

Outcome of Pancreaticoduodenectomy in Cirrhotic Patients

Basem Farhan Shehata Abo-Salem¹, Emad Hamdy Gad², Esam Mohammad Salah Eldin¹

¹Hepato-Pancreato-Biliary Surgery, National Liver Institute, Menoufia University

Corresponding Author: Basem Farhan Shehata Abo-Salem, **Email:** basemabosalem@gmail.com,

Mobile: +201091477717

ABSTRACT

Background: Cure-only treatment for people with malignant disorders pertaining to the pancreas and surrounding region around the ampulla is pancreaticoduodenectomy (PD), a complicated procedure. **Aim:** The purpose of this study was to investigate the outcomes and factors of pancreaticoduodenectomy in cirrhotic patients at Hepato-Pancreato-Biliary (HPB) Department, Menoufia University National Liver Institute.

Patients and Methods: This retrospective study was carried out on 63 cirrhotic patients who were Child class A patients and early B (patient score blow eight) who underwent pancreaticoduodenectomy at Hepato-Pancreato-Biliary (HPB) Department, National Liver Institute, Menoufia University from the beginning of 2016 to the end of 2022. Non-cirrhotic patients, cirrhotic patients with Child class B (score more than eight) and class C were excluded. Assessment of degree of liver cirrhosis was done according to Child-Pugh classification and MELD score. The data were gathered from the medical records in our HPB division.

Results: There were no statistically significant differences between Child classes A and B in postoperative complications or length of stay. Hospital stay was longer in cases with MELD score >10 compared to cases with MELD score ≤10. Pancreatic fistula, postpancreatectomy hemorrhage and overall morbidity were significantly more in cases with portal hypertension compared to cases with no portal hypertension, while insignificant statistical differences were found between cases regarding Delayed gastric emptying (DGE), postoperative dependencies and mortality related to operation. **Conclusion:** When treating carefully chosen cirrhotic individuals, pancreatoduodenectomy may be an option. Patients who have preoperative radiographic indications of portal hypertension should get special care since their outcomes are dismal regardless of MELD or Child score.

Keywords: outcome; pancreaticoduodenectomy; cirrhotic.

INTRODUCTION

Only treatment that has shown to be effective against pancreatic and periampullary malignancies is pancreaticoduodenectomy (PD), a complicated procedure. Additionally, some benign pancreatic cancers and severe pancreatic head trauma call for the surgery⁽¹⁾.

Age, gender, preoperative jaundice, operating time, intraoperative blood loss, pancreatic reconstruction type, anastomotic technique, consistency of pancreatic stump, diameter of pancreatic duct, somatostatin use, size of mass, size of safety margin, size of lymph nodes, and surgeon experience can all have an impact on postoperative morbidity and prognosis following PD⁽²⁾.

Numerous chronic liver disorders have a same pathophysiological route with cirrhosis. From liver damage to cirrhosis, the development might take over weeks to years. In Egypt, Hepatitis C virus is the leading cause of liver cirrhosis⁽³⁾.

Patients with cirrhosis who are properly chosen may be candidates for pancreaticoduodenectomy. Patients who have preoperative radiographic indications of portal hypertension should get special care since their outcomes are dismal regardless of MELD or Child score⁽⁴⁾. Postoperative pancreatic fistula has been observed to be more prevalent in individuals with liver cirrhosis, and intraoperative hemorrhage and blood transfusion are both related with portal hypertension. Postoperative hepatic decompensation, especially refractory ascites, is one possible consequence of having cirrhosis of the

liver, also, the heightened danger of complications during surgery that comes with PD^(5,6).

Referral to a tertiary care facility with expert interventional radiologists and experienced hepatobiliary surgeons would seem to be required to ensure the best outcomes⁽⁷⁾.

This study's objective was to evaluate the pancreaticoduodenectomy outcomes and predictors in cirrhotic patients at the Hepato-Pancreato-Biliary Department of the Menoufia University's National Liver Institute.

PATIENTS AND METHODS

This retrospective study was carried out on 63 cirrhotic patients who were Child class A patients and early B (patient score blow eight) who underwent pancreaticoduodenectomy at Hepato-Pancreato-Biliary (HPB) Department, National Liver Institute, Menoufia University from the beginning of 2016 to the end of 2022. Non-cirrhotic patients, cirrhotic patients with Child class B (score more than eight) and class C were excluded. Assessment of degree of liver cirrhosis was done according to Child-Pugh classification and MELD score. The data were gathered from the medical records in our HPB division.

The detailed information included patient demographics, co-morbidities: e.g. (diabetes mellitus, IHD, CHF, hypertension, COPD) and past history of surgical interventions, the diagnosis of liver cirrhosis that was established clinically, laboratory data, abdominal ultrasonography and computerized

tomography (CT), etiology of liver cirrhosis (Viruses of the hepatic cell (Hepatitis C and B) and nonalcoholic steatohepatitis, etc.). Clinical evidence was used to make the diagnosis of pancreatic pathology, which was then supported by laboratory data (tumor markers CEA and CA19.9) and radiographic information from abdominal ultrasound, endoscopic ultrasound, CT abdomen, MRI, and PET scan. Morbidity and death rates for each patient were assessed.

Ethical Approval:

The study was approved by the Ethics Board of Menoufia University and the patients were given all the information they needed about the trial. An informed written consent was taken from each participant in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis of the data:

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS) version 18 for windows. Qualitative data were defined as numbers and percentages. Chi-

Square test and Fisher’s exact test were used for comparison between categorical variables as appropriate.

Quantitative data were tested for normality by Kolmogorov-Smirnov test. Normal distribution of variables was described as mean and standard deviation (SD). Independent sample t- test and analysis of variance (ANOVA) were used for comparison between groups. P value ≤0.05 was considered to be statistically significant.

RESULTS

Regarding demographic data, there was a total of 63 patients, 41 males (65.1%) and 22 females (34.9%) with median age of 58. 30 patients had Child class A, whereas Child B was found in 33 patients, median MELD score was 11 (range 6–24). There were no statistically significant differences between Child class A and B regarding age, and sex. Also, there was insignificant statistical discrepancies between cases with no portal hypertension and cases with portal hypertension regarding age, and sex. Meanwhile, age and male sex were significantly more in cases with MELD score >10 compared to cases with MELD score ≤10 (**Table 1**).

Table (1): Comparison between the studied groups according to demographic data

Demographic data	Child class				MELD score				Portal hypertension			
	A (n = 30)		B (n = 33)		≤10(n = 29)		>10 (n = 34)		No (n = 54)		Yes (n = 9)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Sex												
Male	18	60.0	23	69.7	15	51.7	26	76.5	34	63.0	7	77.8
Female	12	40.0	10	30.3	14	48.3	8	23.5	20	37.0	2	22.2
X²(p)	0.650 (0.420)				4.217 (0.040*)				0.745 (FEp=0.476)			
Age (years)												
Min. – Max.	20.0 – 73.0		41.0 – 70.0		20.0 – 73.0		41.0 – 70.0		20.0 – 73.0		54.0 – 70.0	
Mean ± SD.	55.37 ± 10.96		58.76 ± 8.11		54.0 ± 11.0		59.82 ± 7.49		56.48 ± 10.05		61.11 ± 5.62	
Median (IQR)	55.0 (50.0 – 62.0)		61.0 (55.0 – 65.0)		53.0 (49.0 – 60.0)		61.5 (56.0 – 66.0)		57.0 (50.0 – 64.0)		61.0 (57.0 – 66.0)	
t(p)	1.404 (0.165)				2.413* (0.020*)				1.341 (0.185)			

IQR: Interquartile range

SD: Standard deviation

χ²: Chi square test

FE: Fisher Exact

t: Student t-test, *: Statistically significant

The preoperative data showed that there were no statistically significant differences between Child class A and B regarding EUS, preoperative biliary drainage, lesion site and peri-pancreatic LNs. Also, there were no statistically significant differences between cases with no portal hypertension and cases with portal hypertension regarding EUS, preoperative biliary drainage, lesion site and peri-pancreatic LNs. No statistically significant differences between case with MELD score > ten and cases with MELD score ≤10 regarding EUS, preoperative biliary drainage, lesion site and peri-pancreatic LNs (**Table 2**).

Table (2): Comparison of the analyzed groups based on many criteria

	Child class				MELD score				Portal hypertension			
	A (n = 30)		B (n = 33)		≤10(n = 29)		>10 (n = 34)		No (n = 54)		Yes (n = 9)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
EUS												
No	22	73.3	27	81.8	22	75.9	27	79.4	40	74.1	9	100.0
Yes	8	26.7	6	18.2	7	24.1	7	20.6	14	25.9	0	0.0
X²(p)	0.655 (0.418)				0.114 (0.736)				3.0 (FEp=0.188)			
Biliary drainage pre-operative												
None	9	30.0	18	54.5	11	37.9	16	47.1	22	40.7	5	55.6
Percut.	4	13.3	4	12.1	3	10.3	5	14.7	7	13.0	1	11.1
Stent (ERCP)	17	56.7	11	33.3	15	51.7	13	38.2	25	46.3	3	33.3
X²(MCp)	4.148 (0.127)				1.194 (0.608)				0.789 (0.782)			
Lesion site												
Head	14	46.7	18	54.5	13	44.8	19	55.9	29	53.7	3	33.3
Uncinate	4	13.3	2	6.1	3	10.3	3	8.8	5	9.3	1	11.1
periampullary	12	40.0	13	39.4	13	44.8	12	35.3	20	37.0	5	55.6
c²(MCp)	1.074 (0.579)				0.867 (0.660)				1.603 (0.422)			
Peri Pancreatic LNs												
Negative	22	73.3	25	75.8	21	72.4	26	76.5	40	74.1	7	77.8
Positive	8	26.7	8	24.2	8	27.6	8	23.5	14	25.9	2	22.2
c²(p)	0.049 (0.825)				0.136 (0.712)				0.056 (FEp=1.000)			

χ²: Chi square test MC: Monte Carlo FE: Fisher Exact

ERCP: Endoscopic retrograde cholangiopancreatography

EUS: Endoscopic ultrasound

The intraoperative data showed that no statistically significant differences between Child class A and B regarding type of pancreatoduodenectomy (PD). In addition, cases with MELD score > ten and cases with MELD score ≤10 did not differ statistically from one another regarding type of PD. Also, no statistically significant differences were found between cases with no portal hypertension and cases with portal hypertension regarding type of PD (Table 3).

Table (3): Comparison of the examined groups based on the type of PD

Type of PD	Child class				MELD score				Portal hypertension			
	A (n = 30)		B (n = 33)		≤10(n = 29)		>10 (n = 34)		No (n = 54)		Yes (n = 9)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Pylorus Resecting	20	66.7	26	78.8	19	65.5	27	79.4	41	75.9	5	55.6
Pylorus preserving	10	33.3	7	21.2	10	34.5	7	20.6	13	24.1	4	44.4
X²(p)	1.172 (0.279)				1.534(0.216)				1.625(FEp=0.236)			

χ²: Chi square test

FE: Fisher Exact

There were no statistically significant differences between Child class A and B regarding postoperative complication and hospital stay. Hospital stays were noticeably longer with MELD score >10 compared to cases with MELD score ≤10. Pancreatic fistula, post-pancreatectomy hemorrhage and overall morbidity was significantly higher in cases with portal hypertension compared to cases with no portal hypertension while, no statistically significant differences were found between cases regarding Delayed gastric emptying (DGE), postoperative dependencies and mortality related to operation. When compared to those without portal hypertension, hospital stays were considerably longer in cases with portal hypertension (Figures 1, 2, 3, 4)

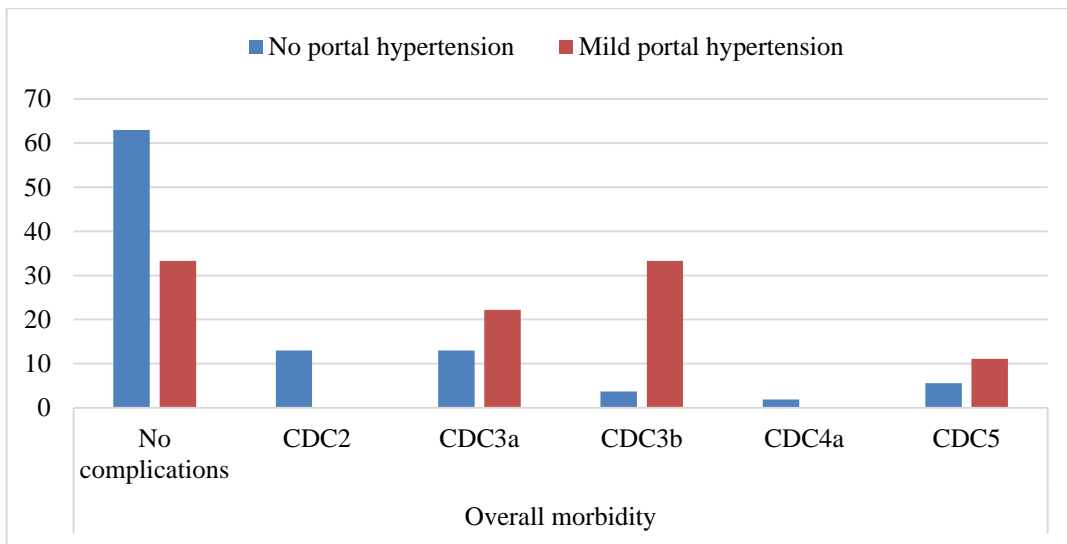


Figure (1): Relation between portal hypertension with overall mortality

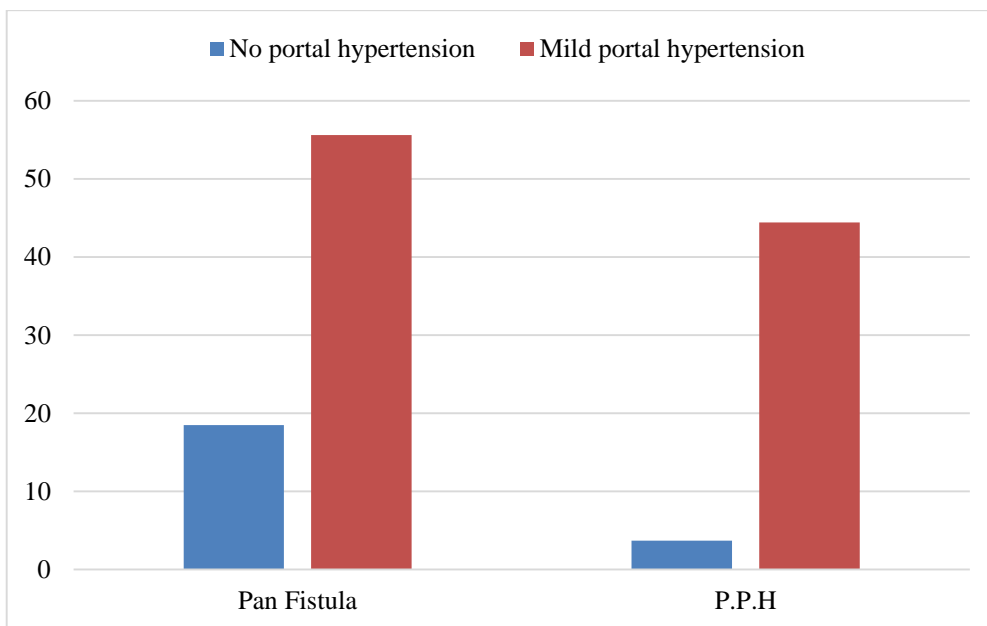


Figure (2): Relation between portal hypertension with pancreatic fistula and postpancreatectomy hemorrhage

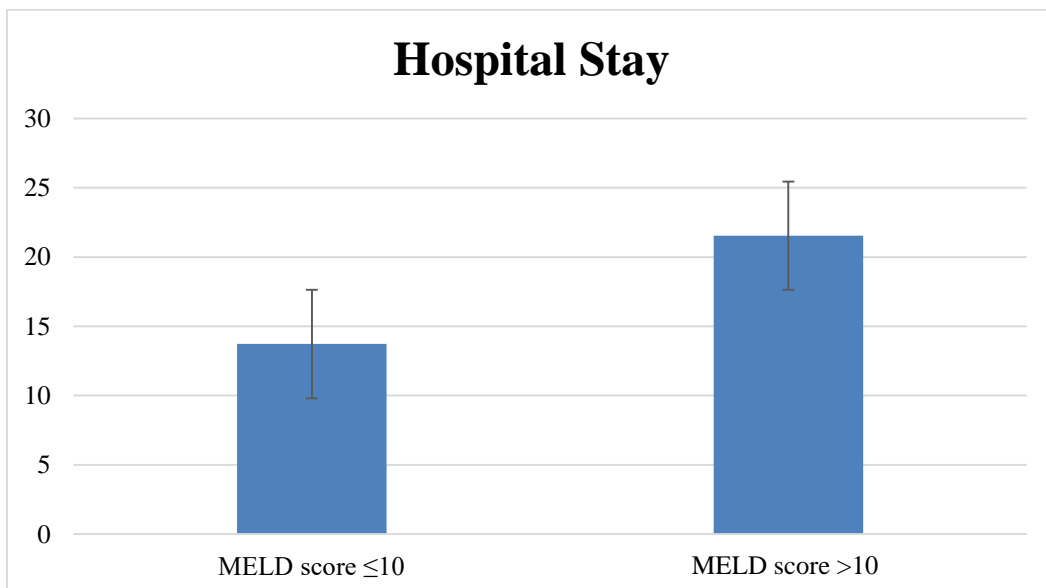


Figure (3): Hospital stay in cases with MELD score less than 10 and MELD score ≥10

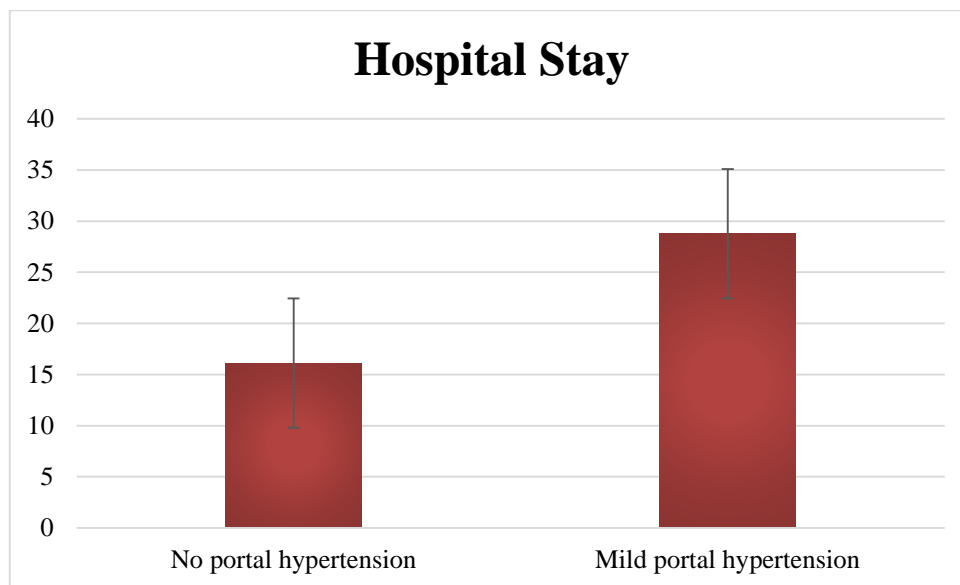


Figure (4): Hospital stay in cases with no and cases with portal hypertension.

DISCUSSION

Postoperative pancreatic fistula (POPF) is more common in patients with hepatic cirrhosis, and portal hypertension (pHTN) is linked to intraoperative bleeding and blood transfusions ^(8,9). The primary purpose of this study was to evaluate the efficacy of pancreaticoduodenectomy for cirrhotic patients treated at the National Liver Institute at Menoufia University.

There were no statistically major variations between Child class A and B regarding age, and sex. Also, there were no discernible differences between cases with no portal hypertension and cases with portal hypertension regarding age, and sex. Meanwhile, age and male sex were significantly greater in cases with MELD score >10 compared to cases with MELD score ≤10.

While, in the study of **Butler *et al.*** ⁽⁴⁾ there were no statistically significant variances between Child class A and B and MELD score >10 compared to cases with MELD score ≤10 regarding age, and sex. Whereas, in the study of **El Nakeeb *et al.*** ⁽⁹⁾ no significant differences were seen between the groups of patients (cirrhotic group and non-cirrhotic group) with regard to age. Regarding gender, there were significant differences between patient groups: Patients with cirrhosis tended to be males (P = 0.006).

The current investigation found no statistically significant changes in EUS, pre-operative biliary drainage, lesion site, or peri-pancreatic LNs between Child classes A and B.

In the study of **El Nakeeb *et al.*** ⁽⁹⁾, there was no statistical difference between cirrhotic and non-cirrhotic groups with regard to preoperative drainage. According to **Regimbeau *et al.*** ⁽¹⁰⁾ 71% of tumors in cirrhotic patients and 68% of tumors in control patients were staged as T3 (P = 0.52); the median number of lymph nodes looked at was 14 in cirrhotic patients and 20 in control patients (P= 0.001); and 60% of cirrhotic

patients and 71% of control patients had positive lymph nodes (P = 0.32).

Our results showed that there were no statistically significant differences between Child class A and B, between cases with MELD score >10 and cases with MELD score ≤10 and between no portal hypertension and portal hypertension cases regarding type of PD.

Regarding postoperative complication and hospital stay; there were no statistically significant differences between Child Class A and Class B in terms of postoperative complications and hospital stays. Hospital stay was significantly higher in cases with MELD score >10 compared to cases with MELD score ≤10. Pancreatic fistula, postpancreatectomy hemorrhage and overall morbidity were significantly higher in cases with portal hypertension compared to cases with no portal hypertension while, no statistically significant differences were found between cases regarding Delayed gastric emptying (DGE), postoperative dependencies and mortality related to operation. Hospital stay was significantly longer in cases with portal hypertension compared to cases with no portal hypertension.

Our results were supported by study of **Butler *et al.*** ⁽⁴⁾ where 90-day postoperative mortality was also reported to be 6/36. The median length of life was 37 months (range 0.2–116). Death rates were higher in patients with a MELD score of ≥10 (4/13 versus 2/13, p = 0.004). Portal hypertension (pHTN) patients fared worse than those who did not have the condition, regardless of their Child or MELD score, in terms of things like intraoperative blood loss, the occurrence of serious complications, and the length of their hospital stay. The pHTN group had a considerably higher postoperative death rate (3/16 vs. 1/13, p = 0.012). Moreover, **Busquets *et al.*** ⁽¹¹⁾ found that the average length of hospital stay after surgery was 25±19 days, with a statistically insignificant increase in the cirrhotic (HC) group compared to the non-cirrhotic (NHC) group

(from 30 days to 18 days). Results showed that 11 patients in the HC group (73 percent) and 16 patients in the NHC group (53%), respectively, showed signs of problems. It was shown that whereas no patients in the HC group experienced hemoperitoneum, two patients in the NHC group did (representing 7%). UGI bleed was reported by one NHC patient (3%).

Furthermore, in the study of **Warnick *et al.***⁽¹²⁾ cirrhosis patients had significantly greater problems (69 vs. 44 patients; $p = 0.044$), with major complications (47 vs. 22%; $p = 0.035$) needing reoperation (34 vs. 12%; $p = 0.039$). These patients also required twice as many transfusions, had a longer hospital stay (27.9 vs. 24.3 days), and stayed in the intensive care unit for twice as long (8.6 vs. 3.7 days; $p = 0.033$). Following surgery, one patient with Child A cirrhosis (3 percent of all Child A patients) and two individuals with Child B cirrhosis died.

In addition, in the study of **El Nakeeb *et al.***⁽⁹⁾ group A had a substantially longer mean postoperative stay compared to group B (12.97 ± 11.2 d vs. 10.71 ± 7.41 d, $P = 0.03$). Seventy postoperative problems were reported by 31 patients in group A, or 46.26 percent. Eighty-five patients (22.66%) in group B experienced postoperative problems. Patients in group A were more likely to get very ill than those in group B. The incidence of wound complications varied significantly ($P = 0.02$), internal bleeding ($P = 0.05$), and the development of a postoperative pancreatic fistula (POPF) ($P = 0.02$). Thirteen patients in group A (19.4%) and 37 patients in group B (9.9%) had POPF. Eleven patients had POPF grade C; Sepsis was the cause of death for five of the cirrhotic patients and six of the non-cirrhotic patients⁽¹³⁾.

The study's short time span and small sample size were major drawbacks. In addition, it is research conducted in a single location. More research is needed to find out how important cirrhosis and portal hypertension are in predicting how well surgery will go after PD, as well as to identify the variables that put patients at risk for these conditions.

CONCLUSION

In certain individuals with cirrhosis, a pancreaticoduodenectomy may be an option. Patients who have radiographic evidence of portal hypertension prior to surgery warrant special consideration since this population has poor results regardless of MELD or Child score.

DECLARATIONS

- **Consent for publication:** All authors have agreed to submit the work.
- **Availability of data and material:** Available
- **Competing interests:** None
- **Funding:** No fund

- **Conflicts of interest:** no conflicts of interest.

References:

1. **Sakai A, Tsujimae M, Masuda A *et al.* (2019):** Clinical outcomes of ampullary neoplasms in resected margin positive or uncertain cases after endoscopic papillectomy. *World Journal of Gastroenterology*, 25(11): 1387.
2. **Ke Z, Cui J, Hu N *et al.* (2018):** Risk factors for postoperative pancreatic fistula: Analysis of 170 consecutive cases of pancreaticoduodenectomy based on the updated ISGPS classification and grading system. *Medicine*, 97:35.
3. **Kouyoumjian S, Chemaitelly H, Abu-Raddad L (2018):** Characterizing hepatitis C virus epidemiology in Egypt: systematic reviews, meta-analyses, and meta-regressions. *Scientific reports*, 8(1): 1-7.
4. **Butler J, Kays J, House M *et al.* (2019):** Outcomes of pancreatoduodenectomy in the cirrhotic patient: risk stratification and meta-analysis. *HPB.*, 21(3): 301-9.
5. **Berardi G, Morise Z, Sposito C *et al.* (2020):** Development of a nomogram to predict outcome after liver resection for hepatocellular carcinoma in Child-Pugh B cirrhosis. *Journal of Hepatology*, 72(1): 75-84.
6. **Futagawa Y, Yanaga K, Kosuge T *et al.* (2019):** Outcomes of pancreaticoduodenectomy in patients with chronic hepatic dysfunction including liver cirrhosis: results of a retrospective multicenter study by the Japanese Society of Hepato-Biliary-Pancreatic Surgery. *Journal of Hepato-Biliary-Pancreatic Sciences*, 26(7): 310-324.
7. **Booij K, Coelen R, de Reuver P *et al.* (2018):** Long-term follow-up and risk factors for strictures after hepaticojejunostomy for bile duct injury: an analysis of surgical and percutaneous treatment in a tertiary center. *Surgery*, 163(5): 1121-7.
8. **Cheng K, Liu W, You J *et al.* (2021):** Safety of laparoscopic pancreaticoduodenectomy in patients with liver cirrhosis using propensity score matching. *Plos one*, 16(1): e0246364.
9. **El Nakeeb A, Sultan A, Salah T *et al.* (2013):** Impact of cirrhosis on surgical outcome after pancreaticoduodenectomy. *World Journal of Gastroenterology*, 19(41): 7129-7137.
10. **Regimbeau J, Rebibo L, Dokmak S *et al.* (2015):** The short-and long-term outcomes of pancreaticoduodenectomy for cancer in child A patients are acceptable: A patient-control study from the Surgical French Association report for pancreatic surgery. *Journal of Surgical Oncology*, 111(6): 776-783.
11. **Busquets J, Peláez N, Gil M *et al.* (2016):** Es la duodenopancreatectomía cefálica una intervención segura en el paciente cirrótico? (Is Pancreaticoduodenectomy a Safe Procedure in the Cirrhotic Patient?). *Cirugía Española (English Edition)*, 94(7): 385-391.
12. **Warnick P, Mai I, Klein F *et al.* (2011):** Safety of Pancreatic surgery in patients with simultaneous liver cirrhosis: A single center experience. *Pancreatology*, 11(1): 24-29.
13. <https://pubmed.ncbi.nlm.nih.gov/14561255>