Evaluation of the usefulness of sequential organ failure assessment (SOFA) and acute physiology and chronic health evaluation III (APACHE III) scoring systems in outcomes prediction of critically ill cirrhotic patients

Thesis

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✍ *Ahmed Nasser Abdelfattah*

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List of Abbreviations

Abb.	Full term

APACHE.....: Acute Physiology and Chronic Health Evaluation
AUC .....: Area under curve
ECM .....: Extracellular Matrix
FiO2.....: Fraction of inspired oxygen
GCS.....: Glasgow coma scale
HS.....: Highly significant
ICU .....: Intensive care unit
MBP.....: Mean arterial pressure
NPV.....: Negative predictive value
NS.....: Non significant
PaO2 .....: Arterial partial pressure of oxygen
PBC.....: Primary biliary cirrhosis
PPV.....: Positive predictive value
ROC curve.....: Receiver operating characteristic curve
RR.....: Respiratory rate
S.....: Significant
SD.....: Standard deviation
SOFA .....: Sequential organ failure assessment
UOP .....: Urine output

INTRODUCTION

Accurate prognostic predictors are crucial for patients admitted to an intensive care unit (ICU). Prognostic scoring systems are useful for clinical management such as predicting a survival rate, making decisions, and facilitating explanation of disease severity by clinical physicians ***(Fu et al., 2014).***

Several predictive scoring systems have been developed and validated in general intensive care unit populations, to evaluate the severity of illness and prognosis.

Although some prognostic models have also been validated in cirrhotics admitted to ICU because there has been renewed interest in critically ill cirrhotics due to increasing use of sophisticated (but more expensive) technology and medical care: e.g. trans jugular intrahepatic Porto systemic shunt placement in uncontrolled gastrointestinal bleeding(GIB) and bio artificial livers in liver failure. In addition, liver transplantation can offer long-term survival. These new therapeutic possibilities require reliable prognostic factors to construct useful therapeutic algorithms for critically ill cirrhotics. Conversely, it is useful to have some basis to assess when ICU therapy may be futile ***(Cholongitas et al., 2006).***

The APACHE III score, one of the widely used scoring systems, is known for its accuracy in predicting mortality.

However, the APACHE III scoring system was initially developed for various diseases and not exclusively for liver-related diseases. By contrast, the SOFA score, another widely used scoring system, is superior to the APACHE III scoring system for assessing specific organ dysfunction including cirrhosis ***(Fu et al., 2014)***.

This study is going to discuss the different clinical characteristics and Outcomes of cirrhotic patients assessed by SOFA compared with these assessed by APACHE III scores.

Aim of the Work

To determine the accuracy of APACHE III and SOFA scores in outcome prediction for cirrhotic patients.

LIVER CIRRHOSIS

Definition:

The term cirrhosis was first introduced by ***Laennec in 1826.*** It is derived from the Greek term *scirrhus* and is used to describe the orange or tawny surface of the liver seen at autopsy ***(Wolf, 2004).***

It is defined histologically as a diffuse hepatic process characterized by fibrosis and the conversion of normal liver architecture into structurally abnormal nodules with a disturbed intrahepatic circulation ***(Wolf, 2004).***

Cirrhosis is the final stage of several chronic hepatic diseases and it is characterized by the presence of fibrosis and morphologic conversion from the normal hepatic architecture into structurally abnormal nodules ***(Daniel et al., 2006)***.

Pathogenesis and Pathophysiology:

Hepatic fibrosis is the result of the wound-healing response of the liver to repeated injury ***(Friedman, 2003*)**. After an acute liver injury (e.g. viral hepatitis), parenchymal cells regenerate and replace the necrotic or apoptotic cells. This process is associated with an inflammatory response and a limited deposition of ECM (Extracellular Matrix). If the hepatic injury persists, then eventually the liver regeneration fails, and

hepatocytes are substituted with abundant ECM, including fibrillar collagen. The distribution of this fibrous material depends on the origin of the liver injury. In chronic viral hepatitis and chronic cholestatic disorders, the fibrotic tissue is initially located around portal tracts, while in alcohol-induced liver disease; it locates in pericentral and perisinusoidal areas. As fibrotic liver diseases advance; progression from collagen bands to bridging fibrosis to frank cirrhosis occurs ***(Ramon and David, 2005)***.

Hepatocytes are targets for most hepatotoxic agents, including hepatitis viruses, alcohol metabolites, and bile acids ***(Higuchi and Gores 2003)***. Damaged hepatocytes release fibrogenic mediators and induce the recruitment of white blood cells by inflammatory cells. Apoptosis of damaged hepatocytes stimulates the fibrogenic actions of liver myofibroblasts ***(Canbay et al., 2004).***

Etiology of Liver cirrhosis:

(1) Presinusoidal:

- Idiopathic portal fibrosis.

(2) Parenchymal fibrosis:

A. Drugs and toxins

- Alcohol.
- Methotrexate.
- Vitamin A.

- Amiodarone.
- α methyl dopa.

B. Infections

- Chronic hepatitis B & C.
- Brucellosis.
- Echinococcosis.
- Congenital or tertiary syphilis.

C. Autoimmune disease

1. Autoimmune hepatitis.

D. Vascular abnormalities

1. Chronic passive congestion.
2. Hereditary hemorrhagic telangiectasia.

E. Metabolic / genetic diseases

1. Wilson disease.
2. Genetic hemochromatosis.
3. α1 antitrypsin deficiency.
4. Carbohydrate metabolism disorders.
5. Bile acid disorders
6. Lipid metabolism disorders
7. Urea cycle defects
8. Porphyria

9. Amino acid disorders

F. Biliary obstruction

1. Primary & secondary biliary cirrhosis.
2. Cystic fibrosis.
3. Biliary atresia.
4. Congenital biliary cysts.

G. Idiopathic / miscellaneous

1. Nonalcoholic steatohepatitis.
2. Indian Childhood cirrhosis.
3. Polycystic liver disease.

(3) Post sinusoidal fibrosis:

Veno-occlusive disease

Budd chiari syndrome ***(Friedman, 2007).***

Classification of cirrhosis:

I) Morphological classification:

The morphologic spectrum can be divided on the basis of nodule size into micronodular, macronodular, and mixed patterns.

1- Micronodular cirrhosis:

It is characterized by a preponderance of uniform small nodules and is usually accompanied by narrow fibrous septa.