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The Effectiveness of Bilirubin Column on Severe Hyperbilirubinemia in a Patient with Cardiac Cirrhosis

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CASE REPORT

ABSTRACT

The aim of extracorporeal detoxification through plasma exchange therapy is to eliminate protein-bound components and to prevent their potential toxic effects. It is thought that hyperbilirubinemia has a direct cytotoxic effect on T lymphocytes and that it thus increases infection and sepsis. The use of bilirubin absorption column reduces bilirubin levels in patients with hepatic insufficiency. For the first time in Turkey, we presented a patient with cardiac cirrhosis and high bilirubin levels who was successfully treated with bilirubin absorption column method.

Key words: Bilirubin absorption column, hepatic failure, hyperbilirubinemia

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INTRODUCTION

It is well recognized that sepsis, hepatitis, and severe inflammatory diseases are frequently associated with bilirubin and bile acid elimination disorders. As a result, elevated serum bilirubin levels may eventually lead to clinical hyperbilirubinemic signs, consisting of impaired consciousness, generalized seizures, and cardiac arrhythmia (1). In recent years, plasma exchange and bilirubin absorption have been preferred in the treatment of hyperbilirubinemia in hepatic diseases (2). Acute-on-chronic hepatic failures, such as hepatic encephalopathy, portal hypertension, ascites, or hepatorenal syndrome, result from endogenous and exogenous toxins (3). The aim of extracorporeal detoxification through plasmapheresis therapy is to eliminate protein-bound components and to prevent their potential toxic effects. The use of bilirubin absorption column reduces bilirubin levels in patients with hepatic insufficiency. Treatment of hyperbilirubinemia with this method in the literature is limited. There is no written information about the method of bilirubin absorption column in Turkey. In this case report, we, for the first time in Turkey, presented a patient with cardiac cirrhosis and high bilirubin levels who was successfully treated with bilirubin absorption column method.

CASE REPORT

A 59-year-old man was admitted to the intensive care unit with complaints of poor general status, dyspnea, palpitation, jaundice across the body, and dark urine. The patient had undergone mitral and aortic valve replacement 12 years before. He also had a history of type 2 diabetes mellitus and hypertension. Laboratory values at admission are shown in Table 1. An abdominal distension was detected in the physical examination. On the abdominal sonography, hepatic veins were prominent; the liver was greater than normal size; and there was free fluid in the abdomen. The patient's left ventricular ejection fraction was 25% in the transthoracic echocardiography. The patient was initially diagnosed as cardiac cirrhosis and acute renal failure. At admission, the patient's blood pressure and heart rate were 110/60 mm Hg and 80 beats/min, respectively. Sepsis and septic shock were excluded in the patient. The patient was initially diagnosed as cardiac cirrhosis and acute renal failure. The patient received hemodialysis every other day with transfusion of 10 units total of fresh frozen plasma. However, plasma perfusion was started by using a bilirubin absorption column (Plasorba, BR-350; Asahi Medical, Japan) on Day 5 due to progressive worsening in the laboratory and clinical findings. Overall, four plasma perfusions (5 hours per day) were performed. The course of laboratory values before and during the plasma perfusion is shown in Table 2. The treatment of the patient's primer disease, heart failure, was continued during that time. The patient, with progressive improvement in the clinical and laboratory findings, was transferred to the ward on Day 10 after the intensive care unit (ICU) admission. He showed further improvement in clinical and laboratory findings and was discharged home on Day 19 after the ICU admission.

DISCUSSION

Bilirubin adsorbent column method was used for liver failure in 1989 for the first time (4). This method is not used very often in the ICU for some reasons, such as the difficulty and the cost of supplying the colon. The clinical

manifestation results from endogenous and exogenous toxins in acute-on-chronic liver failure (2). Water-soluble components can be removed via hemodialysis or hemofiltration techniques. However, components containing lipid, conjugated bilirubin, bile acid, amino acids, and fat acids can not be readily removed from the blood, as they are bound to plasma proteins and albumin (3). The aim of extracorporeal detoxification is to prevent potential toxic effects of these protein-bound components. Hepatic toxins have not only direct toxic effects but also an indirect effect triggering hepatic encephalopathy as a pseudo-neurotransmitter (5). It is suggested that hyperbilirubinemia has a direct cytotoxic effect on T lymphocytes and that it thus increases infection and sepsis (6). High levels of bile acids impede the regeneration of parenchymal liver cells through cytolysis and apoptosis (7). Also, renal failure can develop by the injury of cells in renal medulla via the same mechanism (7, 8). Detoxification prevents these complications. Several systems have been developed for detoxification. These systems can be classified as artificial and bioartificial (9).

Table 1. Laboratory parameters of the patient at admission

Parameters	Laboratory Values
White Blood Cells (/mm^3)	12,640
Hemoglobin (mg/dL)	9.9
Platelet (/mm^3)	73,000
Blood glucose (mg/dL)	43
BUN (mg/dL)	74
Cr (mg/dL)	4.42
Sodium (mmol/dL)	136
Potassium (mmol/dL)	4.5
AST (u/L)	28
ALT (u/L)	19
Total Bilirubin (mg/dL)	63.9
Direct Bilirubin (mg/dL)	52.4
Total Protein (g/dL)	5.8
Albumin (g/dL)	3.7
PT (second)	59.9
INR	6.38
aPTT (second)	54

BUN: Blood urea nitrogen; Cr: Creatinine; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; PT: Prothrombin time; INR: International Normalized Ratio; aPTT: Activated partial thromboplastin time

In patients with hyperbilirubinemia, many factors should be considered to enhance the utilization from plasma exchange. The selection of the method to remove specific bilirubin fractions will enhance utilization (10). Bilirubin absorption column has been primarily used in hepatic failure (11). It has been reported that the use of bilirubin absorption column stabilizes or decreases bilirubin levels in patients with hepatic failure. It has been found that bilirubin levels progressively increase in control groups in which bilirubin absorption column is not used (1). In addition to the decreased bilirubin levels, histological improvement was achieved in patients who underwent liver transplantation with cholestatic graft dysfunction (12). In previous studies, it was shown that the use of bilirubin absorption column stabilizes and decreases bilirubin levels as well as prevents the progression to multi-organ failure (13-15). In our case, the patient was successfully treated via plasma perfusion with bilirubin absorption column.

CONCLUSION

The use of bilirubin absorption column may be considered in patients with severe hyperbilirubinemia.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

Peer-review: Externally peer-reviewed.

Authors' Contributions: Conceived and designed the experiments or case: RC, MS, MG. Performed the experiments or case: RC, KG, and ÇP. Analyzed the data: RC, KG. Wrote the paper: RC, SU, KG, and İHA. All authors have read and approved the final manuscript.

Table 2. The course laboratory parameters by plasma perfusion

	Total Bilirubin (mg/dL)	Direct Bilirubin (mg/dL)	BUN (mg/dL)	Cr (mg/dL)	PT (second)	aPTT (second)	INR
Before procedure	54	46	145	8.5	73.8	56.3	8.03
Day 1	24	21.2	141	7.44	68.4	53.9	7.25
Day 2	21.7	19.9	124	8.05	56.4	45.6	6.3
Day 3	10.4	9.5	71	5.2	46.3	40.4	4.8
Day 4	9.2	7.3	86	6.12	21.8	28.4	2.06
ICU Discharge	9.1	7.3	56	3.9	17	28.7	1.58
Hospital discharge	5.1	4.0	22	1.9	15.6	32	1.4

BUN: Blood urea nitrogen; Cr: Creatinine AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; PT: Prothrombin time; ICU: Intensive Care Unit; INR: International Normalized Ratio; aPTT: Activated partial thromboplastin time

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