

## CASE REPORT



# A multidisciplinary full mouth rehabilitation of non-syndromic oligodontia using twin-stage Hobo's technique: A case report

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## Keywords

Gene mapping, hypodontia, non-syndromic familial oligodontia, tooth agenesis

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## Abstract

Oligodontia is designated as the congenital agenesis of six or more permanent teeth, excluding the third molars. Thus, the comprehensive management of such a condition is always challenging and requires a multidisciplinary approach involving orthodontic, oral surgical, periodontic, and prosthodontic specialties. The purpose of this article is to throw light on the fact that early diagnosis and comprehensive treatment phases are essential for a successful treatment outcome. This case report presents a multidisciplinary management of a 20-year-old female patient of familial non-syndromic oligodontia with congenitally missing eight permanent teeth. The first phase of therapy aimed at a pre-prosthetic orthodontic space gain, alignment, canine uprighting, and corrections of intermaxillary relations as a pre-requisite for better treatment outcome. Phase two therapy was the full mouth rehabilitation of the entire dentition using "Twin-stage Hobo technique" at an increased vertical dimension of 3 mm. The prosthodontic rehabilitation was completed using tooth supported fixed metal ceramic restorations. These full mouth fixed restorations successfully restored function and esthetics.

## Introduction

Dental agenesis and malformations are the most common human developmental anomalies causing significant esthetic and functional deficiency. It is classified based on the number of missing permanent teeth excluding the third molars. According to the 1996 consensus conference on oral implants in young patients, "Hypodontia" is defined as the congenital agenesis of one to five permanent teeth.<sup>[1]</sup> Schalk-van der Weide *et al.*<sup>[2]</sup> in her research defined "oligodontia" as the congenital absence of six or more permanent teeth, excluding the third molars. It is synonymously known as partial anodontia, selective tooth agenesis, multiple aplasia, or severe/advanced hypodontia. "Anodontia" refers to the congenital absence of all the deciduous and/or permanent teeth.

Oligodontia can be classified as an isolated non-syndromic oligodontia or those associated with a syndrome. Most frequently associated syndromes are hypohidrotic ectodermal dysplasia I and 3, Down syndrome, Wolf-Hirschhorn syndrome,<sup>[3]</sup> Van der Woude or lip-pit syndrome, ectodactyly-ectodermal dysplasia-cleft lip/palate syndrome, Fried syndrome, Book syndrome, Rieger's syndrome, oto-palato-digital syndrome, Witkop's

tooth-nail syndrome, oro-facial-digital syndrome Type I,<sup>[3,4]</sup> oculo-facial-cardio-dental syndrome, incontinentia pigmenti (Bloch-Sulzberger syndrome),<sup>[4]</sup> and holoprosencephaly.<sup>[4]</sup> Patients with associated systemic syndromes are diagnosed with having oligodontia-S.<sup>[5]</sup> When it occurs as a part of a syndrome, there are usually concomitant abnormalities in the skin, nails, eyes, ears, or skeleton.

It is characterized by the congenital absence of the third molars (more frequently) followed by mandibular second premolar, maxillary lateral incisors, and maxillary second premolar. This pattern in which the teeth are missing is influenced by the gene affected and the type of mutation that occurs within a gene.

Complete congenital absence of dental follicles is considered to be the pathognomonic feature for oligodontia. Moreover, it is inherited as an autosomal dominant trait which is considered to be associated with the mutations of muscle segment homeobox 1 and paired box 9 (PAX9) genes.<sup>[4-7]</sup> All mutations of PAX9 identified till date have been associated with non-syndromic form of tooth agenesis.<sup>[7]</sup>

It has a wide variety of clinical manifestations. Residual teeth can vary in size, shape, form, and the rate of development

and eruption. It is associated with the growth disturbances of maxillofacial skeleton resulting in the change of facial appearance. Thus, it affects the esthetics, function, and psychology of the patient, especially when the anterior teeth are missing. Thus, diagnosis and comprehensive management of oligodontia is a significant challenge to the clinicians.

The main aim of the present case was to:

1. Recreate esthetic and functional crown contours
2. Develop a canine-guided (mutually protected) occlusion by generating an anterior guidance which would disocclude posteriors on mandibular protrusion
3. Remove balancing side interferences on lateral excursions.

Thus, the purpose of this article is to report a rare case of non-syndromic oligodontia where an esthetic and functional rehabilitation was achieved through orthodontic and prosthodontic intervention.

## Case Report

### Diagnostic phase

A 20-year-old female patient reported to the Department of Prosthodontics, Mahatma Gandhi Postgraduate Institute of Dental Sciences for the correction of unesthetic facial appearance and smile and to correct the spacing between upper front teeth. Complete medical and dental histories were collected in the form of personnel history, clinical examinations, radiographs, and photographs. General physical examination revealed no other abnormalities suggestive of any syndrome.

Extraoral examination in frontal and profile plane revealed a facial asymmetry and a mild decrease in the lower facial height along with a prognathic (concave) profile. The nasolabial angle was well within the normal limits with weak labial commissures and thinning of the lips. The patient's lips were competent. A deep mentolabial sulcus was present, and hyperactivity of the mentalis muscle was visible in the skin overlying the chin upon lip closure. All the aforementioned features were suggestive of collapse of lower facial height [Figure 1].

Intraoral examination revealed that permanent teeth were congenitally missing. The missing teeth included maxillary lateral incisors, maxillary second molar, and mandibular right and left central and lateral incisors. All the third molars in all the four quadrants were clinically missing. There was evidence for the presence of retained deciduous mandibular incisors which had undergone excessive attrition. A supernumerary tooth was seen in relation to mandibular right canine and first premolar and was slightly lingually placed [Figure 2a and b]. There was evidence of deep bite of about 4 mm. Maxillary midline was slightly shifted to the right, and the lower dental midline was in the center. The patient had a Class I molar relationships in both the right and left side.

Crowding was present in between 33 and 34, and spacing was seen between mandibular retained deciduous teeth (51, 52, 61, and 62). There was generalized microdontia of the entire

dentition. There was no evidence of crossbite. Infraocclusion was present in relation to 24, 25, 26, 34, 35, 36, 51, 52, 61, and 62. The freeway space of the patient at rest was estimated to be 6-7 mm. Diagnostic records included study models, pre-operative orthopantomogram (OPG), and lateral cephalograms. OPG substantiated the clinical findings.

### Genetic information

The patient was the first child of two from a consanguineous marriage. One of the patient's paternal aunts showed some evidence of oligodontia. The patient's sweating rate, her nails and skin, and neuromotor development appeared normal, and there was no specific finding suggestive of any syndrome. The differential diagnosis of ectodermal dysplasia was proved beyond doubt, and the diagnosis of non-syndromic oligodontia was made.

### Treatment plan

Prosthodontic treatment of oligodontia patients should aim at functional, esthetic, and psychological rehabilitation. Multiple missing teeth, deep mentolabial sulcus, deep bite, spacing and crowding between teeth, and midline diastema of 2 mm were all listed as orthodontic problems. Thus, treatment of such a patient required a fully integrated multidisciplinary team approach of orthodontists, oral and maxillofacial surgeons,



Figure 1: Pre-operative extraoral photograph in frontal view

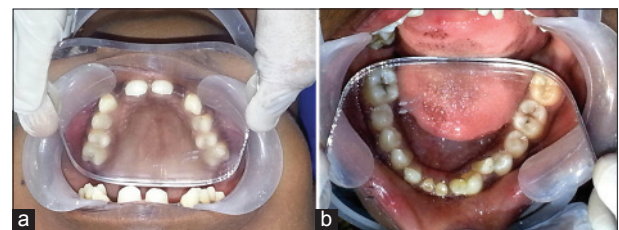


Figure 2: (a) Pre-operative intraoral photograph in occlusal view of maxillary arch, (b) pre-operative intraoral photograph in occlusal view of mandibular arch

and prosthodontists. Various factors such as age of the patient, number and condition of the retained teeth, number of missing teeth, condition of supporting tissues, occlusion, and the interocclusal space must be considered when planning the treatment.

### Treatment procedure

The treatment was planned in a phased manner after obtaining an informed consent from the patient:

#### Phase I therapy

Phase I therapy consisted of a pre-prosthetic orthodontics with the following aims and objectives:

- Space gaining in relation to 12 and 22
- Alignment of mandibular supernumerary tooth presents between 43 and 44 in correct arch form
- To raise the patient's vertical dimension (VD) by 1 mm
- Uprighting of distally inclined maxillary canines.

Orthodontic therapy was started after the accomplishment of a thorough oral prophylaxis. Begg brackets bonded in the upper and lower dentition. Initial alignment achieved using 0.016 inch NiTi wire. Stabilizing wire 0.018 inch SS arch wire inserted, and maxillary midline diastema closed. Rotated 23 corrected using uprighting spring followed by finishing wire 0.014 inch NiTi. The achieved results were retained using an upper Hawley's retention appliance with two lateral incisors as replacement teeth for a period of 6 weeks.

#### Phase II therapy: Surgical phase

After orthodontic phase of therapy was accomplished, mandibular retained deciduous incisors (51, 52, and 61) were extracted due to severe incisal attrition leading to poor crown:root ratio.

#### Phase III therapy: Prosthetic therapy

Prosthetic therapy consisted of replacement of missing anterior teeth and restoration of entire dentition with full mouth fixed restoration to improve mastication and appearance. The prosthetic therapy also reestablished the lost VD.

#### Splint therapy

A full contact permissive hard splint was fabricated with heat cure acrylic resin and inserted on the mandible with a 3 mm raise in the VD.<sup>[8]</sup> This 3 mm increase in VD of occlusion was incorporated to enable placement of a fixed prosthetic restoration and to improve anterior facial esthetics.<sup>[9]</sup>

The patient was insisted to wear the splint throughout the day (along with the maxillary retention appliance for a period of 6 weeks). The patient was recalled after 1 day, 2 days, 1, 2, 4 and 6 weeks interval and was reviewed for her ability to adjust to the newly increased VD. The patient had no complaints of any problem with regard to the splint inserted.<sup>[9]</sup>

After the splint therapy, centric records were obtained using leaf gauge as the anterior deprogrammer. Thirty leaves of leaf

gauge were used to compensate for the lost VD. An interocclusal wax record was made at centric position, and casts were articulated on a semi-adjustable Hanau H2 articulator.

Diagnostic wax-up was done to establish the desired tooth contours, esthetics, tooth position, and occlusal plane [Figure 3]. Diagnostic wax-up was done with maximum intercuspation of all the teeth. All the maxillary and mandibular teeth were prepared quadrant wise for metal ceramic restoration. Individual quadrant restoration technique was chosen as it would provide predictable appointments, maintain VD, and enable quadrant anesthesia.

Thus, the wax-up not only helped in assessing the amount of tooth preparation and modifications necessary but also made the fabrication of provisional restoration less time consuming. The putty index made on the diagnostic wax-up was used in fabricating good provisional restorations with a VD raise of 3 mm [Figure 4].

They were checked intraorally for esthetics and occlusal prematurities. The final modifications of the provisionals can be made in the patient's oral cavity. Provisional cementation was done with freegenol for a period of 2 months.<sup>[10]</sup> The patient was recalled on a regular basis and was checked for her adaptability to the newly established VD. Esthetics and function improved tremendously with the help of provisional restorations.

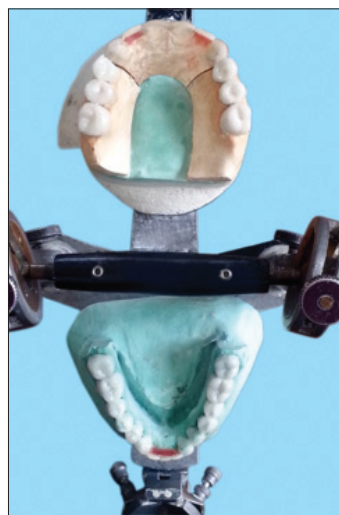


Figure 3: Diagnostic wax-up



Figure 4: Provisional restoration

Gingival retraction was carried out. Full-arch final impression was made with putty-wash impression technique using addition polyvinyl siloxane impression material. The obtained impressions were poured in Type IV die stone. A new Lucia jig was fabricated for this newly established VD. The master casts were articulated on the Whipmix articulator with a new facebow, centric, and lateral records.

The final treatment plan consisted of a full mouth rehabilitation with fixed metal ceramic restorations for the entire dentition using Twin-stage Hobo's technique. A semi-adjustable Whipmix articulator (Arcon) articulator was chosen; the plastic guide table of which was replaced with the adjustable guide table of Hanau H2 articulator (as the final prosthesis was planned to be fabricated on an Arcon articulator). Hobo's technique comprises of two conditions with the following articulator adjustment values [Table 1].<sup>[11]</sup>

#### Condition 1

- Reproduces occlusal morphology of the posterior teeth without the anterior segment
- Reproduces a cusp angle coinciding with the standard value of effective cusp angle. Condylar guidance and incisal guidance are parallel (25° each). Cuspal angle =  $[CG+IG]/2$ . Thus, the cuspal angle that is reproduced is also 25° which is coincident with the condylar and IGs. Such a cuspal angle will produce balanced occlusion.

#### Condition 2

- Reproduces anterior tooth morphology with the anterior segment in place
- Establishes an anterior guidance which produces a standard amount of posterior disocclusion.

This is the principle of Hobo's technique.

Wax patterns were fabricated, and metal try-in of the copings was completed. The final prosthesis that was made included a full-arch fixed partial denture in the maxillary and mandibular arches which were all designed as single crowns except for maxillary anteriors which were fabricated as two 3-unit bridges. In the mandibular arch, anteriors were replaced with a 6-unit bridge. The crowns on 36, 37, 46, and 47 were splinted resulting in two 2-unit bridges on either of the quadrants to avoid supraeruption of 37 and 47. Hence, the need to replace the opposing antagonist (17, 27) with a cantilever was proved unnecessary.

Metal crowns were tried in for fit, marginal adaptation, proximal contacts, and stability. The restorations were provisionally cemented for a period of 2 weeks. With the absence of any significant pathologic sign and symptom, the final cementation of the metal ceramic crowns was done with glass ionomer cement Type I luting cement [Figure 5a-c]. The occlusal scheme chosen for the present case was canine guided/mutually protected occlusion. The patient was advised regarding home care measures and the importance of oral hygiene maintenance. She was also instructed to report for a regular follow-up twice a year.

#### Treatment outcome

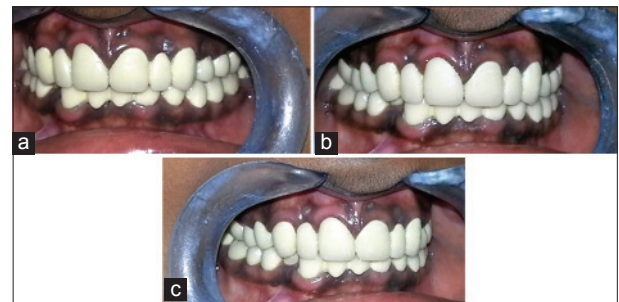
The patient is performing well with the prosthesis for the past 6 months and is extremely happy with the treatment outcome. The patient reported that her facial appearance, esthetics, masticatory efficiency, self-esteem, and self-confidence have tremendously improved as a result of the treatment [Figure 6].

#### Discussion

The case report presented in this scientific paper is unique as it falls under the rare category of familial, non-syndromic oligodontia. This is in accordance with the case report presented by Bural *et al.*<sup>[12]</sup> where a 17-year-old female patient presented with 11 missing permanent teeth, decreased lower facial

**Table 1:** Articulator adjustment values for the twin stage Hobo technique

Condition	Condylar path		Anterior guidance table	
	Sagittal condylar path inclination	Bennett angle	Sagittal inclination	Lateral guidance angle
Condition 1	25	15	25	10
Condition 2	40	15	45	20



**Figure 5:** (a) Final restoration (right side view), (b) final restoration (frontal view), (c) final restoration (left side view)



**Figure 6:** Post-operative photograph

height, flat profile, and deep mentolabial sulcus. Panoramic radiograph of the present case revealed missing maxillary right and left lateral incisors and second molars, retained deciduous mandibular incisors (with severe attrition of incisal aspect), and a supernumerary tooth in relation to the mandibular right canine and first premolar. Lateral cephalogram revealed decrease in the lower facial height.

Akkaya *et al.*<sup>[13]</sup> in their case report of a 16-year-old patient have reported oligodontia of six permanent teeth. A similar case has been reported by Chung *et al.*<sup>[14]</sup> where the OPG confirmed congenitally missing permanent teeth with retained mandibular incisors.

Oligodontia patient should be under proper diagnosis and treatment planning, execution, and coordination of the treatment procedure (with an interdisciplinary approach) with a recall maintenance phase. Patient's age plays a significant role in choosing and planning the treatment. Other factors include the number of missing teeth, presence of retained deciduous teeth, and collapse in the lower facial height.

The features of the present case were suggestive of Type I oligodontia with an intact dental arch with ample alveolar bone, and few areas localized bone deficiency. Spear clearly concluded that patients can function at many acceptable VDs, provided the temporomandibular joint (TMJ) complex is healthy. He stated that VD is a highly adaptable position, and there is no single correct VD.

The prime objective of Hobo's technique is to achieve posterior disocclusion during mandibular protrusion. Posterior disocclusion occurs when either of the conditions prevails:

1. When the condylar and incisal paths are parallel; cusp angle of the posterior teeth is shallower than the condylar path – It results in posterior disocclusion
2. When the cusp angle is parallel to the condylar path, but the incisal path is steeper than the condylar path – It results in posterior disocclusion.

Hence, in Condition 1, the maxillary anterior segment was removed as it would act as an interference in achieving bilateral balanced occlusion of the posterior teeth. Molar disocclusion is determined by cusp shape factor and programming the articulator to Condition 1 produces a standard effective cusp angle of 25°. The final occlusal wax-up of all the posterior teeth was done to obtain a balanced occlusion.<sup>[15]</sup>

In Condition 2, the maxillary anterior segment was reassembled, and the articulator was programmed to the values mentioned in Table 1. Anterior sagittal guidance for Condition 2 was 45°, but the Hanau H<sub>2</sub> series articulators have maximum anterior sagittal guidance value of about 40° only. Hence, to compensate for the 5°, sagittal CG value of Condition 2 was increased to 5°, i.e. from 40° to 45°. By doing so, the condylar and incisal paths were made parallel (i.e., 45° each), and the cusp angle of posterior teeth (25°) was made shallower than the condylar path resulting in posterior disocclusion. The anterior teeth were waxed up to produce canine-guided occlusion to reduce lateral stress on the posterior teeth.

Thus, the rationale behind choosing Hobo's technique is:

- It was a simplified technique
- Centric relation contact position and intercuspal position were coincident
- Eccentric records were not required for articulator programming
- All the values were preset.

Management of oligodontia patients with dental implant is difficult as the congenital absence of teeth would result in inadequate bone width and height affecting the implant placement. Hence, bone augmentation and dental implant placement in the present case were precluded as it would take a long time for graft maturation and osseointegration to occur. Thus, the complete oral rehabilitation of the present case was performed using fixed restorations.

The three prime requirements of full mouth rehabilitation are a healthy TMJ, harmonious anterior guidance, and a non-interfering posterior occlusion. Hence, care should be taken to prevent disharmony in any of these interrelated factors as they would ultimately affect the stomatognathic system.

## Conclusion

Oligodontia is a frequent clinical finding in many syndromes, but in this case, it was not associated with any syndrome which made it a rare case report. Thus, current case report clearly depicts that a prompt and precise diagnosis; a holistic treatment planning with excellent time management and extraordinary coordination is necessary for a successful treatment outcome. The overall esthetic and functional transformation of the patient after the complete mouth rehabilitation was astounding.

## References

1. Biradar VK, Biradar SV. Non-syndromic oligodontia: Report of two cases and literature review. *IJOMP* 2012;3:48-51.
2. Schalk-van der Weide Y, Beemer FA, Faber JA, Bosman F. Symptomatology of patients with oligodontia. *J Oral Rehabil* 1994;21:247-61.
3. Mallayya CH. Non-syndromic oligodontia: A rare case report. *AOSR* 2012;2:103-7.
4. Hobkirk JA, Gill DS, Jones SP, Hemmings KW, Bassi GS, O'Donnell AL, *et al.* Hypodontia: A Team Approach to Management. 1<sup>st</sup> ed. UK: Wiley-Blackwell; 2011. p. 1-40.
5. Prabhuji ML, Ahmed SK, Raghunatha K, Vasudevan V, Murali R, Devaraju D. A rare case of oligodontia. *J Indian Acad Oral Med Radiol* 2012;24:165-7.
6. Hosur M, Puranik RS, Vanaki SS. Oligodontia: A case report and review of literature. *World J Dent* 2011;2:259-62.
7. Galluccio G, Castellano M, La Monaca C. Genetic basis of non-syndromic anomalies of human tooth number. *Arch Oral Biol* 2012;57:918-30.
8. Dylina TJ. A common-sense approach to splint therapy. *J Prosthet Dent* 2001;86:539-45.
9. Carlsson GE, Ingervall B, Kocak G. Effect of increasing vertical dimension on the masticatory system in subjects with natural

- teeth. *J Prosthet Dent* 1979;41:284-9.
10. Song MY, Park JM, Park EJ. Full mouth rehabilitation of the patient with severely worn dentition: A case report. *J Adv Prosthodont* 2010;2:106-10.
  11. Hobo S, Takayama H. *Oral Rehabilitation: Clinical Determination of Occlusion*. Chicago: Quintessence Publishing Co.; 1997.
  12. Bural C, Oztas E, Ozturk S, Bayraktar G. Multidisciplinary treatment of non-syndromic oligodontia. *Eur J Dent* 2012;6:218-26.
  13. Akkaya N, Kiremitci A, Kansu O. Treatment of a patient with oligodontia: A case report. *J Contemp Dent Pract* 2008;3:121-7.
  14. Chung DW, Vang MS, Park SW, Lim HP, Yang HS. Oral rehabilitation for a patient with oligodontia and maxillary hypoplasia. *J Adv Prosthodont* 2009;1:6-9.
  15. Lee RL, Gregory GG. Gaining vertical dimension for the deep bite restorative patient. *Dent Clin North Am* 1971;15:743-63.

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