

# Anterior crossbite correction in primary and mixed dentition with removable inclined plane (Bruckl appliance)

*Irena Jirgensone, Andra Liepa, Andris Abeltins*

## SUMMARY

Anterior crossbite correction in early mixed dentition is highly recommended as this kind of malocclusion do not diminish with age. Uncorrected anterior crossbite may lead to abnormal wear of the lower incisors, dental compensation of mandibular incisors leading to thinning of labial alveolar plate and/or gingival recession. There are several methods for solving this problem. In this article we would like to describe removable inclined plane. This is a removable simple functional appliance on the lower arch (jaw), which works as inclined plane. One of the advantage of the Bruckl appliance is that it can also be used as retention appliance after active treatment as well as it is possible to add acrylic teeth if necessary. Therefore it can be used as a removable partial denture in lower jaw in case where there is a premature loss of the primary teeth. The use of this appliance is illustrated with three cases.

**Key words:** anterior crossbite, early treatment.

## INTRODUCTION

Anterior crossbite can be defined as upper frontal primary or individual permanent teeth lingual position in relationship to lower incisor teeth. There is relatively little literature data about the treatment methods of anterior crossbite in primary and early mixed dentition (Fig 1, 2).

Nevertheless the malocclusion origin – skeletal or dentoalveolar, the treatment of anterior crossbite is recommended in primary and early mixed dentition. However early treatment does not always eliminates orthodontic treatment need in permanent occlusion. The aim of early treatment of this type of malocclusion is to correct anterior crossbite, as otherwise often can lead to very serious Class III malocclusion which would be possible to treat only with combined orthodontic and orthognatic method [1, 10].

As the treatment is carried out with removable appliance good cooperation between the specialist and patient is one of the most important conditions for successful treatment result.

In this paper we would like to show quit simple and inexpensive method of treatment of anterior crossbite in deciduous and mixed dentition. We would like to describe removable inclined plane (Bruckl appliance) [2, 3, 4, 5, 8, 9].

This is a removable simple functional appliance on the lower arch (jaw), which works as inclined plane. One of the advantage of the Bruckl appliance is that it can also be used as retention appliance after active treatment as well as it is possible to add acrylic teeth if necessary. Therefore it can be used as a removable partial denture in lower jaw in case where there is a premature loss of the primary teeth.

Anterior crossbite in the primary dentition can be eliminated by grinding of deciduous teeth, with removable appliances or combination of both.

What can you get from grinding of primary teeth?

With grinding it is possible to remove disturbing contact points. It is important to take in mind the direction of the surfaces which are grinded [11].

For definition of the grinding direction articulation paper is used. It is also important to evaluate the abrasion of primary canine incisal surfaces (Fig. 3).

If there is not possible to get the result with grinding of teeth then a simple functional appliance can be used to treat the malocclusion. For instance, it can be an inclined plane which prevents the mandibular protrusion. This plane is described as it forms the basic active part of the Bruckl appliance (Fig. 4, 5).

\*Department of Orthodontics, Riga Stradins University, Riga, Latvia

*Irena Jirgensone\** – D.D.S., Dr. Med., professor assistant  
*Andra Liepa\** – D.D.S., Dr. Med., professor assistant  
*Andris Abeltins\** – Doctorant student in orthodontic

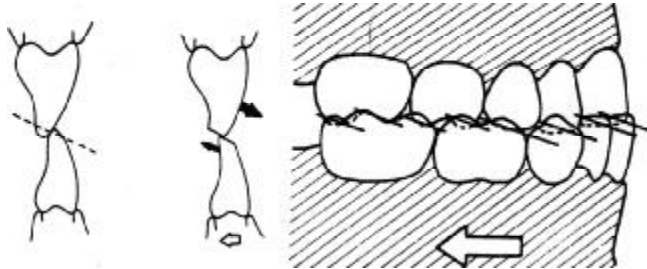
Address correspondence to Dr. Irena Jirgensone, Department of Orthodontics, 20 Dzirciema street, Riga, Latvia, LV 1007.  
E-mail address: i.krauze@latnet.lv



**Fig. 1.** Anterior crossbite in primary dentition



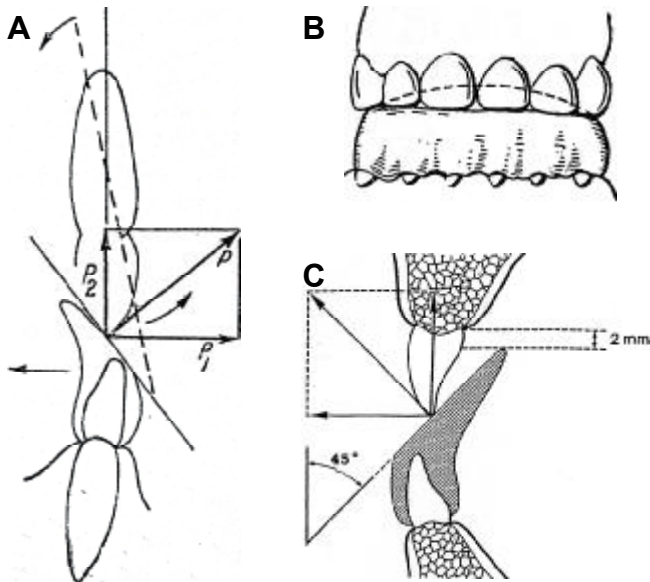
**Fig. 2.** Anterior crossbite in early mixed dentition, there is no abrasion of dd 73 and 83



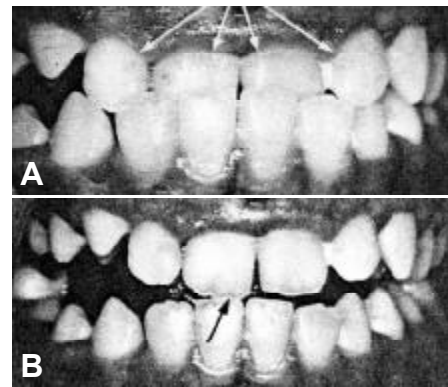
**Fig. 3.** The grinding of primary teeth developing inclined planes [11]



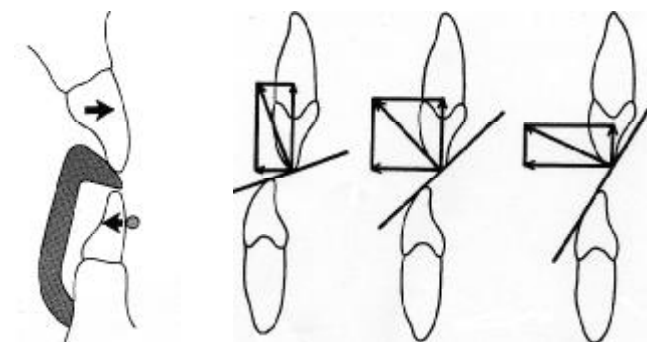
**Fig. 4.** Acrylic lower inclined plane. The lower inclined plane caps the lower incisors and deciduous canines.



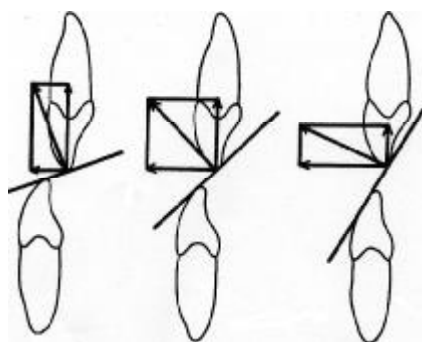
**Fig. 5.** Diagrammatic representation of the lower inclined plane: A – working scheme of the inclined plane; B – inclined plane fixed on the lower teeth (frontal view)[5]; C – the scheme shows the distance between the inclined plane and palate which need to be considered when wearing the appliance.



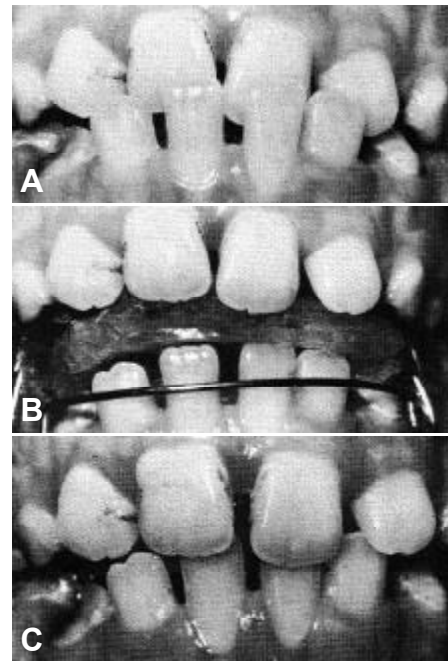
**Fig. 6.** A – in centric occlusion; B – edge to edge bite.



**Fig. 8.** Cross section view of Bruckl's appliance



**Fig. 9.** Force vectors of the inclined plane with different angulations. The steeper the plane the greater the forward pressure on the maxillary incisor [3].



**Fig. 7.** A – anterior crossbite in early mixed dentition; B – Bruckl appliance; C – normal overbite after treatment.



**Fig. 10.** Steps in fabrication of Bruckl appliance: A-C – acrylic plate with inclined plane in wax; D, E – appliance is ready for using.



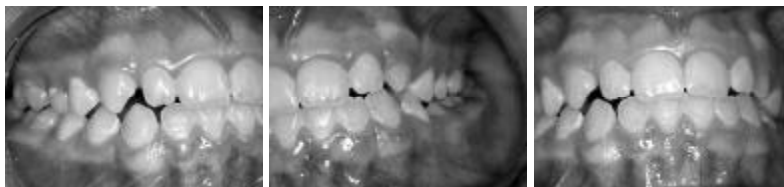
**Fig. 11.** Patient P. E. before treatment



**Fig. 12.** Patient P. E. after treatment



**Fig. 13.** Patient M. S. before treatment



**Fig. 14.** Patient M. S. after treatment



**Fig. 15.** Patient A. L. before treatment



**Fig. 16.** Patient A. L. after treatment

The inclined plane is used if there is enough space in the dental arch to procline upper incisors. Clinically it can be used in cases when upper incisors are in crossbite with more than one half of vertical overbite. The movement of teeth occurs from the resulting force of closing muscle and inclined plane interaction. The acrylic base of the inclined plane should be wide enough. For better stability it is advised to use teeth with different axial inclination. For example, incisors, canines and sometimes even premolars.

The lower inclined plane caps the lower incisors and is inclined at about 45° to the occlusal plane. On closing, the upper incisors, which formerly occlude behind the lower incisors, bite on the inclined plane and the pressure of the bite ( $P$ ) divides into two force vectors  $P_1$  and  $P_2$ . The pressure ( $P_1$ ) proclines the upper incisors. The pressure ( $P_2$ ) intrudes the incisors. The steeper the plane the greater the forward pressure on the maxillary incisors. The advisable angle is 45 degrees [2].

If there are two or more teeth in crossbites then the lower jaw should be accessed not only in centric occlusion but also in edge to edge relationship [1, 11]. If it is possible to bite edge to edge that means the anomaly is of dentoalveolar origin and removable appliance can be used. The primary canine guidance forward and sideways also should be accessed. The canines can be grinded, if necessary (Fig. 6).

## TREATMENT

### Mandibular removable appliance

Bruckl appliance is a simple functional appliance. It is used when there is anterior crossbite involving several teeth (2-4). Vertical overbite approximately 1/2-2/3 or more. It is not recommended in cases with crowded maxillary incisors (Fig. 7).

Parts of Bruckl appliance: mandibular Hawley-type retainer, inclined plane added to Hawley – type retainer, labial bow for retraction of lower incisors. The inclined plane stimulates the forward movement of maxillary incisors which are in crossbite. Muscle force provides sufficient force for maxillary incisor movement.

When activated labial bow acrylic is cut away on the lingual surface of mandibular incisors. The labial bow exerts a retrusive force to upright lower incisors, close spaces and correct anterior crossbite [2, 3] (Fig. 8, 9).

#### **Steps in fabrication of Bruckl appliance (A removable acrylic plane) (Fig. 10).**

Bruckl appliance is made on stone model. At first acrylic base plate is made with Adams clasps on 36 and 46, and labial bow. The inclined plane is built up in wax. Wax inclined plane caps the incisors and canine teeth.

The wax inclined plane is adjusted for height and angulation in mouth. Then the plane is fabricated in acrylic, and finally polished [2, 3, 8, 9].

In the next appointment: the acrylic Bruckl appliance is inserted, it is necessary to use the articulation paper for detection of the right angulation and grinding the acrylic inclined plane. Periodical observation may show that more inclined plane grinding is necessary.

The appliance should be worn full time and the patient is instructed to adopt soft diet until the incisor relationship is corrected and the appliance can be removed.

The treatment should only take a matter of 7-8 weeks. If the improvement does not appear, a check should be made on the wearing of appliance and the diagnosis of the case.

#### **CASE REPORTS**

- Patient P.E. aged 8 years before treatment, girl with anterior crossbite, involved 52; 11; 21. There are premature loss 73; 83; 84; 85 and dentoalveolar deformation (Fig. 11). Treatment was started with Bruckl appliance. Treatment time – 2.5 month. After treatment overbite: +2 mm. The girl needs removable acrylic partial denture in lower jaw (Fig. 12).

- Patient M.S. aged 11 years before treatment, girl with anterior crossbite, involved 12; 11; 21. Overbite: -6 mm (Fig. 13). Treatment was started with Bruckl appliance. Treatment time – 1.5 month. After treatment overbite: +1.5 mm (Fig. 14). Bruckl appliance with cutted off inclined plane was used for retention.

- Patient A. L. aged 10 years, before treatment, girl with anterior crossbite, involved 11; 21. Overbite: ~2 mm (Fig. 15). Spaces and median diastema in lower jaw. Treatment was started with Bruckl appliance. Treatment time – 2 month. After treatment overbite: +1.5 mm. Frontal teeth of the lower jaw were retroinclined; spaces were closed (Fig. 16). Bruckl appliance with cutted off inclined plane was used for retention.

#### **DISCUSSION**

The problems of anterior crossbite in permanent dentition shows progression in severity, so that early intervention aim at stimulating well balance growth and occlusal development is indicated [12].

The important role plays not only the age of the child but also the motivation for treatment, how he or she perceives the problem. There are differences in gender as well – girls are more keen for treatment than boys [13].

One for the shortcomings of early treatment is the possibility of two phase orthodontic therapy as often it is difficult to estimate the further growth of the mandible [14].

Early treatment of the patients with Class III malocclusion depends whether the problem is mandibular prognathism or deficiency in maxillary growth [7].

The aim of our case report was to show easy and cheap method how to deal with this problem. The shortcoming of this method is that it is removable so needs good cooperation with patients and parents. The other methods such as 2x4 appliance is fixed, not so compliant [15].

Other simple treatment methods in mixed dentition are: a palatal plate with anterior springs; a Quad Helix to which springs can be soldered. Each of these methods can be used to correct the anterior crossbite, but to choose the right one the thorough diagnosis is needed [6].

#### **CONCLUSIONS**

The main advantage of early treatment of anterior crossbite is the opportunity to influence the process of growth in the upper jaw with quite simple and not expensive appliance as well as to avoid in many cases orthognatic surgery in future.

- Before treatment it is necessary to consider if the possible treatment result will justify all the used methods and input – material as well as psychological.

- Choosing the appliance for correction of anterior crossbite you have to consider the amount of vertical overbite. If it is 1/2 to 2/3 and more from the

length of a cusp and there are 3 or all 4 frontal teeth in crossbite, then it is advisable to use Bruckl appliance. If the vertical overbite is less than 1/2 from the length of the crown, then is better to use a removable upper plate with protraction spring or a screw for correction of the malocclusion.

- It is possible to correct several dentoalveolar anomalies if you start to treat early. Therefore it is

possible to prevent development of severe anomalies and shorten the orthodontic treatment time in permanent dentition [6].

The main emphasis need to be placed on the diagnosis and evaluation of the malocclusion. This is a competence of a dentist who than refer the patient to the orthodontic specialist for future treatment.

## REFERENCES

1. Arvystas MG. The rationale for early orthodontic treatment. *Am J Orthod Dentofacial Orthop* 1998;133:15-8.
2. Adams P. The design, construction and use of removable orthodontic appliances. 5th ed. Bristol; 1984. p.111-2.
3. Graber TM, Neuman B. Removable orthodontic appliances. 2<sup>nd</sup> ed. Saunders; 1984. p. 57-9.
4. Horosilkina FJ, Maligin JM. Osnovi konstruirovaniya i tehnologija izgotovleniya ortodontoticeskih aparatov. Moskva: Medicina; 1977. p. 168-9. Rus
5. Kalvelis DA. Aparatūras, kas darbojas pēc slīpās plāksnes principa. *Ortodontija* 1964:135-6;
6. Patti A, Perier G. Preface. In: Clinical success in early orthodontic treatment. Quintessence; 2005. p. 8.
7. Proffit WR. The timing of eraly treatment: An overview. *Am J Orthod Dentofacial Orthop* 2006;4:S48;
8. Sztele R. Herstellung Kieferorthopädisher apparate. Berlin; 1960. S. 53.
9. Taatz H. Kieferorthopädische Prophylaxe und Frühbehandlung. München,Wien: Hanser; 1976. p. 238-9.
10. Vadiakas G, Viazis AD. Anterior crossbite correction in the early deciduous dentition. *Am J Orthod Dentofacial Orthop* 1992;102:160-2.
11. Zachrisson B, Thilander B. Treatment of Dento-alveolar anomalies. In: Introduction to orthodontics. Stockholm; 1994. p. 146-182.
12. Tausche E, Luck O, Harzer W. Prevalence of malocclusions in the early mixed dentition and orthodontic treatment need. *Eur J Orthod* 2004;26:237-44.
13. Kiyak AH. Patients' and parents' expectations from early treatment. *Am J Orthod Dentofacial Orthop* 2006;129:S50-54.
14. Ngan P. Biomechanics of maxillary expansion and protraction in Class III patients. *Am J Orthod Dentofacial Orthop* 2002;121:58283.
15. Dugoni S, Aubert M, Baumrind S. Differential diagnosis and treatment planning for early mixed dentition malocclusions. *Am J Orthod Dentofacial Orthop* 2006; 129:S80-1.

Received: 05 08 2007

Accepted for publishing: 19 12 2008