

## Comparison of Risk Factors in Patients With and Without Early Post-Operative Complications After Hepaticojejunostomy for Iatrogenic Bile Duct Injury

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### ABSTRACT

**Objective:** To analyze the risk factors associated with early post-operative complications among patients undergoing hepaticojejunostomy for iatrogenic bile duct injury.

**Study Design:** Comparative Cross-sectional Study.

**Place and Duration of Study:** Army Liver Transplant Unit, Rawalpindi Pakistan, From Jan to Oct 2022.

**Methodology:** Eighty-one patients who underwent different types of hepatobiliary surgeries, had iatrogenic bile duct injury and underwent hepaticojejunostomy for repair. Patients were followed up for couple of weeks after the corrective procedure to look for various early post-operative complications. A comparison was performed for different sociodemographic factors in patients with and without early postoperative complications who were recruited in this study.

**Results:** Fifty-five (67.9%) patients were male and 26(32.1%) were female. Median age of patients put who underwent hepaticojejunostomy for repair of iatrogenic bile duct injury in our study was 45 years with IQR range of 40. Patients were divided into two groups on basis of presence of complications. 13(16.1%) patients had one or more complications early on after the surgery while 68(83.9%) patients had smooth early postoperative recovery without complications. Advanced age and presence of comorbid illness were the risk factors found more in groups of patients with presence of early post-operative complications ( $p$ -value<0.05).

**Conclusion:** Early post-operative complications were not uncommon after hepaticojejunostomy procedure opted for repair of iatrogenic bile injuries. Patients who were more than 50 years of age and had comorbid medical illnesses were more at risk of early post-operative complications in our study.

**Keywords:** Bile duct injury, Comparison, Hepaticojejunostomy, Risk Factors.

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### INTRODUCTION

Hepatobiliary tract surgeries have been revolutionized by use of minimally invasive techniques in last two decades.<sup>1</sup> Despite adequate safety profile and number of added advantages of laparoscopic and minimally invasive methods of surgery, still few patients get the complications which may be related to number of factors.<sup>2</sup> Surgical teams need to know about the complications and their immediate remedies in order to save the patients from mortality and morbidity.<sup>3</sup>

Bile duct injuries during the hepatobiliary surgeries are encountered in both open and laparoscopic surgeries.<sup>4</sup> Iatrogenic bile duct injuries are considered as serious and major complications during surgery and need immediate attention of the team. If not managed in time, these injuries can result

in potentially life threatening consequences for the patients.<sup>5</sup> Hepaticojejunostomy is one of the procedures commonly done as a corrective measure after iatrogenic bile duct injuries.<sup>6</sup>

Various studies done in recent past assessed the patients who were managed for iatrogenic bile duct injuries for short and long term outcome. Moris *et al.*, technically analyzed the evolution of hepaticojejunostomy as a procedure to manage the biliary canal injuries.<sup>7</sup> They found it a reliable and efficient technique for the said purpose. Early, intermediate and late repair of bile duct injury with hepaticojejunostomy was assessed in a large multicentre study in 2019. It was concluded that time of repair was not associated with short and long term outcome of the repair procedure.<sup>8</sup> Ismael *et al.*, in 2017 revealed that 30-day outcomes regarding morbidity and mortality rates was 26.3% and 2% respectively. Sepsis and disability were the risk factors associated with mortality and morbidity in their study participants.<sup>9</sup> Existing literature from different parts of

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the world therefore emphasized that surgical teams should not be undermining the presence of complications in these patients and only prevention or timely diagnosing the complication can reduce the mortality and morbidity inpatients and reduce the burden on health system.

Hepatobiliary and laparoscopic surgery are evolving fields in our part of the world and more and more centres are emerging as centres of excellence in these specialities. A recent case series was published from SUIIT highlighting the management of iatrogenic bile injuries.<sup>10</sup> Surgery remained gold standard for management of these injuries with good long term outcome. Limited local data has been available for short term outcome for these patients. We therefore planned this study with the rationale to analyze the risk factors associated with early post-operative complications among patients undergoing hepaticojejunostomy for iatrogenic bile duct injury at Army Liver Transplant Unit Rawalpindi.

### METHODOLOGY

This comparative cross-sectional study was conducted at the Army liver transplant unit, Rawalpindi Pakistan, from January to October 2022. Sample size was calculated by WHO Sample Size Calculator. Two groups were used for this purpose. Group I had no complications =79%. Group II had presence of significant complications =7%.<sup>11</sup> Non probability Consecutive sampling technique was used to gather the sample.

**Inclusion Criteria:** Patients between the age of eighteen and sixty five years who underwent any type of hepatobiliary surgery, had iatrogenic bile duct injury and underwent hepaticojejunostomy for the repair were included in the study.

**Exclusion Criteria:** Those patients who were having comorbid medical illnesses which were poorly controlled (Diabetes mellitus, hypertension or any other medical illness). Biopsy proven CA gallbladder or other tumors of solid or hematopoietic origin were excluded from study. Patients who after injury did not undergo hepaticojejunostomy for the repair or those who were shifted to other hospitals after the surgery were also not included.

Letter number A/28/202/EC/468/2022 was the ethical approval granted for this study from review board committee of our hospital. Written informed consent from patients with iatrogenic bile injury was taken before they were recruited for study from Army

liver transplant unit, Rawalpindi Pakistan. Iatrogenic bile injury was diagnosed by treating surgeon along with his team on the basis of per-operative findings.<sup>12</sup> Those patients who fulfilled the criteria for hepaticojejunostomy underwent this procedure by consultant general or hepatobiliary surgeon in Army liver transplant unit Rawalpindi.<sup>13</sup> Repair was done under aseptic technique by the team by set protocols after taking consent from the patient and letting him know the details of previous procedure and complications. Patients who underwent hepaticojejunostomy were monitored closely for 48 hours and then assessed after a week to look for other early post-operative complications.<sup>14</sup> Surgical team members who were assigned to observe the patients for presence of different complications did not participate in the hepaticojejunostomy procedure. All the information was entered in a proforma designed for this study by the research team before at the time of planning of study.

Statistical Package for the social sciences (SPSS) version 24:00 was used to enter all the data collected in study duration and get it processed. Gender of patients and all the complications after the procedure of hepaticojejunostomy were calculated in terms of frequencies along with percentages. Age of the patients recruited in study was calculated as mean and standard deviation. Pearson chi-square test and Fischer exact test by keeping the  $p$ -value<0.05 as significant were used to look for different factors associated with complications after hepaticojejunostomy.

### RESULTS

A total of 81 patients who underwent hepaticojejunostomy for repair of iatrogenic bile duct injury were included in the final analysis. Out of these, 55(67.9%) were male and 26(32.1%) were female. Median age of patients who underwent hepaticojejunostomy for repair of iatrogenic bile duct injury in our study was 45 years with IQR range of 40. Table-I summarized the basic characteristics of patients recruited in this study. Two groups were made for the purpose of comparison on the basis of presence or absence of post-operative complications. Out of all the study participants, 13(16.1%) patients had one or more complications early on after the surgery while 68(83.9%) patients had smooth early postoperative recovery without complications.

Table-II mentioned the results of application of statistical tests. Two groups were made for the

purpose of comparison. One group had no Significant post-operative complications while group II had one or more complications. It was revealed that advanced age and presence of comorbid illness were the risk factors found more in group of patients with presence of early post-operative complications in our study participants ( $p$ -value<0.05) as compared to group of patients without presence of complications.

**Table-I: Characteristics of Patients Managed for Iatrogenic Bile Duct Injuries (n=76)**

Study Parameters	n(%)
<b>Age (years)</b>	
Median (IQR range)	45years (40)
<b>Gender</b>	
Male	55(67.9%)
Female	26(32.1%)
<b>Type of surgeries with iatrogenic bile duct injuries</b>	
Open laparoscopic Interval	65(80.2%)
	16(19.8%)
<b>Comorbid medical conditions</b>	
Diabetes mellitus	15(18.5%)
Hypertension	09(11.1%)
Rheumatoid arthritis	04(4.9%)
Ischemic heart disease	06(7.4%)
Others	03(3.7%)
<b>Complications</b>	
Surgical site infection	09(11.1%)
Anastomotic stenosis	05(6.2%)
Pancreatic fistula	04(4.9%)
Bile leakage	03(3.7%)
Others	02(2.4%)

**Table-II: Association of Various Risk Factors with Presence of Complications Among Study Participants**

Factors	No complications n=68	Complications n=13	p-value
<b>Age</b>			
<50 years	52(76.4%)	04(30.7%)	0.002
>50 years	16(23.6%)	09(69.3%)	
<b>Gender</b>			
Male	48(70.6%)	07(53.8%)	0.247
Female	20(29.4%)	06(46.2%)	
<b>Comorbid illness</b>			
No	43(63.2%)	01(7.6%)	<0.001
Diabetes Meliitus	08(11.7%)	07(53.8%)	
Hypertension	05(7.3%)	04(3.1%)	
Rheumatoid arthritis	03(4.4%)	01(7.6%)	
Ischemic Heart disease	06(8.8%)	00(0%)	
<b>Type of wound</b>			
Clean or clean contaminated	50(73.5%)	06(46.2%)	0.059
Contaminated or dirty	18(26.5%)	07(53.8%)	

**DISCUSSION**

Iatrogenic bile duct injury was not very uncommon in patients undergoing various hepatobiliary procedures in our liver unit. Key usually lies in early detection and management of this serious complications. Hepaticojejunostomy is usually the procedure offered after the iatrogenic bile duct injury. As this is the procedure done to counter one serious complications so surgical teams usually become very cautious about safety and prevention of complications in after this procedure. No surgery could be totally free from complications and chance of error remains there. We at our liver transplant unit studied patients of iatrogenic bile injury undergoing hepaticojejunostomy for 10 months and evaluated them for any complications and assessed the risk factors associated with presence of complications.

Popa *et al.*, in 2022 published a retrospective analysis of bile duct injuries treated in a tertiary center of Romania. They revealed that 60% of the patients who had iatrogenic bile duct injury underwent hepaticojejunostomy and most of them had good outcome.<sup>15</sup> 80 patients in 10 months with iatrogenic bile duct injury underwent hepaticojejunostomy at our centre. Out of them 13(16.1%) had one or more complications. Surgical site infection was the commonest short term complication seen in patients in our study.

A recent study published from Denmark analysed the long term outcome of patients undergoing hepaticojejunostomies for bile duct injuries. They came up with the findings that complications were found in considerable number of patients and stricture rate was around 30%.<sup>16</sup> Our study was slightly different as we studied short term outcome only and found out that early post-operative complications were not uncommon after hepaticojejunostomy procedure opted for repair of iatrogenic bile injuries. Patients who were more than 50 years of age and had comorbid medical illnesses were more at risk of early post-operative complications in our study.

A study from Cyprus summarized 6-year experience of management of bile duct injuries and concluded that mortality rate after management was around 2.4%. Almost 1/3<sup>rd</sup> of the patients had surgical management in their study.<sup>17</sup> We only included patients who went surgical management for iatrogenic bile duct injuries and found that surgical management was safe and effective approach with limited

complications. Complications were found more in patients with age more than 50 years and having medical comorbid conditions.

A multicenter study from Egypt revealed that complications of surgical repair were seen less in patients who had complete ligation of the bile duct, level E1 bile duct injury or external stent.<sup>18</sup> In our study more favourable outcome was seen in patients who were less than 50 years of age or those who did not have comorbid medical conditions. Still results of a single centre may not give true picture of what actually may be happening in all the clinical settings especially public sector hospitals.

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#### LIMITATIONS OF STUDY

Short term complications related to surgery were looked for one week after the procedure therefore exact figures regarding all of all the complications could not be determined by this study. Multiple patient related, disease related, surgeon related and facility related factors could be associated with presence of complications which all could not be incorporated via this study design.

#### CONCLUSION

Early post-operative complications were not uncommon after hepaticojejunostomy procedure opted for repair of iatrogenic bile injuries. Patients who were more than 50 years of age and had comorbid medical illnesses were more at risk of early post-operative complications in our study.

**Conflict of Interest:** None.

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#### Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

BAC & MQB: Data acquisition, data analysis, critical review, approval of the final version to be published.

NM & AR: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

WFA & MS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## Complications After Repair of Iatrogenic Bile Duct Injury

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