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Computer Guided Implant Planning and Placement of Implant for A Congenitally Missing Lateral Incisor Using the MSOFT Program

Dr. Nitesh Rai MDS[1]*, Dr Vini Girdharilal Panjwani[2], Dr. Ponnanna A A[3], Dr. R.R.K Jingade[4], Dr Sruthi Ravindra[2], Dr. Dhanya Rajan[2]

[1]Professor and Guide, Department of Prosthodontics, Krishnadevaraya College of Dental Sciences & Hospital, International Airport Road, Hunsamaranahalli, Bangalore, Karnataka, India-562157

[2]Post Graduate student, Department of Prosthodontics, Krishnadevaraya College of Dental Sciences & Hospital, International Airport Road, Hunsamaranahalli, Bangalore, Karnataka, India-562157

[3]H.O.D & Professor, Department of Prosthodontics, Krishnadevaraya College of Dental Sciences & Hospital, International Airport Road, Hunsamaranahalli, Bangalore, Karnataka, India-562157

[4]Professor, Department of Prosthodontics, Krishnadevaraya College of Dental Sciences & Hospital, International Airport Road, Hunsamaranahalli, Bangalore, Karnataka, India-562157

Case Report

***Corresponding author**
Dr. Nitesh Rai

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Abstract: It has been discerning that in approximately 2% of the population one or both the maxillary lateral incisors are congenitally missing. To achieve an optimal aesthetic for missing lateral incisor has been very challenging for a clinician. It is often necessary to establish a harmonious, interdisciplinary approach. There are various treatment options for replacing the missing maxillary lateral incisor, including canine substitution, three unit fixed partial denture or single-tooth dental implant. Dental implants are an appropriate treatment option for replacing missing maxillary lateral incisor teeth in adolescents when their dental and skeletal development is complete. In the present case report, the dental implant with angled abutment was planned as a definitive treatment option for a patient with congenitally missing maxillary lateral incisors.

Keywords: Angled Abutment, CAD/CAM, Congenital, Implant, lateral incisor, Template.

INTRODUCTION

After 3rd molar, maxillary lateral incisors are the most common congenitally missing teeth. There are various treatment options to restore the edentulous space that may include orthodontic correction, removable partial denture, fixed partial denture and the single tooth implant. Before proceeding for treatment planning various factors must be kept in account that includes the patient's age, spacing, tooth anatomy, alveolar bone quality and quantity, gingival display Removable partial denture is often considered as an interim restoration for a maxillary lateral incisor tooth[1].

Conventional three-unit fixed partial dentures are routine dental treatment options for replacing missing maxillary lateral incisor. A major drawback of this alternative is the remarkable tooth reduction and sensitivity of the abutments. Another available option is canine substitution (i.e modifying and repositioning canine into lateral incisor) by orthodontic corrections[2]. This treatment is considered if esthetics permits. Rehabilitation of congenitally missing lateral incisors using dental implant has now become a routine dental procedure. Before implant placement planning plays a very crucial role, both quantity and quality of alveolar bone present should be evaluated. It has been encountered that the congenitally missing lateral incisor had led to restricted growth in the buccolingual direction, as the only source of development available in that region is the narrow root of deciduous lateral incisors. Narrow buccolingual width in the anterior maxilla has often made it difficult to place an implant into a prosthetically ideal position. Use of CBCT has provided virtue for three- dimensional view of the alveolar ridge, which facilitates determination of best implant position and implant axis. Thus, an accuracy of implant placement can be improved by using an innovative CAD/CAM surgical template[3]. Surgical guided templates have proven to be safe and efficient. To obtain optimal esthetics in this zone angled abutment are often planned. This case report presents placement of the single-tooth implant using CAD/CAM surgical guided template for treatment of a patient with congenitally missing maxillary lateral incisors and use of angled abutment to achieve optimal esthetics and function.

CASE REPORT

The 17-year-old female patient had reported to the department of prosthodontics with congenitally missing maxillary lateral incisors. Her dental history was assessed. Dental history disclosed that intentional orthodontic treatment was advised to provide enough space in the edentulous area for restoring esthetically pleasing lateral incisor (Fig-1).

Fig-1: Image showing edentulous space with relation to lateral incisor

Fig-2: Image showing CBCT, OPG of edentulous space with relation to lateral incisor

Panoramic radiograph, CBCT, and preliminary impression were made for diagnostic assessment (Fig-2). After CBCT analysis, planning was done using MSOFT program and decision was made for placement of the narrow dental implant(3.3 X 13) with bone expansion, as the available bone width was 4mm and length was 16mm. Surgical guided templated was printed for the correct implant position (Fig-3).

Fig-3: Image showing Surgical guided template

The surgical procedure recommended by the manufacturer (MIS guided surgery implant systems, Israel) was followed. During the surgical phase, a surgical guided template was disinfected using chlorhexidine and checked for fit in patient's mouth. Punch incision was made using punch drill on surgical site (Fig-4).

Fig-4: Image showing Punch incision which was made using punch drill

The implant of 3.3 X 13 (MIS Implant system, Israel) was placed labially inclined using a surgical guided template. Thereafter, healing abutment was fastened. Till the prosthetic phase, the patient wore an acrylic partial denture and to relieve the implantation site from stress tissue conditioner was applied on the impression surface. After five months, healing abutment was removed and close tray impression post and plastic sleeve were placed onto the implant and impression were made for maxillary arch using polyvinylsiloxane and regular body (DENTSPLY Aquasil Soft Putty/ Regular Set). The abutment analogs were secured in their places in the impression and the cast was poured in type IV hard plaster (Kalabhai Karson Pvt. Ltd., India). Angulation of implant and abutment was preplanned during diagnostic phase using CBCT and MSOFT program. The customized angled abutment was printed (MIS Implant System) which fastens to overcome the axial-position problem of the implants (Fig-5).

Fig-5: Image showing customized angled abutment

The abutment was screwed onto the implants, tightened to 35 Nm using ratchet and ratchet hex driver. Metal ceramic crowns were finished and cemented (Fig-6).

Fig-6: Image showing final prosthesis of porcelain fused metal crown

Oral hygiene and specific care for instructions were given including tooth brushing and flossing. Follow-up was done after 3month.

DISCUSSION

Dental implants are boon to esthetic dentistry and the success of osseointegrated implants has been well documented by Branemark *et al*., [1]. Placement of implants in the esthetic areas has always proven challenging for a dentist. Ideally, more than 1mm of bone should be present on either side of implant in the bucco-lingual direction to retain the soft tissue around it [2]. In maxillary anterior region inadequate width of alveolar bone has always necessitated an additional surgery like bone augmentation [3]. The placement of implants in such regions precisely is one of the vital factors to obtain an esthetic treatment outcome. Conventional radiographs, diagnostic cast for bone mapping did not provide enough information and failed to detect horizontal dimensions of alveolar ridge in edentulous area. In this case, CBCT was used to evaluate alveolar bone in the maxillary lateral incisor area before planning [4]. Virtual planning was done by overlapping CBCT and stone model. Accordingly angulation of implant and abutment was decided in presurgical phase. Surgical guided template fabricated using CAD/CAM has aided in an exact and precise positioning of the implant [5]. The introduction of a surgical guided template has been the boon in implant surgery. For implant placement, flapless surgery appears to be a plausible treatment modality. It has certain advantages like preservation of soft and hard tissue, saves surgical time, and avoids 2nd stage surgery, reduced pain and swelling [6]. In this case, an alveolar bone was available was 4mm in buccolingually in maxillary lateral incisor area. Thus, use of narrow diameter implant with bone expansion was considered as the much predictable option to compensate for the horizontal alveolar bone deficiency. To avoid labial perforations, the implant was planned to be placed off axis in labial direction during the planning phase. The angulation of implants in labial direction was counterbalanced by using angled abutment that was used to obtain satisfactory emergence profile of the metal ceramic crown. Various studies have concluded that use of the angled abutment may be considered a

suitable restorative option when implants are not placed in ideal axial positions [7]. In this case, o-cr angulated abutment was used to provide marginal accuracy and internal fit thus minimize undue stresses by forces applied off axis on bone surrounding the implant [8]. Dental implants can be secured to abutment with screws (screw-retained), or they can be cemented to the abutment. The implant shoulder is mostly located subgingivally. Uses of screw retained restoration are usually preferred over cement retained in such subgingivally located implant shoulder [9]. Removal of cement is troublesome in such situation. But, in the present case, cement retained restoration was chosen because of the angulation of the implant and it also enhanced esthetic in an anterior region as the axis screw channel is placed labially. The metal ceramic crown was initially cemented with interim cement (Zinc polycarboxylate) and later luted with glass ionomer cement.

CONCLUSION

Treatment planning and placement of a single dental implant in horizontal alveolar bone deficient areas using MSOFT program and the surgical guided template has become easy. At the 3 months follow-up, it was observed that interdental papilla levels were increased gradually and improved esthetics.

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