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Endoscopic treatment of obstructive jaundice in patients with Klatskin tumor

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ABSTRACT

Objective. To improve treatment outcomes in patients with Klatskin tumor and obstructive jaundice by using of endoscopic bilioduodenal stenting.

Material and methods. There were 1904 transpapillary interventions between August 2017 and February 2022. Endoscopic bilioduodenal stenting was performed in 250 patients including 25 (10%) ones with Klatskin tumor.

Results. Bilioduodenal plastic and self-expanding stents were installed in 19 (76%) and 6 (24%) patients, respectively. In Klatskin tumor type I, 11 patients (44%) underwent bilioduodenal stenting of common hepatic duct with plastic stent; 5 (20%) patients with Klatskin tumor type II received self-expanding stents. In case of tumor type IIIA, 3 (12%) patients underwent stenting of the right lobar duct with plastic stent. Four (16%) patients with Klatskin tumor type III B underwent stenting of the left lobar duct. Two 2 (8%) patients with Klatskin tumor type IV underwent bilateral bilioduodenal stenting with plastic and bifurcation self-expanding stents. Peroral cholangioscopy using the SpyGlass DS system was performed in 4 (16%) patients. No intraoperative complications were identified. One (4%) patient developed gastrointestinal bleeding in 2 postoperative days after retrograde intervention that did not require surgery. Moreover, 1 (4%) patient with distal dislocation of plastic bilioduodenal stent required redo bilioduodenal stenting. Three (12%) patients died from multiple organ failure despite adequate biliary decompression, and 22 (88%) patients were discharged in 8±5 days after retrograde intervention.

Conclusion. Bilioduodenal stenting as minimally invasive and physiological method was highly effective for obstructive jaundice in patients with Klatskin tumor. Peroral cholangioscopy using the SpyGlass system provides effective and safe direct visualization of the biliary tract, as well as biopsy for morphological verification and prescription of chemotherapy in patients with intraductal growth of tumor.

Keywords: *Klatskin tumor, peroral cholangioscopy, SpyGlass DS direct visualization system, bilioduodenal stenting.*

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Background

The most common complication of hepatopancreatobiliary cancer is obstructive jaundice. The last one occurs in 70-80% of cases [1, 2]. Intraductal cholangiocarcinoma accounts for 0.5-2%. Malignancies of the area of hepatic duct confluence (Klatskin tumor) makes up 60-80% of these cancers [3].

No early symptoms leads to delayed verification of disease in patients with clinical manifestations (hyperbilirubinemia (87%), acute cholangitis (52.4%), weight loss (20%), pain in the epigastric region and right hypochondrium (15.6%)) and common metastatic lesions [4, 5].

Most patients are inoperable at the time of diagnosis mainly due to widespread periductal tumor invasion. Only 5-15% of patients with bile duct cancer undergo total resection. Other ones require palliative care [6].

The "gold standard" in diagnosis of suspected extrahepatic bile duct cancer and detection of tumor localization is endoscopic retrograde cholangiography. This procedure establishes obstruction level in about 90% of cases while enlargement of intrahepatic bile ducts is clearly defined in 90-100% of cases [7].

However, X-ray diagnostics does not allow direct visualization of tumor and biopsy that is necessary for making a correct diagnosis. According to some studies, up to 20% of biliary strictures remain unverified after laboratory and instrumental examination [7]. To date, peroral cholangioscopy is being actively introduced in the world thanks to development of modern en-

doscopic equipment. This procedure is less invasive than percutaneous cholangioscopy and can be easily performed during endoscopic retrograde cholangiography. Peroral cholangioscopy provides visualization of stricture area and subsequent biopsy [8].

Currently, antegrade and retrograde biliary drainage is used for jaundice in patients with unresectable Klatskin tumor.

According to the national clinical guidelines (2018), antegrade percutaneous-transhepatic approach is preferable for biliary hypertension and obstruction proximal to confluence [9]. However, this technique is associated with certain complications, i.e. bleeding following hyperbilirubinemia, bile leakage, impaired quality of life due to external drainage and impossible bile return per os. Moreover, retrograde drainage is accompanied by significantly longer life expectancy compared to antegrade drainage [10]. Therefore, searching for less traumatic and physiological approaches is relevant in decompensated cancer patients with obstructive jaundice. We present own experience of transpapillary treatment of patients with obstructive jaundice and Klatskin tumor.

The objective was to improve treatment outcomes in patients with Klatskin tumor and obstructive jaundice by using of endoscopic bilioduodenal stenting.

Material and methods

There were 1904 transpapillary interventions between August 2017 and February 2022 at the Sklifosovsky Research Institute for Emergency Care. Endoscopic bilioduodenal stenting was performed in 250 (100%) patients including 25 (10%) ones with Klatskin tumor.

Inclusion criterion was bile duct cancer (TisN1M1) in 25 patients not scheduled to total resection due to widespread infiltration who underwent transluminal surgery. These were 11 (44.0%) women and 14 (56.0%) men aged 70±4.6 years.

We assessed severity of obstructive jaundice considering total serum bilirubin (classification by Fedorov V.D., 2000) [11].

Diagnostic algorithm included transabdominal ultrasound, computed tomography of the abdomen, hepatobiliary scintigraphy, endoscopic pancreatobiliary ultrasound.

Endoscopic retrograde cholangiography was performed in standard fashion. For bilioduodenal stenting, modified plastic stents with lateral perforations and nitinol metal self-expanding stents were used.

Results

All 25 (100%) patients had biochemical signs of hyperbilirubinemia (10 (40%) — moderate, 15 (60%) — severe).

Transabdominal ultrasound was performed in all patients. Signs of bile duct enlargement and invasion were found in 13 (52%) and 3 (12%) patients, respectively. In 9 (36%) cases, common bile duct was not visualized.

Hepatobiliary scintigraphy was performed in 15 (60%) patients. In all cases, we found no drainage into small bowel (partial or complete block of bile excretion).

CT was performed in 17 patients. We visualized a round low-density tumor with uneven contours near common bile duct in 10 (40%) cases and enlargement of extrahepatic bile ducts, calcification and distant metastases in 7 (28%) patients.

Endoscopic ultrasound was performed in 10 (40%) patients. In 9 (36%) cases, we visualized hypoechoic parietal tumor with fuzzy external contours of common bile duct in the area of stricture, wall thickening, biliary hypertension and enlargement of regional lymph nodes. There was isolated enlargement of bile ducts in 1 (4%) case **(Fig. 1)**.

As soon as we confirmed the diagnosis, all patients underwent endoscopic retrograde cholangiography to specify localization, degree and extent of bile duct block. The Bismuth — Corlett classification (1975) was applied to determine spread of tumor along hepatic ducts [12].

If we failed to pass delivery system beyond the area of stricture, preliminary endoscopic dilation was performed.

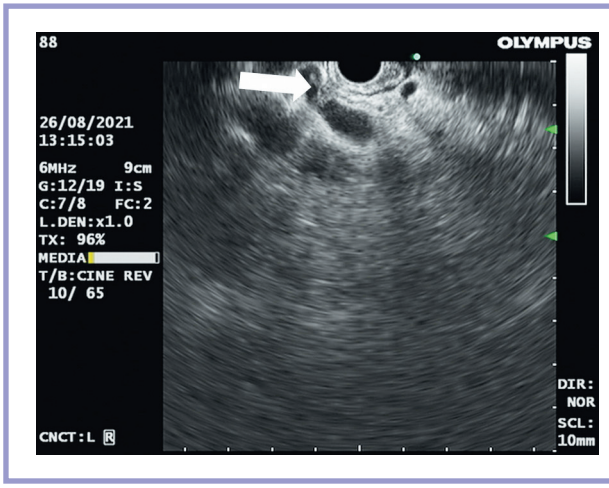


Fig. 1. **Endoscopic ultrasound of common hepatic duct (the arrow indicates parietal solid tumor)**

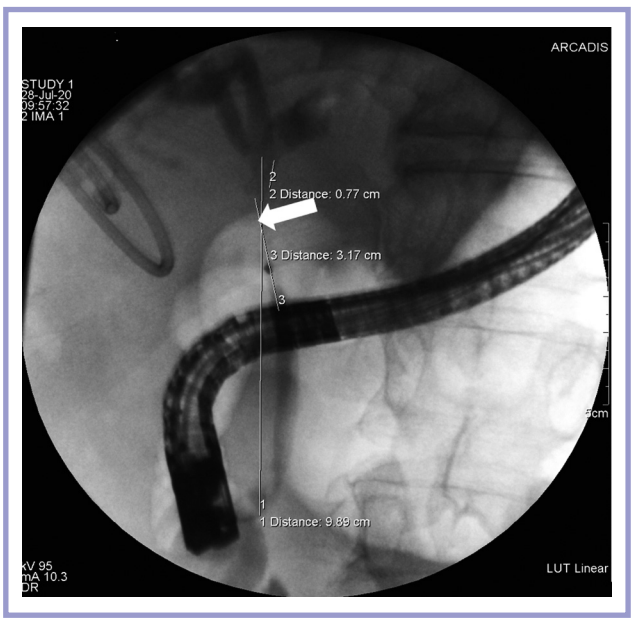


Fig. 2. **Endoscopic retrograde cholangiography for type 1 Klatskin tumor (the arrow indicates the level of block).**

Effectiveness of surgery was assessed according to several criteria (complete evacuation of contrast agent from intrahepatic ducts within 3-5 min, no ultrasonic signs of biliary hypertension in 24 hours after stenting, total serum bilirubin decrease by more than 30% throughout 7 days after intervention).

Morphological verification of disease required peroral cholangioscopy. We analyzed mucosa of the bile ducts, tissue elasticity and bleeding using this method. If tumor tissue was found, we performed biopsy using ultrathin endoscopic forceps.

All patients underwent endoscopic typical papillosphincterotomy and bile duct stenting with plastic or nitinol self-expanding uncovered biliary stents in standard fashion for biliary decompression. Preliminary dilation of malignant stricture was performed in 3 (12%) patients.

Bilioduodenal plastic and self-expanding stents were installed in 19 (76%) and 6 (24%) patients, respectively. In Klatskin tumor type I, 11 patients (44%) underwent bilioduodenal stenting of common hepatic duct with plastic stent **(Fig. 2)**; 5 (20%) patients with Klatskin tumor type II received self-expanding stents. In case of tumor type IIIA, 3 (12%) patients underwent stenting of the right lobar duct with plastic stent. Four (16%) patients with Klatskin tumor type III B underwent stenting of the left lobar duct. Insertion of two stents at once was unsuccessful (bile duct diameter after stenting was smaller than diameter of stent and did not allow the second stent to be inserted into another lobe). However, we additionally modeled perforations at the proximal end of the stent for adequate drainage and prevention of excluded lobe syndrome. No signs of intrahepatic biliary hypertension were obtained during subsequent transabdominal ultrasound.

In 2 (8%) patients with tumor type IV, we preferred retrograde intervention considering severe condition and high risk of bleeding associated with hyperbilirubinemia. In both cases, these procedures were successful. Patients underwent bilateral bilioduodenal stenting with plastic and self-expanding bifurcation stents **(Fig. 3)**.

In all patients, evacuation of contrast agent from intrahepatic ducts occurred within 5 min. In 16 (64%) patients, transabdominal ultrasound in 24 hours after surgery revealed no signs of intrahepatic biliary hypertension. Total serum bilirubin decreased in 22 (88%) patients.

Peroral cholangioscopy (SpyGlass system) was performed in 4 (16%) patients. In all cases, we visualized tumor tissue, duct deformity, disruption of mucosal microvasculature, wall infiltration and ulceration of mucosa typical for malignant lesions. Subsequent target biopsy verified the diagnosis **(Fig. 4)**. Histological examination confirmed poorly differentiated adenocarcinoma in all 4 (16%) patients.

Patients with total serum bilirubin >200 μmol/l underwent plasmapheresis after instrumental and laboratory confirmation of mechanical block elimination.

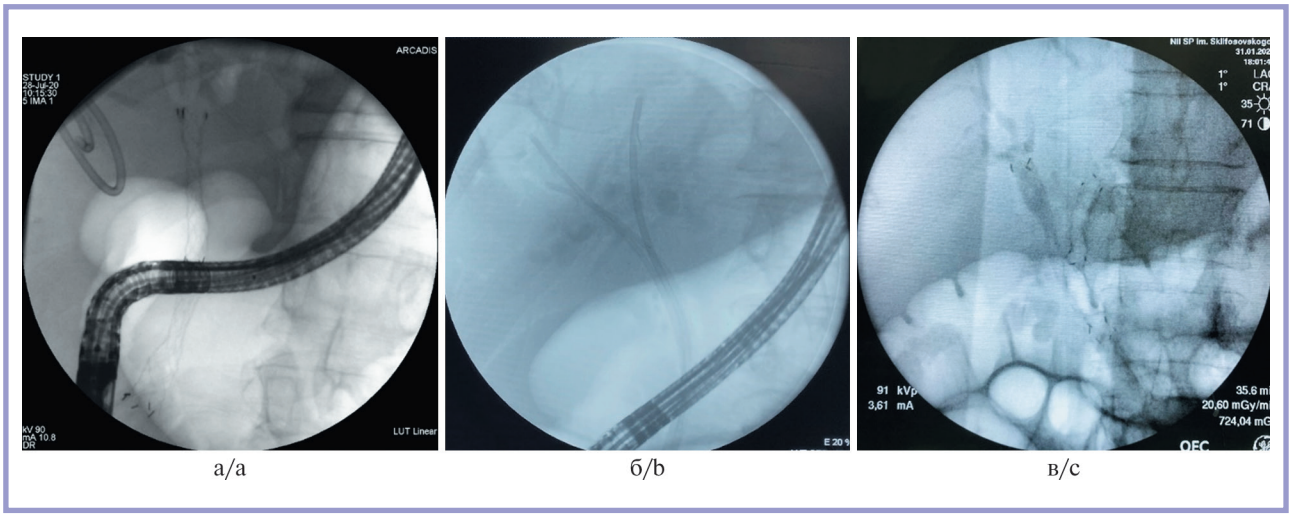
Endoscopic retrograde cholangiography with drainage procedures was followed by regression of jaundice after 3±5.7 days in all patients. Total bilirubin decreased to <100 μmol/L. Dynamics of total bilirubin after endoscopic bilioduodenal stenting is presented in **Fig. 5**.

No intraoperative complications were identified. One (4%) patient developed gastrointestinal bleeding in 2 days after retrograde intervention. Emergency esophagogastroduodenoscopy revealed signs of previous bleeding from the area of endoscopic papillosphincterotomy without need for surgery (Clavien-Dindo grade 1). Moreover, 1 (4%) patient with distal dislocation of plastic bilioduodenal stent required redo bilioduodenal stenting (Clavien-Dindo grade 3).

Three (12%) patients died from multiple organ failure despite adequate biliary decompression, and 22 (88%) patients were discharged in 8±5 days after retrograde intervention.

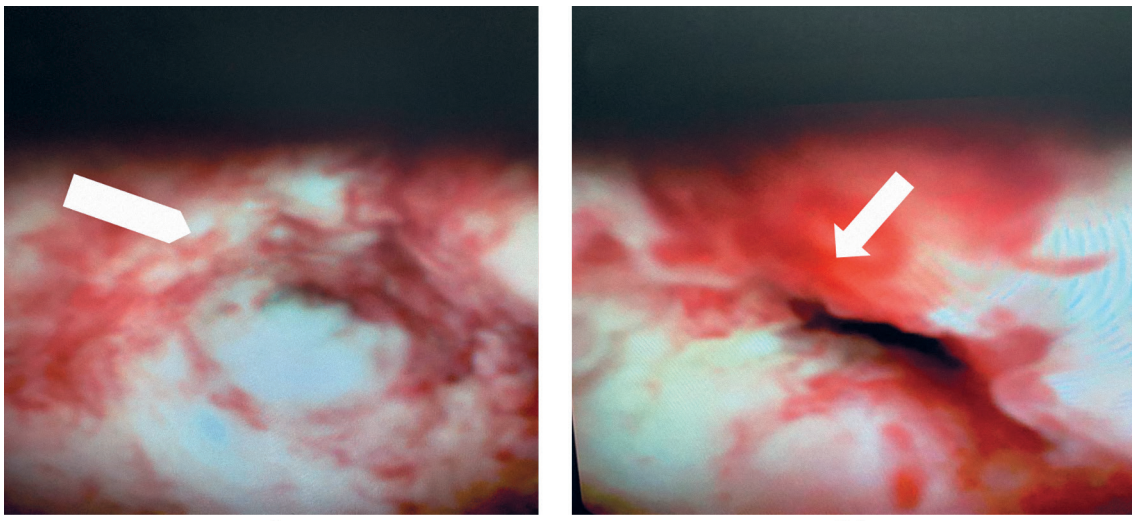
Conclusion

Analyzing own experience of treating patients with malignant obstructive jaundice including those with Klatskin tumors, we revealed that retrograde approach is highly effective (100%



а/a б/b в/c

Fig. 3. **Cholangiography of common bile duct after bile duct stenting.**
a — self-expanding nitinol bare stent; b — bilateral placement of plastic stents. b — bifurcation self-expanding nitinol stent.



а/a б/b

Fig. 4. **Endoscopic image of tumor.**
a — arrow indicates complete obliteration of the duct by tumor; b — zone of duct narrowing.

in our sample), provides small incidence of intra- and postoperative complications (8%) and preserve physiological bile evacuation pathway. Retrograde biliary decompression seems appropriate in all patients with tumor type B III and IV. Traditional antegrade technique may be required if retrograde intervention is ineffective. However, given the small number of observations, further accumulation of experience is required.

In our opinion, peroral cholangioscopy using the SpyGlass system provides effective and safe direct visualization of the biliary tract, as well as biopsy for morphological verification and prescription of chemotherapy in patients with intraductal growth of tumor.

The authors declare no conflicts of interest.

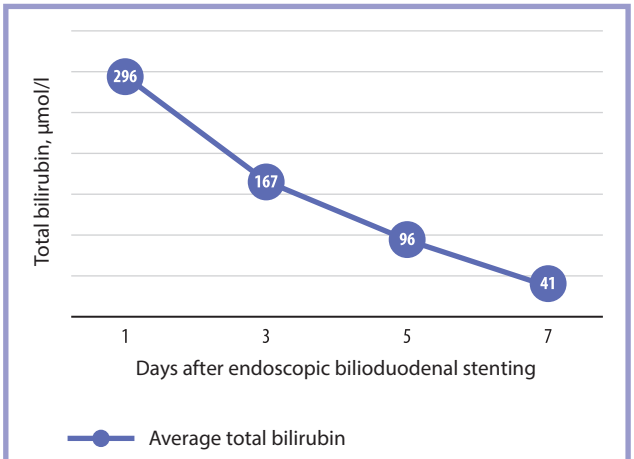


Fig. 5. **Serum total bilirubin after endoscopic bilioduodenal stenting.**

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