Review Article

Endoscopic and Percutaneous Intervention in Malignant Obstructive Jaundice

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Abstract
Most patients with malignant obstructive jaundice have inoperable disease at presentation. There is debate regarding the best approach to palliate these patients, i.e., surgical versus endoscopic versus percutaneous drainage. The purpose of this article is to review the current literature in an unbiased fashion, and to present a rationale for management.

A multi-disciplinary approach is needed if we are to provide the best care for patients with standardization of definitions, complications, and outcomes between specialities such that meaningful comparisons can be made between studies. The need for prospective randomized trials is clear from the currently deficient literature.

Key words: Malignant bile duct obstruction—Pancreatic carcinoma—Cholangiocarcinoma—Klatskin Tumor—Endoscopic retrograde cholangiopancreatography—Percutaneous transhepatic cholangiography

Both endoscopic and percutaneous interventional techniques have established often complementary roles in the palliation of malignant obstructive jaundice. The choice between the endoscopic or percutaneous route has mainly depended on local tradition and the availability of expertise. This is not acceptable practice if one approach is superior, and it behooves us to obtain the necessary expertise and equipment to provide patients with the best possible therapy. The purpose of this review is to examine therapeutic approaches to the palliation of malignant jaundice, and discuss their relative merits.

Pancreatic carcinoma, cholangiocarcinoma, gallbladder carcinoma, metastatic tumor, and periampullary tumors are the most prevalent lesions causing malignant obstructive jaundice. Pancreatic cancer accounts for 10% of all cancers of the gastrointestinal tract, is the fifth commonest cause of cancer-related death in the United States, and is lethal, with a 5-year survival of 1%–2% [1]. The incidence has increased dramatically in recent years and despite improvements in imaging and attempts at earlier diagnosis less than 10% of tumors are suitable for resection. The mean survival time from presentation remains unchanged at 6 months. Cholangiocarcinoma is less common, constituting 2% of all cancers found at post-mortem in the United States, with 4,500 new cases annually [2]. Like pancreatic carcinoma, the incidence increases with age, most tumors occurring in the age group 50–70 years, and both are more common in men. The majority of patients with cholangiocarcinoma die within 6–12 months of diagnosis. Prognosis is worst for those with lesions affecting the confluence and the intrahepatic ducts, possibly reflecting the later presentation of these lesions.

Gallbladder carcinoma has an incidence of 5,000 new cases annually in the United States [3]. Most patients present in their seventh decade and there is a preponderance of women (70%). Fewer than 20% of gallbladder cancers are diagnosed preoperatively, the majority being diagnosed coincidentally at cholecystectomy or during laparotomy for suspected bile duct carcinoma. In one large series [4], two-thirds of patients with gallbladder carcinoma had unresectable lesions at surgery. Survival depends on stage at diagnosis: stage 1 and 2 lesions confined to the muscularis mucosa have a 5-year survival of 100%, while stage 3 lesions involving all layers of the gallbladder wall have a 5-year survival of 7%, and those with more advanced lesions rarely survive beyond 2 years. Tumors of the periampullary region are most commonly adenocarcinomas, and may originate in pancreatic ductal, biliary, or ampullary epithelia. Because
of their site they tend to present early and local or radical resection is possible in the majority of cases, with 5-year survival figures of up to 60% when there is no lymphatic spread [5].

**Diagnosis and Staging**

The majority of patients with malignant obstructive jaundice have inoperable lesions at presentation. However, it is necessary to confirm the diagnosis (usually with biopsy), exclude benign disease that may mimic malignancy (e.g., Mirizzi’s syndrome) and correctly identify those patients with operable lesions. Conventional ultrasound (US) and computed tomography (CT) are both sensitive in detecting biliary dilatation and the level of obstruction.

**Pancreatic Carcinoma**

For detection, staging, and assessment of resectability of pancreatic carcinoma a direct relationship exists between the size of the mass and the sensitivity and specificity of imaging modalities. US and contrast-enhanced CT detect most pancreatic masses larger than 3 cm [6]. For tumors less than 2 cm endoscopic ultrasound (EUS) improves detection by a factor of up to 4. EUS compares favorably with CT, magnetic resonance imaging (MRI) and US in TN staging of pancreatic carcinoma. Accuracy rates for T staging were: EUS, 82%; CT, 45%; MRI, 50%; US, 35%. For N staging accuracy rates were: EUS, 64%; CT, 50%; MRI, 56%; US, 42% [7].

CT and US are good at predicting non-resectability, but the positive predictive value for tumor resectability is only 78% overall, and less than 50% for small tumors [8–10]. Assessment of vascular invasion is probably the most important parameter for determining resectability. A review [7] of comparative studies predicting portal venous invasion showed that EUS and angiography are similar in accuracy (85% and 83%, respectively) and more accurate than conventional CT (excluding spiral and CT portography), MRI, or US (69%, 63%, and 49%, respectively). It is likely that multiple imaging modalities are necessary to determine the small number of operable patients.

While these data apply to pancreatic carcinoma, the same techniques and results are likely to apply for distal duct cholangiocarcinoma, although such data are not available.

**Hilar Lesions**

According to the Bismuth classification of hilar lesions [11] type I lesions involve the common hepatic duct but not the bifurcation; type II lesions involve the bifurcation but do not extend into either main duct; type III lesions extend into either of the main hepatic ducts but do not involve secondary biliary radicals; and type IV lesions involve the secondary biliary radicals. A hilar lesion is probably unresectable if there is:

1. Cholangiographic evidence of extensive bilateral intra-hepatic bile duct tumor.
2. Involvement of the main trunk of the portal vein.
3. Involvement of both branches of the portal vein or bilateral involvement of the hepatic artery and portal vein.
4. A combination of vascular involvement on one side of the liver with extensive cholangiographic involvement on the other, so that it is impossible to preserve a vascularized segment of the liver after complete excision of the tumor [12].

US or contrast-enhanced CT are accurate in determining the level of obstruction. Dilatation of the intrahepatic biliary tree, a normal caliber common bile duct, and a collapsed gallbladder imply obstruction of the common hepatic duct. CT is probably slightly better than US at depicting the primary tumor (40% vs 21%) [13], but both modalities may detect extension of disease into the liver, surrounding lymph nodes, and gross involvement of major vascular structures. Both techniques demonstrate hepatic lobar atrophy, which is important to document prior to surgery or palliative drainage, as drainage of an atrophied lobe may not improve liver function.

Angiography remains the gold standard for assessment of vascular involvement prior to surgery; however, there are limitations to its accuracy because it cannot differentiate encasement or compression from invasion. Recent studies on intraductal US [14, 15], using miniprobes introduced via a percutaneous or transpapillary route, with surgical and angiographic correlation showed 100% accuracy of this technique for predicting portal vein invasion and involvement of the right hepatic artery. Miniprobe US did not demonstrate sufficiently the proper or left hepatic artery and thus this technique will not replace but will complement angiography. EUS has little place in the assessment of hilar lesions as the proximal bile duct is a blind spot for intraduodenal scanning. MRI can image tumor mass, vessels, and the biliary tree in multiple planes, but the value of this technique is still under assessment.

**Cholangiography**

Conventional endoscopic or percutaneous cholangiography is the most sensitive method for defining the location and extent of a biliary stricture. New non-invasive meth-