EUS-guided biliary drainage: a Latin American experience
Drenagem biliar eco-guiada: experiência latino-americana

Everson L. A. Artifon, Flavio Ferreira, Andre Bordini, Carolina Rabello, Jonas Takada, Paulo Sakai
GI Endoscopy Service, University of São Paulo (USP), São Paulo, Brazil.

Summary
Our team was the first to perform an EUS biliary and pancreatic drainage in Latin America. When distal biliary obstruction (pancreatic and papillary lesions) occurs, EUS-guided fistulization between the common bile duct and duodenal bulb is an efficient and feasible strategy on achieving resolution of jaundice with low morbidity and mortality rates under experienced hands. EUS-guided hepaticogastrostomy and coledochoduodenostomy are advanced procedures on biliary and pancreatic endoscopy and together make up the echo-guided biliary drainage. Hepaticogastrostomy is indicated in cases of hilar obstruction, while the procedure of choice is coledochoduodenostomy in distal lesions. Both procedures must be done only after unsuccessful ERCP. The indication of these procedures must have the reference of a multidisciplinary team, with information sharing with the patient or legal guardian. This study was conducted from June 2007 until March 2010.

Keywords: Endoscopic ultrasound, palliation, biliary.

Introduction
Endoscopic transpapillary biliary drainage is the procedure of choice for biliary decompression in patients with unresectable pancreatic cancer associated to obstructive jaundice1,2,3,4. However, ERCP failure can occur in 3 to 10% of cases1,2,4, even in experienced hands. This failure is related to operator inexperience, anatomic variation, tumor extension, prior surgery or incomplete drainage1,2,3,4. The alternatives for biliary drainage in unsuccessful ERCP cases include precut sphincterotomy when a pathologic lesion is suspected, second-attempted ERCP, percutaneous transhepatic drainage (PTBD) or surgery1,3,5. However, PTBD has a complication rate of up to 30%, including biliary fistula, peritonitis, empyema, hematoma and liver abscesses1,6. Furthermore, if subsequent internal drainage cannot be achieved, the patients would have to accept long-term external biliary drainage which can be uncomfortable and is non physiological, with significant
impairment of quality of life. Surgery offers long-term patency but is associated with increased morbidity and mortality. Recently, EUS-guided biliary drainage has been shown in several reports as an alternative treatment for the management of patients with malignant obstructive jaundice, with acceptable success and complication rates. These techniques include EUS-guided transpapillary rendezvous technique, EUS-guided choledochoduodenostomy and EUS-guided hepaticogastrostomy.

EUS-guided biliary drainage has many advantages over PTBD. The proximity of the transducer to the bile duct during EUS is the major advantage. Even in patients who have undergone total gastrectomy or partial gastrectomy with a Billroth II reconstruction, EUS can reveal the etiology of extrahepatic cholestasis, situations in that ERCP may not be possible. Other advantages include puncture of the biliary tree with color-Doppler information to avoid vascular injury, the lack of ascites in the interventional field and the lack of an external tube, improving the quality of life of the patients.

The main risk of EUS-guided biliary drainage is bile leakage, especially if stent insertion is unsuccessful. Burmester et al reported the failure of stent placement in 1 of their 4 patients, causing bile peritonitis. They also reported that only local peritonitis developed, which did not contribute to the death of the patient. Some investigators recommend the transhepatic approach to decrease the risk of biliary peritonitis in case of stent failure. Other complications include pneumoperitoneum and minor bleeding.

EUS-guided biliary rendezvous

EUS rendezvous to obtain bile duct access for conventional ERCP was first reported in 2004, by Mallery et al. This technique is used solely to puncture the obstructed bile duct and pass a guide wire antegrade through the native papilla to allow subsequent ERCP.

EUS-guided biliary rendezvous can be done through a transduodenal route to the common bile duct or through a transgastric route to the intrahepatic ducts. Technical success rate is about 80%. Complications are uncommon, but duodenal perforation and fluid leaks have been described.

Table 1: HCFMUSP experience in EUS-guided biliary drainage (from June 2007 until March 2010).

<table>
<thead>
<tr>
<th>Patient</th>
<th>Gender</th>
<th>Age</th>
<th>Indication</th>
<th>Procedure</th>
<th>Initial TB (mg/dL)</th>
<th>1 week follow-up</th>
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<tbody>
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<td>1</td>
<td>Female</td>
<td>46</td>
<td>Hilar Cholangiocarcinoma</td>
<td>EUS-HG</td>
<td>22</td>
<td>10</td>
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<tr>
<td>2</td>
<td>Female</td>
<td>88</td>
<td>Pancreatic Cancer</td>
<td>EUS-CDS</td>
<td>18</td>
<td>5</td>
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<tr>
<td>3</td>
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<td>Hilar Lymphadenopathy</td>
<td>EUS-HG</td>
<td>15</td>
<td>7</td>
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<tr>
<td>4</td>
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<td>52</td>
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<td>EUS-CDS</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>41</td>
<td>Hilar Cholangiocarcinoma</td>
<td>EUS-HG NO SUCCESS</td>
<td>19</td>
<td>5</td>
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<td>EUS-HG</td>
<td>11</td>
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<tr>
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<tr>
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<td>95</td>
<td>Pancreatic Cancer</td>
<td>EUS-CDS</td>
<td>12</td>
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</tbody>
</table>

Advantages of this procedure include achievement of biliary drainage at a single session by using conventional ERCP techniques, and possibly fewer complications than other EUS transluminal drainage approaches. However, a limitation of this technique is that it can be attempted only in patients in whom the papilla is endoscopically accessible.

**EUS-Guided Choledochoduodenostomy**

Giovannini et al performed a choledochoduodenal fistula under EUS guidance in a patient with pancreatic cancer using a needle knife followed by transduodenal stenting. Since then, many studies described this procedure, with high success rates (92%) and low rate of procedure-related complications (19%).

EUS-guided choledochoduodenostomy (EUS-CDS) has to be done after failure of ERCP and must be performed by an experienced endoscopist. Prophylactic antibiotics are administered prior to the procedure.

The CBD is visualized using a linear echoendoscope positioned in the duodenal bulb. Color doppler US is used to identify regional vascular anatomy. The dilated bile duct is punctured with a 19 gauge FNA needle. The puncture position is chosen based on EUS evaluation, above the tumor and distal to the duodenal bulb (Figures 1 and 2).

To confirm successful biliary access, bile can be aspirated and iodine contrast injected under fluoroscopy to demonstrate biliary opacification (Figure 3).

A 0.035-inch guidewire is introduced through the EUS needle, using fluoroscopy, and attempts to pass the wire through the papilla to the duodenum are made. When this maneuver has no success, the needle is withdrawn and a wire-guided needle knife is used to perform a puncture in the duodenal wall. A partially covered self-expandable metallic stent (C SEMS) is passed over the guide, through the choledochoduodenal fistula, without any dilatation procedure (Figure 4).

Duodenal bulb invasion is a limitation of EUS-guided choledochoduodenostomy, because it can difficult the CBD visualization and the tumoral growth can obstruct the stent. In these cases, EUS-guided hepaticogastrostomy can be done.
but dilation of the left biliary system is not always present, what can difficult the procedure. In some patients, visualization of the CBD from the antrum can allow an alternative of a choledochoantrostomy (Figure 5).

This modification of the EUS-guided biliary drainage has been first performed by our group in a case of unresectable pancreatic cancer with biliary obstruction and extensive duodenal invasion. It seems to be technically easier to perform and more physiological than a hepaticogastrostomy. This case has already been submitted for publication.

**Eus-Guided Hepaticogastrostomy**

Giovannini et al., in 2003, described the first EUS-guided hepaticogastrostomy, in a patient with proximal metastatic biliary obstruction. Other authors have also reported successful outcomes of this technique in which an anastomosis is created between the dilated left intrahepatic biliary system and the cardia or the lesser curve of the stomach. Artifon et al. and Bories et al., in 2007, described the successful use of partially covered metallic stent in EUS-guided hepaticogastrostomy. This modification seems to reduce complication rates. This procedure has technical success rate of 90% to 100% and clinical success rate of 75% to 100%. Complications are rare, and include stent migration, bile leaks and cholangitis. A fatal complication has been described by Martins et al., in 2010, after migration of the hepaticogastrostomy stent.

The procedure is performed using a linear array EUS, placed against the cardia or lesser curve of the stomach. EUS is performed to evaluate for a dilated left intrahepatic biliary system. Vascular anatomy is shown by the power or color Doppler. Then, a dilated peripheral branch of the left intrahepatic system, that is closest to the EUS transducer, is accessed by using a 19 gauge needle (Figure 6).

A 0.035-inch guidewire is introduced through the EUS needle, using fluoroscopy, and attempts to pass the wire through the native papilla to the duodenum are made. When this maneuver has no success, the needle is withdrawn and a wire-guided needle knife is used to perform the fistula between the left intrahepatic branch and the stomach. A partially covered self-expandable metallic stent (PC-SEMS) is passed over the guide, through the hepatogastric fistula, without any dilatation procedure (Figure 8).
A Latin American Experience

EUS-guided biliary drainage has been done in Sao Paulo Medical School since early 2007, in strict study protocols. We present here our experience in a single tertiary referral Institution from June 2007 until March 2010. Nowadays, clinical studies in EUS-guided biliary drainage, approved by ethical committees, are in progress, with remarkable results. We recommend that this method should be made by very experienced endosonographers and in defined protocols. Final results will be shown in future publications. However, our current experience at a public Institution is demonstrated in Table 1.

The short follow-up (1 week) seen in Table 1 is only to demonstrate the immediate improvement jaundice. However, several patients of our protocols already have months of monitoring. Complications, life quality and survival are aims of these studies.

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Conclusion

EUS-guided biliary drainage is an effective and minimally invasive option for malignant biliary obstruction, after ERCP failure. It is feasible, but it is technically challenging and requires experienced endosonographer, proficient in ERCP. Standardization of the procedural technique and development of new specific devices are important to improve success and safety rates. EUS biliary drainage is suitable in those patients with advanced pancreatic cancer, presenting difficult cannulation or duodenal invasion of the second portion. Finally, clinical trials comparing the different types of EUS-guided biliary drainage and the PTBD and surgery are imperative.

References