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Management of bilaterally missing mandibular central incisors: A case report

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Abstract--The present case report describes the interdisciplinary management of a patient with increased overbite and overjet, Angle's Class I malocclusion, bilateral agenesis of the mandibular central incisors and microdontia of the upper lateral incisors. The 18-year-old female patient had a convex profile, maxillary dentoalveolar protrusion and mild spacing in the mandibular anterior region. Therefore, treatment consisted of fixed appliance therapy, followed by replacement of the one lower incisor with an endosseous implant supported prosthesis and aesthetic build-up of the upper lateral incisors. The method of treatment has significantly improved the patient's facial and dental aesthetics and provided a good functional occlusion, despite the absence of a mandibular incisor.

Keywords---mandibular incisors, microdontia, dentoalveolar.

Introduction

One of the most commonly occurring anomalies in clinical practice is the congenital absence of teeth¹. Various terms such as hypodontia, oligodontia, and anodontia have been used to describe these missing teeth. Anodontia refers to complete agenesis of the dentition. Whereas hypodontia and oligodontia are

relative terms, in which hypodontia refers to the congenital absence of six or less teeth and oligodontia refers to the congenital absence of six or more teeth²⁻⁶. Hypodontia primarily affects the permanent dentition and is considered rare in the primary dentition⁷. A meta-analysis by Khalaf et al showed that females have a higher prevalence of hypodontia and the prevalence of hypodontia in Asia was estimated to be 6.3%⁸.

Excluding the both maxillary and mandibular third molars, the most commonly missing tooth in the dentition is the maxillary lateral incisor followed by the mandibular second bicuspid⁹. The absence of teeth can be unilateral or bilateral. Various authors have reported on the unilateral absence of mandibular central incisors^{10,11}. Bilateral agenesis is encountered rarely and there is paucity of data on this anomaly¹². The aetiology of agenesis is varied and can be possibly attributed to nutritional, traumatic, infectious, genetic or phylogenetic factors¹³⁻¹⁵.

The absence of teeth is quite a challenge to an orthodontist and usually patients reporting with missing teeth require an interdisciplinary management to address their concerns. Achieving adequate functional occlusion in patients with congenital absence of mandibular incisors is quite difficult and this aspect is well documented, especially when the patient presents with an increased overbite, increased overjet and Bolton's tooth-size discrepancy^{16,17}. In these cases, the anterior and lateral occlusal guidance will also be impaired.

This case report presents and discusses the treatment of a patient with Class I malocclusion, with bilateral agenesis of a mandibular central incisor, increased overbite and increased overjet.

Case Report

An 18-year-old female patient presented with the chief complaint of protruding upper front teeth and spacing in between her lower front teeth. The patient had no prior history of any dental treatment and medical history was non-contributory. The patient wished for an overall aesthetic and occlusal improvement. The patient's motivation was positive and internal.

On extraoral frontal clinical examination the patient had a well-balanced face with no gross facial asymmetry. She had a convex profile with a straight nasolabial angle, strained lip seal and normal vertical proportions. The incisor display was increased. Intraorally, the patient presented with an Angle's class 1 molar relation and class 1 canine relation on both sides. The maxillary midline was coincident with the facial midline, and both arch forms were ovoid. Her oral hygiene was excellent, with good gingival and periodontal health. She was congenitally missing both mandibular central incisors. The patient did not have a history of any extractions in that mandibular anterior region and had no recollection of any tooth loss. The findings did not present any syndromic aetiology. Overbite was increased (70%), overjet was 10mm, and both mandibular and maxillary incisors were proclined. The maxillary lateral incisors were microdontic and were not proportional. The maxillary right second bicuspid was completely rotated (Figure 1).



Figure 1 – Pre-treatment facial and intraoral photographs at age 18 years 7 months.

The panoramic radiograph confirmed the absence of the missing teeth and aided in ruling out the possibility of these teeth being impacted. The panoramic radiograph also showed developing third molar tooth buds in the 2nd, 3rd and 4th quadrants. The cephalometric analysis showed a skeletal Class II anteroposterior discrepancy with mandibular retrusion. Both maxillary and mandibular incisors were tipped labially (Figure 2).

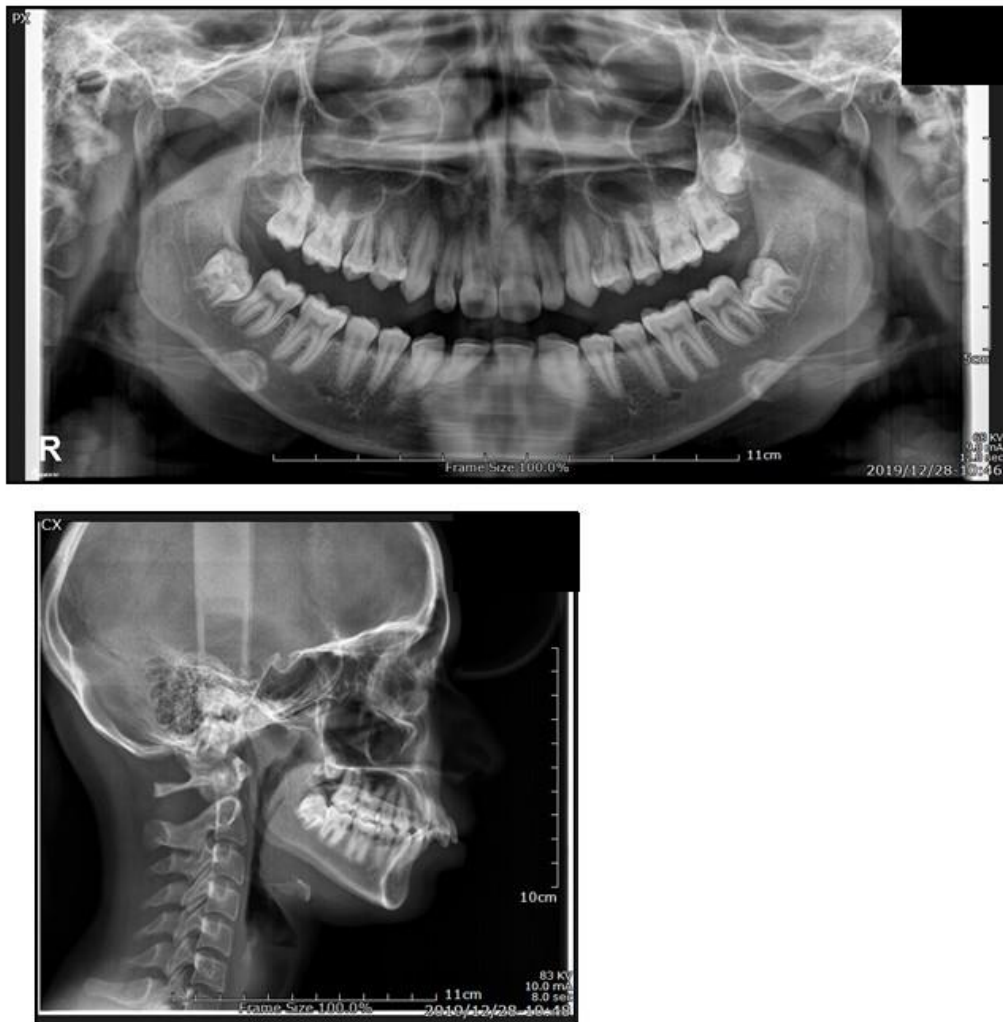


Figure 2 – Pre-treatment panoramic and cephalometric radiographs.

Treatment Objectives

The primary objectives in addressing this malocclusion were to eliminate the mandibular spacing and correct the maxillary dentoalveolar protrusion. Additional objectives aimed to reduce upper lip strain for satisfactory facial harmony and maintain Class I molar and canine relation. Ideal overjet and overbite relationships were desirable to improve the aesthetics of the occlusion.

Treatment Plan

An interdisciplinary line of management was optimized to address this malocclusion. The treatment plan involved aligning the maxillary and mandibular dentition and achieving arch coordination. This was followed by opening of the space in the mandibular anterior dental midline for the placement of dental

implant supported crown. Finally aesthetic build up of the maxillary lateral incisors was proposed to correct the tooth-size deficiency. A decision was made to maintain the rotation of the maxillary right second bicuspid as the intercuspation was adequate and it was deemed that any attempt on derotation would significantly increase the duration of treatment and alter the intercuspation present.

Treatment Progress

Fixed 0.022*0.028-in preadjusted appliances were placed (MBT™ versatile + system), and continuous 0.016-in nickel-titanium archwires were placed. Fixed 0.022 3 0.028-in preadjusted appliances were placed, and continuous 0.016-in nickel-titanium archwires were placed. Continuous 0.016*0.022-in nickel-titanium archwires were placed six weeks later to continue levelling and aligning. Continuous 0.017*0.025-in nickel-titanium archwires were placed six weeks later to continue levelling and aligning. Continuous 0.019*0.025-in stainless steel arch coordinated archwires were placed six weeks later to complete levelling and aligning. This wire was maintained for a period of ten weeks.

Post completion of levelling and aligning, 0.018-in stainless steel wire with a reverse curve of Spee was placed in the mandibular arch along with an open-coil nickel-titanium spring to open up space in the mandibular dental midline. The length of the spring was set at one and quarter inter-bracket distance. The spring was allowed to express itself for six weeks. Once 3mm opening was achieved, the mandibular archwire was changed to a 0.017*0.025-in stainless steel wire with a reverse curve of Spee. The space opening was continued on this wire. After 7mm of space had opened up, a cone-beam computed tomography scan of the anterior mandible was taken to evaluate the site for implant placement. The scan showed an adequate quantity of bone for the placement of a dental implant. Under local anaesthesia, a 3.8mm width and mm length, endosteal implant was placed and allowed to osseointegrate. The arch wire and a passive open coil spring were placed to maintain the space. Four months later, the implant was evaluated for stability. A temporary abutment and crown were placed. The orthodontic appliance was debonded and temporary thermoformed retainers were given on the same day. A permanent abutment and screw retained crown was placed a week post the orthodontic appliance removal. The maxillary lateral incisors were built up using dental composites to improve their aesthetic appearance. Permanent Begg's wrap-around retainers were given for the maxillary and mandibular dentition.

Treatment Results

There was an overall improvement in the patient's facial aesthetics and the lip seal was improved. Molar and canine relationships were maintained and the teeth were well aligned and levelled over the basal bone. Overbite and overjet decreased significantly. The maxillary dental midline was coincident with the facial midline and the centre of the pontic. A mutually protected occlusion was achieved in centric relation, with group function in lateral excursion and posterior disocclusion in anterior guidance. Root resorption was minimal and excellent root parallelism was achieved. An improvement in the facial aesthetics and

balance due to the reduction of the maxillary incisor proclination. There was improvement of the maxillomandibular relationship. The lower incisor proclination and nasolabial angle were increased post treatment (Figure 3 and 4).



Figure 3 – Post-treatment facial and intraoral photographs at age 20 years 7 months.

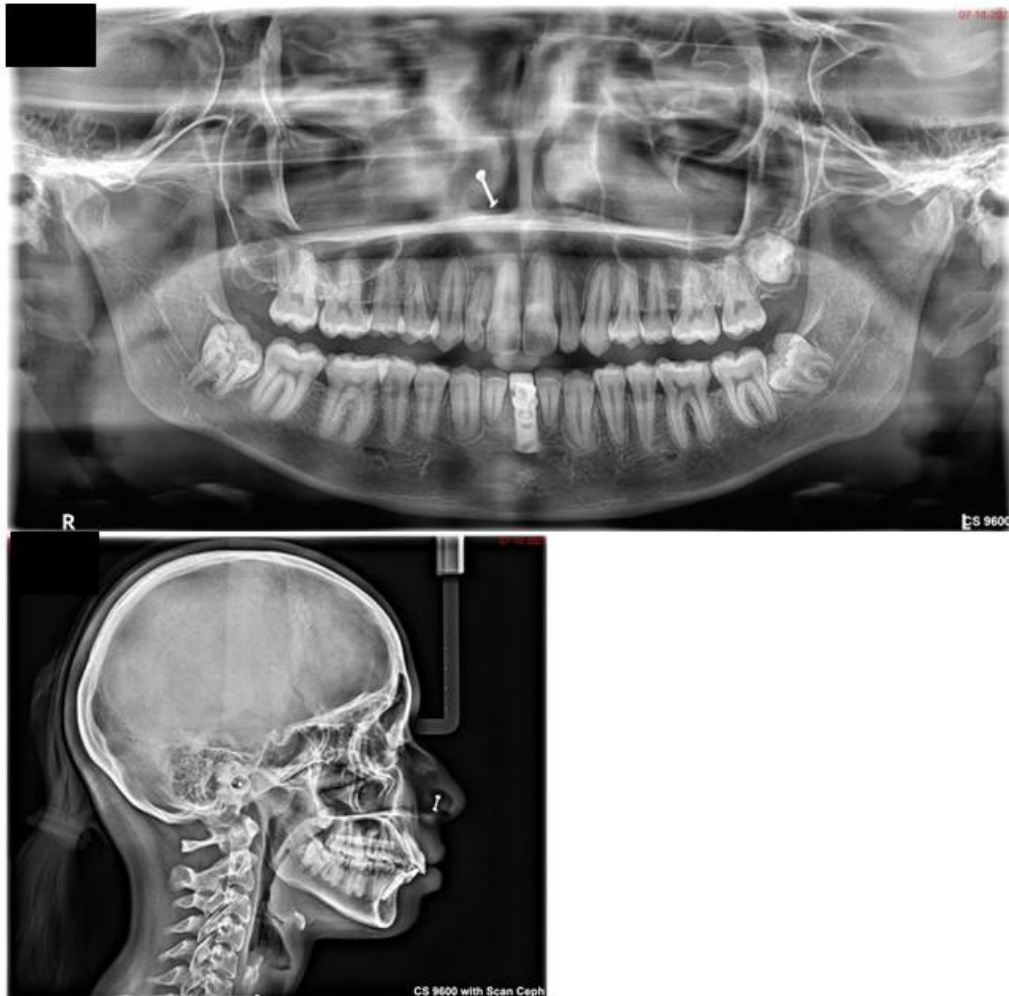


Figure 4 – Post-treatment panoramic and cephalometric radiographs.

Discussion

In certain clinical scenarios, intentional extraction of a mandibular incisor can enable the orthodontist to produce enhanced functional occlusal and aesthetic results, with minimal orthodontic intervention and minimal profile alteration¹⁸. The four indications for extraction of a mandibular incisor include, ectopic eruption of incisors (severe malposition of the mandibular incisors), moderate class III malocclusions (anterior crossbite or edge-to-edge relationship of the incisors, with a tendency toward anterior open bite), tooth size anomalies (macrodontia of mandibular incisors) and anomalies in the number of anterior teeth (supernumerary mandibular incisor)¹⁶. In other situations, a mandibular incisor can be missing congenitally¹⁸. Thus, the clinician must be aware of the unfavourable anterior tooth-size discrepancy in such cases and of the difficulties

and limitations of orthodontic treatment in achieving a satisfactory occlusal result.

In the present case, the anteroposterior skeletal discrepancy, accentuated overjet and overbite were unfavourable findings associated with the missing mandibular central incisors. The patient's age and lack of growth potential were complicating factors. It was deemed not to derotate the right maxillary second bicuspid as there was a lack of space, the tooth had a favourable intercuspation with the opposing teeth, the derotation would complicate the treatment and increase the duration of treatment.

It is of paramount importance to eliminate anterior arch-length discrepancies caused by congenital absence of a mandibular incisor¹⁹. When addressing cases with malocclusion with missing teeth, it would be prudent to utilise a diagnostic setup to study whether the occlusal outcomes will be acceptable and consistent with the treatment objectives¹⁸. In our case, the setup showed that by replacing a single incisor of mesiodistal width 7mm in place of the two missing incisors, the anterior discrepancy can be reduced and anterior guidance can be achieved.

Endosseous implant was selected for replacing the missing teeth as it better preserved the alveolar bone when compared to a fixed prosthesis²⁰⁻²³. The maxillary lateral incisors were built up using dental composites to improve aesthetics. A significant improvement in facial and dental aesthetics was observed, despite the absence of a mandibular incisor. The cephalometric superimposition showed that the treatment changes in this case were primarily dental in nature. Mild labial tipping of the mandibular incisor and palatal tipping of the maxillary incisors were seen (Figure 5 and 6). There was a decrease in the lip strain. The mandibular anterior is a critical part for the orthodontic treatment stability²⁴. Even though the indications for mandibular extraction, some studies have demonstrated that in cases where mandibular extraction was performed to alleviate crowding, the post-retention stability was better when compared to premolar extraction cases^{16,25}. In our case, the missing mandibular incisors resulted in a large overjet, which resulted in excessive mandibular incisor eruption, resulting in an increased overbite²⁶. The deep bite was corrected and the overjet was normalized, satisfactory overbite stability can be expected because the predisposing factors were eliminated. The Begg's wrap-around retainers in the maxilla and mandible will also help in the maintenance post-treatment stability.

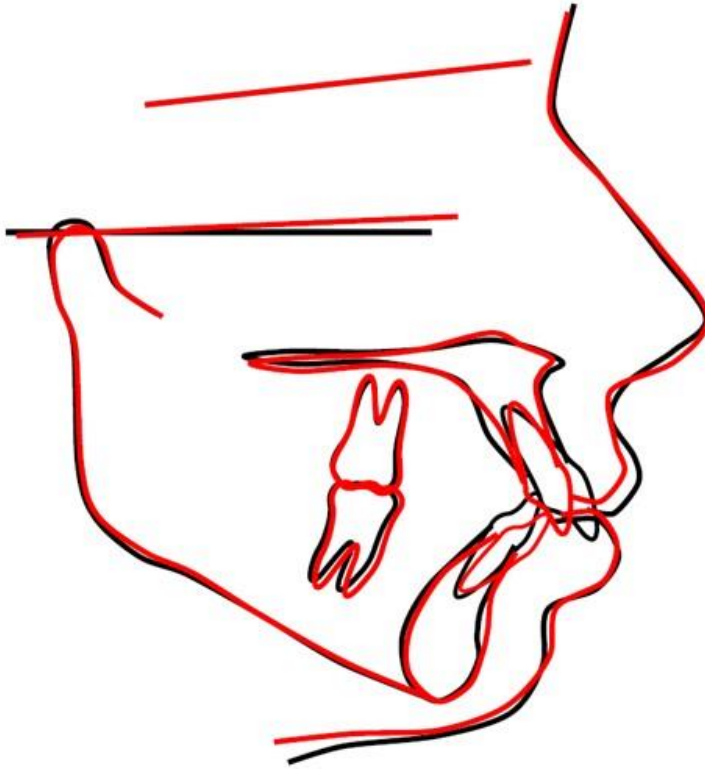


Figure 5 - Cephalometric tracings superimposed on the sella-nasion plane at sella. Pre-treatment, black lines; post-treatment, red lines.

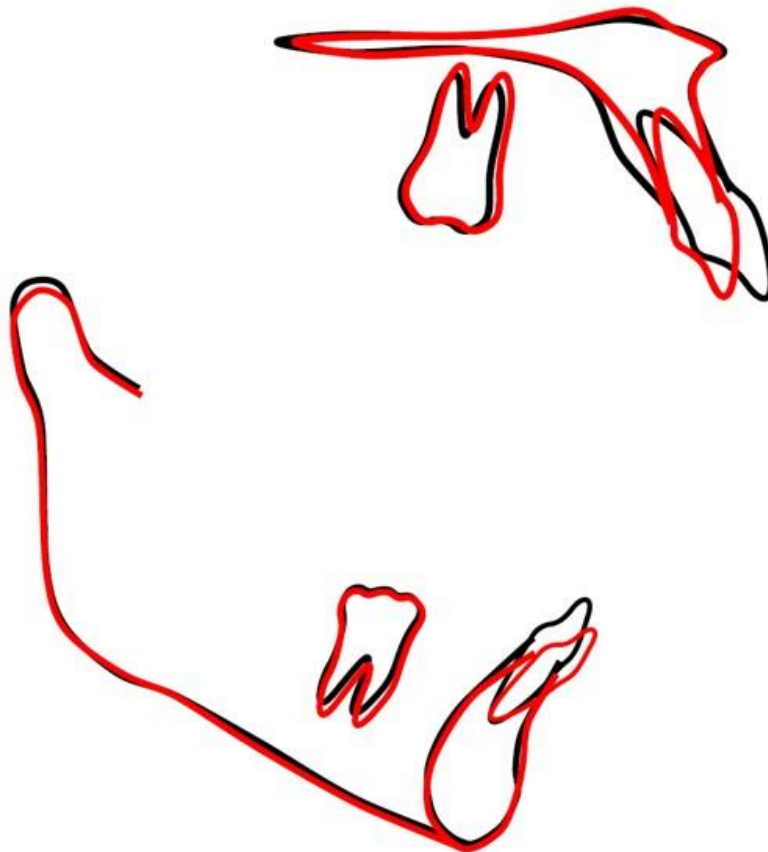


Figure 6 - Cephalometric tracings of the maxilla superimposed on the palatal plane at ANS and Cephalometric tracings of the mandible superimposed on the mandibular plane at menton. Pre- treatment, black lines; post- treatment, red lines

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