Dental findings in patients with renal tubular acidosis

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ABSTRACT

Renal tubular acidosis (RTA) is characterized by metabolic acidosis due to impaired renal acid excretion. Untreated RTA may lead to growth failure, osteoporosis, rickets, nephrolithiasis, and even renal failure. Oral manifestations in distal RTA (dRTA), the most common form of RTA, are very rarely reported. We hereby report the oral manifestations of five patients with dRTA. Oral alterations were observed in these five patients with dRTA, ranging from generalized yellowish discoloration to rough surfaces with loss of the enamel structure. Loss of contrast between enamel and dentin was observed in all patients while teeth with wide pulp chambers characterizing hypotaurodontism were detected in one patient. This study is the first report of dental alterations in Brazilian patients with dRTA. Enamel hypoplasia was the most common finding. We believe that abnormalities of the biomineralization process found in patients with dRTA might also affect calcium deposition in dental tissues.

Key words: Dental Alterations, Distal Renal Tubular Acidosis, Enamel Hypoplasia, Tubular Disorders

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INTRODUCTION

Renal tubular acidosis (RTA) is characterized by metabolic acidosis due to impaired urinary acid excretion by renal tubules.[1] RTA may be inherited (primary) or acquired (secondary), but both forms may lead to growth deficiency, osteoporosis, rickets, nephrolithiasis, and more rarely chronic kidney disease.[1] The most common type of primary RTA in childhood is distal RTA (dRTA), which is characterized by impaired urinary acidification leading to hyperchloremic acidosis with inappropriately alkaline urine.[1] Regarding patterns of inheritance, dRTA may be transmitted as an autosomal dominant trait or an autosomal recessive with or without deafness.

Dental alterations in patients with renal tubular disorders have been described in a few reports.[2,3] Specifically, in dRTA, there is only one case reported in pediatric age group about the association between dRTA and amelogenesis imperfecta (AI).[4] Therefore, purpose of the present study is to report, for the first time, dental alterations in five Brazilian patients with dRTA.

CASE REPORT

Five patients with the diagnosis of dRTA, four of them also being confirmed by molecular diagnosis,[5] were systematically evaluated at the Pediatric Nephrology Unit, Department of Pediatrics, Federal University of Minas Gerais (UFMG), Brazil. There were no parental consanguinity and no history of maternal exposure to known teratogenic agents or maternal diseases during pregnancy. Patients 1 and 2 are two siblings, a 14-year-old

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girl and her 8-year-old brother, with well-defined dRTA. The girl was diagnosed with dRTA at the age of 4 months. The initial findings were failure to thrive, hyperchloremic metabolic acidosis with abnormally high urine pH, and nephrocalcinosis. The boy was diagnosed during his 1st month of life after a severe dehydration with metabolic acidosis, hypokalemia, hypocalcemia, and nephrocalcinosis. A single nucleotide change GAC→TAC (c.1232G>T) in exon 13 of the *ATP6V0A4* gene was observed, which caused a substitution of aspartic acid to tyrosine in position 411 (p.D411Y).[5] Patients 4 and 5 are a twin pair of girls with dRTA in association with nerve deafness. The girls were diagnosed at the age of 2 with rickets and growth retardation. A homozygous one base-pair insertion (c.1149 1155 insC) in exon 12 of the *ATP6V1B1* gene was detected in both sisters.[5] Patient 3 is a 14-year-old girl who exhibited since 1 year of age failure to thrive, polyuria, and polydipsia. Molecular studies are still going on, but the diagnosis of dRTA was confirmed by typical clinical findings associated with hyperchloremic metabolic acidosis in the presence of abnormally high urinary pH.[1]

All the patients have been followed according to a systematic protocol including clinical and nutritional evaluation, laboratory measurements, renal ultrasonography, and genetic analysis.[5] Briefly, the treatment consisted of continuous oral supplementation of alkaline solutions and control of other hydroelectrolyte imbalances.

These patients were also submitted to oral examination at mean age of 14 years and 4 months (range: 8–16 years). Dental alterations were found in all the patients as following.

Patient 1

Intraoral examination revealed teeth presenting rough surfaces with white and opaque areas and irregular enamel defects with loss of structure. The enamel alterations affected teeth in both arches [Figure 1]. The gingiva was normal, without signs of inflammation. Radiographic examination showed mixed dentition.

Patient 2

Intraoral evaluation showed generalized yellowish teeth without loss of dental structure. The gingiva showed signs of inflammation. Radiographic examination showed permanent dentition. In various teeth, no differences were observed in density between enamel and dentin. Enlarged pulp chambers and root canals were observed in the maxillary and mandibular teeth.

Patient 3

Oral examination showed teeth with irregular defects and loss of enamel structure in both arches. In some teeth, alterations in shape were observed. Changes in dental positioning and diastemas were also detected. Anterior teeth were restored. The gingiva showed signs of inflammation. Radiographic examination showed permanent dentition and lack of contrast between enamel and dentin in various teeth. Wide pulp chambers in

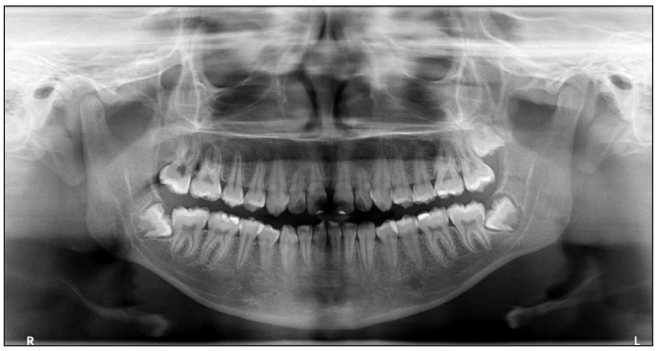

Figure 2: Panoramic X-rays showing permanent dentition and lack of contrast between enamel and dentin in various teeth. Hipotaurodontic mandibular second molars were observed (Patient 3)

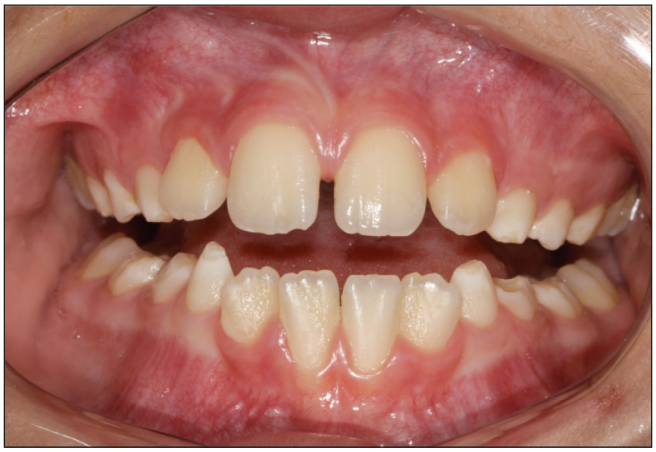

Figure 1: Intraoral examination revealed teeth presenting rough surfaces with white and opaque areas and irregular enamel defects with loss of structure in both arches (Patient 1)

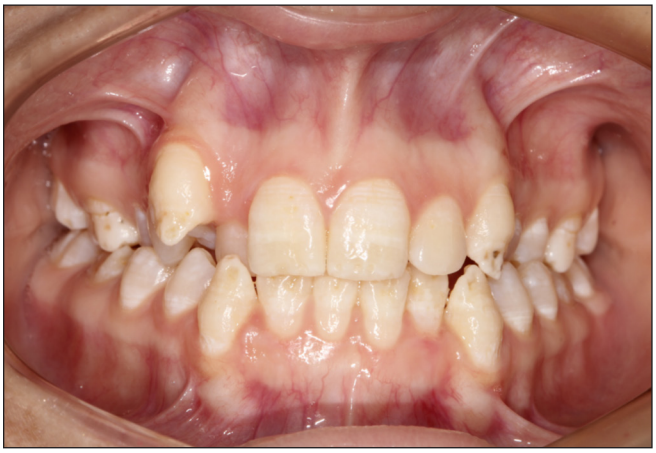

Figure 3: Intraoral examination revealed yellowish teeth presenting rough surfaces and conspicuous and irregular defects in enamel. Malpositioned teeth were noted (Patient 4)

mandibular second molars were noted, characterizing hypotaurodontism [Figure 2].

Patient 4 and Patient 5

These patients corresponded to twin pair of girls. In Patient 4, oral evaluation revealed generalized yellowish teeth presenting rough surfaces and conspicuous and irregular defects [Figure 3]. Malpositioned teeth in both arches were noted in Patient 4. Patient 5 showed lighter enamel defects than Patient 4. In both patients, radiographic examination showed permanent dentition and various teeth exhibited thin enamel with radiopacity similar to dentin. These two patients presented gingiva normal without signs of inflammation.

DISCUSSION

Dental alterations are described in different renal tubular disorders (Bartter syndrome, Fanconi syndrome, and dRTA), particularly those related to enamel formation and calcification.[2-4] The association between AI and nephrocalcinosis is also established.[2,4] AI is the result of many inherited defects of enamel formation that affects quantity and quality of enamel and might be identified in all or some teeth in the deciduous and/or permanent dentition.[2,4] Amelogenin, enamelin, enamelysin, *KLK4*, *WDR72*, *FAM20,* and *FAM83H* are genes associated with isolated AI.[2,4] We have previously described two patients with Bartter syndrome that presented AI and nephrocalcinosis.[2] The findings of this study showed by electron microscopic examination a thin enamel layer with normal structure, alternated by rough areas with severe porosity and irregularly shaped empty spaces, which confirmed the diagnosis of thin hypoplastic AI. In the same way, another study of our team reported two patients of Fanconi syndrome with enamel hypoplasia.[3]

Enamel alterations have also been previously identified in three adults and one pediatric patient with dRTA.[4] Four of our patients with dRTA presented irregular defects with loss of enamel structure, and one patient presented yellowish teeth affecting both arches. The lack of contrast between enamel and dentin was noted in all patients of our study. Patient 2 presented enlarged pulp chambers and root canals while Patient 3 was the only person with hypotaurodontism.

Dental anomalies were very rarely described in dRTA.[4] There is only one case report of a pediatric patient with dRTA and AI, who presented dentition according to chronological age, teeth with brownish orange color and irregular mottling of occlusal surface of the molars.[4]

In summary, we reported here for the first time that Brazilian patients with dRTA exhibit dental alterations in the course of the disease. However, further studies are necessary to explore molecular mechanisms that might link both alterations. This study also reinforces the concept that pediatric patients with renal tubular diseases might have important alterations in the oral cavity and should at least be submitted to clinical evaluation by dentists to early detection and treatment of dental abnormalities, which might improve their quality of life.

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Conflicts of interest

There are no conflicts of interest.

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