saved because too much time can be wasted trying to reenter from the antegrade approach. From pedal access to wire retrieval, we spent an average of 22 minutes of procedure time (range, 15–30 minutes). Procedural time could have been saved if we resorted to the retrograde access prematurely. Lupattelli et al (7) cautioned against adopting SAFARI as a standard procedure. Their arguments regarding the risk of serious complications, such as flow-limiting dissection and thrombosis at the access site, are legitimate. The technique should also be avoided in patients with ulcers at the entry site. Lupattelli et al (7) consider SAFARI as time-consuming, which is a main limitation in critically ill patients, including patients with CLI. In the largest series of SAFARI reported to date (51 cases, 45 of which had CLI), Montereo-Baker et al (8) reported one major complication (1.9%) consisting of pedal access site occlusion requiring immediate surgery and four (7.8%) minor complications: three arterial perforations and one pedal hematoma. We could argue that patients presenting with IC might be more suitable for SAFARI than patients presenting with CLI. These patients usually have “healthier” infrapopliteal vessels, making access and wire manipulation less challenging. By definition, they have no ulcers or tissue loss at the access site. They are usually not as ill as patients with CLI, with relatively better tolerance of long procedures.

At an average of follow-up period of 13.6 months (range, 9–17 months), the DPA and ATA were widely patent, stable compared with baseline, and with no evidence of dissection or progression of atherosclerotic disease, as documented by CT angiography and duplex ultrasound. We believe that the poor results at 1 year are inherent to the nature of advanced infragingual peripheral arterial disease (all three patients had Inter-Society Consensus for the Management of Peripheral Arterial Disease [TASC II] D lesions) and not to the technique or the access per se. Poor patient compliance in terms of clinical follow-up examination and risk factor modification (all patients continued to smoke heavily) could have also played a role.

Retrograde pedal arterial access might be used as a “bailout” technique during endovascular recanalization of challenging femoropopliteal chronic total occlusions, not only in patients with CLI but also in patients with IC. However, the technique should not be considered as a standard first-line therapy until large studies become available.

REFERENCES


Endobiliary Radiofrequency Ablation for Reopening of Occluded Biliary Stents: A Promising Technique

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Editor:
Biliary drainage with the use of self-expandable metallic stents (SEMS) is a well accepted palliative therapy for patients with unresectable malignant hilar obstruction. However, these stents often lose their potency over a period of 3–6 months secondary to tumor ingrowth or overgrowth, epithelial hyperplasia, and/or occlusion caused by sludge deposition or clot or stone formation (1). In such a scenario, limited treatment options are available, such as placement of a stent within a stent percutaneously or through endoscopic retrograde cholangiopancreatography.

Endobiliary radiofrequency (RF) ablation has been shown to be an effective modality in the treatment of malignant biliary obstruction (2). Here we present our experience in two patients in whom we used endobiliary RF ablation to reestablish patency of an occluded SEMS. In view of the retrospective nature of this report, institutional review board approval was not needed per our institutional policy.

The first patient was a 58-year-old woman with cholangiocarcinoma involving the primary and bilateral secondary biliary confluence. She had four SEMSs placed 1 year earlier at another hospital to drain her right and left biliary systems. She presented to the emergency department with...
worsening obstructive jaundice and clinical features of cholangitis. On evaluation, her serum bilirubin level, alkaline phosphatase level, \( \gamma \)-glutamyl transpeptidase level, and white blood cell count were markedly elevated (Table). Abdominal ultrasound (US) and contrast-enhanced computed tomography revealed dilated intrahepatic biliary radicles with echogenic intraluminal contents associated with biliary abscesses. Urgent percutaneous transhepatic biliary drainage (PTBD) was performed for three dilated bile ducts (right anterior and right posterior sectoral and segment III duct) with frank pus drainage. Systemic antibiotic therapy was continued until drain output was clear and white blood cell count returned to normal, following which internalization of the PTBD catheters was attempted. After negotiating the guide wire across the blocked stents, a biliary cytology brush (Cook, Bloomington, Indiana) was passed percutaneously over the guide wire, and samples were taken sequentially from the three occluded stents. Cytologic examination revealed adenocarcinoma consistent with tumor ingrowth within the stents.

Endobiliary RF ablation was then performed for the three stents with the use of a Habib EndoHPB catheter probe (EMcision UK, London, United Kingdom; Fig 1). This device consists of an 8-F bipolar RF ablation probe with two ring electrodes 8 mm apart, with the distal electrode located 5 mm from the catheter tip. It is advanced over a 0.035-inch guide wire. Energy was delivered by a

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before Procedure</th>
<th>At Discharge</th>
<th>At 6-mo Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum bilirubin (mg/dL)</td>
<td>15.16</td>
<td>3.26</td>
<td>1.3</td>
</tr>
<tr>
<td>Direct</td>
<td>9.81</td>
<td>1.32</td>
<td>0.4</td>
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<tr>
<td>Indirect</td>
<td>5.35</td>
<td>1.94</td>
<td>0.9</td>
</tr>
<tr>
<td>ALP (IU/L)</td>
<td>906</td>
<td>100</td>
<td>90</td>
</tr>
<tr>
<td>GGT (IU/L)</td>
<td>172</td>
<td>70</td>
<td>55</td>
</tr>
<tr>
<td>WBC (×10^9/L)</td>
<td>39.1</td>
<td>6.7</td>
<td>5</td>
</tr>
</tbody>
</table>

**Table.** Pre- and Postprocedural Laboratory Parameters

ALP = alkaline phosphatase, GGT = \( \gamma \)-glutamyl transpeptidase, WBC = white blood cell.

Figure 1. Contrast-enhanced CT image (a) shows dilated biliary radicles (thick arrows) with cholangitic abscesses (thin arrow). Fluoroscopic image (b) shows endobiliary RF electrodes (arrows) within the stent. Subtracted image (c) shows opened stent with free flow of contrast agent (arrows) into the duodenum.

Figure 2. Fluoroscopic images show endobiliary RF ablation (arrows showing ring electrodes) being performed (a) and reopened stent with contrast agent flow (arrows) within the stent (b).
RITA 1500X RF generator (AngioDynamics, Latham, New York) at 400 kHz and 10 W for 2 minutes. The entire obstructed segments of the stents were ablated. The guide wire and RF ablation probe had to be repositioned on a couple of occasions during ablation as a result of contact between the electrode and the stent, resulting in short circuit and failure to reach target temperature. Immediately after RF ablation, recanalization was demonstrated on cholangiography, which showed free flow of contrast agent across the stent into the duodenum (Fig 1). Laboratory investigations were periodically performed for follow-up. The patient was clinically asymptomatic at 6-month follow-up.

The second patient was a 53-year-old woman who presented with recently worsening obstructive jaundice. She had a history of unresectable malignant hilar obstruction, for which two biliary stents were inserted via a percutaneous route in right and left ductal systems 3 months earlier at our institution. At presentation, she exhibited severe jaundice, and US revealed dilated biliary radicles on both sides, without pneumobilia (Table), suggestive of stent occlusion. The left ductal system was decompressed by using an endoscopically inserted plastic stent; however, endoscopic recanalization of the right-sided stent failed. PTBD was performed for the right ductal system, and internalization of the drainage catheter was performed through the right stent. After tumor ingrowth was confirmed by brush cytologic examination, endobiliary RF ablation was performed for the entire obstructed segment with the use of similar time and energy levels as for the first patient, and restoration of patency of the right-sided biliary stent was achieved (Fig 2). The patient continued to do well, and laboratory parameters remained within normal limits, for 7 months of follow-up.

Placement of a SEMS is known to be a safe and effective palliation method for patients with biliary obstruction and associated obstructive jaundice caused by unresectable bile duct malignancy. However, progressive tumor ingrowth through the openings between the struts of the stents can lead to recurrent blockage, thereby significantly reducing their primary patency. Despite many attempts at finding a potential solution to this problem, including the use of covered stents, different stent designs, and endobiliary photodynamic therapy, little progress has been made in terms of improving the duration of stent patency (3,4). Endobiliary RF ablation is a recently developed option in the management of such patients. The safety of endobiliary RF ablation in malignant obstructive jaundice before stent placement, and its effectiveness in maintaining bile duct patency over a 3-month follow-up period, was demonstrated in a recent study (2). We have tried to use this ablative therapy to clear tumor ingrowth within the wire mesh of metallic stents. With the increasing use of covered metallic stents for malignant distal biliary obstruction, tumor overgrowth, rather than ingrowth, is expected to become a more common cause of stent occlusion (4). However, covered metallic stents are unlikely to uniformly replace bare metal stents, especially for cases of malignant hilar obstruction. Our initial experience in this limited report of two patients suggests that this recanalization technique seems safe and feasible in patients with preexisting biliary duct stents.

REFERENCES