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ORIGINAL ARTICLE

Application of endoscopic nasobiliary cutting in the treatment of hilar cholangiocarcinoma

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Abstract

Objective The aim of the study was to study the clinical efficacy and prognosis of endoscopically cutting the nasobiliary duct and leaving its residual segment as a biliary stent in the treatment of hilar cholangiocarcinoma (HC).

Methods The clinical data of 55 patients with HC treated by endoscopic biliary drainage at the Gastrointestinal Endoscopy Center of our hospital (Renmin Hospital of Wuhan University, China) from August 2017 to August 2019 were retrospectively analyzed. According to different drainage schemes, patients were divided into the endoscopic nasobiliary cutting group (n = 26) and the endoscopic retrograde biliary drainage (ERBD) group (n = 29). The postoperative liver function indexes, incidence of postoperative complications, median patency period of stents, and median survival time of patients were compared between the two groups.

Results Liver function indexes (total bilirubin, direct bilirubin, alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, gamma-glutamyl transpeptidase) were significantly decreased in 55 patients a week postoperaticely (P < 0.05), and decreases in liver function indexes in the endoscopic nasobiliary cutting group were more significant than those in the ERBD group (P < 0.05). The incidence of biliary tract infection in the endoscopic nasobiliary cutting group was significantly lower than that in the ERBD group (15.40% *vs.* 41.4%, P < 0.05). In the endoscopic nasobiliary cutting subgroups, there were 1 and 3 cases of biliary tract infection in the gastric antrum cutting group (n = 21) and duodenal papilla cutting group (n = 5), respectively, and 0 cases and 2 cases of displacement, respectively; there was a statistically significant difference in terms of complications between the two subgroups (P < 0.05). The median patency period (190 days) and median survival time (230 days) in the nasobiliary duct cutting group were higher than those (169 days and 202 days) in the ERBD group, but there was no significant difference (P > 0.05).

Conclusion The nasobiliary duct was cut by using endoscopic scissors in Stage II after the bile was fully drained through the nasobiliary duct. The residual segment could still support the bile duct and drain bile. The reduction of jaundice and the recovery of liver enzymes were significant, and the incidence of biliary tract infection was low. Cutting off the nasobiliary duct at the duodenal papilla results in a higher incidence of biliary tract infection, and the residual segment of the nasobiliary duct is more likely to be displaced. Endoscopic nasobiliary-cutting drainage is an effective, simple, and safe method to reduce jaundice in the palliative treatment of HC.

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Key words: hilar cholangiocarcinoma (HC); endoscopic nasobiliary drainage; endoscopic nasobiliary cutting; endoscopic retrograde biliary drainage (ERBD); biliary stent

Hilar cholangiocarcinoma (HC) is a kind of malignant tumor with poor prognosis, which originates from the ductuli hepaticus communis, left and right hepatic ducts, and its confluence bile duct epithelium, accounting for approximately 50% to 70% of all cholangiocarcinomas [1]. Currently, surgical resection remains to be the main radical treatment for HC [2]. However, due to its special anatomical structure and biological characteristics, the surgical resection rate is low, and the 5-year survival rate is less than 10% [3–5]. Most patients have insidious onset and are in an advanced stage when they seek medical treatment, thus losing the opportunity for radical surgery. For patients who are unable or unwilling to undergo radical surgery, it is important to choose an

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appropriate and effective palliative jaundice reduction therapy to improve their quality of life and prolong their survival [6–8]. Currently, the palliative treatment of HC is mainly biliary drainage, which can be performed by using endoscopic, percutaneous, and surgical methods, among which endoscopic biliary drainage is considered to be the best non-surgical treatment at present [9–10]. Endoscopic biliary stenting (EBS) and endoscopic nasobiliary drainage (ENBD) could achieve internal and external biliary drainage, respectively. In clinical practice, EBS and ENBD have advantages and disadvantages.

As early as in 2002, Uchida *et al* [11] proposed for the first time that the nasobiliary duct could be cut under endoscopy, and its residual section could be retained to serve as a biliary stent to make nasobiliary drainage change from external drainage to internal drainage, thus alleviating the discomfort of patients' nasophary and improving their quality of life. In 2003, Uchida *et al* [12] implemented the same drainage scheme for four patients, and followed them up after discharge. One patient had a stent patency period of 62 days, which preliminarily showed that this method could replace the hilar bile ductplastic stent implantation, which provided us with a third choice that combined the advantages of biliary stent and nasobiliary duct. Currently, there are few reports on this treatment scheme at home and abroad.To further explore the feasibility of this drainage scheme, from August 2017 to August 2019, the author treated 55 HC cases through two drainage schemes, namely ENBD via endoscopic retrograde cholangiopancreatography (ERCP) in Stage I, followed by endoscopic nasobiliary cutting and leaving the residual segment of the nasobiliary duct as biliary stent in Stage II or direct endoscopic retrograde biliary drainage (ERBD) via ERCP, and achieved certain results.

Patients and methods

Patients

From August 2017 to August 2019, continuous 55 patients with HC, including 31 men and 24 women, aged 34–85 years, with an average age of (66.46 ± 11.26) years, were treated with endoscopic biliary drainage at the Gastrointestinal Endoscopy Center, Renmin Hospital of Wuhan University, China. All patients were diagnosed with HC according to preoperative clinical data and imaging examinations [computer tomography (CT), magnetic resonance cholangiopancreatography (MRCP), ERCP] with a Bismuth-Corlette classification type of Stenosis IV. Among them, there were 26 and 29 cases in the endoscopic nasobiliary cutting and ERBD groups, respectively. There was no significant difference between the two groups in the preoperative general characteristics of the patients ($P > 0.05$), as presented in Table 1. Chest radiography, electrocardiogram, echocardiography, blood routine examination, coagulation function, and liver and kidney functions were examined routinely preoperatively to assess the risk of surgery. This study was approved by the Ethics Committee of the Renmin Hospital of Wuhan University, China.

Equipment preparation

The Olympus TJF-240 and TJF-260 electronic duodenoscopes, electronic gastroscope, duodenal papillotomy knife, zebra guidewire, bile duct dilatation probe, dilatation balloon, nasobiliary [all 7Fr size and made in the same manufacturer (Boston Scientific, Boston, MA, USA)] and plastic biliary stents (all 7Fr size and made by the same manufacturer), nasal guide tube, and Zhang's scissors were used.

Operation method

Routine endoscopic preparation was performed, including routine fasting for 8–12 h preoperatively; intravenous injections of diazepam (10 mg), pethidine hydrochloride (100 mg), and anisodamine (20 mg) were performed to calm and relieve pain preoperatively, and a diclofenac sodium suppository of 50 mg was inserted into the anus to prevent postoperative pancreatitis (PEP); the patient was in the left prone position and received oxygen inhalation and electrocardiograph (ECG) monitoring during the operation.

The papillae opening was exposed under the electronic duodenoscope and a small amount of contrast media was injected to confirm the obstruction position and dilatation condition of the intrahepatic bile duct after successful intubation with papillotomy knives and guidewires. If necessary, papillae dilation or papillae sphincterotomy is performed with biliary dilatation balloons. Guidewires were placed in the main drainage areas of left and right hepatic ducts under digital subtraction angiography (DSA) fluoroscopy. If bilateral intrahepatic bile ducts could not be super-selected, drainage was performed on one side, and the ductuli hepaticus communis and stenosis sections of left and right hepatic ducts were fully expanded along the reserved guidewires with expansion probes.

In the ERBD group, the plastic biliary stent was implanted directly along the guidewire. In the endoscopic nasobiliary cutting group, the nasobiliary duct was inserted into biliary duct along the guidewire for ENBD at Stage I. After we confirmed that there were no complications such as cholangitis and pancreatitis, and the nasobiliary duct was confirmed to be in good position by X-ray fluoroscopy, the duodenoscope or gastroscope was inserted, and the nasobiliary duct was sent into the stomach for about 20 cm. The endoscope was introduced to the duodenal papilla gently, and the scope was straightened. After the nasobiliary duct was confirmed

Table 1 Preoperative general characteristics and liver function indexes of the patients a week after operation

Index	Endoscopic nasobiliary cutting group (n = 26)	Endoscopic retrograde biliary drainage group (n = 29)	Statistic	P value
Male/Female, n	14/12	17/12	$\chi^2 = 0.127$	0.721
Age, years (median ± SD)	66.19 ± 8.94	66.52 ± 13.12	$t = -0.106$	0.916
Biliarytract infection, with/without, n	8/18	11/17	$\chi^2 = 0.311$	0.577
Preoperative general charactertics				
TBIL, μmol/L (median, range)	111.09 (11.65, 352.77)	140.92 (11.91, 536.35)	$Z = -1.854$	0.064
DBIL, μmol/L (median, range)	83.50 (3.60, 289.30)	103.50 (5.70, 398.00)	$Z = -1.796$	0.073
ALT, U/L (median, range)	72.50 (11.00, 489.00)	94.00 (7.00, 526.00)	$Z = -0.868$	0.385
AST, U/L (median, range)	93.00 (23.00, 849.00)	82.00 (17.00, 348.00)	$Z = -0.413$	0.680
ALP, U/L (median, range)	413.00 (63.00,1193.00)	295.00 (86.00, 1230.00)	$Z = -0.565$	0.572
GGT, U/L (median, range)	379.50 (32.00, 2414.00)	405.00 (45.00, 2546.00)	$Z = -0.126$	0.899
A week after operation				
TBIL, μmol/L (median, range)	46.80 (16.70, 186.10)*	54.23 (15.74, 243.70)*	$Z = -2.868$	0.035
DBIL, μmol/L (median, range)	39.10 (4.60, 161.60)*	44.00 (4.60, 185.50)*	$Z = -2.877$	0.029
ALT, U/L (median, range)	40.00 (12.00, 104.00)*	63.00 (12.00, 209.00)*	$Z = -3.914$	0.000
AST, U/L (median, range)	44.00 (17.00, 195.00)*	60.00 (17.00, 208.00)*	$Z = -2.395$	0.017
ALP, U/L (median, range)	213.00 (67.00, 698.80)*	323.00 (74.00, 757.00)*	$Z = -1.919$	0.048
GGT, U/L (median, range)	200.00 (23.00, 900.00)*	295.00 (16.00, 1015.00)*	$Z = -2.063$	0.043
The desrease in TBIL, μmol/L (median ± SD)	110.86 ± 21.22	57.92 ± 15.88	$t = -2.241$	0.026
The desrease in DBIL, μmol/L (median ± SD)	82.19 ± 15.88	38.31 ± 11.96	$t = -2.524$	0.029
The desrease in ALT, U/L (median ± SD)	76.08 ± 20.60	58.90 ± 17.40	$t = -3.585$	0.021
The desrease in AST, U/L (median ± SD)	86.96 ± 32.08	35.55 ± 13.96	$t = -2.732$	0.031
The desrease in ALP, U/L (median ± SD)	144.74 ± 42.56	105.85 ± 51.78	$t = -1.991$	0.048
The desrease in GGT, U/L (median ± SD)	299.44 ± 75.05	209.35 ± 94.26	$t = -2.168$	0.035

Note: *, denotes postoperative indexes compared with preoperative indexes of the same group ($P < 0.05$). $P < 0.05$ was considered to indicate a statistically significant difference. TBIL: total bilirubin, DBIL: direct bilirubin, ALT: alanine aminotransferase, AST: aspartate aminotransferase, ALP: alkaline phosphatase, GGT: gamma-glutamyl transpeptidase

to be in good positionby fluoroscopy once again, the nasobiliary duct was cut off at the gastricantrum or duodenal papilla with Zhang's scissors, and its residual section was retained as a biliary stent. After ensuring that the stent drainage is unobstructed by observing the stent drainage and the stent position was confirmed to be good by fluoroscopy, the duodenoscope or gastroscope was withdrawn and the operation was finished. The operation of cutting the nasobiliary duct at the gastricantrum is depicted in Fig. 1.

Postoperative observation and treatment

After ERCP, patients were treated with routine fasting and water deprivation, appropriate fluid infusion, broad-spectrum antibiotics for anti-infection, inhibition of gastric acid and pancreatin, liver protection, nutrition and other symptomatic support treatment, and the patient's body temperature and abdominal signs were observed closely. Blood routine and pancreas biochemistry were reexamined at 3 h and 24 h postoperatively. Postoperative complications (pancreatitis, biliary tract infection, hemorrhage, perforation, etc.) were focused on. If complications occurred, they were treated according to

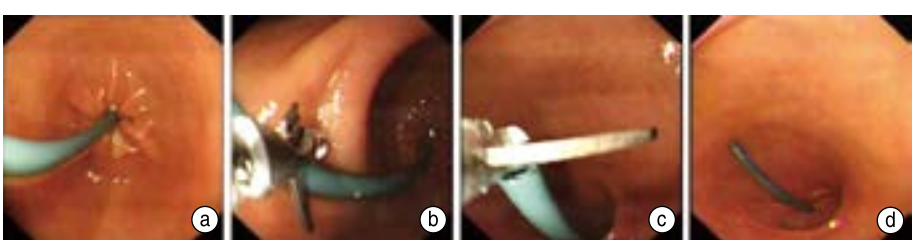

Fig. 1 Endoscopic images of nasobiliary duct cutting off in gastricantrum. (a) endoscopic image of the gastric antrum before nasobiliary duct cutting; (b and c) endoscopic images of cutting off the nasobiliary duct in the gastric antrum; (d) endoscopic image of the gastric antrum after nasobiliary duct cutting

the corresponding diagnosis and treatment standards; if abdominal signs were normal, the diet was opened gradually in combination with the indexes of blood amylase and lipase. Liver function was reexamined a week postoperatively, and related indexes were recorded. The patients were discharged from the hospital after their condition became stable and were followed up by telephone.

Statistical analysis

Statistical software (SPSS 22.0, IBM Corp., Armonk, NY, USA) was used to analyze the data. The measurement data conforming to normal distribution were expressed as mean ± SD, and were compared by Student's *t*-test, while those not conforming to normal distribution were expressed as median and range, and were compared by a rank sum test; counting data were expressed by rates (%) and number of cases, and were compared by the rank sum and Fisher's exact probability tests, respectively. The median survival time was analyzed by a Kaplan-Meier analysis, and the difference in the cumulative survival rate between groups was estimated using thelog-rank test. A *P*-value < 0.05 was considered to indicate statistical significance.

Results

Operation condition

All 55 patients were successfully treated with ERBD or nasobiliary drainage through ERCP. In the nasobiliary cutting group, the nasobiliary duct was cut by using Zhang's scissors under a gastroscope or duodenoscope 3–19 days after ENBD, and its residual segment was retained as a biliary stent; conversion from external biliary drainage to internal biliary drainage was achieved with a success rate of 100%. There was no significant difference between the two groups in terms of unilateral and bilateral drainage ($P > 0.05$), as shown in Table 2. In the endoscopic nasobiliary cutting group, the nasobiliary duct was cut at the gastric antrum in 21 cases, and at the duodenal papilla in 5 cases.

Jaundice reduction and changes of liver function indicators

There was no significant difference in total bilirubin (TBIL), direct bilirubin (DBIL), alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), gamma-glutamyl transpeptidase (GGT) levels between the two groups preoperatively ($P > 0.05$). TBIL, DBIL, ALT, AST, ALP, and GGT levels decreased significantly in the two groups a week postoperatively. Among them, TBIL, DBIL, ALT, AST, ALP and GGT decreased by 110.86 μmol/L, 82.19 μmol/L, 76.08 U/L, 86.96 U/L, 144.74 U/L and 299.44 U/L, respectively, in the endoscopic nasobiliary cutting group a week postoperatively, and TBIL, DBIL, ALT, AST, ALP and GGT decreased by 57.92 μmol/L, 38.31 μmol/L, 58.90 U/L, 35.55 U/L, 105.85 U/L and 209.35 U/L respectively in the ERBD group a week postoperatively; the difference between the two groups was statistically significant ($P < 0.05$), indicating that the endoscopic nasobiliary cutting group was superior to the ERBD group in reducing jaundice and recovering liver function, as shown in Table 1.

Complications

Among the 55 patients, biliary tract infection occurred in 16 patients (29.10%). In the nasobiliary duct cutting group, biliary tract infection occurred in 4 cases (15.40%). The incidence of biliary tract infection in ERBD group was 41.40%, which was significantly higher than that in the nasobiliary duct cutting group; the difference was statistically significant ($P < 0.05$), indicating that the nasobiliary duct cutting group has obvious advantages over the ERBD group in controlling biliary tract infection. There was no significant difference in pancreatitis, biliary bleeding, perforation, or displacement between the two groups (Table 2). There was no significant difference in sphincterotomy and the types of nasobiliary drainage tubes between the gastric antrum cutting group (group A)

Table 2 Comparison of intraoperative situation and postoperative complications between the two groups

Index	Endoscopic nasobiliary cutting group (*n* = 26)	Endoscopic retrograde biliary drainage group (*n* = 29)	Statistic	*P* value
Unilateral/bilateral, *n*	12/14	17/12	$\chi^2 = 0.857$	0.355
Sphincterotomy, *n* (with/without)	20/6	24/5	$\chi^2 = 0.291$	0.589
Complications				
Pancreatitis, *n* (%)	3 (11.5)	4 (13.8)	$\chi^2 = 0.000$	1.000
Biliary tract infection, *n* (%)	4 (15.4)	12 (41.4)	$\chi^2 = 4.491$	0.034
Hemorrhage, *n* (%)	0 (0)	0 (0)		
Perforation, *n* (%)	0 (0)	0 (0)		
Dislocation, *n* (%)	2 (7.7)	1 (3.4)	$\chi^2 = 0.009$	0.922
Total complications, *n* (%)	8 (30.8)	15 (51.7)	$\chi^2 = 2.474$	0.116

Note: $P < 0.05$ was considered to indicate a statistically significant difference

Table 3 Comparison of intraoperative situation and postoperative complications between the two cutting sites

Index	Gastric antrum (n = 21)	Duodenal papilla (n = 5)	P value
Sphincterotomy, n (with/without)	15/6	5/5	0.298
Pigtail-type nasobiliary duct / α-typenasobiliaryduct, n	19/2	5/0	1
Biliary tractinfection, n (with/without)	1/20	3/2	0.014
Dislocation, n (with/without)	0/21	2/3	0.031

Note: $P < 0.05$ was considered to indicate a statistically significant difference

and the duodenal papilla cutting group (group B). There was one case and three cases of biliary tract infection in groups A and B, respectively, and two cases of biliary tract displacement in group B, and the difference was statistically significant ($P < 0.05$), which indicated that biliary tract infection and residual stent displacement were more likely to occur when the nasobiliary duct was cut off at the duodenal papilla than at the gastric antrum, as shown in Table 3.

Median patency of stent and median survival time postoperatively

The overall median survival time of the 55 patients was 202 days. The median patency periods of the endoscopic nasobiliary cutting and ERBD groups were 190 and 169 days, respectively, with no statistical difference (χ^2 = 2.644, P = 0.104 > 0.05). The median survival times of the endoscopic nasobiliary cutting and ERBD groups were 230 and 202 days, respectively, with no significant difference (χ^2 = 2.308, P = 0.129 > 0.05). The survival curves are shown in Fig. 2.

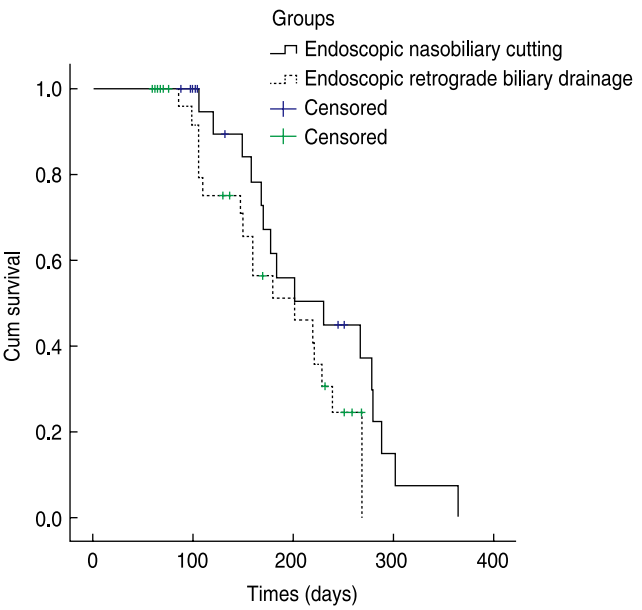

Fig. 2 Analysis of the Kaplan-Meier survival curves of the two groups

Discussion

In recent years, with the development of endoscopic technology, endoscopic biliary drainage for the palliative treatment of HC has attracted increasing attention. Currently, biliary stents are currently considered the most effective treatment for biliary drainage [13]. To reduce the psychological, physiological, and economic burden of patients, studies on the replacement of plastic biliary stents with modified nasobiliary stents and the conversion of external biliary drainage to internal drainage have been reported at home and abroad in recent years, but the clinical efficacy and prognosis of this method are unclear [14–17]. In this study, ENBD was performed under ERCP in Stage I, and the nasobiliary duct was cut under a gastroscope or duodenoscope, and its residual segment was retained as a biliary stent for biliary drainage in Stage II, with a success rate of 100%. In terms of operation, as the operation of cutting the nasobiliary duct only requires to cut the nasobiliary duct directly under a gastroscope or duodenoscope, compared with the traditional procedure of pulling the nasobiliary duct through ERCP and then placing a stent, the number of ERCPs required is reduced by one; this reduces the risk of the pollution of the contrast medium and equipment, such as the guidewire to the bile duct and pancreatic duct system, and the postoperative infection rate; simultaneously, the whole operation is relatively simple and easy, and the operation time is short, which can reduce intraoperative anesthesia accidents, relieve the postoperative discomfort of patients, and improve patients' benefits significantly. This drainage scheme controls the risk and cost of ERCP operation effectively and simplifies the operation efficiently and safely.

By comparing the data of liver function indexes pre- and post-operatively, the author found that the drainage scheme of endoscopic nasobiliary cutting can significantly reduce bilirubin and liver enzymes, and that the short-term curative effect is remarkable; some studies [18] have shown that ENBD and EBS have no significant difference in the drainage effect under the condition of biliary tract patency, and both can achieve ideal drainage effect; however, in this study, the nasobiliary cutting group had obvious advantages over the ERBD group in reducing jaundice and improving liver function. To investigate the reason for this phenomenon, the author believes that the

nasobiliary duct has the following advantages: first, there are many lateral holes in the nasobiliary duct, and the drainage area is wide. Moreover, the nasobiliary duct is soft, which causes little compression or damage to the adjacent non-drainage bile duct and organs [19]. Nasobiliary ducts can be placed in the left and right hepatic ducts respectively, further improving the drainage efficiency. Secondly, the nasobiliary duct is connected externally, and the curative effect can be analyzed directly by observing the drainage volume and bile characteristics to guide the next treatment; if the drainage effect is not good, the blockage and displacement of the nasobiliary drainage tube and poor drainage area can be considered, and then suction, irrigation or ERCP intervention can be conducted again. Finally, the external drainage of the nasobiliary duct reduces the chance of retrograde infection. The bile drainage of the intrahepatic bile duct can be promoted by flushing the bile duct and connecting the external negative pressure drainage device, which is also beneficial intreating jaundice and toward the improvement of liver function.

In this study, the incidence of biliary tract infection in the ERBD group was 41.40%, which was higher than that (15.40%) in the endoscopic nasobiliary cutting group, with statistical significance ($P < 0.05$). This is because the endoscopic nasobiliary cutting drainage scheme is controllable in the occurrence of biliary tract infection. In the control of biliary tract infection, the nasobiliary duct has many lateral holes, achieve ssufficient drainage, and causes little compression or obstruction to other peripheral bile ducts. It can also be sampled through the nasobiliary duct for bacteriological examination to guide the selection of clinical antibiotics, and can be flushed and drained, including antibiotic flushing, to improve the treatment effect. This study showed that biliary tract infection and displacement of the residual segment of the nasobiliary duct are more likely to occur when the nasobiliary duct is cut off at the duodenal papilla than at the antrum, and the difference between the gastric antrum cutting group and the duodenal papilla cutting group was statistically significant ($P < 0.05$). By analyzing the reasons, the author found that due to the anatomical structure of gastrointestinal biliary tract, when the nasobiliary duct is cut off at duodenal papilla intestinal bacteria are more likely to retrograde into the bile duct through the cut end of the residual stent of the nasobiliary duct, compared with at gastric antrum, resulting in retrograde biliary tract infection, and the cut end of the residual stent of the nasobiliary duct is more likely to displace to the intestine. The number of the postoperative complications of the duodenal papilla cutting group involved in this study seems to be higher than that of the gastric antrum cutting group, but the number of the included patients was too small, and might affect the results, which need further clinical studies, that include larger sample sizes, to be confirmed.

It has been reported that the displacement of the modified nasobiliary stent is related to the type of nasobiliary duct and duodenal papillary sphincterotomy. Compared with the α-type nasobiliary duct, the pigtail-type nasobiliary duct structure is easier to fix in the target drainage area; additionally, duodenal papillary sphincterotomy makes the stent displaced to the intestinal tract easily through the damaged papilla, discharged with stool, or left in the intestinal tract, causing intestinal obstruction and even intestinal perforation [12]. In this study, due to the limited sample size, the occurrence of residual stent displacement after endoscopic nasobiliary cutting has no significant correlation with the type of nasobiliary duct stent and duodenal papillary myotomy, which needs further clinical studies to confirm in the future.

Wang *et al* [20] in China studied the modification of a nasobiliary stent, which is cutting a nasobiliary stent directly, and placing it as a common plastic biliarystent to treat hilar bile duct stenosis. Research shows that it is superior to the common plastic biliary stent in improving clinical symptoms and postponing patency time. In this study, the median patency period (190 days) and median survival period (230 days) in the endoscopical biliary cutting group were not significantly different from those (169 and 202 days) in the ERBD group ($\chi^2 = 2.644$, $P = 0.104$; $\chi^2 = 2.308$, $P = 0.129$), which also shows that the clinical symptoms of patients can be relieved for a long time, which further shows the feasibility of resecting the nasobiliary duct and retaining its residual segment as a biliary stent in the treatment of HC.

In conclusion, for patients with obstructive jaundice due to high malignant biliary stenosis in HC, ENBD was performed under ERCP in Stage I, and the nasobiliary duct was cut off by using endoscopic scissors through the nasobiliary duct in Stage II after fully draining the bile, and the residual segment of the nasobiliary duct can still support the bile duct, and drain the bile. Compared with ERBD, the effects of jaundice reduction and liver enzyme improvement in endoscopic nasobiliary cutting drainage are significant, and the incidence of biliary tract infection is low, and there is no significant difference in the median patency period and median survival time between the two drainage schemes. Compared with cutting off the nasobiliary duct at the gastric antrum, the incidence of biliary tract infection is higher in the duodenal papilla, and the stent of the residual segment of the nasobiliary duct is easier to displace. It is safe and feasible to adopt an endoscopic nasobiliary cutting drainage scheme for the palliative treatment of the hilar bile duct stenosis. Of course, this study is a single-center non-randomized controlled retrospective study, and the small sample size

is limiting, meaning that the results of this study still need further comparative researches and multi-center randomized controlled experiments with large samples to be confirmed.

Conflicts of interest

The authors indicated no potential conflicts of interest.

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