Oculocerebrorenal syndrome, also known as Lowe syndrome, is an X-linked recessive disorder which first reported by Lowe et al in 1952.\(^1\) Primary clinical manifestations include congenital cataract, mental retardation and renal tubular dysfunction (Fanconi syndrome). The severity of the renal disease can vary between patients and most of them are asymptomatic at birth. Renal disease can also lead to the development of rickets. Reported prevalence is only a few cases per 100,000-500,000 births.\(^2,3\) The responsible gene, located at Xq26.1, is
called OCRL1 and it encodes a phosphatidylinositol-4, 5-biphosphate-5 phosphatase that is found in Golgi complex. A mutation in the OCRL1 gene locus causes this syndrome by a reduction of the OCRL1 protein. We report, a 6-years-old boy with the clinical features of Lowe syndrome who has distinct radiological and examination findings of rickets. Our purpose is to check out clinical features of Lowe syndrome that was presented with rickets and emphasize the diagnostic importance of proton magnetic resonance spectroscopy.

**CASE REPORT**

A 6-years-old boy was admitted to our hospital suffering from difficulty in walking for six months. He was a term baby and borned by spontaneous vaginal way with a birth weight of 2950 g and bilateral congenital catarracts. The perinatal history was unremarkable but he had motor developmental delay and any seizures were not observed. He was not given vitamin D or multivitamin combinations during infancy and then. Family history revealed that he was born out of a consanguineous marriage and has three brothers who were in good health.

His height was 105 cm (< 3 p, -2.6 SDS), weight was 13 kg (< 3 p, -4.4 SDS) and occipital front circumference was 47.5 cm (< 3 p, -2.4 SDS). Frontal bossing, small nose, deep-set eyes, normally placed large ears, elevated palate, bilateral cataracts, multiple deformed tooth in the mouth, ‘O bines’ deformity with rachitic rosaries were examination findings. He was using eyeglasses. Other examination findings were all normal. Laboratory assessment revealed; hypercalcaemia (urine calcium concentration was ≥ 4 mg/kg/day), hypokalemia (2.4 mEq/L, normal ranges were 3.6-5.1) hyponatremia (125.9 mEq/L, normal ranges were 136-144) and metabolic acidosis (pH: 7.29; PCO₂: 30.1; HCO₃⁻: 10.1 mmol/L and base excess: 7.6 mmol/L). Serum calcium, phosphorus, alkaline phosphatase and parathormone levels were; 9.2 mg/dL (normal ranges 8.9-10.3), 2.9 mg/dL (normal ranges 3.7-4.7), 354 u/L (normal ranges 0-500) and 31 pg/mL (normal ranges 8-76), respectively and all values controlled three months consecutively. There was no glucosuria, however proteinuria (19 mg/m²/hour) was significant. Also tubular reabsorption of phosphorus was 82% (normal range %93 <), urine Ca/Cr, PO₄/Cr were 0.65 (normal ranges 0.04-0.8) and 1.02 (normal ranges 1.2-5) respectively. Other biochemical and hormonal analyses were normal. Renal ultrasonography (USG) demonstrated micro calcules in the renal parenchyma. On radiography; the epiphyses of radius and ulna appeared wider, concave and fraayed (Figure 1a, b). Nevertheless a spontaneous fracture was determined on the right knee. Bilateral subcortical cystic lesions were detected on cranial magnetic resonance images (MRI) and proton magnetic resonance spectroscopy of subcortical white matter showed a myoinositol peak at 3.56 ppm suggesting the presence of gliosis (Figure 2a, b). He was treated with oral administration of 0.5 µg/day calcitriol. Also alkaline supplementation including sodium, potassium citrate and sodium bicarbonate were added on the therapy. Because of the decreased serum phosphorus levels

![Figure 1: (a) The expansion of the wrists due to rickets, (b) Bilateral widered, concave and fraayed epiphyses of radius and ulna on radiography.](image1)

![Figure 2: (a) Normal signal on b= 1000 s/mm² and, (b) high ADC (apparent diffusion coefficient) values on subcortical white matter on diffusion magnetic resonance imaging, (b) Moderate myoinositol peak on proton magnetic resonance spectroscopy at 3.56 ppm.](image2)
and tubular reabsorption of phosphorus, replacement treatment was given. On follow up, his difficulty in walking recovered in 6 months and all laboratory parameters of urine and serum became to normal.

**DISCUSSION**

The clinical diagnosis of Lowe syndrome is based on specific ophthalmologic, urologic and renal abnormalities. Our patient is diagnosed as Lowe syndrome based on clinical and laboratory findings.

Essentially, renal findings of Lowe syndrome vary between patients and the severity of renal disease changes from asymptomatic to chronic renal failure. Metabolic acidosis due to proximal tubular bicarbonate wasting and hypophosphatemia due to renal phosphate wasting can be related with poor growth. Otherwise renal phosphate wasting is associated with renal rickets, osteomalacia and pathological fractures. In addition to the commonly seen tubular dysfunction, several glomerular changes have been recognized such as glomerular sclerosis, thickening of basement membranes and fusion of the foot processes. Recently, increased urine retinol binding protein and N-acetyl-glucosaminidase have been used for detecting early proximal tubular dysfunction in Lowe syndrome.

While admitting to our clinic the primer complaint of our case was difficulty in walking which might be a rachitic symptom. Also clinical examination revealed the rachitic findings such as ‘O bones’ deformity and rachitic rosaries. Yet, the reason that reminded us to research detailed was bilateral congenital cataract which was accompanied to ricketsial findings. Signs of rickets were showed radiologically also with the normal serum parathormone, calcium and decreased phosphate levels. However hypercalcaemia, proteinurea were significant and tubular reabsorption of phosphorus was decreased. Renal calcule formations were detected on ultrasonography. It could be related with hypercalcaemia and metabolic acidosis. Also hypercalcaemia, phosphorurea and metabolic acidosis were all caused rickets together in our patient. It is known that the severity of renal disease changes from asymptomatic to Fanconi syndrome. So, urine and blood analysis of the case showed the laboratory findings of Fanconi syndrome.

Cataract is the major finding of all clinical features as in our patient. It develops in utero and is caused by altered migration of the crystalline embryonic epithelium. Nystagmus, corneal and conjunctival cheloids are the other eye associated findings. Also, incomplete lenticular opacities were reported. Our case had bilateral cataract and was not operated before.

Unfortunately nervous system is affected in the disease. Hypotonia is usually present at birth and suctioning problems may occur. Mental problems are not usual but about 10% of patients show slight mental retardation with an IQ of 50 or less. Also, cognitive impairment, behavioral disturbances, motor milestone delay, areflexia and seizures can be observed. In the present patient there was not any neurological symptoms or signs except the hypotonia at birth and motor developmental delay later on. Electromyogram and motor and sensitive velocity are normal in these patients. On cranial MRI; ventricularomegaly, periventricular cysts that the intensities vary between T1 and T2-weighted images and focal or diffuse myelin pallor can be showed. But, prominent myoinositol peaks suggesting the presence of gliosis on proton magnetic resonance spectroscopy at 3.56 ppm is typical. Also on diffusion MRI normal signal on b= 1000 s/mm² and high apparent diffusion coefficient (ADC) values have been gained. However these lesions were not correlated with the severity of clinical manifestations.

Proton magnetic resonance spectroscopy is a very promising technique that provides in vivo biochemical information on a variety of brain compounds. Also spectroscopy can be used to monitor the effectiveness of therapy for metabolic disorders. In different diseases a variety of representative resonances are detected, for example; N-acetylaspartate peak at 2 ppm in adrenoleukodystrophy, myo inositol peak at 3.56 ppm in Lo-
we syndrome and lactate peak at 1.33 ppm in mitochondrial diseases.

In the present case MRI showed hypointense lesions on T1-weighted images in the bilateral subcortical white matter while the lesions appeared hyperintense on T2-weighted images. The proton spectroscopic study of the subcortical white matter showed a myo inositol peak at 3.56 ppm suggesting the presence of gliosis (Figure 2a, b).

In conclusion; Lowe syndrome is typically diagnosed with clinical and laboratory findings in our case. Also, rarely rickets can be occured as a component of Fanconi syndrome in these patients.

REFERENCES