



<b>Title</b>	<b>Radiofrequency ablation for controlling iatrogenic splenic injury</b>
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<b>Citation</b>	<b>International Journal Of Colorectal Disease, 2010, v. 25 n. 5, p. 667-668</b>
<b>Issued Date</b>	<b>2010</b>
<b>URL</b>	<b><a href="http://hdl.handle.net/10722/144898">http://hdl.handle.net/10722/144898</a></b>
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## Radiofrequency ablation for controlling iatrogenic splenic injury

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Accepted: 30 October 2009 / Published online: 21 November 2009  
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Dear Editor,

Iatrogenic injury to the spleen is a recognized complication of abdominal surgery. It inevitably results in prolonged operative time, increased blood loss, and extended hospital stay. Besides, it entails the potential risk of overwhelming post-splenectomy infection. In the management of iatrogenic splenic injury, splenic salvage is the ultimate goal, and various surgical techniques have been developed for effective control of bleeding which is usually serious in such injury.

A 75-year-old man was admitted to our hospital because of passage of melena with a significant drop in hemoglobin. Upper endoscopy was unremarkable; repeated colonoscopy showed the presence of blood clots in the colon and the rectum with no obvious mucosal lesion. In view of his hemodynamic instability, laparotomy was performed. During laparotomy and intra-operative enteroscopy, blood was found at the distal 50 cm of the ileum associated with multiple ulcers. Extended right hemicolectomy was hence performed. During mobilization of the splenic flexure, a tear was made at the splenic tip, and hemostasis with various hemostatic agents failed.

Hemostasis of the splenic tip laceration was finally achieved with radiofrequency ablation (RFA). It was performed using an internally cooled electrode (Cool-tip®, Radionics, Burlington, MA, USA) with 2.5-cm exposure length. The needle tip was continuously perfused with 4°C cold water at a rate of 100 ml/min via a channel inside the

needle throughout the ablation process. The total RFA treatment time was 4 min. Two liters of blood loss was recorded, and seven units of packed cells, four units of fresh frozen plasma, and four units of platelet concentrates were transfused.

Computed tomography of the abdomen done on postoperative day 1 showed minimal degree of splenic infarction. His condition stabilized and he was discharged on postoperative day 11. Pathology of the specimen showed multiple chronic ulcers in the small bowel, but the origin of these ulcers could not be ascertained. He was seen at the outpatient clinic 1 month after the operation and remained well with no evidence of re-bleeding.

Although iatrogenic injury to the spleen is well-recognized as a complication of abdominal surgery, the extent of the problem is often underestimated. The incidence of splenic injuries secondary to colectomy and nephrectomy has not changed appreciably over the past few decades. Besides causing prolonged operation time, increased blood loss and extended hospital stay, splenic injury is also associated with a two- to tenfold increase in infection rate and up to a doubling of mortality rate. Post-splenectomy septicemia is usually described as overwhelming sepsis with a massive number of circulating organisms, proceeding rapidly to refractory shock and death. Hence, splenic preservation is crucial in the management of any kind of iatrogenic splenic injury.

For avoidance of total splenectomy in the case of iatrogenic splenic injury, there are different kinds of techniques employing different kinds of materials and equipment such as suture, mesh, stapler, metal clip, argon beam coagulator, ultrasonic dissector, and the floating ball, in addition to ligation of segmental vasculature as well as application of topical agents for residual surface bleeding. However, the success rates of these techniques are low

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because of the spleen's vascular nature which gives it the propensity for considerable intra-operative bleeding.

RFA is a recently developed method of local tissue destruction. The radiofrequency generator produces 200-W radiofrequency waves at 400–500 kHz which excite the surrounding electrons to vibrate at a high frequency and thus generate heat energy. When cells are heated to more than 60°C, cell death occurs as a result of the melting and destruction of cell membranes and the denaturation of cell proteins. In the meantime, small- to medium-sized blood vessels are thrombosed because of the deposition of radiofrequency energy. Hence, RFA can achieve complete hemostasis at the site of ablation. It is now an established method for treating neoplastic lesions mainly located in the liver. It is also used to treat hemobilia secondary to hepatocellular carcinoma and to reduce blood loss in post-biopsy bleeding. There are also reports of RFA for control of hemorrhage in ruptured hepatocellular carcinoma and RFA-assisted hepatectomy.

However, studies and case reports on the use of RFA for splenic bleeding in humans are few. The above-mentioned case is, to our knowledge, the first reported case of RFA-assisted hemostasis for iatrogenic splenic injury. The major

advantage of this technique is that it offers excellent control of bleeding from splenic parenchyma without the need for vascular control of the splenic hilum. This is important especially if the exposure is difficult. In addition, RFA is readily available and easy to set up in an emergency situation. It is also easy to handle and quick to perform. We recommend that RFA needs to be considered as a mode of hemostatic technique when iatrogenic splenic injury is encountered. However, the exact efficacy of RFA-assisted hemostasis for spleen injury has yet been investigated in large-scale study.

In conclusion, iatrogenic injury to the spleen remains an important issue in abdominal surgery, and splenic salvage is the ultimate goal of treatment for this complication. The fact that there is a wide variety of techniques for hemostasis implies that none is superior to others. However, with its effectiveness and convenience, RFA should be taken into consideration in the decision on treatment mode for iatrogenic splenic injury.

**Conflict of interest** None