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Early post-operative morbidity and complication rates in liver resection

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Abstract

Background: Liver resection (LR) is a common surgical intervention for various hepatic conditions, including hepatocellular carcinoma, metastatic liver disease, and benign liver tumors. While this procedure can offer a potential cure for patients with localized disease, it is associated with significant early post-operative morbidity and complications that can impact patient outcomes. This study aims to evaluate the early post-operative morbidity and complication rates in patients undergoing LR.

Methods: This prospective observational study was conducted among the indoor patients of the Hepatobiliary unit of the surgery department in Dhaka Medical College Hospital, from January 1st, 2023 to December 29th, 2023. All patients admitted to the hepatobiliary unit of the department of surgery, Dhaka Medical College Hospital were considered the study population. A total of 40 patients were selected as study subjects through a purposive sampling technique. Data were analyzed by the Statistical Package for the Social Sciences version 20.0.

Result: In the early post-operative period following LR in 40 patients, the majority (40%) had blood loss of <400 mL, whereas 15% lost between 400–700 mL, and 7.5% had blood loss exceeding 700 mL. Postoperatively, 65% of patients experienced no complications, whereas 35% developed issues, including surgical site infections in 25% of cases and bile leaks or hemorrhage in 20%. Common interventions included delaying the abdominal drain in 30% of patients, extended hospital stays in 35%, and nutritional support in 25%. Fewer patients required reoperation or drain replacement (5% each).

Conclusion: Results indicated that 65% of patients experienced no complications, whereas 35% faced various morbidities, primarily surgical site infections (25%), and bile leaks (10%). Interventions focused on delaying abdominal drains (30%) and nutritional support (25%). These findings highlight the importance of careful postoperative management to reduce complications, emphasizing the need for ongoing research to optimize patient outcomes following LR.

Keywords: Bile leak, liver resection, post-operative morbidity, sepsis

Introduction

Liver resection (LR) is considered the gold-standard curative approach to numerous liver lesions. Despite being a highly invasive procedure, it has become safer in recent years. Appropriate patient selection, advances in surgical and anesthetic techniques, use of minimal access surgery, and

improvement in perioperative care have expanded the indications of LR. With the advancement of science and technology, it has gained widespread acceptance as a safe and effective treatment for a variety of primary and secondary malignancies.[1] Although the mortality rate is decreasing, deaths still occur following LRs. Studies indicate that mortality ranges from approximately 2% for colorectal metastases to around 10% for biliary tumors and hepatocellular carcinomas (HCCs). However, older studies have reported much higher rates, with major LRs involving more than four segments showing mortality rates as high as 30%.[2] Due to advances in both operative technique and perioperative care, LR is associated with postoperative mortality rates, from 0% to 22% (median 3.7%).[3] However, post-operative morbidity remains high at around 12.5–66%,[4] including liver dysfunction, renal dysfunction, and bile leak.[5,6] Non-lethal complications following LRs are common, occurring in up to 45% of cases. These complications range from mild issues to life-threatening events, such as infections or sepsis, bleeding, bile leakage, or cardiopulmonary complications.[7] Factors associated with perioperative complications and mortality include patient age,[8,9] gender, the annual number of LRs performed at the hospital,[8] the pathological origin of the liver tumor, preoperative liver and renal dysfunction, chronic liver disease,[8,9] and the peripheral neutrophil-to-lymphocyte ratio.[10] Operative factors that influence outcomes include blood loss,[10] blood transfusion,[11] the degree of LR,[11] duration of surgery, simultaneous extrahepatic procedures,[11,12] and the use of the Pringle maneuver.[13] While numerous factors influence outcomes following liver surgery, they have yet to be integrated into a unified scoring system.[14] Previous studies have investigated the Child–Pugh score, the model for end-stage liver disease score, and the albumin–bilirubin score (ALBI). In addition, they explored combining the ALBI score with platelet count — an indirect indicator of portal hypertension — into the platelet-albumin–bilirubin grade, as well as the ALBI-Aspartate Aminotransferase/Platelet Ratio Index (APRI) score. The findings suggest that combining these blood test scores could enhance the predictive value for post-hepatectomy liver failure (PHLF).[15] This study aimed to assess early post-operative morbidity and complication rates in LR.

Methods

This prospective observational study was conducted among the indoor patients of the hepatobiliary unit of the surgery department in Dhaka Medical College Hospital, from January 1st, 2023 to December 29th, 2023. All patients admitted to the hepatobiliary unit of the department of surgery, Dhaka Medical College Hospital were considered the study population. A total of 40 patients were selected as study subjects through a purposive sampling technique. A questionnaire and a consent form were prepared, the sample was selected based on inclusion and exclusion criteria, a questionnaire was filled with informed written consent, and relevant investigations were done. Data were collected by active participation, and interviewing through questionnaires. Univariate and multivariate analysis of the data is carried out using a statistical analysis software program. Descriptive analysis of continuous variables is carried out and presented as the means ± standard deviation. Data were analyzed by the Statistical Package for the Social Sciences version 20.0. Informed as well as verbal consent of the patient was taken. Ethical clearance was taken from the ethical committee of Dhaka Medical College.

Inclusion criteria

- The patient underwent LR for various indication
- Age between 18 and 70 years.

Exclusion criteria

- Patient with concomitant other malignancy
- Patient with a history of pre-existing chronic liver disease including cirrhosis due to other medical causes such as autoimmune hepatitis, hemochromatosis, Wilson's disease
- Patient with concomitant other severe co-morbid illness (severe cardio-respiratory and renal compromise).

Results

The study shows that the majority (16, 40.0%) of the patients were from the 41 to 50 years age group. Out of 40 patients, the mean age was 48.4 years with a standard deviation of 10.27 [Table 1].

Hepatolithiasis and carcinoma of the gallbladder (GB) were the most common diagnoses, each accounting for 30% of the patients. HCC was diagnosed in 20% of the cases. Less frequent conditions included hepatic adenoma (10%), choledochal cyst (5%), and hemangioma (5%) [Table 2].

In this study, 35% underwent non-anatomical resections, and 65% had anatomical resections. Carcinoma GB was treated in 30% of cases, primarily through extended cholecystectomy. Hepatolithiasis accounted for 30% of patients, mostly treated with left lateral sectionectomy. HCC was seen in 20%, with excision or sectionectomy as the primary treatments. Hepatic adenoma, hemangioma, and choledochal cysts were less common, representing 10%, 5%, and 5% of cases, respectively [Table 3].

The majority of patients (40%) experienced blood loss of <400 mL. Blood loss between 400 and 700 mL was observed in 15% of patients, whereas 7.5% of patients had significant blood loss exceeding 700 mL [Table 4].

It was observed that the post-operative outcomes of 40 patients who underwent LR. Twenty-six patients (65%) experienced no complications, whereas morbidity developed in 14 patients (35%). Ten patients (25%) developed a surgical site infection, with 20% of those having associated bile leaks or hemorrhage [Table 5].

The most common approach was delaying the abdominal drain, used by 12 patients (30%), followed by nutritional supplements at 10 patients (25%), indicating an emphasis on recovery support. In addition, delayed hospital stays accounted for 14 patients (35%), reflecting the need for extended monitoring. Conversely, replacing the abdominal drain and reoperation were less frequently employed, each involving 2 patients (5%) [Table 6].

Table 1: Distribution of patients according to age (*n*=40)

Age group (in years)	*n*	Percentage
18–30	4	10.0
31–40	4	10.0
41–50	16	40.0
51–60	10	25.0
61–70	6	15.0
Sex		
Male	18	45.0
Female	22	55.0
Age (Mean±SD): 48.4±10.27		
Male to female ratio=1:1.22		

SD: Standard deviation

Table 2: Distribution of patients according to diagnosis (*n*=40)

Diagnosis	*n*	Percentage
Hepatolithiasis	12	30.0
Carcinoma GB	12	30.0
Hepatocellular carcinoma	8	20.0
Hepatic adenoma	4	10.0
Choledochal cyst	2	5.0
Hemangioma	2	5.0

Discussion

HCC ranks as the fifth-most prevalent malignancy and the third-leading cause of cancer-related mortality globally. For patients diagnosed with early-stage disease and possessing adequate liver function, surgical resection provides the best opportunity for curative treatment, particularly when transplantation is not an option. However, despite advancements in patient selection, surgical techniques, and perioperative anesthetic care, hepatectomy continues to carry considerable morbidity and mortality rates. This risk is particularly pronounced in patients with pre-

Table 3: Distribution of patients according to cause and types of liver resection surgery (*n*=40)

Diagnosis	Types of Liver Resection		*n*	%
	Non-anatomical irrespective of segment	Anatomical		
Carcinoma GB	Extended cholecystectomy *n*=10 (25%)	Resection of segment V and 4b *n*=2 (5%)	*n*=12	30.0
Hepatolithiasis	-	Left lateral sectionectomy with biliary reconstruction (hepaticojejunostomy) *n*=8 (20%) Left lateral sectionectomy without biliary reconstruction *n*=4 (10%)	*n*=12	30.0
HCC	Excision with 1 cm clear margin *n*=4 (10%)	Right posterior sectionectomy *n*=2 (5%) Left lateral sectionectomy *n*=2 (5%)	*n*=8	20.0
Hepatic Adenoma	-	Right hepatectomy *n*=2 (5%), Bi segmentectomy *n*=2 (5%)	*n*=4	10.0
Haemangioma	-	Left hepatectomy *n*=2 (5%)	*n*=2	5.0
Choledochal Cyst Type IVa	-	Right hepatectomy with biliary reconstruction *n*=2 (5%)	*n*=2	5.0

GB: Gallbladder, HCC: Hepatocellular carcinoma

Table 4: Distribution of patients according to blood loss (*n*=40)

Blood loss (mL)	*n*	Percentage
<400	16	40.0
400–700	6	15.0
>700	3	7.5

Table 5: Distribution of patients after liver resection by early post-operative outcome (*n*=40)

Postoperative variable	*n*	Percentage
Evidence of hemorrhage in the drain	2	5.0
Grade C bile leak in the drain	2	5.0
Grade B bile leak in the drain	2	5.0
Grade A bile leak in the drain	4	10.0
SSI	10	25.0
Evidence of both Grade A bile leak and hemorrhage	2	5.0
No evidence of bile leak, bleeding, or SSI	26	65.0

SSI: Surgical site infection

Table 6: Distribution of Patients according to intervention required in the postoperative period (*n*=40)

Intervention	*n*	Percentage
Delaying the abdominal drain	12	30.0
Replacing the abdominal drain	2	5.0
Nutritional supplement	10	25.0
Delayed hospital stay	14	35.0
Reoperation	2	5.0

existing liver dysfunction, who face a heightened risk of perioperative hemorrhage and PHLF.[16] The predominance of patients in the 41–50 years age group aligns with findings from previous studies, which often report that LR is more common among middle-aged individuals. For instance, studies have shown that LR is frequently performed in patients aged 40–60 years, reflecting the typical age of onset for liver tumors, particularly HCC and metastatic liver disease.[10,11] The observed male-to-female

ratio of 1:1.22 indicates a higher proportion of female patients in this cohort, which is somewhat atypical, as many studies have reported a male predominance in liver disease, particularly in HCC.[15] This discrepancy may reflect specific demographic or geographical factors affecting patient selection and disease prevalence in the study population. The finding of this study showed that around 5% of the patients developed severe comorbidity requiring reoperation after LR and 65% of the patients didn't have any kind of complications.

Benzoni *et al*. reported that the inhospital mortality rate was 4.5%, with rates of approximately 7% in patients with HCC and 2.6% in those with liver metastasis. The overall morbidity rate was found to be 47.7%, attributed to several complications, including ascites (10%), temporary liver function impairment (19%), biliary fistula (6%), hepatic abscess (25%), hemoperitoneum (10%), and pleural effusion (30%), with some patients experiencing multiple issues simultaneously.[17] According to Lordan *et al*., there were no significant differences in median blood loss (P = 0.139) or length of hospital stay (P = 0.262). The morbidity rates were 8.9% for the benign group and 20.5% for the metastatic colorectal cancer (MCRC) group (P = 0.002). Serious complications occurred in 1.3% of the benign group compared to 4.4% in the MCRC group (P = 0.041). Notably, there were no post-operative deaths in the benign group, whereas eight patients (2%) in the MCRC group experienced post-operative mortality.[18]

Limitations of the study

The study was conducted in a single hospital with a small sample size. Hence, the results may not represent the whole community.

Conclusion

Results indicated that 65% of patients experienced no complications, whereas 35% faced various morbidities, primarily surgical site infections (25%), and bile leaks (10%). Interventions focused on delaying abdominal drains (30%) and nutritional support (25%). These findings highlight the importance of careful post-operative management to reduce complications, emphasizing the need for ongoing research to optimize patient outcomes following LR.

Recommendation

To enhance patient outcomes following liver resection, it is crucial to implement thorough preoperative assessments to identify at-risk individuals, particularly those with liver dysfunction. Establishing standardized post-operative protocols can aid in the early identification and management of complications such as bile leaks and infections.

Funding

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Conflict of Interest

None declared.

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