INTRODUCTION

Biliary bypass surgery can be performed to re-route the biliary flow in patients with benign and malignant extrahepatic biliary tract disorders including biliary tree injuries, obstruction and congenital anomalies. The common causes of extrahepatic biliary obstruction are Choledocholithiasis, biliary strictures, sclerosing cholangitis, periampullary growth and carcinoma of head of pancreas.\(^1\) Obstructive jaundice is the main presenting feature of these disorders and
advanced digestive cancer. Surgical bypass is considered as a treatment of choice for benign biliary diseases whereas a palliation for advanced biliary malignancies.

There are various bilioenteric bypass procedures to deal these problems depending upon the pancreatico biliary pathology. Non-operative techniques are considered as first line of therapy for malignant biliary obstruction. However in developing countries palliative surgery is the only option available, because sophisticated equipments and expertise are limited to very few centers. The different biliary bypass surgical procedures have been advocated but bilio-enteric anastomosis in the form of Roux-en-Y Hepaticojejunostomy or choledochojejunostomy are considered as procedures of choice. The laparoscopic biliary bypass surgical procedures are also routinely performed in well developed centres but in this study all cases were operated by open surgical methods.

**METHODS**

This study was conducted on 1500 patients of either diagnosed or missed primary pancreatico-biliary pathologies or iatrogenic problems encountered during and after conventional open or laparoscopic cholecystectomy. The diagnosed patients with primary biliary disease or secondary to biliary surgery were operated for planned bypass surgical procedures. Those patients of CBD stones having multiple stones, or CBD dilatation >2cm in size or having doubtful distal patency were considered for bypass procedures. However the cases with incidental operative findings of CBD stones, pancreatico-biliary malignancies or biliary tree injuries assessed at the time of surgery or re-exploration after previous surgery were managed according to the merit of problems.

The investigations utilized for diagnosis were liver function test (L.F.T), Ultrasound, CT scan, MRI of abdomen and HIDA scan of hepatobiliary tree. The data regarding number of cases, age, sex and surgical procedures done were collected on specially designed proforma. The main bypass surgical operations performed were choledocho-duodenostomy, Roux-en-Y Cholecysto-jejunostomy and Roux-en-Y Hepatico-jejunostomy.

The patients underwent biliary bypass procedures were followed up at one week, then one month after surgery and then every six monthly for a period of two years to assess any long term complication.

**RESULTS**

Out of 1500 cases 83 (5.53%) patients required biliary bypass surgery for different pancreatico-biliary disorders. In these 83 cases 69.87% (N=58) were females and 31.13% (N=25) males with female to male ratio of 2.19:1. Majority of patients presented in 4th & 5th decade (63.85%) with mean age of 47.15 years. Different pancreatico-biliary problems for which biliary bypass operations done are presented in Table-I. The CBD injuries (36.15%), CBD stones (25.30%) and Ca of head of pancreas (12.05%) were observed as the common indications for these procedures on frequency distribution.

**Table-I: Indications of biliary bypass.**

| Indication                                         | No. of Patients | Percentage |
|----------------------------------------------------|-----------------|------------|
| Choledochal cyst                                   | 4               | 4.82       |
| CBD* stones + gallstones                           | 21              | 25.30      |
| (Mirizzi synd: 2 cases)                            |                 |            |
| CBD* injuries after open cholecystectomy           | 9               | 10.84      |
| CBD* injuries after laparoscopic cholecystectomy   | 12              | 14.46      |
| Postoperative CBD* strictures                      | 06              | 7.23%      |
| CBD* obstruction with unknown aetiology            | 06              | 7.23       |
| Carcinoma gallbladder                              | 05              | 6.02       |
| Common hepatic duct injury                         | 04              | 4.82       |
| Right Hepatic duct injury                          | 01              | 1.20       |
| Cholangio carcinoma                                | 03              | 3.61       |
| Klastiskin tumor                                   | 02              | 2.41       |
| Carcinoma Head of Pancreas                         | 10              | 12.05      |

* CBD = Common bile duct

**Table-II: Biliary bypass procedures.**

| Name of Procedure                                         | No. of Patients | Percentage |
|-----------------------------------------------------------|-----------------|------------|
| Cholecystectomy & Choledochoduodenostomy                  | 21              | 25.30      |
| Choledochoduodenostomy                                    | 05              | 6.02       |
| Choledocho-jejunostomy                                    | 05              | 6.02       |
| Choledochojejunostomy+ entero-enterostomy                 | 05              | 6.02       |
| Roux-en-Y Cholecysto-jejunostomy                           | 10              | 12.05      |
| Cholecystojejunostomy                                      | 03              | 3.61       |
| Cholecystojejunostomy + Entero Enterostomy                | 04              | 4.82       |
| Roux-en-Y Cholecystojejunostomy                            | 01              | 1.20       |
| Cholecystojejunostomy + Hepatico-jejunostomy+ Entero-enterostomy | 05 | 6.02 |
| Hepatico-Jejunostomy                                     | 22              | 26.51      |
| (Roux-en-Y) Triple bypass                                  | 02              | 2.41       |
The different bilio-enteric bypass procedures performed were Roux-en-Y Hepaticojejunostomy (26.51%), Cholecystectomy and choledocho-duodeno-nostomy (25.30%), Roux-en-Y Choledochojejunostomy (12.05%) as shown in Table-II. The Roux-en-Y Hepatico-jejunostomy was mainly performed in patients having biliary injuries. The overall post-operative morbidity (43.37%) & mortality (2.41%) is given in Table-III whereas hospital stay ranging from one to 4 weeks is given in Table-IV. The most common complications were chest and wound infections, which were seen in cases who were operated for two times and therefore were associated with longer hospital stay. The second most common complication was biliary leak which was observed in majority of cases undergoing choledochojejunostomy, choledochoduodenostomy and cholecystojunostomy. The bleeding was observed in patients having malignancy. The analysis of the outcome of these procedures showed that the Roux-en-Y biliary bypass procedure was associated with lowest rate of major complications and was considered to be a better option to re-join the biliary duct system to gut.

**DISCUSSION**

Disorders of pancreatico-biliary tract affect a significant number of the population all around the world. Majority of the cases are attributed to cholelithiasis and cholestasis due to extra hepatic biliary obstruction. They can be managed by one of the bilio-enteric bypass procedure depending upon the type of pathology in order to relieve the obstruction or re-communicate the pathway when other alternatives are not feasible. These procedures can be done by conventional open technique or laparoscopically depending upon the facilities available. In this study only the open surgical procedures were utilized.

The decision of bilio-enteric bypass procedures in all these patients was based on the type of pathology and most of these patients had at least one strong indication for such procedure. Choledocho-duodenostomy was used either as single procedure (6.02%) for biliary strictures or as a combined procedure (25.30%) for cholelithiasis and choledocholithiasis including two cases of type II Mirrizie’s syndrome. However Moumen M et al has used bilio-intestinal anastomosis in 20% of cases for common bile duct stones. Overall this procedure provides effective relief of obstructive jaundice in benign biliary tract conditions but it is not universally used for malignant biliary obstruction. The treatment of type II Mirizzie’s syndrome described by Chan CY et al is cholecystectomy & hepaticojejunostomy which is different from this study.

Choledochojejunostomy is preferred method for bilio-pancreatic malignancy because majority of cases are not curable & present with obstructive jaundice thus most commonly performed method is cholecystojejunostomy for irresectable pancreatic carcinoma along with routine gastrojejunostomy. In this study different variants of choledochojejunostomy in the form of side to side choledochojejunostomy (6.02%), side to side choledochojejunostomy with enter-enterostomy (6.02%) and Roux-en-Y choledochojejunostomy (12.05%) were performed mainly for benign conditions such as biliary strictures, biliary obstruction of unknown aetiology & biliary injuries. However in case of advanced pancreatic cancer simple cholecysto-jejunostomy (3.61%), cholecystojejunostomy with entero-enterostomy (4.82%) and Roux-en-Y cholecystojejunostomy (1.20%) were performed along with triple bypass in 2.41% of cases. The most commonly preformed procedure by Khan IM et al was also triple bypass. However palliation of jaundice with unresectable pancreatic cancer can be achieved by endoscopic transpapillary biliary stenting, percutaneous transhepatic biliary stenting photodynamic therapy and radio-chemotherapy. Biliary bypass operation confers better survival as compared to metallic stents in the treatment of unoperable distal malignant biliary obstruction.

| Complication         | No. of Patients | Percentage |
|----------------------|-----------------|------------|
| Bleeding             | 05              | 6.02       |
| Chest infections     | 09              | 10.84      |
| Wound infection      | 08              | 9.64       |
| Sub-phrenic collection | 03              | 3.61       |
| Sub hepatic collection | 02              | 2.41       |
| Postoperative adhesions | 02              | 2.41       |
| Biliary leak         | 07              | 8.43       |
| Death                | 02              | 2.41       |

Postoperative Mortality 2.41%, Morbidity = 43.37%

| Hospital stay | No. of Patients | Percentage |
|---------------|-----------------|------------|
| One week      | 28              | 33.73      |
| Two weeks     | 25              | 30.12      |
| Three weeks   | 21              | 25.30      |
| Four weeks    | 09              | 10.84      |

Table-III: Complications of surgery.

Table-IV: Hospital stay.
Major indications for hepatico-jejunostomy are benign or iatrogenic strictures and injuries of biliary system. The appropriate treatment of major bile duct injuries is mandatory in order to avoid serious complications and bile reconstruction is best carried out by Roux-en-Y Hepatico-jejunostomy. In this study simple hepatico-jejunostomy with entero-enterostomy (6.02%) and Roux-en-Y Hepaticojejunostomy (26.51%) was carried out in biliary injuries & strictures above the level of cystic duct & Klatiskin tumor. However Bakhsh R et al used Roux-en-Y Hepaticojejunostomy in 40% of cases with fibrosed CBD which is quite high from this study.

The morbidity and mortality of these procedures is relatively high than simple routine operations because they are time consuming, sophisticated and complicated procedures. However this study still shows low morbidity (43.37%) and mortality (2.41%) as compared to Hussain Z et al study which shows higher morbidity of 52%.

CONCLUSION

Results of the study suggested that the Roux-en-Y biliary bypass is the safe and problem solving procedure for major bile duct injuries showing better outcome in terms to re-route the biliary flow and to show long term benefit to the patients as compared to other procedures done for the same reason. However further prospective studies are required to confirm these findings on a large sample size.

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Authors contribution:
1. K. Altaf Hussain Talpur: Manuscript writing.
2. Arshad Mahmoud Malik: Collection of ten years data.
3. Amir Iqbal Memon: Data collection and statistical analysis.
4. Javed Naeem Qureshi: Editing of manuscript.
5. Ahmed Khan Sangrasi: Literature search.
6. Abdul Aziz Laghari: Critical review and final approval of the manuscript.