Miniscrews—a focal point in practice

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Clinical examples (1)

**Horizontal tooth displacement**

Lack of space is one of the main reasons for the oblique positioning of teeth. One way to solve this problem is to create the necessary space. Conversely, premature loss of teeth or anatomical abnormalities may result in gaps that require modification for various reasons. For the correction of horizontal tooth displacement, miniscrews can be used, as these produce no undesirable reactive effects.

**Distalisation**

The first case (Figs. 1a–c) presented involves a frequently encountered problem: the patient’s molars had migrated in a mesial direction. This resulted in a marked loss of space in the region of the canines. The two treatment options in such a case are extraction or distalisation. In this case, distalisation was a viable option and extraction was unnecessary. Conventional techniques for distalisation (apart from the use of headgear) require support from other groups of teeth. Creating anchorage in this way has negative reactive effects. In the example under consideration, it is highly probable that protrusion of the anterior teeth would have resulted, should a conventional method for distalisation have been employed. Such negative results can be avoided by the use of miniscrews.

Miniscrews can be inserted in the vestibular and—as in this example—palatal areas. Vestibular insertion of a miniscrew (e.g. between the premolars) is always associated with the miniscrew’s eventual interference with tooth migration. When this occurs, the miniscrew must be extracted and a conventional form of anchorage/blocking (e.g. a ligature) must then be used. In this case, the presence of the primary molars represented a contraindication for insertion on the vestibular side of the premolar region. The paramedian insertion of two miniscrews has several advantages. Firstly, the miniscrew does not interfere with the basic basis for anchorage of the distalisation appliance. Secondly, they will never impede the movement of the lateral teeth. Even after successful molar distalisation, they can be used to stabilise the situation achieved for the remainder of the treatment. Thirdly, there is no risk of damaging other teeth because of an unfavourable spatial situation and/or incorrect insertion.

One disadvantage of the coupling necessary between the Walde Frog Appliance used (FORESTADENT) and the miniscrews (see Figs. 1a–c) is that cleaning becomes difficult. As large areas of the mucous membrane are covered, there is the risk of the development of peri-mucositis. If this develops further into peri-implantitis, premature loss of the miniscrews could result. A possible future alternative could be the use of ‘laboratory abutments’ (Figs. 2a–d), which contain no plastics and can be used to couple the appliance with the miniscrews entirely bioclinically.

**Mesialisation**

One of the most problematic areas of orthodontic therapy is the correction of the anterior displacement of teeth, and particularly of jaw segments. It could seem that the availability of miniscrews means that conventional appliances no longer need to be used at all. However, depending on the baseline situation and the nature of the required correction, the use of a combination of devices and appliances is recommended. This is often advisable and may even be necessary for biomechanical reasons, such as in a Class III situation. In the case shown in Figures 3a to c, forced transverse expansion of the palatine suture was used in combination with mesial traction, applied by means of a Delaire facial mask. The support provided by two miniscrews inserted in the paramedian region redirected the forces of sagittal and transverse movements almost entirely onto the bones. Dental side effects were interception of the opposing forces is a major consideration within the therapeutic strategy. The orthopaedic closure of dental spaces using miniscrews is highly recommended if:

- there are no alternative, viable conventional methods and/or there is insufficient certainty that these will be effective;
- the extensive use of braces is to be avoided for cosmetic or functional reasons;
- a short-term treatment or partial treatment is required that does not involve correction and realignment of the basic dental arch;
- asymmetrical treatments are associated with the risk of midline displacement and the possibility of compensatory extraction;
- or a suitable dental baseline situation is to be created for pre-prosthetic treatments.

It is important to note that in cases in which space closure treatment is proposed, it must be ensured that the patient is aware of not only the costs and risks of the treatment, but also of the available alternative options, such as the use of bridges or implants. There are three types of space closure.

**Anterior space closure (e.g. in displacement of the lateral incisors)**

Orthodontic space closure is frequently indicated if there is a gap in the anterior row of teeth, particularly in the region of the lateral incisors. The undesirable effects of conventional thera- peutic techniques are the displacement of the midline and/or negative inclination of the anterior teeth. If miniscrews are used for the stabilisation of the median incisors (Figs. 4a–c), such effects can be avoided. A stable, rigid steel arch with a size of at least 0.48 mm by 0.64 mm (19 x 25) attached to two miniscrews inserted in the

**Space closure**

Owing to the availability of miniscrews, new therapeutic techniques can now be used, particularly for the management of the partially edentulous situation that obviates the need for compensatory extractions and the problem of the loss of stability of the units used for anchorage support. It is here that the effect of Newton’s Third Law is particularly apparent, and the

**Figs. 1a-c:** Distalisation of the upper molars. Mesial positioning of teeth 16 and 26, showing clear displacement of the canines (a). Walde Frog Appliance (FORESTADENT) anchored to two miniscrews (b). Distalisation by approx. 6 mm after three months’ treatment, providing sufficient space for the correct repositioning of the canines (c).

**Figs. 2a-d:** Distalisation of the upper laterals. Miniscrews were inserted in the paramedian region (FORESTADENT) (a). OrthoEasy with attached laboratory abutments (b). The Frog Appliance was fixed to the laboratory abutments (c). Lateral X-ray showing the ideal positioning of miniscrews, laboratory abutments and Frog Appliance (d).

**Figs. 3a–c:** Mesialisation of the upper molars. Miniscrews inserted in the paramedian region with laboratory abutments (FORESTADENT) and transverse screw with hook for a Delaire facial mask (a). Status after transverse expansion and formation of a median diastema (b). Extra-oral view of the appliance with a Delaire mask (c).

**Figs. 4a–c:** Space closure in the region of the upper anterior teeth. Dia-gram showing the anchorage principle (a). Baseline situ-ation: The central front teeth were held in place using a steel arch (19 x 25) fixed to a miniscrew with additional frontal dental torque (b). After nine months the anchorage is stable (c).

**Figs. 5a–c:** Space closure in the region of the upper anterior teeth. En masse retraction with the aid of miniscrews and a Power Arm (FORESTADENT), which has been cramped here (a). Status after extraction of the premolars, showing OrthoEasy miniscrew (b). The Power Arm is used as a sliding mechanism, in order to distalise the canine further (c).
Vertical tooth displacement

Any displacement of the teeth along the vertical axis can present a cosmetic and/or functional problem. The solution is extrusion or intrusion using skeletal anchorage. This technique is very simple to implement and very cost-effective.

Extrusion

Extrusion using mini-screws may be used for single teeth (Figs. 7a–c) and for groups of teeth (Figs. 8a & b). Trauma had caused the intrusion of tooth 22 (Figs. 7a–c). The tooth was returned to its original position within three months by means of the indirect anchorage of tooth 25 to a miniscrew using a straight wire appliance. In the case of a bite that exposed tongue and bone (Figs. 8a & b), the approach adopted was to provide transverse expansion and extrusion of the anterior teeth. Intermaxillary rubber traction braces connected to mini-screws in the lower jaw were used. If the braces had been connected to the lower anterior teeth, undesirable extrusion of these would have resulted (every action has an equal and opposite reaction). Because of the small root surface, this process would have occurred in a much shorter space of time than in the case of the upper anterior teeth. The opposing bone in the lower jaw prevented this undesirable reactive effect.

Intrusion

This open bite with extrusion of the tongue (Figs. 9a & b) was treated by means of intrusion of the molars and consequent caudal rotation of the maxilla. Mini-screws were inserted in the first and second quadrants in each case between the canine and the first premolar. A Titanol Uprighting Spring (FORESTADENT) was attached to the capstan of the mini-screw, and the screw was set to intrude. There was even some overcorrection of the positioning of the first molars on both sides after five months’ intrusion, resulting in closure of the frontal bite.

Conclusions

It may be necessary for therapists to overcome logistical and emotional barriers before they can begin to employ mini-screws, but it is only when they are used that their versatility becomes apparent. Mini-screws make our routine work that much simpler. They enhance the efficiency and effectiveness of many dental appliances, resulting in an overall improvement in treatment quality.