrequency ablation is quickly becoming a valuable option in the treatment of certain unresectable liver tumors. Recent studies have shown the cost effectiveness [1], relatively low complication rates [2] and short hospital stays associated with thermal ablation. Early results suggest a high rate of local control of small or isolated liver lesions [3,4]. Local application of radiofrequency to tissue can create a controlled and predictable area of coagulation necrosis with little collateral damage. Currently, pre-procedural imaging studies are used to determine the spatial relationship of the tumor to organs such as gallbladder, diaphragm, major vessels and bowel. Proximity of tumor to adjacent structures often influences the treatment plan. Although no controlled clinical studies have directly assessed the risk of cholecystitis after ablations adjacent to the gallbladder, reports of post-ablative cholecystitis have been influential in planning the treatment of liver tumors [3,4]. Some have noted that when treating tumors adjacent to the gallbladder and bowel, an open or laparoscopic technique provides the ability to mobilize adjacent vital structures away from the treatment area, thus decreasing the risk [4–6]. A more recent report by Chopra et al. [5], demonstrated in 8 patients who were followed for a mean of 8 months, that radiofrequency ablation near the gallbladder is feasible and appears to be safe.

Case Report

A 58-year-old man with a history of T3N1M1 adenocarcinoma of the colon presented with metastases to the liver 10 months after diagnosis and subsequent right hemicolectomy. Surgical history included a left thoracotomy for the repair of a hiatal hernia and duodenal ulcer 33 years prior to admission. The patient had no history of liver disease or alcoholism. MRI and CT of the liver revealed a small (1 cm) hypervascular enhancing lesion adjacent to the gallbladder within the right lobe of the liver (Fig. 1) and a smaller (>1 cm) lesion in the posterior aspect of the right lobe of the liver.

Informed consent for percutaneous radiofrequency ablation of the two liver lesions was obtained. No institutional review board approval was obtained for the procedure, as radiofrequency ablation is cleared by the FDA for soft tissue ablation. Routine monitoring and conscious sedation were provided in the usual fashion with fentanyl and midazolam, and subcutaneous 1% lidocaine. Using a saline-cooled, 3 cm active-tip, 17.5 gauge single probe and a 480 KhZ, 200 Watt Cool-Tip generator (Radionics, Inc., Burlington, MA), radiofrequency current was administered for 12 min to the 1 cm lesion (Fig. 2) adjacent to the gallbladder followed by a second application for 12 min to the smaller lesion in the posterior right lobe. Following each application, the needle track was cauterized to 70°C on the way out. The cauterizing of the needle tract may have resulted in a small infarct effect, thereby increasing the expected treatment size. The treatment was well tolerated and the patient had only mild complaints of upper right quadrant pain immediately post-procedure, well-controlled with oral analgesics. Post-ablation CT scan (Fig. 3) revealed a 3.7 cm by 4.7 cm area of low attenuation consistent with coagulation necrosis adjacent to the gallbladder. There was also an area of low attenuation in the posterior treatment area consistent with coagulation necrosis of the second lesion.

In the days following the procedure, the patient was observed as an inpatient due to the theoretical risk of developing acute cholecystitis. Liver function tests remained normal except for a rise in transaminases (peaking AST=479, ALT=428). Transaminase elevation is an expected occurrence following liver radiofrequency ablation. The patient developed a fever on post-procedure day 2 with negative blood cultures. Chest radiograph revealed a small right pleural effusion, and ultrasound showed a normal gallbladder wall caliber and no pericholecystic fluid. Low-grade fevers or post-ablation syndrome can be seen for several days post-radiofrequency ablation simply from the treatment, however, the source here was indeterminate. Prophylactic oral amoxicillin/clavulanate was changed to intravenous ampicillin/sulbactam for temperatures reaching 40.1°C, and the potential risk having positive blood cultures (which may take up to 5 days to determine). The patient was afebrile and discharged 3 days after radiofrequency ablation.

Discussion

Surgical candidacy for excision of liver tumors is affected by the size, number, location, and distribution [6]. Tumors in both lobes of the liver may render a patient unresectable. Radiofrequency ablation can be applied to multiple tumors within a lobe or in separate lobes. Combining radiofrequency ablation and resection may increase the operability of certain patients with bilobar disease [7].

Proximity of liver lesions to the gallbladder is not an absolute contraindication for percutaneous radiofrequency ablation, however, it may be a relative contraindication [4,8,9]. Predictability of radiofrequency ablation-induced thermal lesions is somewhat variable, dependent on ablation system, operator, and dielectric properties of the tissues. The insulating nature of cirrhotic livers, commonly referred to as the “oven effect,” has been shown to protect adjacent organs while promoting a more concentrated sphere of thermally induced tissue destruction [10]. In this case, a tumor in direct contact with the gallbladder was ablated without subsequent cholecystitis.

In 1984 there were reports of high rates (53%) of gallbladder necrosis after hepatic artery embolization [11]. Although the exact rate of cystic artery embolization remains controversial, recent reports have stated a much lower rate of 14% [12]. Though technological advancements in imaging equipment and familiarity with the procedure may account for some of the discrepancy, initial reports may have overstated the risks. In a similar fashion, radiofrequency ablation near the gallbladder may prove safer than originally thought, supported by Chopra et

al. [5] in a recent report on a small group of 8 patients. Obtaining satisfactory treatment that includes normal tissue often involves a balance between risk and benefit. The added risk of radiofrequency ablation near the gallbladder or other vital organs remains undefined. Though it is possible to safely perform RFA adjacent to the gallbladder, clinical experience along with risk-benefit analysis should still guide treatment planning.

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Fig. 1. Colon adenocarcinoma metastasis to the liver in close proximity to the gallbladder. A T1-weighted MRI without contrast shows the tumor (arrow) before treatment adjacent to the gallbladder.

Fig. 2. Tumor adjacent to the gallbladder with radiofrequency probe in place. **(A)** Ultrasound at the beginning of treatment shows echogenic artifact secondary to ablation, primarily at the tip of the probe (arrow). **(B)** Echogenic artifact seen up to the tumor margin at the wall of the gallbladder (arrow).

pictsFig. 3.

(A) Treatment area (arrow) 6 weeks after ablation shown by CT with contrast. **(B)** Treatment area (arrow) has decreased in size and is visualized 8 months after radiofrequency ablation with non-contrast T1-weighted MRI.