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Patients treated with therapeutic plasma exchange: A single center experience

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ABSTRACT

Introduction: Therapeutic Plasma Exchange (TPE) is a therapeutic procedure that is used to remove high molecular weight substances from plasma. We analyzed data of patients who received TPE during the last 7 years, and focused on the efficiency of TPE in various disease groups.
Material and Methods: We studied 110 patients treated with TPE by membrane plasma separation technique from 2007 to 2013. We examined the demographic data, underlying disease, biochemical parameters, volume and type of replacement fluid, complications, concomitant treatment, the need for hemodialysis and number of TPE sessions.
Results: One hundred ten patients, 58 male, 52 female were included. The mean age was 47.3 ± 17.6 years. A total of 734 TPE sessions were performed and the mean number of TPE sessions per patient was 6.6 ± 4.3. The underlying disease was renal transplantation in 26 patients, ANCA-associated vasculitis in 18, rapidly progressive glomerulonephritis in 17, hemolytic uremic syndrome in 11, thrombotic thrombocytopenic purpura in 9, autoimmunic hemolytic anemia in 6, focal segmental glomerulosclerosis in 6 and other diseases. Partial and complete remission was obtained in 65 (59.1%) and 24 patients (21.8%) respectively, while 14 (12.7%) patients had no response and 7 (6.4%) patients died. Complications were muscle cramps (6.4%), allergic reactions (4.5%), severe hypotension (3.6%), fever (1.8%), unconsciousness (0.9%), leukopenia (0.9%) and catheter related hematoma (0.9%).
Conclusion: According to our 7 years of experience in TPE, we can say that therapeutic plasma exchange by membrane separation technique is a useful, easy, available and effective life-saving therapeutic treatment.

1. Introduction

Therapeutic plasma exchange (TPE) is a therapeutic procedure in which the blood of the patient is passed through a medical apparatus which extracts high molecular weight substances such as immune complexes, endotoxins, myeloma light chains, autoantibodies, lipoproteins, cryoglobulins from the plasma in exchange for a replacement solution such as albumin or fresh frozen plasma [1,2]. Plasma exchange has been used mainly for two purposes: removing high molecular weight substances like antibodies, immune complexes, etc. from the plasma and supplementing plasma with the missing essential factors [3]. It is indicated for various renal, hematological, rheumatologic, neurological, oncological,

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nephrological and multisystemic diseases usually in conjunction with classical medical therapy. TPE can be made by cytocentrifuge or membrane separation techniques. Especially membrane separation technique applied with hemodiafiltration equipment has gained increasing popularity because of being a relatively easy procedure. Furthermore it does not require a separate unit, device or hospitalization [4]. Herein, we retrospectively analyzed the performance and efficiency of TPE in various disease groups.

2. Material and Methods

In this study we retrospectively analyzed 110 patients treated with TPE between January 2007 and December 2013 in our hospital by membrane separation technique. Patient files were reviewed and data on demographic data (age, sex), underlying disease, biochemical parameters, volume and the type of replacement fluid used for TPE (human albumin and/or fresh frozen plasma), complications related with the procedure, concomitant immunosuppressive treatment, concurrent hemodialysis (HD) requirement, and the number of TPE sessions were collected. The laboratory results before and after each TPE session were also recorded. All patients had given written consent before the TPE procedure.

2.1. Procedure

Plasmapheresis was performed using a Prismaflex machine (Gambro, Lund, Sweden) via double lumen HD catheter placed to all patients. Hemodynamic parameters were monitored throughout the procedure. The patient's plasma volume was calculated using the following formula: **plasma volume (L)** = weight × 0.065 × (1 − hematocrit) [4]. Twenty percent human albumin (diluted to 5% albumin in isotonic saline) and/or fresh frozen plasma (FFP) were used as the replacement fluid.

2.2. Indication of TPE

The indications of TPE were principally based on the relevant guideline of the American Society for Apheresis (ASFA). Requirement of additional treatment and/or HD was predicated by the underlying disease [1,2].

2.3. Response to treatment

The response to treatment was graded as partial, complete or none. Resolution of all the pathological clinical and laboratory findings following adequate number of TPE was defined as complete response. Patients with no improvement in clinical and laboratory findings after at least five TPE sessions or patients with an initial response in whom cessation of TPE led to a prompt recurrence of the disease were identified as non-responders. Partial response includes clinical and laboratory results not fitting into both of the aforementioned categories.

2.4. Statistical analysis

Descriptive and comparative studies were done using SPSS for Windows, Version 20.0 (SPSS Inc., Chicago, IL, USA). Wilcoxon Signed Rank Test was used to compare laboratory parameters before and after treatment. P-value was accepted as statistically significant if it was less than 0.05.

3. Results

Over a period of 7 years, 110 patients [58 male (52.7%) and 52 female (47.3%)] received TPE. The mean age was 47.3 ± 17.6 years (range: 19–86 years). A total of 734 TPE sessions were performed and the mean number of TPE sessions per patient was 6.6 ± 4.3 (range: 1–25) sessions. Fifty percent of the patients required daily therapy while 50% received TPE every other day. The replacement fluid used was FFP in 83 patients (75.5%), albumin in 13 patients (11.8%) and the combination of both in 14 patients (12.7%) (Fig. 1). The indication for TPE was renal transplantation in 26 patients (23.6%), ANCA-associated vasculitis in 18 (16.4%), rapidly progressive glomerulonephritis in 17 (15.5%), hemolytic uremic syndrome (HUS) in 11 (10%), thrombotic thrombocytopenic purpura (TTP) in 9 (8.2%), autoimmune hemolytic anemia in 6 (5.5%), focal segmental glomerulosclerosis (FSGS) in 6 (5.5%), multiple myeloma in 4 (3.6%) chronic inflammatory demyalinating polyradiculoneuropathy in 3 (2.7%), systemic lupus erythematosus (SLE) in 2 (1.8%), paraneoplastic neurologic syndromes in 2 (1.8%), Devic's syndrome in 2 (1.8%), Stiff-person syndrome in 1 (0.9%), hypertriglyceridemic pancreatitis in 1 (0.9%), acute liver failure in 1 (0.9%) and Guillain–Barré Syndrome in 1 patient (0.9%). Table 1 displays the biochemical test results of the patients recorded before and after TPE. All of the patients with paraneoplastic neurological syndromes (n = 2), 8 (72.7%) of patients with HUS, 11 (64.7%) of patients with RPGN, 2 (50%) of the patients with multiple myeloma, 1 (50%) of the patients with SLE, 7 (26.9%) of patients with renal transplantation, 9 (50%) of patients with ANCA-associated vasculitis concurrently required HD at the time of diagnosis. TPE and HD were usually done on alternate days. All the patients with paraneoplastic neurologic syndromes, 23.1% patients with renal transplantation, 35.3% patients with RPGN, 36.4% patients with HUS, 16.7% patients with ANCA-associated vasculitis, 50% patients with SLE, 16.7% patients with FSGS and 25% patients with multiple myeloma remained HD dependent. None of the patients with TTP required HD at the time of diagnosis. Additional treatment with steroids, cyclophosphamide etc. was noted in 62.7% of the patients. Sixty-five (59.1%) patients had partial and 24 (21.8%) had complete remission, while 14 (12.7%) had no remission and 7 (6.4%) patients died during the treatment period. Outcome of the patients according to the primary disease is presented in Table 2. The cause of death was acute respiratory failure in five, sepsis and multi organ failure in two of the patients. There were no deaths related to the TPE procedure itself. Complications of the procedure included hypocalcemia induced muscle cramps (n = 7, 6.4%), allergic reactions (n = 5, 4.5%), hypotension (n = 4, 3.6%), fever (n = 2, 1.8%), loss of consciousness (n = 1, 0.9%), leukopenia (n = 1, 0.9%) and catheter related hematoma (n = 1, 0.9%). No complications were observed in 80.9% of patients. No catheter related infection was observed. A significant decrease was found in the creatinine levels before