# Plasmapheresis to treat Osmotic Demyelination Syndrome from overly rapid plasma sodium correction

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## SUMMARY

**Osmotic demyelination syndrome results from overly rapid serum sodium correction and is often iatrogenic. We report a 50-year-old hypertensive woman on Indapamide presenting with malaise, dizziness and serum sodium less than 100mmol/l who developed osmotic demyelination syndrome after correction of the hyponatremia. Good neurological recovery was seen after plasmapheresis.**

## CASE PRESENTATION

A 55-year-old hypertensive woman on perindopril, indapamide and amlodipine presented with a two-week history of intermittent vomiting, dizziness and malaise. She was a teetotaller, denied use of over the counter supplements or herbs and had no other past medical history of note. On presentation, she appeared lethargic and mildly dehydrated but vital signs were stable with blood pressure 126/75mmHg and heart rate 75beats/minute. Her Glasgow Coma Scale (GCS) was 15/15. Power over all four limbs was 3/5 with normal tone, sensation and reflexes. Other systemic examination was unremarkable. Serum sodium was less than 100mmol/L, potassium 2.8mmol/L, blood urea nitrogen 3.7mmol/L, creatinine 60.1µmol/L and serum osmolarity 247mmol/L. Unfortunately, urine sodium and osmolarity was not done. Thyroid function test was normal and short synacthen test showed adequate adrenal response. ECG revealed sinus rhythm with decreased T-wave amplitude. There were no clinical features or biochemical parameters to suggest heart failure, renal insufficiency or liver disease. She was administered 0.9% saline containing 3grams of potassium chloride per litre infused at 104ml/hour. After four hours, serum sodium remained less than 100mmol/L despite improvement in hydration status. She was then given 3% saline at a rate of 20ml/hour for four hours after which 0.9% saline containing potassium chloride was resumed while awaiting lab results. This was prescribed aiming to prevent overly rapid sodium correction. However, serum sodium rose rapidly from less than 100mmol/L to 115mmol/L over 12 hours. She was given subcutaneous desmopressin and intravenous fluid was subsequently adjusted to hypotonic saline and 5% Dextrose solutions with close monitoring of electrolytes. She had no ongoing losses from the gastrointestinal tract since arrival and remained clinically euvolemic after the first few hours of admission. Over the next few days, serum sodium rose no more than 8mmol/ day. Despite the initial subjective clinical improvement, over the succeeding week, she remained lethargic with power of 3/5 over all four limbs and brisk reflexes. She was wheelchair ambulant and appeared withdrawn. On the 14th day of admission, emotional lability and dysphagia necessitating enteral nutrition via Ryle's tube raised suspicion of osmotic demyelination syndrome. MRI brain done a week following this confirmed the diagnosis of osmotic demyelination syndrome. She underwent five cycles of plasma exchange on alternate days after which she showed remarkable improvement. She was able to discontinue Ryle's tube feeding after the 4th cycle of plasma exchange and was ambulating independently before discharge.

## DISCUSSION

We present a patient with thiazide induced hyponatremia who developed osmotic demyelination syndrome due to rapid serum sodium correction despite close fluid and electrolyte monitoring. Overt neurologic symptoms are often seen with serum sodium less than 115mmol/l.[1] Of note, our patient presented with both hypokalemia and hyponatremia which is a known side-effect of thiazide diuretics. One should keep in mind that the addition of potassium to infused solutions increases osmolality of that solution. Therefore, added potassium should be calculated as increment in the sodium content of the given solution.[2] Failing this, osmotic demyelination syndrome could result from the unexpected rapid rise of osmolality due to simultaneous correction of hyponatremia and hypokalemia.[2] This may have been the case with our patient. Judicious sodium correction is essential to prevent the potentially fatal complication of osmotic demyelination syndrome. A formula worth remembering is:

*change in serum sodium= (infusate sodium+infusate potassium)-serum sodium/ total body water+1*[(2)]

Although rapid sodium correction is well known to cause osmotic demyelination syndrome, the exact rate of correction at which this is associated has not been established.

While most reported cases of osmotic demyelination syndrome occurred with rates of sodium correction exceeding 12mmol/l per day, isolated cases occurred after correction of only 9mmol/l per day. After review of available evidence and taking into account the risk of overly rapid plasma sodium correction, Androgue et al., recommended that sodium correction does not exceed 8 mmol/L in any given day.[2]

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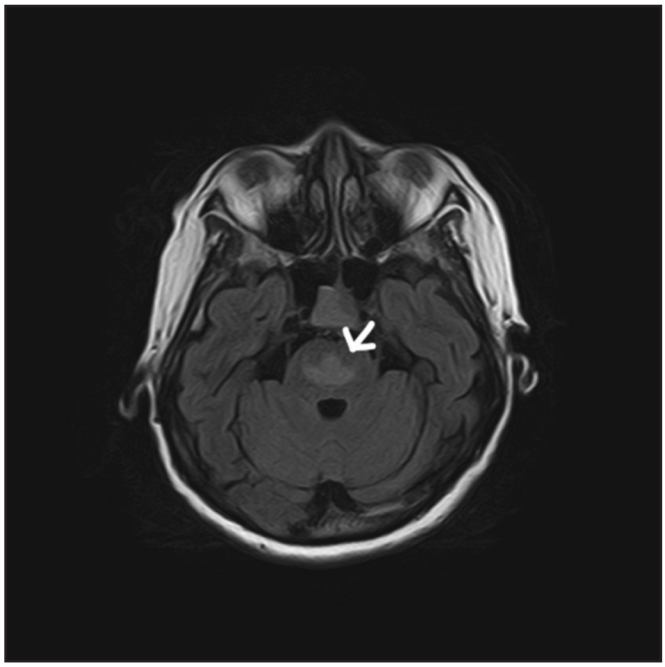

**Fig. 1:** Arrow shows pontine demyelination.

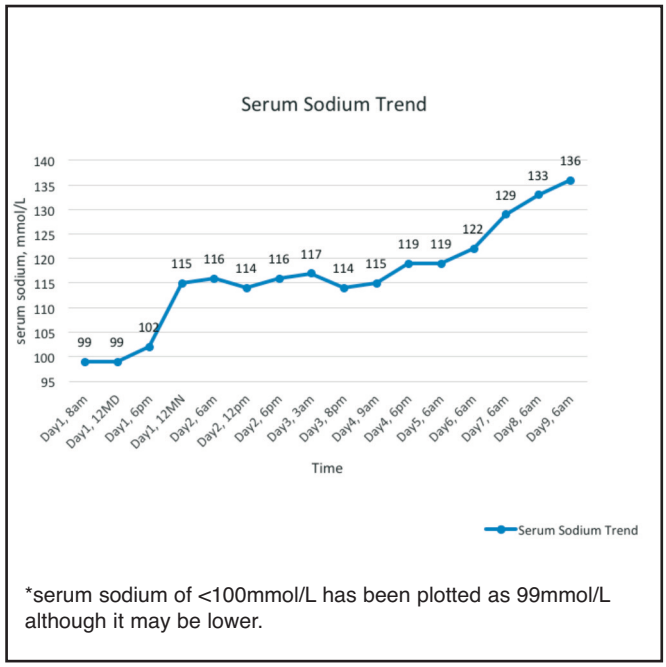


**Fig. 2:** Line chart showing the trend of serum sodium increment.

The clinical presentation of osmotic demyelination syndrome is highly variable. Typical symptoms include pseudobulbar palsy with dysphagia, dysarthria and paraparesis or quadriparesis while some may go on to develop 'locked-in syndrome'.[3] Osmotic demyelination syndrome occurs more commonly among patients with chronic hyponatremia; (>48 hours), due to adaptation of the brain cells to a chronic hypo-osmolar state. Rapid sodium correction in this state results in shrinkage of brain cells. The exact mechanism of demyelination is poorly understood but it has been postulated that disruption of the blood brain barrier occurs, culminating in entry of inflammatory mediators causing brain cytotoxicity.[4]

Osmotic demyelination syndrome has been treated with various modalities, namely plasmapheresis, intravenous immunoglobulins, corticosteroids and thyroid releasing hormone. Our patient showed good neurological recovery after plasmapheresis. It is believed that osmotic stress releases myelinotoxic compounds, which can cause irreversible demyelination. Therapeutic plasmapheresis can reduce the high-molecular myelinotoxic substances leading to clinical improvement.[5] Bibl et al., treated three patients with osmotic demyelination syndrome by intensive plasmapheresis and all showed remarkable recovery in the span of two to twelve months.[5] However, there is yet to be a standardised plasmapheresis regime for treatment of osmotic demyelination syndrome.

## CONCLUSION

Osmotic demyelination syndrome is a devastating condition which is largely preventable. In the event that it occurs, plasmapheresis is promising in aiding neurological recovery.

## REFERENCES

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