

Oral Ellis-Van Creveld Syndrome: A Brief Review of Literature and a Case report

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Abstract

EVC syndrome is a rare autosomal recessive genetic syndrome which its exact prevalence is unknown. The main manifestations of EVC include condro-ectodermal dysplasia, polydactyly, congenital heart defects and tooth and nail hypoplasia, and the survival rate of patients depends on the heart disease. EVC should be differentiated from other chondrodystrophia such as Achondroplasia and Jeune syndrome. Few cases of this syndrome have been reported in dental literature. This article is a brief review about the main orofacial features of EVC and reported all Prosthodontics and Restorative treatment of a 7-year-old girl that was born in prone family to EVC and presenting typical features of this syndrome.

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Introduction

Ellis-Van Creveld (EVC) syndrome is a rare disease (1, 2) that is a result of mutations in two non-homolog genes EVC1 and EVC2 on chromosome 14p16 (2 - 4). The syndrome was first introduced by Ellis and Van Creveld in 1940 (5). Another name for this syndrome is meso-ectodermal dysplasia or chondroectodermal dysplasia.

The incidence of EVC in general population is low (6). This syndrome is most prevalent in the Amish population of USA. The birth prevalence in non-Amish population is estimated to be 7/1.000.000 of live birth (5,6). This disease is inherited in an autosomal recessive form and all three germ cell layers are involved (6,7) but heterozygous individuals are asymptomatic (6). According to reports that have been published, EVC has similar prevalence in men and women (7).

Diagnosis of the disease does not require genetic analysis, but x-rays, laboratory examinations, and clinical heart tests are necessary for clinical diagnosis (4). Prenatal diagnosis by ultrasonography is possible after the eighteenth week of pregnancy (7). Clinical manifestation of this disease is observed as Tetrad (4, 6):

A. Chondroectodermal Dysplasia: The height is below the third percentile at birth and will remain below the third percentile until adulthood in patients (3) and the final height is often reported 119 to 161 cm (1). Fortunately, people with this syndrome have normal intelligence (6, 3) and their congenital evolution is normal (1).

B. Postaxial Polydactyly

C. Congenital Heart Defects: In this syndrome, hematologic disorders and endodermal organ involvement, except for heart, is rare (2). Congenital heart defect, single atria disorders and valvular defects are observed in 50 to 60 % of subjects (1, 6) and the survival rate depends on the severity of heart disease

(6). Prognosis is also related to lung problems in the first month of birth which are associated with chest tightness and possible heart defects which cause (1) Fifty percent of patients die in infancy (7).

Tooth and nail and hair abnormality (hydnoid ectodermal dysplasia): Hair is occasionally sparse and nails are absent or dysplastic and a wide range of tooth abnormalities have been detected in this syndrome including: Enamel hypoplasia, partial anodontia especially in anterior region resulted in diastema, delayed eruption and abnormal eruption of primary and permanent dentition (neonatal teeth and natal tooth) (2), microdontia, abnormal shape of teeth (conical tooth, serrated incisal margins), the abnormal teeth position leading to malocclusion, (1,3). Although the disease has specific oral manifestations, it doesn't have standard processes for dental treatment (5).

In addition to the teeth, oral soft tissue is also affected and multiple frenum, Ankyloglossia, inherency of lip and gums, short upper lip, labiogingival frenulum hypertrophy, gingival hypertrophy and broad alveolar ridges are some instances of oral soft tissue involvement (1,2,3). In this article, a case with this syndrome and her family is reported; whose dental procedures have been completed successfully. The patient was a resident of one of Zanzan (Iran) villages where this syndrome has become prevalent among the people because of several consanguineous marriages.

Case Report

We present a seven-years-old girl with Ellis-Van Creveld syndrome.

Medical history:

The patient had been scheduled to be undergone surgery to correct the knees and legs deformities. The specialist surgeon referred her to the Pediatric Dentistry in Zanzan Faculty of Dentistry to manage dental problems (in order to prevent infection

after surgery and possible endocarditis due to aortic valve problem).

Familial history:

The patient was the third child of a consanguineous marriage. The first child aborted in the third month of the pregnancy and the second child revealed EVC syndrome manifestations – short stature, six-fingered, heart disease and nails deformity – and died at the age of six months because of bacterial meningitis. The Mother, at the age of twenty one, gave birth to the third child with three and a half kilograms of weight, 49 cm height, head circumference of 38 cm, and appearance of a natural person through a vaginal delivery. In the family tree of the patient (Graph 1), this syndrome has occurred in eight people, the closest one was her 24-year-old aunt who did not cooperate for interview and examination, but her parents were healthy. The patient has normal intelligence and educates in regular schools.

observed (Fig. 1).

Paraclinical assessment:

The surgeon had already ordered laboratory tests and radiographic examination before referral. CBC test results evaluated normal and according to the radiographic examination (the X-rays of pelvis, hands and chest) Achondroplasia were the first probable diagnosis.

The examination of internal organs indicated mixomatous aortic valve and moderate heart failure but the size and thickness of the kidney was normal.

Oral Findings:

The mandibular and maxillary incisors were absent (excluding upper left lateral maxillary incisor which was loose) mandibular deciduous molars, right maxillary first deciduous molar and left deciduous maxillary canine had severe decay and the right



Fig 1. Organ involvement in the EVS patient: short long bones, short middle and distal phalanges, short ribs, genu valgum deformity, long narrow chest and shortness of the limbs ,hypo plastic and dystrophic finger and toe nails,

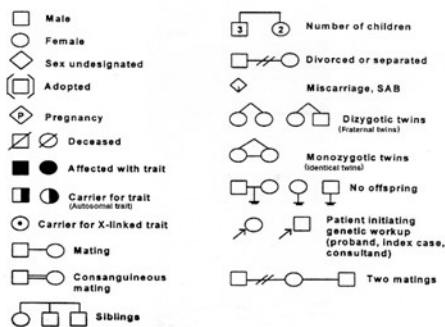
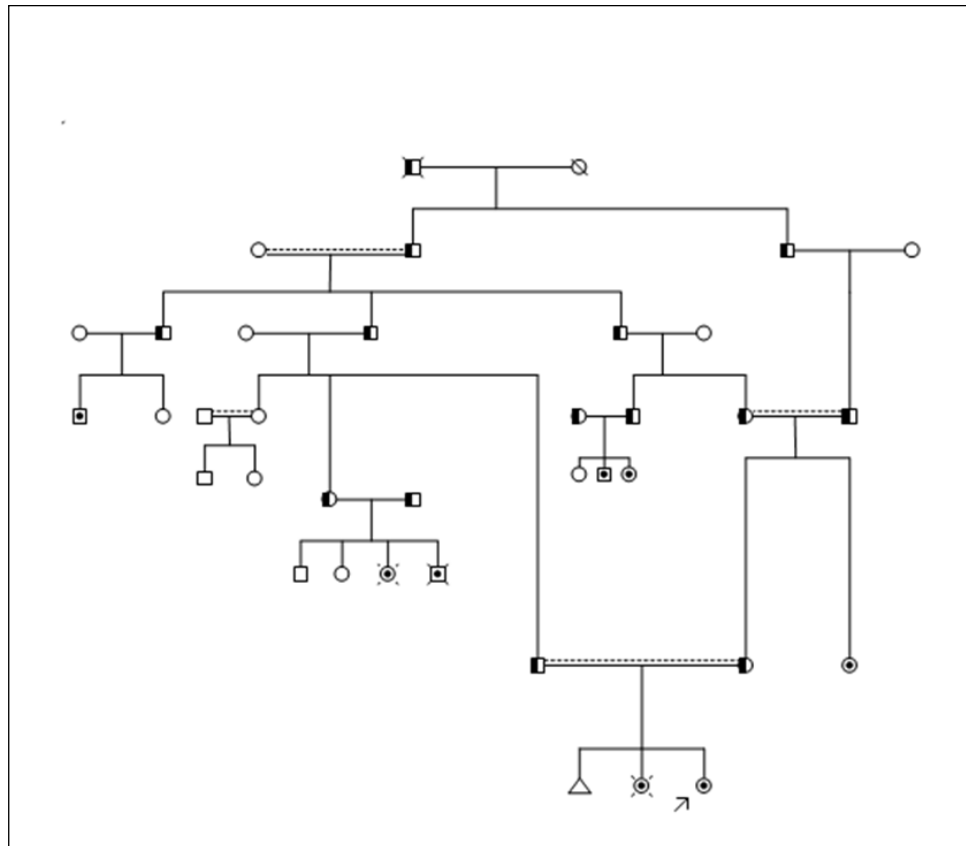
Physical Examination:

After overall examination short stature, deformity of the knee (genu valgum), Polydactyly (previously surgically corrected), small dystrophic nails and hypo plastic phalanges of toe and fingers were

maxillary permanent canines were erupting. Multiple frenulum and attaching labial mucosa to alveolar mucosa were also observed (Figure 2A).

In Radiographic examination of tooth, maxillary incisor tooth germs were absent and all of the four

Graph1. Family tree of the EVS case



“second permanent molars” were un-erupted and root of primary mandibular canines have severe mesial curve (fig. 2).

appointments made her ready for treatment (explaining her little by little how the instruments work and how these works make her comfortable she began to cooperate).



Fig 2. Intra oral photographs and panoramic radiograph: anodontia of mandibular and maxillary incisors, absence of mucobuccal fold in maxillary and mandibular anterior region, congenital absence of the incisors, conical shaped teeth and multiple frenula.

Definitive Diagnosis: In addition to these findings slight heart murmur and history of heart failure also were founded. Considering skeletal features, polydactyly and nail, tooth and oral manifestations, heart involvement could lead to definitive diagnosis of **Ellis-van Creveld Syndrome**.

Dental Treatment

Dental treatment process was performed ordered respectively as bellow:

1-Behavioral Management: It should be mentioned that child's cooperation especially in opening of mouth was extremely low because she had suffered from recognized “dentistry phobia” and an expert pedodontist by scheduling several behavioral management

2- Antibiotic Prophylaxis: Due to valvular heart disease after consultation with the pediatric cardiologist, antibiotic prophylaxis was prescribed before teeth extraction.

3- Extraction: At first all mandibular deciduous molars had been extracted due to severe decay and poor prognosis. Root resorption and looseness led the left maxillary primary canine extracted too.

4- Restoration: Then the first permanent molars of both jaws and the second maxillary molars were restored with composite material.

5- Prosthesis: In order to facilitate chewing, talking and preparing esthetics, removable acrylic prosthesis was fabricated. In this way, after healing of the dental sockets, maxillary and mandibular impressions,

according to the exact molding of multiple labial and buccal frenula have been taken (figure 3) and impression casts were prepared in dental laboratory and partial acrylic dentures were constructed and delivered to the patient.

Results and Discussion:

Failure of intracartilage Ossification is involved in the etiopathogenesis of EVC (6). EVC gene encodes Limbin protein. This protein is highly expressed in duplicating chondrocyte, osteoblasts, and osteoclasts



Fig 3. Partial denture: acrylic partial dentures were prepared after tooth extraction and healing of sockets.

Follow Up: The patient was given appropriate health education and set regular fluoride therapy and follow up sessions for periodic assessment to evaluate missing teeth eruption and apply necessary changes in prosthesis.

Despite of severe insistence of dental staff to continue the treatment process, the child parents only attended her for three appointments at irregular intervals till the age of nine. In these three sessions, dental fluoride treatment was conducted and no new tooth was diagnosed decayed. The patient informed us that she had only used the maxillary prosthesis and the mandibular denture was not used because of poor retention.

(2). Two genes that encode this syndrome can be coordinated by a promoter, so mutations in either of these genes can cause the same phenotype (2). Consanguineous marriage of parents plays a role in increasing prevalence of this syndrome (4).

The most important clinical feature is chondrodystrophia (7). Some clinical features are usually present but their absence does not rule out diagnose (1). Manifestations, usually observed after the birth, are disproportionate short stature increasing from the proximal to the distal, shortness of middle pharyngeal bone and polydactyly of hands and feet and hydrotic ectodermal dysplasia that affect teeth, hair, and nails (1).

The disease affects tubular bones and causes

shortening of stature, narrow chest and etc. (4) Sometimes Genu valgum are also observed in knees (6) and Post axial bilateral polydactyly occur more often on the ulnar side (4, 6). Clinical findings of this patient were similar the other reports of EVC syndrome in the case of short stature, oral manifestation, polydactyly, nail dystrophy, heart disease and familial history (2,6,8).

Differential Diagnosis:

The "Weyers Acrofacial Dysostosis", "Orofacial Digital", "Jeune, McKusick-Kaufman Syndrome (MKK) and "Short Rib Polydactyly (SRP)" are included in EVC differential diagnosis.

Weyers Acrofacial Dysostosis syndrome is transmitted as a dominant autosomal, it is similar to EVC syndrome genetically and based on its prevalence, midline facial anomalies are only observed in EVC and short stature is less severe in Weyers Acrofacial Dysostosis (2).

Orofacial Digital syndrome is also considered in the differential diagnosis (8), but this syndrome is limited to females and the patient has limited mental retardation (7).

Jeune syndrome differentiates from EVC by pigmentation in the retina, kidney involvement, small chest, liver dysplasia and intestinal abnormalities. Moreover, no fingernail problems are observed in Jeune syndrome (5, 7). Hydrometrocolpos in the EVC helps differentiate it from (MKK) (5). (SRP) Syndrome type III is very similar to EVC, but mutations of these two syndromes are different (1).

Main oral manifestations of EVC syndrome include upper lip fusion, multiple frenula and Hypodontia (6, 8). Its specific dental appearance helps diagnose it at an early age (6, 8). These manifestations were observed in this patient too.

Because dental manifestation influences in

aesthetic, speech, and development of jaw, the dentist plays an important role in diagnosis and consolidation of treatment (4, 8). Dental treatment should be done through team work. Surgical treatments are needed to treat heart defects (3, 6). Many of Patients with this syndrome need to fix bone anomalies and before surgery dental problems should be treated in order to prevent post -surgery infection and probable endocarditis (6). General and short-term superficial anesthesia, prevention of endocarditis, checking heart and lung symptoms during surgery, and monitoring of the patient in the ICU after surgery should be considered (6).

Due to the loss of a number of teeth, patients need some facilities to restore function and beauty during growing up, including acrylic partial anterior denture to keep the dental space and improve chewing, beauty, and speech (6, 5). When patients grow up, they need implants and prosthesis replacement. Malocclusion is common and orthodontic treatment may be necessary (5 and 6).

Dental treatment of deep grooves of molars need fissure sealant a; and regular oral hygiene program and use of fluoride varnish or mouthwash are required due to enamel hypoplasia and dental abnormalities (5, 6).

Conclusion

According to the high mortality rate and low quality of life of the affected patients, genetic counseling is necessary to prevent recurrence of the disease (2). Regarding to several oral manifestations, it is suggested to prepare standard treatment protocols to manage dental problems of the patients with this syndrome and other syndromes involving the craniofacial region.

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