Miniscrews—a focal point in practice

Six-part series by Dr Björn Ludwig, Dr Bettina Glasl, Dr Thomas Lietz, & Prof. Jörg A. Lisson—Part IV

Clinical examples (2)
Repositioning individual teeth

The straightening of mesially tipped (2nd) molars in a full dentition represents a therapeutic challenge. The treatment is further complicated if the tooth is not only tipped but also partly impacted. The presence of a non-erupted third molar does not simplify the process (Fig. 1a). When planning the required appliance, it is important to consider whether it is necessary, for example, to reshape the entire dental arch (Figs. 1a–d) or just upright the tipped tooth. If miniscrews with bracket heads are used, it is possible to employ a special NiTi uprighting spring (such as the Memory Titanol spring, FORESTADENT). A standard multi-bracket appliance can be used to reshape the dental arch. At the same time, a second force element can be applied with the aid of a miniscrew and an uprighting spring (Figs. 1b–d). This avoids the loss of anchorage that inevitably occurs when only an uprighting spring is fixed to the multi-bracket appliance (Fig. 2). The straightening of an individual tooth may become necessary for periodontological, prosthetic or orthodontic reasons. This is a very simple procedure if a miniscrew and uprighting spring are used, and the appliance remains invisible to the observer. The tooth need only be fitted with an appropriate attachment system that makes it possible to fix this to the uprighting spring. Depending on how the spring is applied, this can lead to an open bite in the region of the anterior teeth and premolars. Miniscrews provide the definitive form of anchorage for the alignment of displaced teeth (Figs. 5a–c). If sufficient space is available, brackets will not be needed in the initial phase of treatment.

Alignment of retinacted teeth

The alignment of retained or displaced teeth, particularly in the case of canines, is one of the most common forms of surgical intervention in the field of orthodontic techniques. Numerous appliances are available—rubber bands, springs, orthodontic chains—that are effective to a greater or lesser extent. All these mechanisms have the same underlying problem: the neighbouring teeth must be used—directly or indirectly—to provide an anchorage, so that the required traction forces can be applied. Ideally, the neighbouring teeth will offer the greater resistance so that only the retained tooth moves. Realistically, however, both components tend to move towards each other. In the worst-case scenario, only the group providing anchorage is displaced from its original position. This can occur if there is ankylosis of the retinacted tooth, something that is difficult to evaluate during initial examination. If an attempt is made to move an ankylosed canine towards insufficient dental anchorage, the result will be...
stable methods of acquiring more transverse space in the upper jaw. The targeted screw rate should be in the range of 0.2 to 0.6 mm/day. As a rule, the appliance is fixed by means of bands to the molars and premolars. The desired transverse width can generally be achieved within 10 to 20 days. Thereafter, a three-month stabilisation phase should be observed, in order to allow ossification of the ruptured palatine suture. The standard anchorage technique with dental support only has several disadvantages. The most significant is the risk of tipping the anchor teeth. Many appliances have been described that distribute the force over more than one tooth. A further problem is apparent here: as it is necessary to leave the appliance in place for a longer period after the active phase, it is only possible to commence further corrective treatment for teeth in the anterior region. It is possible to overcome these problems by using the ‘hybrid RPE’ (Figs. 4-6). Bands are employed as usual in the molar region. In the anterior region, the RPE appliance is fixed using two miniscrews. These should be placed on a notional transverse line connecting the canine/ premolar contact points paramedially. Distraction is achieved using the same method as in standard techniques. There are several advantages to hybrid RPE. Preparation of the apparatus is much simpler and cheaper, whilst the dental arch, including the premolars, is accessible for additional tooth correction measures.

Class II corrections

In the case of patients with Class II malocclusion who have completed or are near completing their growth phase, simple techniques for the forward positioning of the lower jaw are usually ineffective. Following a thorough initial examination and diagnosis, there are three possible therapeutic approaches: camouflage, fixed Class II correctional appliances (Herbst splint, Sabbagh Universal Spring, FMA, Jasper Jumper etc.) or orthognathic surgery. The patient must be informed of the advantages and disadvantages of each approach. All fixed Class II

Fig. 9: The use of miniscrews to attach intermaxillary rubber traction bands means that no other attachments to the teeth are necessary.

Figs. 10a–d: Missing tooth 12 is to be replaced by an implant-based crown. The initial phase of treatment involves widening the gap (a). The head of the vertically inserted OrthoEasy screw (b) is used to anchor a provisional crown (including bracket), which serves to widen the gap further (c).

Figs. 6a–d: Bilateral cross-bite in a seven-year-old boy (a). X-ray of the hybrid RPE appliance in situ (b). Status after ten days’ use: cross-bite has disappeared and vertical bite has remained stable (c, d).
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Correctional appliances—irrespective of whether these use the Herbst splint or canted plane principle—have the same problem and the same undesirable side effects. There is a risk of protrusion of the lower frontal teeth and/or distalisation of the upper molars. By means of passive stabilisation with the aid of two miniscrews (Figs. 7 and 8), these effects can be readily avoided.

Orthognathic surgery

After surgical intervention to relocate or reposition the jaw (for orthodontic or traumatological reasons), it is important to maintain a stable correlation between bone fragments and the jaw in the postoperative phase. This promotes healing and prevents relapse. The occlusion appliance is fixed intraorally, using intermaxillary elastic or wire ligatures, depending on the situation. It is essential to use the appropriate fixing options, whether this is a splint (Schuchardt splint) or a multi-bracket appliance. Where these are really only needed in one jaw or jaw section, the question arises of whether, in the era of the miniscrew, it is necessary to involve the other jaw in the stabilisation of the surgical effect. If miniscrews are used in the opposing jaw (Fig. 9), the same effect is achieved—but with considerably less restriction from the point of view of the patient.

Pre-prosthetics

It is the aim of pre-prosthetic orthodontics to position the teeth optimally for the subsequent prosthesis. This can include intrusion, uprighting, and the opening or closing of gaps, amongst other techniques. As this series and many other publications have already shown, miniscrews are particularly useful in this context. Miniscrews can also be used as anchoring elements for a provisional prosthesis. Where teeth are missing (particularly the second canines, Fig. 10a) and the growth phase is not yet completed, the fitting of an intermediate prosthesis is problematic. As an alternative, particularly where additional anchorage is required, miniscrews can be used. A longer screw (8 or 10 mm) can be inserted in the centre of the dental ridge (Fig. 10b).

Outlook

The clinical use of miniscrews supports a wide range of tasks. Dental repositioning that was previously deemed impossible becomes achievable, whilst possible repositioning techniques are improved and supported. In order to achieve this, miniscrews alone are not sufficient; an appropriate range of equipment is also necessary.

Several suppliers of miniscrews offer, in addition to screws and insertion tools, a number of devices that facilitate the use of miniscrews. The fifth part of this series will focus on the wide range of useful auxiliaries that are available.

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Editorial Note: The next edition of Dental Tribune India will feature part V of this article.