After removal of the screw, the dental arch can be reshaped using a conventional technique (b, c) months without reactivation of the arch section (c, d).

Figs. 4a–e: Obtaining additional transverse space by means of ‘hybrid RPE’. The initial diagnosis is an asymmetrical narrow jaw with insufficient space for tooth 13 (a). After fixture of the brackets, two mini-screws (OrthoEasy) were inserted during the same session (b). The hybrid RPE appliance was attached to the mini-screws and molar bands using laboratory abutments (FORESTADENT; c). The diastema shows the effect of the appliance after ten days’ use (d). Status after transverse expansion and concurrent reshaping of the dental arch (e).

Clinical examples (2)

Repositioning individual teeth

The straightening of mesially tipped (second) molars in a full dentition represents a therapeutic challenge. The treatment is further complicated if the tooth is not only tipped but also partially 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, FORSTADENT). 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 periodontal, prosthetic or orthodontic reasons. This is a very simple procedure if a mini-screw 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 set, it is even possible to achieve intrusion or extrusion of the tooth. This form of treatment is inexpensive for the patient and the orthodontist will find it highly effective.

Alignment of retained 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 archwires—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 anchorage for the retained or displaced teeth (Figs. 5a–e). If sufficient space is available, brackets will not be needed in the initial phase of treatment.

Figs. 5a–e: The alignment of a displaced canine using a miniscrew. After the canines have been exposed, they are attached to a bracket by means of a miniscrew (a). After removal of the screw, the dental arch can be reshaped using a conventional technique (b, c). Status after transverse expansion and concurrent reshaping of the dental arch (d). Skeletal adjustments

Palatine suture expansion

Rapid palatal expansion (RPE) is one of the most effective and 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, at least one 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). Banda 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 paramedi- nally. 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 faster, whilst the dental arch, including the premolars, is accessible for additional tooth correction measures.

Class II corrections

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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.

**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 intra-oraly, 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-arch appliance. Where these are really only necessary in one jaw or jaw section, the stabilisation of the surgical bone fragments and the jaw in the opposing jaw (Fig. 9), the same effect is achieved—but in the opposite jaw (Fig. 10a) 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 & 8), these effects can be readily avoided.

**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. Mini-screws can also be used as anchoring elements for a prosthetic prosthesis. Where teeth are missing (particularly the second canines, Fig. 11a) and the growth phase is not yet completed, the fitting of an interme-

diate 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). There should be at least 1 mm of bone to the mesial and distal sides of the miniscrew. The hole for the insertion of a miniscrew (1.6 mm) should thus be at least 2.6 mm. A provisional crown can then be mount-
ed onto the head of the mini-
screw. If necessary, a bracket can be fixed to this crown (Fig. 10c).

**Outlook**

The clinical use of mini-
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