



Orthodontic treatment of a severe unilateral open bite and crossbite, by palatal appliance with monolateral screw (by Veltri). A case report

Ortodontska terapija izraženog unilateralno otvorenog i ukrštenog zagrižaja, pomoću palatinalnog aparata sa monolateralnim šrafom (Veltri)

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Abstract

Introduction. An appliance according to Veltri is a kind of palatal construction which is rarely used in our region. It appeared as a logical consequence of the evolution of appliances for rapid palatal separation. It is primarily indicated for upper molars distalization. However, its good qualities allow the use it in case of some other orthodontic problems. **Case report.** The aim of this report is overview of the therapy of 14-year-old boy with asymmetry of the upper dental arch and unilateral open bite and crossbite, using the appliance according to Veltri. The plan of therapy was primarily aimed at correction of upper arch asymmetry by using appliance ac-

ording to Veltri. Extraction of the lower first premolars was done and then upper and lower fixed appliance for leveling the upper and lower dental arch, normalization overjet and the depth of overlap was placed. The total duration of the therapy was two years. **Conclusion.** Presented combined camouflage therapy achieved a satisfactory result, regardless of the poor prognosis due to hyperdivergent growth.

Key words: malocclusion; orthodontic appliance design; cephalometry; dental arch; treatment outcome.

Apstrakt

Uvod. Aparat po Veltriju predstavlja vrstu palatinalne konstrukcije, koja se kod nas retko koristi. Aparat je nastao kao logična posledica evolucije aparata za rapidnu ekspanziju palatuma. Indikovano je, pre svega, za distalizaciju gornjih molara. Međutim, njegove dobre osobine, omogućavaju njegovu upotrebu i u terapiji drugih ortodontskih problema. **Prikaz bolesnika.** Cilj prikaza je terapija četrnaestogodišnjeg dečaka sa asimetrijom gornjeg zubnog luka i unilateralno otvorenim i ukrštenim zagrižajem pomoću aparata po Veltriju. Plan terapije je predviđao, primarno, korekciju asimetrije gornjeg zub-

nog luka aparatom po Veltriju. Zatim je sledila ekstrakcija donjih prvih premolara i primena donjeg i gornjeg fiksnog aparata za nivelaciju donjeg i gornjeg zubnog niza, normalizaciju incizalne stepenice i dubine preklopa. Celokupna terapija je trajala dve godine. **Zaključak.** Prikazana kombinovana kamuflažna terapija postigla je zadovoljavajući rezultat uprkos lošoj prognozi zbog hiperdivergentnog rasta.

Ključne reči: malokluzija; ortodontski aparati, dizajn; kefalometrija; zubni luk; lečenje, ishod.

Introduction

The Veltri screw, within the palatal construction, appeared as a logical consequence of the evolution of appliances for palatal separation¹. The beginnings of palatal constructions are related to the treatment of rapid palatal expansion and they date back to 1860, when Angle, having treated po-

sterior crossbite of a fourteen-year-old boy, applied for the first time one kind of a primitive palatal construction with a screw. In the years to follow, the use of these appliances gave different results. Since 1960 they have been equally used in European countries and the USA. By the end of the same decade, the most commonly used palatal construction was Biederman's separator. It consisted of 4 bands, cemented on

maxillary first premolars and molars and steel extensions which connected the central hygienic palatal screw and the bands². In recent years, there has been the tendency of perfecting palatal constructions in terms of the range of their indication area: primarily distalization and transversal movement¹⁻⁶. The improvement has also been achieved in the construction of the screw: the uneven surface of the screw was replaced with the smooth one which facilitated the hygiene and reduced the possibility of irritation; better mechanic resilience with the help of laser soldering of extensions onto the central body¹⁻⁵. In addition, the stability achieved by a better construction, enabled removing of the bands on premolars, which simplified the placement of the appliance and improved the aesthetic impression since the appliance cannot be seen while smiling or speaking. All the mentioned above broaden the use of palatal constructions in the therapy of teeth movement, which is difficult or not possible to achieve at all with different kinds of appliances¹⁻⁶.

An appliance according to Veltri differs from the appliances with screws for rapid palatal expansion (Hass, Hyrax). In fact, its anchorage is not reciprocal as device appliance for rapid palatal expansion. Only one (at monolateral screws⁷) or two legs (at bilateral and rotary type⁸) which are mobile, move the teeth. Ot-

her legs and the rest of the construction are static and by anchoring teeth it represents very stable anchorage¹.

Case report

A patient was male, 14-years-old, with long, narrow and noticeable asymmetrical face, of convex profile, asthenic constitution (Figure 1) unsuccessfully orthodontically treated two years before. Intraoral finding was: I class occlusion by reconstruction; right: crossbite and lateral open bite of a severe degree, only molars and central incisors, which in "tête-à-tête" were in contact; left: the lack of contact with antagonists from the upper lateral incisor to the second premolar and somewhat milder degree of crossing than on the right side. There was a complete lack of space for the upper left canine and mildly crowded lower dental arch (Figure 2). Functional finding was: labored breathing through the nose with unremarkable rhinological findings, but the patient had a habit of breathing through the mouth due to frequent infections in early childhood. Mastication was difficult due to the lowered number of functional occlusal units. There was macroglossia and infantile swallowing.



Fig. 1 – Pretreatment extraoral photographs.



Fig. 2 – Pretreatment intraoral photographs.

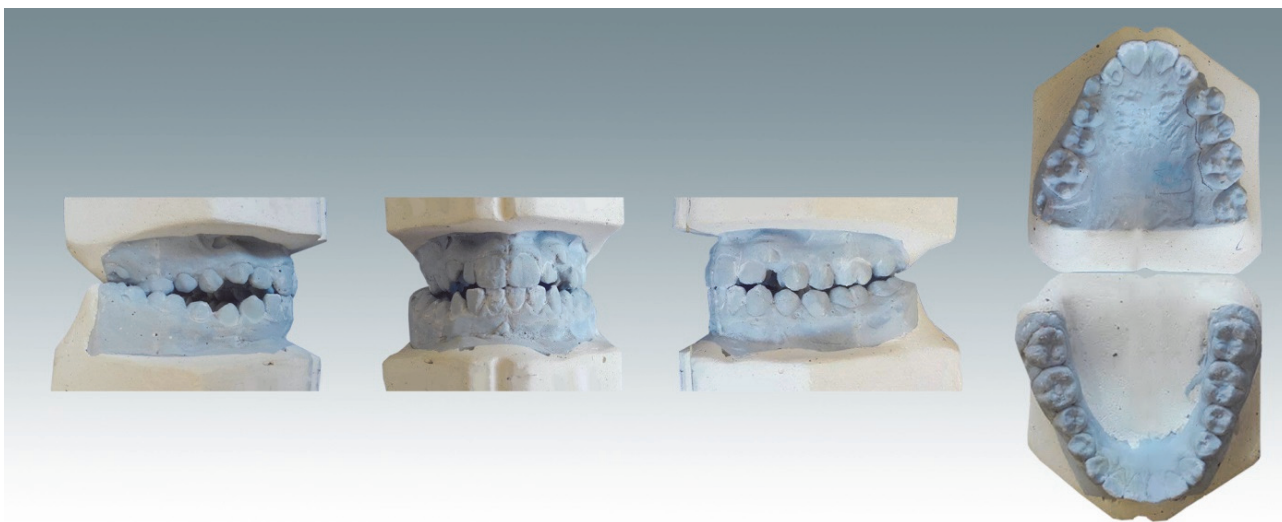


Fig. 3 – Pretreatment study models.

The analysis of the study model revealed (Figure 3): there was an asymmetrical narrowness of maxillary dental arch which caused discrepancy in the width of the upper and lower dental arch of 7 mm. Overjet and overbite values were zero (Table 1).

Cephalometric analysis (Figure 4) showed the increased basal (35°) and gonial angle (144°), followed by mesial gnathic and dentoalveolar relationship (Wits appraisal). There was a protrusion of lower incisors, with decreased interincisal angle (118°). Linear measures showed contracted corpus of the upper jaw, in the direction of the base of the skull.

Analysis according to Steiner showed: bimaxillary retrognathism in class I skeletal relationship. The analysis of

the growth indicated the growth in posterior rotation (Table 2). The overall findings suggested hypoplasia of the maxilla.

Table 1
The values of the frontal dentoalveolar parameters before and two years after the whole treatment

Features	Pre-treatment	Post-treatment
Incisor relationship	"Tête-à-tête"	Normal overjet
Overjet value, mm	0	2 mm
Overbite value, mm	0	3 mm
Midlines	Shifted	Co-incident

The orthopan analysis indicated the presence of crowdedness and unerupted third molars, which pointed to extraction therapy in the lower jaw (Figure 5).

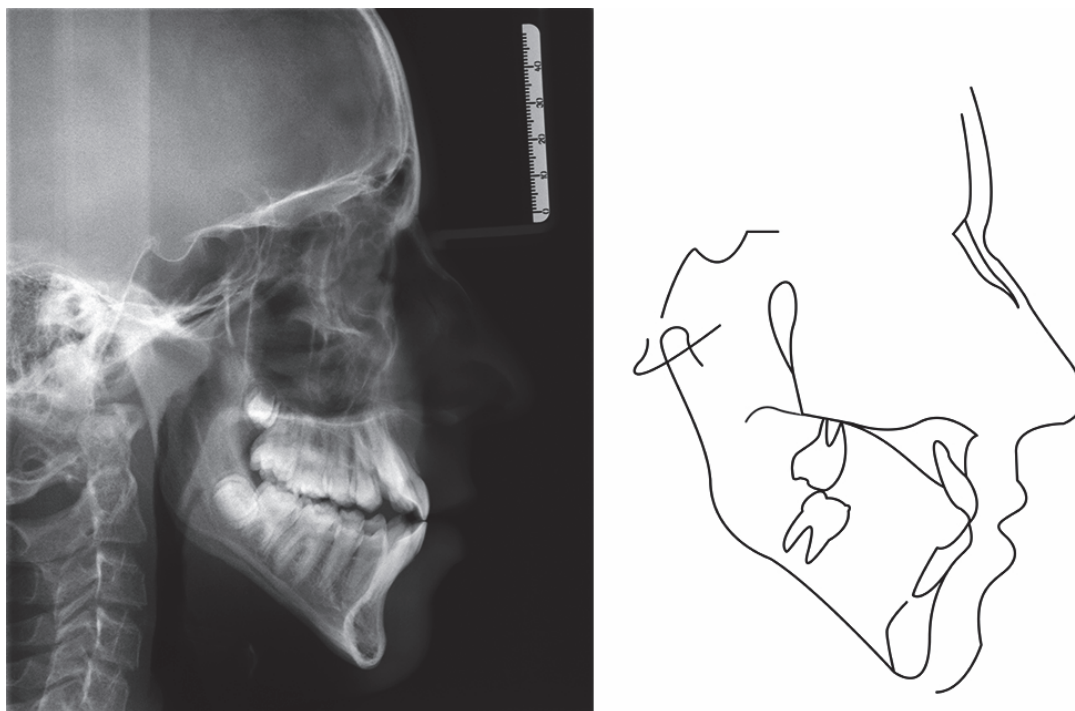


Fig. 4 – Pretreatment lateral cephalometric radiography and cephalometric tracings.

Table 2

The values of the cephalometric analysis before and two years after whole treatment			
Angles	(Referent values)	Pre-treatment values	Post-treatment values
SNA, (°)	82	80	80
SNB, (°)	80	77	77
ANB, (°)	2–4	3	3
SND, (°)	76–77	75	76
I to NA, (°)	22°	22	36
I to NA, (°)	4	4	8
i to NB, (°)	25°	34	25
i to NB, mm	4	10	6
Pg to NB, mm	4	2	3
I to i, (°)	130°–150°	118	117
Occl/SN, (°)	14°	21	18
GoGn/SN, (°)	32°	46	46
SL, mm	51	46	44
SE, mm	24	21	17
FMA, (°)	25°	35	35
IMPA, (°)	90°	92	82
FMIA, (°)	65°	53	63
Wits app., mm	–1	2	–2
NMe, mm		117	118
SGo, mm		68	75
SGo/NMe, %	62–65	8.1	63.5
Y-axis, (°)	59±4	61	62

SNA – Angle of sagittal maxillary position in relation to the cranial base anterior; SNB – Angle of sagittal mandibular position in relation to the cranial base anterior; ANB – Angle of sagittal intermaxillary relationship; SND – Angle of sagittal mandibular position of the lower jaw (D – symphysis center); I to NA – Inclination of the upper incisors (in mm); I to NA – Inclination of the upper incisors (angle); i to NB – Inclination of the lower incisors (in mm); i to NB – Inclination of the lower incisors (angle); Pg to NB – Holdaway distance; I to i – Interincisal angle; Occl/SN – Inclination angle of the occlusal plane in relation to the cranial base anterior; GoGn/SN – Inclination angle of the mandibular plane in relation to the cranial base anterior; SL – Sagittal position of the pogonion (in mm); SE – Sagittal position of the condyle (in mm); FMA – Francfort Mandibular Angle; IMPA – Incisor-Mandibular Angle; FMIA – Francfort Mandibular Incisor Angle; Wits app. – Wits assessment of sagittal intermaxillary relations; Nme – Anterior face height; Sgo – Posteroior face height; Sgo/Nme – Posterior/anterior face height ratio; Y-axis – Angle between the Y-axis and Francfort plane.

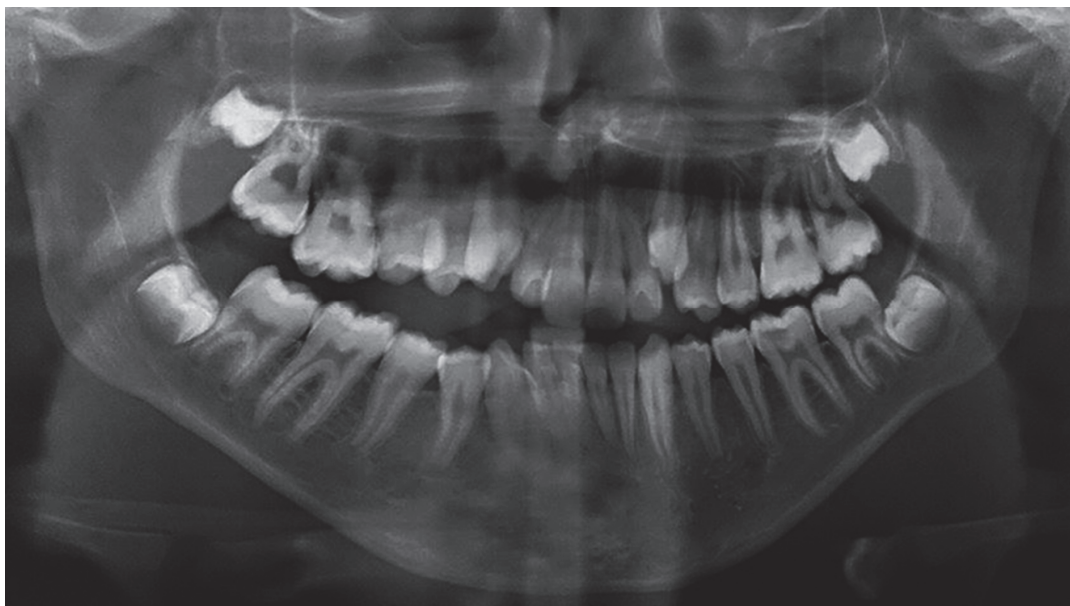


Fig. 5 – Panoramic radiograph before therapy.

The plan of the therapy included: 1) the adjustment of the widths of the upper with the lower dental arch by asymmetrical broadening by means of the Veltri appliance; 2) the extraction of the lower first premolars with the intention of dentoalveolar camouflage of the existing mesial gnathic and dentoalveolar skeletal relationship, relieving the crowdedness and retrusion of the lower front for the sake of establishing normal horizontal and vertical overlap of the incisors; 3) the alignment of dental arches, with the help of fixed appliances: to insert a left canine in the upper jaw in the dental line without extraction; in the lower jaw, close the postextraction space with retrusion of incisors and relieve crowdedness.

The priority in therapy was given to transversal adjustment of the upper and lower jaw by asymmetrical broadening. This effect was achieved by applying palatal construction with monolateral screw Veltri. The screw was activated every fifth day. By using this appliance, optimal width of maxilla was achieved with simultaneous correction of asymmetrical narrowness since only right lateral segment of the dental line was buccally moved. The buccal movement of the left lateral segment was slight, which was enough to correct a mild degree of crossing on the left side. The overall sum of expansion was 9 mm, out of which 2 mm of overcorrection for the sake of preventing therapeutic recidive (Figure 6). After the achieved effect, labial part of the rest was taken from the front teeth in order to place the upper fixed appliance (Figure 7). The Veltri appliance stayed in the mouth partly to stabilize the achieved result and partly to serve as a rest to the fixed appliance. At the same time, the lower first premolars were extracted and the lower fixed appliance was placed. Ten months after the placement of the fixed appliance, a satisfying therapeutic effect was achieved in the upper dental line. The upper fixed appliance was removed as well as the Veltri appliance. As a retention appliance, retention invisible appliance was made. In the lower jaw, the therapy lasted 6 months longer due to the closing of postextraction space and the correction of the middle of the lower dental line. After removing fixed appliance, retention invisible appliance was also applied. The acceptable occlusion was achieved intraorally in all three directions (Figure 8, Figure 9 and Table 1). There was a harmonization and improvement of facial contour profile (Figure 10). The cephalometric analysis

showed harmonization of dentoskeletal relationships to the extent which the camouflage therapy allowed (Figure 11, Figure 12 and Table 2).



Fig. 6 – A progress occlusal view shows an adequate space created with the help of the Veltri appliance.



Fig. 7 – Occlusal view shows phase of combination therapy with the upper fixed appliance and reduced appliance according to Veltri.



Fig. 8 – Post-treatment intraoral photographs, two years after the treatment.

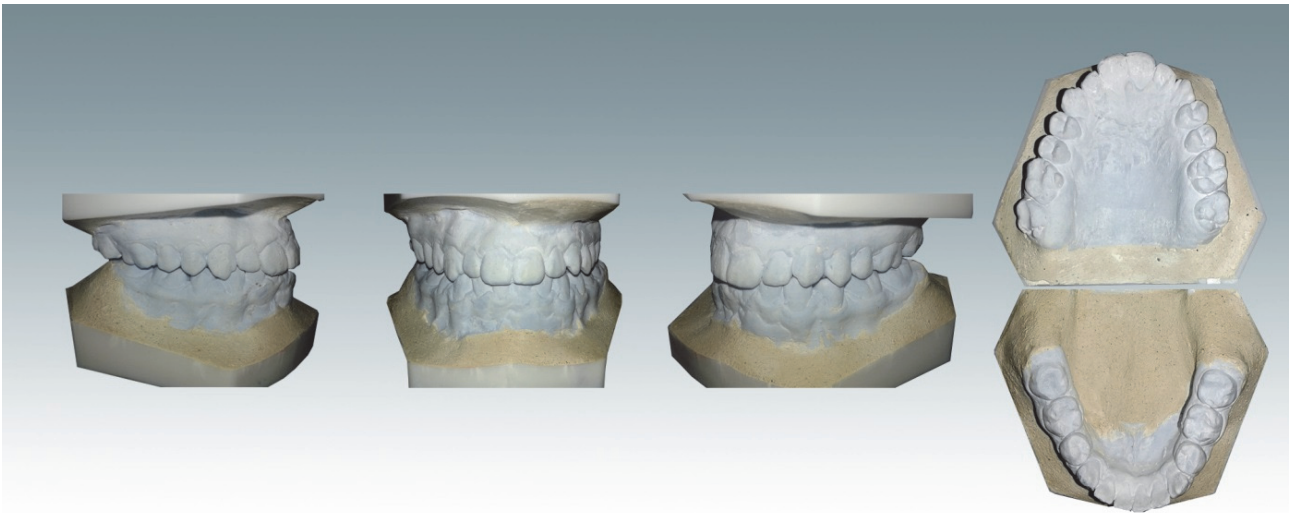


Fig. 9 – Post-treatment study models.

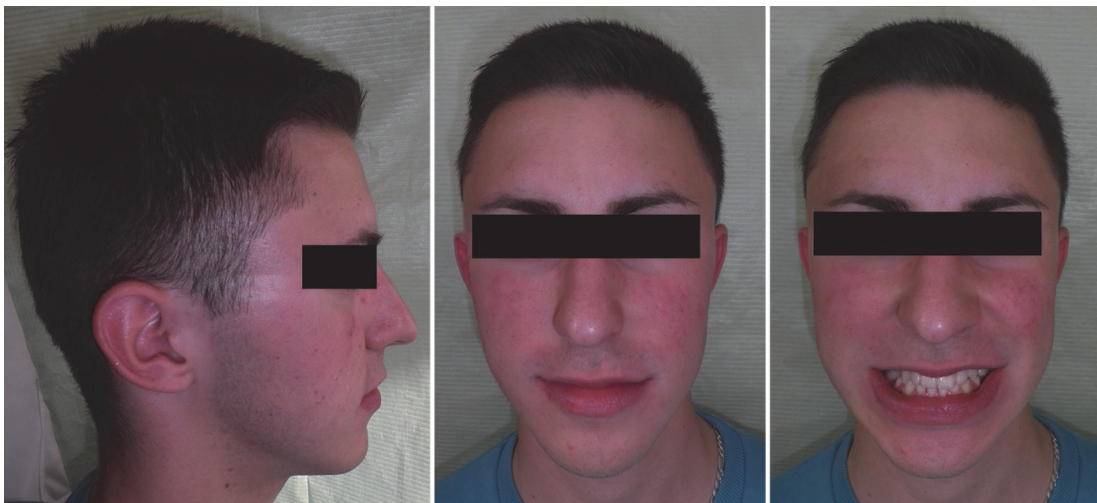


Fig. 10 – Post-treatment extraoral photographs.



Fig. 11 – Post-treatment lateral cephalometric radiograph and cephalometric tracings.



Fig. 12 – Panoramic radiograph after the therapy.

Discussion

Hypoplasia of maxilla, by itself, represents a severe orthodontic problem, which is usually noticeable as early as in childhood. It is considered to be of primarily hereditary etiology with the influence of oral respiration⁹. With age, in most cases, the deformity becomes more difficult, especially because there is a tendency towards infections of upper respiratory pathways⁹. Patients have mostly aesthetic motivation to solve this problem¹⁰, but functional difficulties are not negligible either⁹. The upper incisors line is crowded, due to the underdevelopment of the maxilla in all three directions. What commonly accompanies this condition is impacted or retained canines¹¹, asymmetrical upper dental line¹², obligatory crossbite^{12, 13}, often followed by apertognathia, sometimes by mandibular deviation and mismatch of the middle of dental lines^{13, 14}, which further complicates the therapy of the already existing condition. The early therapy of hypoplasia of maxilla, has a great influence on the normalization of jaw relationship, especially if combination of facial mask Delair is applied¹⁵ along with the rapid palatal expansion^{9, 16}. If this period is skipped, with further progressing of irregularities and enlargement of sagittal skeletal discrepancy, it is hard to camouflage this problem, so it is most often treated orthodontically and surgically.

In the portrayed patient, the existing atypical and asymmetrical hypoplasia of the maxilla was further complicated by a difficult degree lateral apertognathia, which, along with hyperdivergent growth, represent a great therapeutic risk. The increased basal angle, by itself, implies extraction therapy. However, every extraction in the upper jaw would lead to additional consecutive collapse of the maxilla which would compromise the result of the therapy and produce deterioration of the existing sagittal dentoskeletal relationship. For that reason, compromised therapy was planned: the ex-

tension of the maxilla and extraction in the lower jaw. The protrusion of the lower incisors also justifies some extractions in the lower jaw.

The analysis of asymmetry by a transversal, indicated asymmetrical narrowness of the upper dental line so that symmetrical broadening was not considered. The amount of 7 mm of asymmetrical broadening would be impossible to achieve in practice with usual orthodontic procedures. For that reason, palatal construction with monolateral screw Veltri was applied. The construction is produced on the basis of monolateral screw Veltri. The fabric screw is adapted according to the relief and the depth of the palate on the cast model of the upper jaw. Then the bands on first molars that carry the entire construction are adapted. The adapted screw is then soldered onto the bands and the wire parts of the rest. The rest is secured with the tripod axle construction.

The result is achieved in one year at the longest. The duration of the therapy is influenced by the age of the patient and the amount of expansion needed to be achieved. The advantages of using this appliance are: the briefness of the therapy due to the continuity of treatment, aesthetic inconspicuousness, optimal therapeutic effect as well as the fact that after the accomplished expansion and during the use of a fixed appliance, the Veltri appliance remains to serve as a rest. The negative side is minimal discomfort for patients while eating, which is common in all fixed appliances.

Conclusion

The Veltri appliance with monolateral screw represents the appliance of choice in cases of the third degree unilateral crossbite in patients with permanent dentition. Its application enables relatively fast and successful correction of this irregularity with minimal discomfort for the patient.

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