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Peri-Operative Hepatic Protection in Hepatic Patient Undergoing Non-Hepatic Surgery

Essay

Submitted for Partial Fulfilment of Master Degree in Anesthesiology

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Introduction

Liver cirrhosis is a final common pathway for chronic liver diseases of different etiologies. In Egypt, liver cirrhosis is mostly due to bilharzial peri-portal hepatic fibrosis or repeated viral attacks leading to chronic hepatitis ***(Moemen et al., ٢٠٠٤).***

It has been estimated that about ١٠٪ of patients with liver cirrhosis will undergo surgery in the last ٢ years of their life ***(Millwala et al., ٢٠٠٧).***

The reported mortality rates in patients with liver cirrhosis undergoing various surgical procedures range from ٨,٣٪ to ٢٥٪ in comparison to ١,١٪ in non cirrhotic patients ***(Ziser et al., ١٩٩٩).***

This wide range of mortality rates is related to severity of liver disease, type of surgery, anesthesia and intensive care unit (ICU) team (***del Olmo et al., ٢٠٠٣***).

It is therefore, important to assess the risk relation to the type of surgery performed; the type of surgery could be categorized into high, moderate or low risk surgery ***(Keegan et al., ٢٠٠٥).***

Because of significant inter-individual differences and the often severely reduced functional reserve capacity of patients with liver dysfunction, the pre-operative work-up needs to be tailored to individual patient. Assessing the general health and co-morbidities, e.g. coagulopathy, renal function, volume and electrolyte status and cardiovascular function, is essential for anticipating the need for invasive cardiovascular monitoring, transfusion requirements and prolonged post-operative monitoring in high-dependency areas to minimize the risk of peri-operative liver insults ***(Picker et al., ٢٠٠٧)***.

Aim of the work

The aim of this study is to explore the role of anesthesiologist in handling hepatic patients to improve their hepatic condition and boasting or at least preserve their Child's classification category by optimizing pre-operative circumstances, preventing or minimizing intra-operative chemical hepatic injury and planning or advising for post-operative maintaining hepatic functions.

This will be via reviewing the available literature whether the established evidence based data or the newly emerging researches and the feasibility to implement such data &/or protocols on the Egyptian patients population.

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References

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Chapter ١

PATHOPHYSIOLOGY

Cirrhosis is a serious and progressive disease that eventually results in hepatic failure. The most common cause of cirrhosis in the United States is alcohol (Laennec's cirrhosis). Other causes include chronic active hepatitis (postnecrotic cirrhosis), chronic biliary inflammation or obstruction (primary biliary cirrhosis, sclerosing cholangitis), chronic right-sided congestive heart failure (cardiac cirrhosis), autoimmune hepatitis, hemochromatosis, Wilson's disease, non-alcoholic steatohepatitis, and cryptogenic cirrhosis. Regardless of the cause, hepatocyte necrosis is followed by fibrosis and nodular regeneration. Distortion of the liver's normal cellular and vascular architecture obstructs portal venous flow and leads to portal hypertension, whereas impairment of the liver's normal synthetic and other diverse metabolic functions results in multisystem disease ***(Morgan et al., ٢٠٠٦)***

Few diseases can produce hepatic fibrosis without hepatocellular necrosis or nodular regeneration. They result mainly in portal hypertension and its associated complications; hepatocellular function is often but not always preserved. These disorders include schistosomiasis, idiopathic portal fibrosis (Banti's syndrome), and congenital hepatic fibrosis. Obstruction of the hepatic veins or inferior vena cava (Budd–Chiari syndrome) can also cause portal hypertension. The latter may be the result of venous thrombosis (hypercoagulable state), a tumor thrombus (renal carcinoma), or occlusive disease of the sublobular hepatic veins ***(Morgan et al., ٢٠٠٦).***

Classification of liver disease:

Two main classification systems have been developed to stratify patients with liver dysfunction. Both systems were developed initially to differentiate between patients belonging to specific populations but were then extended and extrapolated to all patients with liver disease. The Child-Turcotte-Pugh (CTP) system, initially developed in ١٩٦٤ as the Child-Turcott system, characterized the degree of liver disease in patients undergoing portosystemic shunting procedures *(see table no. ١)* ***(Child et al., ١٩٦٤).***

Patient were assessed using serum albumin level, serum bilirubin level, ascites, encephalopathy, and nutritional status, and then assigned to a class: A (good, ٤٪ ٣-month mortality), B (intermediate, ١٤٪ ٣-month mortality), or C (poor, ٥١٪ ٣-month mortality). The category of nutritional status was replaced with prothrombin time by Pugh in ١٩٧٠ to decrease the subjectivity of the score *(see table no. ٢).* The system evolved into a widely accepted stratification method for all patients with liver dysfunction and became a common term in medical language when discussing a patient with liver disease. It was also a key component in the algorithm for liver transplant allocation until it was supplanted by the Model for End-Stage Liver Disease (MELD) ***(Durand et al., ٢٠٠٥).***

١-Both scores are able to reliably predict mortality in cirrhotic patients, but the MELD is a more uniform system and more applicable to comparing multiple patients or groups of patients due to its lack of subjectivity.

٢-The CTP score is well suited to evaluation of an individual patient because of its familiarity and ease of use. However, care should be taken when applying it to a patient with Childs class A or B with concomitant renal dysfunction, as this is not accounted for in the CTP system but has important prognostic significance in cirrhosis. The MELD provided a more accurate prediction of patient outcomes than the CTP score. The investigators proposed using a ‘‘cutoff’’ MELD score of ١٤ to

distinguish between patients likely to have either a good or bad outcome following abdominal surgery, stating that the positive and negative predictive values of the MELD were more accurate than the three classes of the CTP score ***(Befeler et al., ٢٠٠٥).***

Table (١): Child-Turcotte Classification

	A	B	C
Bilirubin (mmol/L)	<٣٥	٣٥-٥٠	>٥٠
Albumin (g/L)	>٣٨	٣٨-٣٠	<٣٠
Ascites	Absent	Controlled	Poor control
Encephalopathy	Absent	Present	Coma
Nutrition	Excellent	Good	Poor
Postoperative mortality %	١	١٠	٥٠

Table (٢): Child-Pugh modified classification of liver disease

	A	B	C
Bilirubin (mmol/L)	<٤٠	٤٠-٥٠	>٥٠
Albumin (g/L)	>٣٥	٣٥-٢٨	<٢٨
Ascites	None	Mild	Moderate-Severe
Encephalopathy	Absent	Grade I, II	Grade III, IV
PT prolonged (S)	٠	<٢,٥	>٢,٥
Surgical risk	Good	Moderate	Poor
Postoperative mortality (%)	٣-١٠	١٠-٣٠	٥٠-٨٠

MELD score

Current methods of predicting risk of postoperative mortality in patients with cirrhosis are suboptimal. The utility of the Model for End-stage Liver Disease (MELD) in predicting mortality after surgery other than liver transplantation is unknown ***(Teh et al., ٢٠٠٧).***

Patients undergoing major surgery were at increased risk for mortality up to ٩٠ days postoperatively. By multivariable analysis, only MELD score, American Society of Anesthesiologists class, and age predicted mortality at ٣٠ and ٩٠ days, ١ year, and long-term, independently of type or year of surgery. Emergency surgery was the only independent predictor of duration of hospitalization postoperatively. Thirty-day mortality ranged from ٥,٧٪ (MELD score, <٨) to more than ٥٠٪ (MELD score, >٢٠). The relationship between MELD score and mortality persisted throughout the ٢٠-year postoperative period ***(Teh et al., ٢٠٠٧).***

I.Indications

A. Cirrhosis Prognosis

B. Liver Transplantation Evaluation

II. Criteria

A. Serum Bilirubin

B. INR

C. Serum Creatinine

D. Cirrhosis Etiology

١. Alcohol or Cholestasis: ٠

٢. Other etiologies: ١

III. Calculation

MELD = ٣,٨ (Ln Bilirubin) + ١١,٢ (Ln INR) + ٩,٦ (Ln Creatinine) + ٦,٤ (etiology).

.Where Ln is logorithm

United Network for Organ Sharing (UNOS) has made the following modifications to the score:

- If the patient has been dialyzed twice within the last ٧ days, then the value for serum creatinine used should be ٤,٠.
- Any value less than one is given a value of ١ (i.e. if bilirubin is ٠,٨, a value of ١,٠ is used) to prevent the occurrence of scores below ٠ (the natural logarithm of ١ is ٠, and any value below ١ would yield a negative result).

IV. Postoperative Mortality for patients with Cirrhosis

A. Score ٠-٥

١. Mortality at ٧ days: ٠,٦٪

٢. Mortality at ٣٠ days: ٣,٢٪

٣. Mortality at ٩٠ days: ٧,١٪

B. Score ٦-١٠

١. Mortality at ٧ days: ٢,٨٪

٢. Mortality at ٣٠ days: ٨,٦٪

٣. Mortality at ٩٠ days: ١٣,٩٪

C. Score ١١-١٥

١. Mortality at ٧ days: ٧,٢٪

٢. Mortality at ٣٠ days: ٢١,٩٪

٣. Mortality at ٩٠ days: ٣٠,٦٪

D. Score ١٦-٢٠

١. Mortality at ٧ days: ١٤,٦٪

٢. Mortality at ٣٠ days: ٤٤,٠٪

٣. Mortality at ٩٠ days: ٥٥,٨٪

E .Score ٢١-٢٥

١. Mortality at ٧ days: ٢٢,٢٪

٢. Mortality at ٣٠ days: ٥٥,٦٪

٣. Mortality at ٩٠ days: ٦٦,٧٪

F. Score >٢٦

١. Mortality at ٧ days: ٢٥,٠٪

٢. Mortality at ٣٠ days: ٨٧,٥٪

٣. Mortality at ٩٠ days: ٨٧,٥٪

Moemen Modified Child Classification of liver disease

A scoring system to determine surgical risk implies that each parameter in class A, B and C gets ١, ٢ and ٣ points respectively *(see table no. ٣).* Minimum and maximum monitoring for any patient equals ٩ and ٢٧ points respectively. The surgical risk of liver disease is classified according to the points into: mild ٩-١١ points, moderate ١١-١٤ points and severe ١٥-٢٧ points. With mild surgical risk, patients show normal tolerance to surgery due to the liver ability to regenerate. With moderate risk, they show good tolerance to all types of surgery if perioperative preparation and care are carried out efficiently due to the limited ability of the liver to regenerate. Patients in end-stage liver disease show poor tolerance to surgery regardless of efficient perioperative preparation. This stage is the optimum for liver