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# A Comparative Study Between Continuous and Interrupted Suture in Biliary Bypass Surgery

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**Abstract**

**Background:** Biliary bypass surgical procedures are the better options to restore the continuity of biliary system in patients with benign and or malignant extrahepatic biliary tract disorders including biliary tree injuries, obstruction and congenital anomalies. Over the past few decades, remarkable advances in surgical technology have been made that allow early recovery, better outcomes and more accurate treatment of biliary tract diseases. As a rule, biliary anastomoses, whether of duct to bowel or of duct to duct, heal very well provided that the principles of preservation of adequate blood supply, avoidance of tension, and accurate placement of sutures are followed. In preparing the bile duct for anastomosis, it is essential to define adequate margins while avoiding excessive dissection that might compromise the blood supply to the duct. Single-layer anastomoses have been constructed conventionally using an interrupted suture technique. It is however, increasingly popular to perform such anastomosis using a continuous suture. The quest for the best closure technique for biliary bypass surgery continues. The surgeon's endeavour is to eliminate consequences of anastomosis failure: biliary leakage, peritonitis and dehiscence. There is a lack of consensus among surgeons over interrupted versus continuous suturing methods of biliary bypass surgery.

**Objectives:** To make consensus about the suturing technique in biliary enteric bypass.

**Study design:** Descriptive type of observational study.

**Study setting and period:** Department of Surgery, Dhaka Medical College Hospital from January 2018 to December 2018.

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## Introduction

Biliary bypass surgery can be performed to reroute the biliary flow in patients with benign and malignant extrahepatic biliary tract disorders including biliary tree injuries, obstruction and congenital anomalies[1]. A diverse spectrum of diseases affects the biliary system, often presenting with similar clinical signs and symptoms. Common disease includes gallstones, choledocholithiasis, chronic cholecystitis,

cholangitis (recurrent pyogenic, primary sclerosing, primary biliary, autoimmune), biliary tract cysts, neoplasms of the biliary tract, cholangiocarcinoma, and others[2]. It is essential to define the pathologic anatomy accurately before embarking on any operation on the biliary tract.

Extensive familiarity with the numerous variations of ductal and vascular anatomy in this region is crucial[3].

Biliary-enteric anastomosis (BEA) is a common surgical procedure performed for the management of biliary obstruction or leakage that results from a variety of benign and malignant diseases[4]. 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.

Basic principles for the successful implementation of a technique include- a tension free reconstruction, anastomosis in the area of intact, well-perfused bile duct and small bowel mucosa, precise mucosal adaptation between the bile duct and jejunum, etc. There are various surgical techniques available for the creation of a anastomosis. Commonly used techniques: interrupted suture technique and continuous suture technique

In several clinical situations, including resection of malignant or benign biliary lesions, reconstruction of the biliary system using the Roux-en-Y jejunum limb has been adopted as the standard procedure[5].

To achieve the better surgical outcome, several modifications in anastomotic technique have been tried. There are many studies in the literature comparing various methods, with conflicting results. Many meta-analyses of have been performed, which have been successful in resolving many of the issues. However, there is still no consensus over continuous versus interrupted methods of anastomosis, In a study reported interrupted technique reduces the odds of dehiscence by half compared with continuous technique[6].

The continuous technique has some advantages, namely quick closure with a smaller number of knots, thereby lessening the chances of anastomotic leakage. Because some of the trials have not shown any difference in the complication rates between the two methods, many abdominal surgeons have come to believe in the superiority of continuous closure. Study reported continuous sutures may provide a better seal, since this approach involves approximating the tissue in a continuous way[7]. However, some surgeons advocate interrupted sutures, a tightly pulled continuous suture can strangulate the duct edges.

Burch J et al conclude that the single-layer continuous anastomosis requires less time to construct and has a similar risk of leakage compared with the two-layer technique. It also costs less than any other method and can be safely introduced into a surgical training program with no apparent increase in complications. For these reasons, we believe the single layer continuous anastomosis is superior to the two-layer interrupted technique[8].

The aim of this study was to evaluate the better surgical outcome of continuous suture versus interrupted suture in biliary bypass surgery at a tertiary level hospital.

**Study design:** Place of study: Dhaka Medical College & Hospital, Dhaka

**Study periods:** Twelve months from January 2018 to December 2018.

**Study Population:** Total 46 samples were taken in this study. All patients with hepato-biliary and pancreatic pathology and bilioenteric bypass surgery was performedin department of surgery, DMCH were selected according to inclusion and exclusion criteria.

**Sample size:** As the sampling population was confined to those who undergoing biliary bypass surgery in the Department of surgery, the sample size calculation is that for sample size in case of cross sectional study.

**Sampling:** Sample was selected by purposive sampling.

**Data collection procedure:** This is a hospital based observational, cross sectional study on 46 patients. Both male and female fulfilling the inclusion and exclusion criteria was included in the study. All adult patients undergone bilioenteric bypass surgery of various reason at surgery department of DMCH considered eligible. Those patients of CBD stones, pancreatico-biliary malignancies or biliary tree injuries after previous surgery were included. Patients of advanced malignancy excluded. Samples were selected by

purposive type of sampling technique. After fulfilling the inclusion and exclusion criteria, patient were enrolled with unique ID. Subject was briefed about the objectives of the study, risk and benefits, freedom for participating in the study and confidentiality. Informed consent was obtained accordingly.

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**Data analysis:** Data for socio- demographic and clinical variables were obtained from all participants by the use of a pre- designed and easily understandable questionnaire. After collection of all information, these data were checked, verified for consistency and edited for finalized result. After editing and coding, the coded data directly entered into the computer by using SPSS version 16. Data cleaning validation and analysis was performed using the SPSS/PC software and graph and chart by MS excel. The result was presented in tables in proportion. Chi square test was performed to see the level of significance. A "p" value <0.05 considered as significant. Continuous variables were expressed as mean, standard deviation and categorical variables as frequencies and percentages.

**Ethical measures:**
When patient meet the criteria of inclusion, before enrolment in the study, the aims and objectives of the study along with its procedure and benefits or drawbacks was explained to the patient and guardian in details in an understandable way. In case of any query, they answered appropriately. When the patient and guardian satisfied, then an informed consent was obtained. They had the freedom to withdraw from the study at any time.

**Methodology Proper:**
1) This study was conducted in surgery dept in DMCH
2) Pretesting of questionnaire
3) Finalization of questionnaire
4) Consecutive sampling
5) Consent taking
6) Detailed history
7) Physical examination
8) Investigation
9) Filling the questionnaire by data of collected from patients

## RESULTS

This descriptive cross sectional comparative study was carried out to investigate the safety and make consensus about the suturing technique in biliary enteric bypass surgery. This study included total 46 patients admitted to surgery department and scheduled for bilioentericbypass surgery of various reason, allocated in two groups. Among them in group-A there were 23 patients (interrupted suture technique) and group-B, 23 patients (continuous suture). All patient in both arm completed treatment. No drop out was noticed during treatment.

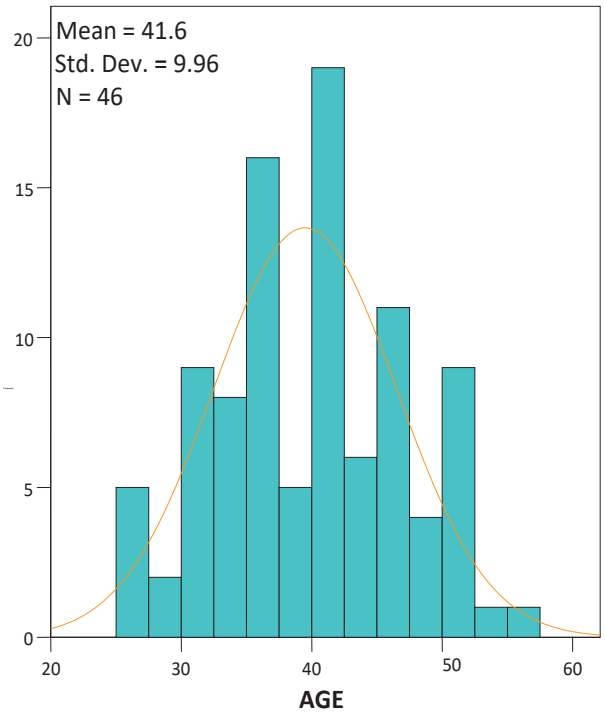


**Figure 1: Histogram showing age distribution of the patients**

Figure depicts the age distribution of the patients. Mean age was 41.6 (SD±9.962) years. Age distribution resembles normal distribution where the numbers of middle to elderly aged patients were high in contrast to extreme or younger age groups. About 80% patient's age was between 30 to 50 years. Least numbers of patients was present from other age groups. Sample 't test' were done to find whether any significant difference does exist or not. The T-value was 0.747815. The P-Value was 0.2282. The result was not significant at $p < 0.05$.

**Table 1**

| Age (years) | Number of patients | | Total (%) | P value |
|---|---|---|---|---|
| | *Group A (n = 23) No. (%)* | *Group B (n = 23) No. (%)* | | |
| 18-30 | 1(4.3%) | 2(8.6%) | 3(6.5%) | 0.318 ns |
| 31-40 | 11(47.8%) | 10(43.4%) | 21(45.6%) | 0.184 ns |
| 41-50 | 9(39.1%) | 8(34.7%) | 17(36.9%) | 0.213 ns |
| 51-60 | 2(8.6%) | 3(13.0%) | 5(10.8%) | 0.204 ns |
| *Mean ± S.D.* | *41.4±9.7* | *42.1±8.5* | | |

Table showed age distribution of patients. This study was conducted on patients with age ranging from 24 to 57 years. It was observed that majority, e.g., 21(45.6%) patients belonged to age 31-40 years, followed by 17(36.9%) patients belonged to age 41-50 years. The mean age was found 41.4±9.7 years in Group-A and 42.1±8.5 years in Group-B. There was no significant difference between two groups.

**Table 2 Gender distribution of patients (n=46)**

| Gender | Number of patients | | Total (%) | P value |
|---|---|---|---|---|
| | *Group A (n = 23) No. (%)* | *Group B (n = 23) No. (%)* | | |
| Male | 12(52.1%) | 15(65.2%) | 27(58.6%) | 0.082 ns |
| Female | 11(47.8%) | 8(34.7%) | 19(41.3%) | 0.128 ns |
| *M:F.* | | | *1.4:1* | |

Out of 46 cases,27(58.6%) cases were male and 19(41.3%) were female. Male and female ratio was 1.4:1.

**Table 3 Distribution of the patients according to indication for surgery (n=46)**

| Diagnosis | *Group A (n = 23) No. (%)* | | *Group B (n = 23) No. (%)* | | Total (%) |
|---|---|---|---|---|---|
| | *No.* | *%* | *No.* | *%* | |
| Cholangiocarcinoma | 6 | 26.0 | 10 | 43.4 | 16 |
| Hepaticolithiasis | 4 | 17.3 | 6 | 26.0 | 10 |
| Carcinoma Head of Pancreas | 5 | 21.7 | 4 | 17.3 | 9 |
| Choledochal cyst | 5 | 21.7 | 3 | 13.0 | 8 |
| CBD injuries after laparoscopic cholecystectomy | 3 | 13.0 | 0 | 0 | 3 |

Table showed the distribution of the patients according to indication for surgery. Common indication was cholangiocarcinoma (34.7%), hepaticolithiasis (21.7%) and carcinoma head of pancreas, (19.5%).

**Table 4 Evaluation of early & immediate postoperative complications (n=46)**

| postoperative complications | Number of patients | | Total (%) | P value |
|---|---|---|---|---|
| | *Group A (n = 23) No. (%)* | *Group B (n = 23) No. (%)* | | |
| Anastomotic leak | 2(8.6%) | 3(13.0%) | 5 | |
| Biliary peritonitis | 3(13.0%) | 3(13.0%) | 6 | |
| Fluid-electrolyte imbalance | 2(8.6%) | 1(4.3%) | 3 | |
| Cholangitis | 1(4.3%) | 0 | 1 | 0.352 $^{ns}$ |
| Hemorrhage and pancreatitis | 2(8.6%) | 2(8.6%) | 4 | |
| Chest infection | 0 | 1(4.3%) | 1 | |
| Surgical infections | 4(17.3%) | 3(13.0%) | 7 | |

It is evident from the table that, total five patients developed anastomotic leak with group B predominance (8.6% vs. 13.0% in group-A and group -B respectively). Biliary peritonitis developed in 6 patients & same in both groups. Fluid-electrolyte imbalance was lower in group B (8.6% vs. 4.3% in group-A and group -B respectively). In this study 4(17.3%) cases in 23 patients developed wound infection in group A while 3(13.0%) cases in 23 patients developed wound infection in group B. Hemorrhage and pancreatitis similar in both groups. Total 6 patients of group A developed early to late complication, on the other hand total 5 patients in group B experienced these complications. The difference was statistically non-significant ($p>0.05$) between groups. Therefore, either group- A (interrupted sutures) or B (continuous sutures) have no significant influence on early & immediate outcome over another technique.

**Table 5 Evaluation of late postoperative complications (n=46)**

| Postoperative complications | Number of patients | | Total (%) | P value |
|---|---|---|---|---|
| | *Group A (n = 23) No. (%)* | *Group B (n = 23) No. (%)* | | |
| Renal failure | 1(4.3%) | 1(4.3%) | 2 | |
| Pulmonary edema | 1(4.3%) | 2(8.6%) | 3 | |
| Venous thromboembolism | 0 | 0 | 0 | 0.269 $^{ns}$ |
| Urinary tract infection | 2(8.6%) | 3(13.0%) | 5 | |
| Acute myocardial infarction | 1(4.3%) | 0 | 1 | |
| Systemic sepsis | 0 | 0 | 0 | |

Table shows different late complications. In this study 1(4.3%) casein 23 patients developed pulmonary edema in group A while 2(8.6%) cases in 23 patients developed pulmonary edema in group B. 2(8.6%) cases in group A and 3(13.0%) cases in group B developed UTI. Single patient experienced acute myocardial infarction or systemic sepsis. The difference was statistically non-significant (p>0.05) between two groups. Therefore, either group- A (interrupted sutures) or B (continuous sutures) techniques superior to other.

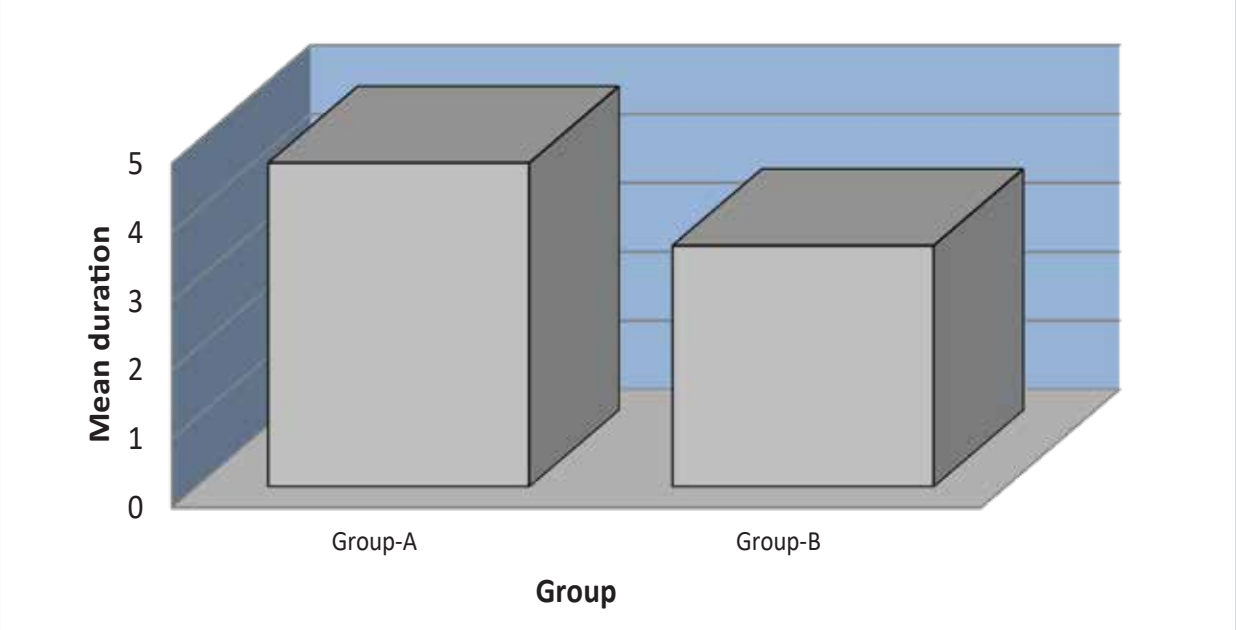


**Figure 2: Mean duration of surgery (hr.)**

Figure shows the length of operating time. Findings revealed that, mean duration of surgery. Length of operating time was shorted in group-B or continuous suture technique. Mean duration of surgery was 4.7±0.2 hrs in group-A (interrupted suture technique) patients and 3.5±0.4 hrs in group-B, continuous suture. The difference was statistically significant (p<0.05).

**Table 6 Length of postoperative hospital stay (n=46)**

| Length of hospital stay | Number of patients | | Total (%) | P value |
|---|---|---|---|---|
| | *Group A (n = 23) No. (%)* | *Group B (n = 23) No. (%)* | | |
| Within 7 days | 2(8.6%) | 1(4.3%) | 3 | |
| 7 to 14 days | 21(91.3%) | 22(95.6%) | 43 | $0.964^{ns}$ |
| >14 days | 0 | 0 | 0 | |
| Average days | *9.3±2.5* | *9.3±2.8* | | |

Table shows length of postoperative hospital stay. It was observed that 43 patients out of 46 were discharged from hospital between 7 to 14 days of operation, 21(91.3%) in group A and 22(95.6%) in group B. mead duration of hospital stay were 9.3±2.5 and 9.3±2.8 days in group A and group B respectively. The difference was statistically non-significant (p>0.05) between groups.

**Table 7 Assessment of overall outcome of the patients (n=46)**

| Impression | Number of patients | | Total (%) | P value |
|---|---|---|---|---|
| | *Group A (n = 23) No. (%)* | *Group B (n = 23) No. (%)* | | |
| Good | 12 | 14 | 26 | |
| Satisfactory | 11 | 9 | 20 | $0.207^{ns}$ |
| Poor | 0 | 0 | 0 | |

After treatment, patient's compliance and outcome of surgery was evaluated. Present study shows that patients undergone interrupted suture technique or group A, 12(52.1%) considered good outcome and 11(47.8%) revealed satisfactory outcome. In patients of continuous anastomoses or group B, 14(60.8%) considered good outcome and 9(39.1%) revealed satisfactory outcome. The difference was statistically non-significant (p>0.05) between groups. So postoperative outcome of suturing technique in biliary enteric bypass not difference was observed between interrupted suture and continuous technique.

**Discussion**:

An observation type study was conducted in department of surgery, Dhaka medical college hospital over a period of 12 month to make consensus about the suturing technique in biliary enteric bypass. It was observed that majority, e.g., 21(45.6%) patients belonged to age 31-40 years, mean age was found 41.4±9.7 years in Group-A and 42.1±8.5 years in Group-B. There was no significant difference between two groups. Age distribution resembles normal distribution where the numbers of middle to elderly aged patients were high in contrast to extreme or younger age groups. About 80% patient's age was between 30 to 50 years. Least numbers of patients was present from other age groups. Out of 46 cases, 27(58.6%) cases were male and 19(41.3%) were female. Male and female ratio was 1.4:1.

In this study, common indication was cholangiocarcinoma (34.7%), hepaticolithiasis (21.7%) and carcinoma head of pancreas, (19.5%). In this study, Roux-enY Hepatico-jejunostomy was the main bypass surgical operations.

It is evident from this study that, total five patients developed anastomotic leak with group B predominance (8.6% vs. 13.0% in group-A and group -B respectively). Biliary peritonitis developed in 6 patients & same in both groups. Fluid-electrolyte imbalance was lower in group B (8.6% vs. 4.3% in group-A and group -B respectively). In this study 4(17.3%) cases in 23 patients developed wound infection in group A while 3(13.0%) cases in 23 patients developed wound infection in group B. Hemorrhage and pancreatitis similar in both groups. Total 6 patients of group A developed early to late complication, on the other hand total 5 patients in group B experienced these complications. The difference was statistically non-significant (p>0.05) between groups. Therefore, either group- A (interrupted

sutures) or B (continuous sutures) have no significant influence on early & immediate outcome over another technique.

On evaluation of frequency and pattern of complications, complications were comparable between two arms but difference was not significant between groups. Length of operating time was shorted in group-B or continuous suture technique. It was observed that 43 patients out of 46 were discharged from hospital between 7 to 14 days of operation, 21(91.3%) in group A and 22(95.6%) in group B. mead duration of hospital stay were 9.3±2.5 and 9.3±2.8 days in group A and group B respectively. The difference was statistically non-significant (p>0.05) between groups.

Complications after biliary-enteric anastomotic procedures have ranged from 3% to 43% in the previous reports4, 24. However, most of these studies are specific to BEA due to iatrogenic biliary tract injuries. The differing disease etiology, surgery performed and definition of 'complications' make it difficult to make logical comparisons. Data indicating biliary complications shows, there were 3 (7.3%) biliary leaks in the CS group and 5 (8.5%) in the IS group (P = .83). The log-rank test indicated no difference between anastomosis groups in the occurrence of biliary leaks (P = .79)[15].

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**Conclusions:**

As a surgeon we are very much concern with delivering better outcomes for our patients. To achieve this goal, we are committed to develop surgical methods. It is very important to reduce post-operative complication in patients. Biliary bypass surgical procedures are the better options to restore the continuity of biliary system in patients with benign and or malignant extrahepatic biliary tract disorders including biliary tree injuries, obstruction and congenital anomalies. The surgeon's endeavour is to eliminate consequences of anastomosis failure: biliary leakage, peritonitis and dehiscence. There is a lack of consensus among surgeons over interrupted versus continuous methods of biliary bypass surgery. Present study confirmed that postoperative outcome is similar in both techniques. No superiority or subsidiarity observed in specific technique. Although length of duration of operation was shorter in continuous suturing.

**Recommendations:**

1. Further study with multiple centers in different part of Bangladesh
2. Further study with larger sample size and sample time
3. Long term follow up should be considered in further study to evaluate the outcome.

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