Review Article

Percutaneous placement of self-expandable metallic stents in patients with obstructive jaundice due to hepatocellular carcinoma

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A B S T R A C T

“Icteric type hepatoma” is a hepatocellular carcinoma (HCC) with tumor invasion to the bile duct (bile duct tumor thrombus, BDTT) causing obstructive jaundice. Effective and long-term decompression of the bile duct is essential for the palliative treatment for the patients. Percutaneous self-expandable metallic stent placement is a well-established treatment for palliating patients with an inoperable malignant biliary obstruction. This article reviews the treatment of percutaneous placement of self-expandable metallic stents for the management of obstructive jaundice caused by HCC.

Keywords: Bile ducts; Carcinoma, hepatocellular; Jaundice; Stents

Introduction

In patients with hepatocellular carcinoma (HCC), jaundice is a common complication, and 19% to 40% of patients have jaundice at the time of diagnosis.1 Usually, jaundice is a result of hepatic insufficiency due to hepatic parenchyma destruction by the tumor invasion or progression of underlying cirrhosis.2 In a small proportion of patients with HCC, the bile duct can be obstructed by direct invasion of HCC, hemobilia and extrinsic compression by the HCC or metastatic lymph nodes.3,4 “Icteric type hepatoma” is an HCC with tumor invasion to the bile duct (bile duct tumor thrombus, BDTT) causing obstructive jaundice and is an uncommon condition with a frequency of 0.53% to 12.9%.5–7 The majority of the patients with obstructive jaundice caused by HCC are not candidates for surgery because of either the advanced state of the HCC or another significant comorbidity. In such patients, effective and long-term decompression of the bile duct is essential. For biliary decompression, either percutaneous transhepatic biliary drainage (PTBD) or endoscopic retrograde biliary drainage (ERBD) can be performed. As most of the BDTT involving the first-order intrahepatic duct or hepatic confluence, PTBD has been traditionally preferred.8 In this article, the authors discuss the treatment of obstructive jaundice caused by HCC, with the emphasis on stent placement through a percutaneous approach.

Diagnosis and Treatment Consideration

Bile duct invasion by HCC was diagnosed based on computed tomography (CT) and/or magnetic resonance imaging (MRI): the presence of a mass within the bile duct connected to the intrahepatic parenchyma lesion with dynamic imaging features similar to that of HCC, and upstream bile duct dilation greater than 3 mm.9 Macroscopic BDTT was classified according to the location of BDTT, as proposed by Ueda et al10; type 1 (BDTT involving the second order intrahepatic duct), type 2 (BDTT involving the first-order intrahepatic duct), type 3 (BDTT involving the hepatic confluence), and type 4 (dislodged BDTT within the common hepatic duct). According to the study of Moon et al,9 which evaluated surgical outcomes of HCC with BDTT in 73 patients, type of BDTT were type 2 in 46.6% and type 3 in 53.4%.

For the patients with HCC with BDTT, surgical resection is the only option for curative treatment.8,9,11 But it is difficult to decide surgical indication for these patients because jaundice makes it hard to assess hepatic function. Jaundice due to advanced cirrhosis is a contraindication for major hepatectomy. Obstructive jaundice associated with BDTT reduce the quality of life due to development of pruritus, malaise, hemobilia, and cholangitis and may cause hepatic failure. The ideal treatment for HCC associated with obstructive jaundice is to perform preoperative biliary drain-
age and subsequent hepatic resection because the poor general condition of the patient at initial presentation may preclude surgical treatment. Biliary drainage may improve immune function as well as nutritional status and reduce the risk of infection and postoperative complications.\textsuperscript{14} Most of the patients were inoperable because of advanced disease and poor hepatic functional reserve, or the presence of portal vein invasion. Recently, An et al\textsuperscript{10} reported 247 consecutive HCC patients with bile duct invasion. Of the total patients, 66.8\% had Barcelona Clinic Liver Cancer (BCLC) stage C HCC, and 67.2\% had portal vein invasion. Only 10.9\% of the patients underwent surgical resection with curative intent.

In inoperable patients, effective and durable decompression of a biliary tract is essential. For biliary decompression, either PTBD or ERBD can be performed. Regardless of what procedure was performed, successful biliary drainage was associated with better overall survival rate.\textsuperscript{10,15} There are no prospective randomized trials regarding PTBD versus ERBD for obstructive jaundice caused by HCC. However, in patients with malignant obstruction other than HCC, there are randomized controlled trials comparing PTBD with ERBD. Piñol et al\textsuperscript{16} revealed that a metallic stent inserted percutaneously has better therapeutic success than plastic stents inserted endoscopically. For hilar obstruction, Saluja et al\textsuperscript{12} showed that PTBD out-performed ERBD using plastic stent; a significantly higher therapeutic success (89\% vs 41\%) and substantially lower complication rate than ERBD (52\% vs 18\%) and significant improvement in the quality of life. Because of proximal biliary obstruction at the hilum, hypervascularity of tumors and underlying cirrhosis, PTBD has been traditionally preferred, but recently ERBD is also used.\textsuperscript{15,18} ERBD requires skilled, experienced operators for catheter passage to preclude post-procedural complications such as gastrointestinal bleeding, post-endoscopic retrograde choledangiopancreatography pancreatitis, and bowel perforation. Another disadvantage of ERBD is its limited durability due to obstruction by a blood clot or tumor thrombus.\textsuperscript{19} Although PTBD is expected to improve obstructive jaundice and patient’s general condition, it may cause catheter-related complications. Maintaining PTBD catheter and the need for regular catheter change may worsen the quality of life. Common complications associated with PTBD catheter are catheter dislodgement, cholangitis, and bile leakage.\textsuperscript{20} Percutaneous or endoscopic self-expandable metallic stent (SEMS) insertion is a well-established treatment for palliating patients with an inoperative malignant biliary obstruction due to hepatic, pancreatic, and gallbladder cancer and metastatic lymphadenopathy.\textsuperscript{21–24} Previous studies revealed that percutaneous placement of the self-SEMS is a feasible and effective palliative treatment in a patient with obstructive jaundice due to HCC, especially for those with Child-Pugh class A disease.\textsuperscript{25} The purpose of stent placement is not only to improve jaundice and quality of life but also to give the opportunity for further treatment such as transarterial chemoembolization (TACE) or systemic chemotherapy. Many systemic chemotherapeutic drugs require an intact mechanism of bilirubin excretion and bile drainage for efficacy and to prevent toxicity.\textsuperscript{25}

### SEMS Placement Procedures and Clinical Outcomes

PTBD procedures are performed with the use of sonographic and fluoroscopic guidance. The approach site is determined based on the location and the extent of the bile duct dilation by the tumor as well as the feasibility of approach based on CT or MRI. The dilated intrahepatic ducts proximal to the obstructive HCC are punctured with a 21 G Chiba needle under US guidance. A 4 F or 5 F vascular sheath and 0.035-inch hydrophilic guidewire inserted into the dilated bile ducts. After dilation of the track, an 8.5 F or 10 F drainage catheter is inserted over the guidewire and positioned in an appropriate portion of the bile duct. Broad-spectrum antibiotics are administered before and after the procedure. Fluoroscopic guidance is required to precisely position the catheter so that the tip is placed in the area of obstruction. Anteroposterior (AP) digital spot image (D) after placement of 10 mm × 10 cm-diameter biliary stent shows partial lipiodol uptake HCC. HCC mass compress confluence of both intrahepatic ducts. Total bilirubin was 34 mg/dL. Anteroposterior (AP) digital spot image (C) after placement of 10 mm × 7 cm-diameter biliary stent. Total bilirubin level decreased to 7.4 mg/dL. There was no significant bleeding during percutaneous transhepatic biliary drainage (PTBD) and stent insertion procedures. Because of stent occlusion after one year, additional stent insertion was needed. AP digital spot image (D) after placement of 10 mm × 10 cm-diameter biliary stent (catheter: 7 F). The total bilirubin level was normalized.

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**Fig. 1.** A 68-year-old man with hepatocellular carcinoma (HCC) with previous transarterial chemoembolization (TACE). Axial images (A, B) of contrast-enhanced computed tomography scan before stent insertion show partial lipiodol uptake HCC. HCC mass compress confluence of both intrahepatic ducts. Total bilirubin was 34 mg/dL. Anteroposterior (AP) digital spot image (C) after placement of 10 mm × 7 cm-diameter biliary stent. Total bilirubin level decreased to 7.4 mg/dL. There was no significant bleeding during percutaneous transhepatic biliary drainage (PTBD) and stent insertion procedures. Because of stent occlusion after one year, additional stent insertion was needed. AP digital spot image (D) after placement of 10 mm × 10 cm-diameter biliary stent (catheter: 7 F). The total bilirubin level was normalized.
antibiotics are given for 12 hours before and after each procedure.

Biliary stent insertion is better to be performed after improvement of jaundice-related symptoms. Because HCC is a hypervascular tumor and most of the patients have a bleeding tendency due to cirrhosis, balloon dilation of the stenosis before the stent insertion is not performed. Subsequent hemorrhage and hemobilia can be serious complication after the PTBD and stent placement. Hemobilia may cause stent obstruction, transduction, and arterial embolization. Non-covered self-expandable stents are used due to the obstruction involving first-order intrahepatic duct or hepatic confluence. For bilateral drainage, two stents are placed through dual PTBD tract (Y configuration) or single PTBD tract (T configuration). Several days after stent placement, cholangiogram is obtained to confirm the position and patency of the stents through PTBD. Considering stent patency and patient’s condition, PTBD catheter could be removed [Fig. 1]. Hong et al.18 evaluated the technical and clinical success of the percutaneously inserted self-expandable stent in the patients with obstructive jaundice due to HCC. The mean time between PTBD and stent placement was 20.5 days (range, 3–140 days). Stent placement was technically successful in all the patients. Clinical success was achieved in 73%. The overall mean stent patency was 149.8 days (range, 12–790 days). Self-limiting hemobilia and hemobilia necessitating transfusion occurred in 10%. Transcatheter arterial embolization was not needed for the treatment of hemobilia. The mean stent patency in a patient with Child-Pugh class A disease (257.8 days) was significantly longer than that of patients with Child-Pugh class B and C disease (123.2 days and 63 days, respectively). After improvement of the patient condition, TACE was performed in 26.6% of the patients.

Conclusion

A multidisciplinary approach is essential as effective biliary drainage is a challenging treatment for the patients with HCC with BDTT. Adequate biliary drainage might be crucial to preserve liver function and improve survival. Percutaneous placement of self-SEMSs is an effective palliative treatment option in a patient with obstructive jaundice resulting from HCC.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

References

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