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Endoscopic treatment for post-cholecystectomy bile leaks: update and recent advances

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The introduction of laparoscopic cholecystectomy (LC) was associated with an increased incidence of biliary injuries. One of the initial series reported an incidence of bile duct or hepatic duct injuries of roughly 0.5%, likely an underestimate [1]. A substantial decline in such complications was noted with acquisition of experience in LC. Subsequent studies reported an incidence of 0.8% to 1.1% [2,3]. The incidence of biliary injuries has since remained unchanged as shown by a recent study from a large tertiary care center [4].

From the endoscopist's stand point, biliary injuries during LC can result in bile leaks, biliary stricture formation, or both. Bile leaks are divided into: 1) low grade (LG), where the leak can only be identified after complete opacification of the intrahepatic biliary system and 2) high grade (HG), where the leak can be observed before intrahepatic opacification [5]. The most common sites of post-cholecystectomy bile leak (PCBL) are the cystic duct stump and the duct of Luschka, which tend to be LG and often resolve spontaneously [3, 6, 7]. The duct of Luschka refers to an accessory bile duct that is in close proximity to the gallbladder body and can be injured during LC. Other types of PCBLs range from direct hepatic duct injury and leak to complete bile duct transection and are usually HG. Patients with HG leaks present within the first post-operative week with persistent biliary discharge from an abdominal drain left during surgery or varying degrees of abdominal pain and distension, consistent with intrabdominal bile collections or bile peritonitis, jaundice, or even sepsis. Ultrasound is the initial diagnostic test although in many LG cases diagnosis can be confirmed by a hepatobiliary iminodiacetic acid (HIDA) scan, also called cholescintigraphy, or an endocopic retrograde cholangiopancreatography (ERCP) [8].

Endotherapy is the standard of care in the management of LG and HG bile leaks [9, 10]. The main goal of endoscopic therapy is to reduce the transpapillary pressure gradient to facilitate preferential bile flow through the papilla as opposed to the site of the leak, providing time to the biliary tree injury to heal. This is most commonly achieved by placing a transpapillary stent with or without sphincterotomy [11]. Another approach includes placement of a nasobiliary drain to decompress the biliary system without a sphincterotomy. This approach offers the advantage of repeat cholangiography without the need of another ERCP [12-14]. Its use, however, has been limited due to poor patient tolerance, tube displacement and need for hospitalization until the tube is removed [5].

A variety of endoscopic approaches have been proposed for the management of PCBL. Sandha et al [5] proposed an algorithm for their management based on the grade of leak in a non-randomized setting. They concluded that endoscopic biliary sphincterotomy (EBS) alone without stent placement is a viable treatment option for most patients with LG leaks, unless there is a compelling indication for stent insertion such as retained stone, biliary injury with stricture formation, coagulopathy precluding EBS, or sepsis necessitating immediate closure of the leak. All HG lesions were successfully treated with EBS and stent placement. The study did not address whether EBS alone had an equally favorable outcome as biliary stent placement in patients with LG leaks.

Mavrogiannis et al compared biliary stenting alone vs. EBS plus biliary stenting in a prospective randomized study limited to patients with endoscopically-proven PCBL [10]. They concluded that both methods were equally efficacious in resolving LG leaks and did not differ significantly in their adverse effect profile. However, it is known that EBS is associated with both short- and long-term adverse consequences. Mild pancreatitis is perhaps the most common early complication followed by hemorrhage, perforation and sepsis [15, 16]. Long-term effects include papillary stenosis and cholangitis [17]. The authors therefore recommended against routine EBS in the management of patients with LG bile leaks.

In the same study, 7Fr plastic biliary stents were placed due to ease of insertion in the group without EBS. In the group with EBS, however, wider 10Fr stents were used to minimize risk of migration. It is worth mentioning that 10Fr stents could have been used in both groups, since there is no evidence that insertion of wider 10Fr stents is associated with any increased risk of complications. In fact, it may pose a lower risk of stent clogging in the setting of bile leak with associated choledocholithiasis [10].

There is also debate regarding the optimal proximal extent of the biliary stent. Some investigators believe that the endoprosthesis should extend beyond the site of leakage [3,18]. Others propose that placement of a transpapillary stent in an effort to equilibrate pressure across the biliary tree and duodenum is sufficient to stop the leak [12]. Actually, based

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on the Young-Laplace-Gauss equation, the shorter in length and larger in width the endoprosthesis, the lower the pressure gradient across the papilla. In the study by Ryan et al there was no impact of proximal stent position on outcome after stent placement in the setting of PCBL [19].

There seems to be consensus with respect to the duration of stent placement. Successful endotherapy leads to symptom resolution in most patients within the first week and the stent remains in place for a period of 6 weeks. This seems to be of sufficient duration for biliary leak healing in most studies [10,12,18]. Following this period, the biliary stents can be removed by simple endoscopy with the use of a snare or stent-retrieving forceps.

As far as HG leaks are concerned, there are recent reports in the literature supporting the placement of fully covered removable self-expandable metal stents (SEMS) with successful outcomes [20]. Our own experience, in a small series of three patients with HG leaks secondary to incomplete cholecystectomies, refractory to 10Fr biliary stenting, all patients were successfully treated with placement of 8 or 10 mm in diameter fully covered SEMS long enough to cover the cystic duct take-off.

The featured study in this issue of *"Annals of Gastroenterology"* by Fasoulas et al [21] is an 11-year retrospective review of all patients presenting at a tertiary care center in Northern Greece with a suspected diagnosis of PCBL. It is interesting to note that all patients underwent EBS, stone extraction when indicated, and placement of wide 10Fr or 11.5Fr stent extending across the site of bile leak. In case of LG leaks, such as those originating from the duct of Luschka, short (5 cm in length) transpapillary stents were placed. Overall, endoscopic intervention was highly successful in treating bile leaks in 98% (65 out of 66 patients). The most common ERCP complications encountered included post-ERCP pancreatitis, intraprocedural bleeding and biliary stricture. The authors' results from this series are in accordance with the published literature. They suggested enhanced vigilance and early ERCP so as to initiate diagnostic and therapeutic interventions in patients with diffuse abdominal pain, fever, malaise, abnormal liver injury tests, and increased output from surgical drain post-cholecystectomy. This would ultimately result in reduced hospital stay and total costs.

What is our endoscopic practice? In patients with LG bile leaks, we tend to avoid EBS in younger patients with otherwise normal biliary tree on cholangiogram. We perform EBS only in patients with dilated bile ducts or presence of filling defects. We place short and "fat" plastic biliary stents, usually 10Fr by 5 cm, regardless of the performance of EBS or not in all patients. In the presence of symptomatic bilomas, percutaneous catheters are also placed by interventional radiology to drain the intrabdominal collections following endotherapy. In patients with HG bile leaks, especially post liver transplantation, an attempt is made to access the proximal biliary tree with the guide-wire and bridge the area of the leak with a long plastic stent. Rarely, when access to the proximal biliary tree is not feasible via ERCP, percutaneous transhepatic catheters are placed as a bridge to surgical biliary reconstruction. As mentioned above, we tend to use fully covered SEMS only in a very small subgroup of patients with HG bile leaks, refractory to initial endotherapy.

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