Extra pontine osmotic demyelination syndrome

Pervaiz M Zunga, Omar Farooq, Mohd I Dar, Ishrat H Dar, Samia Rashid, Abdul Q Rather, Javid A Basu, Mohammed Ashraf, Jahangeer A Bhat

Department of Internal Medicine Smhs Hospital Gmc Srinagar Kashmir, INDIA

ABSTRACT

The osmotic demyelination syndrome (ODS) has been identified as a complication of the rapid correction of hyponatremia for decades. However, in recent years, a variety of other medical conditions have been associated with the development of ODS, independent of changes in serum sodium which cause a rapid changes in osmolality of the interstitial (extracellular) compartment of the brain leading to dehydration of energy-depleted cells with subsequent axonal damage that occurs in characteristic areas. Slow correction of the serum sodium concentration and additional administration of corticosteroids seems to be a major prevention step in ODS patients. In the current report we aimed to share a rare case which we observed in our hospital. A 65 year old female admitted as altered sensorium with history of vomiting, diarrhea was managed with intravenous fluids for 2 days at a peripheral health centre. Patient was referred to our centre with encephalopathy, evaluated and found to have hyponatremia and hypokalemia rest of biochemical parameters and septic profile were normal. Patient's electrolyte disturbances were managed as per guidelines but encephalopathy persisted. Supportive treatment was continued and patient was discharged after 2 wks of stay in hospital after gaining full sensorium and neurological functions.

KEY WORDS: Hyponatremia, Hypokalemia, Demyelination, Myelinolysis

doi : 10.5214/ans.0972.7531.220212

Corresponding Author:

Pervaiz M Zunga
Department of Internal Medicine
Government Medical College Srinagar
Srinagar - 190 010, INDIA
Tel : 8491046799
E-mail : perpg781@gmail.com

Introduction

The human demyelination disorder myelinolysis may be a pathological condition caused by a rapid rise in serum sodium, usually when hyponatremia is trying to be corrected. However, in recent years, a variety of other medical conditions have been associated with the development of Osmotic Demyelination Syndrome, independent of changes in serum sodium this will cause a rapid changes in osmolality of the interstitial (extracellular) compartment of the brain which leads to dehydration of energy-depleted cells with subsequent axonal damage that occurs in characteristic areas.[1]

Case report

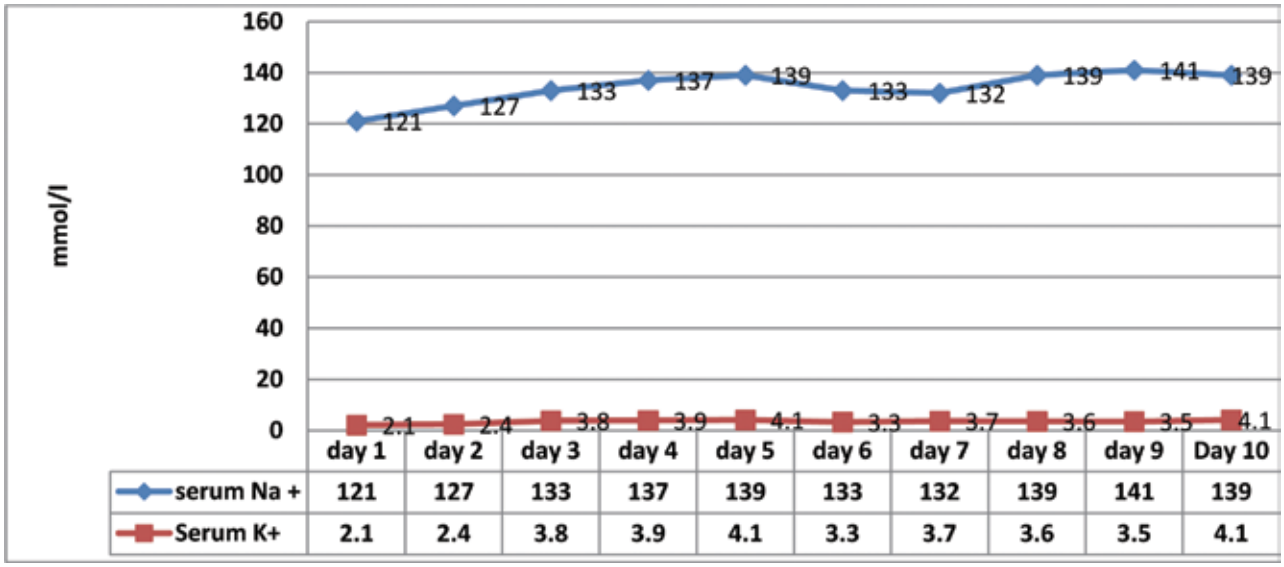
We would like to present a case of isolated extrapontine myelinolysis of the osmotic demyelination syndrome which has been reported only a few times in the literature. A 65 year old female known case of hypertension, first time detected type 2 diabetes mellitus was admitted in SMHS hospital with history of altered sensorium for 1 day. Patient had a history of recurrent vomiting and diarrhea for 2 days managed as a case of viral gastroenteritis at peripheral health centre for 2 days with intravenous fluids (dextrose 5% and DNS) and subsequently referred to our centre after patients consciousness deteriorated. Patient was admitted and evaluated. On examination she was stupurous with GCS; 11/15. (E2V3M6). Pulse 92 beats per minute, regular. BP was 146/84 mmHg. JVP was not raised, no pedal edema. Chest, CVS, per abdominal examination was unremarkable. Neurological examination, patient was stupurous there were no focal neurological signs. Plantars were up going bilaterally. There were no meningeal signs, fundus examination was normal. All baseline parameters CBC, KFT, LFT were normal. Chest x–ray, routine urine examination and ECG were also normal. CSF examination was normal, USG abdomen showed cystic lesion left ovary. NCCT head showed hyper dense area in Left parietal lobe. Blood and urine cultures were sterile. Serum lactate levels were normal. EEG showed normal awake record. CA- 125 was normal.

After preliminary evaluation encephalopathy turned out to be metabolic, hyponatremia with hypokalemia. Her metabolic parameters were corrected gradually as per advised guidelines. But patient's sensorium worsened and she progressed from grade 2 to grade 4 encephalopathy. CECT abdomen showed large well defined rounded heterogeneous mass. Cyst adenoma BAER showed WAVES with increased latency, rest was normal. Plasma lactate pre and post exercise were normal.

MRI BRAIN multifocal hyper intensities involving bilateral basal ganglia and cerebellar hemispheres. Foci of hyper intensities are seen in deep white matter. Magnetic resonance imaging (MRI) showed high signal intensity on T2-weighted, FLAIR (fluid attenuated inversion recovery) and DWI (diffusion weighted imaging) images in the bilateral symmetric putamina, caudate nuclei and external capsule there were no changes within the pons in T2-weighted images. No restriction of diffusion on ADC imaging suggestive of extrapontine myelinolysis.

Discussion

Our case demonstrates that Osmotic Demyelination Syndrome develops also with graded correction of hyponatremia. ODS (osmotic demyelination syndrome) developing with slow correction of sodium in a patient of hyponatremia has been reported earlier.[2] It was First described in alcoholic and malnourished patients who developed neurological symptoms in association with demyelination which was noninflammatory within the pons, the demyelination may even occur in extra pontine areas like basal ganglia, hippocampi, and lateral geniculate bodies, cerebral white matter,



	day 1	day 2	day 3	day 4	day 5	day 6	day 7	day 8	day 9	Day 10
serum Na +	121	127	133	137	139	133	132	139	141	139
Serum K+	2.1	2.4	3.8	3.9	4.1	3.3	3.7	3.6	3.5	4.1

Fig. 1: Serial serum sodium and potassium on serial days of admission stay in hospital.

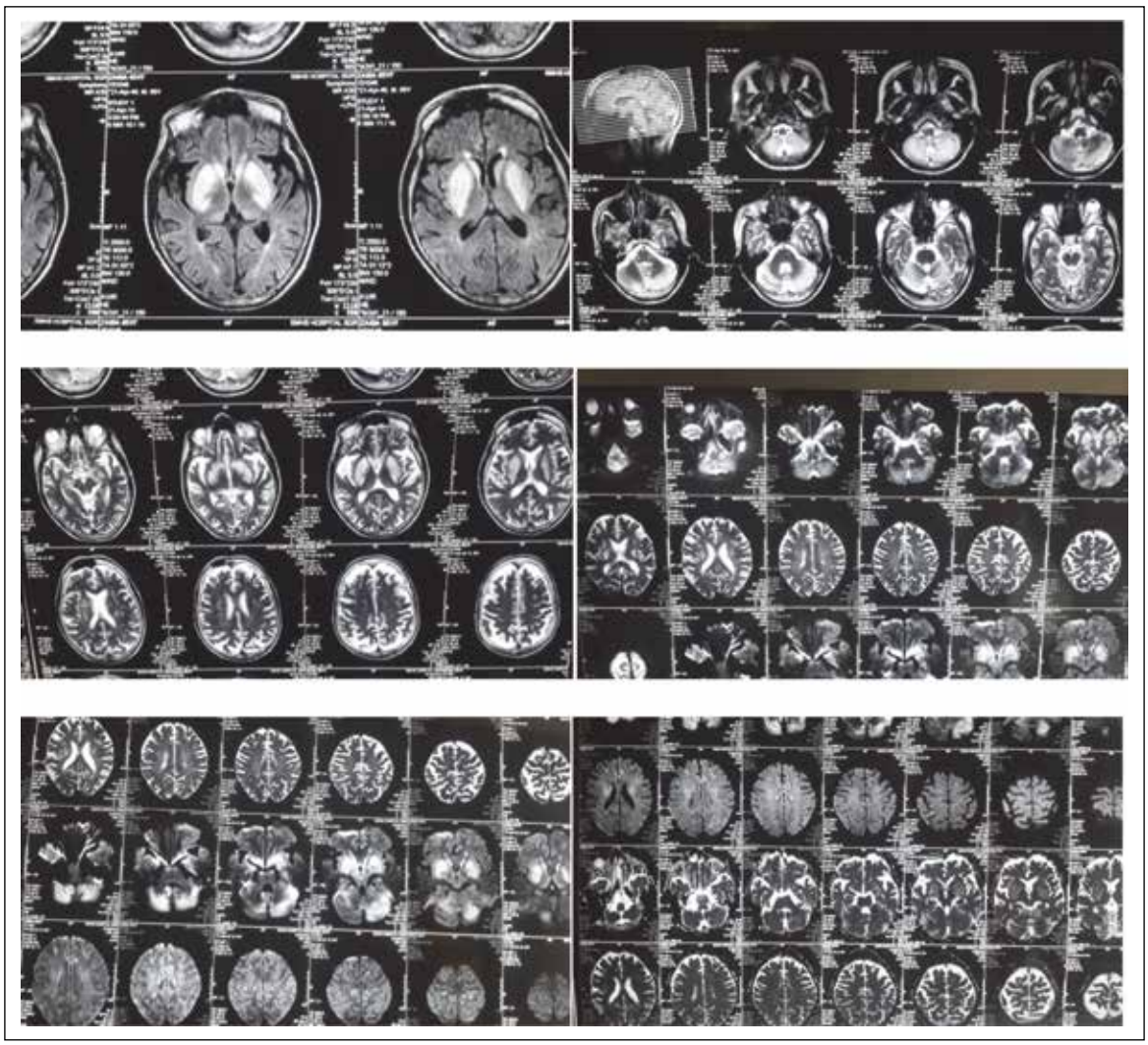


Fig. 2: MRI brain (T2W & FLAIR images) depicting bilateral basal ganglia & cerebellar hyperintensities.

peripheral cortex.[3] Extrapontine myelinolysis (EPM) is Seen in up to 10% cases of Osmotic Demyelination Syndrome, and mostly involves the basal ganglia and thalamus.[4] It is commonly associated with rapid correction of hyponatremia, (rise in sodium level by >12 mmol/day) the pathogenesis of Osmotic Demyelination Syndrome is not clearly understood. Osmotic demyelination syndrome occurs due to depleted adaptive process to protect against brain swelling, the redistribution of solutes with correction of hyponatremia causes brain shrinkage, which leads to disruption of tight junctions and disruption of blood brain barrier causing oligodentrocyte damage and the demyelination of neurons. it has also been shown that as hyponatremia is corrected it causes down regulation of a neutral amino acid transporter and impairs cellular reuptake of amino acids, rendering them more susceptible to injury as.[5] Patients with osmotic demyelination syndrome usually develop seizures or altered sensorium. As normal serum sodium concentration is restored, mental status improves and may return to normal within 48–72 hrs, only to rapidly deteriorate days later. Symptoms associated with Central Pontine Myelinolysis include dysphagia, flaccid quadriparesis, dysarthria, that later becomes spastic, and horizontal gaze paralysis, which is progresses to coma or delirium.[3] EPM is characterized by tremor, ataxia, and other movement disorders including mutism, parkinsonism, dystonia, and catatonia.[6] An important accompaniment of the hyponatremia in our patient was hypokalemia Figure 1. Hypokalemia was found to be a predisposing factor in 7 cases of Central pontine myelinolysis seen amongst 22 cases of hyponatremia in a recent study, even when rapid correction of hyponatremia and non-acuteness of hyponatremia were not found to be the risk factors.[7] In another report, 89% of 74 cases of Osmotic Demyelination Syndrome had associated hypokalemia at presentation that, in contrast to our patient, had not normalized prior to the rapid correction of hyponatremia.[8] Reduced endothelial cell membrane concentration of NaK-ATPase in hypokalemia may predispose the cell to injury by osmotic stress associated with the rapid rise in the serum sodium concentration.[8] the rate of correction of serum sodium is dictated by the clinical condition of the patient but slow correction of hyponatremia is the most important step in the management of hyponatremic patients,. In asymptomatic patients, plasma Na+ should be raised very slowly (0.5–1.0 mmol per h and up to 10–12 mmol/L over first 24 hrs). In patients with altered mental status and/or seizures, a relatively rapid correction (1–2 mmol/L per h for first 3–4 hrs or until seizures stop and up to 10–12 mmol/L over first 24 hrs) is recommended. Severe symptomatic hyponatremia can be treated with hypertonic saline. Isolated case reports suggest that steroids,[9] imidazolpyridine tartrate,[10] or plasmapheresis may be helpful in therapy.[11] Patients who survive might require extensive and prolonged neurorehabilitation. In a recent study of 34 patients with Osmotic demyelination syndrome, one-third of the surviving 32 recovered, one-third were debilitated but independent, and one-third were dependent. Furthermore, clinical severity or extent of radiological/imaging changes is not predictive of the prognosis.[11]

Our case illustrates the development of ODS in graded correction of hyponatremia and emphasizes the possible pathogenetic role of associated hypokalemia.

Authorship Contribution

Pervaiz M Zunga: Chief author, **Omar Farooq:** Co-author, **Ishrat Hussain Dar**, **Iqbal Dar**, **Samia Rashid**, **Abdul Qayoom Rather**, **Javaid Basu and Mohamed Ashraf:** Helped in reviewing the work

References

1. King JD, Rosner MH. Osmotic demyelination syndrome. Am J Med Sci. 2010; 339(6): 561–7.
2. Brown WD. Osmotic demyelination disorders: Central pontine andextrapontine myelinolysis. Curr Opin Neurol. 2000; 13: 691–7.
3. Osborn AG, Salzman KL, Barkovich AJ. 2nd ed. Salt Lake City, Utah: Amirsys; 2009. Diagnostic imaging: Brain.
4. Sterns RH, Riggs JE, Schochet SS., Jr Osmotic demyelination syndrome following correction of hyponatremia. N Engl J Med. 1986; 314: 1535–42.
5. Maallem S, Mutin M, Gonzalez-Gonzalez IM, et al. Selective tonicity-induced expression of the neutral amino-acid transporter SNAT2 in oligodendrocytes in rat brain following systemic hypertonicity. Neuroscience. 2008; 153: 95–107.
6. Martin RJ. Central pontine and extrapontine myelinolysis: The osmotic demyelination syndromes. J Neurol Neurosurg Psychiatry. 2004; 75(suppl 3): iii22–8.
7. Heng AE, Vacher P, Aublet-Cuvelier B, et al. Centropontine myelinolysis after correction of hyponatremia: Role of associated hypokalemia. Clin Nephrol. 2007; 67: 345–51.
8. Lohr JW. Osmotic demyelination syndrome following correction of hyponatremia: Association with hypokalemia. Am J Med. 1994; 96: 408–13.
9. Sakamoto E, Hagiwara D, Morishita Y, et al. Complete recovery of central pontine myelinolysis by high dose pulse therapy with methylprednisolone. Nippon Naika Gakkai Zasshi. 2007; 96: 2291–3.
10. Wang WT, Chen YY, Wu SL, Wei TS, Liu SY. Zolpidem dramatically improved motor and speech function in a patient with central pontine myelinolysis. Eur J Neurol. 2007; 14: e9–10.
11. Grimaldi D, Cavalleri F, Vallone S, Milanti G, Cortelli P. Plasmapheresis improves the outcome of central pontine myelinolysis. J Neurol. 2005; 252: 734–5.