

Adjunct orthodontics in contemporary prosthodontic rehabilitation of hypodontia: An interdisciplinary case report

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Abstract

Congenitally missing teeth or hypodontia are conditions which compromise the functional, esthetics and phonetic demands of the patients. Adjunct esthetic treatment procedures like orthodontic space regaining lead to predictable outcomes and create a myriad of available treatment options. This case report is a step-by-step procedure in which congenitally missing maxillary anterior teeth were restored with modern contemporary prosthodontic rehabilitative techniques integrated with adjunctive orthodontics and implantology.

Keywords: Adjunct Orthodontics, Hypodontia, Cad-Cam.

Introduction

Interdisciplinary esthetics is a contemporary modality of treatment assuring successful outcomes in the field of restorative dentistry. Hypodontia or congenitally missing teeth remains a common occurrence in human dentition with the maxillary lateral incisors being the most affected anterior teeth followed by the mandibular central incisors¹. Phonetic, esthetic and functional compromises have a direct influence on the quality of life. An adjunct approach to rehabilitation of congenitally missing anterior teeth with orthodontic intervention and chair side restorative techniques coupled with the judicious application of implant dentistry in rehabilitating anterior esthetics throws light on an integrated treatment modality.

This case report outlines an interdisciplinary adjunctive intervention in treating a 36yr old female patient with congenitally bilaterally missing lateral incisors in which contemporary rehabilitative modalities such as pre-adjusted edgewise appliance therapy, CAD-CAM milled implant supported prosthesis and all ceramic veneers were used to restore anterior esthetics.

Case Report

A 33-year-old female patient reported to the division of Prosthodontics and Crown & Bridge AFMC, Pune with a chief complaint of having gaps in her front teeth and loss of confidence on smiling.

Intraoral examination, revealed a permanent dentition with teeth absent in relation to 18 12,22,28,38,46,47,48. The patient exhibited a normal lip length, class I molar relation on the left side, concave facial profile and generalized anterior spacing due to missing upper lateral incisors (Fig. 1a)

The treatment plan planned with due consent of the patient involved regaining of anterior space lost due to mesial migration of maxillary canines, maintaining adequate and proportionate arch space for restoring the missing teeth with a definitive prosthesis, proper axial alignment and leveling of teeth. To maintain the existing molar occlusion and canine relationship with adequate overjet and overbite, restoring the lip fullness, achieving stable and functional occlusion, and

most importantly restoring the anterior esthetics. Adjunct orthodontics was planned followed by placement of two stage dental implants in 12, 13 and 22, 23 regions. This was followed by CAD-CAM based definitive crowns for the dental implants and CAD-CAM based veneers for 11 and 21.

Adjunct orthodontics

Fixed orthodontic appliance therapy was initiated and completed using preadjusted edgewise technique on the maxillary arch over a period of 9 months. (Fig2. a, b, c).

Levelling and alignment procedures were carried out using .016 Ni Ti arch wires and sequential stainless-steel wires up to 0.017 x 0.025" were used. The incorporation of Ni Ti open coil springs was carried out to distalize the canines bilaterally. When orthodontic treatment objectives were met the case was taken up for prosthetic rehabilitation with implants.

Implant therapy

Diagnostic casts were made and space analysis was performed in conjunction with radio diagnostic modalities such as Cone beam computed tomography (Planmeca ProMax® 3Ds) in order to plan the placement of Dental Implants. The proportions and esthetics were confirmed with the help of a diagnostic wax up (Maarc Mock up wax). The Visual Treatment Objective was shown to the patient and discussed and a prior consent was obtained.

The implant placement was performed under sterile surgical conditions after reflecting a full thickness mucoperiosteal flap bilaterally under local infiltration anaesthesia using 2% xylocaine with 1:80000 adrenaline (Fig 3a).

A two stage loading protocol was followed in which a sequential widening osteotomy was carried out with the myriad implant surgical kit using a 2mm pilot drill and a 2.8mm osteotomy twist drill (Fig- 3b). Four titanium endosseous root form implants (Equinox Myriad Plus) of lengths and diameters of 3.3mm x 13mm were placed respectively in regions of 13,12, 22, 23. (Fig. 3c).

Braided 3-0 silk sutures (Lotus Silkus) were used to approximate the mucoperiosteal flaps. Post operative instructions were given and patient was placed on anti microbial therapy as per protocol. Immediate post operative implant placement was confirmed using an orthopantomograph (Fig. 3d) and sutures were removed after 7 days. Monthly recalls were done and the patient was taken up for 2nd stage surgery after 3 months of healing.

Second stage surgery was performed to expose the cover screws and gingival formers were placed (Fig. 4a), (Fig 4b).

Closed tray impression procedures were carried out after placing the myriad equinox abutments and direct transfer copings (Fig. 5a).

The Impression transfers (Fig. 5b) were picked up in the elastomeric impressions (Fig 5) (Photosil poly vinyl siloxane, Coltene Whaledent) and the respective analogs were connected with the abutments and a gingival mimic was placed (Gingifast Rigid, Zhermack) and casts were made using Type-III dental stone. The abutments were milled (Fig. 5d) and temporisation was done for the implants and 11 and 21 were conservatively managed with composite veneers.

Definitive Restorative phase using CAD-CAM

One month post insertion of temporary crowns the patient was taken up for definitive therapy. The composite veneers were replaced with all ceramic veneers with a wrap around design and preparation was kept on enamel to a depth of 0.3mm with supragingival finish lines in relation to 11 and 21. The abutments in relation to 12, 13, 22, 23 were restored using CAD CAM milled zirconia full coverage splinted crowns. The casts were scanned using an extraoral lab scanner (Ceramill Map 200+) and the standard tessellation language (STL) data was transferred onto a CAD software (Exo CAD) where virtual articulation and virtual designing was done (Fig. 6a,b,c) and the definitive prosthesis was virtually proportioned. The CAD data was processed and sent to a milling machine (Ceramill motion 2, AmannGirrbach). The Zirconia copings were sintered and layered with glass ceramics. The all ceramic veneers and implant supported crowns were tried in and checked for implant protected occlusion by removing interferences and then cemented using a self adhesive resin cement, RelyX™ Unicem (3M ESPE). A teflon tape barrier technique was used while carrying out luting procedures to prevent the ingress of luting cement into the implant soft tissue interface. (Fig. 7a, 7d). Post insertion hygiene and maintenance instructions were given with periodic recall visits scheduled post insertion.



Fig. 1a: Pre-treatment; **1b:** intraoral pre-op pic of teeth in occlusion; **1c:** Pre-treatment pic maxilla; **1d:** Pre-treatment mandible



Fig. 2a: Fixed appliance therapy; **2b:** Canine distalised in arch; **2c:** Post orthodontic treatment



Fig. 3a: Mucoperiosteal flap reflected to reveal underlying bone; **3b:** Pilot drill used for Osteotomy; **3c:** Implants placed with torque ratchet; **3d:** Post-operative orthopantomogram showing implants in Situ.

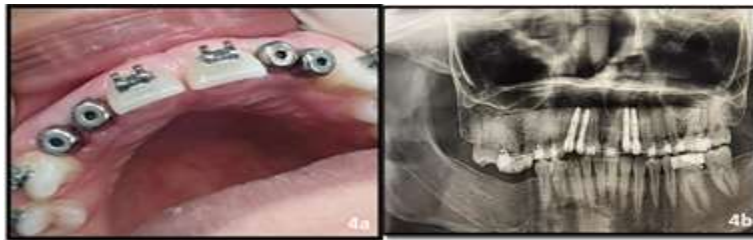


Fig. 4a: & 4b: Gingival Formers placed after 2nd stage surgery



Fig. 5a: Abutments in Situ; 5b: Direct transfer coping placed on abutments; 5c: transfer copings picked up using closed tray; 5d: Prepared abutments in Situ.

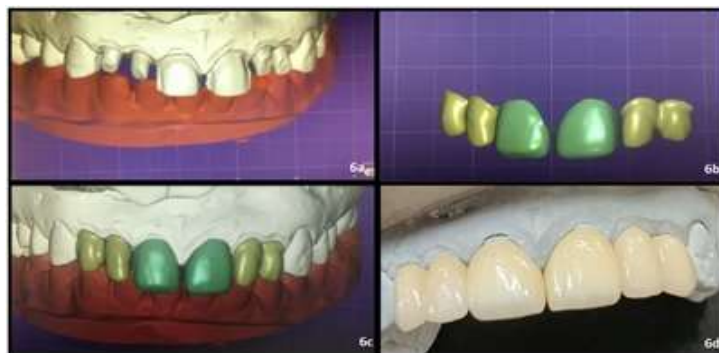


Fig. 6a: Virtual articulation; 6b: Cad designing of frameworks and veneer copings; 6c: Virtual try in of copings; 6d: Finished zirconia prosthesis



Fig. 7a, b, c, d: All ceramic prosthesis in situ



Fig.8a: Pre-Treatment frontal view; 8b: Post Treatment frontal view

Discussion

Hypodontia differs from oligodontia in having lesser number of missing teeth (< 6 teeth). The unilateral or bilateral absence of maxillary lateral incisors may have both syndromic or non-syndromic etiological factors with females being more affected than males.² The prevalence studies of hypodontia done by Santosh Patil et al.³ Shows hypodontia to be the most common dental anomaly amongst Indian population followed closely by impacted teeth. Anterior teeth edentulism has a major impact on psychosocial wellbeing of patients affecting their self-esteem and social confidence.⁴

Adjunctive procedures to prosthetic rehabilitation in treating cases of hypodontia depend on factors such as the degree of the edentulous span, the alignment of teeth in the arch, the amount of space present, the type of occlusion present, the skeletal relation and if any shift in the midline.⁵ The different modalities of prosthetic rehabilitation ranges from restoring esthetics with an interim removable partial denture, using a resin retained fixed dental prosthesis to making an implant supported prosthesis. Formulating a distinctive treatment plan depends on various factors such as the tooth size relationship, the severity of the malocclusion, the size and esthetics of the canine.

Adjunct orthodontic techniques like distalisation of the canine to regain both adequate space and bucco palatal bone volume for the placement of dental implants in case of missing maxillary lateral incisors have been routinely advocated by various authors.⁶ CAD-CAM technology is a highly reliable modality of rehabilitation having attributes such as accuracy, reliability and most importantly faster treatment outcomes.⁷ Osseointegrated implants can diversify treatment options as to restore esthetics with an option of splinting the prosthesis or keeping them separate. The occlusal scheme used in the rehabilitation was implant protected occlusion (IPO) which was designed to have no interferences in both excursive and centric relations. CAD-CAM zirconia crowns were fabricated keeping in mind the unesthetic nature of the titanium abutments and the adequate durability required.⁹

Treatment options in restoring anterior esthetics range from conservative approaches such as using removable partial dentures, the use of resin retained FDPs, to more definitive treatment modalities such as space regaining or closure using adjunct orthodontics and restoring arch esthetics with fixed tooth supported or implant supported prosthesis.¹⁰ The availability of arch space, the inclination of teeth present, the availability of primary abutments, the quality and quantity of the underlying osseous topography, the attitude, acceptance and consent of the patient and the available expertise and resources all play a deciding factor in choosing the right modality of rehabilitation.

Conclusion

Adjunct orthodontics, prosthodontic and implant therapies require a coordinated and integrated effort to build optimum esthetics in the anterior zone with emphasis on reaching a balance on satisfying the patients needs, using the best

treatment modalities available and using the skill of the dentist to bring about a triad of successful outcomes.

Source of Funding

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Conflict of Interest

The authors confirm that this article content has no conflict of interest.

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