

Use of mini implants in the multidisciplinary treatment of congenitally missing mandibular lateral incisors: a case report

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SUMMARY

The aim of this case report is to present the multidisciplinary treatment of a patient with congenitally missing mandibular lateral incisors. In the intraoral examination of a 35 years old female patient, it was determined that neighbor teeth were migrated to the space of the congenital missing mandibular lateral incisors. Sufficient mesiodistal space was prepared by orthodontic treatment to place the implants. 3 dimensional (3D) cone-beam computed tomography (CBCT) revealed that vestibulolingual and mesiodistal bone dimensions were not adequate for conventional implants so crowns supported with mini implants were performed to the patient. At the end of multidisciplinary treatment approach, stabile occlusion and esthetic appearance was achieved. In cases with insufficient bone mini implants may be preferred instead of conventional implants.

Key words: Congenitally missing mandibular incisor, mini implant, 3D tomography, alveolar bone volume

ÖZET

Konjenital mandibular lateral eksikliğin multidisipliner yaklaşım ile tedavisinde mini implant kullanımı: olgu sunumu

Vaka sunumunda amaç, konjenital mandibular lateral eksikliği olan hastanın multidisipliner tedavi yaklaşımı ile tedavisinin açıklanmasıdır. 35 yaşında bayan hastanın ağız içi muayenesinde komşu dişlerin konjenital mandibular lateral diş eksikliği boşluğuna doğru hareket ettiği belirlendi. İmplant yerleştirilmesi amacıyla yeterli mesiodistal mesafe ortodontik tedaviyle hazırlandı. İmplant yerleştirilecek bölgedeki kemiğin incelenmesi amacıyla 3 boyutlu computerize tomografi yöntemine başvuruldu ancak vestibulolingual ve mesiodistal olarak kemik boyutlarının standart implant uygulaması için uygun olmadığı belirlendi ve hastaya mini implant destekli kuron yapımına karar verildi. Multidisipliner tedavi yaklaşımı sonunda uygun bir kapanış ilişkisi ve estetik bir görünüme ulaşılmış oldu. Yetersiz kemiğin mevcut olduğu vakalarda standart implantlar yerine mini implantlar tercih edilebileceği değerlendirilmektedir.

Anahtar kelimeler: Konjenital mandibular kesici eksikliği, mini implant, 3 boyutlu tomografi, alveolar kemik hacmi

Introduction

Congenitally missing tooth or teeth can be defined as agenesis of one or more teeth and it is one of the most common developmental anomalies(1). It has been reported that etiology of congenitally missing teeth includes evolutive(2), local(3,4), systemic(5) and genetic factors. Burzynski and Escobar(2) stated the familial tooth agenesis as an autosomal dominant, recessive, or X-linked condition. Tooth agenesis has been determined to be more frequent in the parents of individuals with congenitally missing tooth than in the whole population and this finding revealed the importance of genetic tendency(6,7).

Maxillary lateral incisors have been reported to be the most common congenitally missing teeth in Caucasian population(8) and it is the mandibular incisors in Japanese population(9,10). Congenitally missing lateral incisors usually cause significant aesthetic and functional problems by creating malocclusion, periodontal damage, and lack of development of maxillary and mandibular bone height(11). Endo et al(12) reported that the patients with congenitally absent mandibular incisors showed significantly greater retroclination of mandibular incisors and mandibular alveolar bone. Additionally, symphysis area was reported to be smaller in these patients.

In the treatment protocol of congenitally missing lateral incisors usually multidisciplinary approach is needed. Patient's profile, crowding, and buccal corridor should be taken into consideration during treatment planning. In some cases maxillary canines are mesialized to the place of the missing laterals and they are reshaped, but usually the space of the absent incisors is opened by fixed orthodontic mechanics and either fixed prosthodontic restorations

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or implant supported restorations are performed(13). Congenitally missing tooth usually causes undeveloped alveolar bone and leads to knife-edge ridge bone morphology. This condition makes challenge during implant placement since adequate alveolar bone volume is mandatory. Consequently, bone graft is often recommended for these patients(14).

In patients who have very thin anterior mandibular residual bone, using narrow implants with smaller diameter may be another treatment alternative(15,16). The term mini has also been used to describe narrow diameter implants with standard or larger diameters(17). Sohn et al (18) reported that one-piece narrow diameter implant can be successfully used to support restorations of missing maxillary lateral incisors and mandibular incisors. Renouard and Nisand(19) reviewed the effects of implant length and diameter on survival rate. The authors reported a trend of increased failure rate due to the use of short or wide implants; however, when the bone density, surface characteristics of the implant, operator's surgical skill, and indications for treatment during the surgical preparation were considered, the survival rates of short-or wide-diameter implants were comparable to those of longer implants and implants with standard diameters. In general, no difference in the clinical outcome between standard diameter implants and narrow implants has been observed(20,21).

The aim of this case report was to present the multidisciplinary treatment of a patient with congenitally missing mandibular lateral incisors. The morphology and volume of the symphysis was evaluated with three dimensional (3D) cone-beam computed tomography (CBCT) and due to the structural features of this anatomical region, prosthetic restorations supported with mini implants were used in this patient.

Case Report

A 35-year-old female patient referred to the department of orthodontics of GMMA Haydarpasa Training Hospital for treatment. Her chief complaint was the unaesthetic appearance of her mandibular anterior teeth due to the congenitally absence of the mandibular lateral incisors. In the intraoral examination and panoramic radiographic evaluation, it was determined that mandibular central incisors and canines were migrated to the space of the congenital missing lateral incisors and polidia-stema was observed between these teeth. It was also determined that left

mandibular primary canine was retained between permanent canine and first premolar. Anterior open bite was another challenge of the patient. Panoramic radiograph showing all these problems are presented in figure 1.

The treatment goals were to open the space of the congenitally missing lateral incisors, to correct the anterior open bite, and to place implant supported crowns so as to provide a functional occlusion and aesthetic appearance.

The retained left canine was extracted before orthodontic treatment. Roth brackets and molar tubes with 0.18 slots were attached on the maxillary and mandibular teeth. After the leveling phase with 0.12 and 0.16x0.16 nitinol arch wires, 0.16x0.16 stainless steel arches were inserted. Nitinol open coil spring, elastic chains and intraoral elastics were used during the mesialization of the mandibular central incisors and distalization of the canines. 0.16x0.22 stainless steel arches were used during the finishing phase. At the end of 18 months of orthodontic treatment; anterior open bite was moderately corrected, polidia-stema was closed and adequate space for the congenitally missing lateral incisors was opened.

The distance between the roots of the mandibular central incisors and the canines, the alveolar bone morphology of the symphysis, and vestibulolingual and mesiodistal bone area were evaluated by 3D CBCT. In the vestibulolingual measurement it was observed that alveolar bone volume was 3.6 mm in the right side and 3.5 mm in the left side. Mesiodistal measurement it was observed 5.7 mm in the right side and 6.1 mm in the left side. Alveolar crest height was 13mm in both of the sides. Since these values are not sufficient to insert conventional implants, it was

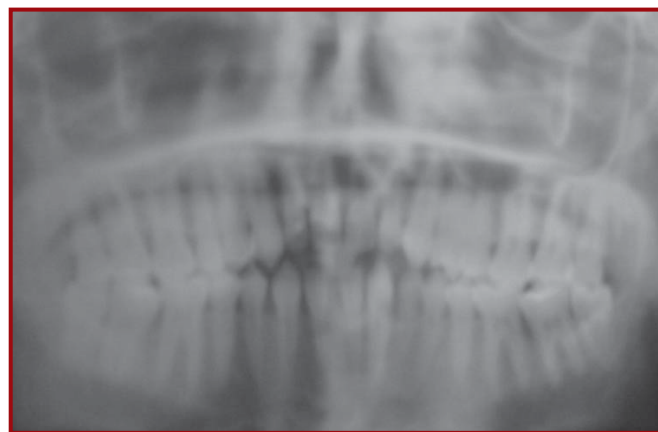


Figure 1. Panoramic radiograph of the patient showing the congenitally missing mandibular lateral incisors and retained left primary canine.

decided to perform mini implant (2.5-13Lmm) supported crowns for the compensation of congenitally missing mandibular incisors. In figure 2a and b, 3D CBCT images and measurements are presented.

Anterior mandibular area was infiltrated facially and lingually with 1,8ml of articaine. A split thickness apically positioned flap was raised with a 15C scalpel to increase the resulting zone of attached gingiva. Each drilling was started with a round burr. Then drills were used to complete the osteotomy to 13mm depth. Only external irrigation was used. The 2.5-13L mm implants (MDL, Intralock, USA) were inserted to the place of mandibular right and left lateral incisors with a specific technique as described by the manufacturer. The patient was instructed in after-care and prescribed chlorhexidine oral rinse. She returned at 1 week for follow-up and had healed well with no complications. After healing phase of 12 weeks, the patient returned to our clinic for construction of a fixed prosthesis.

The coronal portion of each implant was slightly prepared with a fine diamond burr to crowns (Figure 3a). Impressions were taken with a polyvinyl siloxane material. No provisional prosthesis was made. Two porcelain fused to noble alloy crown were constructed that avoided direct centric and excursive contacts and to insure passive fit. Two weeks later the esthetics and function of the constructed prosthesis were evaluated. The prostheses were cemented with zinc phosphate cement. Figure 3b shows the intraoral photographs of the patient after the cementation of the porcelain prosthesis. The patient has successfully functioned with the prostheses with no complications for one year.

Discussion

There are two different treatment alternatives for the patients with congenitally missing teeth: the space of the absent teeth may be closed or opened by orthodontic treatment. In the treatment of congenitally missing laterals; type of occlusion, crowding/spacing, tooth size relationship, and position, shape and color of the canines have to be taken into consideration(13). In the treatment of the presented case, all these factors were evaluated and space of the absent mandibular incisors was decided to be opened by orthodontic treatment.

Following the orthodontic treatment, bone volume and quality of the anterior mandibular region and

morphology of the symphysis was detected with 3D CBCT. Panoramic radiograph provide information about the bone height and, to some extent, gives limited information about horizontal distances(22). Supplementary intraoral radiographs are usually obtained if horizontal distances are critical for the treatment planning. However, these radiographs only give information in two dimensions. 3 dimensional evaluations of the mandibular canal, maxillary sinus, nasal cavity, alveolar bone volume, and morphology and angulation of the alveolar crest are essential for preoperative implant planning. The possibility of placing implants can sometimes be limited due to physical conditions, like inadequate space between adjacent teeth and roots, or narrow anterior alveolar ridge(20, 21, 23). The mandibular anterior region of the mouth often has less available bone volume than the other regions. Especially bone volume of congenitally missing teeth area is usually not sufficient for implant operations because mandibular incisors are one of the chief factors affecting mandibular symphysis growth and morphology(12). Periimplant bone volume, bone quality and implant insertion depth affect the treatment success. In the presented case 3D CBCT evaluation revealed that alveolar bone volume and morphology of the anterior region of the mandible was not adequate to place conventional implants so mini implants were preferred. The split ostetomy technics and using osteotom may be alternative treatment obtions in narrow alveolar ridge. In this patients with limited space, a mini implant with narrow diameter implants may be another option. Especially, these kinds of implants may be appropriate when the occlusal forces can be minimized or eliminated and placement torque should not exceed 50 Ncm(24, 25). Mini implants supporting single tooth replacements have shown favorable clinical results in the long-term perspective(25). In the presented case, a mini implant was preferred due to the inadequate bone volume of the anterior mandibular region. The patient had a slight open bite so occlusal forces were eliminated during function. We also advised not to bite food with her anterior teeth in order to minimize the risk of failure. The patient has been using the mini implant supported crowns for one year without any complications in implant sites and gingiva.

In patients with congenital missing incisors, 3D CBCT is a promising tool to determine the bone vol-

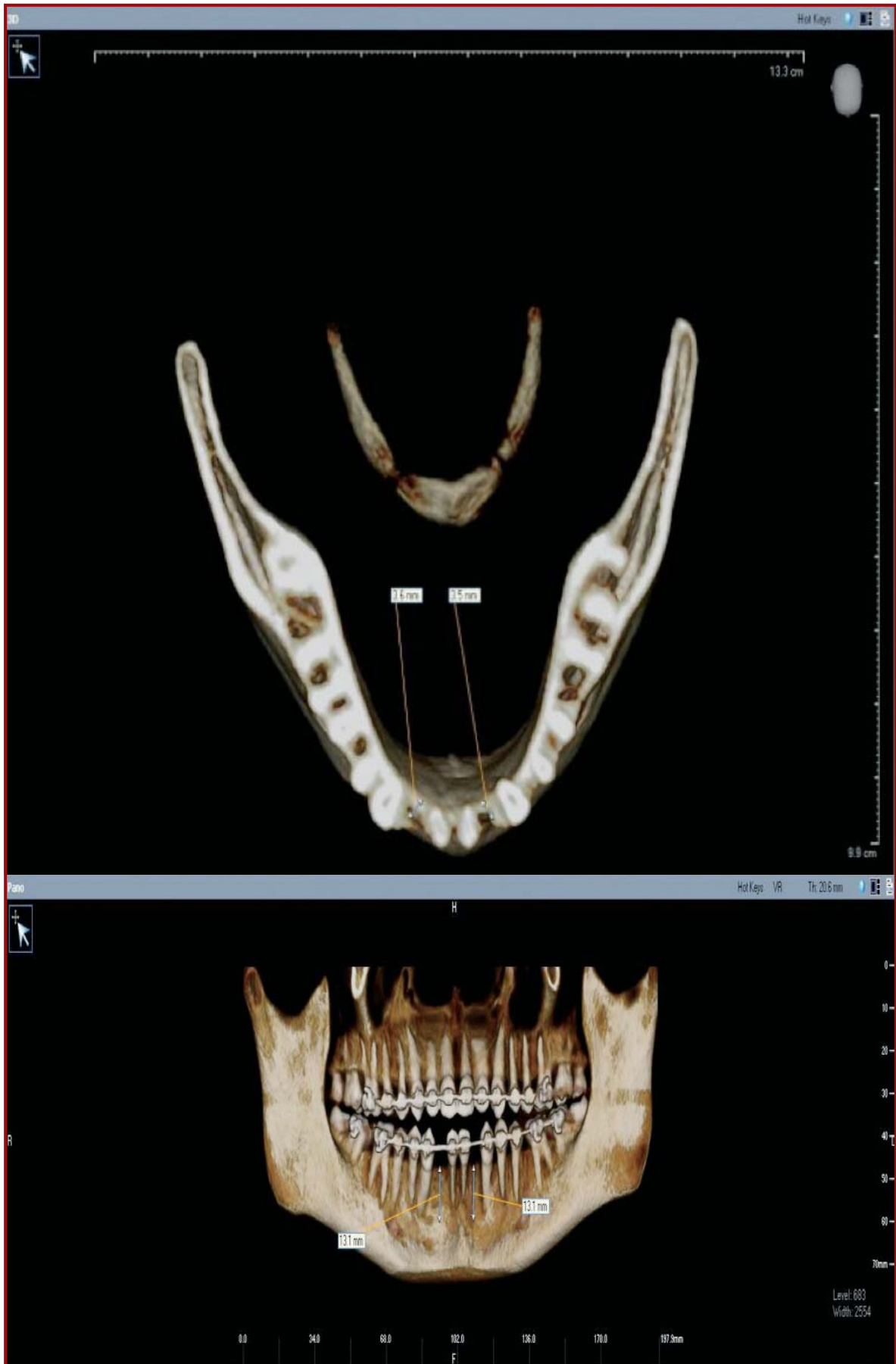


Figure 2. a,b. 3D CBCT images and measurements.



Figure 3. Intraoral photographs of the patient after implantation



Figure 4. and the cementation of the porcelain prosthesis.

ume. In patients with inadequate alveolar bone volume, mini implants may be preferred instead of conventional implants.

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