

Replacement of a Congenitally Missing Maxillary Incisor by Implant Supported Prosthesis

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Abstract Maxillary central incisors have the least incidence of congenital absence. When it does happen, the patient may present with over retained deciduous centrals or the contralateral central may have drifted into the available space presenting as generalised anterior spacing with loss of midline. In such cases a multi-disciplinary approach may be required with orthodontic treatment to re-organise the space available in order to rehabilitate the patient with a fixed prosthesis. This case report presents the treatment of a patient with congenitally missing maxillary left central incisor using dental implant with angulated abutment after orthodontic correction and stabilization of the remaining maxillary anteriors.

Keywords Missing central incisor · Dental implants · Prosthetic replacement · Papillary preservation · Adjunctive orthodontics

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Introduction

Tooth loss in the maxillary anterior region is commonly the result of a traumatic injury or a congenital anomaly. If sufficient space is available, a removable dental prostheses (RDPs), conventional fixed dental prostheses (FDPs), resin-bonded FDPs, or a single-implant supported prosthesis can be given. However, if the space available is not sufficient then orthodontic treatment is done to create space and stabilise the tissues, following which a prosthesis can be given [1–4].

The traditional treatment for an edentulous space in maxillary central incisor area is a conventional three-unit or cantilever FDP. A major shortcoming of these alternatives is the significant tooth reduction of the abutments. Subgingival margins are required in aesthetic situations, but these are associated with increased gingival inflammation [5]. While some clinicians may suggest that a resin-bonded prosthesis is a viable option, clinical experience has shown that these resin-bonded pontics do not have a good long-term success rate if the teeth are not prepared aggressively enough for mechanical retention, and debonding rates of 25–31 % have been reported for these restorations [6, 7].

Dental implant is an appropriate treatment option for replacing missing maxillary anterior tooth in adolescents when their dental and skeletal development is complete [8–10]. For males, completion of facial growth may not occur until the age of 21 years; in young women, growth may be completed by age 15 [2, 8]. If growth is complete, dental implants can be placed as soon as the edentulous space has been created and the tissues have stabilized following orthodontic treatment. The cervical aesthetics of a single implant crown must accommodate a round diameter implant and balance hygiene and aesthetic parameters [11].



Fig. 1 Pre-operative extra-oral photograph

In the anterior maxilla, the placement of an implant in a prosthetically ideal position is often not possible because of the lack of sufficient bone, vertically or horizontally [12]. Because of aesthetic or spatial needs, angled abutments are often needed after placement of dental implants in the aesthetic zone [13, 14]. The preservation of soft tissues and regeneration of inter-dental papillae are critical for the aesthetic success of single-implant-supported crown [15, 16]. This paper presents the technique of managing a patient with the congenitally missing maxillary left central incisor using a conventional implant supported prosthesis with adjunctive orthodontic treatment.

Case Report

A 23-year-old female patient with congenitally missing left central incisor, with the right central incisor in the midline and spacing in between the maxillary anteriors (Figs. 1, 2, 3) reported to the Department of Prosthodontics, AECS Maaruti College of Dental Sciences and Research Centre. Her medical and dental history was evaluated. Periapical and panoramic radiographs and preliminary impression were taken for diagnostic evaluation (Figs. 4, 5).

After a thorough evaluation, a multidisciplinary approach involving fixed orthodontic to gain space, and prosthetic replacement of the missing left central incisor using the

Figs. 2, 3 Pre-operative intra-oral photographs showing the missing left central incisor and right central incisor in the midline with anterior spacing

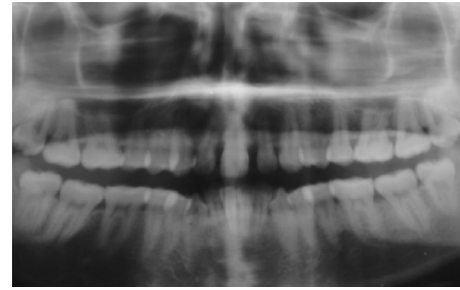


Fig. 4 Pre-operative OPG

implant supported prosthesis was planned. Treatment plan was explained to the patient and consent was taken.

Fixed orthodontic treatment was done to achieve space for left central incisor by distributing the available space (Figs. 6, 7, 8).

Once the space was gained and the teeth were stabilised, a maxillary arch CT Scan was taken which showed alveolar bone length available as 13 mm and width available as 6 mm in the maxillary left central region (Figs. 9, 10).

Surgical stent was prepared for the correct implant position and formal surgical procedure recommended by the manufacturer of the dental implant system was followed (Figs. 11, 12). A 3.3 × 10 mm tapered double thread, internal hex was placed (Hi-Tech, Life Care, Fig. 13), cover screw were fastened, and the flap was precisely repositioned and sutured free of tension.

During the healing period, the patient wore an acrylic provisional removable dental prosthesis relieved in the implantation sites. After 3 months, an IOPA radiograph (Fig. 14) was taken to assess the osseointegration and the second at the stage II surgical procedure was done, during which papilla preservation incision was given (Fig. 15), cover screw was removed, and gingival former was placed.

At the 4th month, gingival former was unscrewed and final impression of the maxillary arch was made using vinyl polysiloxane impression material (speedex, coltene waldent) while the transfer coping and cap was in place.

The abutment analog was secured in its place in the impression and the cast was poured in type IV gypsum (kalrock). Abutment selection was performed in the patient's mouth and on the definitive cast. Standard abutment was



Fig. 5 Pre-operative IOPA radiograph



Fig. 6 Intraoral picture during the orthodontic treatment



Fig. 7 OPG showing the space gained and an acrylic left central tooth bonded to a bracket

excessively in labial position that would not allow proper crown placement, hence angled abutment was chosen due to the axial-position problem (orofacial direction) of the implant. However, even angled abutment was insufficient to eliminate excessive labial emergence; therefore, it was prepared using laboratory implant analog and analog holder to achieve sufficient emergent profile and to optimize place for the ceramic crown (Fig. 16).

Temporary crown was prepared on the master cast using temporary restoration material. Abutment was attached to the implant, screwed on to it and tightened to 35 Nm using



Fig. 8 Intra oral picture after orthodontic treatment showing the space gained

ratchet and ratchet hex driver. Temporary crown was cemented using temporary cement on abutment for 2 weeks aiding also for maintaining the tissue form while the permanent crown were fabricated. Metal ceramic crown was finished, tried in and final cementation was done using the glass ionomer cement (Fuji Type I), Figs. 17, 18).

The patient was instructed in the specific care for her new restorations including tooth brushing and flossing. Follow ups were done at monthly intervals for 3 months, after 6 months and then after 1 year (Fig. 19).

Discussion

The use of dental implants in the aesthetic zone is well documented in the literature, however placing dental implants in the anterior maxillary area is considered to be the ultimate challenge for many dentists [1–4, 8, 17]. In some patients, the edentulous space might be insufficient, or the alveolar crest is too narrow to permit placement of an implant. Occasionally, the root apices of the adjacent teeth might be in close proximity [2, 18]. In such cases orthodontic treatment would help in regaining the space and getting the roots parallelism. In other cases, ridge thickness may be inadequate, requiring soft tissue or bone augmentation [8, 16]. The placement of implants in a correct three-dimensional position is one of the keys to an aesthetic treatment outcome [4, 8].

Surgical stents are used for proper positioning of the implants during surgery. To accommodate a standard implant in the maxillary central incisor area, there should be a minimum of 10 mm of inciso-gingival bone and a minimum of 6.0 mm of facial-lingual bone. Adequate space for the implant is also required between the adjacent roots. 1 to 2 mm of space is necessary between the implant and the adjacent roots [19]. In this case the required amount of mesiodistal space was gained by fixed orthodontic treatment but the thickness of bone facio-lingually was not ideal



Fig. 15 Papillary preservation incision placed to expose the cover screw during stage-II

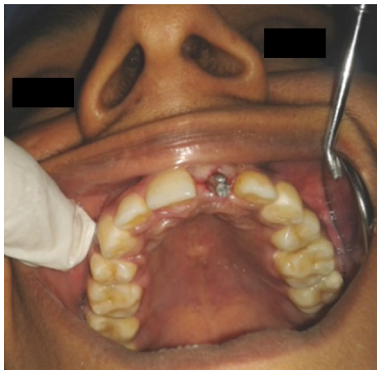


Fig. 16 Abutment seated

collapse before definitive restoration. Dental implants can be restored with cemented or screw-retained FDPs. In this case the prosthesis was retained using the GIC cement.

Conclusion

Orthodontic correction followed by the dental implant treatment of a patient with congenitally missing maxillary central incisor with insufficient edentulous space and alveolar bone deficiency was performed using narrow diameter

Figs. 17, 18 Intra oral and extra oral pictures showing the implant supported prosthesis

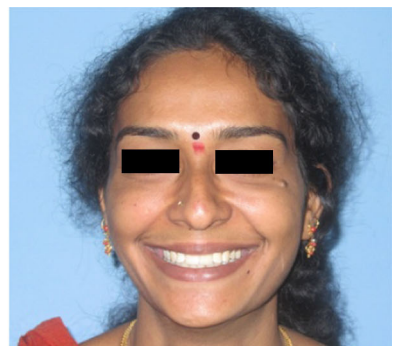


Fig. 19 RVG showing the implant supported prosthesis after 1 year of placement

implants and angled abutments. After 1-year follow-up, it was concluded that treatment using angled abutments were satisfactory for the patient's aesthetic expectations.

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