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Distraction in a case of otopalatodigital syndrome type II

P. BATRA, F. S. RYAN, H. WITHEROW & M. L. CALVERT
Maxillofacial and Dental Department, Great Ormond Street Hospital for Children NHS Trust, London WC1N 3JH, UK

Summary. *Introduction.* Otopalatodigital syndrome type II is a rare X-linked recessive disorder with generalized skeletal dysplasia and hearing anomalies. Its features include conductive hearing loss, unusual facies, cleft palate, micrognathia, and overlapping flexed fingers and toes. It is a more lethal variant of otopalatodigital syndrome type I. There are many consistently reported craniofacial and dental findings; however, no case has been published in dental literature.
Case report. We report a case of otopalatodigital syndrome type II with micrognathia, cleft of the soft palate, and partial anodontia, and discuss the combined orthodontic and surgical management.
Conclusion. We also discuss the differential diagnosis and consider more recent theories on possible aetiology as well as clinical management strategies for such cases.

Introduction

Otopalatodigital (OPD) syndrome (OMIM 304120) was first described by Taybi in 1962. He reported three siblings with generalized dysplasia and multiple other anomalies [1]. The term otopalatodigital syndrome was first used by Dudding [2]. However, it was Smith who emphasized the genetic and embryologic aspects of the syndrome, along with clinical details [3]. According to him, features of the syndrome included moderate conductive hearing loss, facial bone hypoplasia, cleft palate, partial anodontia, short stature, mild mental retardation, and dysplasia of the toes and phalanges. With the discovery of another variant that represented a wide spectrum of anomalies that could not be described under one uniform presentation, the syndrome was subdivided into types I and II.

OPD type II was first described by Fitch *et al*. [4]. Features of the condition include short stature, unusual facies, micrognathia, cleft palate, overlapping flexed fingers, bowing of the long bones, and irregular ribbon-like ribs. The skeletal manifestations are far more severe than in OPD type I. Approximately 35 cases have been reported in literature so far. Death has occurred within 5 months of life in at least 12 of the reported cases because of respiratory infection [5].

Correspondence: M. L. Calvert, Maxillofacial and Dental Department, Great Ormond Street Hospital for Children NHS Trust, London WC1N 3JH, UK. E-mail: calvem@gosh.nhs.uk

Craniofacial features include hypertelorism, frontal bossing, lateral fullness of supraorbital ridges, a broad nasal bridge, stubby nose, downslanting palpebral fissures, midface hypoplasia, low-set ears, microstomia with down-turned bow of the upper lip, and marked mandibular micrognathia [6–8]. Cleft palate is found in 85% of affected males [5]. In some cases, Robin Sequence may be present. Despite the many consistently reported craniofacial and dental findings, no case has been published in the dental literature. We report a case with OPD type II and discuss the combined orthodontic and maxillofacial surgical management.

Case report

A 10-month-old patient was referred to the cleft clinic at Great Ormond Street Hospital with a cleft of the soft palate. He also presented with hypertelorism, frontal bossing, broad nasal bridge, down-slanting palpebral fissures, low-set ears, and mandibular micrognathia (Fig. 1). The patient had bilateral inguinal hernias, cryptorchidism, and hypometropic astigmatism. His left hand exhibited a tight first web space and short radii, as well as duplication of terminal phalanges of both thumbs (Fig. 2). There was partial syndactyly of the third digit of the left hand and bilateral polydactyly. The chest X-ray showed steeply sloping sinuous clavicles and sinuous ribs (Fig. 3). Audiological examination confirmed conductive hearing loss. The patient was diagnosed with OPD syndrome type II by the team geneticist after a detailed examination.

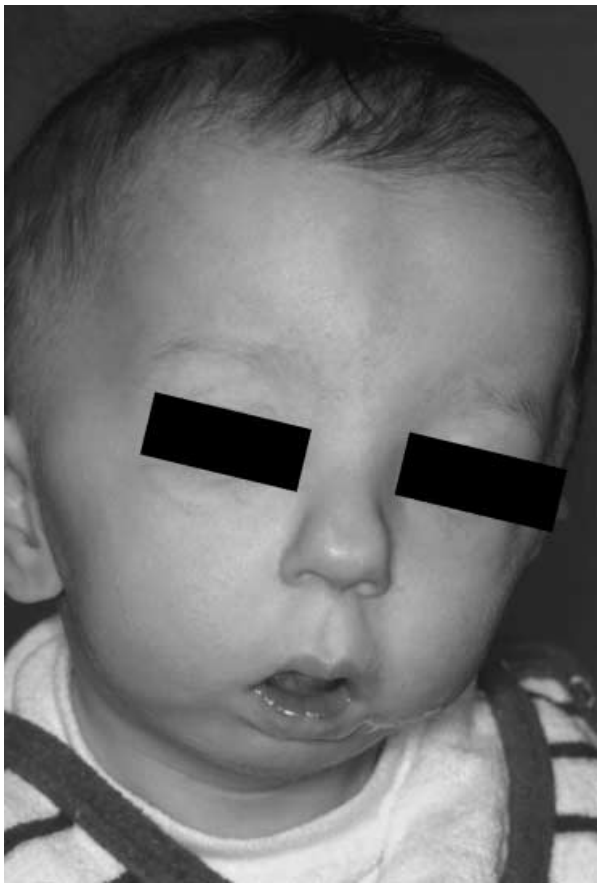

Fig. 1. Appearance at presentation. Note the severe micrognathia.

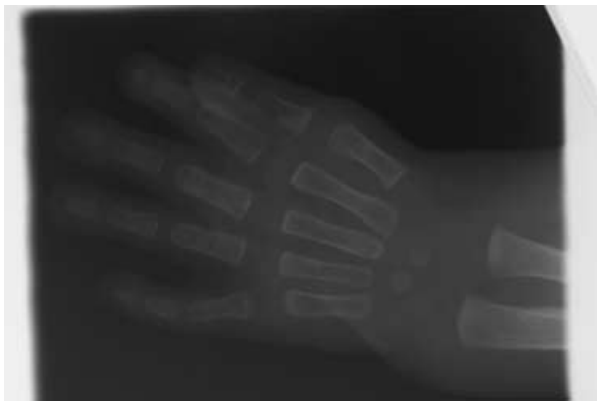

Fig. 2. X-ray of left shows short radii, as well as duplication of terminal phalanges of the thumb. There is partial syndactyly of the third digit.

Palatal repair was carried out at the age of 14 months and grommets were placed bilaterally at the same time. The hearing improved after surgery to within normal limits. At 16 months, hand surgery was performed to release the first web space.

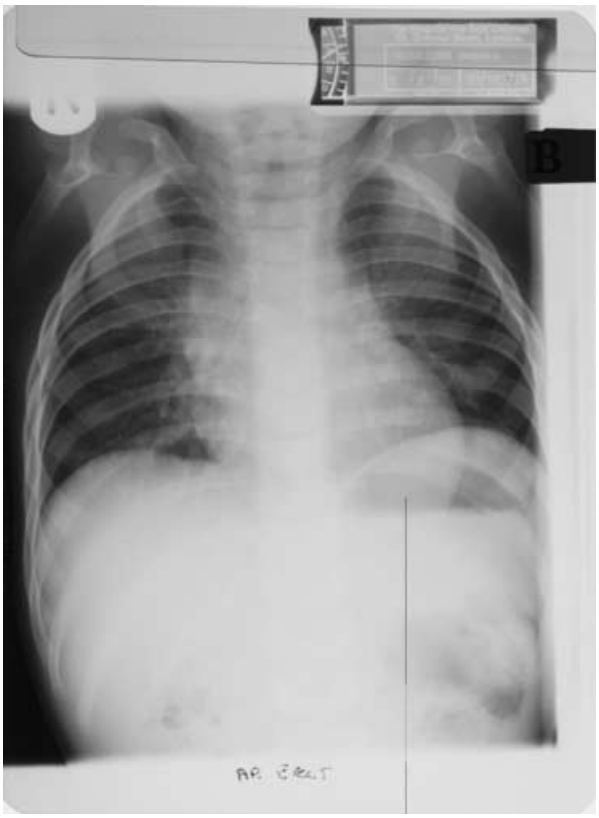

Fig. 3. The chest X-ray showed steeply sloping sinuous clavicles and sinuous ribs.

The patient was monitored within the multidisciplinary team, but no further surgery was considered until 8 years of age. At that stage, the patient presented with marked micrognathia and an associated class II division 1 malocclusion with an overjet of 10 mm (Figs 4a,b, 5 and 6). Treatment options were fully discussed with patient and parents, and distraction osteogenesis of the mandible was planned.

External bilateral unidirectional distractors were placed after bilateral ramus osteotomies had been performed (Figs 7a and b). Distraction was started after a 5-day latency period at a rate of 1 mm per day and continued bilaterally for 3 weeks until the desired antero-posterior dimensions were achieved. At this stage, the chin point was displaced to the left. Activation of the distractor was continued on the left side only until symmetry was restored. After a 6-week consolidation period, the devices were removed. The patient was kept under review until the permanent teeth had erupted (Figs 8a,b, 9). At that point, orthodontic treatment was carried out to achieve arch alignment. The patient presented with many missing teeth:

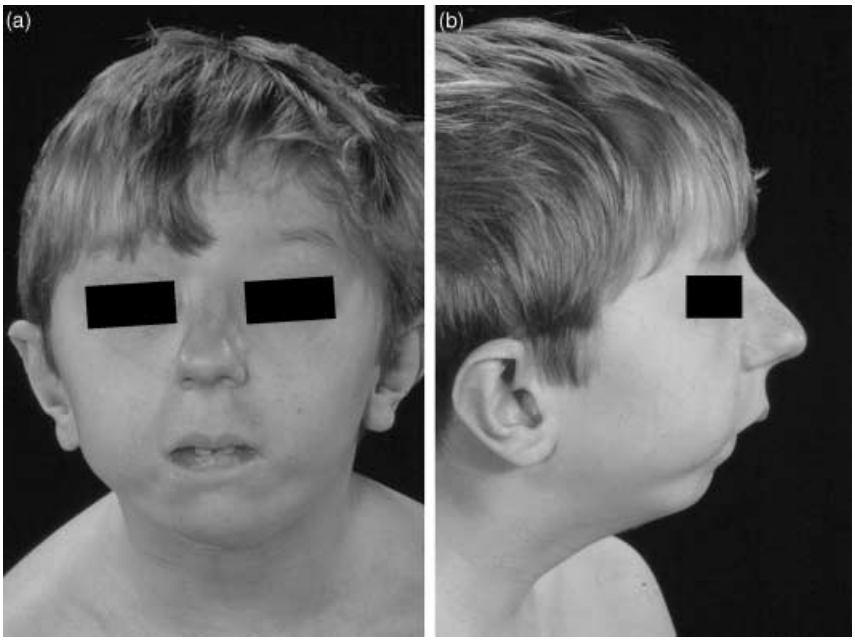

Fig. 4. (a,b): Extra-oral photographs of the patient at age 8. Note the mandibular micrognathia.

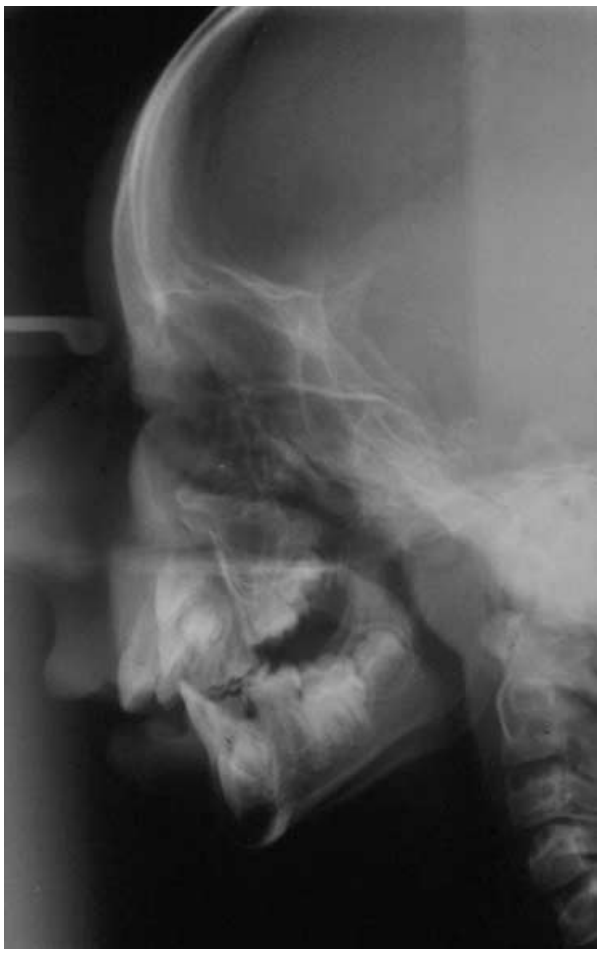

Fig. 5. Pre-distraction lateral cephalogram with teeth in occlusion.

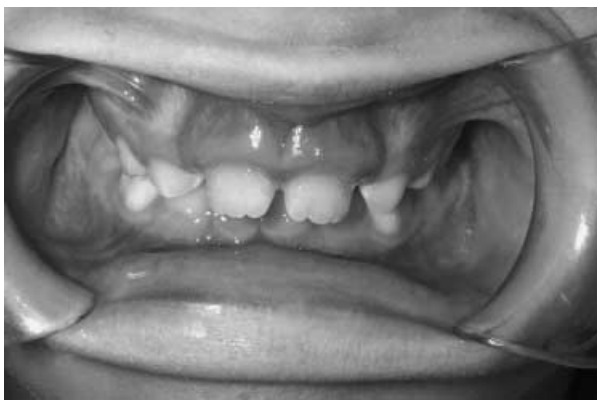

Fig. 6. Intra-oral photograph of the patient showing the marked overjet and class II molar relationship.

8 | 7 8	(18; 27; 28; 38; 37; 35; 32; 42; 45; 48).
8 5 2 | 2 5 7 8	

The lower second deciduous molars were retained and infra-occluded. These teeth will be restored using composite onlays. The patient is now 8 years post-distraction (Fig. 10).

Discussion

Despite recent advances in genetics, the aetiology and pathogenesis of OPD are still unknown. The rarity of the syndrome as well as the wide variation

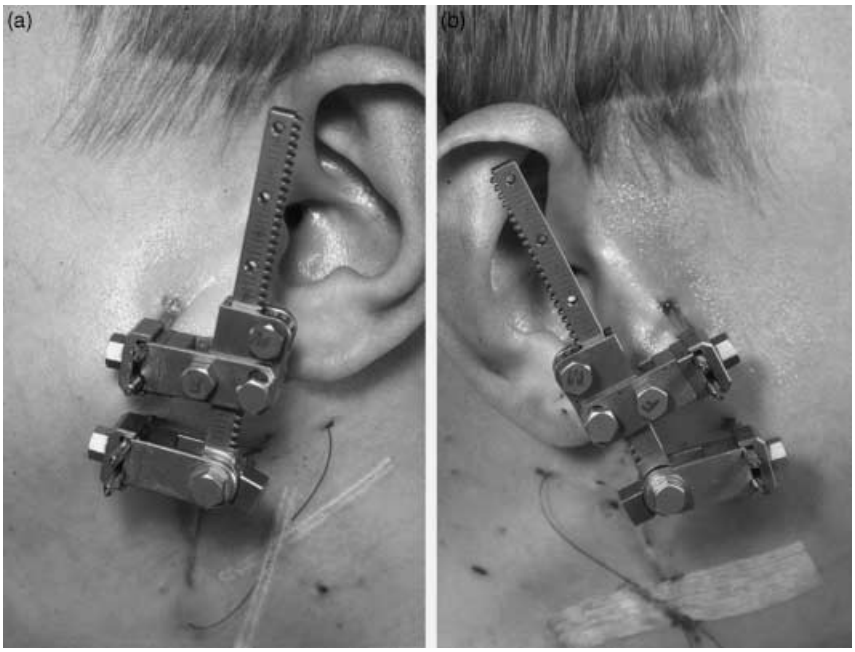

Fig. 7. (a,b): Extra-oral photograph of the patient showing the external bilateral unidirectional distractors.

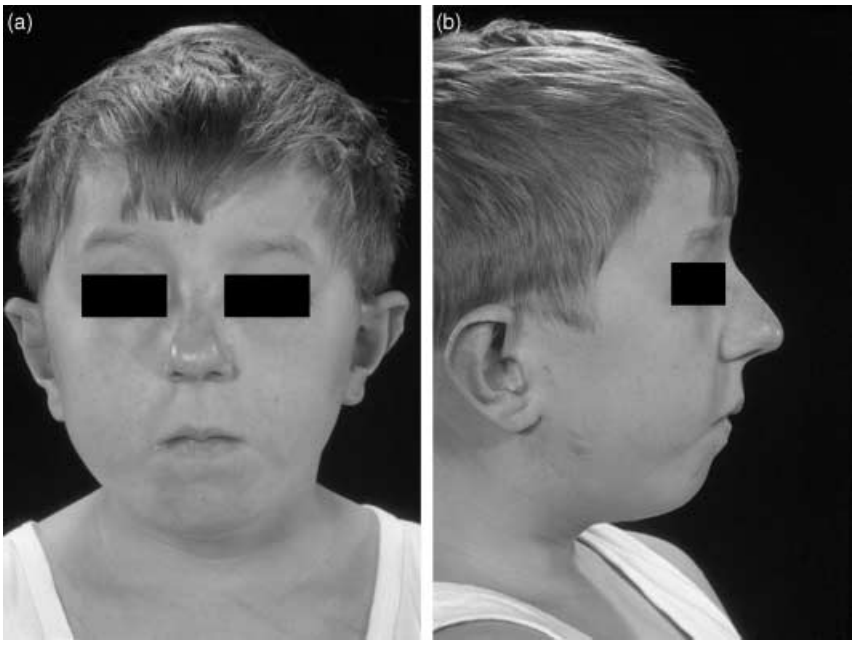

Fig. 8. (a,b): Extra-oral photographs of the patient showing significant improvement in chin position.

in expression makes isolation of the basic defect difficult. Ogata *et al*. noted mildly disordered bony trabeculae in their single case report but concluded that it was a secondary phenomenon related to curvature of tubular bones [9]. However, Savarirayan *et al*. found consistent trabecular disorganization in specimens from various anatomical sites [10]. They concluded that the basic defect underlying OPD type II might involve the extracellular matrix and its turnover. It is unlikely that distraction would have been considered if the information regarding trabecular disorganization and defective bone formation had

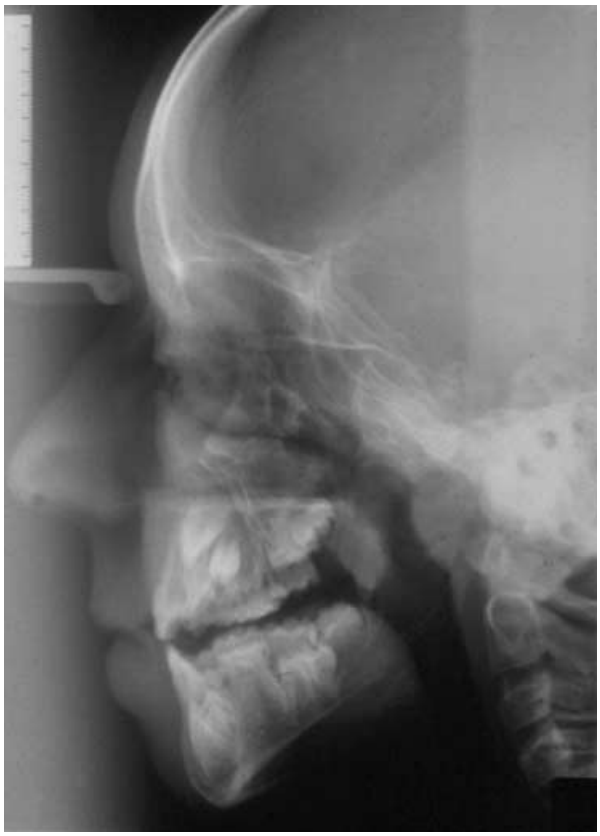

Fig. 9. Post-distraction lateral cephalogram with teeth in occlusion.

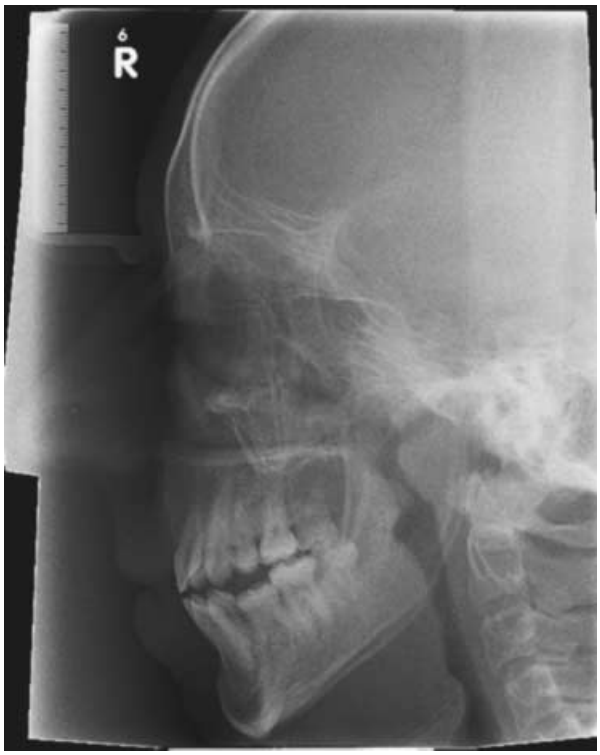

Fig. 10. Lateral cephalogram 8 years post-distraction.

been known at the time of treatment planning. However, despite this the patient showed stable results 8 years post-distraction, and orthodontic tooth movement was uneventful.

The presence of many non-skeletal features in OPD suggests that the gene responsible for the condition has a widespread role in early development [10]. There are many other extracranial features including variable psychomotor development and intelligence [5,11–16]. The base of the skull may be sclerotic and a large anterior fontanelle may be present. Midface hypoplasia may also be a feature. Abnormalities of the clavicles, ribs, and radial heads may be present. The thorax is narrow and scoliosis can be present. Fingers may be flexed and overlapping. The bones of the hand and feet are often deformed, and bones of the wrists and ankles are hypoplastic and malformed. Some may fail to ossify. Hearing loss has been described. Histological study of one of the cases reported malformed ossicles and abnormalities of the bony labyrinth. Both intramembranous bone formation and bone remodelling are defective.

This syndrome should be distinguished from OPD syndrome type I, campomelic dysplasia, and trisomy18 [5]. The phenotypes in types I and II are similar. There are reports of OPD types I and II occurring within the same family that led to the suggestion that these may be allelic disorders [17,18]. Verloes *et al*. have proposed that OPD types I and II, Melnick–Needles syndrome, and frontometaphyseal dysplasia may be representative of a phenotypic spectrum of disease termed as fronto-otopalatodigital osteodysplasia [19]. OPD type II is characterized by a higher grade of prenatal, perinatal, and early lethality, especially in affected males. The facial features are more marked, the skeletal deformities are more severe, and the hearing loss is more pronounced. Bowing of the long bones and absence of the fibulae seem to be pathognomic features of OPD type II.

It is essential that this condition is recognized and that management is within a multidisciplinary team. Our experience with this case suggests that complex surgical procedures, including distraction, should not necessarily be excluded in patients with OPD syndrome.

What this paper adds

- This treatment has not previously been described in the literature for OPD.
- In view of the pathology, the treatment was controversial but was successful.

Why this paper is important for paediatric dentists

- Paediatric dentists are part of the multidisciplinary team looking after these patients.
- The paper highlights features of OPD and its dental presentation.

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