Lingual active retainers to achieve teeth levelling in orthodontics: case series

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ABSTRACT

In the present paper, a clinical procedure to achieve teeth levelling by means of orthodontic retainers activated and bonded onto the lingual aspects of teeth is described. These appliances are not visible and are very comfortable for the patients. The wires are modelled according to the principles of biomechanics described by Burstone and Melsen.

Key words: lingual orthodontics, retainer, tooth levelling

Introduction

The treatment of adult patients asking for invisible and comfortable orthodontic therapies is becoming a more and more frequent clinical need. Consequently, orthodontic therapies with lingual brackets has become a widespread treatment option. In order to perform invisible and comfortable therapies in case of anterior teeth crowding, some authors developed lingual retainers in nickel-titanium bonded onto the lingual aspects of anterior teeth.[1-3] The same authors successively improved such technique, then followed by other clinicians[4]

The aim of the present work is to describe a case series in which innovative active fixed lingual orthodontic appliances have been used to level anterior teeth.

Clinical procedures

The activated retainers used to solve the clinical cases explained in the present paper have been realized with 0.175" multi-strand wires (Supra-flex™ S.S. Twisted 6 strand, Rocky Mountain Orthodontics, Denver, USA). These wires have been modelled according to the principles of biomechanics described by Burstone and Melsen.[5-7]

Vertical U-shaped loops and step bends have been modelled to treat teeth crowding. The step bends allowed the clinicians to derotate teeth; furthermore, such bends can be used alone to level teeth in case of limited crowding. On the contrary, when more evident crowding have to be treated, vertical loops, just like U-shaped loops, have to be added to level teeth. Such loops increase the elasticity of the wire and permit to increase the applied system of forces.

The wire has to be modelled to passively fit onto the lingual aspects of teeth. Before the wire was bonded, it has been activated by opening the loops of about 2 mm. During the bonding procedures, these loops have been closed of about 2 mm: the elastic return of the wire has been used to develop the forces necessary to decrease the crowding. Obviously, in presence of diastemata, the opposite activation is necessary: the U-shaped loops have to be closed of about 2 mm before bonding the wire and then they have to be opened of about 2 mm during the bonding procedures. In this case, the elastic return of the wire is used to develop the system of forces necessary to close the spaces.

After polishing the teeth by means of pumice paste and a rotary brush mounted on a low speed handpiece, the lingual surfaces of teeth have been etched for 30 sec according to the principles of the acid etching technique. Then, the bonding agent has been applied on such surfaces and has been light cured for 20 sec. The wire has been bonded covering it with a flowable resin composite (Filtek, 3M ESPE, Feeld, Germany) for at least 1 mm; then, the composite resin has been light cured for 40 sec.

Considering that after the activation has been performed the wire does not fit onto the lingual surfaces of the teeth,

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Figure 1 – Clinical case 1: preoperative frontal view.

at first it has to be bonded onto the teeth nearest to the wire itself and that require the more limited movement. Then, it has to be bonded onto the other teeth opening or closing the loops and pushing the wire on the teeth with an utility probe. It is paramount to keep the horizontal plane of the wire during the bonding procedures in order to avoid undesired intrusive or extrusive forces. Consequently, especially during the activation of the wire by opening or closing the loops, it is advisable to use two utility probes to avoid the overturning of the wire.

The active retainer is controlled after 3 weeks of treatment. During each control, the wire has to be debonded from the teeth that need to be moved. The removal of the wire is performed by thinning the composite resin with a diamond bur under water irrigation; then, the wire can be debonded using a dental explorer as a lever, in order not to damage the wire. The layer of composite resin still bonded on the teeth has to be roughened to create micromechanical retentions, so that it is not necessary to perform any further acid etching. Finally, the wire is activated and bonded again.

After the treatment has been completed, the active retainer has to be substituted with a traditional passive retainer.

Clinical Case 1

A moderate crowding of the mandibular anterior teeth (i.e. from 33 to 43) was diagnosed. The treatment was accomplished by means of an active retainer modelled with U-shaped loops mesially and distally to the central incisors and to the right lateral incisor.

The crowding was solved after 12 months of treatment; then, the active retainer was substituted by a passive retainer.

Figure 2 – Clinical case 1: preoperative overjet evaluation.

Figure 3 – Clinical case 1: preoperative right lateral view.

Figure 4 – Clinical case 1: preoperative left lateral view.

Figure 5 – Clinical case 1: preoperative maxillary occlusal view.

Figure 6 – Clinical case 1: preoperative mandibular occlusal view.

Figure 7 – Clinical case 1: active retainer bonded at the beginning of the treatment.

Figure 8 – Clinical case 1: reduced crowding after 3 months of treatment.

Figure 9 – Clinical case 1: postoperative frontal view.

Figure 10 – Clinical case 1: postoperative overjet evaluation.

Figure 11 – Clinical case 1: postoperative right lateral view.

Figure 12 – Clinical case 1: postoperative left lateral view.

Figure 13 – Clinical case 1: postoperative maxillary occlusal view.

Figure 14 – Clinical case 1: postoperative mandibular occlusal view.

Clinical case 2

A moderate crowding of the mandibular anterior teeth (i.e. from 33 to 43) was diagnosed. The treatment was accomplished by means of an active retainer modelled with U-shaped loops mesially and distally to the lateral incisors and a step bend to derotate tooth 41.

The crowding was solved after 6 months of treatment; then, the active retainer was substituted by a passive retainer.

Figure 15 – Clinical case 2: preoperative mandibular occlusal view; moderate crowding of anterior teeth.

Figure 16 – Clinical case 2: active retainer bonded at the beginning of the treatment.

Figure 17 – Clinical case 2: reduced crowding and partial derotations after 2 months of treatment.

Figure 18 – Clinical case 2: alignment achieved after 6 months of treatment.

Discussion

Fixed active retainer bonded on the lingual aspect of the teeth is an innovative technique to solve anterior crowding. Patients prefer this appliance in comparison with the lingual brackets because is more comfortable and thin and doesn't interfere in patients' phonetics. Since the bonding process to each reactivation of the retainer needs isolation of oral fluids this technique requests a greatest patient collaboration. So this technique is not indicated for the patients that don't collaborate as the children.

Conclusions

Within the limitations of the present clinical report, the following conclusions can be drawn:

- Teeth levelling by means of wires bonded onto the lingual aspects of teeth can be considered the first treatment option in cases where aesthetics is the most important goal, since the retainer is not visible. Furthermore, according to the patients, lingual retainers are more comfortable than lingual brackets. No mucosal lesions on the tongue have been described in the presence of lingual retainers.[1-2]
- Such orthodontic appliances can be used to solve a disaligment, to remove brackets before the end of the therapy or in case of relapse.[3] In case of severe crowding, active retainers can be associated to interdental stripping.[1-2]
- In order to achieve the desired teeth movements, nickel-titanium wires or multi-strand wires modelled applying the biomechanical principles described by Burstone and Melsen can be used.[6-7]

References

1. Macchi A, Rania S, Cirulli N (1999) Una proposta per la gestione di disallineamenti anteriori: il mantenitore attivo di contenzione (MAC). Mondo Ortodontico 5: 389-393

2. Macchi A, Cirulli N (2000) Fixed active retainer for minor anterior tooth movement. Journal of Clinical Orthodontics 34: 48-49

3. Liou EJ, Chen LI, Huang CS (2001) Nickel-titanium mandibular bonded lingual 3-3 retainer: for permanent retention and solving relapse of mandibular anterior crowding. American Journal of Orthodontics and Dentofacial Orthopedics 119: 443-449

4. Musilli M (2008) The Bracketless Fixed Orthodontics: nine years of clinical Experimentation. Prog in Orthod 9:72-91

5. Burstone CJ, Koening HA (1988) Creative wire bending-the force system from step and V bends. American Journal of Orthodontics and Dentofacial Orthopedics 93: 59-67

6. Burstone CJ, Koening HA (1974) Force system from an ideal arch. American Journal of Orthodontics 65: 270-289

7. Ronay F, Kleinert W, Melsen B, Burstone CJ (1989) Force system developed by V bends in an elastic orthodontic wire. American Journal of Orthodontics and Dentofacial Orthopedics 96: 295-301