

Removing an Occluded Biliary Stent Utilizing Argon Plasma Laser

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Abstract

Stent occlusion is a well-known complication in patients needing decompression of the biliary tract, and it requires active intervention to prevent progression to cholangitis and further sepsis. Occlusion due to in-stent growth can occur particularly in the cases of uncovered stents. We report a rare case of an 83-year-old male who developed obstructive jaundice due to a pancreatic adenoma, which was managed with an uncovered stent in the biliary tract. Occlusion of an uncovered expandable metallic stent [EMS] led to placement of a covered stent within the uncovered stent. This again occluded, which required extraction of the covered stents along with the overlying uncovered EMS. An argon plasma laser was used to dissect the ingrown tissue between the uncovered EMS and the wall of the biliary duct while pulling with rat forceps. This was technically challenging given the presence of a second stent within the first stent, which was covered and rather easier to extract, delineating the differences between the two. It was quite evident why covered stents are more prone to migration, whereas uncovered ones are prone to in-stent growth, especially with malignancies leading to occlusion. No surgery-related complications occurred, and the patient developed normalization of the liver function test.

Keywords

Occluded Biliary Stent, Argon Plasma Laser

1. Introduction

Obstruction of the biliary system can lead to a buildup of bile proximal to the level of obstruction [1]. Bile stasis proximal to the obstruction is prone to infection,

causing ascending cholangitis, which can be fatal. Obstruction generally occurs in the setting of gallstones, but rare causes can include pancreatic mass, autoimmune disease, pancreas divisum, or ampullary adenomas [2] [3]. The addition of an expandable metallic stent (EMS) is the standard treatment. Following successful ERCP and sphincterotomy, putting a metallic stent prevents restenosis of the duct due to post-ERCP inflammation or extrinsic mass [4]. Metallic stents are broadly available in two types—covered and uncovered. Covered stents reduce tissue ingrowth but are susceptible to migration. They are readily removable. On the contrary, uncovered stents are preferred in extrinsic malignancies but can develop tissue ingrowth leading to obstruction [5] [6].

We report a case of a serous cystadenoma impacting the common bile duct, leading to obstructive jaundice, warranting an ERCP-guided uncovered EMS placement. This was followed by a recurrence of the obstructive jaundice leading to the in-stent placement of a covered metal stent with a resolution of symptoms.

However, when the patient presented for a third time with obstructive jaundice with symptoms concerning an infection, supported by imaging for yet another blockage, a decision was made to replace the pre-existing stents with the covered EMS to avoid further blockage.

2. Case Report

An 83-year-old man presented with fever, fatigue, and jaundice. He denied any history of vomiting, diarrhea, constipation, and loss of appetite. Family history is insignificant for congenital illness. He denies any travel to international countries. His presenting temperature was 101.3°F, heart rate was 98, and blood pressure was 106/78 mm of Hg. On physical exam he had abdominal distension with right upper quadrant tenderness. Other systemic examination findings were unremarkable. No rebound tenderness, rigidity, or Murphy's sign was appreciated. Examination of the other system was unremarkable. Lab work demonstrated elevated bilirubin levels in the blood with total bilirubin: 3.5 mg/dl, and elevated levels of transaminases, aspartate aminotransferase (AST): 394 U/L, alanine aminotransferase (ALT): 291 U/L, and alkaline phosphatase (ALP): 320 U/L. His blood cultures grew *Klebsiella pneumoniae*. Imaging demonstrated a pancreatic head mass of 3 × 5 cm, and a widening of the common bile duct up to 18 mm proximal to a preexisting stent with an obstruction within the stent and likely biliary sludge proximal to it.

Two months ago, he presented with features of obstructive jaundice (icterus, dark urine, pale stools). At that time, Computed Tomography (CT) showed a pancreatic mass, and the biopsy showed pancreatic serous cystadenoma. He had an uncovered metallic stent placed, but it was complicated by in-stent tissue growth presenting as cholangitis 3 weeks later. This prompted a repeat ERCP; ingrown tissue was dissected, and a covered EMS was placed inside the uncovered stent.

Finally, during this admission, an ERCP was decided upon for diagnostic and therapeutic purposes. At the duodenal papilla, an obstructed covered EMS inside

an uncovered stent was seen. At first, the covered EMS stent was evacuated easily, and it led to the expulsion of pus, biliary sludge, and stones. The biliary tree was cleared utilizing balloon extraction. A cholangiogram was obtained showing narrowing at the level of the uncovered EMS. On further progressing the camera inside the bile duct, ample growth was noticed within the stent. A decision was made to remove the second stent. Initial tugging with forceps provided significant resistance. Dissection of the tissue growing into an uncovered metal stent was performed utilizing argon plasma (power: 15 W, pulsed mode, 1 L/min flow, effect 1) in a plane between the stent and the duct, breaking the ingrown tissue into the stent. The stent came off and was extracted using a rat-tooth alligator jaw grasp. Vacuuming was regularly done to diminish propelled gas in the duodenum. In almost 30 minutes, the uncovered EMS was removed.

By mechanical cleaning utilizing a balloon catheter, sludge inside the EMS was cleared off. A covered EMS was embedded to permit adequate drainage given the presenting cholangitis. Rectal indomethacin was given to decrease the risk of pancreatitis. Momentous change in the patient's health was seen in the patient with slow normalization of liver function tests beginning with bilirubin, with discharge values indicating bilirubin of 0.9 mg/dL and AST/ALT/ALP of 84 U/L, 78 U/L, and 140 U/L, respectively. The patient was switched to oral antibiotics and discharged home the next day without complications.

The ERCP imaging are presented as follows (**Images 1-7**):



Image 1. Obstructed covered EMS protruding into duodenum.



Image 2. Biliary drainage after covered stent removal.



Image 3. Uncovered EMS with ingrown tissue.



Image 4. Dissecting the uncovered EMS.

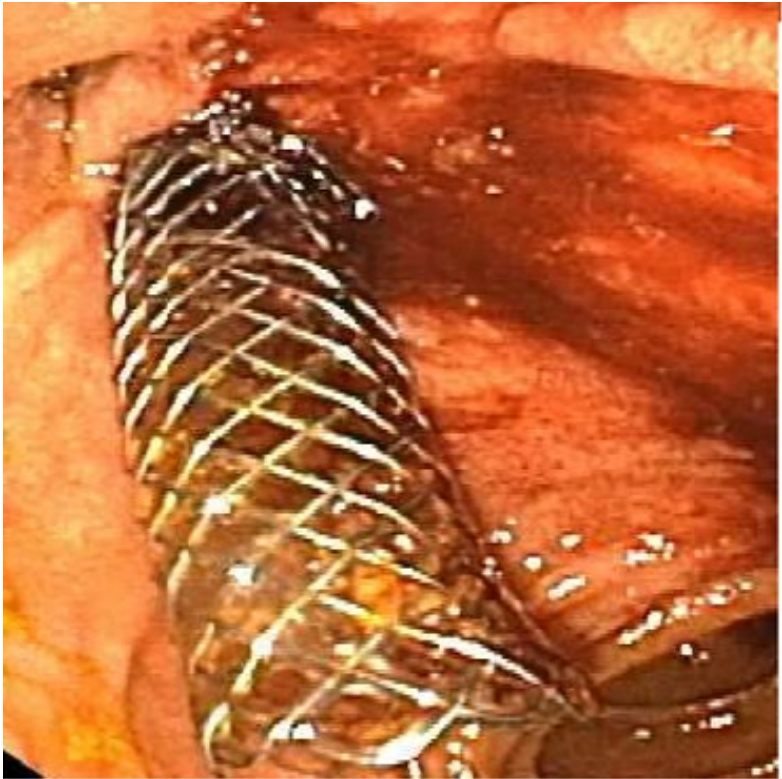


Image 5. Removing the uncovered EMS.

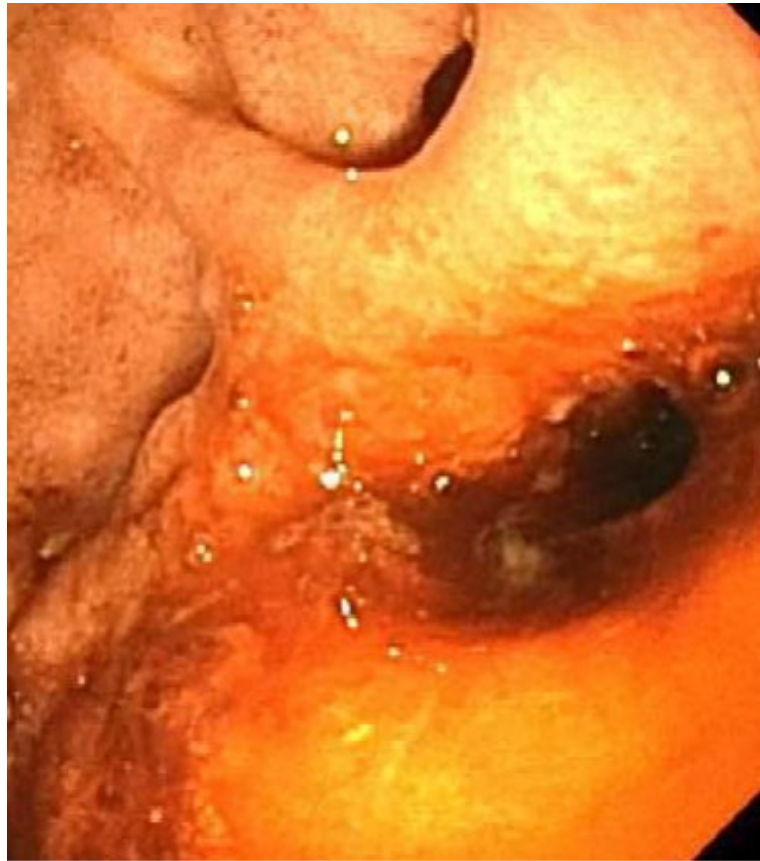


Image 6. Ampulla of Vater post stent removal.



Image 7. Re-introduction of covered EMS.

3. Discussion

This case underscores several aspects regarding the endoscopic management of the biliary obstruction [7]. Pancreatic adenoma causes bile duct obstruction, which was managed with uncovered stent placement. It was placed to keep the bile duct patent and to prevent distal migration of stent which were more critical at that moment than to prevent adenoma overgrowth. Our case demonstrates two episodes of tissue ingrowth into the same uncovered EMS. The first episode dealt with the introduction of the covered EMS within the previous stent. However, during the second episode, the tissue ingrowth pushed the covered EMS out slightly, and there was subsequent tissue growth into the covered EMS. Due to the easy mobility of the covered stent, it could be extracted easily. These demonstrate common complications of both types of stents, *i.e.*, an uncovered stent causes tissue ingrowth, and a covered stent causes distal migration. Finally, extraction of the uncovered stent was difficult and required time and precision.

Endoscopic stent placement to relieve occlusion is commonly performed for the palliation of unresectable threatening biliary strictures [8]. Metal stents are for the most part favored in patients with anticipated survival higher than 3 months, although occlusion still happens in 20% - 27% of the patients [9].

Re-occlusion of the biliary tree demands removal of the occluded stent or placement of a second stent within to obtain source control and achieve adequate drainage, but there are no strict guidelines for it. No standardized parameters for the control setting and gas stream of Argon Plasma Coagulate (APC) have been built up in the writing. As well, higher bursts cause harm to the bile duct epithelium [10]. Thus, controlled depth of tissue destruction while limiting perforation risk is needed.

The evacuation of uncovered EMS by basic pulling is regularly unsuccessful due to the embedment of the metalwork in the biliary duct. Endoscopic evacuation is effective in most cases of covered EMS (86.4% [7] to 92.3% [1]), but it isn't simple in uncovered ones (0% [2] to 38.4% [1]). Kahaleh *et al.* depicted that expulsion of uncovered EMS was more troublesome and required a combination of methods in addition to the gadgets already portrayed [3]. A few strategies have been created to proficiently move forward the expulsion of EMS without complication, such as the wire-loop technique, the open-biopsy-forceps technique, or the lasso technique [4]-[6] utilizing forceps and snares. Our case demonstrates that APC provides a possible alternative. This is because the thermal effect reaches a depth of 0.5 - 3.0 mm. This makes it safer for treating thin-walled structures, as it reduces the risk of deep tissue injury and perforation while the coagulation depth is less controllable from other procedures such as the wire-loop technique, the open-biopsy-forceps technique, or the lasso technique [4]-[6] utilizing forceps and snares [11].

Surgery is another choice of treatment for patients with fizzled endoscopic evacuation. Critically, our patient avoided surgical intervention, which at his advanced age would have caused a high mortality rate. In any case, when the em-

bedded EMS was impeded, most patients with pancreaticobiliary malignancies wanted a less obtrusive approach.

4. Conclusion

In our case, the expulsion of the biliary metallic stent was performed with argon plasma dissection in a satisfactory time without complication. Nowadays the argon plasma laser is broadly utilized in clinics around the world. Larger clinical studies are needed to establish APC settings, evaluate long-term outcomes, and develop guidelines for stent removal strategies. This case emphasizes the importance of technical skill and multidisciplinary judgment in endoscopic biliary interventions.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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