ENDOSCOPY UPDATE/BILE DUCT ISSUES

Frontiers in Surgical Endoscopy

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Background on endoscopic therapies: endoluminal therapy has increased in prominence over past 10 yr; use of transluminal therapy has recently declined, but has driven investigation into endoluminal therapy; endoscopic therapies associated with less morbidity (no abdominal wall wounds required) and less need for anesthesia; have had large impact on some procedures in gastrointestinal surgery; however, not all new technologies successful; potential uses for some (eg, endoscopic ultrasonography [EUS]) have emerged only recently; adoption depends on, eg, costs, learning curves, availability of competing technologies

Endoscopic hemostasis: necessary skill for performance of therapeutic endoscopy; in most cases, injection therapy with epinephrine and saline sufficient to control bleeding; when second modality needed, heater probe or clips added; heater probe — causes tamponade and submucosal burn; avoidance of transmural burn recommended because corrective suturing more difficult in endoscopic setting; clips — mainstay for management of endoscopic hemostasis; prevent bleeding and avoid use of heating element (ie, avoids transmural burn and potential perforation); literature supports using clips for bleeding and some perforations (although not standard of care); sometimes used for retroperitoneal perforations during endoscopy (treatment of intraperitoneal perforations necessary to achieve adequate insufflation); use for treatment of perforation requires proficiency with endoscopic clipping; endolopy — use in flexible endoscopy same as use during laparoscopy; prevents postpolypectomy bleeding in cases with large stalk; with experience, surgeons find leaving cap on helpful (provides separation and facilitates retrieval of specimen); risks — bleeding more likely than perforation

Transluminal therapies: current therapies include drainage of pancreatic pseudocysts, celiac block, neurolysis, brachytherapy, and biliary drainage; endoscopic balloon sphincteroplasty — endoscopic retrograde cholangiopancreatography (ERCP) and esophageal dilatation balloon used to dilate sphincterotomy to size of bide duct, followed by removal of large stones; pseudocysts — endoscopic management (eg, accessed with EUS) frequently reported; guide wire placed, then balloon endoscopy used to open hole between stomach or duodenum and pseudocyst; fluid from pseudocyst drained, followed by placement of stents into pseudocyst; cyst dries out and can be reclinened if infection develops

Emerging technologies: direct-visualization camera system (SpyGlass) — increases visualization using “mother” and “daughter” endoscopes; small scope placed through ERCP endoscope to view indeterminate strictures in bile duct; other applications — removing stents that have migrated up pancreatic duct; guidance of lithotripsy inside bile duct; sutureng devices — use includes closing fistulas, hemostasis, and treatment of perforations; consists of large clip on end of scope; use of cap helps improve visualization during treatment of perforations; spiral enteroscopy — uses spiral advancement device that allows enteroscope to extend ~250 cm into small bowel; enables therapy or biopsy (unlike pill camera); faster than balloon enteroscopy; Third-Eye retroscope — miniature retroscope allows visualization behind folds during colonoscopy; increased rate of detection of adenomas reported (however, significance and management of small polyps and adenomas still debated)

Endoluminal bariatrics: intragastric balloons and vertical-banded gastroplasty can be performed endoscopically; many devices patented in recent years; most current data show only short-term results

Conservative Approach to Common Bile Duct Strictures

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Causes of strictures: in West, 15% of strictures benign; percentage higher in underdeveloped nations (due to parasitic infections); malignant strictures — caused by pancreatic carcinomas, cholangiocarcinomas, portal adenopathy, and other

Educational Objectives

The goal of this program is to improve surgical outcomes through the use of endoscopic techniques and management of strictures and bile duct leaks. After hearing and assimilating this program, the clinician will be better able to:

1. Select endoscopic therapies for patients who might otherwise require open surgery.
2. Determine which new technologies are appropriate for one’s practice.
3. Weigh the benefits and risks of different therapies for patients with biliary strictures.
4. Evaluate the evidence for various approaches to patients with biliary leakage.
5. Use imaging in conjunction with endoscopic techniques in patients with biliary leakage.

Faculty Disclosure

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diseases; benign strictures — due to primary sclerosing cholangitis, chemotheraphy and/or radiation therapy, parasites, cholangiohepatitis, adult immune deficiency syndrome, other cholangiopathies, and vascular compromise; these conditions tend to affect small ducts, and be untreatable by proceduralists; postoperative — due to liver transplantation (may cause anastomotic strictures); bilioenteric anastomosis after Whipple procedure or resection; bile duct injuries; other causes — chronic pancreatitis (causes chronic strictures); trauma; Mirizzi syndrome

Sequela of strictures: cholangitis — recurrent and repeated bouts due to poor drainage above stricture; secondary biliary cirrhosis — less common; occurs when tight stricture remains unrecognized (usually for 8-12 mo, or more); choledocholithiasis — sequelae of stasis and poor drainage

Management options: conservative — watching and waiting appropriate if liver function tests normal and sequential US shows no change in size of intrahepatic ducts; decision based on findings seen on magnetic resonance cholangiopancreatography (MRCP); surgery — includes anastomosis and resection; interventional radiology — options include percutaneous treatment using dilators and stents; endoscopic therapy — minimally invasive use of dilators and stents

Surgery: case example — female patient, 57 yr of age, presented after second episode of cholangitis with bacteremia; had history of “difficult” laparoscopic cholecystectomy that required conversion to open procedure and subsequent revision; stricture seen at take-off of left enterohepatic system; cholangioscopy demonstrated area filled with stones; patient managed with surgical resection and returned to normal function

Interventional radiology: performed alone or in combination with endoscopic procedure; percutaneous access obtained, then dilators and stents passed into biliary tree; catheters sequentially upsized to achieve bile duct diameter capable of supporting flow without pressure; case example — female patient, 26 yr of age, had transection of common bile duct; anastomotic stricture developed 18 mo after laparoscopic cholecystectomy and choledochujejunoscopy; patient treated with double-balloon enteroscopy; drain placed and sequentially upsized until 4.2-mm opening established; approach clinically successful; however, required 9 procedures over 8 mo, and patient developed complications; approach useful when endoscopy unavailable; case example — male patient, 74 yr of age, status post Whipple procedure for node-negative ampullary adenocarcinoma; presented with pain and jaundice; US showed dilated intrahepatic ducts; limb and intrahepatic ducts dilated on percutaneous transhepatic cholangiography (PTHC); rate of bile duct leak >30% in patients in A2ALL study, rate of leakage low (9%), compared with patients undergoing resection for cancer or other indications (rate ≥20%); liver transplantation (LT)-associated — rate of bile duct leak >30% in patients in A2ALL study who received living donor LT (LDLT), compared with 10% in those with cadaveric transplant; all complications should decrease as experience increases; incidence of biliary leaks in Asian centers (where ≥350 LDLTs performed each year) only 5%

Clinical presentation: patients with LT who are critically ill or on corticosteroids likely to present differently than those undergoing elective surgery; most fluid collections asymptomatic and eventually resolve; abdominal pain, fever, nausea, vomiting, tenderness, and jaundice common clinically significant presentations; presentation with mass or ascites less common but can occur if diagnosis of leak delayed; subhepatic collections of fluid on US, bilious fluid from surgical drains or ascites; presentation with mass or ascites less common but can occur if diagnosis of leak delayed; subhepatic collections of fluid on US, bilious fluid from surgical drains or wound, and peritonitis also seen

Radiographic diagnosis: may combine US and CT with concomitant percutaneous drainage if degree of suspicion high; direct imaging with percutaneous transhepatic cholangiography (PTHC) or T-tube cholangiography possible if placed at time of surgery; hepatobiliary iminodiacetic acid (HIDA) scan — scintigraphy appropriate noninvasive procedure with high specificity (requires only 2-3 mL of extravasated bile); sensitivity dependent on liver function

Strategies for management: antibiotics, nutritional support, and effective in-situ drainage (percutaneous drainage if in-situ drainage inadequate); internal or external drainage procedure needed to identify location of leakage and facilitate decompression; PTHC — invasive; cannulation more difficult when bile ducts decompressed; biliary sphincterotomy — associated with poor results without stent; nasobiliary stent — tube easily removed after leak resolved; however, tube easily displaced and procedure not well tolerated; stent placement — treatment

**Endoscopic management:**

**Indeterminate strictures:** unrelated to surgical intervention; common duct stricture (with or without pancreatic duct), with no obvious mass; pathology negative; case examples — 1) patient, 63 yr of age, with painless jaundice; computed tomography (CT) showed dilated common bile duct without mass; 2-cm mass revealed on EUS; biopsy positive; accuracy of EUS in detecting pancreatic masses >98%; 2) patient, 72 yr of age, with painless jaundice; fullness seen in head of pancreas; stricture seen without obvious mass; EUS showed heterogeneous area with dilated ducts; no malignant tissue found on biopsy; patient treated with covered expandable metal stent and steroids; had no further problems 2 yr after stent removal; conclusion — EUS offers alternative to Whipple procedure

**Management of Bile Leaks After Complex Surgery**

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**Definition of bile duct leak:** collection or drainage of fluid with bilirubin concentration ≥3 times greater than serum bilirubin; grading of severity of leakage — based on need for further intervention; grade A requires little or no management, grade B requires additional diagnosis or intervention, and grade C requires relaparotomy

**Incidence:** cholecystectomy-associated — incidence 0.5% to 1%; subclinical incidence of leakage after cholecystectomy significantly higher than clinical incidence; injury to common bile duct less common (9%); more commonly due to cystic duct leak from stump (78%) and leaks from subvesical duct of Luschka (26%); incidence of bile duct leaks from common or hepatic duct only 10%; trauma-associated — incidence 26% with grades III to V (deep parenchymal) hepatic injury, and 3% with grade I to II (superficial) injury; resection-associated — risk for leaks dependent on anatomy and reason for resection; in healthy adults who donated liver lobes in Adult-to-Adult Living Liver Donor (A2ALL) study, rate of leakage low (9%), compared with patients undergoing resection for cancer or other indications (rate ≥20%); liver transplantation (LT)-associated — rate of bile duct leak >30% in patients in A2ALL study who received living donor LT (LDLT), compared with 10% in those with cadaveric transplant; all complications should decrease as experience increases; incidence of biliary leaks in Asian centers (where ≥350 LDLTs performed each year) only 5%

**Conclusion** — sequelae of stasis and poor drainage
of choice (with or without sphincterotomy) in patients with limited leakage; persistent leakage generally requires bilienteric anastomosis and possible resection of proximal liver; ERCP — removes gradient caused by intact sphincter of Oddi; causes bile to flow into duodenum; 70% to 95% of patients have resolution of bile duct leak within 1 wk

Studies: Kyoto LDLT study — rate of leakage 6.6% among 731 LDLTs; incidence of right lobe bile leakage higher than incidence in left lobe; leakage often from transected right duct system; 48 patients with nasobiliary stenting or percutaneous biliary drainage had excellent overall outcomes (few cases developed strictures requiring repair); liver resection study — success rate 95% after endoscopic treatment of biliary fistulas; study suggested use of 10-Fr stent associated with faster resolution than with other stent sizes; Greek study — in patients treated with endoscopic sphincterotomy, no significant difference seen between success rates with 7-Fr vs 10-Fr stent; retrospective sphincterotomy study — complication rate 2.4% in patients treated with 10-Fr stents and sphincterotomy, vs 13% in patients treated with large-bore stent alone; repeat ERCP study — no difference in outcomes between patients who had repeat ERCP at stent removal and patients with stent removal via endoscopy alone

Noncardiac interventional radiology: 3-dimensional imaging with rotating C-arm useful in visualization and treatment of biliary complications (rotation of images helps to elucidate anatomy and position of bile ducts); case example — patient treated with right trisegmentectomy developed bile duct leak persisting >1 yr after surgery; second biliary system seen on imaging; CT-fused image visualized hypertrophied caudate lobe with remnant caudate bile duct draining freely into abscess cavity, and facilitated cannulation of bile duct

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Suggested Reading

Audio-Digest General Surgery 60:04

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1. All the following are acceptable methods of endoscopic hemostasis, except:
   - (A) Epinephrine and saline
   - (B) Submucosal burn
   - (C) Transmural burn
   - (D) Clips

2. Which of the following statements about treatment with endoscopic mucosal resection (EMR) are true?
   1. Patients without cancer may be able to avoid hemicolectomy
   2. The porcelain ball on the end of the needle-knife prevents penetration into the muscularis
   3. No differences in treatment have been noted with use of different types of snares
   4. EMR is currently widely used in the United States
   5. The risk for perforation is greater than the risk for bleeding
      - (A) 1,2
      - (B) 2,3
      - (C) 1,3,5
      - (D) 2,4,5

3. Which of the following statements is(are) true?
   - (A) Use of a retroscope during colonoscopy can increase the rate of detection of small adenomas and polyps
   - (B) Studies have definitively shown that detection and removal of small adenomas improve patient outcomes
   - (C) A and B
   - (D) Neither A nor B

4. Benign strictures due to ______ tend to be in small ducts and untreatable by proceduralists.
   - (A) Mirizzi syndrome
   - (B) Chemotherapy or radiation therapy
   - (C) Liver transplantation
   - (D) Chronic pancreatitis

5. Sequential widening of strictures can generally be accomplished in 1 to 2 procedures.
   - (A) True
   - (B) False

6. _____ expandable metal stents have a tendency to migrate; multiple-stent procedures for upsizing strictures are associated with ______ risk for occlusion.
   - (A) Uncovered; increased
   - (B) Covered; increased
   - (C) Uncovered; decreased
   - (D) Covered; decreased

7. Which of the following statements about indeterminate strictures is correct?
   - (A) Always indicate an underlying malignancy
   - (B) Require a Whipple procedure
   - (C) Those in the common bile duct may be present with or without stricture of the pancreatic duct
   - (D) Always painful

8. Incidence of bile duct leakage is higher ______ than ______.
   - (A) In patients with superficial hepatic injury; in patients with deep hepatic injury
   - (B) In healthy adult liver donors; in patients undergoing resection for cancer
   - (C) In patients receiving liver transplants from living donors; in patients receiving cadaveric liver transplants
   - (D) Clinically after cholecystectomy; subclinically after cholecystectomy

9. Which of the following statements about hepatobiliary iminodiacetic acid (HIDA) scans in the diagnosis of biliary leaks is(are) true?
   - (A) They have high specificity
   - (B) Sensitivity is unrelated to liver function
   - (C) A and B
   - (D) Neither A nor B

10. Studies of patients treated with stenting for biliary leakage have found that:
    - (A) Nasobiliary stenting and percutaneous drainage have poor outcomes
    - (B) The combination of sphincterotomy with large-bore stenting may lower complication rates
    - (C) Use of 10-Fr stents is associated with better outcomes than use of 7-Fr stents
    - (D) Patients treated with repeat endoscopic retrograde cholangiopancreatography (ERCP) at stent removal had better outcomes than those who underwent endoscopic stent removal alone

Answers to Audio-Digest General Surgery Volume 60, Issue 03: 1-D, 2-D, 3-C, 4-B, 5-A, 6-B, 7-C, 8-A, 9-C, 10-A