Therapeutic apheresis in nephrology and neurology

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Introduction

Within the past decades, membrane plasmapheresis has emerged as a new blood purification modality [1–5]. It is employed not just for diseases resulting from excessively elevated concentrations of proteins or protein-bound substances, but has also been applicable to a broad spectrum of immunologically based disorders. In nephrology, plasmapheresis therapy can provide an approach by mechanically removing nephritogenic factors from the circulation, antibodies or immune complexes [4,5]. Plasma exchange has also been accepted as a treatment of patients with several neuroimmunological diseases. In several controlled investigations, treatment by plasma exchange has significantly benefited patients with acute Guillain–Barre syndrome as well as myasthenia gravis, but there are still controversies concerning the other neurological disorders [1,2,6,7].

Patients and methods

Patient selection

Patients with nephrological diseases. Eleven patients suffering from glomerulonephritis (>80% crescents on biopsy) with acute development of anuria were treated. Eight patients were male and three female, aged 18–32 years (21 ± 8.9). The aetiologies of crescentic glomerulonephritis were different: immune complexes form in seven patients, anti-GBM form in two patients and ANCA-associated in two patients. Fifteen patients suffered from systemic lupus erythematosus and lupus nephritis in different stages; all patients were female, aged 13–34 years (23 ± 10.5). Lupus nephritis class III (focal-segmental lesions) was found in six patients, class IV (diffuse lesions) in five patients, and class VI (sclerotic lesions) in two patients. One patient was on regular haemodialysis treatment, plasma exchange was performed because of appearance of severe skin lesions. The last patient with SLE was treated because of recurrence of the underlying disease after renal transplantation. Two patients with renal grafts and underlying focal segmental glomerulosclerosis were also treated. The first patient presented early recurrence of the disease (within 2 weeks) and in the second patient plasma exchanges were used as preventive treatment, before and after transplantation.

Patients with neurological diseases. Twelve patients with different neuroimmunological disorders were treated, three with myasthenia gravis, two with Guillain–Barre syndrome, two with myelopolyradiculoneuritis, four with chronic inflammatory demyelinating polyneuropathy and one patient with POEMS syndrome.

Methods

We performed plasma exchanges two to three times weekly using Belloe BL 0.2 mm³ or Gambro 2000PF filters with an adaptation of Gambro AK 10 dialysis machine. Three to nine plasma exchanges were performed in each patient. Fresh frozen plasma, 20% and in some cases 5% human albumin solutions, combined with Ringer’s solution were used as the substitution fluid. To prevent the new accumulation of immune complexes or antibodies, the patients were also treated with pulse therapy with methylprednisolone 1 g daily for three consecutive days, continuing with oral steroids 0.5 mg kg⁻¹ daily and oral cyclophosphamide 100 mg daily.

The functional assessment in the patients with neurological diseases was made using the modified Rankin Disability Scale Score (RDSS, 0–5), Disability Grading Scale Score (DGSS, 0–10), MRC strength score (0–5) and lower extremity sensory testing at the time of maximal neurological deficit. A treatment response was defined as improvement with at least one grade for at least 1 month. The functional assessment in myasthenia gravis was done by the Besinger Score.

Results

Patients with nephrological diseases (Table 1)
The initiation of diuresis and a significant decrease of serum creatinine was noted in five of 11 patients. Remission occurred in all patients with the anti-GBM
form of the disease and in two cases with immune-complex form. The serum creatinine level at the start of the whole group was $985 \pm 386 \mu mol/l$; in the patients who experienced the start of the diuresis: $186 \pm 72 \mu mol/l$. Serum creatinine level decreased in patients with lupus nephritis, from $407 \pm 156$ to $206 \pm 58 \mu mol/l$, and proteinuria from $5.2 \pm 2.8$ to $3 \pm 0.4$ g daily. Treatment with plasmapheresis was without benefit in the patient with recurrent focal segmental glomerulosclerosis, but recurrent disease has not been observed in the patient with preventive treatment.

### Patients with neurological diseases

All patients with myasthenia gravis achieved improvement with a reduction of the Besinger score from $26.3 \pm 4$ to $18 \pm 4.5$. All other patients enrolled in the study achieved significant improvement with a reduction of mean DGSS from $60.89 \pm 1.4$ to $4.89 \pm 1.7$. Mean RDSS significantly decreased from $4.78 \pm 0.6$ to $3.67 \pm 1.1$, and mean MRC score also improved from $2.44 \pm 1.1$ to $3.11 \pm 1.2$.

### Conclusions

Plasma exchange can be of benefit in severe histological stages of crescentic glomerulonephritis with acute oligoanuria, with the capability of releasing some dialysis-dependent patients from dialysis. It can also be a useful therapeutic method in patients with severe histological forms of lupus nephritis.

Plasmapheresis is a life-saving procedure in myasthenic crisis and patients with a generalized form of this disease. It can be also used in the other immunoneurological disorders during relapse or rapidly progressive course of the disease.

### References


### Table 1. Clinical data of the patients with crescentic glomerulonephritis treated with plasma exchange

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<th>Creatinine after PE ((\mu mol/l))</th>
<th>Remission</th>
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