Extended Right Hemihepatectomy as a Salvage Operation for Recurrent Bile Duct Cancer 3 Years after Pancreatoduodenectomy

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Received October 12, 2005; accepted November 29, 2005; published online February 14, 2006

Salvage surgery for recurrent bile duct cancer is generally impractical due to local invasion of surrounding major vascular structures or distant metastases. We describe a case of a relapsed tumor in the right hepatic duct 3 years after pancreatectoduodenectomy for middle to distal bile duct cancer. The recurrent tumor, measuring 25 × 12 × 12 mm, was mostly confined within the right hepatic duct. It displayed an intraductal superficial extension rather than transmural invasive growth to the hepatic hilum. An extended right hemihepatectomy was successfully performed with a histologically negative margin. The patient is currently doing well without any signs of local recurrence or distant metastasis 8 months after the second operation. Precise pathological examination revealed that the lesion had originated from multicentric foci in the right hepatic duct, not as a result of anastomotic recurrence. These results raised the consideration of a potentially more indolent subgroup of bile duct cancer. This is a detailed report of a successfully resected recurrent bile duct cancer, for which the patient underwent major hepatectomy as a salvage procedure after pancreatectoduodenectomy for the primary tumor. An aggressive surgical approach will be a rational treatment of choice for recurrent disease when metachronous multicentric tumor development in the bile duct is suspected and curative resection can be safely performed.

Key words: bile duct cancer – recurrence – salvage therapy – hepatectomy

INTRODUCTION

The prognosis after surgery for bile duct cancer remains unsatisfactory. The reported 5 year survival rates range from 24 to 39% despite increased resectability up to 90% (1,2). Locoregional failure is the most common pattern of disease recurrence even after margin-negative resection, resulting in bile duct obstruction, liver failure and repetitive sepsis (1–3). In most of the relapsed cases, re-resection is not feasible due to the involvement of critical structures in the hepatic hilum. The survival benefit of radiation and chemotherapy for locally advanced or recurrent disease is limited (4,5). This is a detailed report of a successfully resected recurrent bile duct cancer using major hepatectomy as a salvage procedure 3 years after pancreatectoduodenectomy for the primary tumor. Precise histopathological examination shed light on the pathogenesis of recurrence and raised the consideration of a potentially more indolent subgroup of bile duct cancer.

CASE PRESENTATION

The patient is a 65-year-old Japanese man who presented to a local hospital with jaundice and back pain in January 2002. A computed tomography (CT) scan revealed a polypoid tumor in the middle to distal bile duct and the serum CA19-9 (carbohydrate antigen 19-9) level was 24 U/mL (normal range: <39 U/mL). The patient underwent pancreatectoduodenectomy. Pathological examination revealed a diffusely spreading papillary adenocarcinoma measuring 60 mm in diameter (including the area of superficial spread), which invaded the fibromuscular layer of the bile duct wall (T1 according to TNM classification, Fig. 3C and D) (6). A negative surgical margin (cancer-free margin: 11 mm) with no vascular, lymphatic and perineural invasions or nodal involvement...
was confirmed (T1 N0 M0, Stage I). The margin of the right hepatic duct displayed mild dysplasia of the biliary epithelium.

In January 2005, a follow-up CT scan demonstrated an oval mass in the right hepatic duct, suggestive of a recurrent bile duct cancer, and the patient was referred to our institution.

Blood tests revealed mild liver dysfunction and inflammatory reactions with slight elevation of the tumor marker CA19-9 to 61 U/mL. A CT scan revealed an oval tumor measuring 2 cm in the right hepatic duct, adjacent to the hepatico-jejunostomy site (Figs 1 and 2A). Dilatation of the intrahepatic bile duct was noted only in the right lobe. The tumor displayed expansive growth within the right hepatic duct. The origin of the tumor appeared to be, apart from the hepatico-jejunostomy of the previous operation, the biliary epithelium in the right hepatic duct. No signs of distant metastasis or invasion of critical structures in the hepatic hilum were detected. Curative resection was deemed feasible and an extended right hemihepatectomy was proposed. Preoperative right portal vein embolization by absolute ethanol was performed to increase the safety of the major hepatic resection, which permitted histologically negative resection margins to be obtained (7). Two weeks after the embolization, the volume of left hemiliver increased from 43.4 to 49.3% of the total liver.

An extended right hemihepatectomy, caudate lobe resection (8) and hepatico-jejunostomy were performed in February 2005. The enteric continuity was resumed by side-to-side anastomosis between the pancreatico-jejunostomy and hepatico-jejunostomy (Fig. 2B). The operation time was 14 h and the amount of blood loss was 2850 ml. The postoperative course was uneventful and the patient was discharged on the 15th day after the surgery. He is currently doing well without any signs of local recurrence or distant metastasis 8 months after the salvage operation.

**PATHOLOGICAL FINDINGS**

A cross-section of the resected specimen revealed a polypoid indurated mass arising in the right hepatic duct extending proximally to the intrahepatic ducts along the anterior and posterior branches. Microscopically, the tumor consisted of

**Figure 1.** A CT scan of an oval mass (arrowhead) showing expansive growth in the right hepatic duct adjacent to the hepatico-jejunostomy site. Dilatation of the intrahepatic bile duct was confined to the right lobe. There were no signs of distant metastasis or tumor invasion of critical structures in the hepatic hilum.

**Figure 2.** Schema of the operation. A: On incision, the tumor (T) was detected in the right hepatic duct. The dotted lines indicate the resection line. B: After the reconstruction. Pancreatice-jejunostomy and Roux-en-Y anastomosis (*) of the previous operation were preserved. Enteric continuity between the pancreatico-jejunostomy and hepatico-jejunostomy was resumed by side-to-side anastomosis. The middle hepatic vein (MHV) was exposed in its full length on the transected liver plane. The right hepatic vein (RHV) was resected at its root.
a variable proportion of short and tall tubular glands. The tumor size was 25 × 12 mm and the main location was the right hepatic duct. Invasion was limited to within the mucosa of the bile duct, but superficial tumor spread extended beyond the hepatico-jejunostomy site and displayed minute submucosal infiltration in a small portion of the jejunum (Fig. 3A). The lesion was diagnosed as a non-invasive, moderately to well-differentiated tubular adenocarcinoma in the bile duct (Fig. 3B). There was no evidence of vascular, lymphatic or perineural permeation.

In the initial operation, a small polypoid tumor projected into the lumen and exhibited minimal invasion of the bile duct wall, associated with superficial spread longitudinally along the common bile duct (Fig. 3C). The features of the tumor cells were identical to those of the tumor in the right hepatic duct resected in the salvage operation (Fig. 3D).

DISCUSSION

Several explanations have been proposed for the pathogenesis of locoregional failure, including incomplete resection, hematogenous/lymphatic metastasis, second primary (metachronous) cancer and intraluminal implantation (9–11). In the present case, the negative surgical margin was histologically confirmed in the initial operation and no concurrent hepatic metastases or nodal involvement was detected in the salvage operation. Since the relapsed tumor appeared to have arisen from the biliary epithelium of the right hepatic duct and its histopathological features were identical to the primary tumor in the middle to distal bile duct, we concluded that the tumor recurred as a mode of multicentric tumor development. Malignant tumors of the bile duct often originate from multiple separate foci. Suzuki et al. (12) demonstrated that a dysplastic zone surrounding a focus of carcinoma was found in 75% of surgical or autopsy materials from patients with bile duct cancer, supporting the assumption of a dysplasia-carcinoma sequence. They also showed that carcinoma proved to form multiple foci in 42% of the patients, in some of whom the malignant foci developed independently without intervening dysplasia (12). In our case, these dysplastic zones or microscopic foci might have been left behind in the initial operation, resulting in a slow growth over the 3 years.

However, implantation or intraductal dissemination still cannot be ruled out. Preoperative transhepatic biliary decompression performed prior to the initial operation, intraoperative manipulation, and presence of bile stasis due to tumor obstruction together with unrecognized cholangitis from choledochoenteric anastomosis may all account to some degree for the development of recurrent bile duct cancer in our patient.

There are few alternate therapies for recurrent bile duct cancer except surgery, since no effective radiation and/or chemotherapy has been established to date. However, a salvage operation for recurrent disease is generally impractical and only a few cases have been described in the past (Table 1) (13–16). Although the population is small and criteria for re-resection are not well defined, these operable cases appear to...
be associated with favorable prognosis compared with unreatable recurrent disease, which is far more common in daily practice. It is notable that only one patient died of disease progression 3 years after the second surgery and one patient has survived nearly 8 years at the time of this report. In general, salvage surgery is technically demanding since pancreato-duodenectomy or major hepatectomy is often the treatment of choice for primary bile duct cancer. This is a successfully resected case of recurrent bile duct cancer, for which the patient underwent major hepatectomy as a salvage procedure after pancreato-duodenectomy for the primary tumor.

These findings raise the consideration that there might be a particular subgroup of bile duct cancer characterized by its indolent growth. This slow-growing type of tumor may carry a high possibility of cure even after disease relapse, and every effort to achieve curative resection should be made. Obviously, the relationship between recurrence pattern and tumor location as well as the mode of spread and its morphologic properties requires further investigation (17–19).

In conclusion, a case of recurrent bile duct cancer in the right hepatic duct was reported. Extended right hemihepatectomy was successfully performed 3 years after initial pancreato-duodenectomy for middle to distal bile duct cancer. Aggressive surgical eradication will be beneficial for patients with a relapsed tumor originating from metachronous malignant foci in the bile duct, provided that histologically negative resection can be safely performed.

Acknowledgments

Some of the content of this article was presented at the 1st Tokyo Surgical Oncology Conference held at Tsukiji, Tokyo, on June 11, 2005. This work is supported in part by a grant-in-aid for scientific research from the Ministry of Education, Science and Culture, and the Ministry of Health and Welfare of Japan.

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