Case Report

Small Volume Plasma Exchange as an Alternative to Conventional Plasma Exchange and Intravenous Immunoglobulin for Myasthenic Crisis: A Case Report

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Abstract

Myasthenic crisis is a life-threatening condition. At times it manifests as the initial presentation of the underlying myasthenia gravis. Rapidly acting therapies for treatment of this condition are plasma exchange and intravenous immunoglobulin. We report a case of myasthenic crisis in a young female, presenting with respiratory failure and bulbar symptoms. She had significantly raised titres of anti-acetylcholine receptor antibody. She was treated with multiple sessions of small volume plasma exchange. This modification of conventional plasma exchange significantly reduces costs and is potentially an effective alternative to conventional plasma exchange and intravenous immunoglobulin in resource-poor settings.

Introduction

Myasthenic crisis is characterised by worsening of myasthenic weakness requiring intubation or non-invasive ventilation. Plasma exchange and intravenous immunoglobulin are the two established modalities of rapid therapies for patients in myasthenic crisis.[1] Data from previous studies indicate the use of both the modalities are associated with similar patient outcomes.[2] However, both are expensive modalities of treatment, especially where healthcare expense is out-of-pocket. We describe a patient in myasthenic crisis who was treated with a more economic modality of treatment using small volume plasma exchange.

Case Report

A 28-year-old female, weighing 40 kg, 6 weeks post-partum presented with history of regurgitation of food followed by difficulty in breathing. She had difficulty in swallowing food, more so with liquids than solids. Feeding was regularly associated with bouts of cough. Her dyspnea had worsened in the past 3 days. She could not lie flat and was unable to effectively clear respiratory secretions. She complained of droopy eyelids in the past three days as well. Additionally, in the past, she had episodes of intermittent change in voice with dysarthria lasting for about five days. They were followed by spontaneous recovery. These episodes occurred since the past eight months. There was no history of progressive weakness of the limbs. No other immediate family members had previously developed similar complaints.

At presentation, her respiratory rate was 26/min with SpO2 of 51% in room air. The pulse rate was 104/min with BP 146/87 mm of Hg and she was afebrile. Air entry was decreased in the right hemithorax. Her GCS was E3V1M6. Her pupils were normal and reacting to light, but she had ptosis. There was weakness in neck flexion and gag reflex was absent. Examination of the rest of the neurological system was grossly within normal limits. Signs of autonomic dysfunction were not evident.

She had respiratory acidosis with a pH of 7.2 and PaCO2 of 107 mm of Hg. She was intubated for the same in the emergency and shifted to the intensive care unit (ICU) for further management. A non-contrast CT of the head was normal. Chest roentgenogram revealed an elevated right hemidiaphragm. Electrocardiography revealed sinus tachycardia. Her baseline hematological and biochemical parameters were within normal limits.

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The clinical history and examination suggested the patient was in myasthenic crisis. Motor neuron disease (MND) can have a similar presentation but they are not known to cause ocular symptoms as seen in our patient. Similarly features of MND such as of signs of upper motor neuron characterized by hyperreflexia, jaw jerk and the Babinski sign were absent. Signs of lower motor neuron disease such as muscle and tongue atrophy and fasciculations were not present. Some acute immune-mediated polyneuropathies may have an acute onset of cranial impairment. Weakness of other muscles is usually seen in such cases. They are not associated with periods of recovery in between.

Botulism can mimic myasthenia gravis but has an acute onset and a usual association with ingestion of food contaminated by *Clostridium botulinum*. A brainstem stroke may present with bulbar symptoms but was ruled out by a normal head CT. MRI of brain and C-spine done subsequently did not show any abnormal signal changes. CECT of the chest showed a normal thymus.

Myasthenia gravis was confirmed with anti-acetylcholine receptor antibody titre of 2.51 nmol/L (Normal value <0.4). Anti-muscle specific kinase antibody titres were normal.

The patient was started on high-dose glucocorticoids and rapid therapies were discussed with the family. However, due to their poor economic condition, the family was unable to afford for either plasma exchange or intravenous immunoglobulin (IVIg).

We started the patient with small volume plasma exchange (SVPE) through a femoral hemodialysis catheter. These exchanges comprised of eight daily sessions, with 600 ml (15 ml/kg) of plasma filtered daily. A polysulfone membrane filter was used for this purpose. A flow rate through the filter of 150-200ml/min maintained. The flow was achieved through rotatory pumps of a hemodialysis machine. These sessions lasted for around 20 minutes. The removed plasma volume was replaced with two units of fresh frozen plasma (FFP) and 200 ml of Plasmalyte. Serum calcium was monitored regularly. There were no episodes of hypotension in any of the sessions, and the patient did not develop any infection.

She had gradual improvement of her respiratory function and was extubated at the end of the fifth SVPE. Following three more sessions of SVPE, she was able to vocalize well and her dysarthria had settled. She was subsequently shifted to the ward. She was discharged home on steroids, pyridostigmine and azathioprine. After 18 months, her disease is stable on the same treatment and she is on regular follow-up with no exacerbations of the disease.

Discussion

Although the mainstay of therapy for myasthenic crisis are plasma exchange and IVIg, they are not inexpensive.[1] These therapies start to work within several days and the benefits usually last for a few weeks.

Plasma exchange (PE) removes antibodies against acetylcholine receptors directly from the circulation. Although no randomized, controlled trial (RCT) has been conducted to evaluate PE in the treatment of patients in myasthenic crisis, it still is an established treatment.[3–5] A usual course of treatment during PE is comprised of five exchanges over 1 to 2 weeks. Three to five litres of plasma is exchanged during each exchange. Exchanges done every other day may be more effective, allowing time for the extravascular immunoglobulin to equilibrate after each exchange.[6] Acetylcholine receptor antibody levels have been seen to rebound within weeks if concurrent immunotherapy is not used. A short duration of benefit and the rebound of antibodies necessitates use of high-dose glucocorticoids along with the PE with addition of immunomodulators thereafter.

IVIg is an alternative used to quickly reverse a myasthenic crisis. Although used usually as a dose of 2 g/kg over 5 days, one study concluded that even a single dose at 1 g/kg had similar effects on the myasthenic muscular score.[7]

A double-blind randomized trial has compared PE and IVIg.[2] Results showed that at day 14, a similar proportion of patients assigned to the PE and IVIg group had improved (69 % versus 65 %). The duration of improvement was similar in both groups on a longer follow-up as well.

Small volume plasma exchange has been described in literature as early as 1990.[8] Islam et al. in their phase II study of SVPE for Guillan-Barré syndrome (GBS) in Bangladesh evaluated its safety and feasibility.[9] SVPE appeared to be a safe and feasible alternative treatment to standard PE or IVIg for GBS. The clinical efficacy, however, was only a secondary endpoint assessment in that study. More studies are required to establish its efficacy. Infective complications, issues with venous access and transfusion reactions associated with of FFP are some common complications that may be encountered during SVPE.

Conventional PE involves exchange of 1–1.5 plasma volume exchanges per procedure while during SVPE plasma is exchanged at a volume of 10-15 ml/kg. Endpoints vary with SVPE with some centres completing exchanges amounting to two plasma volumes while others awaiting clinical improvement.[8,9] We carried out 8 sessions in our patient in order to complete two total plasma volumes.

The use of FFP as replacement is SVPE is far economical than the use of human albumin used with conventional PE. In a study from India, aiming to look at the costs when using SVPE, the cost was INR 8000/cycle.[10] Apart from this, FFP preserves the plasma oncotic pressure and prevents hypotension following SVPE. We resorted to SVPE because of the financial issues faced by the family and this was the first experience in our centre. The total cost of the 8 sessions amounted to Nepali Rs. 75,000 for our patient. This is far cheaper than the cost of conventional PE which would cost in excess of Rs. 250,000. Similarly, it is also cheaper than IVIg which would cost Rs. 224,000. Each vial of IVIg consists of 5 grams of pooled immunoglobulins and costs around Rs. 15,000.

Conclusion

SVPE appears to be an effective and safe modality of therapy for patients in myasthenic crisis. It is significantly cheaper as compared to conventional PE and IVIg. Limited data is available regarding efficacy of SVPE and future studies comparing SVPE with conventional PE is much needed to test this hypothesis.

Conflict of Interest: None.

Consent: The consent form was signed by the patient and the original article is attached with the patient's chart.

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