Percutaneous plastic stent placement in malignant biliary obstruction

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Abstract

Malignant biliary obstruction may be due to a wide range of tumors, such as cholangiocarcinoma, gallbladder carcinoma, recurrent or advanced gastrointestinal and colorectal tumors, pancreatic adenocarcinoma and metastasis, causing malignant obstruction through invasion of either the distal, or the hilar or the intrahepatic bile ducts.

At the time of diagnosis, the vast majority of such patients are not good candidates for surgical resection, but they may benefit from palliative treatments. Palliative treatment options include percutaneous and endoscopic intervention, chemotherapy and radiotherapy, or the multimodality approach, as a combination of such techniques and therapies. Percutaneous plastic stenting is the treatment of choice for biliary decompression in carefully selected patients with malignant biliary tract obstruction, with significant symptomatic relief, improvement in the quality of life and extension of the survival time.

We report two cases of successful percutaneous biliary decompression with good outcomes in patients' survival time and quality of life in two patients with malignant obstructive jaundice as a result of advanced disease.

Keywords: endoscopic intervention, malignant biliary obstruction, percutaneous biliary decompression.

Introduction

Malignant biliary tract obstruction is a result of tumor invasion of bile ducts. The most common tumors are cholangiocarcinoma and gallbladder carcinoma, other tumors include pancreatic adenocarcinoma, recurrent or advanced gastro-intestinal and colorectal tumors, metastasis etc. (1-3). Previous reports have shown that gastric and colorectal cancers are major causes of obstructive jaundice from non-biliary and non-pancreatic cancers with a generally poor prognosis (4-6). Due to silent disease or other factors, most patients with malignant biliary obstruction (MBO) are diagnosed in advanced stages, when either because of patients' unfitness or because of local tumor spread, they are not good candidates for surgical resection. Therefore, less invasive palliative techniques play an important role. Such techniques include percutaneous or endoscopic biliary stenting, biliary-enteric surgical bypass, radiotherapy and chemotherapy, or the multimodality approach, which includes a combination of these techniques and therapies.

At present the current use of plastic stents placed by percutaneous approach, is a well established palliative treatment for decompression of malignant biliary obstruction in patients affected by advanced disease, with good outcomes (2,3,7-13). We report our initial experience in percutaneous biliary stenting in two patients with malignant biliary obstruction due to locally advanced disease, respectively hilar cholangiocarcinoma and recurrent colon cancer, with very good outcomes in the patients' quality of life and survival time.

Case report

The first patient was a 56 year-old female with jaundice, pruritis, sub febrile temperature and weakness. She was in poor clinical condition, upon hospital admission, her laboratory findings included high levels of bilirubin (>15 mg/dl), low blood count etc. Abdominal CT findings included a locally invasive liver hilar mass associated with dilated intrahepatic biliary ducts, more prone on the left lobe of the liver. These findings raised the suspicion of hilar type CCA, hypothesis which was further supported by high levels of CA19-9. As, bio-chemical findings are indistinguishable from other causes of biliary obstruction and diagnosis usually relies on radiological investigation (14-19), the patient was diagnosed with hilar CCA. According to the diagnostic findings of advanced disease and due to the poor clinical conditions, the patient was considered unresectable and was referred for percutaneous biliary stenting.

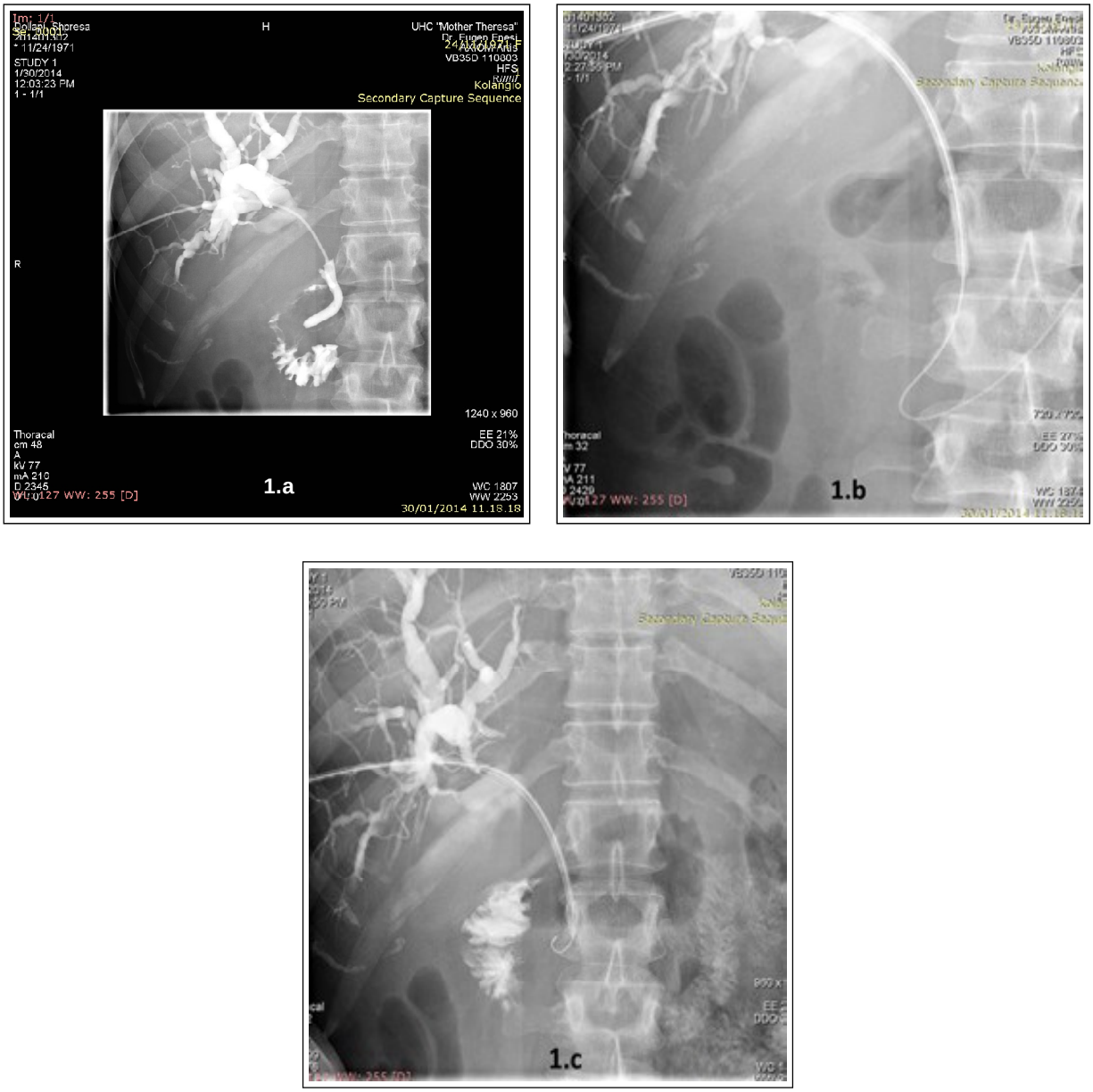
The second patient, a 41 year-old female, was admitted with progressive obstructive jaundice, distinctive itching, after previous surgery for right colic flexure carcinoma with right sided hemi-colectomy, ileo-colonic anastomosis and a liver metastasis extirpation. Her laboratory findings, five months after surgery, included high levels of bilirubin (>25 mg/dl). On the abdominal CT tumor recurrence was found, with common hepatic duct infiltration from the proximal level till the preampular distal part of the common bile duct, with subsequent dilated biliary ducts. Due to the locally advanced disease and the poor clinical conditions, the patient was referred for percutaneous transhepatic biliary drainage and stent placement.

Both patients' fitness for the procedure was assessed in accordance with their presenting coagulation time, findings which were within the generally accepted range. As a result, stent insertion was performed with the purpose to offer good palliation to the patients. Stent selection was patient- and operator-dependant, preferring plastic over metallic stents mainly, as the patients' survival time in our cases were not expected to exceed the mean patency time of plastic stents.

The interventions were attempted as a two-stage procedure, internal-external biliary drainage for three weeks followed by stent placement (Figure 1). The main reason was to improve stricture crossing as a result of expected inflammation reduction during the period of three weeks of biliary drainage. Other reasons included giving time for fibrous adhesion creation at the level of percutaneous puncture to

avoid a possible biliary peritonitis, and also improvement of jaundice symptoms and the clinical condition of the patients. Both patients were treated with broad-spectrum antibiotic cover and pain relief was achieved with conscious sedation. During the first-stage, percutaneous cholangiography demonstrated the neoplastic infiltration of the bile ducts confluence in the first patient; while in the second patient the malignant stricture extended from the proximal part of the common hepatic duct to the distal part of the common bile duct (ductus choledochus) (Figure 1.a). The procedure was followed by the percutaneous placement of an internal-external biliary drainage above the obstructed level. Decompression of the bile ducts was achieved in both cases.

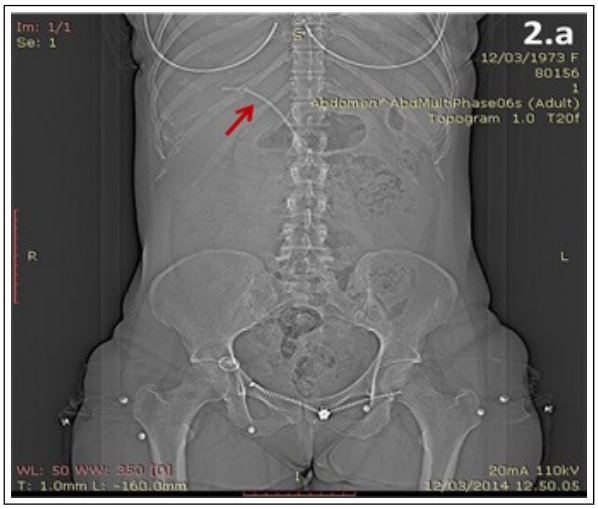
Figure 1.a. Percutaneous Cholangiography, obstruction at the proximal part of the common hepatic duct is noticed (*red arrow*). 1.b, c. Stent placement procedure.

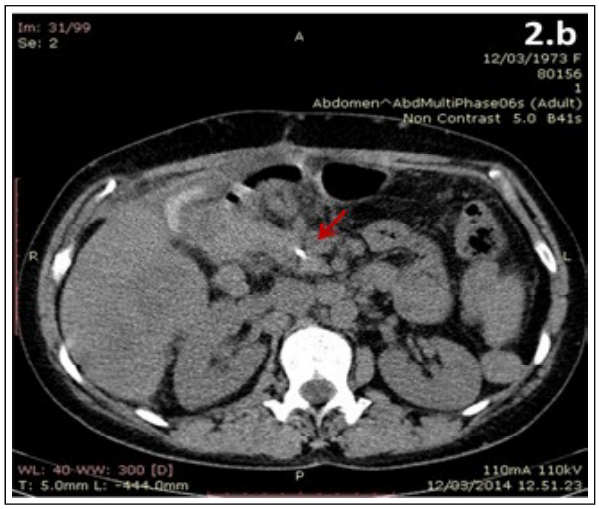


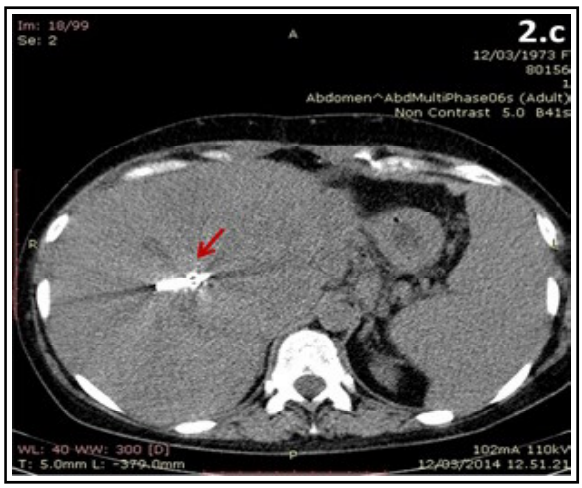
On the second stage (three weeks later), a percutaneous cholangiogram was performed, followed by placement of the definitive plastic stent (Wilson-Cook stent double Miller mushroom) above the stricture (Figure 1.b,c). Stent insertion was successful on both cases as deployment of the stent across the stricture was achieved with immediate flow of contrast on the control cholangiography. Stent placement was followed by a fall of 30% of the pre-procedure bilirubin levels within 30 days of the original procedure in both patients, along with improvement in the symptoms of obstructive jaundice. No early complications occurred, as classified by Cotton et al (20), neither stent occlusion was recorded.

The patients were hospitalized for one day and then were submitted to follow up by the clinician with laboratory tests and ultrasound examination every three months. Both patients showed up in the second follow-up with stable clinical status and preserved stent patency as confirmed through the improvement of the bilirubin levels. The patient with colon carcinoma, performed a control-CT, three months from the procedure, which confirmed the presence of the plastic stent (Figure 2), and stent patency, as three months from the procedure, bilirubin levels had fallen to 1.5 mg/dl.

Figure 2.a, b, c. Native abdominal computed tomography (CT) study (three months from plastic stent placement) including the CT scout and CT scans at two different levels, where the presence of the plastic stent (*red arrows*) is noticed in the scout image (**1.a**) and its extension from the distal choledochus duct (**2.c**) to the right hepatic duct (**2.b**).







Discussion

Malignant biliary tract obstruction due to either primary biliary or non-biliary tract cancer or metastasis to the porta hepatis is a common clinical problem. Obstructive jaundice in patients with advanced or recurrent gastrointestinal cancer, as well as in those with pancreatic cancer or metastasis, occurs because of neoplastic infiltration of the common bile duct, which was the case with our second patient with recurrent colon cancer; other mechanisms may be metastasis to abdominal lymph nodes, hepatoduodenal peritoneum or the liver.

Patients with tumors causing biliary tract obstruction are often asymptomatic or symptoms are non-specific until disease is significantly advanced. Therefore at the time of diagnosis most patients are unresectable and their prognosis is very poor, with a life expectancy of approximately 3-16 months for unresectable CCA (14,22,23,25-30); and 1 to 6 months in patients with MBO due to advanced or recurrent colorectal or gastric cancers (4-6). Surgical resection was not possible for our patients also, as the first one was diagnosed at an advanced stage of hilar type CCA, and the second with recurrent colon cancer. To overcome this clinical challenge, several strategies, including percutaneous and endoscopic intervention, adjuvant surgery, adjuvant chemotherapy or radiotherapy, brachytherapy have been proposed, including the multimodality approach (22,23), in the hope to extend survival rates.

The available palliative treatment modalities for relieving MBO are percutaneous, endoscopic and surgical approach. The selection of the most appropriate modality with which to provide biliary decompression will largely depend on the interventional options available to the patient at the time of presentation (31-35). For those who are not surgical candidates due to nonresectability of disease or to co-morbidities, the choice of percutaneous versus endoscopic route may largely depend on the location and extent of the obstructing lesion in addition to the expertise of the operator. As surgical bypass has not been demonstrated to be superior to stenting (15), stenting procedures resulting in adequate biliary drainage have improved survival. In recent years, endoscopic retrograde biliary drainage (ERBD) has overtaken percutaneous transhepatic biliary drainage (PTBD) as the initial procedure of choice in patients with distal bile duct obstruction (36-40). Much of this trend can be attributed to the availability of trained gastroenterogists at most institutions and to reported lower complications rates with ERBD (32,41,42). In contrast, the percutaneous approach is considered as the treatment of choice for inoperable malignant hilar biliary strictures (Klatskin tumor) (31,40). These publications note that ERBD too often provides ineffective drainage of isolated bile duct segments that become opacified during ERCP and as a result develop biliary sepsis (43-46). In patients with CCA, percutaneous stent placement has been successful in 69%-97%, with a 30-day mortality of 0%-24%; while mean survival time is 3-23 months (2,3,7-13). Percutaneous transhepatic biliary drainage (PTBD) and stent placement has shown useful in achieving biliary decompression and also in improving hepatic function (4,21), making it possible for patients to undergo chemotherapy safely, as chemotherapeutic agents are often implicated in causing liver damage.

In summary, the choice between percutaneous, endoscopic or surgical bypass therapy will greatly depend on the clinical status (co-morbidities) of the patient, the etiology and extent of the biliary pathology. In inoperable biliary obstruction, percutaneous stent placement is the appropriate therapeutic approach (50,51) for patients with advanced disease and poor prognosis, because of high successful rates, low mortality rates and a satisfactory long-term patency (51-55). Both of our patient were successfully treated with plastic stent placement, the patient with malignant infiltration of the common hepatic duct and ductus choledochus had very good outcomes. As the treatment of choice, percutaneous stent placement was successful in the patient with hilar type CCA

with significant improvement.

Percutaneous biliary drainage is one of the most challenging procedures performed by interventional radiologists. Contraindications to PTBD and stent placement are relatively few but might include severe coagulopathy or ascites (42). The reported technical success rate of percutaneous transhepatic choangiogram/ PTBD has between 90-95% (16,33-35). Related periprocedural mortality rates of 0.7 to 8.6% have been reported (16,34). Drainage-related complications such as hemorrhage, acute sepsis and pleural transgression can occur during the catheter placement (56-62), and delayed complications such as pericatheter bile leak, catheter dislodgement, catheter obstruction with or without cholangitis, and tumor spread along the catheter tract have been described (16,35-39,56-62). None of our patient experienced procedure-related complications and had preserved stent patency (Figure 2), with no signs of cholangitis.

There have been some uncertainties on the choice of plastic or metallic stents for the optimal percutaneous or endoscopic palliation of patients with nonresectable malignant biliary obstruction (24). Plastic stents have some advantages, including: less expense, technically easy insertion, and relatively easy removal and exchange when stent occlusion or malfunctions occur. However, plastic stents in hilar biliary strictures have limited stent patency due to their narrow lumen and a higher chance of clogging because of the longer length of the stent. Comparative trials have shown that plastic stent patency is significantly prolonged by the use of larger caliber stents (35-39). Metallic stents have been shown to be more cost-effective when placed, with fewer reinterventions needed and fewer hospital stay and costs in patients with longer life expectancies (33,47), whereas plastic stents are superior for patients with life expectancies of six months or less (31,51). The long-term patency of metallic stents, on the other hand, is not good, with high occlusion rate by 6 months (48-50), other major limiting factors is that they may be difficult to remove and greater cost relative to plastic stents, that is another reason why plastic stents are more cost-effective in patients with poor life expectancy (51). Although there are no clear data in the literature, the temporary use of plastic stents may be preferable also in cases of obstructive lesions that may respond to chemotherapy/radiotherapy (for e.g. lymphoma), in patients who have hilar lesions with multiple isolated biliary segments, or in patients whose histological diagnosis has yet to be made (31,33,47,51). Plastic stents were used in both of our patients with preserved stent patency and optimal palliation.

In relation to using one or multiple stents (unilateral versus bilateral) for the optimum approach to percutaneous palliation, a single biliary stent in one functional liver lobe for unilateral drainage can provide adequate palliation in the majority of patients with hilar biliary malignancy. It is well known that only 25% of the liver volume requires drainage for adequate palliation of obstructive cholestasis in order to see improvement in biochemical parameters (32).

A number of prognostic factors have been proposed as to the expected life expectancy. While survival rates depend on a wide range of factors, generally speaking cases that did not experience improvement of their liver functions after biliary stent placement had poor prognoses (6). This may be due to the fact that most of these patients do not benefit from the subsequent chemotherapy. In e few reports patients who improved their hepatic function after stent placement, and received subsequent chemotherapy after complete resolution of jaundice, survived longer (4-6). We hereby emphasize that most of the studies confirm that life expectancy is mostly related to the underlying disease causing MBO (55), than to the success of the stent placement procedure. Thus, those patients who are younger, with better performance status, without lung metastasis, chemo-naive seem to live longer (55). In patients with CCA, the topographic classification has major prognostic value, too. In Western countries, approximately 60%-70% of

cases of CCA were reported to be hilar CCA (Klatskin tumor) (14,25,26,29), and these patients with hilar or intrahepatic CCA had worse clinical outcomes than those with distal CCA (26-29). Our patient with hilar CCA has worse outcomes than the patient with colon cancer.

It is clear that symptoms of obstructive jaundice can significantly impair quality-of-life. Apart from attempts to extend survival, the main goal of percutaneous stent placement in unresectable patients with MBO is palliation, with relief from obstructive jaundice, pruritis, cholangitis, pain and quality of life improvement (15,31,54). Our patients, after successful percutaneous plastic stent placement, reported relief of symptoms and a stable clinical condition. The improvement of clinical findings after successful PTBD and stent placement such as pruritis, nausea and abdominal discomfort caused by obstructive jaundice have been reported (4,6,54).

In summary, plastic stent placement for biliary drainage has evolved over the past three decades and has established itself as an important treatment modality in the management of patients with malignant obstructive jaundice. For an effective percutaneous biliary drainage, the selection of the appropriate stent according to the patient's condition and anatomical position is important. Also, acknowledgement and understanding of the advantages, disadvantages, and complications according to each type of stents are needed. Palliative therapeutic strategies should be made on an individual basis such as the experience of the center, patient condition, or surrounding medical curriculum. Multidisciplinary tumor boards with participation of medical oncologists, gastro-enterologists and interventional radiologists must be where the decision is made.

As a conclusion, percutaneous plastic stenting is a treatment of choice in carefully selected patients with malignant biliary obstruction due to advanced or recurrent biliary and nonbiliary tumors, with significant improvement in the quality of life, and good outcomes well beyond simply relieving the obstructive jaundice, as a successful technique in extension of the survival time.

Conflicts of interest: None declared.

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