Successful Treatment of Stereotactic Body Radiation Therapy Combined with Transarterial Chemolipiodolization for Hepatocellular Carcinoma with Biliary Obstruction

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Conventional radiation therapy (RT) is a widely recognized treatment for hepatocellular carcinoma (HCC). However, conventional RT currently plays only a limited role in HCC treatment due to its low efficacy and the low tolerance of the liver for its effects. The total dose of irradiation has been shown to be the most significant factor associated with response [1]. Cell survival with lengthy treatment time was increased, presumably as a consequence of cellular repair mechanisms. To improve local tumor control and overall survival, dose escalation during short treatments has become an important issue. It is not possible with conventional RT to deliver a high radiation dose to a treatment volume in a short time without also irradiating some normal hepatic tissue with a high dose. Stereotactic body radiation therapy (SBRT) is the only modality that can deliver a high dose in a short time to well-defined hepatic tumors with a rapid dose fall-off gradient. SBRT was initially used only for benign and malignant intracraniome lesions with the advent of advanced imaging techniques and robotic image-guided radiation technologies [2,3].

Recently, local, not whole liver, RT has been attempted by several investigators, and this work has demonstrated that high doses of radiation can be safely delivered to a portion of the liver [4]. These results suggest a benefit of the combination of radiation and chemotherapy for advanced HCC with portal vein tumor thrombosis (PVTT).

Here we report the use of CyberKnife with transarterial
chemolipiodolization (TACL) treatment for advanced HCC developing extrahepatic biliary obstruction (EHBO), which showed a partial response and safety.

**CASE REPORT**

A 63-year-old man was admitted to our hospital complaining of epigastric discomfort and jaundice. He was diagnosed as a hepatitis B virus (HBV) carrier, a status he had held for 20 years without receiving treatment. He had complained of epigastric discomfort with abdominal bloating and jaundice with pruritus a few months previously associated with a 25-kg body weight loss over the previous three months. He had no history of herb medication or travel.

His initial blood pressure was 120/80 mmHg, pulse rate 78/min, respiratory rate 20/min, and body temperature was 36.4°C. The physical examination showed icteric sclerae and no palpable mass, abdominal distention, and shifting dullness. Laboratory findings showed white blood cell 4,190/µL, hemoglobin 10.2 g/dL, hematocrit 28.3%, platelet 145,000/µL, prothrombin time (PT) 115% of normal PT, INR 0.93, aPTT (control/test) 29.5/31.8 sec, fasting blood glucose 96 mg/dL, urea nitrogen 20.4 mg/dL, creatinine 1.41 mg/dL, total protein 6.59 g/dL, albumin 3.02 g/dL, aspartate aminotransferase (AST) 57 U/L, alanine aminotransferase (ALT) 39 U/L, alkaline phosphatase 687 IU/L, gamma-glutamyl transpeptidase (GGTP) 39 U/L, total bilirubin 56.66 mg/dL, direct bilirubin 34.84 mg/dL, alpha-fetoprotein (AFP) 613 ng/dL, and PIVKA II > 2,000 mAU/mL. The serum hepatitis B surface antigen was positive, and hepatitis C antibody was negative. Hepatitis B e antigen was negative, e antibody was positive, and HBV DNA titer was 2.0 × 10^4 copies/mL.

The abdominal CT scan revealed a 5.6 × 5-cm-sized arterial enhancing, delayed-washout mass with a central necrotic portion in segment 1, left intrahepatic bile duct dilatation, right portal vein invasion, and underlying liver cirrhosis with splenomegaly and ascites. The diagnosis was likely HCC and less likely cholangiocarcinoma (Fig. 1).

First, percutaneous transhepatic cholangiographic drainage was performed to lower the elevated bilirubin and to diminish the pruritus. The fistulography revealed hilar and proximal common hepatic duct obstruction with left intrahepatic duct dilatation (Fig. 2); this suggested right lobar hepatic malignancy with hilar invasion.

Figure 1. Abdominal computed tomography scan showing a 5.6 × 5-cm-sized arterial and portal enhancing, delayed-washout mass with a central necrotic portion in segment 1. It is likely that intrahepatic bile duct dilatation and right portal vein and hilar invasion are also present. Underlying liver cirrhosis with splenomegaly and ascites is also present.

Figure 2. Percutaneous transhepatic biliary drainage showing hilar and proximal common hepatic duct obstruction with left intrahepatic duct dilatation. There is non-opacification of the right intrahepatic duct, suggesting right lobar hepatic malignancy with hilar invasion.

Fifteen markers were inserted around the region of the target under sono guidance to act as radiographic landmarks. The CyberKnife® (Accuracy Inc., Sunnyvale,