Usage of liver assist device in chemotherapy induced acute hepatic failure

Karaciğer destek aygıtının kemoterapiye bağlı akut karaciğer yetmezliğinde kullanımı

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Abstract
Drugs, especially chemotherapeutics might induce acute hepatic failure with different mechanisms. Mortality rates in patients with acute liver failure still remain unacceptably high. Management should aim to prevent complications to allow the liver to regenerate or, if this is unlikely, to allow enough time to find a suitable organ for transplantation. Different liver support devices have been developed to stabilize the patient during this period. In this case report we present the usage of liver support device in an acute lymphoblastic leukemia (ALL) patient with chemotherapy induced acute hepatic failure while waiting chemotherapy results in bone narrow.
Key words: chemotherapy, hepatic failure, liver asist device

Özet
İlaçlar özelliklede kemoterapötikler farklı mekanizmalarla akut karaciğer yetmezliğine neden olmaktadırlar. Akut karaciğer yetmezlikli hastalarda mortalite oranları hala kabul edilemeyecek düzeyde yüksektir. Tedavide, karaciğer rejenere olana kadar veya bu mümkün değilse organ nakli için uygun bir organ bulunana kadar komplikasyonları engellemek hedeflenmelidir. Bu bekleme periyodunda hastayı stabilize etmek için farklı karaciğer destek araçları geliştirilmiştir. Bu olgu sunumunda ALL'li bir hastada kemoterapiye bağlı gelişen akut karaciğer yetmezliğinde, kemik iliğinin kemoterapiye cevabı beklenirken, yapay karaciğer desteği kullanımı sunulmuştur.
Anahtar kelimeler: kemoterapi, karaciğer yetmezliği, karaciğer destek aygıtı

Introduction

Acute liver failure (ALF) is a syndrome in which acute loss of metabolic and synthetic liver function leads to hepatic encephalopathy and multiorgan failure within a short time in patients with no previous history of liver disease (1). Mortality rates in patients with ALF vary considerably in different studies, ranging from 10% to 90%, but still remain unacceptably high (2). Management should aim to prevent complications to allow the liver to regenerate or, if this is unlikely, to allow enough time to find a suitable organ for transplantation. Different liver support devices have been developed to stabilize the patient during this period. We report chemotherapy induced acute hepatic failure in an Acute lymphoblastic leukemia (ALL) patient in whom artificial liver support was used while waiting for the chemotherapy results in bone narrow.

Case report

65 year old woman accepted to our reanimation unit with ALF. She was diagnosed as ALL according to bone narrow examination one month ago. LINKER chemotherapy protocol including; daunorubicin, vincristine, prednisone, asparaginase was applied to patient. Her liver enzymes and coagulation parameters worsened day by day at the end of the chemotherapy protocol. On admission Glasgow coma scale (GCS) was 8, tension arterial was 95/47 mm Hg, CVP was 3 mm Hg, and mechanical ventilation was started according to the arterial blood gas (ABG) examination. Laboratory examination revealed AST: 156 IU/L, ALT: 262 IU/L, GGT:378 IU/L, ALP: 247 IU/L, LDH: 1930 IU/L, Albumin: 2.9 g/dl, Total bilirubin: 14.9 mg/dl, direct bilirubin: 8.8 mg/dl, indirect bilirubin :6,1 mg/dl, platelet: 78 000 PT:17 s, aPTT: 37.4 s, D-dimer: 719 mcg/ml, INR: 1.4, Amoniac: 62 µg/dl.

Acute hepatic failure was serious, we decided to use Protmetheus (Fresenius) liver assist device for four sessions in four days. After the last session results were as follows: AST: 67 IU/L, ALT: 56 IU/L, GGT: 594 IU/L, ALP: 391 IU/L, LDH: 567 IU/L, Albumin: 3 g/dl, total bilirubin: 4,9 mg/dl, direct bilirubin: 3,8 mg/dl indirect bilirubin :1,6 mg/dl, platelet: 31 000 PT:13 s, aPTT: 25.4 s, D-dimer: 244 mcg/ml, INR: 1.1, amoniac: 48 µg/dl, GCS: 15. ALL was accepted as remission on the 8th day of admission. Mechanical ventilation was ended according to the ABG results and clinicai condition. Patient was transferred to gastroenterology clinic. She was discharged on 12 th day of admission.

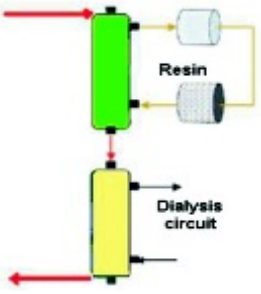

Figure 1. *Schematic depiction of the Prometheus system. Blood from the patient is pumped through a filter which is permeable to albumin (A). Blood ultrafiltrate enters a closed loop circuit containing two adsorbent cartridges (resin). Purified albumin enters the blood stream and is subjected downstream to high-flux hemodialysis.*

Discussion

Liver support devices may broadly be classified into artificial systems, which are cell-free, and bioartificial systems, which use human or animal livers or hepatocytes. The key role of artificial support devices is to remove toxins which are responsible for hepatic encephalopathy and multiorgan failure secondary to liver failure. The first generation of these devices was based on charcoal haemoperfusion (3, 4). Newer systems are relatively specific for albumin-bound toxins which are thought to have a causal role in ALF. Two extracorporeal liver-assist devices are currently commercially available, the Molecular Adsorbents Recirculating System (MARS; Gambro, Sweden) and the Fractionated Plasma Separation, Adsorption and Dialysis system (FPAD; Prometheus, Fresenius Medical Care, Germany). In MARS, blood is dialysed across an albumin-impermeable membrane with a molecular weight cutoff of 60 kDa against 20% human serum albumin, which is continuously stripped by subsequent passage through columns of charcoal and an anion exchange resin. Water-soluble substances are removed by a low-flux dialyser connected to the secondary circuit (5). In Prometheus, (Figure 1) the patient's own albumin is separated by a membrane with a molecular weight cut off approximately 300 kDa and directly passed over two columns containing different adsorbents. Water-soluble substances are cleared by a high-flux dialyser directly inserted into the blood circuit (6). Prometheus produces higher blood clearances than MARS for many toxins (urea nitrogen, creatinine, ammonia, bilirubin), although not bile acids and cytokines (5, 7). However, clinical experience is limited and prospective controlled studies are necessary to evaluate specific clinical endpoints, including the effect of this therapy on patient survival.

In conclusion, mortality associated with liver failure remains high and liver support therapies with non-biological systems may have a role in the treatment of drug induced hepatic failure and might be used safely in these patient group while waiting for the chemotherapy results in bone narrow.

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References

1) O'Grady JG, Schalm SW, Williams R. Acute liver failure: redefining the syndromes. Lancet 1993; 342:273–275.
2) O'Grady JG. Acute liver failure. Postgrad Med J 2005; 81:148–154.
3) O'Grady JG, Gimson AE, O'Brien CJ, et al. Controlled trials of charcoal hemoperfusion and prognostic factors in fulminant hepatic failure. Gastroenterology 1988; 94:1186–1192.
4) McGuire BM, Sielaff TD, Nyberg SL, et al. Review of support systems used in the management of fulminant hepatic failure. Dig Dis 1995; 13:379–388.
5) Stadlbauer V, Jalan R. Acute liver failure: liver support therapies. Curr Opin Crit Care. 2007 Apr;13(2):215-21.
6) Rifai K, Ernst T, Kretschmer U, et al. Prometheus: a new extracorporeal system for the treatment of liver failure. J Hepatol 2003; 39:984–990
7) Phua J, Lee KH. Liver support devices. Curr Opin Crit Care. 2008 Apr;14(2):208-15