

Non-biological liver replacement (RHENOB): An alternative of Albumin Liver Dialysis

Guillermo Rosa Diez^a; Adrián Gadano^b; Sebastián Marciano^b; Federico Varela^a; Griselda Bratti^a; Eduardo San Román^c.
 Division of Nephrology^a, Hepatology^b and Critical Care^c  HOSPITAL ITALIANO de Buenos Aires

Introduction: Chronic liver diseases affect 10% of the world population. Five million people per year have acute liver failure in occidental countries. Since more than 30 years now, orthotopic liver transplantation has been the treatment of choice for selected patients with these diseases, but the lack of enough organs to satisfy the increasing need of transplantations as well as the elevated mortality of the operation in patients in critical condition, has led to search for additional therapies. Within the last years several therapies aiming to support liver function have developed in order to serve as a bridge to liver transplantation or as replace therapy allowing regeneration of the injured live. Biological and non biological devices providing liver support have been developed. Biological methods are difficult to implement and have a potential risk of transmitting diseases infectious and generate rejection. Then, non biological devices are being extensively studied at present, as MARS or PROMETHEUS. Our working group has had experience with the use of these devices, as well as other more accessible and effective alternatives proposed by us, such as Combined extended haemodialysis with single-pass albumin dialysis (SPAED)¹ or Combined Extended Hemodialysis with Multiple-Pass Albumin Dialysis (RAED)². Our objective is to describe a new alternative, RHENOB, as well as the preliminary results of our experience in its clinical use.

Methods: RHENOB corresponds to the initials of "non-biological liver replacement" in spanish (Reemplazo Hepático No Biológico). Figure 1 shows the characteristics, the system consists of an albumin recirculation circuit placed in series to a renal circuit (hemodialysis, hemofiltration, or hemodiafiltration) as in the case of the RAED; but includes the regeneration of albumin through the use of DPMAS (Double Plasma Molecular Adsorption System; Jafron). For the renal circuit, a dialysis membrane is used according to the chosen method (low flux hemodialysis, high flux hemodialysis, hemofiltration or hemodiafiltration); a high cut-off dialysis membrane is used for the albumin circuit; 300 ml of 20% human albumin in the albumin circuit acts as the dialysate, and is passed through the dialysate compartment of blood cut-off dialyzer. The blood flow and dialysate flow depends of hemodialytic technique used; the albumin dialysate flow is 200 ml/min. The use of heparin is applied through the renal circuit. Figure 2 shows the circuit combined with SLED. Table 1 describes 7 patients who underwent RHENOB. The efficiency of the method was evaluated through the decrease in bilirubin values. Figure 3 shows an example of a patient who later received a successful liver transplant.

Figure 1

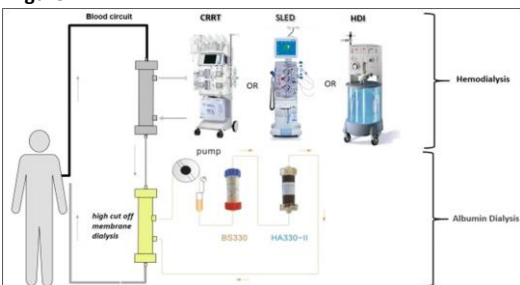
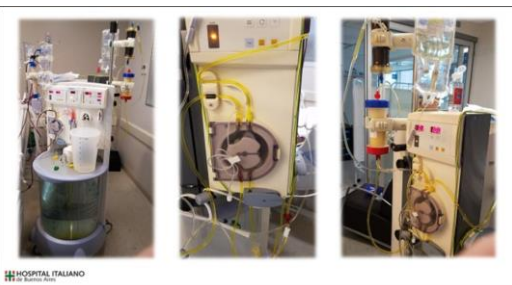


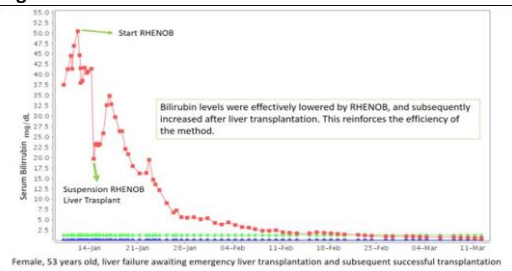
Figure 2



Table

Age	G	Etiology	Liver Tx	Outcome
53	F	Hepatic failure of unknown cause - AKIN 3	Yes	Alive
45	M	Alcoholic - Acute on Chronic Liver Failure - AKIN 3	Yes	Alive
42	M	COVID Pneumonia - Liver Failure - AKIN 3	No	Alive
63	F	Amiloidosis AL - AKIN 3	No	Alive
47	F	Primary Biliary Cirrhosis	No	Dead
66	F	Liver Transplant - Rejection - Cholestasis	Yes	Dead
61	M	Hepatitis B - Fulminant Subacute Hepatitis	Yes	Alive

Figure 3



Discussion and Conclusions:

RHENOB shows effectiveness in the elimination of albumin-bound toxins in patients with severe liver disease, presenting certain advantages over MARS and PROMETHEUS. Unlike MARS, it has an albumin circuit placed in series and not interposed, it uses less volume of albumin and does not require special technology. Unlike PROMETHEUS, it allows any type of associated hemodialysis therapy (PROMETHEUS only allows associated hemodialysis) and the heparin requirement is less. RHENOB is shown as an effective and accessible alternative for non-biological liver replacement.

1. Rosa Diez G, Greloni G, Gadano A, Giannasi S, Crucelegui M, Trillini M, Algranati S. Combined extended haemodialysis with single-pass albumin dialysis (SPAED). Nephrol Dial Transplant. 2007; 22(9):2731-2.

2. Rosa Diez G, Greloni G, Gadano A, Giannasi S, Greloni G, Crucelegui M, Varela F, San Roman E. Combined Extended Hemodialysis with Multiple-Pass Albumin Dialysis (RAED). Blood Purification 2010; 30(3):228-229.



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