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White Paper on Orthodontic Treatment in Early Mixed Dentition with Eruption Guidance Appliance: **Effects and benefits**



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Abstract

This paper reports on the outcomes of a study that investigated the effectiveness of orthodontic treatment in early mixed dentition with eruption guidance appliance (EGA) for various malocclusions. The results demonstrate that EGA treatment is an effective method for malocclusions with Class II or Class II tendency, excess overjet, deep bite, open bite, crowding, anterior crossbite, or buccal crossbite and for restoring normal occlusion. The treatment also effectively eliminated the need for further treatment.

Additionally, the study emphasizes the advantages of starting treatment during the active eruption of teeth. The role of parental cooperation and the cost benefits of this treatment approach is also addressed.

Introduction

This prospective, controlled cohort study studied the treatment effects of the eruption guidance appliance on children with various malocclusions after 3 years of treatment from 5 to 8 years of age. A group of untreated children acted as the control group and these children were offered treatment later.



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Study Overview

The study involved 167 children from Jalasjärvi and Kurikka, Finland, who received EGA treatment, and 104 children from Seinäjoki, Finland, who served as the control group. The participants met at least one of these specific inclusion criteria related to dental malocclusions such as distal step (≥ 1 mm), 2) Class II canine relationship (≥ 1 mm), 3) crowding, 4) overjet (≥ 3 mm) and lack of tooth-to-tooth contact between incisors, 5) overbite (≥ 3 mm) and lack of tooth-to-tooth contact between incisors, 6) anterior crossbite, and/or 7) buccal crossbite (scissorsbite).

Orthodontic intervention in the early mixed dentition: A prospective, controlled study on the effects of the eruption guidance appliance. Conducted by K. Keski-Nisula, R. Hernesniemi, M. Heiskanen, L. Keski-Nisula, J. Varrela. Publication: American Journal of Orthodontics and Dentofacial Orthopedics: 2008:133:2: 254-260. https://doi.org/10.1016/j.ajodo.2006.05.039

The study included a treatment group consisting of 167 children (85 boys, 82 girls) from Jalasjärvi and Kurikka, Finland, and a control group comprising 104 children (52 boys, 52 girls) from Seinäjoki, Finland.

Treatment Duration and Protocol

Treatment began during the early mixed dentition stage when the first deciduous incisor was exfoliated and continued until all permanent incisors and first molars had fully erupted. The average treatment duration was 3.3 years. The mean age was 5.1 years at the beginning of the treatment and 8.4 years at the end of the treatment.

During active treatment, 2–3 appliances were used, with a night-time wear protocol. Daytime wear was introduced for 1 hour if any difficulties were encountered until night-time wear became feasible.

Appointments were scheduled every 12 weeks during active treatment and every 6 months during retention. The last appliance was used as a retainer and was worn 2 nights a week until all permanent canines, premolars, and second molars fully erupted.

Positive Effects of EGA Treatment

Children who received EGA treatment experienced significant improvements in occlusion compared to the control group:

- Overjet (horizontal overlap of upper central incisors over lower central incisors) decreased by 1.2 mm.*
- Overbite (vertical overlap of upper and lower teeth) decreased by 1.1 mm.*
- Incisor crowding in both the upper and lower jaws was significantly reduced.*
- Class I prevalence increased from 41% to 90%.*
- Only 13% of the treated children showed one or more remaining occlusal deviations at the end of treatment compared to 88% of the untreated control children.

*Highly significant difference between treatment and control groups at the end of treatment.



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Effective treatment for dental Overbite: Results show a significant decrease in Overbite with the treatment group compared to the control group.

Successful Overjet reduction: The reduction of overjet has been successfully achieved through treatment, as evidenced by a significant decrease observed in the treatment group when compared to the untreated control group.

Overbite (mm)



Overjet (mm)



Untreated control group

Crowding						
	Treatment group		Control group			
	Start of active treatment (age: 5.1 years)	End of active treatment (age: 8.4 years)	Start of active treatment (age: 5.1 years)	End of active treatment (age: 8.4 years)		
Upper jaw	11%	2%	9%	32%		
Lower jaw	48%	1%	44%	47%		

The results indicate that orthodontic intervention with the eruption guidance appliance in the early mixed dentition is effective for treating malocclusions with Class II or Class II tendency, excess overjet, deep bite, open bite, crowding, anterior cross-bite, or buccal crossbite.

In the middle of the mixed dentition stage, there was little – if any – need for treatment in the treatment group compared to the control group, where the frequencies of malocclusions were more common. None of the children in the treatment group were considered to need further treatment.

Frequencies of malocclusions after treatment					
	Treatment group	Control group			
Overjet ≥ 5mm	0%	30%			
Overbite ≥ 5mm	1%	38%			
Open bite	1%	36%			
Palatal contact	0%	40%			
Crowding, maxilla	2%	32%			
Crowding, mandible	1%	47%			
Unilateral Class II	7%	17%			
Bilateral Class II	3%	35%			



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Dentofacial Changes

The evaluation of the skeletal and dentoalveolar changes resulted in the following findings, of which one was significant:

- The skeletal changes were largely restricted to the dentoalveolar region, so the occlusal correction was mainly achieved though changes in the dentoalveolar region of the mandible.
- The increase in mandibular length of +3.9 mm compared to the control group was significant.*
- The lower incisors became more protruded and more labially inclined in the treatment group.
- * Highly significant difference between treatment and control groups at the end of treatment

Mandibular length/Condylion-Gnathion



Treatment with EGA seems to significantly enhance mandibular growth. Many studies have indicated that the growth of the mandible can be influenced by functional appliances in the middle or late mixed dentition. These results indicate that an orthopedic effect on mandibular growth can be achieved much earlier, in early mixed dentition.

Dentofacial Changes after Orthodontic Intervention with Eruption Guidance in the Early Mixed Dentition. Keski-Nisula K; Keski-Nisula L; Salo H; Voipio K, Varrela J. Publication: Angle Orthod 2008;78:324–331 <u>https://doi.org/10.2319/012607-37.1</u>

Other Observations

The study highlights additional essential findings:

- The EGA effectively guides teeth with 3-dimensional control acting on the transversal, sagittal, and vertical relationships of both arches.
- Prefabricated EGAs are usually recommended for correcting mild to moderate malocclusions only, but if treatment is started in early mixed dentition, almost all cases can be considered mild or moderate and therefore suitable for treatment.
- The appliance seems to be effective in most patients when treatment is carried out during the active eruption of the teeth. The effectiveness is not limited to this period, but clinical experience indicates that treatment tends to become more complicated if started later.
- Parental cooperation is essential for successful treatment, particularly at the beginning of the treatment.
- Orthodontic treatment with EGA can be considered very cost-effective as the total chair-side time required for completing the treatment is relatively short and routine check-ups, every 12 weeks, normally took no more than 5–10 minutes each.

The treatment group exhibits a notable increase in mandibular length during treatment, indicating a significant growth rate of 1.2 mm per year more than in the control group, which can be considered remarkable.



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Follow-Up Study

A follow-up study examined dentoskeletal effects and the long-term stability of Class II treatment with EGA during early mixed dentition. 65 Class II patients treated with EGA in early mixed dentition were compared with 58 children with untreated Class II malocclusions.

The result of the analysis of stability shows that the treatment results remain largely stable in the early permanent dentition. Furthermore, the frequency of Class II decreased from 14% to 1%.

Class II treatment in early mixed dentition with eruption guidance appliance: effects and long-term stability. Conducted by K. Keski-Nisula, L. Keski-Nisula, J. Varrela: Publication: European Journal of Orthodontics: 2020:42:2:151-156. <u>https://doi.org/10.1093/ejo/cjz092</u>

Study group:

Treatment group: 65 Class II children (38 girls, 27 boys) Control group: 58 control children (26 girls, 32 boys)

Mean age at T1: Treatment group: 5.4 years Control group 5.1 years

Mean age at T2:

Treatment group 8.5 years Control group 8.4 years

Mean age at T3: 16.7 years

Mean retention time: 4.9 years (range 1.3–7.1 years Mean out-of-retention time: 3.1 years





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The sagittal molar relationship was corrected from Class II to Class I in 86% of the cases during the active treatment, and it showed further improvement post-treatment. At the age of 16.7 years, 98% of the treatment children, had a Class I relationship. These patients all had Class II relationship at the beginning of the early mixed dentition phase. In overbite and lower crowding, some increase was observed.

As a result of the treatment, the mandible of the treated children grew 5 mm more compared to patients in the control group during the period of early mixed dentition. The higher mandibular growth rate seemed to be a major factor contributing to the correction of the Class II to Class I molar relationship in the treatment group. There was no indication that enhanced growth of the mandible would have been only temporary. This would indicate that the early EGA treatment in addition to correcting the occlusion also guided the skeletal development into a more normal Class I developmental path.

In addition to enhancement of the mandibular growth, EGA can be used to adjust the upper and lower arch perimeter and positions of the permanent teeth. If the EGA treatment is carried out during early mixed dentition, growth modification takes place during the juvenile growth spurt and the erupting incisors can simultaneously be guided in good alignment, with favourable overjet and overbite. With the early growth modification and adjustment of the arch perimeter, there was no need for orthodontic extractions or a second treatment phase in any of the 65 Class II children.

The present study did not include a cost-benefit analysis of the treatment, but the clinical experience indicated that the costs remained low because EGA treatment allows long check-up intervals, up to 3 months, and short chair-side time at check-ups. Furthermore, the early EGA treatment eliminated the need for a second treatment phase. The present results corroborate the earlier findings that early intervention seems particularly beneficial in public health care with limited resources.

Conclusion

The findings of this extensive study indicate that significant improvement in the occlusion was achieved with early intervention using eruption guidance appliances. The results show a clinically significant correction of molar relationship, overjet, overbite, incisor alignment, and growth enhancement of the mandible after treatment in the early mixed dentition. An increase was observed in the overbite and lower crowding. The treatment results from the early treatment phase remained largely stable in early permanent dentition. Furthermore, the early treatment remarkably reduced the need for further treatment representing a single-phase treatment.



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