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Digital Rehabilitation of Non-Syndromic Oligodont in a Pediatric Patient: A Case Report

[1]Arya Krishnan. D, [2*]Sunantha Selvaraj, [3]G. Rajkumar, [4]R. Ramesh

[1]Postgraduate Student, Dept of Prosthodontics And Crown & Bridge, Vinayaka Mission's Sankarachariyar Dental College, Vinayaka Mission's Research Foundation-Du Salem,Tamilnadu, India. Orcid Id: 0009-0005-1701-2133 Krishnandarya20@Gmail.Com

[2]Professor, Dept of Postgraduate Student, Dept of Prosthodontics And Crown & Bridge, Vinayaka Mission's Sankarachariyar Dental College, Vinayaka Mission's Research Foundation-Du Salem,Tamilnadu, India. drsunujai@yahoo.co.in

[3]Professor, Dept of Postgraduate Student, Dept of Prosthodontics And Crown & Bridge, Vinayaka Mission's Sankarachariyar Dental College, Vinayaka Mission's Research Foundation-Du Salem,Tamilnadu, India. ORCID ID:0000-0002-1670-1106 drrajkumar@vmsdc.edu.in

[4]Professor & Head Dept of Postgraduate Student, Dept of Prosthodontics And Crown & Bridge, Vinayaka Mission's Sankarachariyar Dental College, Vinayaka Mission's Research Foundation-Du Salem,Tamilnadu, India. ORCID iD: 0000-0003-4926-5053, drramesh@vmsdc.edu.in

Keywords

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Abstract

Oligodontia is a rare developmental anomaly characterized by the congenital absence of six or more permanent teeth, resulting in significant functional, aesthetic, and psychosocial challenges. Management in growing patients is complex because definitive implant therapy should be deferred until completion of craniofacial growth. This case report describes the digital interim prosthodontic rehabilitation of a 12-year-old female with non-syndromic oligodontia. Clinical and radiographic examination confirmed the congenital absence of eighteen permanent teeth bilaterally. Diagnostic casts were digitized using a laboratory scanner, and restorations were virtually designed using Exocad software. CAD/CAM-fabricated three-dimensional printed polymethyl methacrylate (PMMA) provisional crowns were produced and cemented to restore function and aesthetics. The restorations demonstrated satisfactory fit, occlusal stability, and aesthetics, with marked improvement in mastication, speech, smile appearance, and patient confidence. The digital workflow enabled accurate treatment planning, reduced chairside adjustments, and preserved future restorative options. This case highlights the effectiveness of CAD/CAM-assisted three-dimensional printed PMMA provisional crowns as a conservative and predictable interim treatment for adolescents with non-syndromic oligodontia until definitive rehabilitation can be undertaken after skeletal maturity.

***Corresponding Author Details:** Sunantha Selvaraj, Professor, Dept of Postgraduate Student, Dept of Prosthodontics And Crown & Bridge, Vinayaka Mission's Sankarachariyar Dental College, Vinayaka Mission's Research Foundation-Du Salem,Tamilnadu, India
Email id: drsunujai@yahoo.co.in

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Introduction

Congenital tooth agenesis is a common developmental anomaly resulting from disturbances during odontogenesis.[1] It is classified as hypodontia when fewer than six permanent teeth are missing and oligodontia when six or more permanent teeth, excluding third molars, are congenitally absent.[2] Oligodontia is rare, with a prevalence of 0.08–0.3% in the permanent dentition.[3]

Its etiology is multifactorial, involving genetic mutations (**MSX1, PAX9, AXIN2, EDA, WNT10A** and **LRP6**) and environmental factors such as trauma, infection, irradiation, and medications, although many cases remain idiopathic and non-syndromic.[4] Clinically, oligodontia compromises mastication, speech, aesthetics, occlusion, and alveolar bone development, adversely affecting quality of life, particularly during adolescence.

Management requires a multidisciplinary approach with treatment tailored according to age, skeletal maturity, occlusion, and long-term rehabilitation goals.[5,6] Since implant placement is contraindicated during active craniofacial growth, interim prosthodontic rehabilitation is essential.[7] Recent advances in CAD/CAM and 3D printing have improved the precision, aesthetics, and reproducibility of provisional restorations while allowing easy modification during growth.[7] Three-dimensional printed PMMA restorations also demonstrate favorable mechanical properties and reduced chairside adjustments compared with conventional techniques.[8,9]

This case report describes the digital interim prosthodontic rehabilitation of a 12-year-old female with non-syndromic oligodontia using CAD/CAM-designed, 3D-printed PMMA provisional restorations.

Case Report

A 12-year-old female presented with multiple missing and partially erupted permanent teeth, difficulty in mastication, and dissatisfaction with her smile. Delayed eruption of permanent teeth had been noticed since the age of 7 years, and several permanent teeth had reportedly never erupted. The age at diagnosis was 12 years, when clinical and panoramic examinations documented congenital absence of six permanent teeth.

Medical history: The child was examined by a paediatrician and growth assessment was done. The results showed that the child was apparently normal without any abnormal underlying systemic conditions. The available medical history was significant for adenotonsillectomy approximately 1.5 years before presentation. The available record reports no consanguinity marriage, or relevant family history of tooth agenesis. No other medical, developmental, dental, or medication history.

Family history: There was no reported family history of tooth agenesis. No consanguinity was reported.

Genetic/specialist assessment: The diagnosis of non-syndromic oligodontia was based on the clinical and radiographic findings and the absence of reported systemic, craniofacial, and ectodermal abnormalities. Genetic testing was not performed; pediatric evaluation clinical and family history supported the non-syndromic classification.

Clinical examination

Extraoral examination revealed no clinically evident craniofacial or ectodermal abnormalities. Intraoral examination showed good oral hygiene and healthy periodontal tissues. The teeth presents according to FDI are 11 , 52 , 53 ,55 , 16 , 21, 62 , 63, 65 , 26, 31, 73,74, 75, 36, 37, 41, 82, 83, 84, 85, 46 and 47. The teeth number 12,13, 14, 15,17 , 22,23, 24, 25, 27, 32,33,34 , 35, 42, 43, 44 , 45 were clinically absent as shown in .Figure 1

Figure 1. Pre-treatment intraoral photographs demonstrating clinically missing teeth , with the remaining permanent teeth in varying stages of eruption.

Most remaining permanent teeth were absent .Only the maxillary and mandibular first molars provided posterior occlusal support, resulting in reduced masticatory efficiency, mild speech impairment, and compromised smile aesthetics. No periodontal pathology was described in the supplied clinical record. The developmental finding of delayed eruption was noted from childhood.

Diagnostic Assessment

The diagnosis of oligodontia was established by combining the clinical finding of eighteen clinically absent permanent teeth with panoramic radiographic confirmation of congenital absence. The six absent teeth were 12,13, 14, 15,17 , 22,23, 24, 25, 27, 32,33,34 , 35, 42, 43, 44 , 45. The panoramic examination showed no impacted or supernumerary teeth and no other developmental abnormalities. The remaining teeth demonstrated normal root morphology with open apex in molars and adequate alveolar bone support. The absence of six or more permanent teeth, excluding third molars, fulfilled the diagnostic definition of oligodontia.[2]

The designation 'non-syndromic' was based on the absence of reported ectodermal abnormalities, craniofacial abnormalities, systemic disease, and relevant family history. Genetic testing was not documented in the supplied case record; therefore, the term non-syndromic should be understood as a clinical diagnosis rather than a genetically confirmed diagnosis.

Radiographic Findings

Panoramic radiography shows the mixed dentition and it confirmed congenital absence of 12,13, 14, 15,17 , 22,23, 24, 25, 27, 32,33,34 , 35, 42, 43, 44 and 45 . No impacted or supernumerary teeth or other radiographically evident developmental abnormalities were identified. The remaining permanent teeth showed normal root morphology with open apex and adequate alveolar bone support as shown in. Figure 2 Most remaining permanent teeth were in various stages of eruption, consistent with the patient's ongoing dental development.

Figure 2. Panoramic radiograph (pantograph report) demonstrating congenital absent teeth with remaining permanent dentition whose root are showing open apex.

Therapeutic Intervention

Because craniofacial growth was incomplete, definitive implant-supported rehabilitation was deferred. Following discussion with the patient and her parents, interim rehabilitation using CAD/CAM-fabricated 3D-printed PMMA provisional restorations was selected. Primary alginate impressions were poured in Type III dental stone and the resulting casts were digitized using a Shining 3D laboratory scanner. Virtual treatment planning and digital wax-up were completed using Exocad Dental CAD while maintaining the existing occlusion and accommodating the partially erupted dentition show as in ..Figure 3 The definitive design was exported as an STL file. The restorations were fabricated using Prestocraft PMMA resin in a Shining 3D AccuFab-L4K 3D printer. A 0.5-mm printing thickness and a 45° build orientation were used

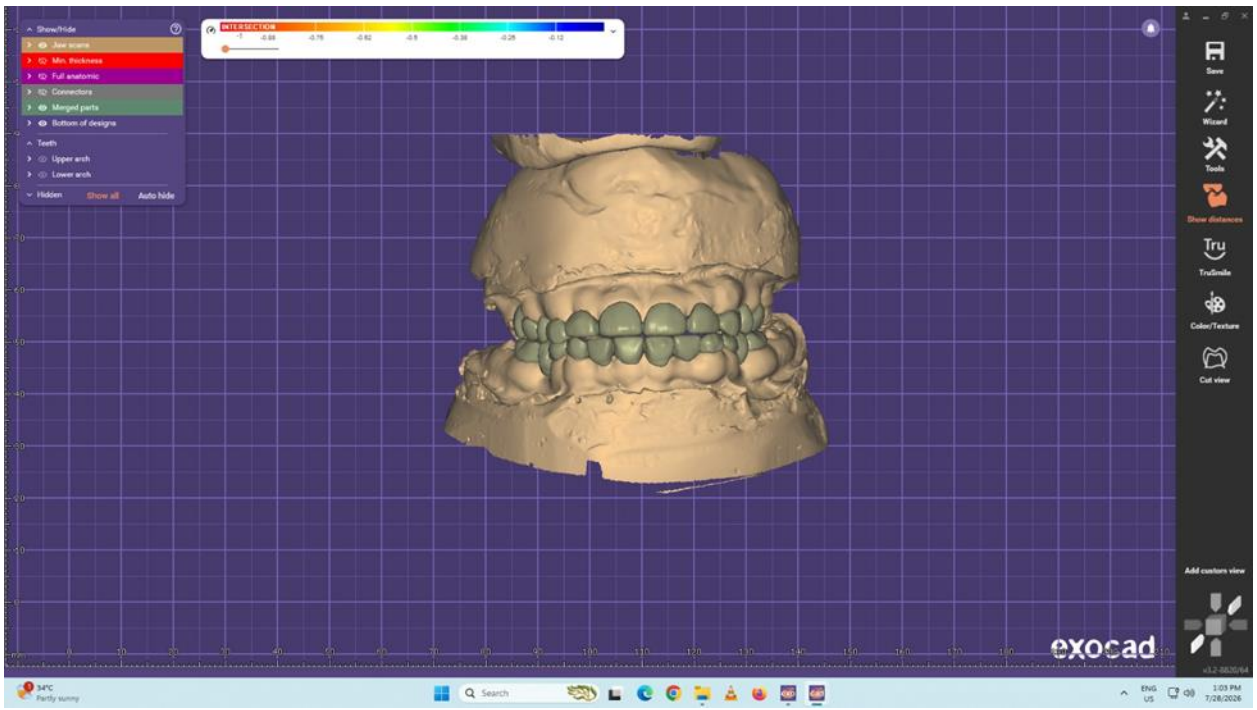

Figure 3. Digital treatment planning and mock-up performed using Exocad Dental CAD 3.2 Software.

The digital design was exported as an STL file and fabricated using a Shining 3D Acco Fab-L 4K printer with

printable Presto craft PMMA resin interim prosthesis is fabricated.

Post-printing and finishing procedure: Following fabrication, the 3D-printed PMMA restorations underwent a standardized post-processing protocol. Initially, the printed restorations were cleaned manually using a brush with **isopropyl alcohol (IPA)** to remove residual uncured resin. The restorations were then subjected to **ultrasonic cleaning for 180 seconds using isopropyl alcohol**. Following cleaning, the restorations were **post-cured for 10 minutes in a Shining 3D Fab Cure curing unit**. After completion of post-processing, the restorations were inspected for surface integrity, dimensional accuracy, adaptation, and overall finish. No chairside adjustment was required before insertion.

The restorations were clinically assessed for fit, occlusal relationship, phonetics, and aesthetics as shown in. Figure 4 Following satisfactory clinical evaluation, the restorations were cemented using GC glass ionomer luting cement. The preoperative and postoperative intraoral views are presented in Figure 5, while the corresponding extraoral views are presented in Figure 6. The prosthetic design was intended as an interim restoration rather than a definitive replacement, with the design adapted to the existing partially erupted dentition and current occlusal relationships

Figure 4. Intraoral clinical photographs demonstrating fit checking of the interim prosthesis. (A) Right lateral view, (B) frontal view, and (C) left lateral view.

Figure 5. Intraoral comparison: (A) pre-treatment view demonstrating missing teeth and reduced posterior occlusal support; (B) post-treatment view following insertion of the CAD/CAM-fabricated PMMA interim restorations.

Figure 6. Extraoral comparison: (A) pre-treatment facial/smile view demonstrating the aesthetic effect of multiple missing teeth; (B) post-treatment view following interim prosthodontic rehabilitation with improved lip support.

Prosthesis Design and Retention

The interim restorations were CAD/CAM-designed PMMA provisional restorations intended to replace the clinically absent teeth while preserving the patient's existing occlusal relationships. Retention was achieved through the available supporting teeth and cementation with glass ionomer luting cement**.**

Treatment Rationale and Growth Considerations

An interim restoration was selected because the patient had incomplete craniofacial growth and therefore was not considered ready for definitive implant-supported or fixed rehabilitation. Conventional interim options may include removable prostheses or conventionally fabricated provisional restorations; however, the digital workflow was selected in this case because it allowed virtual control of tooth form and occlusion, reproducible fabrication, less chair side time and preservation of the digital design for future modification or reproduction.

The restorations were designed to accommodate the existing partially erupted dentition rather than to serve as definitive prostheses. This approach allows future reassessment as eruption and craniofacial growth progress. The stored digital design may facilitate subsequent modification or replacement; however, continued clinical monitoring is necessary because growth, eruption, occlusal change, and alteration of the supporting teeth may require adjustment or replacement.so the follow up of the patient is necessary till growth spurts are achieved.

Patient Perspective

The patient and her parents expressed satisfaction with the treatment, particularly with the improvement in appearance, speech and function. At the 1-month review, the patient reported feeling more confident when speaking and smiling at school ,improves the lip support , mastication and accepted the interim restorations well.

Follow-up and Outcomes

The patient was reviewed at 1 month after insertion. At this visit, the interim restorations remained in place with clinically satisfactory fit and function. No fracture, debonding, soft-tissue complication, discomfort, relining, occlusal adjustment, or replacement was reported or required. The patient and her parents expressed satisfaction with the treatment. The patient reported increased confidence in speaking and smiling at school. Continued periodic review for every 3 months was

advised to monitor eruption of the remaining permanent teeth, occlusal development, prosthesis integrity, and the need for future modification as craniofacial and dental growth progresses.[10]

Table 1. Clinical timeline of the patient's diagnosis, treatment planning, digital workflow, prosthesis insertion, and follow-up

Time point	Major event
By the age of 7 years	Parents noticed the delayed eruption of permanent teeth and several teeth noted not to have erupted.
12 years	Presentation with missing/partially erupted permanent teeth, masticatory difficulty, and dissatisfaction with smile.
Initial assessment	Clinical examination, family/medical history, and panoramic radiography; eighteen congenital tooth absences confirmed.
Treatment planning	Interim digital prosthodontic rehabilitation discussed with patient and parents. Implant-supported definitive rehabilitation deferred because craniofacial growth was incomplete and it can be done when growth spurts stops.
Digital workflow	Alginate impressions → Type III dental stone casts → laboratory scanning → virtual design/digital wax-up in Exocad Dental CAD.
Fabrication	STL export and fabrication using Shining 3D AccoFab-L 4K printer with printable PMMA resin; post-processing and finishing performed before clinical evaluation.
Insertion	Restorations evaluated for fit, occlusion, phonetics, and aesthetics and cemented with glass ionomer luting cement.
Post-insertion	Patient and parents expressed high satisfaction. Follow-up was planned to monitor eruption and growth.
Follow-up	For 1month was done patient and parents were satisfied with prosthesis

Adverse Events and Intervention Modifications

No adverse events were observed during the reported 1-month follow-up. There was no fracture, debonding, soft-tissue problem, or reported discomfort. No relining, occlusal modification, chairside adjustment, or replacement was required.

Discussion

The present case illustrates the role of interim prosthodontic rehabilitation in a growing patient with oligodontia. In growing individuals, definitive implant-supported or fixed treatment is generally postponed because implants do not adapt to subsequent skeletal changes and may become infraoccluded. [5,11] Conventional interim approaches remain clinically useful because they can provide immediate replacement of missing teeth and can be modified as the patient develops.

In the present case, a digital workflow was used instead of a conventional laboratory-only workflow. Laboratory scanning and Exocad-based virtual design provided a reproducible digital record of the intended tooth form and occlusion, while additive manufacturing was used to fabricate PMMA provisional restorations. Digital storage of the STL design may facilitate later reproduction or modification, which is particularly relevant in a growing patient.[7] Nevertheless, the advantages observed in this single case should not be interpreted as evidence that digital rehabilitation is universally superior to conventional interim prosthodontic treatment.[8,9]

The clinically distinctive aspect of this case is the application of a documented laboratory-scanning/CAD/3D-printing workflow to provide a conservative interim rehabilitation while preserving the option for future modification as the patient's dentition and craniofacial structures mature.[11,12] Compared with conventional interim rehabilitation, the digital workflow offers the advantages of **retrievable three-dimensional records, reproducible prosthesis design, virtual treatment planning, and easier modification or reproduction as dental eruption and craniofacial**

growth progress. In patients with oligodontia and a partially erupted dentition, these stored digital records also permit comparison of sequential intraoral conditions during follow-up, facilitating monitoring of growth and eruption and supporting future prosthetic modification and definitive treatment planning.

The reported outcome was primarily clinical and subjective. The patient and parents expressed high satisfaction, and the restoration was assessed for fit, occlusion, phonetics, and aesthetics. However, objective functional and psychosocial outcomes were not measured. Therefore, the results should be interpreted as a case-specific clinical observation.

Limitations

This report has several limitations. First, it represents a single case and therefore cannot establish comparative effectiveness or superiority over conventional interim prosthodontic approaches.It does not provide a documented long-term follow-up duration or detailed serial clinical findings. There was no objective measurements of masticatory performance, speech, oral-health-related quality of life, or psychological outcomes were performed. The patient remains in active dental and craniofacial development, so eruption and growth may alter the occlusion, supporting teeth, and prosthesis fit over time. Future prosthetic modification, adjustment, or replacement may therefore be necessary.

Conclusion

In this 12-year-old patient with clinically and radiographically confirmed non-syndromic oligodontia, CAD/CAM-designed and 3D-printed PMMA provisional restorations provided a conservative interim rehabilitation during active growth. The approach allowed digital planning and fabrication while maintaining the option for future modification. The documented clinical assessment and patient/parent satisfaction support its usefulness in this individual case; however, longer-term follow-up and objective outcome assessment are required before broader conclusions regarding clinical effectiveness can be made.

Patient Consent

Written informed consent for treatment and publication of clinical details and photographs was obtained, as the patient was a minor, consent was obtained from both the patient and her parents. As this was a clinical case report and not original research, institutional ethical approval was not obtained.

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