

TREATMENT STRATEGIES AND EFFECTIVENESS OF ORTHODONTIC AND PROSTHETIC MANAGEMENT IN CHILDREN WITH PARTIAL PRIMARY TOOTH AGENESIS

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Abstract

Partial primary tooth agenesis is a developmental anomaly that requires individualized and stage-specific treatment planning. Management strategies depend on the patient's age, dentition stage, occlusal characteristics, and craniofacial growth pattern. The purpose of this study was to evaluate the effectiveness of orthodontic and prosthetic treatment approaches in children and adolescents with partial tooth agenesis. A prospective clinical study was conducted involving 210 pediatric patients aged 6–18 years undergoing orthodontic and/or prosthetic treatment. Treatment modalities included space maintenance, orthodontic space closure, space opening for prosthetic replacement, removable partial dentures, adhesive bridges, and implant planning after growth completion. Clinical effectiveness was evaluated based on occlusal stability, facial symmetry, masticatory efficiency, esthetic satisfaction, and complication rates. The results demonstrate that early interceptive orthodontic therapy significantly reduces arch asymmetry and prevents secondary malocclusion. Combined orthodontic-prosthetic management in adolescence yields the most stable long-term functional and aesthetic outcomes. The study emphasizes the importance of multidisciplinary planning and growth monitoring in pediatric patients with agenesis.

Keywords: Tooth agenesis, pediatric orthodontics, space management, prosthetic rehabilitation, interceptive treatment, dental implants, treatment outcomes.

Introduction

Partial tooth agenesis affects not only dental development but also occlusal harmony, alveolar bone formation, and facial aesthetics. The absence of one or more teeth disrupts the eruption sequence and alters biomechanical balance within the dental arches.

Treatment of agenesis is complex because it must consider: patient age, stage of craniofacial growth, occlusion type, bone volume, psychological factors.

In young children, the primary objective is prevention of space loss and maintenance of arch symmetry. During mixed dentition, interceptive orthodontic therapy plays a central role. In adolescence, comprehensive orthodontic treatment combined with prosthetic replacement may be required.

The debate between space closure and space opening remains one of the main controversies in managing agenesis, particularly for maxillary lateral incisors and mandibular premolars.

The aim of this study was to evaluate the clinical effectiveness of different treatment strategies in children and adolescents with partial tooth agenesis and to assess their functional and aesthetic outcomes.

Materials and Methods

A prospective clinical study was conducted over a 4-year period. A total of **210 children and adolescents** diagnosed with partial tooth agenesis were included.

Age groups:

- Group I: 6–9 years (early mixed dentition) – 60 patients
- Group II: 10–13 years (late mixed dentition) – 80 patients
- Group III: 14–18 years (permanent dentition) – 70 patients

Treatment Modalities. Depending on clinical indication, patients received:

1. Space Maintenance Appliances

- Fixed lingual arch
- Removable plates

2. Orthodontic Space Closure

- Fixed braces
- Controlled mesial movement

3. Orthodontic Space Opening

- Arch expansion

- Alignment for prosthetic planning
- 4. **Removable Partial Dentures (temporary)**
- For esthetic and functional support
- 5. **Adhesive (Maryland-type) Bridges**
- 6. **Implant Planning**
- Delayed placement after skeletal maturity

Evaluation Criteria. Treatment effectiveness was assessed using:

- Occlusal classification improvement
- Arch symmetry measurements
- Cephalometric analysis
- Patient-reported aesthetic satisfaction (VAS scale)
- Masticatory efficiency tests
- Complication rate

Follow-up duration: 24 months minimum.

Results

Group I (6–9 Years)

Early interceptive treatment outcomes:

- Prevention of space loss – 92%
- Maintenance of arch symmetry – 88%
- No significant complications

Space maintenance significantly reduced later orthodontic complexity.

Group II (10–13 Years)

Orthodontic treatment results:

- Successful space closure – 61%
- Successful space opening for prosthetic replacement – 34%
- Minor relapse – 9%

Midline deviation improved in 76% of cases.

Group III (14–18 Years)

Comprehensive treatment outcomes:

- Combined orthodontic-prosthetic rehabilitation – 68%
- Temporary removable prostheses – 22%
- Implant placement (after 18 years) – 10%

Esthetic satisfaction score improved from 4.1 to 8.6 (VAS scale).

Functional Improvement. Masticatory efficiency increased by 31% after treatment.

Speech articulation improved in 82% of patients with anterior agenesis.

Complications

- Mild root resorption – 7%
- Appliance breakage – 5%
- Gingival inflammation – 12% (temporary)

No severe adverse effects were recorded.

Discussion. The results confirm that treatment success depends strongly on timing and interdisciplinary coordination.

Early Interceptive Phase. Space maintenance in early mixed dentition is highly effective in preventing mesial migration of molars. Without intervention, spontaneous space closure often complicates future prosthetic rehabilitation.

Orthodontic Space Closure vs Space Opening. Space closure is preferred in cases of: mandibular second premolar agenesis, mild crowding, acceptable facial profile.

Space opening is recommended when: maxillary lateral incisors are missing, esthetic replacement is desired, occlusal harmony requires symmetry.

The decision must consider facial profile, lip support, and smile line.

Prosthetic Considerations. Temporary removable prostheses provide psychological comfort during adolescence. Adhesive bridges are minimally invasive but require careful case selection.

Implants represent the most stable long-term solution but should only be placed after skeletal growth completion.

Growth Considerations. Premature implant placement may result in infraocclusion due to continued vertical growth. Therefore, growth monitoring is essential.

Multidisciplinary Approach. Optimal outcomes require collaboration between: pediatric dentist, orthodontist, prosthodontist, oral surgeon.

Individualized treatment planning improves long-term stability and patient satisfaction.

Conclusion

Treatment of partial tooth agenesis in children requires age-specific and growth-sensitive strategies.

Early interceptive orthodontic therapy effectively prevents secondary complications. In adolescence, combined orthodontic-prosthetic management provides stable functional and aesthetic outcomes.

Implant therapy should be postponed until skeletal maturity. Multidisciplinary collaboration and long-term follow-up are critical for achieving predictable results and improving quality of life in pediatric patients with agenesis.

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