



Malignant obstructive jaundice treated with intraluminal placement of Iodine-125 seed strands and metal stents: An analysis of long-term outcomes and prognostic features

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ABSTRACT

PURPOSE: The purpose of this study was to analyze the long-term outcomes, including safety, efficacy, and prognostic features, of intraluminal brachytherapy with Iodine-125 (¹²⁵I) seed strand and stent placement for treatment of patients with malignant obstructive jaundice (MOJ).

METHODS AND MATERIALS: From January 2009 to December 2013, 107 consecutive patients with MOJ were treated with intraluminal placement of ¹²⁵I seed strands and metal stents. A retrospective evaluation of therapeutic outcomes, including overall survival (OS), stent patency rate, complications, and prognostic features, was conducted in 101 patients.

RESULTS: ¹²⁵I seed strands and stents were all successfully implanted. The median followup time was 231 (45–1015) days, and the median OS was 394.0 (95% confidence interval: 319.1–468.9) days. The cumulative OS rates at 3, 6, 12, and 24 months were 95%, 77%, 53%, and 20%, respectively. The median stent patency period was 278.0 (95% confidence interval: 164.1–391.9) days, and cumulative patency rates at 3, 6, 12, and 24 months were 92%, 69%, 45%, and 13%, respectively. Multivariate analysis indicated that the serum conjugated/total bilirubin $\geq 88\%$ before procedure ($p = 0.032$) and whether the patient receiving further treatment ($p = 0.041$) appear to be the prognostic factors of OS. There is no statistical prognostic factor for stent patency.

CONCLUSIONS: The intraluminal placement of ¹²⁵I seed strands and stents appears to be a safe and efficient therapy on MOJ. The patient with serum conjugated/total bilirubin $\geq 88\%$ before procedure and receiving further treatment seems to live longer. © 2018 American Brachytherapy Society. Published by Elsevier Inc. All rights reserved.

Key words:

Malignant obstructive jaundice; Intraluminal brachytherapy; Stent; Iodine-125 (¹²⁵I) seed strand

Introduction

Malignant obstructive jaundice (MOJ) usually results from biliary invasion or compression by advanced abdominal malignant tumors, but less than 20% of the patients are

eligible for radical operation (1). For patients with unresectable MOJ, stent implantation is recommended as a palliative treatment to restore bile drainage and improve quality of life (2–6). However, the stent patency period is about 2–9 months after implantation, in which metal stent remains patent much longer than plastic stent (6,7). Stent occlusion may be caused by tumor ingrowth or overgrowth, leading to biliary re-obstruction (3,4,8,9). Accordingly, delaying tumor growth is likely to prolong the stent patency period.

In recent years, Iodine-125 (¹²⁵I) brachytherapy has been used in the treatment of various advanced malignant tumors, including malignant melanoma, prostate cancer, esophageal cancer, and breast cancer. It has also been reported to use ¹²⁵I brachytherapy for the treatment of

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malignant biliary obstruction (10–12). Our previous studies demonstrated that the combination of ^{125}I seed strand and metal stent implantation was safe and efficient for the treatment of hepatocellular carcinoma. More recently, we implanted ^{125}I seed strands and metal stents in patients with locally advanced, nonmetastatic, inoperable pancreatic ductal adenocarcinoma associated with obstructive jaundice. The results showed that successful bile drainage was achieved in all 18 patients within 1 week after surgery. Only 1 patient (5.6%) was found to have stent dysfunction at about 18 months after surgery. The stent patency rate seems significantly higher than that shown in other reports. The preclinical study showed that ^{125}I seed strand would cause necrosis and detachment of epithelial cells, and infiltration of inflammatory cells in bile duct at 15 days after implantation, whereas the damaged bile duct epithelium was almost completely repaired within 60 days after implantation (9,13–15). Based on these data, we believe that the placement of ^{125}I seed strand may delay the growth of advanced malignant tumors and prolong stent patency period. In the present study, we analyzed the long-term outcomes for 101 MOJ patients treated with intraluminal ^{125}I brachytherapy and metal stent placement.

Methods and materials

Patients

From January 2009 to December 2013, 107 consecutive patients with MOJ were treated with intraluminal placement of ^{125}I seed strands and metal stents. Seven patients were excluded from the study. The exclusion criteria include (1) normal serum total bilirubin level associated with dilation of intrahepatic and common bile duct shown by imaging ($n = 2$), (2) received treatment for MOJ before admission ($n = 3$), and (3) incomplete data ($n = 1$). Written informed consent for procedure was obtained from every patient. This study was approved by the Ethics Committee of Zhongshan Hospital of Fudan University.

Procedures

The degree of dilation and obstructive site of bile duct were examined by using the preoperative imaging (CT or magnetic resonance cholangiopancreatography). The biochemical and hematological variables were measured before and after

operation. For patients with massive ascites, preoperative paracentesis was performed.

Percutaneous transhepatic cholangiographic drainage (PTCD) was performed before stent placement and withdrawn until symptoms of jaundice disappeared or serum total bilirubin decreased to less than 100 $\mu\text{g}/\text{mL}$ (15). Bilateral drainage was only performed in patients with hilar lesions because the unilateral drainage was not sufficient for them.

Self-expanded nitinol stents (8 or 10 mm in diameter and 60–120 mm in length, Luminxx III, Bard, Covington, Georgia) and the model 6711 ^{125}I seed (XinKe, Shanghai, China) were used in this study. To enable ^{125}I seeds to fit for the lumen shape, we encapsulated ^{125}I seeds into a 4F catheter to form a ^{125}I seed strand (Fig. 1).

The length of biliary tract obstruction (L) was examined by using preoperative imaging and the process of percutaneous transhepatic cholangiography. The size of stent and the number of ^{125}I seeds (N) were selected according to the length of biliary tract obstruction (L). The formula for calculating the number of ^{125}I seeds was $N = L/4.5 + 4$. A 5F long sheath and a stent were separately introduced into the bile duct using two parallel stiff guide wires. After stent installation, the premade ^{125}I seed strand was implanted through the 5F long sheath.

An external drainage tube was placed proximally to the stent during operation and tapped after 24 hours. The drainage tube would be removed 2 weeks later if the stent remained patent. By contrast, the drainage tube would be retained when the serum total bilirubin was increased or the cholangitis feature appeared during 2 weeks after operation. Other medical managements were conducted for these patients.

All patients underwent single-photon emission computed tomography to confirm the position and radiation scope of ^{125}I seed strands.

Complication

According to the criteria of the Interventional Radiology Association, the complications were divided into major and minor complications (16). The major complications, including sepsis, biliary or intestinal bleeding, abscess, pleural or peritoneal effusion, acute renal failure, require prompt treatment. The minor complications include low

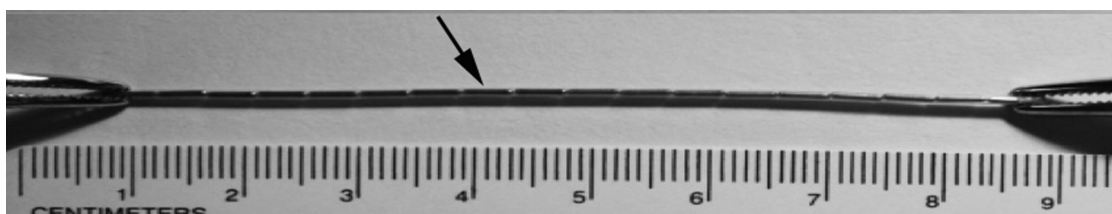


Fig. 1. Encapsulate Iodine-125 (^{125}I) seeds (black arrow) into the 4F catheter in a continuous way to form the ^{125}I seed strands.

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