Case Report

DOI: 10.5582/irdr.2016.01022

Cleidocranial dysplasia: A report of two cases with brief review

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Summary **Cleidocranial dysplasia (CCD) is a genetic disorder primarily causing dysplasia of bones and teeth with autosomal dominant inheritance pattern. Affected individuals presented with several skeletal and dental abnormalities mainly hypoplasia of clavicles, open fontanelles, short stature, retention of primary teeth, supernumerary teeth, delayed eruption of permanent teeth, multiple impacted permanent teeth *etc*. The present series of two cases illustrates the clinical and radiological features of pediatric patients with cleidocranial dysplasia. The early diagnosis of the condition helps in proper orientation of the treatment thereby offering better quality of life to such patients.**

Keywords: Marie and Sainton's disease, *CBF-1* gene, supernumerary teeth

1. Introduction

Cleidocranial dysplasia (CCD) is a well-known, congenial, developmental disorder that primarily affects bones undergoing intramembranous ossification *i.e*. calvarial bones and clavicles and teeth (*1*). This rare disease can occur spontaneously or by an autosomal dominant inheritance pattern, with no predilection of genre or ethnic group. Hypoplasia or agenesis of clavicles with a narrow thorax, which allows approximation of the shoulders in front of the chest and delayed ossification of the skull are the manifestations. Boys and girls have an equal chance of getting affected. The condition is of clinical significance to the dental practitioners due to the involvement of facial bones, altered eruption patterns, presence of retained primary teeth, delayed eruption of permanent teeth and multiple supernumerary teeth *etc*. (*2*)

The aim of this article is to describe the clinical features, radiological features and associated dental abnormalities of two cases of pediatric patients with CCD.

2. Case Report

Case report I A 14 year old male child patient reported to the department of pedodontics and preventive dentistry with the chief complaint of pain in the right and left upper posterior back teeth region and delayed eruption of teeth in the lower front teeth region. Detailed medical history revealed him to be a known case of CCD. No other members of his family suffered from this present medical condition.

General physical examination demonstrated short stature, thin and lean build, slurred speech and drooping shoulders that can be brought easily forward in the midline if asked. Macrocephaly, frontal, parietal and occipital bossing was seen that gives a skull a large globular shape (Arnold head). Depressed nasal bone, hypertelorism, mid-face hypoplasia and mandibular prognathism were also noticed (Figure 1). Intraoral examination showed high arched and narrow palate, presence of multiple retained primary teeth and delayed eruption of permanent teeth. Supernumerary teeth were seen in the maxillary midline and bilateral mandibular premolar region. Radiological investigations included orthopantomogram (OPG) that revealed several unerupted permanent teeth and supernumerary teeth in both maxilla and mandible. Gonial angles on both sides of mandible were missing and maxillary sinuses were underdeveloped. Narrow thorax with oblique ribs and hypoplastic clavicles were seen on chest radiograph. Lateral cephalogram and PA view of skull revealed open fontanelles, depressed skull, multiple wormian bones and prognathic mandible (Figure 2A, 2B, and 2C; Figure 3A, 3B, and 3C).

Case report II A 10 year old child patient reported to the department of pedodontics and preventive dentistry

Released online in J-STAGE as advance publication May 2, 2016.

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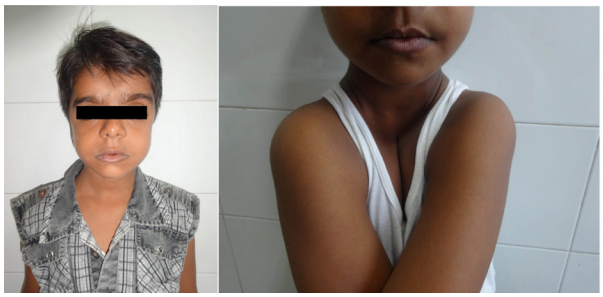

Figure 1. Frontal view of the patient with approximation of shoulders in midline.

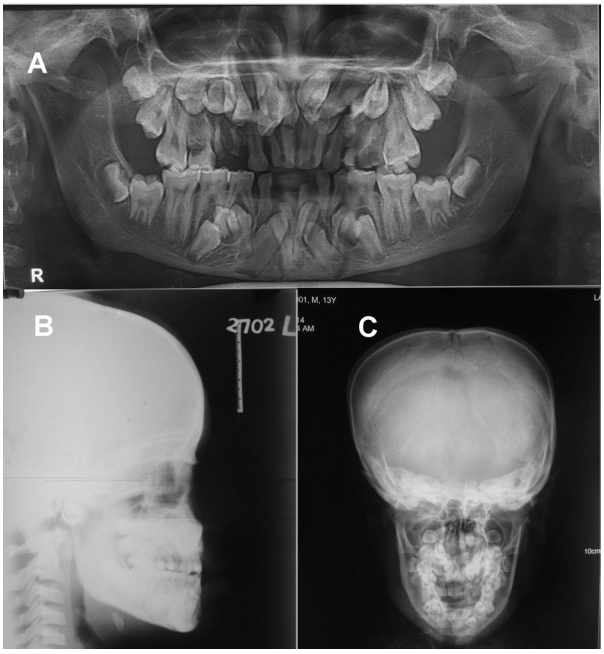

Figure 2. Radiographs showing dental abnormalities (A), OPG shows supernumerary teeth, multiple impacted teeth and over retained primary teeth. **(B)**, Lateral view of skull shows broad sutures and wormian bones. **(C)**, Anteroposteriar view of skull showing sunken sutures and depressed calvaria.

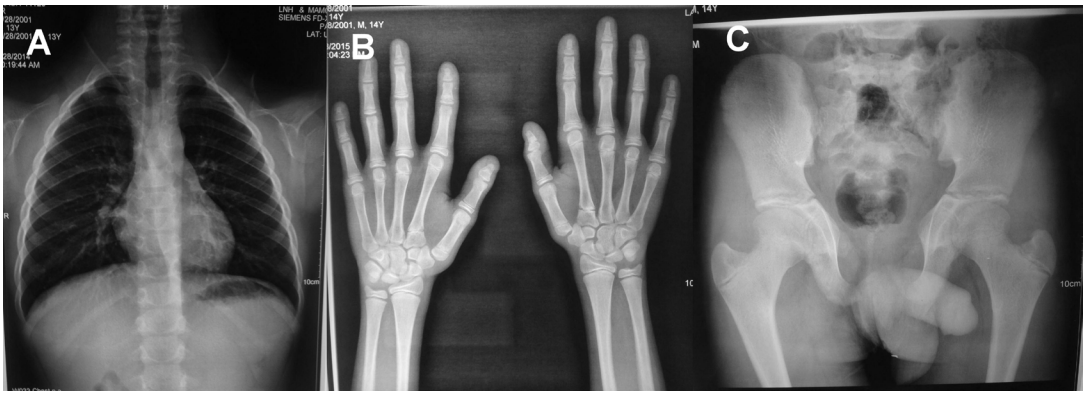

Figure 3. Radiographs showing skeletal abnormalities (A), Chest radiograph showing hypoplastic clavicles and narrow thoracic cage. **(B)**, Hand wrist x-ray showing metacarpel pseudoepiphysis and **(C)** x-ray pelvis shows wide pubic symphysis ,broad femoral heads and short femoral necks.

with a chief complaint of delay eruption of teeth in the upper front teeth region. Detailed medical history was obtained through parents that described him a follow up case of celiac disease with primary hypoparathyroidism with CCD and global developmental delay.

Short height, apparently well built, narrow thoracic cage and shrugged shoulders which were easily apposable were the features seen on general examination. Extraoral findings were hypertelorism, brachycephaly, depressed nasal bridge, prominent forehead and maxillary hypoplasia (Figure 4). Intraoral findings were multiple retained permanent teeth, delayed exfoliation of primary teeth. Radiological investigations such as OPG, lateral cephalogram, chest radiograph, P-A view of skull and pelvis were carried out to confirm the diagnosis. Multiple unerupted permanent teeth, supernumerary teeth in the region of 11 and 45 were seen on OPG. Cranial abnormatilies such as calvarial thickening, open fontanelles, wormion bones, sunken sagittal sutures were also evident (Figure 5A, 5B, and 5C). Barrel shaped thorax with hypoplastic clavicles were also noticed on chest x-ray Metacarpal pseudoepiphysis, absence of carpel bones and wide pubic symphysis with short femoral neck were also seen on hand wrist and pelvic x-ray respectively (Figure 6A, 6B, and 6C).

3. Discussion

CCD is also known as Marie and Sainton's disease, Scheuthauer-Marie-Sainton syndrome, Mutational dysostosis. It was first described by Pierre Marie and Paul Sainton in 1898 (*3*). They coined the term

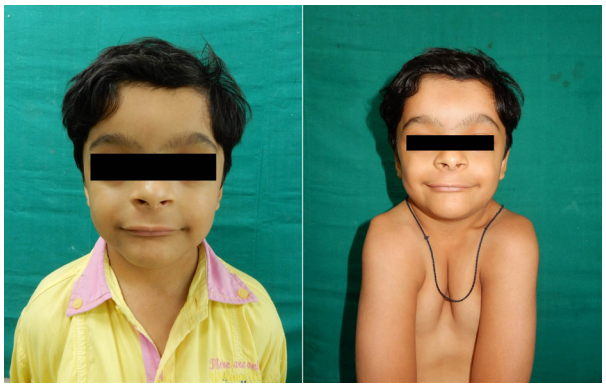

Figure 4. Characteristic feature of CCD patient: Adduction of shoulders.

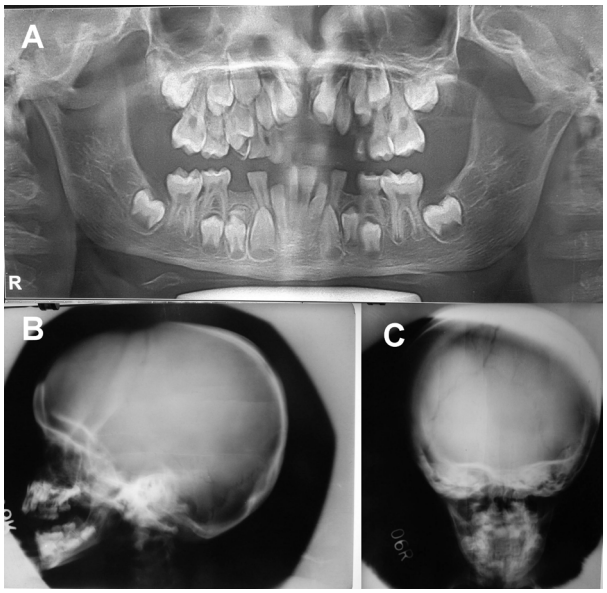

Figure 5. Radiographs showing dental abnormalities (A), Retained primary teeth and supernumerary teeth seen on OPG. **(B)** and **(C)** Cranial abnormalities such as open fontanelles, sunken sutures, wormian bones seen on lateral view and anteroposterior view of skull.

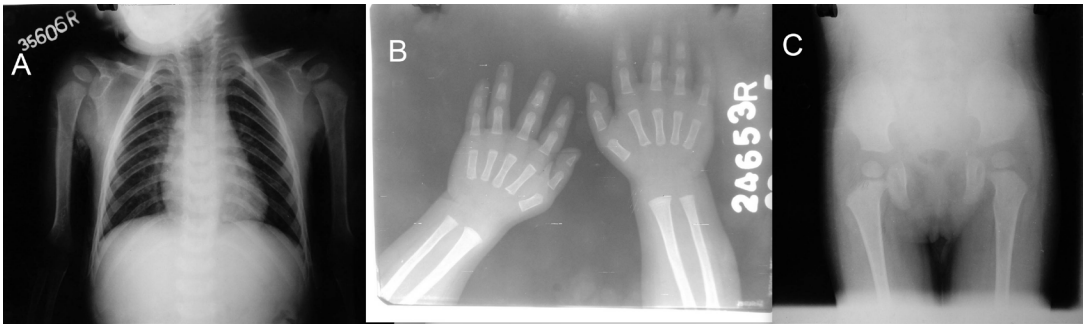

Figure 6. Radiographs showing skeletal abnormalities (A), Chest radiograph shows hypoplastic clavicles bilaterally. **(B)**, Absence of carpel bones seen on hand wrist x-ray. **(C)**, Pelvic abnormalities seen on radiograph.

'Cleidocranial Dysostosis' (*4*). This condition is known to be associated with several chromosomal abnormalities such as rearrangement of long arm of chromosome 8 and 6 or mutation in the core-binding factor alpha-1 (*CBFA-1*) gene, located on chromosome 6p21, which encodes a protein necessary for the correct functioning of osteoblast cells (*5*). *CBFA-1* also called as *RUNX2*-Runt related transcription factor 2 gene, is expressed specifically in chondrocyte and osteoblast progenitors, as well as in mature osteoblasts. It regulates the expression of several important osteoblast proteins including osterix (another transcription factor needed for osteoblast maturation), osteopontin, bone sialoprotein, type I collagen, osteocalcin and receptor activator of NF kβ ligand (*5*).

Patients with CCD have short height and have frontal, parietal and occipital bossing leading to bulging calvarias. There is a partial or complete absence (in about 10% of cases) of the clavicle permitting an abnormal mobility of shoulders, open fontanelles, wormian bones, a wide pubic symphysis, short middle phalanges of the fifth fingers, and various vertebral and dental abnormalities. Dental manifestations are underdeveloped maxilla, relative mandibular prognathism, retained primary dentition, multiple impacted permanent dentition, delayed eruption of permanent teeth, multiple supernumerary teeth, crown and root abnormalities, crypt formation around impacted teeth, and a high palate (*6-8*). Various scientific views has been postulated regarding etiology of non-eruption of permanent teeth, such as lack of cellular cementum (*9*), defectiveness in post cementum formation (*10*), presence of thick connective tissue between oral epithelium and dental follicle (*11*), delayed tooth formation and maturation (*12*).

Dental management of cleidocranial dysplasia is largely dependent on the chronological and dental age of the patients. Timely diagnosis with appropriate treatment plan is essential for attaining successful results (*13,14*). A multidisciplinary approach for the management of these patients utilizing a pedodontist, an orthodontist, an oral surgeon and prosthodontist is

recommended. Various treatment options available are: removal of the impacted permanent, supernumerary and primary teeth, combined with fabrication of over-dentures; surgical removal of the primary and supernumerary teeth, combined with orthodontic traction of the impacted permanent teeth; removal of the supernumerary teeth immediately after completion of mineralization of their crowns, combined with removal of the overlying bone of the permanent teeth to facilitate their eruption (*13,15,16*). However, Pusey and Durie also suggested removal of only erupted teeth and use of a removable prosthesis to minimize alveolar bone loss (*17*).

The present case report highlights the need for awareness among pedodontists about the prosthodontic rehabilitation of pediatric patients with CCD syndrome as it not only causes physical discomfort but also leads to psychological problems. Therefore, along with achieving a well functioning dentition and an esthetically satisfying facial appearance, proper motivation and psychological support for the patients and their parents are also important.

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(Received April 03, 2016; Revised April 21, 2016; Accepted April 24, 2016)