Non-Extraction Therapy of Class II/1 Malocclusion Using Quick Self-Ligating Brackets and Orthodontic Miniimplants – Case Report

Abstract

The paper presents a case of Class II/ division 1 malocclusion, treated without extraction. Quick self-ligating brackets and miniimplants were used to shorten the treatment time and provide absolute anchorage for the en masse distal movement of teeth. Miniscrews were maintained firmly throughout the therapy. Self-ligating brackets seem to be a promising solution, reducing a frictional resistance and shortening treatment and chairside time. Orthodontic miniimplants provide an absolute anchorage – their ability to distalize the teeth without adverse reciprocal movement is especially important in non-extraction treatment of Class II malocclusion. Such therapy requires posterior movement of the upper teeth, anterior movement of the lower ones or a combination of both. Described approach involving self-ligating brackets and miniimplants seems a promising, effective and well-tolerated solution in non-extraction treatment (Dent. Med. Probl. 2009, 46, 3, 365–370).

Key words: class II/1 malocclusion, self-ligating brackets, orthodontic miniimplants.

The prototype of self-ligating brackets was Russell Lock, described for the first time in 1935, however the low-friction systems were subjected to many modifications in contemporary orthodontic treatment. Currently self-ligating brackets can be divided into active – with a spring clip, that presses actively against the archwire, and passive ones with a slide [1, 2]. In some clinical studies shorter treatment time was reported: decreased number of follow up visits and reduced chair-side time when comparing with conventional treatment involving standard brackets [3–5]. On the other hand, similar efficiency in providing torque for upper incisors was noticed in both systems [6]. Nonetheless, most studies emphasized in vitro reduction of friction force in self-ligating systems if
comparing with conventional ones, which is very important feature especially during levelling phase and in sliding mechanics with extraction approach [7–12].

Method for obtaining maximum anchorage has been searched in orthodontics for many years. In 1997 Kanomi published a case report with orthodontic miniplants – titanic screws [13] and since that time many new anchorage systems were launched on the market. They can enable correction of anterior-posterior dimension (anterior teeth retraction, posterior teeth protraction, molar distalization in distal occlusion) or vertical one (molar-intrusion in open bite malocclusion, incisor-intrusion in deep bite). Miniscrews may be also applied whenever dental displacements are essential, as well as in pre-prosthetic therapy. Miniplants can be divided into two types: self-tapping and self-drilling ones [14]. In Titan® system, 1.7 mm diameter conical self-tapping miniscrews of two lengths: 6 mm in mandible and 8 mm in maxilla are the most common. Insertion procedures include local anesthesia, 3–4 mm vertical incision of mucosal membrane and preparation of the locus for miniscrew, with a pilot drill directed at 90º towards alveolar process, spinning at 500 rounds per minute, with massive cooling using 0.9% NaCl. The best area to insert miniplants is located vestibularly, between the roots of second bicuspid and first molar in maxilla and between the roots of first and second molars in mandible. Evaluation of inserted miniscrews may be obtained via periapical radiograms taken in different projections. Miniimplants may be loaded immediately after insertion, however two-week postponement is suggested due to healing of soft tissues. Removing of screws succeeds debonding: elements of temporary anchorage devices may be removed in local anesthesia [15].

In the presented case, two modern techniques were applied: both self-ligating brackets and miniimplants, enabled en masse distalization achieved faster with no adverse side-effects.

### Case Report

Patient S. K. was a 15-year-old adolescent individual referred to the Department of Orthodontics and Dentofacial Orthopedics with the diagnosis of Class II division 1 malocclusion. The analysis of photographs (transfrontal and retrognathic profile), diagnostic models (overjet – 9.2 mm; overbite – 3.9 mm) and cephalometric variables (<1+: 34.0º; <1+; NB = 31.2º; <1+; 1– = 108.4 º; 1+: NA mm = 7.8 mm; 1–: NB = 8.8 mm; 1+: NPg = 14.4 mm) showed the need for extraction treatment, subsequently negated by the parents. Functional test: forced advancement of the mandible was positive. Non-extraction treatment was planned, utilizing Quick self-ligating brackets and 4 miniimplants. The appliances were bonded in both dental arches, in November 2007. The archwire sequence was following: .012 NiTi, .016 × .022 NiTi, .016 × .022 S.S. (Posted). Stripping of lower incisors was also performed. In June 2008, two 8 mm miniimplants Titan® were implanted in maxilla between teeth 15, 16 and 25, 26. Subsequently, two miniscrews (6 mm long) were inserted in the mandible between the second premolar and the
first molar in both quadrants. Indirect anchorage in the lower arch was obtained due to the stiff connection – via. $0.016 \times 0.016$ S.S wire – of miniscrews and bands on the lower first molars serving as the attachments for Class II elastics. After 2 weeks and, once the soft tissues healing process was over, the miniimplants were loaded with NiTi coil springs, expanded between miniimplants and posted $.016 \times .022$ S.S. basic archwire in the upper arch (force 150 G) and Class II 3/16” elastics were used from the hooks of posted archwire to the hooks on the bands on lower first molars. After 10 months of treatment Class I relationships on molars and canines were regained. In October 2008 $.016 \times .022$ anty-Spee archwires were used in upper and lower arch with vertical 5/16” medium elastics in anterior segment to deepen the overbite. Transitional open bite in this case was the side effect of torque play; even the largest diameter of archwire ($21 \times 25$) engaged in $.022$ slot of self-ligating brackets with an active clip still allows slight
torque-loss. This effect may by avoided if TAD-s are in high position, however this is not always achievable due to anatomical limitations; furthermore – as proved by the evidence – TAD-s placed high in maxilla in Caucasians are more susceptible to instability. The miniplants were maintained firmly during the treatment. The case is currently in finishing phase.

**Discussion**

Class II can be corrected with 4 methods: 1) growth modification, 2) teeth movement, camouflage maxilla disproportion (orthodontic camouflage), 3) combination of both methods, 4) orthognathic surgery in conjunctive orthodontic-surgical treatment [16].

Treatment of the presented case started after pubertal spurt; furthermore, parameters of cephalometric radiogram and the positive result of functional test called for orthodontic camouflage. Conventionally, treatment of Class II with co-exciting crowding requires evaluation of incisor placement in their basal bones, as well the assessment of the profile-type, prior to choice of either extraction or non-extraction approach. The treatment of Class II division 1 malocclusion usually involves extractions: removal of two upper premolars followed by canine distalization and en masse retraction which requires maximum anchorage [17]. However, firm refusal of either the patient or his parents to be subjected to extraction approach, forced the clinicians to choose non-extraction protocol. As reported in the literature [18], treatment of Class II malocclusion without planned removing of teeth requires distal movement of the upper teeth, mesial movement of the lower ones or combination of both displacements what was reached in the presented case. Typically, distalization of molars pro-
ceeds further distal displacements of adjacent upper teeth. Distal movement of terminal molars can be achieved applying extraoral appliance, such as headgear [19] or with intraoral appliances; the latter ones require intra- and intermaxillary or absolute anchorage. Management of different conventional devices serving as intramaxillary anchorage reinforcement is widely known: removable upper plate with distalizing spring/screw or permanent appliance with magnets, superelastic Niti wires, NiTi or TMA springs, Keles Slider, Jones Jig, Distal Jet, Pendulum should be listed as the efficient tools for anchorage reinforcement [20–23]. Intermaxillary, mutual anchorage is best exemplified in MALU [24] and Herbst appliances [25] or Carriere Distalizer [17], however their basic disadvantage — requirement of periodontal support for settlement overloads ones teeth and they are exposed to undesirable displacements called jiggling. Elimination of the described iatrogenic adverse side-effects can be achieved only with palatal implants and miniscrews, which play the role of resistant units for orthodontic force [26]. Mini-implants provide skeletal anchorage and they are used in 28.5% cases to correct Class II malocclusion, of all cases treated with miniscrews [27].

The authors concluded that non-extraction therapy of Class II/1 malocclusion using self-ligating brackets and orthodontic miniscrews seems a promising, effective and well-tolerated modern treatment modality. Distalization en masse and low-friction system shorten the active treatment time. Excluding of ligatures also facilitates proper oral hygiene.

References


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