Miniscrews – a focal point in practice

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

Therapeutic auxiliary elements

Down in the jungle

The number of dental suppliers worldwide that offer miniscrews has expanded to an estimated 45 and this number is still growing. Two trends are apparent from the range of products that are currently available. There are companies that supply miniscrews only in combination with the required insertion instruments. However, miniscrews are only a means to an end where bone anchorage is concerned—an aspect that is far too often overlooked. This is because if the desired therapeutic outcome is to be achieved, appropriate auxiliary devices must also be used (e.g. springs, elastic chains, wires). For the purpose of a treatment, this means that a range of suppliers must be approached in order to obtain all the elements required for the actual procedure. A potential problem under these circumstances is that the miniscrews and the auxiliary elements may be incompatible. Very few suppliers of miniscrews also offer a complete system. Such a system consists of diagnostic and therapeutic auxiliary products, in addition to miniscrews (Table 1). In the case of a complete tailored appliance from the various elements. The greater the range of auxiliary elements that is available, the more freedom and flexibility these elements afford in a range of applications.

Fig. 3a–c: When a wire is to be bent at right angles in the screw slot (a), the edges at the point of crossover must be rounded. This convenient detail is currently only found in the FORESTADENT OrthoEasy (b) and the tomas-pin from DENTAL.BIM (c).

Auxiliary elements for direct chairside use

These auxiliary elements can be divided into three main groups:

• basic elements;
• semi-finished elements; and
• finished elements.

Classification is determined by the extent to which the user has to process or manipulate the element before it can be used.

Basic elements

These consist solely of orthodontic wires (particularly wires with square profiles but also those with round profiles) of various grades and materials. The wires are used to fashion individual auxiliary elements, which can be more or less time-consuming depending on the type of appliance required. The wires (particularly those made of stainless steel) are quite reasonably priced. Round profile wires are mainly used as ligatures, in other words, simply as fixing elements, but if appropriately twisted, they can also be used for traction purposes (Fig. 1). Three-dimensional monitoring of round profile wires is not possible as they offer little resistance to torque. Square profile wires, however, can be subjected to 3-D inspection because they are torsion free and highly stable and provide (depending on their dimensions) for a very rigid attachment between miniscrew and appliance (Fig. 2). It is advisable to use a grade of wire that fills the slot of the miniscrew.

In some cases, it may be necessary to bend a square profile wire. This can be an antagonistic mesialisation when a hook can be provided on the pin for attaching a spring or

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Table 1: There are at least 45 companies that manufacture or supply miniscrews. However, only 13 of these offer auxiliary elements for use in orthodontic treatments that are compatible with their own screws.
Nature knows best.

Millions of years of evolution went into refining the protein systems that stabilise and transport calcium and phosphate essential for the growth and health of our teeth and bones. Whether it is the protein carrier systems for bone growth or enamel formation, or statherin in saliva or casein in milk, they all share a common ancestry**: evolution and natural selection have refined and perfected these systems. Cows’ milk remains the most efficient carrier of calcium and phosphate, and the specific peptide which so elegantly and efficiently transports these essential minerals is called RECALDENT™ CPP-ACP (casein phosphopeptide amorphous calcium phosphate).

No other system comes close to matching what nature has developed.

elastic chain and for attachment to the main arch of the appliance. For this purpose, the wire should be bent at a right angle. Bent wires can also be used in another situation. A ligature or a drop of adhesive is used to fix a square profile wire in a mini-screw slot. Depending on the reciprocal forces and the quality of fixation, the wire (square or round profile) can start to slip within the slot. This can readily be prevented by bending the wire, at least if a pin with a cross-slot is used (Fig. 5a). In these two situations, however, a grade of wire that fills the slot can only be used if the edges of the slot at the point of crossover are removed.

There are three companies that offer pre-prepared wire elements, such as the L and U wires (FORESTADENT) and the tomas T wire (DENTALB). These elements facilitate the attachment of bands and brackets (Fig. 7a). The tomas T wire (Fig. 7b) with its three arms provides for a wide range of possible application combinations. For the purpose of mesialisation, for example, one arm can be bent to form a hook. Another can be attached to the main arch by means of a cross tube. Another variant devised by Dr. S. Baumgartel is the fixation of the anterior teeth to a paramedian mini-screw (Fig. 7c).

### Finished elements

This group covers a whole range of auxiliary products for use in many different applications (Table 3). All of these require little or no time for preparation and can be used directly without adaptive adjustments. However, these products are also accordingly priced relative to type and grade of finish.

#### Crimpable hooks

For the purposes of En Masse Retraction, it is often an advantage when the forces provided by the spring or elastic chain is applied at the same level as the centre of resistance. This can be readily implemented using ready-made hooks, which are crimped to the arch of the appliance (Fig. 8).

#### Compression springs

Compression springs are also ready-made elements and are sold by the metre. The springs can be used for distalisation and mesialisation. One problem is ensuring continuous activation as the spring effect is lost. Stop elements can be incorporated to avoid needing to remove the whole appliance whenever this happens (Table 5). These are available as crimpable elements and as screw stops. The latter have the advantage that they can be quickly adapted to a wide range of situations. When such stops are used, the effort required for the repeated activation of springs is considerably reduced.

#### Coiled springs

Coiled springs are not new in the field of orthodontic treatment. They are generally too small to be attached to miniscrews (Fig. 7b). A firm attachment to the screw head can only be achieved using ligatures or ready-made hooks that allow attachment of the spring to the head. For this reason, several suppliers now offer coiled springs (Table 5) with at least one eyelet that is compatible with the head of their mini-screw (Fig. 8). These springs are generally made of NiTi and can be used in many different applications. New on the market are the Nokodens springs (Fig. 9a). These flat coil springs made of NiTi were originally developed for the alignment of displaced canines. However, they

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### Table 2

<table>
<thead>
<tr>
<th>Finished elements which need to be individually adjusted</th>
<th>Element</th>
<th>Device</th>
<th>Application</th>
<th>Characteristics</th>
<th>Product name</th>
<th>Available for</th>
<th>Example applications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Power arm</td>
<td>T-MS</td>
<td>For Manual Retraction</td>
<td>Campanile bends as a result of the force of the head. They can be used in certain situations to isolate the main arch and the orthodontic appliance</td>
<td>t-MS</td>
<td>Cystore®</td>
<td>Distalisation, En Masse</td>
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### Table 3

<table>
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<th>Finished elements which can be directly used</th>
<th>Element</th>
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<th>Application</th>
<th>Characteristics</th>
<th>Product name</th>
<th>Available for</th>
<th>Example applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression spring</td>
<td>Compressible spring</td>
<td>OrthoLock Closed Spring</td>
<td>Orthodontic Mini Implant</td>
<td>Coiled coil compression spring</td>
<td>OrthoLock Closed Spring</td>
<td>OrthoLock®</td>
<td>Distalisation, En Masse</td>
</tr>
</tbody>
</table>

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*Figures 7a–c: Using the L-anchor (FORESTADENT), it is possible to attach a mini-screw to a bracket or hand piece (a). With all three arms (b), the tomas T screw (DENTALB) can be used to create a wide range of attachments between a screw, an MB-appliance or the tooth itself (Photo: Dr. F. R. Baumgartel, USA).*
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have also since been found to be effective in intrusion and En Masse Retraction treatments (Fig. 9b).

Elastic chains are widely used traction elements. In contrast with NiTi springs, however, these rapidly lose their effectiveness. For this reason, a chain is only placed around the head of a miniscrew so that it can be more easily removed later. Depending on head design and the direction of the force applied, it is possible for the chain to become accidentally dislodged from the screw head. This problem can be avoided by the use of ready-made hooks (Table 5) that can be attached to the head of the screw.

Sliding hooks

Sliding hooks with a welded arm for attaching springs (Table 5) are an equally familiar piece of equipment. They are experiencing something of a renaissance in connection with the use of miniscrews. They are used for En Masse Retraction, mesialisation and distalisation. The effect of a sliding hook is determined by many different factors, which is why the value of attaching sliding hooks to the arch is disputed.

Auxiliary elements for laboratory use

All the elements discussed above can be prepared and inserted, with varying amounts of time expenditure, directly at the chairside. In recent years, the range of applications for miniscrews has also been extended to skeletal adjustment treatments, such as palatine suture expansion (see Dental Tribune Asia Pacific, 5(2009)) or the use of slings (Fig. 9a).

The following auxiliary elements are of particular importance and are described below.

- Hooks for intrusion and En Masse Retraction (b).
- Elastic chains are widely used for En Masse Retraction, intrusion, and En Masse Retraction, and experience something of a renaissance in connection with the use of miniscrews. They are used for En Masse Retraction, mesialisation and distalisation.
- Sliding hooks with a welded arm for attaching springs (Table 5) are an equally familiar piece of equipment. They are experiencing something of a renaissance in connection with the use of miniscrews. They are used for En Masse Retraction, mesialisation and distalisation. The effect of a sliding hook is determined by many different factors, which is why the value of attaching sliding hooks to the arch is disputed.

Conclusion

Depending on the task at hand, it may be necessary to use various auxiliary elements. Most of the connection elements discussed are not new and have already been used successfully in orthodontic treatment for some time. For this reason, most of them will already be available in every practice, but often not where they should be. In order to be effective and not waste time searching for them, the use of auxiliary elements has also been extended to skeletal adjustment treatments, such as palatine suture expansion.