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Conservative approach for the management of congenital bilateral agenesis of permanent mandibular incisors: case report and literature review

ABSTRACT

Background Agenesis of mandibular incisors can lead to compromised dental and facial aesthetics and therefore requires appropriate treatment. When retained primary incisors are associated to this condition, a medium-term restoration may be provided before any definitive treatment to provide aesthetic relief to the young patient.

Case report The aim of this paper is to discuss the aesthetic management of a case with bilateral congenital agenesis of permanent incisors and retained primary incisors, which were successfully treated with direct composite restorations.

Conclusion This appears a viable technique that restores function and aesthetics with a very conservative approach.

Keywords Adhesive dentistry; Central incisor; hypodontia; Retained primary incisors; Tooth agenesis.

Introduction

The most common developmental anomaly in humans is dental agenesis. Oligodontia and hypodontia are two

relative terms in which the congenital absence of six or more teeth excluding molars refers to oligodontia, and congenital absence of less than six teeth excluding third molars refers to hypodontia [Endo et al., 2006]. Partial anodontia involves one or more teeth and is a rather common condition, and may be either bilateral or unilateral [Nagaveni, 2009, Lombardo et al., 2007, Favero et al., 2012]. Hypodontia is associated with the frequency of other missing teeth, the size of the remaining teeth, and the rate of dental development [Nunn et al., 2003]. Agenesis can also be associated with altered craniofacial dimensions [Lagana et al., 2011].

The most frequently occurring congenital missing permanent teeth, excluding third molars, are the mandibular second premolars (3.4%) and the maxillary lateral incisors (2.2%) [Backman and Wahlin, 2001]. There are reports showing unilateral occurrence of permanent mandibular central incisors [Pfeiffer et al., 1994, Newman & Newman, 1998]. Bilateral agenesis of mandibular central incisors is not well documented and literature shows paucity of data pertaining to this anomaly. Newman [1967] gave the first report of congenitally two missing mandibular incisors. It has been reported that missing mandibular incisors is common in certain populations like Japanese, Korean and Chinese [Niswander & Sujaku, 1963; Davis, 1987]. In the Swedish population, lower central incisors are more commonly missing than in other races [Nunn et al., 2003]. However, in other populations the prevalence is as low as 0.23% for central incisors and 0.08% for lateral incisors [Cameron & Sampson, 1996]. This shows that there is a significant variation in the prevalence of missing mandibular incisors among different ethnic groups. A retrospective study done in Hong Kong showed a high prevalence (3.4%) of missing mandibular incisors in this population [Davis, 1987]. Another study in Icelandic children showed the prevalence of missing mandibular central incisors and lateral incisors to be around 0.6% and 0.5%, respectively [Magnusson, 1977]. The difference in prevalence of congenitally missing mandibular incisors in different ethnic groups confirms the fact that both genetic and environmental factors are mainly involved [Rozsa et al., 2009]. Recently, some case reports showing different approaches in the management of congenitally missing permanent mandibular incisors were published [Prakash et al., 2011; Satish et al., 2014; Nagaveni, 2009; Pannu et al., 2011]. Documentation of such case reports still appears necessary due to its rarity, to provide a review to minimise the clinicians challenge in diagnosing such cases and thus helpful in providing a multidisciplinary approach in treating the patient [Satish et al., 2014].

In this paper, a case with bilateral congenital agenesis of permanent incisors and retained primary incisors, which were treated successfully with direct composite, is presented.

Case report

A 25-year-old female patient was referred to a private dental practice with a chief complaint of retained primary teeth in the lower midline part of the oral cavity. The patient was concerned about the unsightly appearance of the primary incisors. On general physical examination patient's height, weight, built and nourishment was consistent with the chronological age. There was no history of such findings in any of the patient's family members. The intraoral examination revealed the presence of retained primary mandibular incisors (Fig. 1), and the radiograph in that region showed the absence of both permanent mandibular central incisors tooth buds. The retained lower primary incisors were infra-occluded and no associated mobility was clinically registered. Moreover, the teeth appeared vital. As part of the examination, radiographs, photographs (intraoral and extraoral), and diagnostic casts were obtained.

The patient's casts were duplicated, mounted in centric relation position on a semi-adjustable articulator (Protar evo 7; Kavo Dental GmbH, Biberach, Germany) and waxed-up, in order to establish effective communication with the patient through a visual language, as well as to allow the clinician to verify, correct, and follow the future shape of anterior teeth. Restorations with new heights, shapes, and incisal edges were planned and projected based on tooth size (width/height ratio). A silicone guide was fabricated using a putty addition silicone material (Zetalabor, Hard 85 Shore A; Zhermack Spa, Badia Polesine, Italy). An impression of the lingual and incisal third of the teeth surfaces from the waxed-up cast was used as a dimensional guide for composite placement and symmetry.

On the next appointment, after administration of local anaesthesia with articaine and 1/100.000 adrenaline (Ubistesin; 3M ESPE, Cergy Pontoise, France) and insertion of retraction cords (Ultrapack #1; Ultradent Products Inc., St Louis, MO) a rubber dam was placed to isolate the tooth. The rubber-dam isolation included 4 lower incisors and lower canines, which ensured appropriate gum retraction. The premolar clamps (Hygienic, Coltène/Whaledent AG; Altstätten, Switzerland) were placed on lower premolars over the rubber dam. The incisal margins were slightly prepared with the aid of a diamond bur (No. 880.305S Intensiv, Viganello - Lugano, Switzerland). Any sharp margins on the prepared tooth surface were rounded to ensure enough surface area for bonding (Fig. 2a). Prior to the restorative procedures, the entire surface of the tooth was sand blasted with 50 µm particles of Aluminium Oxide (Korox, Bego; Bremen, Germany) and the adaptation of the silicone guide was verified. A 36% phosphoric acid (Conditioner 36; Dentsply DeTrey GmbH, Konstanz Germany) was applied for 20 seconds followed by a water rinse. Excess water was blot dried



FIG. 1 Frontal view showing retained deciduous mandibular central incisors.



FIG. 2 A Any sharp margins on the prepared tooth surface were rounded to ensure that there was enough surface area for bonding.



FIG. 2 B Intraoral view immediately after the palatal layer was cured and the silicone guide was removed.



FIG. 2 C Application of dentin shade to create mamelons and reproduce the region that corresponds with the deepest dentin area.



FIG. 2 D Front view of teeth after the final enamel layer application.

FIG. 2 Restorative phases with rubber dam isolation.

from the dentin surfaces leaving the surfaces visibly moist. Then, an adhesive (EnaBond Light curing; Micerium, Avegno, Genova, Italy) was applied in accordance with the manufacturer's guidelines and light-cured (L.E. Demetron I, Sybron/Kerr; Orange, CA, USA; output: 1200 mW/cm²). All the composite increments were warmed up using a heater for composite (Ena Heat; Micerium) to 39°C [D'Amario et al., 2013; D'Amario et al., 2015]. A thin layer of translucent enamel composite (Enamel Plus HRI, EF2 shade; Micerium), warmed up using a heater for composite (Ena Heat; Micerium) to 39°C, was placed onto the silicone guide as a lingual shelf to establish the lingual contour and the new incisal edge (Fig. 2b). The excess material was removed and the resin composite was light-cured in position for 20 seconds. Acetate strips were placed interproximally and pulled through to aid in creating tight contacts points. The halo effect (i.e., a thin layer along the incisal edge) was sculpted with a dentine shade (Enamel Plus HRI, UD2 shade; Micerium). The artificial dentin (Enamel Plus HRI, UD4 shade; Micerium) was placed over the facial portion and sculpted in the shape of the lobes and developmental depressions (Fig. 2c). To mimic the effect of the natural tooth, the composite stratification technique suggested by Lorenzo Vanini [1996] was applied (Enamel Plus HRI, UD3-UD2 shades; Micerium). The final layer, which corresponded to the artificial enamel, was restored with translucent enamel composite (Enamel Plus HRI, EF2 shade; Micerium) (Fig. 2d). Composites were carefully applied with a very thin and flexible spatula instrument (LM-Arte Applicata, LM-instruments Oy, Finland) and smoothed with the aid of a #4 flat-tipped brush (Ivoclar Vivadent). Increments of resin composite were light-cured according to the manufacturer's instructions. Finally, both the buccal and palatal surfaces were cured for 40 seconds. Before polishing, any excess material at the margins was removed with a #12 surgical scalpel blade (Swann-Morton, Sheffield, England). A coarse-gritted disk (FlexiDisc, Cosmedent) and diamond coated drill (ISO 806 204 012, Gebr. Brasseler GmbH & Co. KG / Komet, Germany) were used to produce the primary anatomy and to achieve symmetry between similar teeth. After reaching the desired cervical-incisal and mesio-distal dimensions, symmetrical light reflection areas and light deflecting zones were outlined with pencil, and the distance was checked with a sharp-ended caliper.

In sequence, the facial and lingual surfaces were finished with a coarse silicone cup and point (KG Sorensen) to prepare for the macro surface texture. Perikymata and lines along the facial surface were created with the aid of a #1190F fine-grit diamond bur and #9903FF flame carbide finishing bur (KG Sorensen) on a 1:4 Increaser contra angle (T2 REVO, Sirona, Bensheim, Germany) for better operative control. Restorations were then buffed with silicon points (KG Sorensen) to eliminate some of the accentuated texture.

The restoration's final natural gloss was achieved using ENA Shiny polishing system included soft hair goat brush with diamond and aluminium oxide polishing pastes (Ena Shiny, Micerium, Italy). Diamond and paper strips (Micerium, Italy) were used to refine and polish the interproximal areas. This procedure is the key factor in the natural integration of the restorations (Fig. 3).

Occlusion was checked and post-operative instructions to the patient were given to discourage from loading the anterior teeth. The patient was instructed to return immediately if there was any indication that the restored primary incisors were mobile. Clinical and radiographic examinations were carried out immediately and after 12 months (Fig. 3, 4). In every follow-up visits, stability of restorations, good aesthetics, and periodontal health were evident. Teeth responded positively to the electric pulp tester and the radiographs showed no periapical changes.

Discussion

Due to the lack of adequate data in this field, the management of mandibular incisors agenesis is not well described in literature. This condition can result in severe psychological stress, as well as aesthetic and masticatory problems for the patient. Management often requires a multidisciplinary approach. Treatment strategies used in handling missing mandibular incisors include various restorative and orthodontic procedures to improve aesthetics and function [Nagaveni, 2009]. Careful treatment planning is important, because there is a need to deal with not only the immediate, but also the medium and long-term adverse implications. Hence, multidisciplinary treatment planning, which takes account of established and emerging techniques, needs to be practiced. Also the subsequent development of



FIG. 3 A
Postoperative view of restored primary teeth.



FIG. 3 B
Clinical 12 months follow-up.



FIG. 4 A The retained deciduous mandibular central incisors and congenitally missing permanent ones.

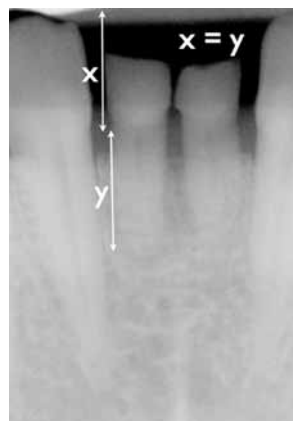


FIG. 4 B Restored crown/root ratio.

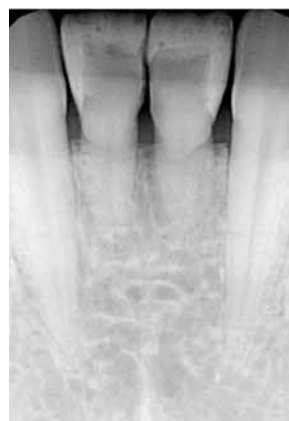


FIG. 4 C Postoperative radiograph.

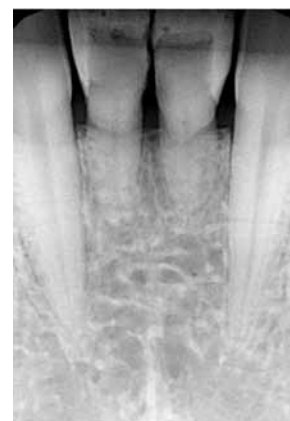


FIG. 4 D THE 12 months follow-up.

different treatment options, that taking into account the growth and development of the dentition and the compliance of the child, can lead to a treatment plan that can produce pleasing interim results, which do not compromise any future treatment.

The primary teeth act as ideal space maintainers that prevent the undesirable movement of adjacent teeth, which may cause difficulties in the placement of implants or fixed prosthesis [Hobson et al., 2003]. The longevity of the retained primary teeth with no permanent successors is uncertain. A retrospective radiographic study done by Haselden et al. [Haselden et al., 2001] has shown that some primary teeth without permanent successors can retain until 50 years of age, but not beyond 60. The recent trend of implant therapy suggests that the preservation of primary teeth until late teenage years is very critical. They have concluded that deciduous teeth should be retained where they can fulfill both aesthetic and functional demands of the young patient as long as possible [Haselden et al., 2001, Prakash et al., 2011]. In the present paper follow-up examination conducted after 12 months showed no signs of resorption in the retained conservative restored primary teeth.

In this case report, hypodontia could not be associated with any syndrome as the patient was normal in all other aspects and did not suffer from any other abnormality. None of the family members suffered from the congenital abnormality, suggesting absence of a hereditary basis to the defect. Regarding the environmental causes, both the prenatal and postnatal histories were noncontributory, as there was no history of trauma, radiotherapy, chemotherapy, or medication that the patient may have been exposed to.

In last decades, improved adhesive techniques and materials have seen an increasing acceptance of composite restorations [D'Arcangelo et al., 2014]. Jepson et al. [Jepson et al., 2003] suggested that anterior

dental spacing could be improved using composite buildups and veneers. Veneer restorations seem to be an optimal choice also for endodontically treated teeth [D'Arcangelo et al., 2010], ideally combining a fiber post restoration [D'Arcangelo et al., 2007; D'Arcangelo et al., 2008a,b]. The composite technique proposed in this paper restores form and function with a minimal reduction of the tooth and conserves tooth tissues, ensuring good bonding of the resin-based composite with tooth structures. Therefore, composite restoration meets the functional and aesthetic needs of the patient and is an easy, relatively inexpensive solution for the management of infra-occluded primary teeth. However, the patients must be warned about possible failure of the composite restoration, and the need for periodic follow-up appointments must be encouraged. In the same appointments, all the approaches of preventive dentistry, such pit and fissure sealants, can be scheduled [Albani et al., 2005]. The past reports of a particularly poor survival of interim composite restorations may be the result of the inadequacies of the then-available techniques and adhesive materials [Prakash et al., 2011].

On the other hand, it should be taken into account that mandibular incisor agenesis has a large effect on mandibular symphysis growth and morphology. Buschang et al. [1992] demonstrated that vertical and horizontal growth changes during childhood and puberty, were most pronounced in the upper half of the mandibular symphysis and tooth eruption plays a critical role in continuous growth of the mandibular symphysis, resulting in an increase in the height of the mandibular body. Hence patients with absence of mandibular both central incisors, exhibit significantly smaller mandibular symphysis area than the normal patients. They have also reported that the growth of alveolar bone is associated with continuous eruption

of the dentition. Thus the congenital absence of lower incisors can result in minimal volume of bone for the placement of endosseous implants.

Conclusions

Agenesis of mandibular incisors can lead to compromised dental and facial aesthetics and therefore requires appropriate treatment. Cases of agenesis need to be well diagnosed to provide comprehensive range of treatment modalities and thus help in restoring esthetics and function. With the materials available today, in conjunction with an appropriate adhesive technique, excellent aesthetic and functional results can be achieved with predictable medium-term outcomes through a direct adhesive approach. This appears a viable technique that restores function and aesthetics with a very conservative approach, and it should be considered when treating patients with agenesis of mandibular incisors and retained primary teeth, especially younger subjects.

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