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Early Outcomes of Cardiac Surgery in Patients with Liver Cirrhosis

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ABSTRACT

Background: Liver cirrhosis is known to be associated with increased morbidity and mortality in patients undergoing cardiac surgery.

Objective: The purpose of this study was to evaluate the early outcomes of cardiac surgery in patients with liver cirrhosis in our settings, and to assess the performance of the Child-Pugh classification as a predictor of early mortality.

Patients and Methods: A retrospective observational study included 58 patients operated between March 2012 and October 2019. Among these 52 patients required open-heart procedures and 6 were operated without the use of cardiopulmonary bypass. The primary endpoint being examined was early mortality.

Results: The overall mortality was 20.7%. Higher Child-Pugh (CP) class was associated with marked rise in mortality. The mortality rate increased from 10.8% patients in class A of the Child-Pugh, to 25% in class B patients to 80% in class C patients. The need for urgent or emergent procedures was also found to be associated with an increased risk of mortality.

Conclusion: Early results of cardiac surgery in Child-Pugh class A patients although apparently higher than the general population, remain acceptable. The mortality in patients with CP class C is extremely high and almost prohibitive. Non-elective procedures also seemed to be associated with a significant increase in early mortality. This should be borne in mind while assessing surgical risk in cirrhotic patients.

Keywords: Cardiac surgery, Liver cirrhosis, Child-Pugh score.

INTRODUCTION

Chronic liver disease constitutes a major health problem in Egypt. Despite a recent decline, Egypt has the highest age-standardized rate of death due to liver cirrhosis in the region, with hepatitis B and hepatitis C being the main etiologic factors [(1)]. Although cardiac surgery in cirrhotic patients is known to carry a higher mortality and morbidity risk [(2-5)], the impact of the severity of hepatic dysfunction on surgical outcomes remains difficult to quantify.

The severity of liver cirrhosis has commonly been evaluated by CP classification [(6, 7)].

Although this classification has been developed for different clinical applications, many authors have used it to predict the cardiac surgical outcomes in cirrhotic patients [(3, 8, and 9)].

The purpose of the current study was to evaluate the early outcomes of cardiac surgery in patients with liver cirrhosis in our settings, and to assess the performance of the CP class as a predictor of early mortality.

PATIENTS AND METHODS

This retrospective observational study included all patients diagnosed with liver cirrhosis and operated in the Cardiothoracic Surgery Department, Kasr Al Ainy University Hospitals during the period spanning from March 2012 to October 2019 where 61 cirrhotic patients were offered a cardiac surgical procedure.

Three patients were excluded due to deficient files and lack of necessary laboratory results. The remaining 58 patients were included in the study and their individual files were reviewed to extract clinical data.

Diagnosis of liver cirrhosis was founded on clinical history and physical findings consistent with cirrhosis, along with findings of abdominal ultrasonography or other imaging studies, which were characterized by a coarsened heterogeneous echogenic pattern along with nodularity of the liver surface and increased echogenicity of hepatic parenchyma. The severity of liver cirrhosis was graded according to the CP classification.

In-hospital mortality was defined as death within the same hospital admission regardless of cause. The occurrence of hepatic decompensation, evidenced by the new appearance of portosystemic encephalopathy, ascites, jaundice, coagulopathy, variceal bleed, and hepatorenal syndrome, was noted. The diagnosis of hepatic encephalopathy was made after ruling out hypoxemia, pharmacological factors or other metabolic factors. Re-exploration for bleeding was defined as bleeding that required surgical re-operation after initial departure from the operating theatre. Renal failure was defined as patients with a post-operative kidney dysfunction requiring dialysis. Prolonged mechanical ventilation was defined as the need for intubation and mechanical ventilation for more than 72 hours, after completion of the operation.

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Surgical Procedures:

All surgical procedures were carried out through a median sternotomy. Six patients were operated without the need for cardiopulmonary bypass (CPB). Among those, there were five cases of off-pump coronary artery bypass grafting (OPCAB) and one case of pericardiectomy. The remaining 52 patients were operated using cardiopulmonary bypass. 21 patients were offered multiple valves surgery, 11 patients required single valve surgery. 14 patients underwent conventional coronary artery bypass grafting and 4 patients required CABG & valve surgery and 2 patients required aortic surgical procedures.

Ethical approval:

The study was approved by the Institutional Ethical Committee of Cairo University Hospitals. Given the retrospective nature of the study, patients' consents were waived.

Statistical analysis

Data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as mean ± SD. Categorical variables were expressed as numbers and percentages. Comparison of quantitative variables was done using student-*t* test while comparison of categorical data was done using Chi-square test (X^2). A difference was considered significant when $p \leq 0.05$.

RESULTS

Among the 58 patients receiving a cardiac surgical procedure during the study period, early mortality rate was 20.7%. The commonest cause of death was sepsis, which occurred in 5 patients. Four patients died as a result of profound hepatic decompensation culminating into multi-organ failure, and one patient died as a result of low cardiac output syndrome. There was no statistically significant difference in the basic characteristics between the survivors and the deceased except for the need for an urgent or emergency procedure (Table 1).

Table (1): Patient characteristics

	Survivors (N=46)	**Non-survivors (N=12)**	***P* value**
Age	44.8 ± 11.8	45.5 ± 15.3	NS
Female	11 (23.9%)	3 (25%)	NS
NYHA III-IV	24 (52%)	6 (50%)	NS
Ejection Fraction	56 ± 10	55.6 ± 10	NS
Hypertension	17 (34.7%)	4 (33.3%)	NS
Diabetes Mellitus	19 (39.1%)	3 (25%)	NS
Current smoker	22 (47.8%)	5 (41.6%)	NS
Non-Elective procedure	7 (15.2%)	5(41.6%)	≤ 0.05
Cardiopulmonary bypass time (min)	100 ± 65	102 ± 76	NS
Aortic cross clamp time (min)	67 ± 38	77 ± 46	NS

Concerning their hepatic profile, the only variable proving to be significantly different was the CP class (Table. 2).

Table (2): Hepatic & renal profile of patients

	Survivors (N = 48)	**Non-survivors (N =12)**	***P* Value**
CP Class A	33/37 (89.2%)	4/37 (10.8%)	
CP Class B	12/16 (75%)	4/16 (25%)	
CP Class C	1/5 (20%)	4/5 (80%)	≤ 0.05
Total Bilirubin (mg/dl)	1.7 ± 0.09	2 ± 0.8	NS
Albumin (g/dl)	3.4 ± 0.5	3.2 ± 0.1	NS
INR	1.2 ± 0.2	1.4 ± 0.3	NS
Platelet count	170 ± 9	161 ± 7	NS
Serum Creatinine	1.2 ± 0.3	1.4 ± 0.2	NS

The complication rate was high compared to normal population with only 37 patients (63.7%) having an uneventful postoperative course until discharge. The need for prolonged mechanical ventilation was the commonest complication, occurring at a rate of 13.7% and hepatic decompensation occurred in 10.3% of the patients (Table 3).

Table (3): Mortality and Morbidity

	Incidence
Early Mortality	10/58 (20.7%)
Hepatic decompensation	6/58 (10.3%)

Renal Failure	5/58 (8.6%)
Prolonged Ventilation	8/58 (13.7%)
Re-exploration for bleeding	7/58 (12%)
Deep Wound Infection	5/58 (13.7%)

DISCUSSION

In the current study, we analyzed the early outcomes of patients with liver cirrhosis who underwent cardiac surgery in the setting of an Egyptian University Hospital. Compared to other studies on cirrhotic patients undergoing cardiac surgery, the only remarkable difference in the demographic characteristics of our patients, was a much lower mean age [2-5, 8, 9].

This maybe attributed to the large number of patients requiring valvular procedures due to a rheumatic etiology, which tends to occur at a younger age in our region. The hepatitic etiology of cirrhosis as compared to alcoholism being a major cause of cirrhosis in western studies may also contribute to a younger age of incidence of cirrhosis in our population [1, 10]. Despite the younger age, the early mortality rate in our study (20.7%) was comparable to other studies where early mortality of cirrhotic patients ranged between 15.9% and 26% [8, 9, 11].

Only two factors seemed to be associated with a higher early mortality. The first was the CP class reflecting the severity of hepatic decompensation. In our study early mortality increased from 10.8% in patients with a CP class A to 80% in patients with a CP class C. Although, some authors did not find a statistically significant association between CP class and early mortality [9], the majority of published series found the CP class to be the major determinant of outcomes in cirrhotic patients undergoing cardiac surgery [8, 11-13]. In two of these studies the mortality in patients with CP class C reached 100% [12, 13], which is comparable to the 80% early mortality rate in the same subset of patients in our study. Another model that was tried to prognosticate in cirrhotic patients undergoing surgery is the model for end-stage liver disease (MELD). This is an objective scoring system used to predict 90 days mortality in cirrhotic patients, used mainly to prioritize organ allocation in patients awaiting liver transplant [14]. Similar to the CP class, the higher the MELD score, the poorer were the surgical outcomes in cardiac surgical case series [3, 4]. However, CP class was found to be a better predictor of hospital mortality in cirrhotic patients undergoing cardiac surgery [11].

Similar to other reports [3-5, 11-14] this higher mortality was paralleled by a significant increased rate of complications; with higher incidence of postoperative bleeding, prolonged ventilation, and a higher incidence of deep wound infection. The significant increase in morbidity and mortality from CP class A to class C has been proven in a meta-analysis [15] including 939 patients from 22 reports originating from eight countries, and another publication compiling available evidence to guide management of such patients [16].

Of note, was also the significant increase in the incidence of renal failure compared to the general population. This should be borne in mind, ensuring adequate hydration and avoidance of nephrotoxic medications in cirrhotic patients, which are more prone to renal failure perioperatively [17].

From these findings it seems that cardiac surgery can be undertaken with acceptable outcomes in CP class A patients. The decision in CP class B patients should be individualized after proper assessment of the cardiac condition and the level of hepatic decompensation. In Class C patients, the risks of heart surgery are almost prohibitive. Other medical and interventional alternatives to surgery should be contemplated. Some authors recommended combining cardiac surgery with hepatic transplantation, although such a strategy seems overly complex and unrealistic in most settings [18, 19].

The second variable that was found to be associated with higher mortality in cirrhotic patients was the need for urgent or emergency procedures. In an elective setting, the surgical team is offered the luxury of patient selection and preparation, which is not the case in emergency settings. This finding should encourage early referral of cirrhotic patients in need of cardiac surgery for consultation prior to deterioration of their cardiac condition necessitating urgent procedures. Otherwise, the poor surgical outcomes would become a self-fulfilling prophecy, compounded by the added risk of a non-elective procedure.

Our study had certain limitations. It's retrospective in nature and including only the patients that were operated, which might have introduced a form of selection bias. Like similar studies, the number of cases is relatively small especially when divided into three groups according to the CP classification. Despite these limitations, the study provided good insight into expected outcomes of cirrhotic patients being operated in our settings.

CONCLUSION

CP class seems to be an effective tool to assess cardiac surgical risk in patients with liver cirrhosis. CP class A patients although apparently having a higher morbidity and mortality risk than the general population, their mortality rate following cardiac surgery remains acceptable indicating that cardiac surgery can be safely performed in such patients. CP class B patients have a higher mortality rate following cardiac surgery and may benefit from more thorough evaluation before surgery. The mortality in patients

with CP class C is extremely high and almost prohibitive.

Alternatives to surgery should be contemplated prior to offering such extremely risky procedures. Non-elective procedures are also associated with a significant increase in early mortality. This should be borne in mind, as well while assessing surgical risk in cirrhotic patients.

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