INTRODUCTION

Malignant hilar biliary obstruction (MHBO) is a malignant tumor that causes biliary stenosis and bile drainage problems, which can lead to elevated liver enzymes and jaundice. Endoscopic biliary drainage performed to treat MHBO is essential to improve treatment, survival rate, and patients' quality of life. However, the biliary drainage in MHBO is technically challenging because of its anatomical complexity, and the successful palliation of cholestasis is less frequent in MHBO than in distal biliary obstruction. In this article, we report a case of proximal stent migration of fully covered self-expandable metal stent following side-by-side deployment in the patient with Klatskin tumor. It is expected that it will be of great help if various preventive methods to reduce stent migration are developed in the future.

Keywords: Hilar biliary obstruction; Klatskin tumor; Side-by-side; Fully covered self-expandable metal stent; Migration

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Malignant hilar biliary obstruction (MHBO) is a malignant tumor that causes biliary stenosis and bile drainage problems, which can lead to elevated liver enzymes and jaundice. Endoscopic biliary drainage performed to treat MHBO is essential to improve treatment, survival rate, and patients' quality of life. However, the biliary drainage in MHBO is technically challenging because of its anatomical complexity, and the successful palliation of cholestasis is less frequent in MHBO than in distal biliary obstruction. In this article, we report a case of proximal stent migration of fully covered self-expandable metal stent following side-by-side deployment in the patient with Klatskin tumor. It is expected that it will be of great help if various preventive methods to reduce stent migration are developed in the future.

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Copyright © 2024 by The Korean Journal of Pancreas and Biliary Tract
biliary drainage performed to treat MHBO is essential to improve treatment, survival rate, and patients’ quality of life. However, due to the complex anatomical characteristics of the hilar bile duct, the difficulty of the procedure is high and there is a risk of procedure-related complications. Therefore, research has recently been conducted on various stent types and endoscopic techniques to increase the clinical effectiveness of biliary drainage for MHBO. However, to date, there has not been sufficient evidence established regarding what type of stent and method to use for MHBO.

For extrahepatic biliary strictures, it has been proven that a self-expandable metal stent (SEMS) is superior to a plastic stent (PS) in terms of stent patency and survival rate. However, there are conflicting results regarding MHBO. It is important to note that when using SEMS for MHBO, the covered self-expandable metal stent (cSEMS) may potentially cause cholangitis or cholecystitis due to obstruction of the intrahepatic bile duct branch or cystic duct. As a result, uncovered self-expandable metal stent (ucSEMS) is primarily used to avoid any complications. However, ucSEMS has the disadvantage that tumor ingrowth and tumor overgrowth occur inside the stent, making replacement and removal of the stent difficult. Therefore, fully covered self-expandable metal stents (fcSEMSs) with a small diameter of 6 mm were developed. In this report, we present a case of proximal stent migration of fcSEMS with a small diameter of 6 mm following side-by-side deployment in the patient with Klatskin tumor.

CASE

A 77-year-old man visited the emergency room due to abdominal pain and fever in the right upper quadrant 3 days before admission. Two years ago, he was diagnosed with perihilar bile duct cancer (Klatskin tumor, Bismuth type IV) and underwent parallel bilateral biliary drainage using two 7 Fr double pigtail PS (Zimmon Biliary Stent; Cook Medical, Bloomington, IN, USA) (Fig. 1). Combination chemotherapy was administered, but repeated stent replacement was required due to recurrence of biliary tract inflammation. However, one month prior to this visit, biliary drainage was performed using fcSEMSs by side-by-side deployment method. The fcSEMS used was the COMVI II (Taewoong Medical, Gimpo, Korea; Fig. 2A) device with a diameter of 6 mm and a length of 12 cm (Fig. 2B, C).

In blood tests, white blood count 19,800/mm³, hemoglobin 9.6 g/dL, platelets 108,000/mm³, aspartate aminotransferase 55 U/L, alanine aminotransferase 75 U/L, alkaline phosphatase 155 U/L, gamma-glutamyl transpeptidase 209 U/L, total bilirubin 13.7 mg/dL, direct bilirubin 8.4 mg/dL, and C-reactive protein 224.1 mg/L were confirmed, suggesting biliary obstruction and recurrence of cholangitis due to stent dysfunction. Acute renal failure was confirmed with blood urea nitrogen 58.3 mg/dL, creatinine 4.98 mg/dL, and creatinine-estimated glomerular filtration rate 8 mL/min, endoscopic retrograde cholangiopancreatography was performed immediately for rapid diagnosis and treatment. Among the previously inserted fcSEMS, both stents were observed to have dislodged (proximal stent...
migration) into the proximal bile duct, resulting in incomplete patency of the distal tip of the opposite stent (Fig. 3). Using alligator forceps, the distal tip of the fcSEMS on the side of the migrated right intrahepatic bile duct was pulled down toward the duodenum (Fig. 4A, B) and safely removed out of the bile duct using a polypectomy snare (Fig. 4C). Next, the stone extraction balloon catheter was expanded and the distal tip of the fcSEMS on the left intrahepatic bile duct was pulled into the duodenum and removed without resistance using a polypectomy snare (Fig. 4D, E). After removing both fcSEMSs, bilateral biliary drainage was performed using 7 Fr PS, and the procedure was completed after confirming that there were no complications (Fig. 4F). During outpatient follow-up 1 week after discharge, symptoms improved and chemotherapy was restarted.

**DISCUSSION**

According to the meta-analysis results published by Jang et al. in 2022, SEMS was superior in stent patency and re-intervention time, but the clinical success rate was low. In addition, the 2018 ESGE practice guideline recommended ucSEMS for MHBO, but in the 2021 ASGE and 2023 ACG practice guidelines, there is not enough evidence on which type of stent to preferentially insert between PS and SEMS. However, in situations with a short life expectancy of less than 3 months or in situations where it is important to avoid repeated procedures, SEMS was recommended first. If a decision is made to insert ucSEMS, it was suggested that PS be inserted first to ensure effective biliary drainage.

When using SEMS for MHBO, the cSEMS has the potential to cause cholangitis or cholecystitis due to obstruction of the intrahepatic bile duct branch or cystic duct, so ucSEMS was mainly used. However, ucSEMS has the disadvantage that tumor ingrowth and tumor overgrowth occur inside the stent, making replacement and removal of the stent difficult. Therefore, fcSEMS with a small diameter of 6 mm was developed as a method to prevent tumor growth inside the stent and reduce the incidence of cholecystitis and cholangitis, which are disadvantages of cSEMS. However, fcSEMS may have a high risk of stent migration.

In a previous study by Inoue et al., when two 6 mm fcSEMS were side-by-side deployed in a total of 17 patients, the technical success rate was 94% and the time to recurrent biliary obstruction (TRBO) was 210 days, and there was no stent migration. However, there are several differences from the fcSEMS used in this case. The fcSEMS used by Inoue et al. is connected to a lasso, so the distal end of the fcSEMS is positioned inside the bile duct above the duodenal papilla, and the stent delivery system was 8 Fr, which was thicker than the stent delivery system used in this case (7 Fr).

Recently, in 2023, Paik et al. published the results of a prospective multicenter randomized clinical trial comparing fcSEMS and PS using the same COMVI II (Taewoong Medical, Gimpo, South Korea). It was performed on a total of 25 patients.
and the technical success rate was 100% and the average TRBO was confirmed to be 121-260 days. Importantly, unlike the study results published by Inoue et al.\(^1\), stent migration occurred in a total of 48%. In all cases, stent migration occurred toward the distal bile duct, and no stent migration was observed into the proximal bile duct as in this case. This difference in stent migration rate was analyzed to be due to differences in the target patient group and differences in the details of the stents mentioned above.

The proximal stent migration could also be related to the length of the distal end of the stent protruding into the duodenal lumen. Currently, there are no exact guidelines for the length of the distal end of the stent protruding into the duodenal lumen, but many studies indicate that 1-1.5 cm is appropriate.\(^1\)\(^2\)\(^3\) In this case, this length was slightly short and this may have affected the proximal migration of the fcSEMS. To support this possibility, a well-designed, large-scale prospective cohort study is needed in the future.

To date, there has not been sufficient evidence established regarding what type of stent and method to use for MHBO. However, it is important to be aware that when using fcSEMS as in this case, the risk of stent migration is higher than with ucSEMS, and appropriate preparation (i.e., proximal, distal flaring or anchoring flap) should be made by taking this into consideration when treating patients. Developing preventive methods to reduce stent migration is crucial. It is expected that it will be of great help if various preventive methods to reduce stent migration are developed in the future.

**Conflicts of Interest**

The authors have no conflicts to disclose.

**REFERENCES**