

# Outcomes of Therapeutic Plasma Exchange: Single Tertiary Center Experience in Bangladesh

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## ABSTRACT

**Background:** Therapeutic Plasma Exchange (TPE) is a well-established therapeutic procedure commonly used in many disorders of autoimmune etiology. It is an extracorporeal blood purification technique used to remove high molecular weight substances from the plasma. Examples of these substances include immune complexes, pathogenic auto antibodies, endotoxin, cryoglobulins and cholesterol-containing lipoproteins and myeloma light chains. Early starting of Therapeutic plasma exchange after diagnosis of disease may enhance fast recovery.

**Aims/objectives:** The aim of this study to assess the clinical outcome in patients of different immunological and non-immunological diseases treated with TPE.

**Methodology:** This prospective study was done on patients referred to Transfusion Medicine Department, Asgar Ali Hospital, and Dhaka, Bangladesh for TPE during one year period (from January, 2018 to December, 2018). TPE procedures were performed on apheresis machine (Cobe Spectra, continuous flow cell separator). A minimum one and maximum of six procedures of plasma exchange were done depending upon the clinical outcome of the patient. 1-1.5 volume exchange was done per day or every alternate day. Demographics, clinical data, number of sessions, volume of plasma exchanged, patient's tolerance and complications during or post to the procedure were systematically recorded.

**Results:** A total sixty one (61) TPE procedures were done on fifteen (15) patients. Out of 13 patients, five patients had Guillain Barre Syndrome (GBS) followed by three patients with Thrombotic Thrombocytopenic Purpura (TTP) and others such as Good pusturs Syndrome, Renal allograft rejection, Wegener's granulomatosis, acute pancreatitis with hypertriglyceridemia, Dermatomyositis, hepatic failure and Hyper viscosity Syndrome were one each. Among fifteen patients, eleven patients (73.4%) were improved while four (26.6%) patients showed no improvement. Patients with GBS and TTP were fully improved. Patient had Acute Pancreatitis with Hypertriglyceridemia, Renal allograft rejection and hyper viscosity Syndrome was also improved. Total male was four (28.5%) and female was eleven (73.3%). Out of 61 procedures, two (3.2%) complications were reported and these were hypotension and mild citrate toxicity.

**Conclusion:** Therapeutic plasma exchange is an effective adjuvant treatment for several diseases especially autoimmune and neurological diseases. TPE can reduce morbidity, mortality and improve patient's outcome. So, it can be practice in all in practice tertiary care hospitals.

**Keywords:** Therapeutic plasma exchange; Autoimmune disorder; Guillain-Barre syndrome; Hypotension

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## INTRODUCTION

Antibodies and immune complexes play a crucial role in many kinds of autoimmune diseases. Removing these pathogenic substances from patient plasma may result in an efficient means of treatment. When Therapeutic Plasma Exchange (TPE) was introduced to the first time in 1962 for treatment of Waldenström's macroglobulinemia [1]. The clinical indications for TPE have been progressively growing although the clinical efficacy of TPE has been documented with randomized controlled studies only in limited numbers of diseases [2,3]. It is well-established therapeutic procedure most commonly used in many neuro-immunological disorders like chronic inflammatory demyelinating polyneuropathy, Guillain-Barre syndrome, myasthenia gravis and other disorders such as Thrombotic Thrombocytopenic Purpura [4]. More recently TPE should also be considered in renal diseases like Renal Transplantation: Antibody Mediated Rejection and HLA Desensitization, Anti- Glomerular Basement Membrane Disease (Anti-GBM-Goodpasture's Syndrome), ANCA-Associated Rapidly Progressive Glomerulonephritis-RPGN (Wegener's Granulomatosis), Cryoglobulinaemia, ABO Incompatible Renal Transplantation [5]. TPE is an extracorporeal blood purification technique used to remove high molecular weight substances from the plasma. Examples of these substances include immune complexes pathogenic autoantibodies, endotoxin, cryoglobulins and cholesterol-containing lipoproteins and myeloma light chains [6]. Other potential benefits of TPE include the discharge of the reticuloendothelial system, the stimulation of lymphocyte clones to increase cytotoxic therapy, and the possibility of reinfusion of large amounts of plasma without the risk of intravascular volume overload [7]. In order to consider TPE as a therapeutic option, two conditions need to be present, a disease state related to the presence of a pathological substance in the plasma and the possibility of removing the substance in a sufficient amount to permit resolution of the disease. TPE is often employed as the last resort treatment of various diseases unresponsive to conventional therapy. The complications are procedure as well as access related. The large extracorporeal blood volume and blood loss in the circuit carry the risk of hypotension and anemia, respectively. Also, blood product transfusion during plasma exchange exposes patients to the additional risks of viral infection and transfusion-related acute lung injury. Furthermore, Catheter-related complications are also reported and include access thrombosis and infection [6,8].

## METHOD

This prospective study was done on patients referred to Transfusion Medicine Department, Asgar Ali Hospital, Dhaka, Bangladesh for TPE during one year period (from January, 2018 to December, 2018). Patient age between 27-67 years and body weight above 30 kgs were included in this study. Patient was informed about the procedure in their own understandable language and informed consent was obtained. Detailed history of the patients were taken and assessed clinically. Most of the cases venous access was double lumen dialysis catheter in femoral vein.

Only 3 cases fistula needle were used in anti-cubital vein. After ensuring adequate flow through the catheter TPE was started. The amount of plasma to be exchanged (Estimated Plasma Volume) during TPE was determined using the formula  $EPV = (\text{total blood volume} \times \text{weight [kg]}) \times (1 - \text{hematocrit})$ .

TPE procedures were performed on apheresis machine (Cobe Spectra, continuous flow cell separator). A minimum one and maximum of six procedures of plasma exchange per patient were done depending upon the clinical outcome of the patient. 1-1.5 volume exchange was done per day or every alternate day. The removed plasma volume was replaced with normal saline (20%), 4%-5% Human Albumin (30%) and 100% fresh frozen plasma in case of TTP patients. ACD solution was used as an anticoagulant in all cases in the ratio 1:12. Clinical outcome of TPE (Table 1) was assessed at the time of discharge. Demographics, clinical data, number of sessions, volume of plasma exchanged, patient's tolerance and complications during or post to the procedure were systematically recorded.

**Table 1:** Clinical outcome of TPE.

Clinical Outcome	No of Patients	Percent
Patient with improvement	11	73.30%
Patient without improvement	4	26.60%
Total	15	

## RESULTS

A total sixty one (61) TPE procedures were done on fifteen (15) patients. In which 10 (66.6%) were Female and 5 (33.3%) were Male. Out of 15 patients, five patients had GBS followed by three patients with TTP and others such as Good pastures Syndrome, Renal allograft rejection, Wegener's granulomatosis, acute pancreatitis with hypertriglyceridemia, Dermatomyositis, hepatic failure and Hyper viscosity Syndrome were one each. Among fifteen patients, eleven patients (73.4%) were improved while four (26.6%) patients showed no improvement. Patients with GBS and TTP were fully improved. Patient had Acute Pancreatitis with Hypertriglyceridemia, Renal allograft rejection and hyper viscosity Syndrome was also improved. Out of 61 procedures, two (3.2%) complications were reported and these were hypotension and mild citrate toxicity (Tables 2 and 3).

**Table 2:** Clinical outcome in different disease and number of procedure.

Disease	No of Patient	No of procedure	Good Outcome	Non Responding
TTP	3	26	3	-
GBS	5	25	5	-
Renal allograft rejection	1	1	1	-
Wegener's granulomatosis	1	3	-	1
Acute pancreatitis with high TG	1	1	1	-

Hyper viscosity system	1	2	1	-
Hepatic failure	1	1	-	1
Good pastures syndrome	1	1	-	1
Dermatomyositis	1	1	-	1
Total	15	61	11(73.3%)	4(26.6%)

**Table 3:** Incidence of adverse reaction.

Type of complications	Number(procedure)	Percent
Hypotension	1	1.60%
Allergic reaction	-	0%
Citrate toxicity	1	1.60%
Total	2	3.20%

## DISCUSSION

TPE is an effective therapeutic option for treating serious manifestations of systemic autoimmune diseases, such as myasthenia gravis, Guillain-Barre syndrome, lupus, and idiopathic thrombocytopenic purpura and a valid option for those patients with diseases refractory to conventional treatments [8]. Different studies showed that Therapeutic plasma exchange is effective in 55% -100% of Neuro-immunological patients. This wide discrepancy between the reports can be due to difference in severity of disease, protocol of Therapeutic plasma exchange or different in study conduction [6,9]. In a study done by Valbonesi et al. the success rate of plasma exchange in GBS is 100%, which is similar with our result, but was evaluated only in six patients [9]. Kennard et al. studied twelve patients with Guillain-Barre syndrome treated with plasma exchange. Examination two weeks after treatment was commenced showed that three had not improved and nine patients (75%) improved [10]. Osterman 1984 studied 38 adult patients with GBS, out of which 18 patients received plasma exchange and 20 patents were given a supportive care. Clinical outcome for plasma exchange group was 77.7% whereas control group 30% [11]. In our single of hyper viscosity syndrome, there was a good response to the single TPE procedure. This is in agreement with other study done by Zarkovic et al. and Marvin [12,13]. Different case report shows dramatic improvement in Acute Pancreatitis with high TG by Therapeutic plasma exchange, which are similar to our study [14,15]. In our study in case of Thrombotic thrombocytopenic purpura, the average of TPE was on 3 patients and the 2 Patient showed no relapses during the 6 months follow up. Guillermo et al. was reporting (100%) cure rate within their 31 patients with refractory autoimmune diseases [16]. Forzley suggests an excellent outcome for relapsed TTP [17]. In other study which is similar with our result, done by Bambauer et al. they concluded that using of cyclosporine and TPE to control symptomatic disease in patients with flares resulted in quicker resolution of symptoms and decreased doses of cytotoxic drugs [18].

In case of early presentation, high index of suspicion among treating physicians and early introduction of TPE along with dialysis and appropriate immunosuppression may be promising in effectively decreasing morbidity and improving outcome in patients with immunological renal disease [19], in our study, there was one patient with ACLF who showed no improvement during their treatment course with TPE. Deshpande et al. agreed with our results in their randomized study [20]. Miller et al. established the ineffectiveness of plasma exchange as a single treatment for corticosteroid-resistant polymyositis or dermatomyositis which correlate with this study [21]. Regarding the complications of the procedure, we conclude that most complications reported were hypotension, nausea and allergic reaction either due to the fresh frozen plasma or human albumin, all of which never seriously endangered the patient's life or affected patient's mortality. Shemin et al. study agreed with our results [22].

## CONCLUSION

Except minor complications TPE can reduce morbidity, mortality and improve patient's outcomes. So, it is recommended to widely practice this therapeutic procedure in all tertiary care hospital.

## CONFLICT OF INTEREST

Authors have no conflict of interest.

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