Bilateral nephrocalcinosis and amelogenesis imperfecta: A case report

Alok Patel, Chetana Jagtap, Chetan Bhat, Rohan Shah

Abstract

Amelogenesis imperfecta (AI) is a group of hereditary disorders that affect the quality and/or quantity of dental enamel. This paper describes the clinicopathological features of a patient who was born of nonconsanguineous parents and who presented with oral alterations, including yellow and misshapen teeth, intrapulpal calcifications, delayed tooth eruption, and gum enlargement. Scanning electron microscopy of the teeth revealed hypoplastic enamel, and a renal ultrasound detected bilateral nephrocalcinosis, leading to a diagnosis of AI and nephrocalcinosis syndrome. Since nephrocalcinosis is often asymptomatic and can be associated with impaired renal function, dentists who see children with a generalized and thin hypoplastic AI should consider a renal ultrasound scan and referral to a Nephrologist. Children with nephrocalcinosis should also be considered for a dental check.

Keywords: Amelogenesis imperfecta, nephrocalcinosis syndrome, hypoplastic enamel

Introduction

Amelogenesis imperfecta (AI) is a developmental, inherited disorder, affecting dental enamel. It usually occurs in the absence of systemic features and comprises diverse phenotypic entities.[1] The predominant clinical manifestations of affected individuals are enamel hypoplasia (enamel is mineralized, but thin), hypomineralization (subdivided into hypomaturation and hypocalcification), or a combined phenotype, which is seen in most of the cases.[2-4]

The AI can be transmitted by an autosomal-dominant, autosomal-recessive, or X-linked mode of inheritance.[5,6] Hypoplastic AI can occur in a variety of ectodermal syndromes and metabolic disorders (Witkop and Sauk, 1976; Catena *et al*., 1970; Edward and Nord, 1974; Chosack *et al*., 1979; Frank and Bolender, 1962; Wennstrom, 1963; Bergman *et al*., 1964; Witkop *et al*., 1975).

Occasionally, AI occurs with other features as part of syndromes, for example, amelo-onycho-hypohidrotic syndrome, Morquio syndrome, Kohlschutter syndrome, tricho-dento-osseous syndrome, AI with taurodontism syndrome, oculo-dento-osseous dysplasia, epidermolysis bullosa hereditaria, AI and nephrocalcinosis syndrome.

In 1972, MacGibbon[7] reported a brother and sister with an absent enamel, nephrocalcinosis, and with normal calcium metabolism. Nephrocalcinosis is deposition of calcium in renal tissue and may be predominantly cortical or, more commonly, medullary found in conditions such as primary hyperparathyroidism, distal renal tubular acidosis, medullary sponge kidney, hypervitaminosis D, oxalosis, and some forms of Bartter's syndrome.[8] The syndrome of AI with nephrocalcinosis, also called as enamel-renal syndrome (OMIM 204690). This syndrome has been described previously in 14 cases[1-10] from consanguineous as well as nonconsanguineous families.[7,9-18]

The importance of this syndrome is diagnosis and recognition in this condition is in guiding pediatric dentist, who meets this patient group in early ages, to recognize the possibility of the other anomalies in AI patients.

Case Report

A 16-year-old girl reported to the department of Pediatric and Preventive Dentistry, Bharti Vidyapeeth Deemed University, Pune. With a chief complaint of absence of multiple teeth in both the maxillary and mandibular arch with pain associated with maxillary right and left posterior region.

She was the 1st child born to healthy nonconsanguineous family. The family history was otherwise unremarkable. Intraoral examination revealed yellow to yellowish-brown teeth with rough surfaces, conspicuous and irregular defects, and a lack of contact points. The enamel alterations were generalized affecting both lower and upper teeth [Figure 1]. Also revealed the absence of

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mandibular right and left permanent central and lateral incisors, canines and premaolars followed by maxillary right premolars [Figures 2 and 3]. Orthopantamograph showed deciduous teeth and incomplete permanent dentition with the delayed eruption and several impacted teeth. No density difference was observed between enamel and dentin. Significant amount of bone covering was present over permanent mandibular right and left central and lateral incisors and premolars and maxillary right premolars even after complete root formation but there had been no axial movement of the above teeth through bone. Radiograph also revealed absence of periodontal ligament space and lamina dura in primary and erupted permanent teeth. Intrapulpal calcifications in erupted and unerupted molars were evident [Figure 4]. A diagnosis of hypoplastic AI was made, and the patient was further investigated. Ultrasound and X-ray of kidney, ureter, bladder showed nephrocalcinosis with bilateral multiple calculi and few small calcifications in the region of the renal medulla at the lower pole on either side were evident on computed tomography. These may represent changes of medullary nephrocalcinosis [Figures 5 and 6].

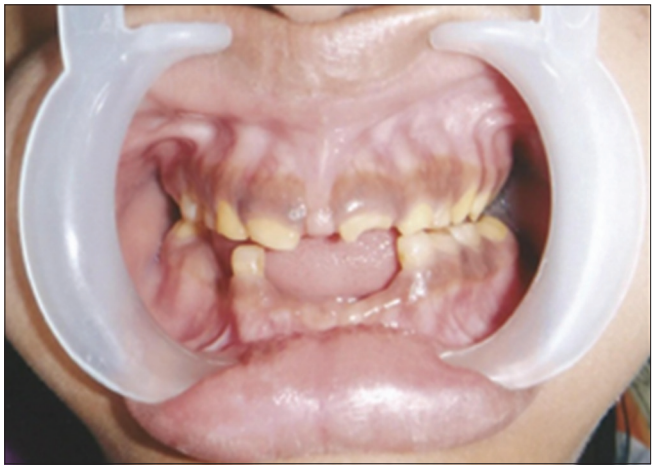

Figure 1: Generalised enamel alterations

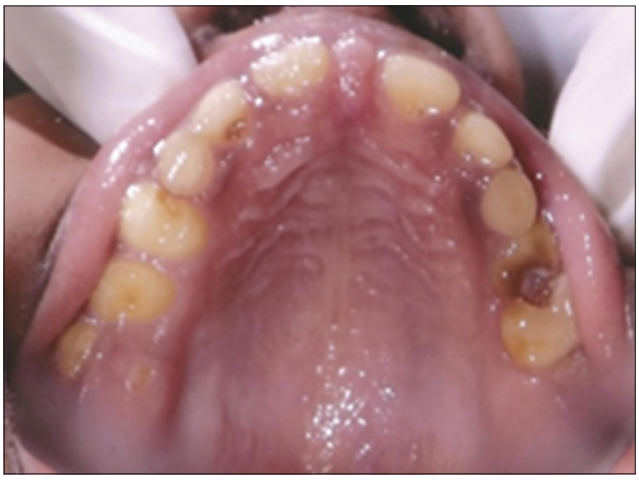

Figure 3: Missing maxillary teeth

Biochemical and hematological investigation revealed marked increase in alkaline phosphatase which is consistent with reduced 25-hydroxy cholecalciferol Vitamin D to 10.8 ng/ml (<20 ng/ml considered as deficient), reduced serum creatinine to 3.61 mg/kg/day (*N* = 8.00–30.00). A 24 h urine examination revealed reduced calcium (13.60 mg/day) and phosphorus (100 mg/day) excretion. Based on the systemic investigation, patient has been diagnosed to have bilateral medullary calcinosis and a Vitamin D deficiency state with hypocalcinuria and hypophosphateuria with metabolic alkalosis.

The parents and two healthy siblings had no clinical abnormalities. Mental and motor development and growth parameters of the patient have been normal.

Discussion

The syndrome of AI and nephrocalcinosis has been previously reported only in 14 cases.[7,9-18] Although AI and nephrocalcinosis are an extremely rare syndrome, untreated nephrocalcinosis is known to be associated with significant morbidity. Patient's family who had this syndrome was not detected until they were well into adulthood, with recurrent

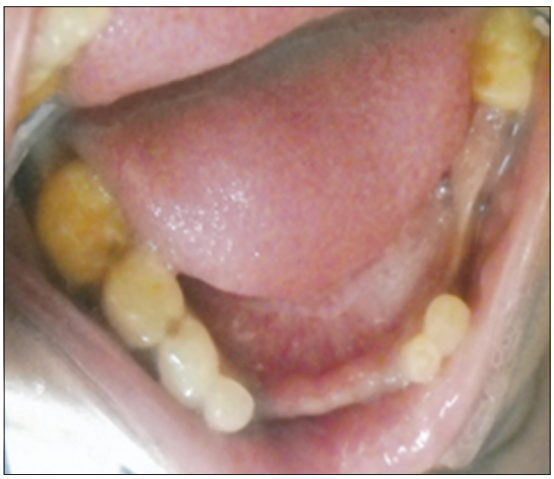

Figure 2: Missing mandibular teeth

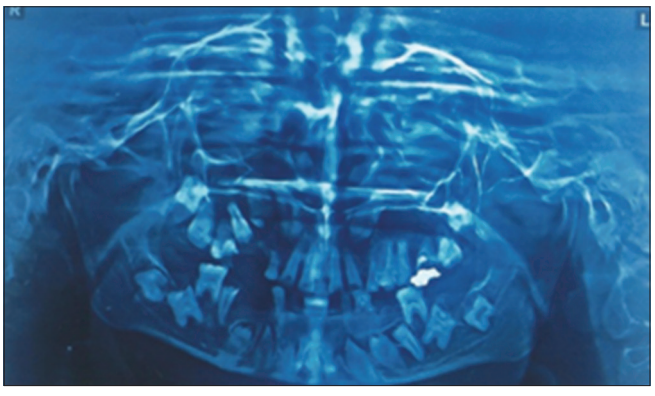

Figure 4: OPG

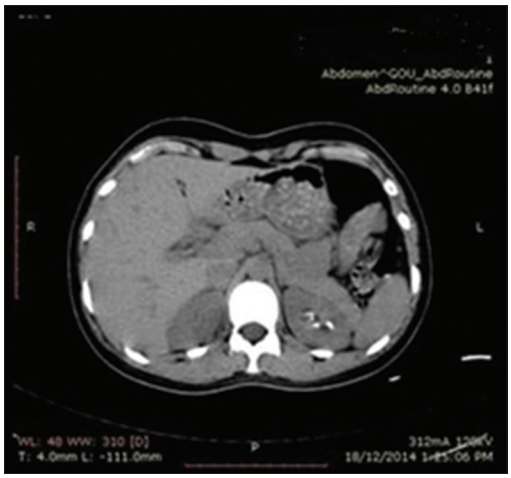

Figure 5: Left CT scan

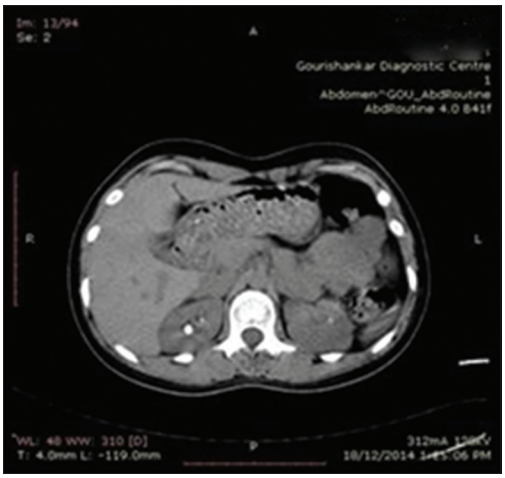

Figure 6: Right CT scan

urinary infections, pyelonephritis, or renal colic and the passage of renal stone. In our case, nephrocalcinosis was only detected when the diagnosis of autosomal recessive hypoplastic AI was made and a renal ultrasound scan. The patient had no urinary symptoms to suggest renal stones, and serum urea and electrolytes were within normal limits. However, nephrocalcinosis can progress, and it will be important to keep her under regular medical follow-up.

The earlier paper by MacGibbon[7] in which AI and nephrocalcinosis were reported in a young woman when her 26-year-old brother with nephrocalcinosis and similar teeth died. In the cases reported, renal function was stable until the patient was 16 years of age, but progressive renal failure and death of the patient was reported.

The another paper described by Lubinsky *et al*.[9] in 1985, in two siblings who had AI and nephrocalcinosis, impaired renal concentration and possible abnormality of calcium metabolism. Hall *et al*.[10] described another sibling pair with hypoplastic AI and nephrocalcinosis. Both had normal 24-h urinary excretion of calcium and phosphate.

More recently, Hunter *et al*.[11] reported case in which hypoplastic AI with delayed eruption of the permanent teeth in association with renal calcification.

Fu *et al*.[17] described a case of 14-year-old girl with AI and nephrocalcinosis syndrome, which was complicated by impaired renal concentration and hypokalemic metabolic alkalosis (Bartter like syndrome).

Subsequently reported cases[9,10,15] showed the following common features: Failure of eruption, enamel agenesis, unexplained nephrocalcinosis, and normal plasma calcium, 25-OH Vitamin D3, alkaline phosphatase and parathyroid functions, in contrast with previously mentioned studies, case reported in this article had reduced 25-OH Vitamin D3 and reduced urinary excretion of calcium and phosphorous.

The rarity of this syndrome makes diagnosis difficult. The relationship between the enamel defect and nephrocalcinosis is still unknown.

Hence, to summarize, further research is necessary to clarify the genetic defect behind this syndrome, which combines two uncommon conditions, such as AI and nephrocalcinosis. Pediatric dentists should be aware of this pathology as early diagnosis provided by the oral symptoms leads to a better renal prognosis.

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