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OUTCOME OF BILIARY ENTERIC ROUX-EN-Y IN MANAGEMENT OF OBSTRUCTIVE JAUNDICE

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ABSTRACT

Background: Obstructive jaundice is a significant clinical challenge often caused by malignant or benign biliary obstruction. Roux-en-Y choledochojejunostomy is a widely used palliative surgical approach for restoring bile flow in patients where curative resection is not feasible. **Aim**: To evaluate the early and late outcomes and effectiveness of Roux-en-Y choledochojejunostomy in managing patients with obstructive jaundice. **Patients and Methods**: A prospective observational study was conducted on patients undergoing Roux-en-Y triple bypass for obstructive jaundice. Clinical, biochemical, and nutritional parameters were assessed pre- and postoperatively. Postoperative complications, including bile leak, surgical site infection, bleeding, cholangitis, and incisional hernia, were documented. Thirty-day morbidity and mortality were also evaluated. **Results**: Improvement in liver function was noted by postoperative day 14, with significant reductions in total serum bilirubin and alkaline phosphatase levels, along with increased serum albumin. Oral intake was tolerated by 85% of patients by day 14. Postoperative complications included bile leak (5%), cholangitis (7.5%), biliary strictures (5%), and incisional hernia requiring surgical intervention (7.5%). Four patients (10%) died within 30 days post-surgery. However, 50% of patients were reported to be alive and in very good general condition at follow-up. **Conclusion**: Roux-en-Y choledochojejunostomy offers favorable short-term outcomes in the palliative management of obstructive jaundice, with acceptable morbidity and mortality. The procedure provides effective biliary drainage, improves hepatic function, and supports nutritional recovery.

KEYWORDS: Obstructive jaundice, Roux-en-Y choledochojejunostomy.

INTRODUCTION

The surgical treatment of OJ depends on the cause, location, and severity of the obstruction. The causes of OJ include bile duct stones, tumors, and congenital anatomical abnormalities of the bile duct. Depending on the patient's condition, the obstruction can be relieved by biliary drainage, surgery, and endoscopic intervention.

Roux-en-Y choledochojejunostomy (RYCJ) is a surgical procedure in which the common bile duct (CBD) is anastomosed to a segment of the jejunum that has been rearranged into a Y-shaped configuration. It is commonly used to bypass obstructed or damaged parts of the biliary system, ensuring effective bile drainage into the intestine.

The success of RYCJ is typically measured by the absence of biliary complications, and improvement in quality of life. Several studies have reported on the short-term and long-term outcomes of this procedure.

Quality of life assessment is an essential component of long-term follow-up after RYCJ. Abdelrafee et al. noted that the physical component was more affected than the mental component in quality of life assessments following hepaticojejunostomy. This highlights the

importance of comprehensive care addressing both physical and psychological aspects of recovery.[1]

AIM OF THE STUDY

The present study aimed to evaluate the early and late outcome of the RYCJ procedure in the management of patients with obstructive jaundice.

PATIENTS AND METHOD

This is a prospective observational study including a total of 40 patients with obstructive jaundice for different causes who were underwent RYCJ at surgical wards in Baghdad teaching hospital Medical City during the period from 1st January 2023 to 31st December 2024. The study was approved by Arab Council for Health Specializations.

Inclusion criteria

- Adult patients from both gender (above 14 years)
- Obstructive jaundice which need surgical intervention after failure of ERCP or contraindications to ERCP.

Patients whom refuses to participate or missed to be followed up were excluded.

A verbal consent from each participant was obtained prior to data collection after explaining the aim of study. The confidentiality of data throughout the study was guaranteed and the patients were assured that data will be used for research purpose only.

All patients included in the study were preoperatively assessed through detailed history taking and clinical examination. Ultrasound examination of the organs of the gastropancreatoduodenal zone was performed. Computed tomography (CT) was performed when indicated. Magnetic resonance cholangiopancreatography(MRCP)

Endoscopic ERCP was performed using video duodenoscopes. Demographic data included age, gender, causes of OJ, past medical history and past surgical history.

Biochemical indicators of hepatic function included total serum bilirubin (TSB), alkaline phosphatase (AP) and albumin were measured.

RYCJ was performed as a palliative or definitive surgical procedure for patients with obstructive jaundice due to malignant or benign biliary obstruction. The procedure was carried out under general anesthesia, with the patient positioned supine. A right subcostal or upper midline abdominal incision was made to allow exploration of the hepatobiliary system. After confirmation of the site and cause of obstruction, the common bile duct was mobilized and transected proximal to the obstructing lesion or stricture.

A segment of the jejunum approximately 40 to 60 cm distal to the ligament of Treitz was identified and divided. The distal limb (Roux limb) was brought up in an antecolic fashion and an side-to-side anastomosis was fashioned between the jejunal loop and the proximal bile duct using an absorbable suture in a single or double layer technique, depending on surgeon preference. The proximal limb of the divided jejunum was reconnected to the Roux limb approximately 40 cm distal to the biliary anastomosis to restore intestinal continuity and prevent bile reflux. In cases of CBD stones, the common bile duct was carefully dissected and opened. Stones were extracted under direct vision, and clearance of the duct was confirmed by flushing and palpation. After ensuring the duct was stone-free, a Roux limb was created approximately 40–60 cm distal to the ligament of Treitz and side-to-side choledochojejunostomy was performed using absorbable sutures. This biliary-enteric bypass allows continuous drainage of bile into the jejunum, reducing the risk of recurrent stone formation and cholangitis.

One or more closed drains were routinely placed near the site of the anastomosis to monitor for potential leakage or bleeding. Hemostasis was achieved, and the abdominal cavity was irrigated before layered closure of the abdominal wall. Postoperative care included clinical monitoring, serial liver function testing, and drain assessment. Oral intake was gradually resumed based on the return of bowel function and overall clinical recovery.

All patients were followed postoperatively, during which TSB, ALP and albumin were measure 1 day, 7 days and 14 days postoperatively beside the baseline value. Furthermore, the need for drain and the amount of drain, nutritional status and postoperative complications were recorded at the end of follow up period.

Nutritional status was assessed according to American Society for Parenteral and Enteral Nutrition (ASPEN) Consensus Criteria which categorize nutritional status into: Adequate intake(good), Inadequate intake / reduced oral intake and, no oral intake/ intolerance to food.[2]

All data were analyzed with statistical package for social sciences (SPSS) software (version 26). Descriptive statistics were used to present the data. Continuous variables are presented as mean± standard deviation (SD); categorical variables were presented as frequencies and percentages. Categorical variables were expressed as number and percentage and analyzed with Chi-square test. A value of $P < 0.05$ was considered statistically significant.

RESULTS

Table 1 presents the baseline characteristics of patients diagnosed with obstructive jaundice, summarizing their demographic data, preoperative diagnoses, and relevant medical and surgical histories. The mean age of the

patients was 59.65±16.15 years, ranging from 24 to 77 years. Regarding gender distribution, males constituted the majority of the cohort, representing 67.5% (n = 27), while females accounted for 32.5% (n = 13). The most common preoperative diagnosis was advanced pancreatic tumors in 57.5%, followed by choledocholithiasis (CBD stones) in 30% of the patients and CBD strictures in 12.5%. In terms of comorbid conditions, 62.5% of the patients had diabetes mellitus, and 52.5% had hypertension, highlighting a high prevalence of chronic diseases. Other comorbidities included heart failure in 22.5%, IHD in 15%, CVA in 15%, and atrial fibrillation in 7.5% of the patients. Regarding past surgical history, 55% of the patients had no prior surgeries, while 25% had undergone laparoscopic cholecystectomy. Less frequently reported procedures included umbilical hernia repair in 7.5% of patients. additionally, (12.5%)reported other non-abdominal surgeries not related to the hepatobiliary system.

Table 1: Demographic characteristics of the patients (n=40).

Variables	Category	Percentage
Age, years	Mean±SD Range	59.65±16.15 24-77
Gender	Male Female	27(67.5%) 13(32.5%)
Preoperative diagnosis	CBD stones Advanced pancreatic tumors CBD stricture	12(30%) 23(57.5%) 5(12.5%)
Past medical history	Diabetes mellitus Hypertension Heart failure IHD CVA Atrial fibrillation	25(62.5%) 21(52.5%) 9(22.5%) 6(15%) 6(15%) 3(7.5%)
Past surgical history	None Lap. Cholecystectomy Umbilical hernia Other non-abdominal surgeries	22(55%) 10(25%) 3(7.5%) 5(12.5%)

The effect of RYCJ triple bypass surgery on TSB levels is demonstrated by a progressive decline over time, indicating effective biliary decompression and improved hepatic function. Preoperatively, the mean TSB level was elevated at 9.05 mg/dL, reflecting significant biliary obstruction. By the first postoperative day, TSB had decreased to 5.61 mg/dL, showing a substantial early reduction with a significant difference. This trend continued over the following days, with TSB levels dropping to 5.12 mg/dL by the seventh postoperative day and further to 3.93 mg/dL by the fourteenth day (Figure 1). TSB returned to its normal value at 30-50 days after surgery.

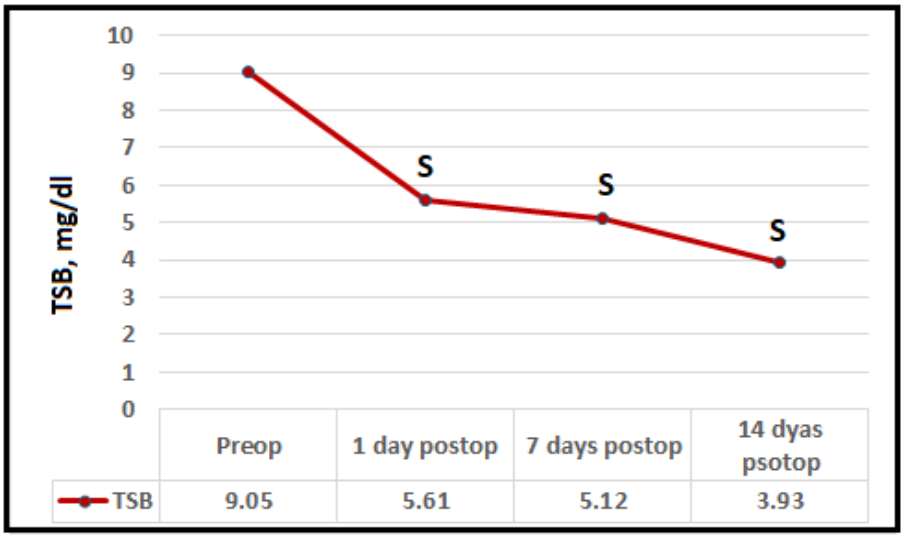

Figure 1: Serum level of TSB before RYCJ triple bypass surgery and at different time points postop. S: significant difference from baseline value.

The changes in ALP levels before and after RYCJ triple bypass surgery is shown in figure 2. There was a clear downward trend with significant differences reflecting the gradual resolution of cholestasis and improvement in biliary drainage. Preoperatively, the mean ALP level was elevated at 324.1 U/L, consistent with biliary obstruction. By the first postoperative day, ALP levels had decreased to 249.9 U/L, showing an early biochemical response. This decline continued steadily, reaching 188 U/L by the seventh postoperative day and further decreasing to 128.9 U/L by the fourteenth day.

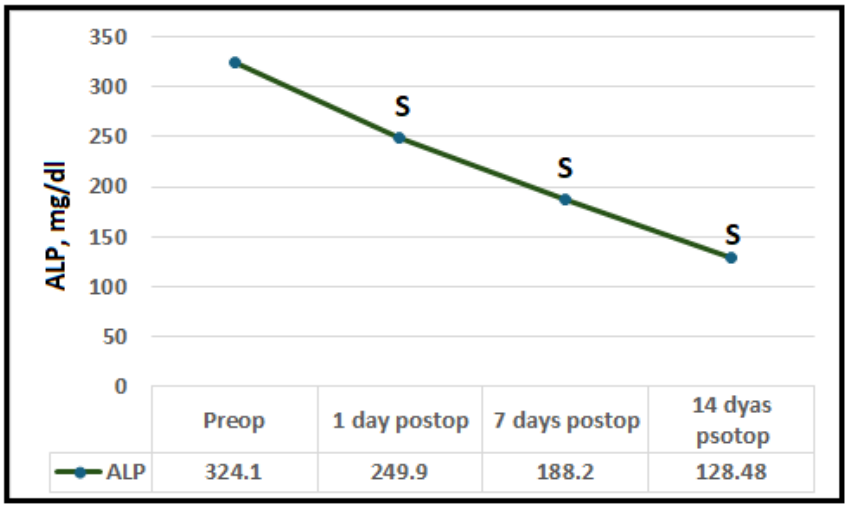

Figure 2: Serum level of ALP before RYCJ triple bypass surgery and at different time points postop. S: significant difference from baseline value.

The postoperative trend in serum albumin levels following TYCJ triple bypass surgery shows a gradual and consistent improvement, suggesting recovery of liver synthetic function and improved nutritional status. Preoperatively, the mean albumin level was low at 2.98 g/dL. By the 7th postoperative day, albumin increased to 3.23 g/dL and 3.65 g/dL by day 14 (with a significant difference from baseline value) as shown in figure 3.

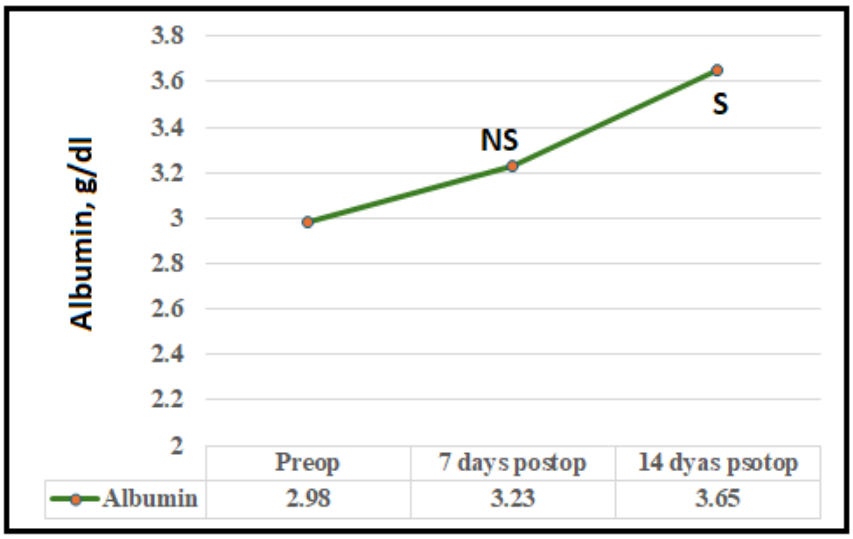

Figure 3: Serum level of albumin before RYCJ triple bypass surgery and at different time points postop. S: significant difference from baseline value.

A surgical drain (Jackson-Pratt drain) was inserted routinely for all patients (n=40) following RYCJ in order to detect bile leakage, bleeding, or postoperative fluid collection. The mean drain output was highest on the first postoperative day (50–100 mL) and decreased gradually to 40–80 mL on the second day. From the third to the fifth day, drain output showed a progressive decline. By the sixth postoperative day, the amount had almost completely disappeared in the majority of patients, allowing safe removal of the drain in most cases (table 2).

By the seventh postoperative day, drains were removed in 32 patients (80%), while 6 patients (15%) required

reinsertion due to ultrasonographic evidence of intra-abdominal collection, and 2 patients (5%) developed postoperative bleeding necessitating surgical revision. The cause of bleeding was progressive tumor and upper GIT bleeding.

Statistical analysis demonstrated a significant reduction in drain output and progressive removal of drains across the postoperative period ($p < 0.05$), confirming the effectiveness of the procedure and the safety of drain removal after the sixth day in the majority of patients.

Table 2: Drain status and output during the first 7 postoperative days (n=40).

Day	Mean Drain Output (mL)	Drain in place n (%)	Drain removed n (%)	Reinsertion n (%)	Bleeding n (%)	p-value
1	50 – 100	40 (100%)	0 (0%)	0 (0%)	0 (0%)	
2	40 – 80	40 (100%)	0 (0%)	0 (0%)	0 (0%)	
3–5	Progressive decline	38 (95%)	2 (5%)	0 (0%)	0 (0%)	<0.05*
6	Minimal / disappeared	10 (25%)	30 (75%)	4 (10%)	2 (5%)	
7	Almost none	2 (5%)	32 (80%)	6 (15%)	2 (5%)	

*Statistically significant difference in drain output and status over time (Chi-square test, $p < 0.05$).

During 72 hrs. postop, only 18 patients were classified as having good nutritional status, while 13 (32.5%) had decreased oral intake, and 9 were unable to tolerate any intake. By the seventh day, the number of patients with good nutritional intake increased to 26 (65%), while those with decreased intake dropped to 9(22.5%), and only 5 (12.5%) remained unable to tolerate oral intake. By the fourteenth postoperative day, 34 (85%) patients had resumed good nutritional intake, and the numbers with decreased intake and complete intolerance declined further to 3 (7.5%) patients each statistically, there was a significant difference in nutritional status (Figure 4).

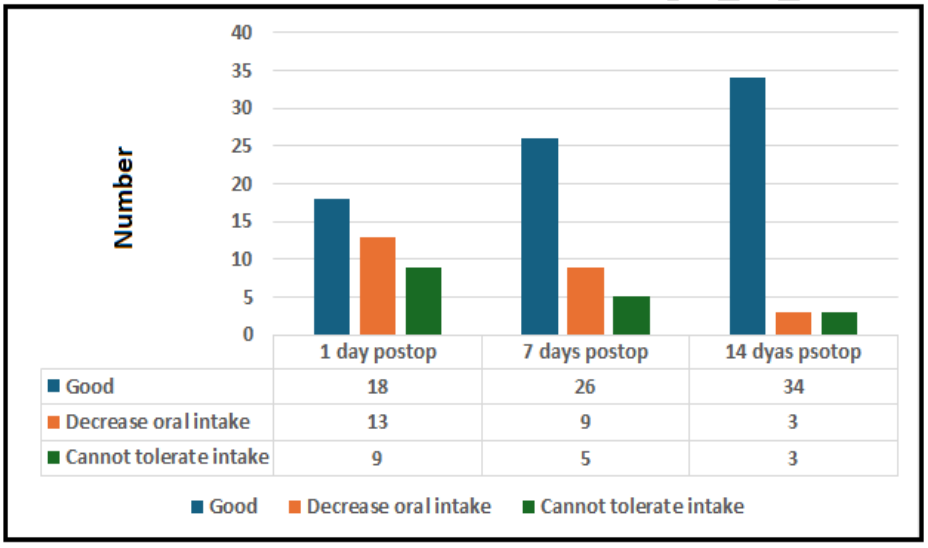

Figure 4: Nutritional status at different time points postop. S: significant difference from baseline value.

During the first three months following RYCJ, patient outcomes varied depending on their baseline condition, underlying pathology, and postoperative course. Out of the total 40 patients included in the study, the majority demonstrated a favorable short-term recovery.

A total of 36 patients (90%) survived beyond the early postoperative period and were discharged in stable condition. Among these survivors, most regained satisfactory liver function and nutritional status, allowing them to resume near-normal daily activities within the three-month follow-up period. Minor symptoms, such as mild fatigue or decreased appetite, were noted in some patients but were generally attributed to the progression of their underlying malignancy rather than direct postoperative complications.

Four patients (10%) died within the first three months. Of these, two patients experienced early mortality within 24–72 hours postoperatively, both due to acute myocardial infarction confirmed by clinical and biochemical findings. The remaining two deaths occurred later within the three-month period and were associated with advanced malignancy, where the disease progression led to multi-organ failure despite supportive measures.

Overall, early postoperative mortality in this cohort was relatively low and largely related to comorbidities and advanced disease stage, underscoring the importance of careful preoperative evaluation and patient selection (Table 3).

Table 3: Short-term outcomes during the first three months.

Outcome	Number of Patients (n=40)	Percentage (%)
Survived beyond early postoperative period	36	90%
Death within 24–72 hours (MI)	2	5%
Death due to tumor progression	2	5%

During the 3-month follow-up period, a spectrum of postoperative complications was observed, reflecting both procedure-related risks and the severity of underlying disease.

The most common complication was cholangitis, occurring in 3 patients (7.5%). This was primarily attributed to transient biliary stasis or early anastomotic narrowing. All cases responded to conservative management with antibiotics and supportive measures.

Bile leak was noted in 2 patients (5%), most likely related to minor anastomotic insufficiency. Both patients were managed with prolonged drainage and supportive care, without the need for reoperation.

Biliary stricture developed in 2 patients (5%) during follow-up, presenting clinically with recurrent jaundice. These patients required further endoscopic or radiological intervention.

Incisional hernia was detected in 3 patients (7.5%), necessitating elective surgical repair. Risk factors included malnutrition, diabetes, and postoperative wound infection.

Persistent jaundice without new obstructive lesions was recorded in 3 patients (7.5%). This was attributed to advanced malignant disease and poor hepatic reserve rather than surgical failure.

Overall, 5 patients (12.5%) required re-intervention either surgically or radiologically due to complications such as collections or strictures.

Regarding mortality, 4 patients (10%) died within the follow-up period. Two patients (5%) experienced early mortality within 72 hours postoperatively due to acute myocardial infarction, reflecting the burden of comorbid cardiovascular disease. The remaining two patients (5%) died later due to progression of their advanced malignancy, despite initial satisfactory surgical recovery.

These findings highlight that while RYCJ provides effective palliation for obstructive jaundice, it is still associated with significant morbidity and mortality. Most complications were manageable and aligned with rates reported in the literature, but outcomes were influenced by patients' baseline comorbidities and disease stage. Careful preoperative selection and optimization remain crucial for minimizing risk and improving prognosis.

Table 4: Postoperative complications and mortality within 3 months (n=40).

Complication / Outcome	Number	Percentage (%)
Bile leak	2	5%
Cholangitis	3	7.5%
Biliary stricture	2	5%
Incisional hernia	3	7.5%
Persistent jaundice	3	7.5%
Re-intervention required	5	12.5%
Mortality (first 72 hrs, MI)	2	5%
Mortality (tumor progression)	2	5%
Total mortality	**4**	**10%**

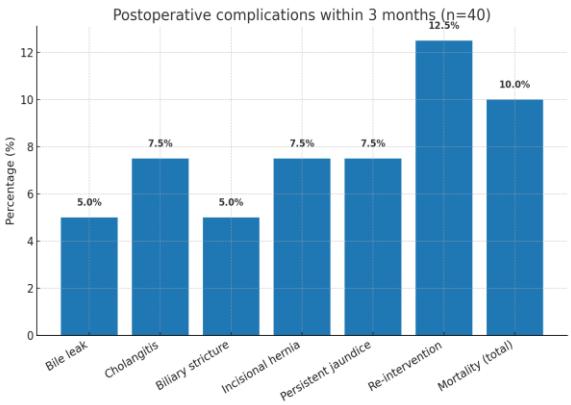

Figure 5: Distribution of postoperative complications within 3 months.

DISCUSSION

The present study aimed to evaluate the short-term outcome of the RYCJ procedure in the management of patients with obstructive jaundice.

According to the result of the study, the most common preoperative diagnosis was advanced pancreatic tumors in 57.5%, followed by choledocholithiasis (CBD stones) in 30% of the patients and CBD strictures in 12.5%. A Pakistani study with bypass surgery, the CBD stones were observed as the most common indication (25.3%), followed by CBD injuries after open (10.84%) or laproscopic-cholecystectomy (14.46%), carcinoma head of pancreas (12.05%) and CBD obstruction(14.46%)

either due to CBD strictures or unknown distal obstruction.[3]

Following RYCJ triple bypass surgery for obstructive jaundice, liver function tests are crucial for monitoring recovery and identifying potential complications and help in assessment of the liver's ability to process bile and detoxify the body. In the current study, the values of TSB and ALP successively decreased and finally fell below those of the preoperative values, whereas albumin values were steadily increased over the observational period indicating the improvement of liver health indicators. A retrospective study from Austria found lowered values of AST and ALT with no differences appeared in the course of albumin after the operation.[4] Another study from India found significant progressive reduction in ALP and TSB and an increase in the serum albumin postoperatively as compared to the preoperative values.[5] These findings help track the effectiveness of the bypass in relieving the obstruction and restoring normal liver function.

The need for postoperative drain in the present study decreased significantly over the postoperative period. In RYCJ triple bypass surgery for obstructive jaundice, the use of surgical drains is a common practice to manage potential complications like bile leaks or fluid collections. While not always mandatory, drains help monitor and divert any leakage from the surgical site, reducing the risk of infection and promoting healing. Biliary drainage is an established and well-reported method used to relieve jaundice with clinical success rates ranging between 75% and 98% in various reports.[6]

Moreover, the drainage output was significantly decreased in the seventh as compared to the first postoperative day indicating successful surgical procedure with no complication. While drain volume is monitored, it's not the primary indicator of success. Adequate bile drainage, absence of leaks and strictures, and prevention of infection are the key goals of post-operative management after Roux-en-Y hepaticojejunostomy for obstructive jaundice.[7]

As per the postoperative complication, 5% of our patients developed postoperative leaks, 7.5% developed cholangitis, 7.5% required surgical repair for incisional hernias, 2.5% underwent a second operation, 7.5% presented with persistent jaundice and 5% had stable clinical findings during follow-up without significant deterioration or new complications. 10% of our patient died following the surgery.

Postoperative leaks following RTCJ bypass are a serious complication, potentially leading to severe morbidity and even mortality. These leaks typically occur at the staple lines or anastomotic sites (where the intestine is connected to the stomach or to another part of the intestine). They can result in peritonitis, sepsis, and prolonged hospital stays. In a study from Canada, an overall leak rate of 0.6%.[8] In a study from Thailand, the overall anastomotic/staple line leak was 0.28%. A study from Sweden, showed that the small bowel leaks, seen in 0.3% and associated to prolonged operative time.[9]

Cholangitis, an inflammation of the bile ducts, can occur after a RYCJ surgical procedure due to various factors, most commonly anastomotic stricture or reflux of intestinal contents into the biliary tract. This can lead to infection and potentially serious complications. Recent systematic reviews and meta-analysis found that approximately 10% (range 0-47%) of patients who receive an hepaticojejunostomy develop post-operative cholangitis.[10]

Incisional hernias are a potential complication after RYCJ bypass surgery, with an incidence ranging from 1% to 25%.[11] A study from USA found the incidence of incisional hernia was 18.7%.[12] Several risk factors can contribute to the development of incisional hernias after RYCJ bypass surgery. These include factors related to the patient's health, surgical procedure, and post-operative recovery. Key factors include a higher BMI, malnutrition, smoking, diabetes, and complications like wound infection or dehiscence.[13]

The incidence of reoperation following RYCJ is variable, but generally ranges from 5% to 22% depending on the cause and specific circumstances. The most common reasons for reoperation include strictures at the anastomosis, bile leaks, and recurrent cholangitis.[14] The authors concluded that a restrictive surgical intervention strategy can effectively reduce the rate of redo surgery and exhibited promising outcomes.

Persistent jaundice after choledochojejunostomy for biliary obstruction can occur due to various factors, including anastomotic strictures, recurrent cholangitis, or complications related to the underlying cause of the obstruction. While RYCJ is a common surgical procedure for biliary reconstruction, it is not without potential complications, and persistent jaundice is one such complication that can significantly impact a patient's quality of life.[15]

The mortality rate in the present study was 10%. Mortality rate after RYCJ for biliary obstruction varies, but generally falls within the range of 1-4%. While it's a well-established procedure for bile duct reconstruction, particularly for high-grade injuries, it's associated with increased morbidity and mortality compared to simpler repairs.[16] In a French study with 253 hepaticojejunostomies for bile duct repair, Iannelli et al. identified morbidity and mortality rates of 19.7% and 1.6%, respectively.[17] Stilling et al. reported different outcomes from Denmark with a 36% morbidity rate and a mortality rate of 4%.[18]

The higher mortality rate of 10% observed in the present study, compared to the 1–4% range reported in other

studies, may be explained by several contributing factors. These include the likely inclusion of more critically ill patients with advanced malignancy, delayed presentation, or poor nutritional and functional status, all of which increase surgical risk. Additionally, limited access to advanced perioperative care and specialized surgical teams may have negatively impacted outcomes. The relatively small sample size in the current study also increases the influence of individual high-risk cases on overall mortality. In contrast, larger international studies, such as those in French and Danish studies, were conducted in high-volume centers with more favorable operative conditions and patient selection criteria, which may explain their lower mortality rates.

CONCLUSIONS

- The Roux-en-Y triple bypass procedure demonstrated effective short-term (30 days) outcomes in the management of patients with obstructive jaundice.
- Biochemical markers, including TSB, ALP, and albumin, showed significant improvements by postoperative day 14, indicating successful biliary decompression and recovery of liver function.
- Nutritional status also improved progressively, with 85% of patients tolerating oral intake by day 14.
- Drains were safely removed in 80% of patients with minimal fluid collection. Only a small proportion (15%) required reinsertion due to postoperative collections, and bleeding occurred in just 5%.

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