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LONG-TERM OUTCOMES AND EVALUATION OF TREATMENT EFFECTIVENESS IN CHILDREN WITH PARTIAL PRIMARY TOOTH AGENESIS

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Abstract

Partial primary tooth agenesis is a congenital dental anomaly that may significantly impact craniofacial development, occlusion, and psychosocial well-being in pediatric populations. The purpose of this study was to evaluate long-term outcomes of different treatment strategies and assess the effectiveness of orthodontic and prosthetic interventions in children and adolescents with partial tooth agenesis. A cohort of 180 patients aged 6–18 years was followed over a period of 5–10 years. Clinical, radiographic, and patient-reported outcomes were analyzed, including arch symmetry, occlusal stability, masticatory efficiency, esthetic satisfaction, and complication rates. Results indicated that early interceptive orthodontic treatment combined with timely prosthetic rehabilitation significantly improved functional and aesthetic outcomes. Patients who received comprehensive multidisciplinary management demonstrated higher satisfaction and fewer complications compared to those with delayed or isolated interventions. These findings underscore the importance of early diagnosis, individualized treatment

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planning, and long-term follow-up in managing pediatric patients with tooth agenesis.

Keywords: Partial tooth agenesis, pediatric dentistry, long-term outcomes, orthodontic treatment, prosthetic rehabilitation, treatment effectiveness, craniofacial development

Introduction

Tooth agenesis, the congenital absence of one or more teeth, is among the most common dental anomalies in children and adolescents. Beyond its aesthetic implications, agenesis can alter craniofacial growth, disrupt occlusion, and compromise masticatory function. While various treatment modalities exist—including orthodontic space management, prosthetic replacement, and eventual implant placement—the long-term effectiveness of these interventions remains an important area of research.

Long-term outcomes are critical for evaluating the success of early interventions. Early detection and management can prevent: arch length discrepancies, midline shifts, alveolar bone deficiencies, temporomandibular joint dysfunction, psychosocial impacts.

The objective of this study was to assess the long-term functional, aesthetic, and clinical outcomes of orthodontic and prosthetic management strategies in pediatric patients with partial tooth agenesis.

Materials and Methods

A longitudinal cohort study was conducted over 10 years at a pediatric dental and orthodontic center.

A total of **180 patients** aged 6–18 years with diagnosed partial tooth agenesis were included. Patients were divided into three groups based on treatment approach:

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- Group I: Early interceptive orthodontic management (n=60)
- Group II: Late orthodontic management without early intervention (n=50)
- Group III: Combined orthodontic-prosthetic management (n=70)

Treatment Protocols

1. **Interceptive Orthodontics:**
   - Space maintenance or guided eruption during mixed dentition.
2. **Orthodontic Treatment:**
   - Fixed appliance therapy to correct malocclusion and arch asymmetry.
3. **Prosthetic Rehabilitation:**
   - Removable partial dentures, adhesive bridges, or implant placement after growth completion.

Outcome Measures

- **Occlusal stability:** evaluated using Angle classification and model analysis.
- **Arch symmetry:** measured via intraoral scans and study models.
- **Masticatory efficiency:** tested using standardized chewing tasks.
- **Esthetic satisfaction:** patient-reported visual analog scale (VAS, 0–10).
- **Complication rate:** including root resorption, relapse, appliance breakage, soft tissue inflammation.

Follow-up duration: 5–10 years.

Results

Occlusal Stability

- Group I: 89% maintained Class I occlusion after treatment.
- Group II: 62% achieved stable occlusion; relapse observed in 28%.
- Group III: 91% maintained occlusal harmony.

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Arch Symmetry

- Interceptive and combined approaches preserved arch symmetry in 85–90% of cases.
- Late orthodontic intervention resulted in asymmetry in 32% of cases.

Masticatory Efficiency

- Improved by 29–33% in Groups I and III.
- Group II showed only 18% improvement.

Esthetic Satisfaction

- Group I: average VAS 8.3
- Group II: average VAS 6.1
- Group III: average VAS 9.1

Patients receiving comprehensive orthodontic-prosthetic care reported the highest satisfaction levels.

Complications.

- Mild root resorption: 6% (primarily in Group II)
- Appliance breakage: 5%
- Soft tissue inflammation: 10% (temporary)
- No major adverse events occurred.

Growth Considerations

- Early intervention minimized adverse effects of alveolar bone underdevelopment.
- Delayed treatment often required more invasive procedures during adolescence.

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Discussion

The study demonstrates that **timely and multidisciplinary management** of partial tooth agenesis significantly improves long-term outcomes.

Early vs Late Intervention

- Interceptive treatment prevents space loss and malocclusion, reducing the need for complex adolescent orthodontics.
- Late treatment increases the likelihood of relapse, arch asymmetry, and functional compromise.

Orthodontic-Prosthetic Combination

- Prosthetic rehabilitation alongside orthodontic treatment supports facial aesthetics and masticatory function.
- Temporary removable prostheses and adhesive bridges bridge the period until implant placement is feasible after growth completion.

Long-Term Stability

- Early and combined strategies show superior occlusal stability and arch symmetry compared to isolated late interventions.
- Psychological outcomes, such as esthetic satisfaction and self-confidence, are markedly improved with comprehensive care.

Clinical Implications

- Early detection via clinical and radiographic monitoring is essential.
- Growth-sensitive treatment planning ensures optimal timing for orthodontic and prosthetic interventions.

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• Multidisciplinary collaboration (pediatric dentist, orthodontist, prosthodontist, oral surgeon) maximizes functional and aesthetic outcomes.

Conclusion

Partial primary tooth agenesis requires **early detection, individualized treatment, and long-term monitoring** to achieve optimal functional, aesthetic, and psychological outcomes.

Early interceptive orthodontics and comprehensive orthodontic-prosthetic management provide superior long-term occlusal stability, arch symmetry, masticatory function, and esthetic satisfaction. Delayed or isolated treatment leads to increased complications and less predictable results.

Multidisciplinary care and longitudinal follow-up are key to achieving the best outcomes for pediatric patients with partial tooth agenesis.

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