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Review Article

Surveillance method and imaging characteristics of recurrent biliary cancer after surgical resection

Yong Moon Shin

Department of Radiology and Research Institute of Radiology, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea

This is a review of the diagnostic imaging techniques and findings of recurrent biliary cancer after surgical resection of the extrahepatic bile duct and gallbladder. Radiological examination plays an important role in diagnosing postoperative recurrence of biliary cancers. Early detection and diagnosis of recurrent cancer is critical in obtaining proper treatment and improves the prognosis. In the surveillance of recurrent biliary cancer, several diagnostic imaging modalities are currently used. Usually CT is the most common method for surveillance of postoperative patients, but MRI and PET/CT scans are also widely used. Recurrent biliary cancer can manifest as local recurrence, liver metastasis, lymph node metastasis, and peritoneal metastasis. Imaging findings of a locally recurrent tumor or metastatic lymph node enlargement overlaps with benign postoperative changes, thus radiologists commonly overlook subtle CT findings or misinterpret them as benign postoperative changes. There are several reports that FDG-PET scan is more effective in the diagnosis of recurrent biliary tract cancer than CT. Multidisciplinary diagnostic approaches using CT, MRI, and FDG-PET as well as clinical information seem to be essential for the precise diagnosis of recurrent tumors. **(Korean J Hepatobiliary Pancreat Surg 2014;18:73-76)**

Key Words: Surveillance; Imaging; Recurrence; Biliary cancer; Resection

INTRODUCTION

Adenocarcinoma of the gallbladder, hepatic duct confluence (hilar cholangiocarcinoma, Klatskin tumor), and extrahepatic bile duct are the most common malignancies of the biliary tract. Complete resection of these tumors is the most effective and only potentially curative treatment. With the advent of improved surgical technique and radiation therapy, curative resection is applied more aggressively and diagnostic imaging assists in determining the extent of the disease and the resectability of the tumors.[1] However, recurrence is still common after resection.

In order to perform additional curative therapy for recurrent biliary cancers, early detection and diagnosis are essential. For early detection and diagnosis, several imaging diagnostic modalities are currently used. Computed tomography (CT) is the most common method of surveillance in postoperative cases, but magnetic resonance imaging (MRI) and positron emission tomography (PET)/CT scans are also widely used.

IMAGING STUDY METHODS

There has been no study determining if a follow-up CT is effective in detecting recurrent biliary tract cancer. The likelihood of getting a follow-up CT may be associated with various factors such as initial tumor stage, complete or incomplete tumor resection, medical insurance, and cost effectiveness. In any case, according to our experience, a follow-up CT shortly after surgery may be helpful in the early diagnosis of postoperative tumor recurrence.

CT scan

CT is the main imaging modality for evaluating the postoperative status of biliary tract cancer. With the help of multi-detector row CT (MDCT), fast scanning and achieving thinly sliced section become possible. It also helps in looking at 3-dimensional reconstructive images such as

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Corresponding author: Yong Moon Shin
Department of Radiology and Research Institute of Radiology, Asan Medical Center, University of Ulsan College of Medicine, 88 Olympic-ro 43-gil, Songpa-gu, Seoul 138-736, Korea
Tel: +82-2-3010-5946, Fax: +82-2-476-4719, E-mail: cjimage@amc.seoul.kr

coronal reformation, curved multiplanar reconstructive image (MPR) and vascular reconstruction. These images are useful for pre- and postoperative biliary tract disease, because anatomical complexity around the bile duct makes axial conventional images very confusing to read.[2-5]

It is suggested that follow-up including CT scans of short intervals is necessary during the early postoperative period to detect tumor recurrence early. However, in daily practice, we have occasionally missed an opportunity to diagnose postoperative tumor recurrence in the early stages. Because the imaging findings of locally recurrent tumor or metastatic lymph node enlargement overlaps with benign postoperative changes, radiologists commonly overlook subtle CT findings or misinterpret them as benign postoperative change.

MRI

In addition to conventional T1 and T2 weighted images, MR cholangiopancreatography (MRCP) is widely used in the diagnosis of biliary tract disease. MRCP used heavily T2-weighted sequences to generate bright signals from fluid in the bile duct, allowing for the delineation of the dilated duct from surrounding tissue.[3-6]

PET scan

Fluorodeoxyglucose-PET (FDG-PET) has generally been utilized to detect various types of malignant tumors because it enables the visualization of the hypermetabolic state of malignant cells. Moreover, the findings of FDG-PET are independent of postoperative anatomical or architectural changes, whereas those obtained by conventional imaging modalities, such as CT and MRI, are affected by such changes. There are several reports that FDG-PET scan is more effective in the diagnosis of recurrent biliary tract cancer than CT.[7,8]

IMAGING FINDINGS OF RECURRENT BILIARY CANCER

Recurrent biliary cancer usually manifests as local recurrent cancer, liver metastasis, lymph node metastasis and peritoneal metastasis.[1-8]

Local recurrent tumor

Local recurrent tumor after surgical resection is considered to be cancer infiltration along the lymphatic vessels, nerves, and loose connective tissues at the operation site. It looks like an irregular mass or infiltration of soft tissue attenuation in the surgical bed. A local recurrent tumor can invade the adjacent portal vein, liver, bowel and pancreas. It can also cause bile duct obstruction.

On CT scan, bile duct cancer shows contrast enhancement of the arterial and portal phases, because the fibrotic component of the tumor stroma progressively collects contrast media.

On MRI, cholangiocarcinomas are either iso-intense or low in signal intensity relative to the liver on T1-weighted images. On T2-weighted images, the tumor signal intensity ranges from markedly to mildly increased relative to the liver. Tumors with high fibrous content tend to have lower signal intensity on T2-weighted images. Cholangiocarcinomas enhance to a moderated degree on gadolinium-enhanced T1-weighted MR images. Like CT, contrast enhancement is better appreciated on delayed images because of the nature of the tumor.

In certain instances, postoperative change in the surgical bed may mimic local recurrence. CT findings such as the invasion of fat between the mesenteric vessels, encasement of the vessels, and adjacent bowel obstruction are helpful in differentiating tumor recurrence from postoperative change. And also, to differentiate local recurrence from a postoperative change or a pseudo-lesion with collapsed bowels, follow-up CT within a short interval is recommended. A locally recurrent tumor can be assumed only when the extent of lesion has increased on a follow-up CT. Even if there is a mass of a considerable size, it is usually a benign postoperative change if the size decreased or showed no change on follow-up CT.

Benign postoperative biliary strictures occasionally manifest as focal areas of wall thickening that obstruct the lumen and the mimic malignant strictures. Therefore, it is well known that is difficult to distinguish the malignant strictures of the bile duct from benign ones on the basis of radiologic findings alone. There are no reports that discuss the radiological findings of recurrent malignant biliary obstruction after curative surgery. With the pre-operative diagnostic criteria for bile duct cancer, we can assume that malignant strictures are more likely than benign strictures, when CT shows strictures that are longer, more dilated upstream duct, a greater area of wall thickness,

and hyper-enhancement of the involved duct during the arterial and portal venous phase. On contrast-enhanced MRI with MRCP, the presence of hyper-enhancement relative to liver parenchyma that is greater than 12 mm in length wall thickness ＞3 mm, indistinct outer margin, luminal irregularity, and asymmetry of stenotic bile ducts are significant factors for diagnosing malignant biliary strictures. On MRCP and endoscopic retrograde cholangiopancreatography (ERCP), a lengthy segment of biliary stricture with irregular margins and asymmetric narrowing suggests malignant strictures. In contrast, a short segmental stricture with regular margins and symmetric narrowing suggests benign strictures.

FDG-PET could increase the diagnostic accuracy of malignant strictures.

Liver metastasis

Usually liver metastasis from biliary tract cancer after surgical resection, but hepatic metastasis can also occur by way of other routes. Liver metastasis shows low attenuated multiple nodules in the liver on CT scan and MRI. Sometimes it shows peripheral rim enhancement. But in some cases, hepatic abscess or focal inflammation can mimic the findings of liver metastasis. Local recurrence may be a predisposing factor for hepatic metastasis.

Lymph node metastasis

Lymph node metastasis is considered to be present when CT shows a lymph node larger than 1 cm in short-axis diameter that progressively grew or did not shrink on follow-up CT. Lymph nodes larger than 1 cm in short-axis diameter that shrank on follow-up CT are not considered a metastatic lesion. In certain instances, postoperative changes in the surgical bed may mimic local recurrence. Sometimes internal low attenuation which suggests necrosis is indicative for metastasis, but there are so many imaging findings that overlap with reactive hyperplasia lymph node enlargement (sensitivity 47-78% and specificity 65-95% in preoperative staging work-up).

Peritoneal metastasis

As like other carcinomatosis peritonei of abdomen, recurrent biliary tract cancer with peritoneal metastasis shows ascites, seeding nodules especially in the rectovesical pouch and paracolic gutter, and omental fat stranding and infiltration.

DIFFERENTIAL DIAGNOSIS WITH RECURRENT TUMOR

Postoperative benign fibrosis and traumatic neuroma should be taken into account in the diagnosis of recurrent biliary duct cancer. After cholecystectomy, a benign neuroma can develop at the cystic duct resection site due to reactive hyperplasia of the nerve tissues. It is a rounded, well-defined mass or a thickening of bile duct wall. It shows homogenous contrast enhancement, and can be misdiagnosed as a recurrent tumor.

CONCLUSIONS

Many patients who underwent radical resection for biliary tract cancer have experienced recurrence. In diagnosing postoperative recurrent biliary cancer, radiologic examination plays an important role. Therefore, detailed knowledge of the radiologic findings of postoperative tumor recurrence in biliary tract cancer is important for radiologists and clinicians, and precise interpretation of the postoperative radiologic examination is crucial in planning treatment, monitoring its efficacy, and estimating the patient's prognosis. Multidisciplinary diagnostic approaches using CT, MRI, ERCP, and FDG-PET as well as clinical information seem to be essential for precise diagnosis of recurrent tumors.

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