Our Treatment Experience with Nocturnal Continuous Enteral Calcium Infusion in a Case with Vitamin D Resistant Rickets Type II

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BACKGROUND

Vitamin D resistant rickets type II (VDDR-II) is a rare disease which results from mutations in the *VDR gene*. In most cases treatment is difficult and despite conventional treatment with high dose active vitamin D and oral calcium, sufficient recovery cannot be achieved. Intravenous calcium infusion is an alternative treatment which have been reported with successful results. However, it has limitations and serious complications such as need for hospitalization, catheter infection, thrombosis, skin necrosis. We present the results of nocturnal-continuous enteral calcium infusion in a patient who did not respond to conventional treatment.

CASE REPORT

19-month-old male patient was referred for rickets findings. His parents were related. **On physical examination;**

- Weight: -1.47 SDS
- Lenght: -3.20 SDS
- Head Circumference: 0,25 SDS
- Caput quadratum, rachitic beads, enlargement in wrists and lower limb deformity were present.
- He had no alopecia.

- **Biochemical findings:** Compatible with stage 3 rickets (Table 1).

- **Radiological findings:** Compatible with rickets (widening and irregularity of the growth plate ("fraying") widening of the metaphyseal end of the bone ("splaying") concavity of the metaphysis ("cupping") (Figure 1)

Molecular Genetic Analysis

- R158L (c.473 >T) homozygous mutation was identified in *VDR* gene.

Clinical Follow-up

- At presentation the patient was diagnosed with nutritional rickets and given stoss therapy which did not result in any improvement. Due to high serum 1,25 $(OH)_2D3$ level and unresponsiveness to stoss therapy VDDR-II was considered. A treatment with high dose calcitriol and oral calcium was initiated. However, this treatment also failed to improve the clinical and laboratory findings.

- Due to the possible complications an intravenous calcium treatment was avoided and a trial with nocturnal-continuous enteral calcium gluconate infusion (100 mg/kg/12 hour with nasogastric catheter) was initiated after taking informed consent. After 20 days of treatment, the patient referred with lethargy and severe metabolic acidosis with increased anion gap.

- Despite detailed laboratory work-up, the cause of acidosis could not be clarified. Dialysis was applied to the patient who did not respond to NaHCO3 replacement. After being discharged from the hospital, the patient referred to us on the 30th day of the treatment with the same clinical picture. Screening tests for neurometabolic diseases revealed normal findings.

- Metabolic acidosis attacks of the patient recovered with supportive treatment and did not recur after discontinuation of enteral calcium gluconate treatment. The patient is still 4 years old and he periodically receives intravenous calcium gluconate treatment.

Table 1. Treatment results of the case diagnosed with vitamin D resistant rickets type 2

	At Diagnosis	After Stoss treatment	Prior to Enteral Calcium Gluconate	After Enteral Calcium Gluconate	After Intravenous Calcium Gluconate
Age (year)	1,5	1,66	2,9	3,1	4,08
Weight SDS	-1,47			-1,55	-1,27
Height SDS	-3,2			-3,19	-4,86
Height velocity SDS	-				-0,55
Ca (mg/dL) (N, 8.8-10.8)	**8,8**	7,9	7,9	9,7	10,4
P (mg/dL) (N, 4,0-7,0)	**2,6**	2,6	2,5	1,6	1,6
ALP (IU/L) (N, 82-383)	**2742**	2636	2927	2198	2418
PTH (pg/mL) (N, 10-69)	**610**	693	693	103	28,9
25(OH)D3 (ng/mL) (N, 20-100)	**9,9**	48,9	7,1	14,6	9,89
$1,25(OH)_2D3$ (pg/mL) (N, 16,4-81)	-	**>180**	-	-	-

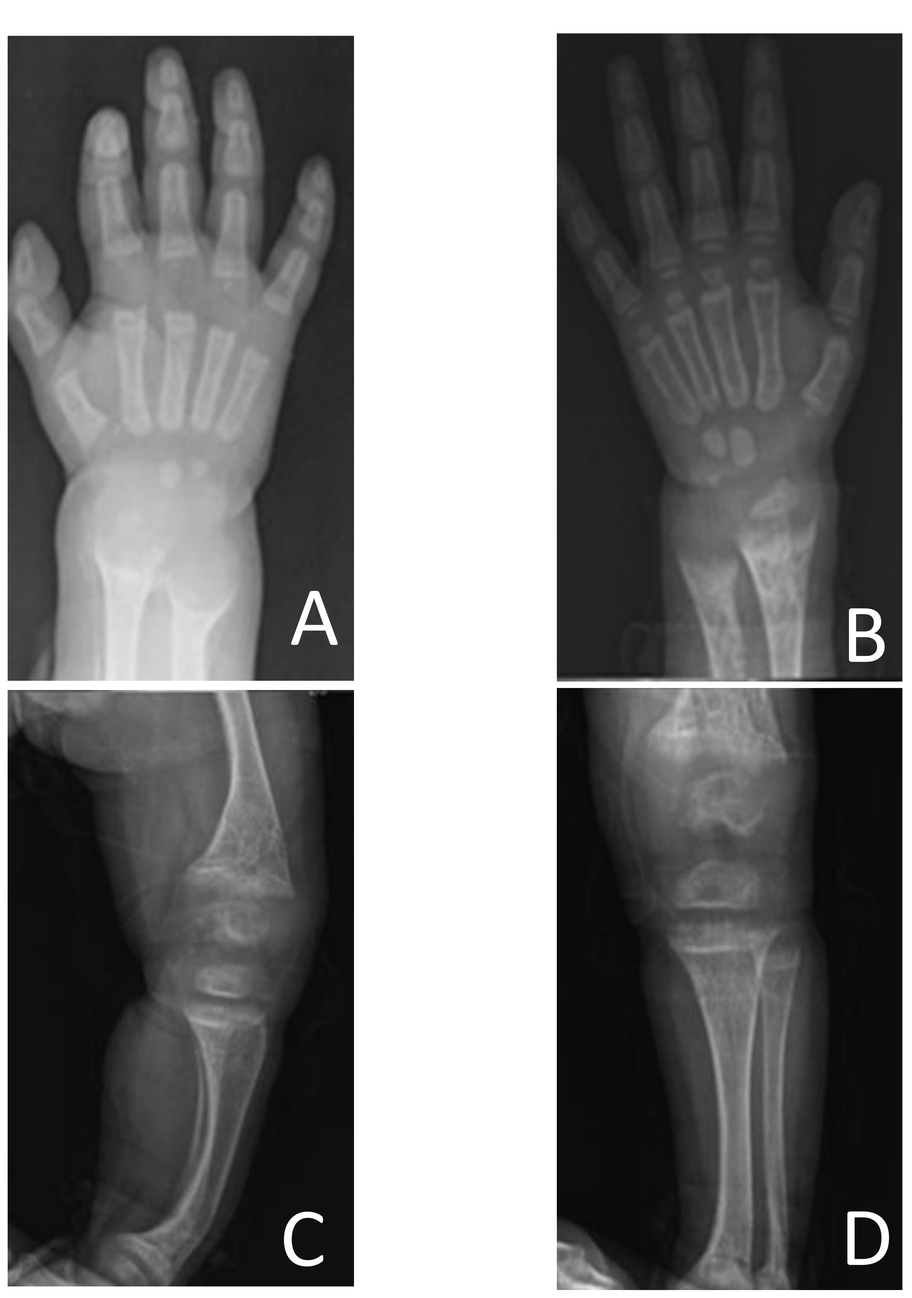

Figure 1. Radiographic findings of the case diagnosed with Vitamin D resistant rickets type II; at the time of diagnosis (A,C) and following treatment (B,D)

CONCLUSION

Difficulties in the treatment of cases with VDDR-II direct physicians to alternative treatment search. In this case, we applied a trial with enteral calcium gluconate which we suggest to cause severe metabolic acidosis. Enteral calcium gluconate is used extensively in newborn infants. However, experience with high dose oral calcium gluconate use is limited. While calcium gluconate treatment does not lead to metabolic acidosis when applied intravenously, it is unclear why it causes this situation when applied enterally.