Prospective Observational Study of Short-Term Postoperative Outcomes Following Hepaticojejunostomy versus Hepaticoduodenostomy in Benign Biliary Pathology

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ABSTRACT

Background: Biliary-enteric reconstruction is an established surgical approach for benign biliary disorders. Hepaticojejunostomy (HJ) and hepaticoduodenostomy (HD) are commonly used techniques, but prospective comparative data remain limited.

Objective: To compare short-term postoperative outcomes following HJ and HD in benign biliary pathology.

Methods: This prospective observational cohort study was conducted at Hayatabad Medical Complex, Peshawar, from 1 December 2025 to 30 June 2026. Eighty consecutive adults underwent biliary-enteric reconstruction; 55 underwent Roux-en-Y HJ and 25 underwent direct HD. Procedure selection was individualized according to anatomical feasibility, complexity of biliary disease, previous surgery, bile duct size, availability of the duodenum, surgeon judgment, and departmental practice. The primary outcome was anastomotic leak; secondary outcomes included anastomotic stricture, major complications, mortality, hospital stay, and early oral intake. Data were analyzed using SPSS.

Results: Common bile duct injury was the most frequent indication (43.8%), followed by benign biliary stricture (28.8%) and choledochal cyst (27.5%). Anastomotic leak occurred in 5.5% of HJ patients and 4.0% of HD patients (p=0.85), while stricture occurred in 5.5% and 4.0%, respectively (p=0.85). Major complications occurred in 12 HJ patients (21.8%) and 2 HD patients (8.0%; Fisher exact p=0.205). Two HJ patients died after anastomotic leak: one developed sepsis and died on postoperative day 5, and another developed multiorgan failure and died on postoperative day 7; mortality was 3.6% versus 0% (Fisher exact p=1.000). Mean hospital stay was 6.5 ± 1.5

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versus 4.0 ± 1.2 days (p<0.001), and oral clear liquids by postoperative day 2 were achieved in 74.4% versus 93.9% (p=0.032).

Conclusion: Both HJ and HD were effective options for biliary-enteric reconstruction, with no statistically significant difference in major short-term complications. HD was associated with shorter hospital stay and earlier oral intake. Because the study was observational, had unequal group sizes, limited follow-up, and lacked detailed baseline and disease-severity data, these findings should be interpreted as associations rather than evidence of superiority. Larger multicenter prospective studies with standardized baseline and long-term outcome assessment are needed.

Keywords: Hepaticojejunostomy; Hepaticoduodenostomy; Biliary Reconstruction; Biliary Tract Diseases; Postoperative Complications

INTRODUCTION

Biliary-enteric anastomosis is an important reconstructive procedure in hepatobiliary surgery when normal bile drainage is compromised. Common benign indications include iatrogenic bile duct injury, benign biliary strictures, and choledochal cysts [1,2]. Hepaticojejunostomy (HJ) and hepaticoduodenostomy (HD) are commonly used reconstructive techniques [3-6].

Hepaticojejunostomy has traditionally been regarded as a durable reconstruction, particularly for complex biliary injury and benign strictures [3,7]. In contrast, hepaticoduodenostomy can provide a direct reconstruction while maintaining intestinal continuity and may facilitate subsequent endoscopic access [4-6,8,9]. The choice between the two procedures therefore depends on anatomy, disease complexity, previous operations, and surgeon judgment.

Comparative evidence exists internationally, but prospective comparative data from Pakistan remain limited [10-14]. Local studies have primarily described outcomes after biliary reconstruction rather than directly comparing HJ and HD.

The objective of this study was to compare short-term postoperative outcomes following hepaticojejunostomy and hepaticoduodenostomy in patients undergoing biliary-enteric reconstruction for benign biliary pathology.

METHODS

Study Design

Prospective observational cohort study.

Study Setting and Duration

The study was conducted in the Department of General Surgery, Hayatabad Medical Complex,

Peshawar, Pakistan, from 1 December 2025 to 30 June 2026.

Ethical Approval

Ethical approval for the study and publication of the collected clinical data was obtained from the Institutional Review Board of Hayatabad Medical Complex (Approval No. 2929; Reference No. HMC-QAD-F; approval date: 24 November 2025). Written informed consent was obtained from all participants.

Participants and Sample

Eighty consecutive adult patients undergoing biliary-enteric reconstruction for benign biliary pathology were included. Fifty-five patients underwent HJ and 25 underwent HD. No formal sample-size calculation was performed; all consecutive eligible patients during the study period were included.

Inclusion Criteria

- Adults aged ≥18 years undergoing HJ or HD for benign biliary pathology.
- Written informed consent.
- At least one documented postoperative follow-up assessment.

Exclusion Criteria

- Hepatobiliary malignancy.
- ASA Class IV or higher.
- Hemodynamically unstable emergency cases.

Procedure Selection

The decision to perform HJ or HD was individualized according to surgeon assessment and intraoperative findings. HJ was generally selected for more complex biliary pathology, including high or complex bile duct injuries, difficult benign strictures, and patients with previous biliary surgery. HD was considered when the anatomy was favorable for a tension-free direct anastomosis. Other factors included bile duct diameter, availability of the duodenum, previous surgery, local operative conditions, surgeon judgment, and departmental practice. Because treatment allocation was not randomized, confounding by indication was considered a potential source of bias.

Surgical Technique

All procedures were performed as open operations by a single consultant hepatobiliary surgeon with more than 10 years of independent surgical experience. HJ was performed as a Roux-en-Y reconstruction using an approximately 50–60 cm Roux limb. HD was performed as a direct side-to-side biliary-enteric anastomosis. Both procedures used a two-layer anastomotic technique with the same suture material for both layers. Abdominal drains were routinely placed in all patients. Biliary stents

were used selectively according to intraoperative findings and surgeon judgment.

Data Collection

A standardized data collection proforma was used for all patients. Demographic, clinical, operative, and postoperative outcome data were prospectively recorded during the study period. Additional postoperative information was obtained from outpatient visits and available hospital records.

Outcome Measures

Primary outcome: Anastomotic leak.

Secondary outcomes: Anastomotic stricture, major complications, mortality, hospital stay, and early oral intake.

Anastomotic stricture was defined as narrowing at the biliary-enteric anastomosis demonstrated on cholangiography or imaging, associated with impaired bile drainage and/or requiring intervention. Major complications were defined as Clavien–Dindo Grade III–V complications. Early oral intake was defined as tolerance of clear liquids by postoperative day 2. Length of hospital stay was calculated from the date of surgery to the date of discharge.

Follow-up

Patients were followed through outpatient visits and available hospital records. Follow-up duration was variable, and patient-level follow-up durations were not systematically recorded in the final study database; therefore, a reliable median follow-up duration could not be calculated.

Statistical Analysis

Data were analyzed using SPSS. Continuous variables were summarized as mean ± standard deviation and compared using independent-samples t-tests. Categorical variables were analyzed using chi-square or exact tests as appropriate. For the revised analysis, Fisher exact testing was applied to the small-count comparisons of major complications and mortality. Statistical significance was set at $p<0.05$. Because individual patient-level data were not available for all outcomes at revision, confidence intervals could not be reliably recalculated for the significant recovery outcomes.

RESULTS

Eighty patients were included: 55 underwent HJ and 25 underwent HD. The indications were common bile duct injury in 35 patients (43.8%), benign biliary stricture in 23 (28.8%), and choledochal cyst in 22 (27.5%) shown in Table 1. Detailed baseline demographic, ASA, and comorbidity data were not systematically available in the final study database and therefore could not be reliably compared between groups.

Table 1. Indications for Biliary–Enteric Reconstruction

Indication	HJ (n=55)	HD (n=25)	Total (n=80)	% of Total
Common bile duct injury	24	11	35	43.8%
Benign biliary stricture	16	7	23	28.8%
Choledochal cyst	15	7	22	27.5%
Total	55	25	80	100%

Anastomotic leak occurred in 3 patients (5.5%) in the HJ group and 1 patient (4.0%) in the HD group (p=0.85). Anastomotic stricture occurred in 3 HJ patients (5.5%) and 1 HD patient (4.0%) (p=0.85) in table 2. Major complications occurred in 12 HJ patients (21.8%) and 2 HD patients (8.0%); the difference was not statistically significant (Fisher exact p=0.205).

Table 2. Postoperative Complications

Complication	HJ (n=55)	HD (n=25)	p-value
Anastomotic leak	3 (5.5%)	1 (4.0%)	0.85
Stricture formation	3 (5.5%)	1 (4.0%)	0.85
Mortality	2 (3.6%)	0 (0%)	1.000†
Any major complication	12 (21.8%)	2 (8.0%)	0.205†

† Fisher exact test used in the revised analysis.

Two patients in the HJ group developed persistent postoperative jaundice during follow-up due to biliary obstruction of undetermined cause. Both underwent percutaneous

transhepatic cholangiography with balloon dilatation after discharge, with successful relief of the obstruction. These two patients were included among the 12 HJ patients classified as having major complications.

Two postoperative deaths occurred in the HJ group (2/55, 3.6%) and none in the HD group (0/25); the mortality difference was not statistically significant (Fisher exact p=1.000). Patient 1 had benign biliary stricture treated with HJ and subsequently developed anastomotic leak and sepsis, dying on postoperative day 5. Patient 2 had bile duct injury treated with HJ and subsequently developed anastomotic leak and multiorgan failure, dying on postoperative day 7. The exact timing of leak diagnosis was not available in the study database.

Mean hospital stay was significantly longer in the HJ group (6.5 ± 1.5 days) than in the HD group (4.0 ± 1.2 days; p<0.001). Early oral intake, defined as tolerance of clear liquids by postoperative day 2, was reported in 74.4% of HJ patients and 93.9% of HD patients (p=0.032) in table 3. These recovery differences should not be interpreted as evidence of superiority in surgical safety.

Table 3. Postoperative Recovery

Outcome	HJ (n=55)	HD (n=25)	p-value
Hospital stay (days, mean ± SD)	6.5 ± 1.5	4.0 ± 1.2	<0.001*
Early oral intake (by POD 2)	74.4%	93.9%	0.032*

* Statistically significant at p<0.05.

DISCUSSION

The present prospective observational study compared short-term postoperative outcomes following HJ and HD in patients undergoing biliary-enteric reconstruction for benign biliary pathology. Both procedures achieved acceptable short-term reconstructive outcomes, with no statistically significant differences in anastomotic leak, stricture formation, or mortality.

HJ has traditionally been considered a durable reconstructive procedure, particularly for complex bile duct injuries and benign biliary strictures [3,6,7]. HD offers direct reconstruction and preserves intestinal continuity, and may facilitate subsequent endoscopic access [4,5,8,9].

The choice between the two techniques therefore remains dependent on anatomy, complexity, and surgical judgment rather than a universally applicable preference.

In this study, anastomotic leak occurred in 5.5% of HJ patients and 4.0% of HD patients, while stricture formation occurred in 5.5% and 4.0%, respectively. Neither difference was statistically significant. The observed major-complication rate was higher in HJ patients (21.8%) than in HD patients (8.0%), but this difference was not statistically significant (p=0.205). The safety findings should therefore be interpreted as indicating no demonstrated difference in this sample rather than equivalence of the two procedures, particularly given the limited sample size and low event counts.

Both postoperative deaths occurred in the HJ group and followed anastomotic leakage. Patient 1, treated for benign biliary stricture, developed sepsis and died on postoperative day 5; Patient 2, treated for bile duct injury, developed multiorgan failure and died on postoperative day 7. HJ was generally selected for more complex biliary pathology, while HD was considered when anatomy was favorable for a tension-free reconstruction. Because formal disease-severity classifications were unavailable, the observed mortality may reflect, at least in part, confounding by indication rather than an independent adverse effect of HJ.

Patients undergoing HD had a significantly shorter hospital stay and earlier tolerance of oral clear liquids. These are recovery outcomes and may be expected with a simpler direct reconstruction and preservation of intestinal continuity. They should not be interpreted as evidence that HD is superior in overall surgical safety.

The findings can be contextualized by emerging Pakistani literature describing outcomes of biliary reconstruction, particularly hepaticojejunostomy, in patients with iatrogenic bile duct injury. Hadi et al. and Ahmad et al. reported favorable outcomes following surgical biliary reconstruction in Pakistani centers [13,14]. Additional local reports have described acceptable morbidity and mortality after complex biliary reconstruction [15-20]. These studies provide local context but are not direct prospective comparisons of HJ and HD [21-24].

Several limitations should be considered. This was a single-center observational study with a small and unequal group distribution and no formal sample-size calculation. Treatment allocation was not randomized, and HJ was generally used for more complex disease, creating potential confounding by indication. Baseline age, sex, ASA classification, and

comorbidity data were not systematically available in the final database and therefore could not be compared between groups. Detailed classification of bile duct injuries according to Strasberg and of choledochal cysts according to Todani was not available. Similarly, the cause and anatomical level of benign biliary strictures were not systematically recorded. Follow-up duration was variable and patient-level durations were not systematically captured; therefore, later-presenting outcomes such as anastomotic stricture may be underestimated. The standardized definition of anastomotic stricture was available, but a prespecified diagnostic definition for anastomotic leak was not retained in the original database. These limitations constrain causal inference and generalizability.

CONCLUSION

Both hepaticojejunostomy and hepaticoduodenostomy were effective options for biliary-enteric reconstruction in benign biliary pathology, with no statistically significant difference in major short-term complications. Hepaticoduodenostomy was associated with shorter hospital stay and earlier oral intake. Because the study was observational, had unequal group sizes, limited follow-up, and lacked detailed baseline and disease-severity data, these findings should be interpreted as associations rather than evidence of superiority. Larger multicentre prospective studies with standardized baseline and long-term outcome assessment are needed.

DECLARATIONS

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AUTHOR CONTRIBUTIONS

Study conception, supervision, data validation, manuscript review, critical revision, and final approval: *Rumman Khan*

Data collection, case selection, statistical analysis, manuscript drafting, interpretation of results, revision, and final manuscript preparation: *Aqib Ali Khan*

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