DIAGNOSIS AND TREATMENT OF BILIARY CALCULI AFTER SIDE-VIEW DUODENOSCOPIC BILLROTH-II GASTRECTOMY

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ABSTRACT

Introduction: *The present study aims to explore the diagnosis and treatment of biliary calculi after side-view duodenoscopic Billroth-II gastrectomy. Endoscopic retrograde cholangiopancreatography (ERCP) is efficacious in patients who have undergone BillrothIIgastroenterostomies. ERCP was performed in 206 patients after Billroth-II gastrectomy.*

Methods: *Among these patients, 56 patients underwent endoscopic sphincterotomy (EST), while six patients underwent endoscopic papillary balloon dilatation (EPBD) for stone removal.*

Results: *Among these 206 patients, ERCP has been successful in 158 patients (79.7%), but failed in 48 patients (23.3%). In the 56 patients who underwent EST and six patients who underwent EPBD for stone removal, the operation succeeded in 48 patients (85.7%), but six patients were complicated with massive hemorrhage of the digestive tract. No digestive tract perforation or death occurred in any patient.*

Conclusion: *The success rate of ERCP in the treatment of biliary calculi after Billroth-II gastrectomy is relatively high. This method is not only effective but also has clinical practical value.*

Keywords: *Bile duct lithiasis, billroth-II gastroenterostomy, ERCP, treatment.*

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Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is widely used in the diagnosis and treatment of pancreaticbiliary disease and is efficacious in patients who have undergone BillrothII-gastroenterostomies[1]. Patients who develop biliary calculi after Billroth-II gastrojejunostomy are common in clinic[2-5]. Due to changes in anatomical correlations, the diagnosis and treatment are special, and it is not enough to rely on ultrasound, computed tomography (CT) and magnetic resonance imaging results for treatment and surgery. However, there are potential difficulties in performing this examination after Billroth II gastrectomy, and in this case few centers have extensive experience with ERCP[6]. In the study, from May 1984 to October 2018, our hospital completed ERCP in 5,500 patients. Among these patients, 206 patients (3.75%) underwent Billroth-II gastrectomy. These cases are summarized and reported as follows.

Materials and methods

General information

A total of 115 male and 91 female patients were enrolled into the present study. The age of these patients ranged within 32-76 years old, with an average age of 46.3 years old. A total of 121 patients developed right upper quadrant pain combined with chills, fever, jaundice and other biliary inflammatory symptoms, 47 patients developed repeated right upper quadrant pain, and 38 patients developed obstructive jaundice. Anterior gastrojejunostomy was performed in 30 patients, with an afferent jejunal loop of 25-40 cm (average, 32.4 cm), while posterior gastrojejunostomy was performed in 176 patients, with an afferent jejunal loop of 5-8 cm (average, 6.4 cm). Furthermore, the proximal stump was anastomosed with the greater curvature in 147 patients, while the proximal stump was anastomosed with the lesser curvature in 55 patients. Among these patients, 79 patients underwent Billroth-II gastrectomy for more

than 30 years, 88 patients underwent Billroth-II gastrectomy for more than 20 years, 32 patients underwent Billroth-II gastrectomy for more than 10 years, and seven patients underwent Billroth-II gastrectomy for less than 10 years.

This study was conducted with approval from the Ethics Committee of The Sixth People's Hospital of Chengdu. Written informed consent was obtained from all participants.

Methods

The endoscope used was an Olympus side-view fiber (or electronic) duodenoscope. The preoperative preparation was the same as that for normal ERCP patients. The patient took the left lateral position, and the endoscope was inserted into the remnant stomach through the oral cavity and esophagus to observe the presence of lesions in the residual stomach and anastomosis site. According to gesture to view "the sun setting down", the operator side-viewed the duodenoscope passing through the afferent opening of the jejunum, and retrogradely entered the duodenal stump. The front end of the endoscope was slowly lifted to search the intestinal cavity in the anterior wall. If the lateral intestinal visual field was horizontally opposite to the anterior wall of the intestinal mucosa, the endoscope was pushed forward. If the intestinal cavity could not be seen, the hook stretching method was adopted. That is, the intestinal lumen was hooked up with a large twist, the endoscope was withdrawn, and the abdomen was pressed to adjust the lens, or the body position was adjusted. This movement was repeated for several times. When the intestinal cavity was found, the endoscope was passed through the Treitz ligament to identify the duodenal nipple. The nipple was found in the upper intestinal wall at 3-5 cm from the closed stump, which was opposite to the endoscopic visual field.

Since the side-view lens was invertedly inserted through the nipple, four methods were used to make the endoscopic view close to the nipple:

• Changing the patient's position, left-lateral position, semi-Trendelenburg position and Trendelenburg position;

• Significantly rotating the operator's body and adjusting the big-small twist;

• Abdominal massage by nurses to adjust the lens;

• The contrast catheter was extended longer, the tip of the catheter was placed on the nipple opening, the big-small twist was adjusted, and the direction between the patient and operator was changed. Since the direction was changed, the catheter could easily be inserted into the pancreatic duct, and could not easily be inserted into the bile duct, in order to develop the bile duct. In principle, it was still inserted upward in the direction of the bile duct opening. The visual field lens could be placed close to the breast intubation, or the biliary duct could also be developed using the kissing method.

EST operating technology: Since the endoscope was retrogradely inserted into the closed duodenal stump, the nipple and opening were in opposite directions in the visual field under the microscope. In addition, the closure of the stump limited the upward movement of the endoscope. All these increased the difficulty of operation and application of some endoscopic therapeutic devices. For example, the chance to smoothly incise the nipple sphincter with a bow-shaped incision knife is rare. In the present study, merely two patients completed the EST with an arcuate incision. In other patients, the operations were mainly completed using a needle-shaped incision knife, because a needle-shape knife is more convenient for endoscopic nipple sphincterotomy at the 5-6 o'clock directions, but it is difficult to adjust the position of the bow-shape knife to the 5-6' o'clock directions under an endoscope after Billroth-II gastrectomy. In some patients, needle-shape and bow-shape knives were used.

According to the actual situation of the duodenal stump and nipple, three methods were used to incise the nipple sphincter:

• Anterograde incision: this is suitable for patients with an obvious nipple opening. The needle-shaped knife targeted the front wall of the opening of the nipple, and was steadily slipped upward (bile duct direction) to incise the nipple for approximately 1 cm at one time. Dolay et al. recommend that[4] the length of nipple incision in EST after Billroth-II gastrectomy is safe when it is 0.5-1.0 cm in length, but this cannot be more than 1.5 cm utmost.

• Retrograde incision: this is suitable for patients with a cryptic nipple opening. The needle-shaped knife was directly poked against the nipple surface at the junction between the nipple and duodenal mucosa, and was steadily slipped downward (nipple opening direction) to incise the nipple in one time.

• Window opening method: this is suitable for patients with structural deformations, such as nipple bulge. With the needle-shaped knife facing the most obvious site of nipple bulge, a small window of 2-3 mm was opened on the anterior wall of the nipple, and the directions of distributions of the nipple and

the opening were detected through the small window using a contrast catheter. Under this condition, it was easy to incise the nipple part under the window (the direction of the nipple opening) with a bow-shaped knife. The nipple part above the window was incised (in the direction of the bile duct) using a needle-shaped knife. When the stone removal net was not smoothly placed, this was performed combined with the balloon dilatation technique[7-10]. After the nipple and sphincter incision and EPBD, the stones were removed with the stone removal net. Unlike the common EST operation, the stones were pulled back before endoscope withdrawal, rather than pushing it forward. Foreign scholars mostly adopt the combination of S-shaped and needle-shaped knives for EST after Billroth-II gastrectomy[11-14].

Results

Among the 206 patients, ERCP has been successful in 158 patients (76.7%), but failed in 48 patients (23.3%). The reasons for failure of operation were as follows: the length of the endoscope was insufficient in 35 patients who underwent anterior gastrojejunostomy. The endoscope failed to cross the Treitz ligament in nine patients, and the operation was not completed due to severe responses in examination and operation in four patients. Merely 18 patients had moderate fever after the ERCP examination. In the 158 patients who succeeded in the ERCP, simple common bile duct calculi were found in 49 patients, intrahepatic biliary calculi were found in 29 patients, and calculi in both the intrahepatic and extrahepatic bile ducts were found in 23 patients. Gallbladder imaging was performed in 98 cases, calculi in the gallbladder were definitely found in 39 patients, effusion and delayed emptying were observed in 74 patients. Furthermore, EST and stone removal were performed in 56 patients, and the operation succeeded in 48 patients (85.7%). Among these patients, 10 patients were treated with emergency stone removal. After EST and stone removal, six patients were complicated with massive hemorrhage of the digestive tract, and were cured after conservative treatment. After stone removal, 16 patients were treated with naso-biliary catheter drainage. After one week, angiography through this catheter revealed that all of the stones were taken out of the nipple. In the present study, no digestive tract perforation or death occurred in any of the patients.

Discussion

The surgical methods of Billroth-II gastrojejunostomy can be classified into two types: proximal jejunum-greater curvature of the stomach and proximal jejunum-lesser curvature of the stomach. In general, the patient is placed in the left-lateral position during endoscopy. If it is the proximal jejunum-lesser curvature of the stomach, in the endoscopic visual field, the opening above the anastomosis in the remnant stomach is the afferent jejunal end, while the opening below is the efferent jejunal end. On the contrary, if it is the proximal jejunum-greater curvature of the stomach, the upper opening is the efferent jejunal end, while the lower opening is the afferent jejunal end. If the patient's original operation record can be read before the endoscopy, the diagnosis can be immediately made. However, it would be difficult to obtain such information in clinical practice. Gastrointestinal surgery regards the proximal jejunum-greater curvature of the stomach as peristalsis.

Therefore, most surgeons prefer the anastomosis method of the proximal jejunum-greater curvature of the stomach[15]. Usually, two methods are used to insert the gastroscope: one method is to observe the two openings of the gastrointestinal anastomosis for a few minutes. The opening with bile and bubbles is the afferent jejunal end. This condition is uncommon, and occurred in merely 22 patients in the present study.

The other method is to respectively insert the gastroscope from the two openings. If the duodenal stump cannot be identified until the endoscope completely enters, it is withdrawn back to the anastomosis site, and it can be determined that another opening is the efferent end. Under a microscope, the characteristics of the efferent jejunal loop were as follows: the intestinal cavity was relatively clean, and the endoscope was not easily obstructed during endoscopy. The characteristics of the afferent jejunal loop were as follows: there were common bile and gas bubbles in the intestinal cavity, the color of the intestinal mucosa was slightly yellow, the endoscope could easily be obstructed during endoscopy, particularly in the process of the endoscopy, and it was difficult to observe the anterior intestinal cavity due to sudden obstructions. In this case, the endoscopes are mostly in the afferent jejunal loop. It is difficult for a side-view endoscope to enter the afferent jejunal end.

This is the same with the situation that the endoscope passes through the pylorus. Under this condition, the endoscope smoothly passes through when the proximal jejunum-greater curvature of the stomach method is used. However, it would be more difficult to when the proximal jejunum-lesser curvature of the stomach method is used.

The reason is that the afferent jejunal opening is at a higher position, and usually forms an acute angle, changing the patient's position, or repeated use of the hook-pull technique can help the endoscope enter the afferent jejunal end. Bergman et al. reported that[16] in front-view duodenoscopy, the endoscope can easily pass through the afferent jejunal opening, and the front-view lens reveals a clear vision, while side-view endoscope can easily reach the duodenal papilla, and improve the success rate of the ERCP. The disadvantage is that the front-view endoscope has no lifting forceps, its biopsy hole diameter is small, and it is difficult to use in therapeutic procedures such as EST.

Therefore, more and more foreign scholars advocate that side-view duodenoscopy should be used for therapeutic ERCP after Billroth-II gastrectomy[17]. The insufficient endoscope length in Billroth-II anterior gastrojejunostomy often confuses operators. The length of the afferent jejunal loop of the anterior gastrojejunostomy varies from 25 cm to 40 cm, and the length of the duodenoscope commonly used in posterior gastrojejunostomy is adequate. In the present study, in the 48 failed patients, the surgical history of 27 patients was confirmed as anterior gastrojejunostomy. Therefore, the success rate of ERCP and EST in patients who had undergone Billroth-II anterior gastrojejunostomy is very low. In the present study, merely three patients (10%) succeeded. Therefore, the operation of this kind of surgical procedure is very difficult due to the long afferent jejuna loop[18].

Hence, endoscopic diagnosis and treatment for biliary and pancreatic diseases should be chosen with caution. Furthermore, it is recommended that surgeons choose posterior gastrojejunostomy for digestive tract reconstruction in Billroth-II gastrectomy to increase the success rate of endoscopic diagnosis and treatment in the future. Even if the patient has undergone posterior gastrojejunostomy, the length of the endoscope is sometimes obviously not enough. The use of the hook-pull jejunal endoscopic insertion method and allowing a nurse to massage the abdomen to adjust lens can partially overcome these difficulties. If the duodenal stump could not be seen until the endoscope is completely inserted, the operation should be immediately given up to avoid complications during the prolonged operation[18]. After Billroth-II gastrectomy, the upper digestive tract is reconstructed. Although endoscopic technology has made great progress in the past 40 years, ERCP and EST following Billroth-II gastrectomy are still regarded as the most complicated and difficult endoscopic techniques. Under normal circumstances, ERCP operation is far more difficult than the gastroscope technique.

These patients would have great pains, some patients would have difficulties to insist to the end of the operation. The endoscopic operation after Billroth-II gastrectomy is more difficult, and consumes a longer operation time. Furthermore, most patients could not bear the procedure, forcing the operator to give up. Even if these difficulties are barely overcome, the complication rate is also relatively high. Therefore, ERCP and EST after Billroth-II gastrectomy should be better performed in a painless pattern, particularly for EST, under the condition that the patient is painless and quiet. This would allow the operators to exert the best technical levels, improving the success rate of the endoscopic operation after Billroth-II gastrectomy.

Conclusions

In the study, ERCP has been successful in 158 patients (79.7%), but failed in 48 patients (23.3%). The success rate of ERCP in the treatment of biliary calculi after Billroth-II gastrectomy is relatively high. This method is not only effective but also has clinical practical value.

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