Osmotic Demyelination Syndrome in a Normonatremic Patient of Chronic Kidney Disease

Kronik böbrek yetmezliğine bağlı osmotik demyelinizasyon sendromlu normonatremik bir olgu

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Abstract

Osmotic demyelination syndrome (ODS) also known as central pontine myelinolysis is a neurological disorder characterized by loss of myelin in the central pons as well as in the other parts of the brain like basal ganglia, lateral geniculate bodies, external and internal capsules and cerebellum. Osmotic demyelination syndrome is a demyelinating disorder associated with rapid correction of hyponatremia. Classically, this is associated with hyponatremia, but it can also occur in the presence of normonatremia. Changes in osmolality are found to be responsible in the pathogenesis of the lesions. Rarely, in patients having normal sodium levels, pontine myelinolysis with delirium clinic was also described. We report the clinical and radiological findings of a normonatremic 45 years old woman patient with chronic kidney disease, suffering from central pontine myelinolysis. The aim of this report is to point the fact that pontine myelolysis may occur in normonatremic circumstances and fast management of the disease before it is too late to defeat the permanent damage.

Keywords

Osmotic demyelination syndrome, normonatremia, chronic kidney disease

Anahtar Kelimeler

Osmotik demiyelinizasyon sendromu, normonatremi, kronik böbrek yetmezliği

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Öz

Santral pontin miyelinolizis olarak da bilinen osmotik demiyelinizasyon sendromu pons ve beynin bazal gangliyon, lateral genikulat cisimler, eksternal ve internal kapsül ve serebellumda miyelin kaybı ile giden nörolojik bir hastalıktır. Osmotik demiyelinizasyon sendromu hiponatreminin hızlı düzeltilmesi ile birlikte gelişen bir demiyelinizasyon hastalığıdır. Klasik olarak hiponatremi ile ilişkilendirilse de, normonatremi varlığında da görülebilir. Lezyonların patogeneğinde ozmolalitedeki değişiklikler sorumlu tutulmuştur. Hastalarda normal sodyum seviyelerinde deliryum kliniği ile birlikte pontin miyelinolizis nadiren de olsa tanımlanmıştır. Deliryum kliniği ile acil servise başvuran, kronik böbrek yetmezliği ile birlikte normonatremik santral pontin miyelinolizisli, 45 yaşında ki kadın hastanın klinik ve radyolojik bulgularını sunduk. Olgunun sunulmasında ki amaç, hasta normonatremik bile olsa pontin miyelinolizis gelişebileceğine dikkat çekerek; kalıcı hasar gelişmeden erken tedavi başlanmasının sekelli iyileşmeyi engelleyeceğini vurgulamaktır.

Introduction

Osmotic Demyelination Syndrome (ODS) was first defined and described in 1959 [1]. Central pontine myelinolysis is a neurological disease characterized with demyelination within the pons, demyelination also occurs in extrapontine regions, including the thalamus, subthalamic nucleus, amygdaloid nucleus, corpus geniculatum laterale and cerebellum. Rapid correction of hyponatremia is an important risk factor for the development of ODS. On the other hand ODS has also been reported in normonatremic and hypernatremic patients, especially in association with conditions like chronic alcoholism, liver transplantation, diabetes mellitus, hypokalemia, hepatocellular dysfunction, lithium toxicity, chemotherapy and chronic renal failure [2-3-4]

The mechanism that causes ODS is not absolutely known but some logical reasons are to be thought. One of them is the penetration of complement and other cytotoxic plasma components through to blood brain barrier (BBB) due to osmotic changes. These consequent events induce astrocyte apoptosis and eventually disrupts the structure of oligodendrocytes, myelin and afterwards microglia activation occurs according to the release of inflammatory cytokines. Hyponatremia causes intracellular volume changes so that intracellular soluble matters redistribute and adapt to osmotic changes; thus body is protected but intracellular organic osmotic particules reduce and in five days stores of these particules are rebuilt. Serum osmolality increases again and brain faces osmotic dehydration risk [5]. In classic ODS hypertonic fluid that causes edema is located at the extracellular space until the endothelial integrity is ensured. This fluid shows its toxic effects on myelin and oligodendrocytes. During the hemodialysis plasma becomes more hyponatremic than brain cells, this rapid shift causes brain edema in extracellular space. In ODS pathologic mechanism, there is a rapid change in the amounts of plasma solubles. The only thing that effects the serum osmolality is not the sodium; BUN and glucose also differs before and after the hemodialysis and this changes the serum osmolality. As known, three components that determine osmotic gradient are BUN, glucose and sodium. The changes in the level of these, provoke brain edema [6]. We reported a rare clinic and radiologic case which is seen in a

normonatremic patient who has ODS due to chronic renal disorder to evaluate the physiopathologic mechanisms that underlied.

Case Report

Forty-five years old woman consulted to emergency service having unreasonable speaking and impairment of consciousness. The patient was having dialysis because of kidney failure since two years. The complaints started two days ago and progressed. Delirium and hallucinations were observed in examination. Beside the enhanced bilateral deep tendon reflexion, the plantar reflex bilaterally was extensor determined in neurologic examination.

In routine bio-chemical tests, urea was 57 mg/dl, creatinine was 5.89 mg/dl. Sodium level was 137 mEq/L and the other electrolyte levels, sedimentation, CRP and biochemistry parameter was regular. Vitamin B12 was 929 pg/ml and folic acid was 6.67 ng/ml. Cerebrospinal fluid and electroencephalography examination was regular.

In cranial CT examination hypodensity was determined in a part of pons and mesencephalon (Figure 1). In view of Cranial Magnetic Resonance, volumetric dilatation was evidently taking attention in the level of pons and paraventricular intensity alteration having dimensions of 37x33x45mm was seen bilaterally extending to cerebral pedicle, including a part of the pons and mesencephalon and slightly compressing IV. ventricle in T2A sequences in high signal intensity (Figure 2,3). The diffusion weighted MR images of the patient shows observed diffusion restriction in the areas of demyelination (Figure 4).

Figure 1. Patient's CT imaging demonstrating density reduction in the pons and cerebral pedicles accompanied by pressure on the 4th ventricle are observed

Figure 2. Sequences of MR imaging: Axial T1 (a), Axial T2 (b) and Sagittal T2 (c) demonstrating diffusion enlargement in the pons and mesencephalon without significant mass formation. In T1-weighted sequences; cerebral pedicles, mesencephalon, and pons are hypointense, and in T2-weighted sequences, there is a signal increase.

Figure 3. Axial FLAIR sequences demonstrating corticospinal tracts and transverse pontine fibers in the demyelination areas

Figure 4. Diffusion-weighted images demonstrating diffusion restriction of mesencephalon and pons

In clinical follow the conscious status, the neurologic symptoms were getting worse so that the patient was taken to the intensive care unit. Dialysis therapy was continued and decreasing levels in urea (51 mg/dl) and creatine (4.33mg/dl) were observed. After the second week of hospitalization, recovery

began in neurologic examination and the patient was extubated without any loss in consciousness or motor capability. After two months, there was no any anomaly in neurologic examination except from the increase in bilateral deep tendon reflexes.

Discussion

The mechanism is not certainly known that causes osmotic demyelination syndrome and there is no specific therapy. Supporting therapy and therapy for inhibiting complications should be considered. One third of the patients who developed osmotic demyelination syndrome and survived, heals without any sequel, one third is harmed but lives an independent life and one third has a permanent damage.

When the diagnosis is determined, therapy is most likely supportive. Reports on small case series or

single case reports of treatments including steroids, intravenous immunoglobulin, and thyrotrophin releasing hormone, have all shown good outcomes but are difficult to interpret for the above reason. These therapy methods are not proposed to ODS patients because there are no tests done on human [7].

In the study of Abbott et al., where they examined 34 ODS patients, death percentage was 6%, fully cured patients rate was 30%, the rate of the harmed patient but living without any help was 32%, dependent living patient rate was 32% [8]. In the literature review of Martin et al., ODS death rate was found to be 40-50%, hospitalization in intensive care units was 10-20% [9]. In the literature death rate differs within a wide range from 6% to 90%. Menger and Jorg reported that 40% of patients are recovering without any neurologic sequel [10].

Bacillus, perforant artery infarcts, demyelination diseases, pontine gliomas and hypertensive encephalopathies take place in radiologic differential diagnosis. Massless density reduction mainly in pons and also in thalamus and basal ganglia is defined in computed tomography for ODS [11]. Magnetic resonance is a more sensitive neuro imaging method in diagnosis. In magnetic resonance imaging, hypointense signal changes in T1-weighted images and hyperintense signal changes in T2-weighted images are observed at the areas of demyelination [12-13]. Diffusion limitation is defined in the myelinolysis areas at the beginning of the symptoms, but in some studies it is defined that diffusion findings shows late onset till 24 hours after the clinical symptoms [14]. Typically, lesions do not show any contrasting [15-16]. In this reported case, neuroradiologic images are found compatible with ODS. Massless diffuse expansion in T2 weighted images and signal enhancement on flair images are observed at pons and mesencephalon as MR findings. In diffusion-weighted images, diffusion limitation was identified at mesencephalon and pons where corticospinal tracts and transverse pontine fibers are protected. The protection of ventrolateral pons and corticospinal tracts are diagnostic in ODS where as in this case [15-16-17].

Although the rapid correction of hyponatremia is an important risk factor, the phenomenon can also be seen in normonatremic chronic kidney failure

[1]. In this case findings came out in the presence of normonatremic chronic kidney failure. Pontine myelinolysis is a rare disease and it must be especially considered in chronic kidney failure patients who have unconsciousness when they are hospitalised in emergency. The most important point is the rapid diagnosis of this disease and initializing rapid supportive therapy so it can be defeated without any sequels.

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Uncorrected Proof