

Biliary Enteric Diversion with Uncut Roux-Y

Safra Yoluyla Enterik Diversiyon ve Uncut Roux-Y

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ABSTRACT

Aim: Conventional Roux-Y (C-RY) hepaticojejunostomy has been used for bilienteric diversion for many years. Following this operation, postoperative ascending cholangitis may occur due to Roux anus stasis. To avoid this problem, an alternative technique called uncut Roux-Y (U-RY) anastomosis has been proposed. The aim of this study was to compare the effect of anastomosis type on postoperative cholangitis in patients undergoing C-RY and U-RY hepaticojejunostomy for bilienteric diversion.

Methods: The medical records of patients who underwent hepaticojejunostomy at Celal Bayar University Department of General Surgery and İzmir Tepecik Training Hospital General Surgery Clinic between January 2000 and January 2018 were retrospectively reviewed. Patients who underwent hepaticojejunostomy were divided into 2 groups as U-RY (n=18) and C-RY (n=17) according to anastomosis type. The association of both methods with the development of postoperative cholangitis was analyzed. The limit of statistical significance was accepted as p<0.05.

Results: Thirty-five patients underwent hepaticojejunostomy. Twenty of the patients were female and fifteen were male. Eighteen patients underwent U-RY hepaticojejunostomy (twelve women and six men) and seventeen patients underwent C-RY hepaticojejunostomy (nine men and eight women). The mean age of the patients was 53.2 years (range: 22-73). Fourteen patients had malignant lesions. The diagnoses of malignant patients were gallbladder carcinoma and cholangiocarcinoma. Resectable malignant patients underwent anastomosis after resection. Irresectable patients underwent only biliary enteric bypass procedures. Twenty-one patients had benign lesions. The diagnoses of benign patients were bile duct stricture, intraoperative bile duct injury, occlusion choledochoduodenostomy and choledochal cyst. Different complications developed in seven cases. Postoperatively, two of the malignant cases died due to hepatic failure. Postoperative cholangitis developed in two patients with C-RY ans during the follow-up period. None of the patients with U-RY developed cholangitis. There was no statistically significant difference in the development of cholangitis between the two anastomosis techniques. (p>0.05)

Conclusions: The U-RY ans technique is an easy surgical procedure for biliaryenteric diversion. This procedure may be useful to prevent Roux stasis syndrome and postoperative cholangitis. Multicenter clinical trials with large patient series are needed to reach reliable results.

Keywords: Uncut Roux-Y, Conventional Roux-Y, Hepaticojejunostomy

ÖZ

Amaç: Konvansiyonel Roux-Y (C-RY) hepaticojejunostomi uzun yıllardır bilienterik diversiyon için kullanılmaktadır. Bu operasyonu takiben Roux ans stazına bağlı olarak postoperatif asendan kolanjit oluşabilir. Bu problemi önlemek için, kesilmemiş Roux-Y (U-RY) anastomozu olarak adlandırılan alternatif bir teknik önerilmiştir. Bu çalışmanın amacı, bilienterik diversiyon için C-RY ve U-RY hepaticojejunostomi yapılan hastalarda, anastomoz tipinin postoperatif kolanjit üzerine etkisini karşılaştırmaktır.

Yöntemler: Ocak 2000 ile Ocak 2018 tarihleri arasında Celal Bayar Üniversitesi Genel Cerrahi Anabilim Dalı ve İzmir Tepecik Eğitim Hastanesi Genel Cerrahi Kliniğinde hepaticojejunostomi yapılan hastaların tıbbi kayıtları retrospektif olarak incelendi. Hepaticojejunostomi yapılan hastalar anastomoz tipine göre U-RY (n=18) ve C-RY (n=17) olarak 2 gruba ayrıldı. Her iki yöntemin postoperatif kolanjit gelişimi ile ilişkisi analiz edildi. İstatistiksel anlamlılık sınırı p<0.05 olarak kabul edildi.

Bulgular: Otuz beş hastaya hepaticojejunostomi uygulandı. Hastaların yirmisi kadın, on beşi erkekti. On sekiz hastaya U-RY hepaticojejunostomi (on iki kadın ve altı erkek) ve on yedi hastaya C-RY hepaticojejunostomi (dokuz erkek ve sekiz kadın) uygulandı. Hastaların ortalama yaşı 53,2 yıldır (aralık: 22-73). On dört hastada malign lezyon vardı. Malign hastaların tanıları safra kesesi karsinomu ve kolanjiyokarsinomdu. Rezektabl malign hastalara rezeksiyon sonrası anastomoz uygulandı. Rezeke edilemeyen hastalara sadece biliyer enterik bypass prosedürleri uygulandı. Yirmi bir hastada benign lezyonlar vardı. Benign hastaların tanıları safra kanalı striktürü, intraoperatif safra kanalı yaralanması, oklüzyon koledokoduodenostomi ve koledok kisti idi. Yedi olguda farklı komplikasyonlar gelişti. Ameliyat sonrası malign olguların ikisi karaciğer yetmezliği nedeniyle kaybedildi. C-RY ans'li iki hastada takip döneminde postoperatif kolanjit gelişti. U-RY'li hastaların hiçbirinde kolanjit gelişmedi. İki anastomoz tekniği arasında kolanjit gelişimi açısından istatistiksel olarak anlamlı bir fark yoktu. (p>0,05)

Sonuçlar: U-RY ans tekniği biliyerenterik diversiyon için kolay bir cerrahi prosedürdür. Bu prosedür Roux staz sendromuna bağlı postoperatif kolanjit önlemek için yararlı olabilir. Güvenilir sonuçlara ulaşmak için geniş hasta serileri ile çok merkezli klinik çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Kesilmemiş Roux-Y, Konvansiyonel Roux-Y, Hepaticojejunostomi

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Introduction

Roux-Y anastomoses have been used for biliary enteric diversion and upper gastrointestinal operations for many years. Roux stasis syndrome and ascending cholangitis are one of the most serious complications after classical Roux-Y (C-RY) anastomosis, and this problem can develop in 30-40 percent after gastroesophageal surgery [1,2]. Therefore, an alternative technique, also called uncut Roux-Y (U-RY) anastomosis, has been proposed [3]. In the literature, there are studies reporting U-RY results in upper gastrointestinal tract surgery. Although there are experimental studies suggesting the U-RY technique for hepaticojejunostomies, no studies are reporting clinical results. In this article, we aimed to compare the effect of anastomosis type on postoperative cholangitis in a total of 35 patients who underwent C-RY and U-RY hepaticojejunostomy for bilioenteric diversion.

Material-Method

Approval for this study was obtained from the Ethics Committee of Manisa Celal Bayar University Faculty of Medicine. The medical records of patients who underwent hepaticojejunostomy at Celal Bayar University Department of General Surgery and Izmir Tepecik Training Hospital General Surgery Clinic between January 2000 and January 2018 were retrospectively reviewed. Patients who received non-surgical conservative treatment for obstructive jaundice and biliary duct injury were excluded from the study. All patients who underwent hepaticojejunostomy were included in the study. Demographic data including age, gender, preoperative diagnosis, surgical procedure, type of anastomosis, early postoperative morbidity and mortality were recorded. Patients were divided into 2 groups as U-RY (n=18) and C-RY (n=17) according to the type of anastomosis. The data obtained were transferred to IBM SPSS Statistics 24 program on computer. The association of both methods with the development of postoperative cholangitis was analyzed by chi-square test. The limit of statistical significance was accepted as $p < 0.05$.

Surgical Method

For U-RY hepaticojejunostomy, the jejunal lumen

was first occluded 30-35 cm distal to the ligament of Treitz. Four or five seromuscular sutures with 000 polypropylene or silk were made circularly around the jejunal wall, and the suture material was tightly tied. An end-to-side or side-to-side biliary enteric anastomosis was created 5-7 cm distal to the jejunal occlusion site. Approximately 25-30 cm distal to this anastomosis, a side-to-side jejunojejunostomy was performed to divert duodenal fluid (Figure 1-A). A 30-35 cm long jejunal segment extending distal to the ligament of Treitz and passing anterior to the transverse colon can easily access the porta hepatis at any level of anastomosis.

For C-RY hepaticojejunostomy, the jejunum was first incised 20-25 cm distal to the Treitz ligament, and the distal end was closed with 000 silk or polypropylene material. A side-to-side or end-to-end hepaticojejunostomy was created 3-4 cm distal to the jejunal closure site. After this procedure, an end-to-side jejunojejunostomy was created approximately 25-35 cm distal to this anastomosis (Figure 1-B).

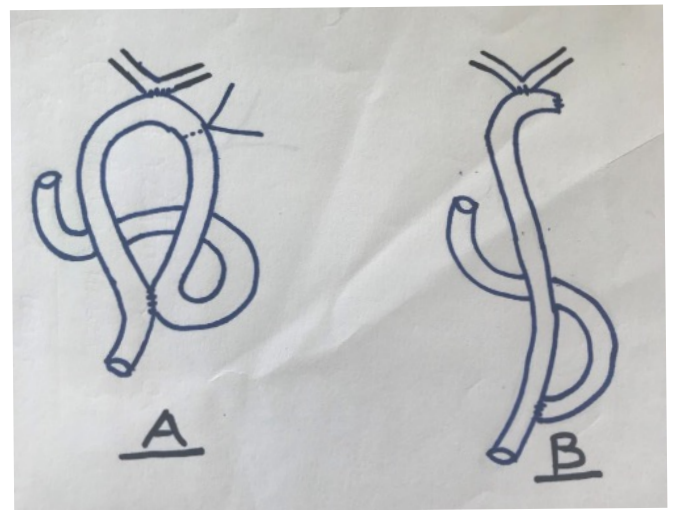


Figure 1. A: Uncut Roux-Y ans, B: Conventional Roux-Y ans

Results

Thirty-five patients underwent hepaticojejunostomy. Twenty of the patients were female and fifteen were male. Eighteen patients underwent U-RY hepaticojejunostomy (twelve women and six men) and seventeen patients underwent C-RY hepaticojejunostomy (nine men and eight women). The mean age of the patients was 53.2 years (range: 22-73).

Fourteen patients had malignant lesions. The diagnoses of malignant patients were gallbladder carcinoma and cholangiocarcinoma. Resectable malignant patients underwent anastomosis after resection. Irresectable patients underwent only biliary enteric bypass procedures. Twenty-one patients had benign lesions. The diagnoses of benign patients were bile duct stricture, intraoperative bile duct injury, occlusion choledochoduodenostomy and choledochal cyst. Demographic data, preoperative diagnoses and surgical techniques of the patients are shown in Table 1.

Table 1. Demographic characteristics, diagnosis and surgical technique in our patients

	Total	Uncut Roux-Y	Classic Roux-Y
Age (Years) mean	53,2	55,3	51,1
Gender (n)	f:20	f:12	f:8
Female (f), Male (m)	m:15	m:6	m:9
Pathological state (n)	B:21	B:11	B:10
Malign (M), Benign (B)	M:14	M:7	M:7
Diagnosis and operation			
Gallbladder Cancer (n)	6	3	3
Resection	3	1	2
By-Pass	3	2	1
Cholangiocancer (n)	8	4	4
Resection	4	3	1
By-Pass	4	1	3
Bileduct Stricture (n)	11	5	6
Resection	5	2	3
By-Pass	6	3	3
Operative Bileduct Injuries (n)	6		
Resection	6	4	2
Occlusion - Choledochoduodenostomy (n)	2		
By-Pass	2	1	1
Choledochal Cysts (n)	2		
Resection	2	1	1

Biliary enteric anastomoses were performed at various levels of the biliary tract. The U-RY anastomosis was performed on the left hepatic branch in seven patients, on the common hepatic duct in seven patients, on the right hepatic branch in two patients, and on the bifurcation in two patients. C-RY anastomosis was performed to the common hepatic duct in seven patients, to the right hepatic branch in four patients, to the left hepatic duct in four patients, and to the bifurcation in two patients. The anastomosis sites in the biliary

system are shown in Table 2.

Table 2. Sites of anastomosis

Sites of Anastomosis	Uncut Roux-Y	Classic Roux-Y
Common Hepatic Duct (n=14)	7	7
Left Hepatic Duct (n=11)	7	4
Right Hepatic Duct (n=6)	2	4
Bifurcation of Hepatic Duct (n=4)	2	2

In the early postoperative period, two patients, one with metastatic cholangiocarcinoma and one with metastatic gallbladder carcinoma, died due to hepatic failure. Early morbidities included two biliary fistulas, three wound infections, one wound dehiscence, and one pulmonary infection. Patients with biliary fistula were treated conservatively. The distribution of postoperative complications is shown in Table 3.

Table 3. Postoperative Complications

	Uncut Roux-Y	Classic Roux-Y	p value
Biliary fistula	1	1	
Wound site infection	1	2	
Wound dehiscence	-	1	
Pulmonary infection	1	-	
Postoperative cholangitis	-	2	0,486*

* Chi Square Test

Late follow-up:

Twelve patients with malignant lesions lived between 2-34 months (mean: 8.6 months) after hospital discharge. There was no mortality in twenty-one patients with benign lesions. Cholangitis attack developed in two patients who underwent C-RY. Magnetic resonance cholangiopancreatography (MRCP) examination of the patients who developed cholangitis did not reveal any anastomotic stenosis or gallstones. These patients were treated conservatively. Endoscopy was conducted four to eight months following surgery in eight patients who had undergone U-RY anastomosis, and no deterioration of the occlusion zone created in the jejunum was observed. There was no morbidity in the benign patients during the five-year follow-up period.

Chi-square test was applied to the data transferred to SPSS Statistics 24 program to

compare postoperative cholangitis in terms of two different anastomosis techniques. (The statistical significance limit was accepted as $p < 0.05$.) The difference between the groups in terms of postoperative cholangitis development was not statistically significant ($p = 0.486$).

Discussion

The C-RY technique, which has been used in gastric surgery for many years, is known to cause motility disorders [4,5]. Motility alteration due to this technique may be responsible for Roux stasis syndrome [6,7]. Roux stasis syndrome may result from the separation of the Roux anus from the native small bowel pacemaker, which is situated in the proximal duodenum, and the subsequent postoperative development of ectopic pacemakers in the proximal and middle portions of the Roux limb. [6,8,9]. These ectopic pacemakers generate new peristaltic waves in the oral direction, and these retrograde contractions delay transit through the anus of Roux [8].

Van Stiegman and Goff proposed an alternative technique for Roux-Y construction in 1988. This operation is called the U-RY procedure. [3]

U-RY operation eliminated Roux stasis syndrome by maintaining neuromuscular continuity between the proximal jejunum and the Roux limb. Maintaining the myoneural continuity between the duodenal pacemaker and the Roux limb may prevent Roux stasis syndrome [10,11,12]. Miedema et al. reported that staple lines placed along the jejunal wall for U-RY operation in dogs did not disrupt the myoneural continuity to the uncut Roux limb. [9] Therefore, ectopic pacemakers are not seen in the uncut Roux anus. Occlusion of the jejunal anus with staplers or non-absorbable circular sutures did not interfere with the myoneural continuity between the duodenal pacemaker and the uncut Roux limb. The incidence of Roux stasis syndrome after U-RY in upper gastrointestinal tract surgery is low compared to the C-RY technique [2,4,5,13,14]. Therefore, U-RY procedures are the preferred technique for gastroesophageal open or laparoscopic operations [2,13,15].

For many years, hepaticojejunostomy with C-RY reconstruction has been used in many benign and malignant diseases. Cholangitis has been reported

in 5-10% after this operation [16-19]. Impaired intestinal motility of the Roux limb may cause bile stasis and bacterial overgrowth [20]. This bacterial overgrowth in the Roux anus is a common and unfavorable event leading to cholangitis. Klaus et al. showed that the C-RY limb may be responsible for stasis, bacterial translocation, and infection in the liver, which may lead to disruption of liver architecture in animals. [21] The findings of this study indicate that hepatic histomorphologies in long-term survivors exhibited a statistically significant improvement in the U-RY group relative to the C-RY group. The U-RY technique prevents both motility disorders and bacterial overgrowth of the limb. [21]

Klaus et al. investigated small intestinal transit after bilioenteric anastomosis in rats using an intravenous radioisotope. They showed that large amounts of the isotope were retained in the liver and at the proximal end of the C-RY limb, with microscopically more pronounced liver damage. They stated that cholangitis and liver damage may develop after C-RY hepaticojejunostomy. [22] Therefore, they concluded that the U-RY technique may be more beneficial than the C-RY technique in terms of bile drainage. In our series, cholangitis developed in two out of seventeen patients (11.7%) who underwent C-RY hepaticojejunostomy without gallstones and anastomotic stenosis. In contrast, none of the patients who underwent U-RY developed postoperative cholangitis. Based on the results of previous experimental studies, we think that bile stasis may be a factor in patients with cholangitis. Our cholangitis rate in the C-RY group (11.7%) was found to be compatible with the rate reported in the literature. [16,19] However, we posit that the absence of a statistically significant difference between the groups is attributable to the limited patient sample size within our series.

There are several reports of staple line disruption in animal models and humans undergoing U-RY [5,7,13,14,23]. The same authors achieved permanent occlusion of the anus of Roux using a novel wingless six-row linear stapler [14]. Noh et al. proposed the placement of seromuscular suture with polypropylene for permanent occlusion of the jejunum and showed that there was no disruption in the occlusion line.[2] It has been reported that

the jejunal lumen can be permanently closed with this method, and the myoneural continuity of the jejunum is not disrupted [15,23,24]. We used this closure technique in our operation. Endoscopic examination of our eight long-term survivors revealed no disruption of the jejunal occlusion line.

Limitations

The most important limitation of our study is its retrospective nature. In addition, the number of patients was limited due to the relatively low number of surgical operations. The surgical procedure was evaluated in a heterogeneous patient group (without differentiation between benign and malignant). The short survival time of the malignant patient group (gallbladder carcinoma, cholangiocellular carcinoma) in the study prevented us from reaching the long-term results of the U-RY technique.

Conclusion

Cholangitis attacks after C-RY hepaticojejunostomy have been reported in both experimental and clinical studies. The results of our series indicate that cholangitis did not develop in patients who underwent U-RY hepaticojejunostomy. We found postoperative cholangitis in 11.7% of patients who underwent C-RY hepaticojejunostomy. Although there was no statistically significant difference between our two patient groups in terms of cholangitis development, our cholangitis incidence rate in the C-RY procedure was consistent with the literature. Therefore, we believe that U-RY hepaticojejunostomy is associated with less postoperative cholangitis compared to C-RY hepaticojejunostomy. We also think that U-RY hepaticojejunostomy is a surgical procedure that can be easily applied in bilioenteric diversion. Our findings are limited by the small number of patients and retrospective study. A large clinical study comparing the postoperative outcomes of C-RY and U-RY hepaticojejunostomy in bilioenteric diversion is needed.

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