TECHNIQUE / CASE SERIES

Radiofrequency Ablation of Splenic Tumors: a Case Series

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ABSTRACT

Radiofrequency ablation (RFA) for treatment of splenic tumors has rarely been reported. Here we describe our experiences of undergoing RFA in three patients with solitary metastatic (n=2) and benign (n=1) tumors of the spleen. Two patients also had underlying cirrhotic hypersplenism. A 53-year-old male with solitary splenic metastasis from hepatocellular carcinoma underwent laparoscopical RFA of the splenic tumor. Another 61-year-old female with intraabdominal recurrence, focal splenic metastasis from colon cancer and cirrhotic hypersplenism underwent cytoreductive surgery and RFA of splenic tumors. On the third patient, a 32-year-old man with severe hypersplenism, splenic artery steal syndrome and a solitary splenic hemangioma, a laparoscopical RFA of the splenic tumor was performed. The three patients recovered uneventfully. The concurrent hypersplenism of the latter two patients improved significantly. The results indicate that RFA of splenic tumors is feasible and safe, and could be evaluated as an alternative to splenectomy in selected patients with solitary splenic tumors.

Key words: radiofrequency ablation (RFA) – spleen – neoplasms – hyerpsplenism – splenic artery steal syndrome.

INTRODUCTION

Splenic tumors, benign or malignant, are relatively rare entities [1]. Splenectomy has been selected as a first-line choice over several decades [1, 2]. However, the spleen is an important immune organ in tuning up immune homeostasis and protecting against infections [3]. Hyposplenic state after splenectomy might predispose individuals to major morbidities, especially infectious complications [3, 4]. Therefore, optimal management of splenic diseases has shifted from splenectomy to conservative treatment in the past decade, in order to preserve partial splenic function [3, 5-7].

Several minimally invasive methods for local tumor ablation have recently been developed, such as radiofrequency ablation (RFA) [5, 6] and microwave ablation (MWA) [7]. Among these, RFA has become the most widely employed method. Hitherto only two splenic metastases cases treated by RFA have been reported [5, 6], and we have added three new cases now.

CASE 1

A 53-year-old man presented with a solitary mass with 3.4-cm diameter in the lower pole of the spleen on computed tomography (CT) (Fig.1) 6-months after right hemihepatectomy for hepatocellular carcinoma (HCC). The serum AFP was >10,000 ng/ml preoperatively, which decreased to normal level after surgery. There were no splenic lesions on preoperative CT images. The initial planned splenectomy for the splenic metastasis was declined because of fear for its invasiveness and laparoscopic RFA of the splenic tumor was accepted.

The patient was placed in a supine oblique position under general anesthesia. Following laparoscopic mobilization of the lower splenic pole, a Cool-Tip cluster electrode (Cool-Tip;

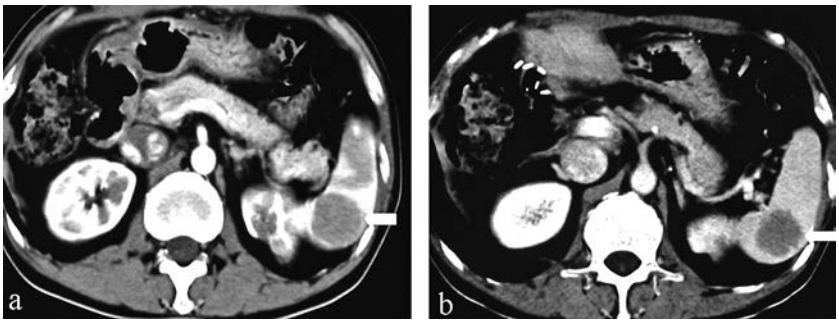

Fig. 1. Contrast-enhanced CT images revealed a solitary round splenic metastasis with a diameter of 3.4-cm (arrow). No attenuation evidenced on arterial phase (a), and peripheral enhancing on venous phase (b).

Radionics, Mass) consisting of 3 parallel 17.5-gauge electrodes was inserted into the splenic tumor (Fig. 2), with an initial power output of 80W. Two different overlapped sites were ablated with a curative intention, and each cycle lasted 14 minutes. The needle track was cauterized on needle removal.

The patient recovered uneventfully, and was discharged 3 days later. Unfortunately, an accidental stroke occurred on the 20th postoperative day, and he refused the scheduled radiologic examination. He died 8 months after the splenic RFA.

CASE 2

A 56-year-old woman underwent a right hemicolectomy for colonic serous papillary adenocarcinoma in May 2005. Another operation was performed for pelvic metastases in 2006. Relapsed intraabdominal tumors and a splenic metastasis were confirmed in 2007, and partial responses occurred after bevacizumab-based chemotherapy. She was readmitted in January 2010 for intestinal obstruction due to rapid-growth metastases. She had a history of chronic hepatitis B over 20-years.

The followings were the preoperative examining results: a 14-cm intraabdominal cyst-solid tumor, a 4cm×3cm splenic metastasis and the presence of massive splenomegaly on CT images (Fig. 3 a, b); CA125 296.4 U/ml, WBC count of 2.1×10^9/L, platelet count of 75×10^9/L, and prothrombin time (PT) 14sec (normal range 9.9-12.8), international normalized ratio (INR) 1.24 (0.8-1.2) on blood tests.

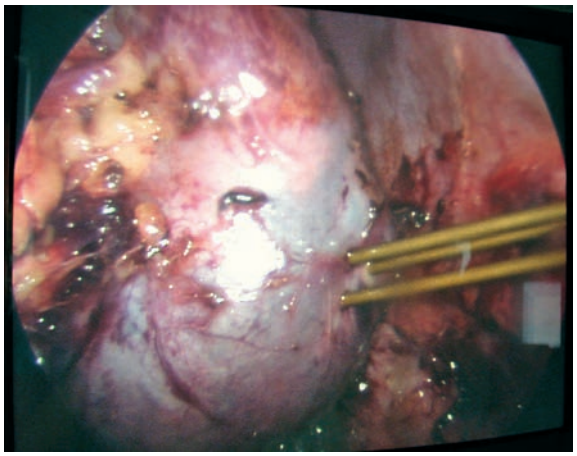

Fig. 2. Laparoscopic view of radiofrequency ablation of splenic tumor using a Cool-Tip cluster electrode.

To resolve the intestinal obstruction, surgical procedures including palliative resection of the cyst-solid tumor, omentectomy, partial resection of the infiltrated bowels and enteroanastomosis were devised. Simultaneous RFA of splenic tumor and partial parenchyma following ligation of the splenic artery was selected for the management of hypersplenism.

Radiofrequency ablation of the splenic tumor was performed via open surgery by using the RITA 1500 generator (RITA Medical Systems Inc., CA) supplying up to 200W of power. A 15-gauge multi-tined expandable electrode (StarBurst XL) containing 9 individual tines deployed into the splenic tumor, with an initial power output of 180W, then working with a roll-off mode after a mean temperature above 105°C. Partial splenic parenchyma was simultaneously ablated to resolve the concurrent hypersplenism. Pulse RF energy was applied for 20 min, 15 min and 10 min for 3 overlapped regions each.

A postoperative contrast-enhanced CT scan showed complete destruction of the splenic tumor, and an ablation of 30% of the splenic volume (Fig. 3 c, d). The postoperative course was uneventful. During a 2-year follow-up period, although bone and intraabdominal metastases occurred, no relapsed splenic metatases and respiratory infections were found and the laboratory results remained normal.

CASE 3

A 32-year-old man was admitted with severe hypersplenism and chronic hepatitis B. He had no history of gastrointestinal hemorrhage. CT scanning showed liver cirrhosis, esophagogastric varices, splenic artery steal syndrome (smaller diameter of the hepatic artery than that of the splenic artery, delayed filling of hepatic parenchyma on arterial phase, early visualization of portal vein, and massive splenomegaly), and an incidentally discovered 3cm splenic hemangioma (Fig. 4 a, b). Preoperative blood tests displayed WBC count of 1.84×10^9/L, platelet count of 33.2×10^9/L, serum total bilirubin of 35.12 μmol/L, PT 13.9 sec, and INR 1.24.

In order to overcome the heat-sink effect from an overrushing splenic flow, we performed laparoscopic splenic RFA following transcatheter splenic arterial embolization by deployment of 6 metal Gianturco coils with 5-15-mm in diameter. The splenic RFA was accomplished laparoscopically, and the procedure was similar to that of case 2. The ablated parenchyma included the splenic hemangioma. Five overlapped regions totally lasting 65 minutes were ablated.

The patient recovered rapidly without any complications, except for a transient low-grade fever (<38.0°C). A postoperative CT scan showed an ablation of 70% of the splenic volume, with a complete destruction of the hemangioma (Fig. 4c), and correction of splenic artery steal syndrome (Fig. 4d). Blood tests at 2-weeks postoperatively showed a normalization of all abnormalities, the Child-Pugh score and MELD scores were 5 and 7 respectively, compared with preoperative scores of 6 and 12. The patient did not have vaccinations and during a 3-year follow-up period he had no evidence of increased incidence of infection.

DISCUSSION

Splenectomy is a standard therapy for splenic tumors. However, splenectomy entails risks of morbidity and mortality [3, 4]. Additionally, some patients in poor conditions are not eligible for surgery. Thus RFA was attempted in order to manage splenic tumors and simultaneously for underlying hypersplenism. This technique can avoid splenectomy, preserve the splenic function, and minimize splenectomy-related complications.

As a minimally invasive technique, RFA has been accepted widely as a safe alternative to surgery in the management of tumors in solid organs and now can be expanded to cirrhotic hypersplenism [8-10]. The nature of high-vascularization of the spleen makes invasive procedures fraught with risks of bleeding, which may explain the rare experience of ablation of splenic tumors [5, 6]. We have confirmed the safety and efficacy of RFA for cirrhotic hypersplenism [8-10]. In our experience, splenic ablations via percutaneous, open or laparoscopic pathway are all feasible. Besides applying higher RF initial power output, longer ablating time and needle track cauterization, occlusion of the splenic artery by embolization or ligation before RFA can greatly lower the risk of bleeding.

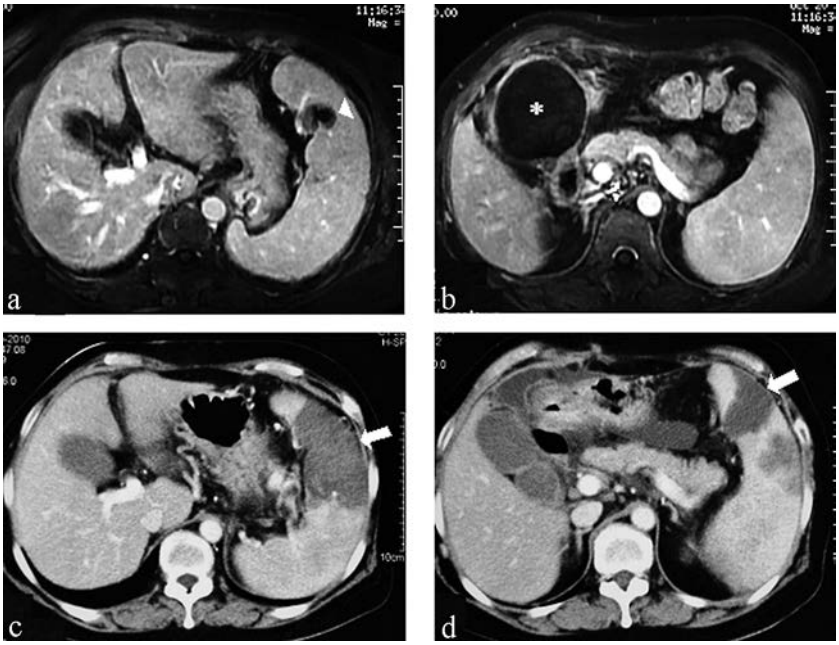

Fig. 3. Preoperative contrast-enhanced MRI images revealed a solitary splenic metastasis with a diameter of 2.5-cm (a, arrowhead), and a 14-cm cyst-solid tumor (b, *) at right upper quadrant. Postoperative contrast-enhanced CT images showed complete destruction of the splenic metastasis (c, d, arrow), and approximately 30% ablation of total splenic volume. The tumor located in right upper quadrant has disappeared (d).

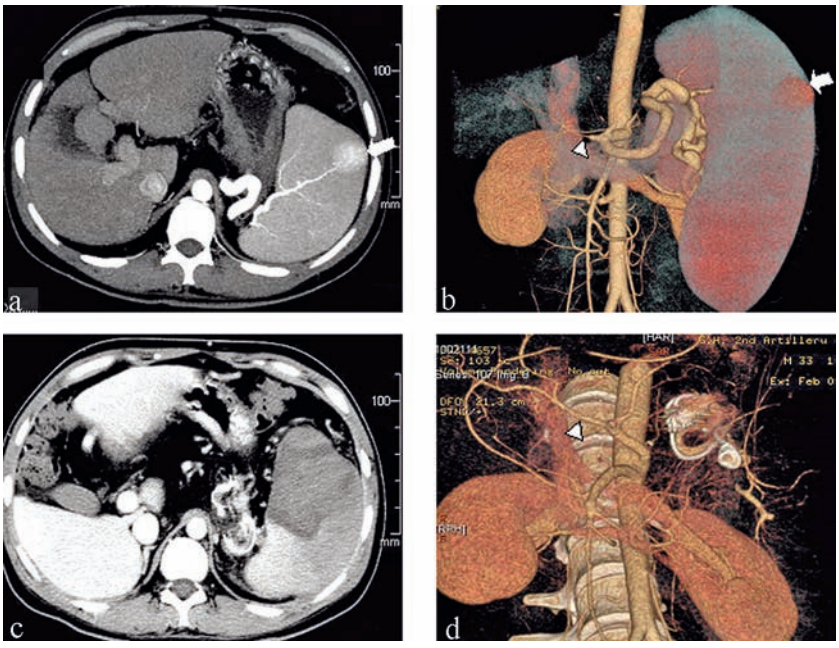

Fig. 4. Preoperative contrast-enhanced CT images evidenced liver cirrhosis, 3cm splenic hemangioma (a, b, arrow), and splenic artery steal syndrome indicated by a distinctly smaller diameter of the hepatic artery (b, arrowhead) than that of the splenic artery, delayed filling of hepatic parenchyma and early visualization of portal vein on arterial phase, and massive splenomegaly. Postoperative contrast-enhanced CT images showed complete destruction of the splenic tumor, and approximately 70% ablation of the total splenic volume (c), and the splenic artery steal syndrome was corrected (d).

The latter approach has two other benefits: (1) expanding the ablated efficacy by reducing heat-sink effect and increasing intrasplenic heat exchange, (2) ameliorating hepatocelluar function by increasing hepatic arterial flow and oxygen supply, owing to a correction of splenic artery steal syndrome [11-13]. For small central tumors, it may select percutaneous RFA under US or CT guidance. For splenic tumors adjacent to major vessel branches, or to manage underlying hypersplenism such as cases 2 and 3, concomitant splenic artery occlusion can be considered [8, 9, 11-13].

CONCLUSION

Our results indicate that RFA of splenic tumors is feasible. However, further clinical trials with more patients is still required to evaluate the feasibility of RFA as an alternative to splenectomy in selected patients with solitary splenic tumors.

Conflicts of interest: None to declare.

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