Basics on the OrthoEasy® System

FORESTADENT®
GERMAN PRECISION IN ORTHODONTICS

Contents

Acknowledgements:
We wish to express our gratitude to Drs Björn Ludwig and Bettina Glasl, as well as the team in Traben-Trarbach for their professional support, correction of the texts and for providing the clinical images.

Foreword

OrthoEasy® – it‘s all in the name. Easy to use and a manageable number of components – that is OrthoEasy®, the complete programme for skeletal anchorage. Well proven in practice, the use of this system allows successful solutions for the numerous orthodontic treatment challenges which were unthinkable previously or only difficult to realise.

With systematically arranged tips, this brochure demonstrates how the OrthoEasy® system can be integrated into daily practice routines successfully and used clinically. The prime focus is on newcomers to the skeletal anchorage technique using miniscrews. But users who have gained first experiences with this system are also bound to find the occasional tip for their daily work. Maybe the following pages may even motivate adding a treatment method hitherto not applied to your own therapeutic spectrum.

All illustrations are arranged in the logical order of treatment with miniscrews, whereby the information on the various aspects of employing skeletal anchorage using OrthoEasy® pins is presented as briefly as possible and in a practice-relevant way. All the knowledge and years of experience resulting from daily work with miniscrews can be found in condensed form in this brochure. It must however be noted, that this is not intended as a scientific abstract. We have purposely omitted quotes and references. Nonetheless, many of the statements reflect practical experience and insights from the literature and have been confirmed in daily use. This brings us full circle. However, those interested in further literature can find it in the service section of the OrthoEasy® CD.

Enjoy reading!
Your FORESTADENT Team

1. Basics on the insertion of OrthoEasy® pins

What are the basics for the successful insertion of OrthoEasy® pins?
To achieve high primary stability during insertion, the site of insertion must offer sufficient bone and the screw head must be positioned in the area of the attached gingiva.

According to which criteria is the suitable pin to be selected?
The selection of the most suitable OrthoEasy® pin depends on the space available locally. Accordingly, three different pin lengths are available:

- ***6 and 8 mm:*** *for vestibular use in maxilla and mandible as well as the anterior palate*

- ***10 mm:*** *for bicortical anchorage in the mandible, edentulous alveolar ridge.*

Two requirements need to be fulfilled for a miniscrew to function successfully as an orthodontic anchoring element:

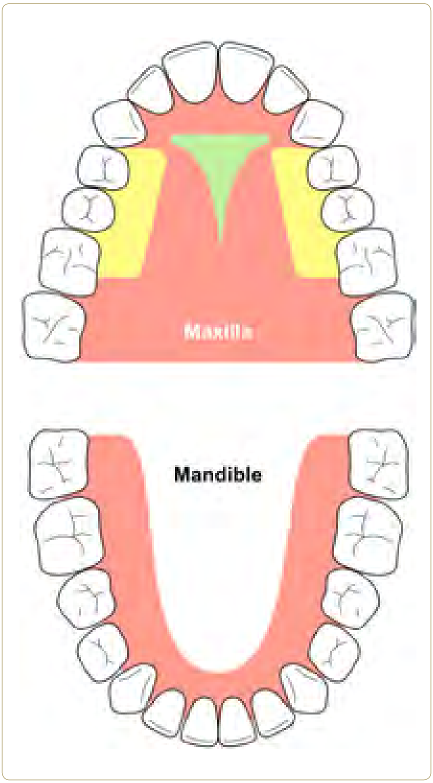
- *The screw needs to have firm anchorage in the bone. (primary stability)*

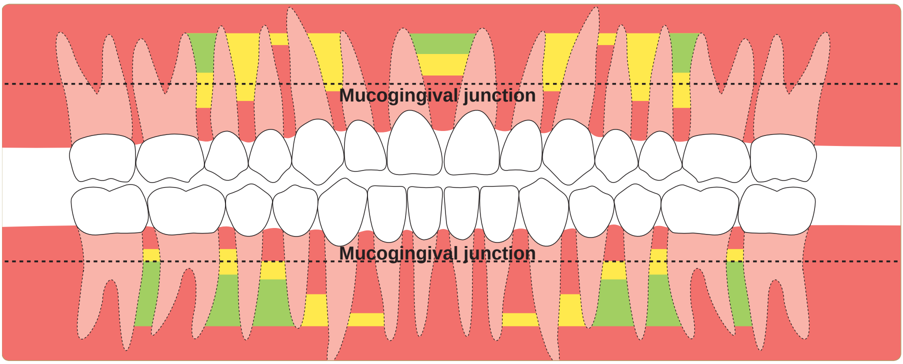
- *For insertion on the vestibular side, the head of the screw must lie in the region of the attached gingiva (Gingiva alveolaris).*

The available bone and localisation of the attached gingiva result in non-critical, critical, as well as unsuitable areas for insertion.

If these requirements are not observed, partial or complete failure is preprogrammed.

- *non-critical, low loss rate*
- *critical, pronounced loss rate*
- *unsuitable, very high loss rate*





Localisation of areas which are non-critical, critical and unsuitable for insertion of miniscrews.

1. 1. Anchorage in the bone

The following factors are of significance for primary stability and thus immediate loading:

The bone volume

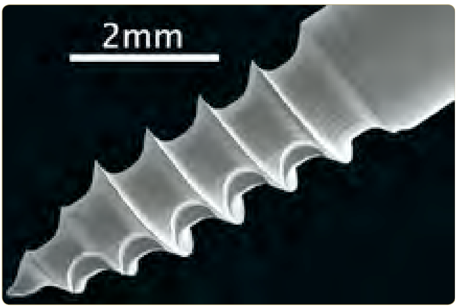
Miniscrews should be surrounded by a circle of at least 0.5 mm of bone. However, this is only of importance for interradicular insertion, as there is sufficient bone available for the other insertion sites (anterior palate, edentulous alveolar ridge). For interradicular insertion, a distance of at least 3.1 mm (Fig. 15 and 16) between the roots is necessary. This value is calculated from the diameter of the miniscrew (thread of the OrthoEasy® pin Ø 1.6 mm), the circle of required bone volume (2 x 0.5 mm) and the neighbouring periodontal gaps (2 x 0.25 mm). The depth of bone volume depends on the length of the OrthoEasy® pin plus 1 mm.

Thickness of the cortical bone

The length of the screw is not the deciding factor for bone stability, this is primarily the thickness of the cortical bone. This correlates with bone quality. During insertion, attention needs to be paid to not inserting the OrthoEasy® pin too deep, so that the thread is always placed in the more or less thin cortical bone. Bicortical anchorage is an option (see chapter 3.3. Movement of individual teeth – mesialisation) for certain indications.

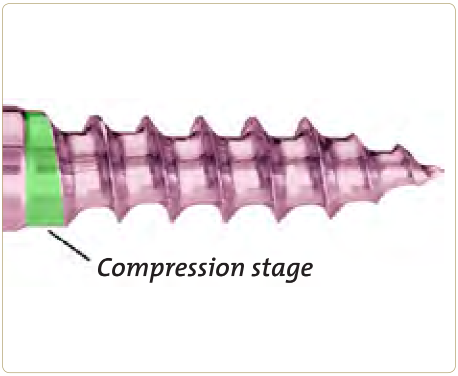
Thread design

The self-drilling Shark thread of the OrthoEasy® pin cuts a new thread into the bone respectively. This provides harmonious insertion torque, reduced bone pressure and better primary stability.



The compression stage

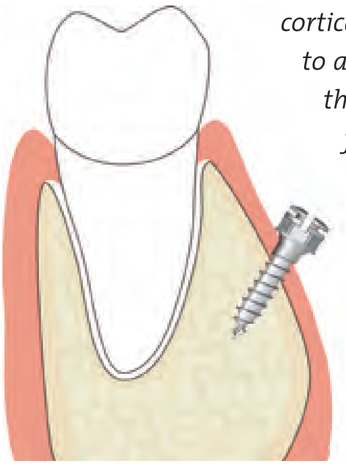
OrthoEasy® pins have a compression stage. This conical extension from the thread to the neck enters the bone. Increasing compression results in resistance to screwing in. This can be felt. This avoids the risk of the screw not biting, or at least minimises it.



1.2. The position of the screw head

The head of a miniscrew should be placed in the region of the attached gingiva. Otherwise complications, such as mucosal overgrowth, inflammation or loss, are bound to occur.

The width of attached gingiva is often only low in the mandible (ffi 7 mm). In such cases, insertion of the screw parallel to the occlusal plane may prove problematic. There is either insufficient space between the teeth or the bone volume is insufficient and the screw does not have enough retention. In such circumstances the screw needs to be angled accordingly, a) to stay in the attached gingiva, and b) to obtain somewhat more anchorage in the cortical bone. During insertion one should take care to align the head of the OrthoEasy® pin such, that the wires, springs etc. can be fixed securely and fulfil their function. The insertion instruments for the OrthoEasy® pin have laser markings which indicate the position of the slot (see chapter 2.1. The insertion technique).



1.3. Choice of OrthoEasy® pins

The OrthoEasy® pin is available in three lengths. The maximum shaft diameter for all three lengths of the OrthoEasy® pin is 1.7 mm in the compression stage. The outer diameter tapers slightly to ffl 1.6 mm in the direction of the screw tip.

The selection of the length depends on the space available locally. The following indications have proven themselves in practice:

- ***6 and 8 mm:*** *for vestibular use in maxilla and mandible as well as the anterior palate*

- ***10 mm:*** *for bicortical anchorage in the mandible, edentulous alveolar ridge.*

The planning model gives the information for determining the length of the OrthoEasy® pin for insertion on the vestibular side. First the thickness of the alveolar ridge needs to be measured in the direction of insertion. And unless there are patient-related data available, subtract 2 mm for the vestibular gingiva (GV) and 1 mm for the oral gingiva (GO) from this value (C). This gives some indication of the probable bone thickness (A).

$$A = C - (GO + GV)$$

If the screw is only be anchored monocortically, 1 mm is subtracted from the calculated value for bone thickness (A). This provides the information for the maximum length of the screw.

If the OrthoEasy® pin is to be used for constructing a four-point mechanism, then the pin must protrude by approx. 2 mm from the oral mucosa (see also chapter 3.3 Mesialisation). For this variant one adds 2 mm to the thickness of the model (C) and this gives the length of the pin.

Perforation on the oral side also has another advantage. The oral cortical bone offers additional – and thus bicortical – anchorage for the screw. However, this is a special variant of bicortical anchorage, as normally the oral periosteum is not perforated for bicortical anchorage.

For the insertion of OrthoEasy® pins at the anterior, central palate, cephalometric radiography (CR) is used to determine the length. Depending on bone volume, the OrthoEasy® pin with 8 mm length is usually used here.

Insertion at anterior palate

There is sufficient bone at the anterior central palate of the upper incisors in direction of the root tips.

2. Insertion of OrthoEasy® pins

What needs to be observed when screwing OrthoEasy® pins into bone?
The OrthoEasy® pin should be screwed in with a feel for bone and material to achieve the necessary primary stability. The thread of the OrthoEasy® pin should be surrounded by at least 0.5 mm of bone. For interradicular insertion, a distance of at least 3.1 mm between the roots is necessary.

Which insertion sites can be expected to provide high success rates?
The following insertion sites have proved to be successful:

- ***Maxilla vestibular***
  Interdental spaces 4/5; 5/6 near the mucogingival line:
  edentulous jaw sections and the anterior, paramedian area of
  bony palate in the area of the transversal line between 3/4.

- ***Mandible vestibular***
  Interdental spaces 4/5; 5/6, 6/6 near the mucogingival line,
  edentulous jaw sections.

As a rule of thumb for vestibular insertion: place the miniscrew as far as possible posterior and apical. The former for biomechanical reasons, the latter, to have sufficient space between the roots, to achieve high primary stability and to be as close as possible to the centre of resistance.

2.1. The insertion technique

Before going into details of the various, site-related insertion techniques, some important basic information is given which applies to all techniques.

Anaesthesia

Anaesthesia of the mucosa and the periosteum at the site of insertion is quite sufficient. In interradicular insertion this has the advantage that the sensitivity of the periodonteum is retained fully. This means that the patient is able to feel if the miniscrew enters the immediate vicinity of the periodontal pocket. The contact of a miniscrew with a root during the insertion process can be detected in vitro by an increase in torque. In vivo however, the practitioner can hardly notice this change when inserting a miniscrew. But the patient feels the contact of pin and root. In such cases, remove the pin and insert at another site.

Pre-drilling

The OrthoEasy® pin belongs to the group of self-drilling miniscrews. This means that pre-drilling is not necessary for insertion. The screw tip and the thread shafts are manufactured such that they cut (drill) into the bone during screwing in. The OrthoEasy® pin can be loaded immediately after insertion in case of sufficient primary stability. The necessary primary stability at the potential insertion sites is largely achieved by compression of the peri-implant bone due to the small shaft diameter (max. 1.7 mm) and the bone quality. Part of the required bone volume would be lost by pre-drilling. This is the reason for refraining from pre-drilling. The thickness of the cortical bone at the sites suitable for insertion is considerably less than 1.5 mm. These thin bone layers do not represent a problem for the self-drilling threads of the OrthoEasy® pins.They drill their own way without problems.

Placing the pin on the OrthoEasy® blade

The blades (for manual and mechanical insertion) have two opposite laser markings at the slot for the pin. When retaining the OrthoEasy® pin by placing the blade on the pinhead, the laser marking should be aligned with a slot. The slot position is therefore always visible during insertion. This allows exact alignment of the screw without having to remove the insertion instrument. This avoids the otherwise necessary repeated placing and removing of the blade to check the slot position. This has a positive effect on primary stability, as each manipulation of the inserted pin can lead lead to damaging micro-movement.

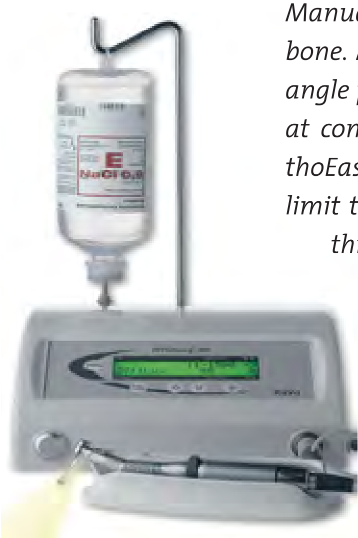
Instrumentation

Short and long blades are available for screwing in the OrthoEasy® pins. The torque necessary for this purpose should not exceed 20 Ncm. This could otherwise lead to overloading of the bone or to breaking of the pin.

The torque (M) is the product of force (F) and distance (s): M = F x s. If the force is increased and the distance (length of the blade) remains constant, this results in higher torque. If the force remains constant and the distance is changed (shorter or longer blade), then torque is either reduced or increased. This means that high torques can be achieved requiring little force using the long blades and the standard OrthoEasy® screwdriver handle (Order-No. 1199-0002). Sensitive handling is therefore essential during insertion.

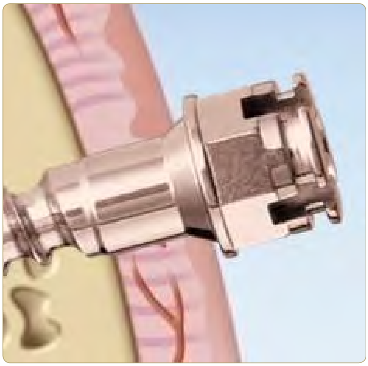
Manual and mechanical insertion

The screw must be screwed in using slight and even torque, smooth movements and continuous force at a maximum of 30 rpm. Fluctuations in torque and interrupted or inconsistent turning widen the bone site and may reduce primary stability. The mechanical load during insertion must be compensated by the OrthoEasy® pin and the surrounding bone. Overload may lead to fatigue failure of the screw and traumatization of the bone.



Manual insertion offers a better feeling for screw and bone. Mechanical insertion requires a motor and an angle piece which allow very low revolutions (25 rpm) at constant torque. To avoid overloading of the OrthoEasy® pin during insertion, it should be possible to limit the torque (20 Ncm) of the drive unit. As a rule this is only the case in appropriate surgical units.

2.1.1. Depth of insertion



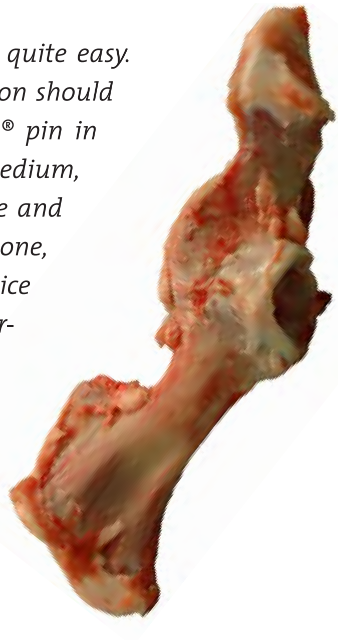
Ideally the rim is positioned at the transition between transgingival neck and the octagonal head of the OrthoEasy® pin slightly above the gingival level, and the last convolution of the thread at the transition to the neck (compression stage) is still in the area of the cortical bone. This is important as the retention of a miniscrew depends largely on its anchorage in the cortical bone. For this reason the transgingival neck of the OrthoEasy® pin has a height of 1.85 mm. The gingiva is generally thicker at the suitable sites for insertion. One can therefore assume that the last convolution or the compression stage will always be in the cortical bone. If the mucosa is thicker than 2 mm, the thread is completely in the cortical bone.

	Maxilla							
Gingival thickness	2,2	2,5	2,3	2,1	1,9	2,0	2,2	2,0
Mucogingival junction	8,3	8,1	7,9	8,1	8,1	8,0	7,9	4,6
Bone >3,1 mm	13,5	8,0	8,5	13,0	13,5	8,0	8,5	13,5
Approximal space	6/7	5/6	4/5	3/4	3/4	4/5	5/6	6/7
Bone >3,1 mm	5,0	5,5	7,0	10	10,5	7,0	6,0	5
Mucogingival junction	7,3	7,4	7,3	7,2	7,4	7,3	7,2	7,5
Gingival thickness	2,2	1,9	1,5	1,7	2,0	2,0	2,2	2
	Mandible							

critical, pronounced loss rate   *unsuitable, very high loss rate*

Table 1: Determination of the approximal contact point.

2.1.2. Notes for new users



Screwing a miniscrew into the bone is actually quite easy. However, beginnings are always difficult. Insertion should be practiced before placing the first OrthoEasy® pin in patients. The pelvic bone of a pig is a suitable medium, as this offers different strengths of cortical bone and bone quality. One soon develops a feel for screw, bone, instruments and insertion technique. This practice does not take up much time and offers considerable learning experience. This training provides first experience and more confidence for the first insertion of an OrthoEasy® pin in a patient If the orthodontist is unable to place the OrthoEasy® pin himself, for whatever reasons, then the only option is to refer the patient to an experienced colleague (implantologist or oral surgeon). The orthodontist should always specify the exact site of insertion.

2.1.3. Notes for experienced implantologists & oral surgeons

With its function as skeletal anchorage, the miniscrew plays an important role in the biomechanical concept of orthodontic therapy. For this reason, the orthodontist selects a specific site of insertion and passes this on to the oral surgeon. If, during insertion, it turns out that the selected site is not possible, then the alternatives need to be found together with the orthodontist.

Those who have already placed numerous endosseous implants will, of course, have appropriate experience and a feel for bone and insertion techniques. However, the insertion of a miniscrew must not be performed the same as for placing an implant. Pre-drilling is not required. At 20 Ncm, the torque for miniscrews is considerably lower than for endosseous implants (> 30 Ncm). As a rule, the critical moment is when the OrthoEasy® pin has reached the correct insertion depth. For endosseous implants, tight turning attempts to provide *secure retention in the bone. For miniscrews this runs the risk of screwing the miniscrew too deep into the bone. In this case the last convolution of the thread is no longer in the cortical bone. The screw can start slipping in the bone and will be lost within a short space of time.*

2.2. Insertion – vestibular/interradicular

The site of insertion is determined following the above requirements and the following parameters. For the vestibular side, it is a rule of thumb to place the miniscrew posterior and apical as far as possible. Firstly, for biomechanical reasons and to obtain sufficient space between the roots, and secondly, to achieve high primary stability and to be as close as possible to the centre of resistance. The clinical and preclinical findings determined during the planning for orthodontic treatment are sufficient to determine the site of insertion. New diagnostic options for three-dimensional imaging of orofacial structures (CT, DVT) are not necessary. However, if such data are available for other reasons, the three-dimensional images should, of course, be used. Conducting a CT or DVT only to determine the site of insertion for a miniscrew is an inappropriate and unjustified expense.

2.2.1. Vestibular side – selection of insertion site

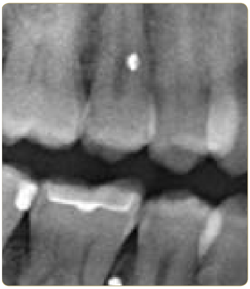
Interradicular placement on the vestibular side may be the most common site of insertion, but it is not necessarily the most convenient, at least not in the maxilla. In the maxilla, one should always check whether the biomechanical concept permits insertion in the anterior, central palate. For the mandible there is no alternative.

For interradicular insertion of a miniscrew on the vestibular side, only a narrow corridor is available (see above). Limitations are given by the cervical to apical course (invisible) of the crestal bone ridge and the (visible) course of the mucogingival line. From mesial to distal, the space is determined by the distances between the tooth roots to each other which increase apically. For this reason one should insert the OrthoEasy® pin apically as far as possible – taking into account the mucogingival line. Also to be taken into account are malpositions and the planned direction of movement of the teeth, which could affect the space between the roots. A distance of at least 3.1 mm is necessary to provide safe insertion between the roots.

The reference point for the bone and mucogingival line values is the approximal contact point. Two examples to illustrate this work are in table 1. If a screw is to be placed in the maxilla in the approximal area 5/6, then sufficient space between the roots (> 3.1 mm) is first found at a distance of 8 mm from the approximal contact. The screw is positioned directly at the mucogingival line, as the average distance from the contact point to the flexible oral mucosa is 8.1 mm. With a distance of 5.5 mm to the contact point, there is sufficient bone in the mandible in the approximal area 5/6. The mucogingival line is still 2 mm apart. The data in the table represent the results from investigations of 80 patients. As these are average values, they can only serve for orientation purposes. When planning with two-dimensional x-rays (see page 11) it is essential to take the magnification factor into account.The individual findings to be taken into account as part of planning, are decisive.

2.2.2. Using the x-ray pin

There are numerous aids for finding, marking and transferring an insertion site. These can be self-bent wires such as an x-ray pin. Of all the aids, this is the simplest and quickest.

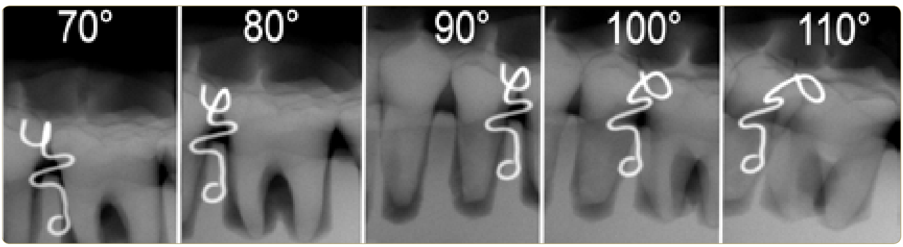


False negative result in maxilla

Generally, the first x-ray images are disillusioning. Although the aid for finding the position for the miniscrew was in the right position, according to the x-ray there should be a root. What is the reason for this? All aids have the same difficulty. They project into the desired area but cannot, or only occasionally, actually be seen at the potential site of insertion. A second x-ray - which would not be acceptable for reasons of radiation protection - would be unlikely to provide a better result.

What is the reason? All types of x-ray aids can lead to visual distortion, be it due to the position of the x-ray tube, the x-ray object and x-ray film or x-ray sensor to each other. When evaluating the x-ray image this needs to be taken into account to avoid false positive or negative results. True representations are strokes of luck!

The clinical findings are always decisive for the placement of a miniscrew. The x-ray image can only serve as orientation!



The images on the phantom skull clearly show: if the focus, the object to be X-rayed and the X-ray film are angled at 90° to each other, then true conditions are displayed. Deviations greater than 10° lead to false positive results.

Distance on X-ray image (mm)	Distance in reality (mm) taking into account various magnification factors.			
	1,1	**1,2**	**1,3**	**1,4**
1,0	0,91	0,83	0,77	0,71
1,5	1,36	1,25	1,15	1,07
2,0	1,82	1,67	1,54	1,43
2,5	2,27	2,08	1,92	1,79
3,0	2,73	2,50	2,31	2,14
3,5	3,18	2,92	2,69	2,50
4,0	3,64	3,33	3,08	2,86
4,5	4,09	3,75	3,46	3,21
5,0	4,55	4,17	3,85	3,57
5,5	5,00	4,58	4,23	3,93
6,0	5,45	5,00	4,62	4,29
6,5	5,91	5,42	5,00	4,64
7,0	6,36	5,83	5,38	5,00
7,5	6,82	6,25	5,77	5,36
8,0	7,27	6,67	6,15	5,71
8,5	7,73	7,08	6,54	6,07
9,0	8,18	7,50	6,92	6,43
9,5	8,64	7,92	7,31	6,79
10,0	9,09	8,33	7,69	7,14
10,5	9,55	8,75	8,08	7,50
11,0	10,00	9,17	8,46	7,86
11,5	10,45	9,58	8,85	8,21
12,0	10,91	10,00	9,23	8,57
12,5	11,36	10,42	9,62	8,93

The only possible benefit of such x-ray images is to have a reference object for calculating the dimensions. Objects always appear magnified on x-ray images! This needs to be taken into account for planning. The following overview serves to determine the true distance in relation to the distance measured on the x-ray image and the magnification factor of the x-ray equipment.

2.2.3. Vestibular side – Screwing in the OrthoEasy® pin

Screwing in can be done either manually or mechanically. The OrthoEasy® pin is pierced through the mucosa into the bone. Only once resistance of the bone is felt, is the pin aligned in the direction of insertion and screwing in commenced. Initially this requires slightly greater force on the tip of the OrthoEasy® pin and the first convolution of the thread to find traction for anchorage in the bone. As soon as the thread finds traction, force is hardly required any more, as the self-drilling thread cuts well through the bone. Once the pin is inserted, the blade is removed by retraction from the screw head in axial direction. The correct depth of insertion needs to be observed (see also chapter 2.1.1. Depth of insertion).

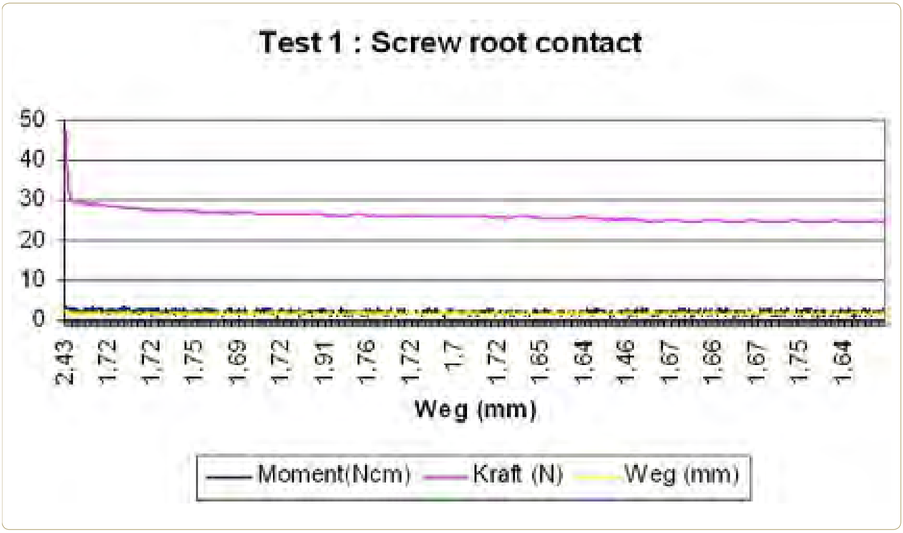
2.2.4. Protection against root injuries

Despite precise planning and careful insertion, contact of the pin with the tooth root cannot be excluded completely during interradicular insertion. This can be avoided fairly easily by selection of an insertion site which offers at least 3.1 mm of space. Further, it must be attempted to to gain a dimensional impression of the insertion region on the basis of available data as well as inspection and palpitation. In particular in the maxilla, the arches of the alveoli (juga alveolaria) can be palpated vestibularly and give good orientation on the position and direction of the neighbouring roots. Once the OrthoEasy® pin penetrates the mucosa and touches the bone, the direction must be checked prior to screwing in and corrected if necessary. A change in direction is not possible after a few turns of the pin into the bone.

If contact with the root remains undetected, this has two consequences. The connective tissue and the root surface are damaged. This is generally viewed as the worst complication, but it is not. Numerous histological studies, as well as clinical studies, have shown that the connective tissue regenerates fully after removal of the screw (restitutio ad integrum).

This type of contact with the root has far worse effects on orthodontic treatment, as the screw is usually lost prematurely. The reason is physiological movement of the teeth. Each mastication and even every pulse beat lead to micro-movement of the tooth in the alveole. This effect may even be exaggerated *under circumstances by micro-movement generated directly by elements connected to the pin, such as springs or elastic chains. These minimal deflections of differing origin can be transmitted to the miniscrew depending on the size and location of the contact surface to the screw. This permanent micro-movement repeatedly interferes with the integration and regeneration process of the peri-implant bone which is required for providing secondary stability. During the first weeks after insertion, primary stability decreases anyway and is replaced by increasing secondary stability.If this process is permanently impaired by micro-movement transmitted from the tooth or the appliance to the miniscrew, this will result in premature loss of the screw.*

Direct insertion of an OrthoEasy® pin into the root is not possible. The screw tip was designed such that it cuts through the bone without causing problems. However, it is not able to penetrate root dentine. The diagram opposite illustrates the attempt of screwing an OrthoEasy® pin frontally through the bone into the root. Initially this requires considerable force to drive the screw tip into the bone. Once the thread attains traction, less force is required. After approximately 1.7 mm a plateau is reached - the screw tip touches the root surface. Despite constant force (rotation of the insertion instrument) the OrthoEasy® pin no longer penetrates any deeper – i.e. into the root. The overall distance travelled with the screw (given on the abscissa) is merely 0.08 mm from the first contact of the screw tip with the root to the end of this trial! This is less than the width of a hair and clear evidence that it is quite difficult for the tip of the OrthoEasy® Pin to penetrate the root.



If one wants to avoid the problems associated with interradicular insertion, an option is the placement of the OrthoEasy® pin in the central, anterior palate, at least in the maxilla. The assumption being that the biomechanical concept can accept this.

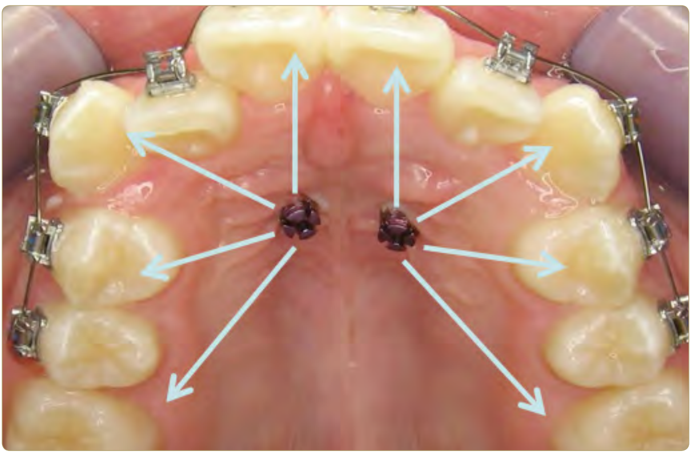
2.3. Insertion – palatinal

2.3.1. Insertion site – anterior palate

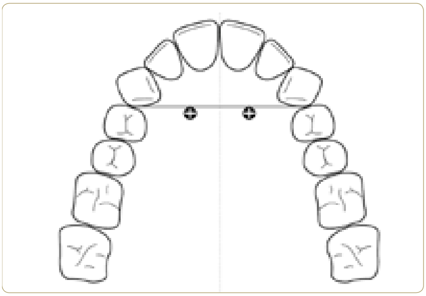
The anterior, central palate is the ideal location for placing OrthoEasy® pins and associated with correspondingly high success rates. In terms of quality and quantity, the bone offers good conditions for secure retention of the screw. There is no risk of damage to roots. The main benefits however, apply to treatment per se. For example, the frontal dental arch can already be formed during distalisation of the first molars using the skeletal Frog appliance. This reduces the time required for treatment. For more information please see chapter 3.4.3. Frog appliance - application.

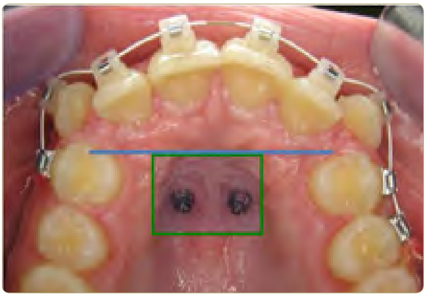
Compared with the placement of a miniscrew on the vestibular side, a palatinal inserted screw is never located in the direction of tooth movement, as may be the case for distalisation, and certainly for mesialisation. As a consequence, the miniscrew can remain in situ throughout the entire treatment period and need not be removed in between. This saves the patient translocation of the screw, which may prove necessary on the vestibular side.

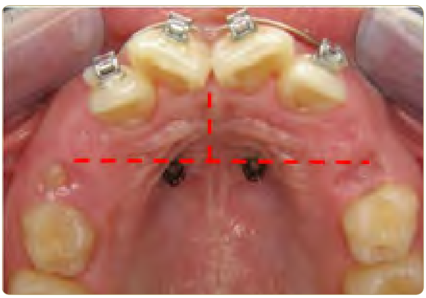
The number of OrthoEasy® pins necessary depends on the treatment objective and the appliance, but two pins should be placed to be on the safe side.



Paramedially placed pin







Two Ortho-Easy® pins are to be placed for distalisation using a skeletal Frog appliance or palate extension. Finding the site of insertion is very simple. The central palatal suture and the transversal connecting line of teeth 3/4 serve as orientation. If these teeth do not exist, use the papilla and find the insertion line 8 to 9 mm distally. The soft tissue margin is always the overriding aspect. One should always remain close behind the pair of rugae. The pins are placed on the transversal line 3 to 6 mm paramedian.

If two OrthoEasy® pins are required, the distance between them must be at least 8 mm. This is necessary to ensure sufficient space for the laboratory abutments and the appliance later.

2.3.2. Anterior palate – Screwing in the OrthoEasy® pin

Insertion at the anterior, central palatal region should only be done mechanically. The use of an angle piece ensures best access to the anterior palate. A screwdriver is not suitable for this insertion site.

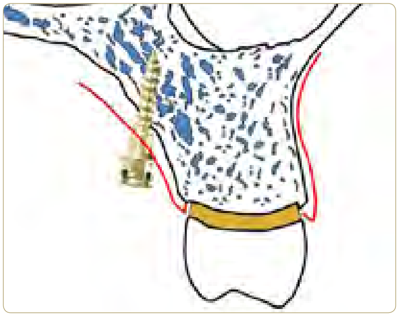
The OrthoEasy® pin is pierced through the mucosa into the palate at the planned site of insertion. Only once resistance of the bone is felt, is the pin aligned in the direction of root tips of the first incisors and the motor started. Initially this requires slightly greater force on the tip of the OrthoEasy® pin and the first convolution of the thread to find traction for anchorage in the bone. As soon as the thread finds traction, force is hardly required any more, as the self-drilling thread cuts well through the bone. Once the pin is inserted, the blade is removed by retraction of the screw head in axial direction. The correct depth of insertion needs to be observed (see also chapter 2.1.1. Depth of insertion).

2.4. Unsuitable insertion sites

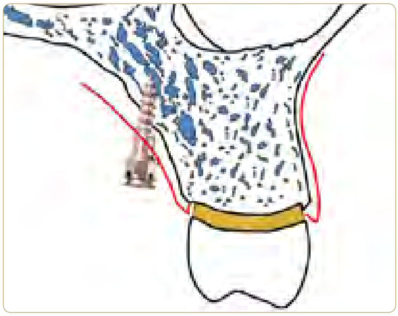
All insertion sites marked yellow in the illustrations are only of limited suitability for the placement of a miniscrew. This is confirmed by a considerable loss rate. The areas marked in red are unsafe as insertion sites and therefore not suitable. The loss rate can be up to 100%. The retromolar region and the lingual side of the mandible are also unsuitable for the insertion of miniscrews. Insertion in the vicinity of extraction wounds, tooth follicles and primary teeth is also problematic.

2.4.1. Posterior palate

Insertion is problematic due to the profile of the palate, the thickness of the gingiva in this region and the proximity to the area affected by the Arteria palatina major and the Nervus palatinus major.



This starts with selecting the right screw length and insertion angle. Presumably most complications in this area are due to the fact that the portion of the screw in the bone is less than the portion protruding from the bone.



This results in unfavourable leverage, which eventually leads to a loss of the screw.

2.5. Removal of the OrthoEasy® pin

The OrthoEasy® pin can be removed without anaesthesia. After disassembling the connecting elements from the head of the pin, place the blade and turn to the left. On the vestibular side, the OrthoEasy® pin is unscrewed manually from the bone. Removal of the pin inserted in the palate again requires the use of the angled piece.

Depending on how well the pin is integrated in the tissue, unscrewing may prove slightly difficult initially. After rotation of approx. 5°, the OrthoEasy® pin can then be unscrewed easily from the bone. The residual hole does not require further wound treatment. As a rule, the defect in the mucosa is already closed within two days.

3. Accessories for treatment

Is therapy more efficient?

The laws governing biomechanics and the movement of teeth are, of course, not changed by the use of OrthoEasy® pins, however, they can be applied more favourably in terms of therapeutic success and more efficient treatment due to skeletal anchorage.

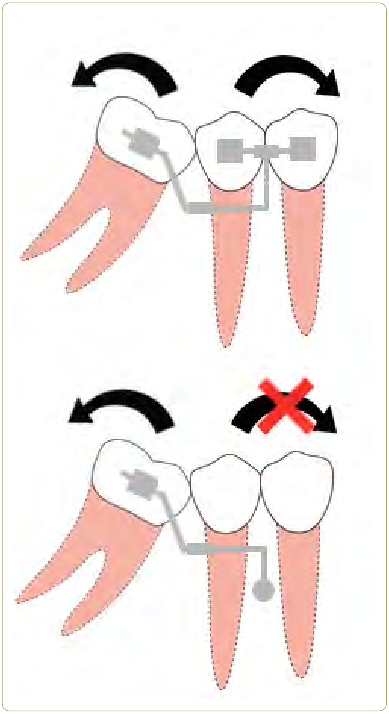
What are the advantages of using OrthoEasy® pins?

The use of OrthoEasy® pins as rigid anchorage point avoids undesirable reciprocal tooth movement. This becomes very obvious when using the Memory Titanol® spring for uprighting teeth, the Frog appliance for distalisation and the Snap Lock Expander for the transversal expansion of the palatal suture.

***Which appliances are predestined for** combination with OrthoEasy® pins?*

OrthoEasy® pins serve as skeletal anchorage for the movement of individual teeth or groups of teeth and for skeletal changes. This broad spectrum of indications leads to a multitude of applications. The use of OrthoEasy® pins avoids undesirable reciprocal tooth movement.

There are a number of tips and tricks for each of these treatment variants. As these would exceed the constraints of this small guide, the comments will be limited to examples with only selected appliances.



3.1. Biomechanical aspects

Next to the anatomical conditions, the site of insertion and the type of connection (direct/indirect) between miniscrew and appliance, biomechanics play an important role for the treatment success or treatment progress.
Biomechanical considerations on the treatment necessary are required as part of therapeutic planning and thus also the determination of the insertion site. The biomechanics for the individual treatment tasks is multi-faceted, highly complex and always individual. For this reason only a few selected basics can be presented in the following.

3.1.1. Appliances

There are a number of appliances whose efficacy can be improved considerably by skeletal anchorage using OrthoEasy® pins. For this to be possible, the user needs to be aware of how the appliance functions, which direction the teeth will follow, and where there could be problems during use. Tension springs are a simple example. They can be used for mesialisation or distalisation. For this to function, they require the appropriate tension. If a spring of 12 mm length is used and if the distance between the anchorage and the attachment point of the spring is only 14 mm, the effect will quickly be cancelled.

3.1.2. Direct connection

Direct connection means that the active element (spring, rubber chain, T-loop) is only attached to the miniscrew and the relevant tooth. This results in a two-point mechanism. The effects will therefore always only take place between the connected tooth and the miniscrew, regardless of which active element is concerned. The remaining tooth arches are free for other treatment measures. This permits the fitting of two independent force-transmitting systems and helps to save time. For example, a bilaterally placed tension mechanism can serve for gap closure in the molar region. Using a multiband appliance, corrections to the anterior region or the counter-lateral posterior region can be carried out simultaneously.

However, the disadvantage of direct connection is that the load of the active element is focused solely on the screw and this must absorb all reciprocal forces. Depending on the load characteristics (permanent or intermittent) this can lead to micro-movement, especially during the first few weeks. If the amplitude exceeds 50 - 150 µm, this leads to a loosening of the screw.

3.1.3. Indirect connection

In indirect connection, a tooth or a group of teeth are retained in position using the OrthoEasy® pin. This allows the movement of other teeth against this anchorage block with reciprocal movement. This is absorbed by the screw and the attached anchorage block. By distributing the forces over the teeth and the skeletal anchorage, the load on the miniscrew is lower than for direct anchorage. For such anchorage tasks, the screw should be in the proximity of the tooth to be anchored to keep the distance as short as possible to prevent a long lever. The connection between the teeth and the screw should be as rigid as possible. Three variants are available:

Round wires – Ligatures

In the case of Class II appliances, changes in the lower anterior region are an undesirable side effect. This can be avoided by anchoring the lower anterior teeth with OrthoEasy® pins. When using the Easy-Fit Jumper, a coiled round wire connects the anchor tooth with the OrthoEasy® pin. The reciprocal forces emanating from the appliance are thus absorbed via the OrthoEasy® pin (see figure above).

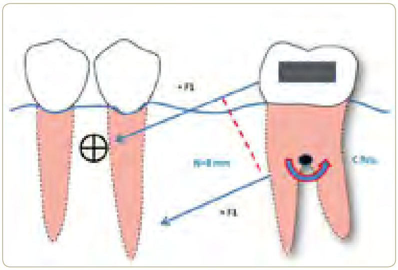
Rectangular wire

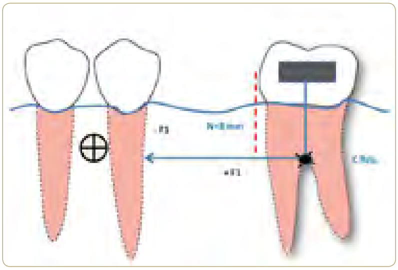
For anchoring individual teeth, rigid anchorage can be achieved using an OrthoEasy® pin and a rectangular wire. A precondition is that steel arch wires are used with dimensions of 0.48 mm x 0.64 mm (19 x 25) or 0.53 mm x 0.64 mm (21 x 25). The connecting wire can be attached to the tooth with adhesive bond. Transpalatinal bars

Transpalatinal Bar

The transpalatinal bar enables extremely rigid anchorage if it is connected to two OrthoEasy® pins. The connection between the delicate heads of the OrthoEasy® pins and the bar is achieved using a laboratory abutment. The transpalatinal bar is welded to this.

3.1.4. Horizontal and vertical movement of teeth





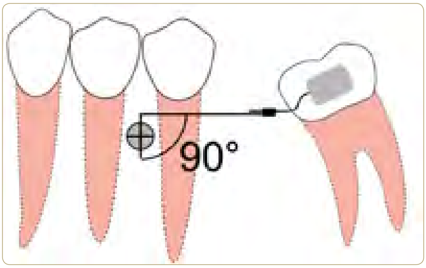
If teeth are to be moved physically in the horizontal or vertical direction, the point of force should always be near the centre of resistance. An eccentric point of force will always lead to tilting. The further removed the point of force from the centre of resistance, the more the tooth can tilt. The point of force can, for example, be shifted by using customised power arms or by shifting the appliance. The unilateral application of force, which is unavoidable for two-point mechanisms, will inevitably not only lead to inclining, but also to rotation of the tooth involved. Such movement is generally undesirable for gap closures. This can only be avoided using a four-point mechanism.

In the case of gap closures, this means that a suitable tension mechanism is required not only vestibularly, but also orally. You can find more details in chapter 3.3.2. Space Jet - fitting. The same principle applies to intrusion. Here too, a purely vestibular force approach will lead to tilting in this direction. This undesirable side effect can be avoided by using a palatinal counterbalance.

3.2. Movement of individual teeth – uprighting

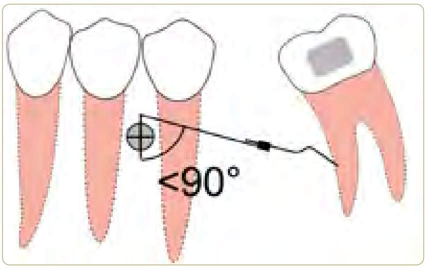
3.2.1. Memory Titanol® spring- indication and components

The uprighting of inclined teeth, primarily among molars, can be done extremely efficiently using the Memory Titanol® spring and an OrthoEasy® pin placed between the lower first and second premolar (fig. 32). The Memory Titanol® spring consists of a superelastic nickel-titanium spring and a steel wire. Depending on the adjustment of the spring, uprighting can be combined with intrusion or extrusion. The nickel-titanium spring is responsible for uprighting. The steel wire can contain additional information:

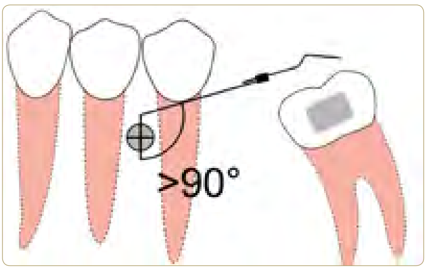


Steel wire – without information: uprighting only.

Cave: extrusion is expected.



Steel wire – angled in apical direction: uprighting with intrusion.



Steel wire – angled in coronal direction: uprighting with extrusion.

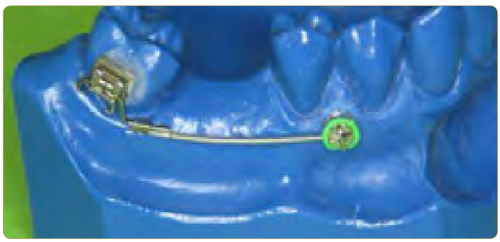
The two wire elements of the Memory Titanol® spring are connected with each other via a 2 mm long cross tube. The nickel-titanium spring can be moved along this cross tube and fixed by compressing the tube in the desired position. The Memory Titanol® spring is available for the 22 and 18 technique.

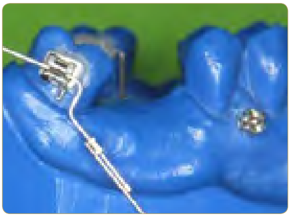
A variant is also available which fits into the auxiliary slot of the self-ligating Quick Bracket. For the application shown here, a Memory Titanol® spring for the 22 technique is used as the OrthoEasy® pin has a 22 slot.

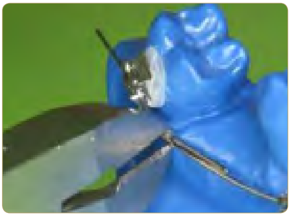
3.2.2. Memory Titanol® spring - fitting

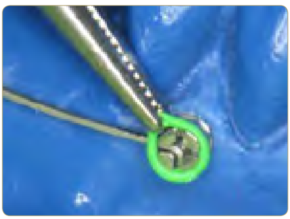
The inclined molar can either be managed conventionally using a band with welded tube, or with a bonded tube. Depending on various circumstances, such as tooth structure, fit of the bonded tube, strength of bond and transmitted forces, the bonded tube could disengage from the tooth. By shifting the nickel-titanium spring in the cross tube, its effect can be altered. If the nickel-titanium spring is positioned as far as possible into the tube, the alpha and beta moments will attain maximum values.

By retracting the nickel-titanium spring from the tube, the alpha and beta moments are reduced, as well as the intruding or extruding force.









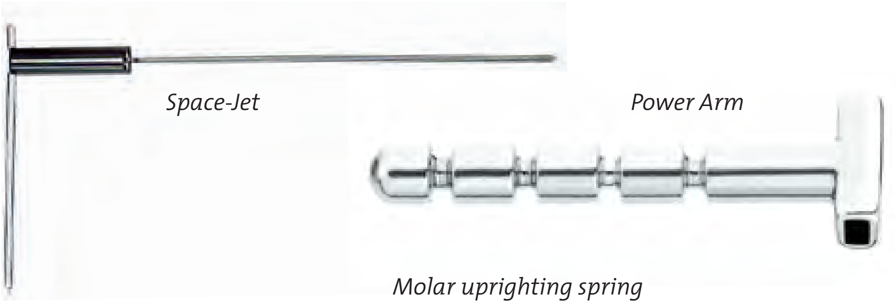
The nickel-titanium spring is to pushed into the main slot of the tube and the steel wire to be placed in the horizontal slot of the OrthoEasy® pin. The position of the nickel-titanium spring is fixed by crimping the cross tube. Then the spring and steel wire are to be shortened. When shortening the nickel-titanium spring, the expected movement of the tooth should be taken into account. To protect the cheek and to prevent the nickel-titanium spring from slipping out, the distal end is bent in the cervical direction. The steel wire is shortened and bent such that it lies in the horizontal and vertical slot of the OrthoEasy® pin. Then it is secured in the sagittal and vertical direction. To prevent the steel wire from slipping from the slot of the OrthoEasy® pin in buccal direction, place a rubber ring in the retention groove on the pin head.
The described procedure is available as video on the OrthoEasy® CD.

3.2.3. Memory Titanol® spring - application

The tooth can also be distalised during the uprighting phase. To this purpose, a pressure spring is slipped over the nickel-titanium spring. This way the space restricted by the inclined molar can, for example, be enlarged for the placement of an implant.

3.3. Movement of individual teeth – mesialisation

As a rule, the mesialisation of individual teeth is performed to close gaps. Together with the OrthoEasy® pin, the following items are available from the FORESTADENT accessory portfolio:



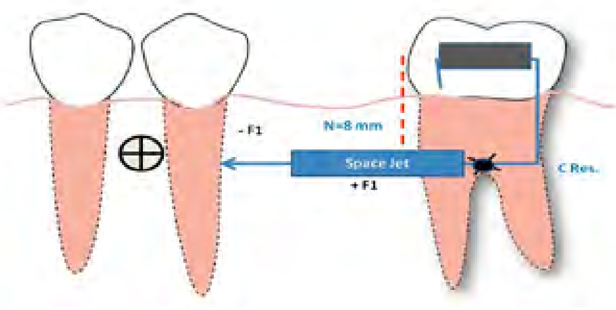
Space-Jet

Power Arm

Molar uprighting spring

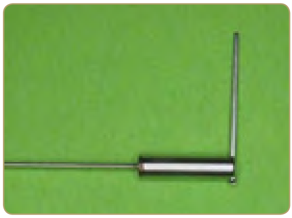
3.3.1. Space Jet - indication and components

The Space Jet is a telescopic spring. The core element is an encapsulated nickel-titanium spring (up to 400 g) to which a tension wire (stainless steel 0.43 mm x 0.64 mm, 17 x 25) is connected. The tension wire has a travel of 5 mm. The tension wire is fitted with a laser marking placed exactly at the outlet of the housing in starting position. With the aid of this marking, one can check the distance already travelled during the active phase and thus read off the progress in treatment. A base wire is welded to the telescope base, which is anchored on the tooth to be displaced. The position of the telescopic spring versus the centre of resistance can be adjusted using the base wire. This avoids the eccentric use of force and makes its application extremely efficient.

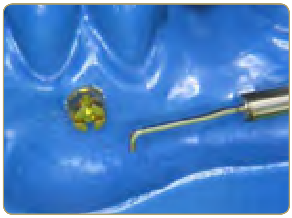


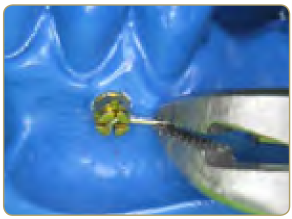
3.3.2. Space Jet - fitting

Fitting of the Space Jet is explained using the example of a lower second molar, which is to be shifted mesially to the position of the missing first molar. Adaptation of the appliance in the mouth is time-consuming. This step can also be transferred to the laboratory. This requires a model which reflects the later situation during fitting in the mouth. That means, an appropriate band needs to be fitted and placed on the molar. After appropriate cleaning and disinfection the band can be used with patient. An OrthoEasy® pin is placed at the planned site of insertion. One slot of the pin is aligned horizontally so that the tension wire of the Space Jet can be introduced into the slot without requiring additional bending. The OrthoEasy® pin used on the model cannot be used with the patient later on.

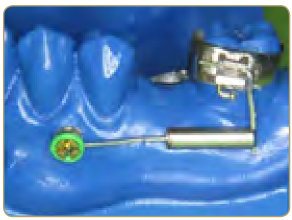


The base wire is introduced into the tube distally, so that the tooth is more „pushed“ than „pulled“ later on. This position also helps to avoid tilting of the molar and provides better guidance. First the base wire is fitted.





Remove the caudal section and smooth the angle. To this purpose, the telescopic housing is held at the height of the centre of resistance, the base wire lies at the distal end of the molar tube and the tension wire is at the height of the OrthoEasy® pin. The height of the main slot of the tube is marked on the base wire and bent mesially at right angles at this position. The base wire is fed into the slot of the tube.








The unshortened tension wire is pulled completely from the telescopic housing and placed in the horizontal slot of the pin. A marking is made distally from the pin head. This position acts as orientation for bending the traction wire caudally at right angles. Then this is shortened to lie completely in the head of the OrthoEasy® pin. The traction wire is secured against transversal movement in the pin head with a rubber ring. The described procedure results in a two-point mechanism which always has the inherent risk of undesired movement. A four-point mechanism is required in the case of gap closure, especially in the lower posterior region. Therefore, a second traction mechanism should always be fitted on the oral side to give a four-point mechanism. From a biomechanical point of view it is favourable if the attachment points of the active elements (springs, rubber chains) are at the height of the resistance centre.As a rule, the OrthoEasy® pin is at this height. It is therefore reasonable to also use it on the oral side for anchorage of the active elements. To this purpose, the pin should protrude from the oral mucosa by approximately 2 mm. The oral tension mechanism can only be fabricated chairside, but does not take long to do. The lingual anchor is made in the laboratory from a rectangular wire (19 x 25). The loop for attaching the elastic chain is also at the height of the centre of resistance. The tabs on the lingual hooks need to be bent to prevent the U-anchor from slipping out. To prevent the patient from chafing his tongue, the region is covered with light-curing adhesive. Then the elastic chain is attached between the lingual counter-bearings and *the tip of the OrthoEasy® pin and also fixed there with light-curing adhesive. The completed mechanism provides the physical mesial movement of the second molar.The described procedure is available as video on the OrthoEasy® CD.*

3.3.3. Space Jet - application

If the travel of the spring at 5 mm is insufficient for the necessary movement, mesialisation can be performed in several steps. The Space Jet then needs to be activated again. First remove the rubber ring. Lift the tension wire carefully from the slot and pull the telescopic housing to the desired extension (max. 5 mm). As described above, mark the tension wire, bend it, and remove the excess wire. Then the tension wire is again fixed to the pinhead using the rubber ring.

3.4. Movement of individual teeth – distalisation

Distalisation of the posterior teeth, especially in the mandible, is a challenging task. All dentally supported intra-oral appliances for the treatment of sagittal crowding – via distalisation – lead to reciprocal effects, in other words, counter-movement of the anchor teeth. A gain in space can be observed, but this is often due to the combination of distal movement of the molars and mesial movement of the anterior teeth. In most cases this is not a desirable outcome. In the first instance, extra-oral anchorage using headgear proved to be the solution to the problem. The acceptance by patients for use of this therapeutic means, which is clearly visible, has dropped considerably over the past years. The alternative consists of skeletal anchored intra-oral appliances which enable distalisation of the posterior teeth, especially in the mandible.Thus, known appliances achieve considerably greater effectiveness when connected with an OrthoEasy® pin and enable more efficient therapy. One example is the Frog appliance.

Anchored on two OrthoEasy® pins, this screw for distalisation is connected to the molars to be distalised via a flexible palatinal arch wire.
For „en masse“ retraction of the anterior teeth, the OrthoEasy® system provides Power arms.

3.4.1. Frog appliance - components

The Frog appliance according to Dr. Keven Walde is used for the distalisation of molars. The front section of the Frog appliance contains two mounting tabs. Originally they were intended for incorporating in a Nance Button, but they are also ideally suited for connection with the laboratory abutment of the OrthoEasy® pins. The moveable expansion screw body has a travel of 0.4 mm per spindle revolution. The maximum travel is 8 mm.

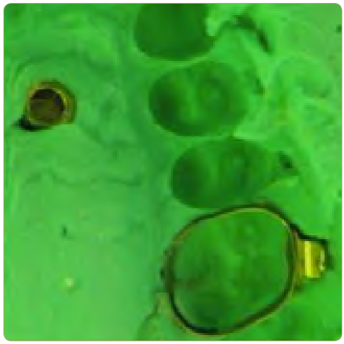
The preformed, flexible palatinal arch wire is made of stainless steel. It is inserted into an opening on the distal front of the moveable expansion screw body. Connection with the molars is via the palatinal locks on the bands. The palatinal arch wire for the skeletal Frog appliance should be fabricated individually from TMA wire (diameter 0.8 mm / 0.032"). Betaflex titanium is suitable for this purpose.

3.4.2. Frog appliance: fabrication and fitting

The skeletal Frog appliance for the distalisation of upper molars offers a stable four-point support. Two OrthoEasy® pins (8 mm recommended), inserted in the frontal palate, acts as anchorage elements together with the molars to be displaced distally. Placement of the pins in the frontal palate is described in „Chapter 2.3. Insertion - palatinal". The appliance is largely fabricated in the laboratory.

Once the bands have been placed on the molars, but not yet bonded, and the two OrthoEasy® pins have been inserted, one can immediately commence with preparing the fabrication of the skeletal Frog appliance in the laboratory. The first step is taking an impression for transfer of the situation in the mouth to a model. Multifunctional laboratory abutments are used for this purpose. They also serve as connection between the OrthoEasy® pins and the Frog appliance.

Two laboratory abutments are coated with petroleum jelly on the inside and placed on the heads of the OrthoEasy® pins. Check for correct fit. Then the impression is taken using a torsion-free tray. The choice of impression material depends on how fast the impression can be cast. If this is possible immediately, one uses cost-efficient alginate. Otherwise only silicone is the impression material of choice. After removing the impression from the mouth, the position of the laboratory abutment and the molar bands is checked. If these are incorrect and repositioning impossible, the impression needs to be repeated. Imprecision of the impression will inevitably lead to imprecise models, which in turn can cause problems in terms of precision of the appliance.



Following disinfection of the impression, steel training screws are placed in the laboratory abutments. It is recommended to cover the gap between the screw and the abutment thinly with wax in a circular manner. This prevents the transfer screw coming loose easily during filling with plaster. This coating also prevents the plaster pulp from entering the interior of the laboratory abutment. The model is fabricated using superhard plaster (Class IV plaster). After removing the impression tray, the model and the abutments are cleaned. Observe the correct fit of the bands.

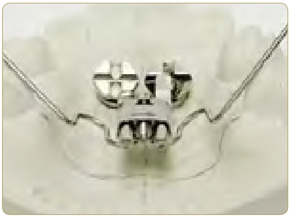
To align the Frog appliance mark the model with auxiliary lines:

- *central line*
- *transversal connection line between the mesiopalatinal humps of the molars*

Next, the laboratory abutments are placed over the training screws. Should the abutments touch or contact the palate, they can be ground at the relevant places. After placing the laboratory abutment, place a piece of pliable silicone at the palate. On the one hand the silicone serves to align the Frog appliance. At the same time the silicone acts as a placeholder so that the space between palate and appliance can be rinsed. The Frog appliance is placed centrally over the the palatinal suture. The centre line and the spindle of the Frog appliance act as orientation for alignment. The fixing tabs are adapted to be as broad as possible directly on the abutments. The directional arrow on the moveable expansion screw body lies on the transversal connecting line of the molars.When aligning the Frog appliance, it is essential to ensure that the positioning key can be inserted into the hexagon on the spindle head without difficulties and that the spindle can be rotated. For orientation purposes one places the positioning key between the first incisors and guides it into the spindle head. The tolerance for alignment is approximately 15°. Once the Frog appliance has been aligned as described, the mounting screws are welded to the laboratory abutments using a laser. For reasons of biocompatibility, one should





refrain from soldering. Sharp edges are to be smoothed, transitions rounded off, and the weld seams polished.

Then the palatinal arch wire is fabricated. The loops in the arch wire are created to meet the case requirements and the desired spring effect. Double pendulum springs are recommended. To ensure that the ends of the arch wires are secure after insertion into the palatinal locks of the bands, a U-shape should be bent in advance. To be safe, the two parallel wires can be welded.

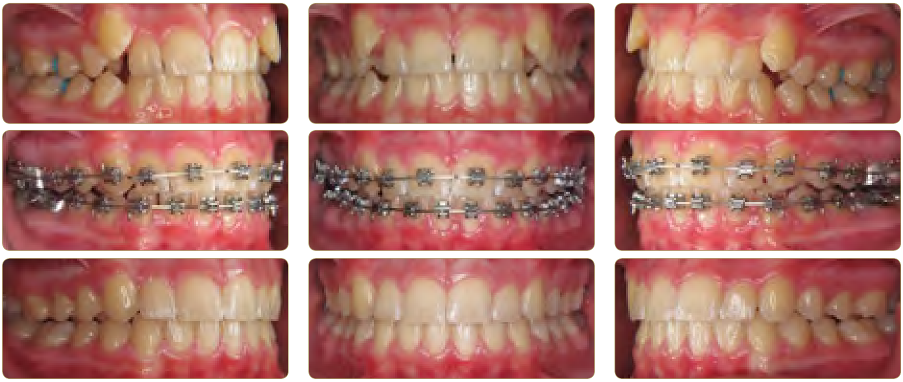
The corresponding molar and the Frog appliance form a two-point mechanism on each side. The rigid (non-moving) component is the appliance fixed to the OrthoEasy® pins. These will inevitably move distally due to the distal movement caused by the Frog appliance and the forces transmitted to the molars via the transpalatinal arch wire.
As force is only exerted at one point, tilting and rotation of the molars are an unwanted side effect. Therefore the two end-pieces must already be programmed initially in the laboratory, or chairside at the latest.

A toe-in bend counteracts the rotation and uprighting activation counteracts inclining of the molars. Both spring arms of the palatinal arch wire are pre-activated distally with approximately 200 g. Without this activation the appliance would not function as intended. Force adjustment can be checked using a pressure and spring balance.

After completion of this work the skeletal Frog appliance is ready for placement. The palatinal arch wire is only inserted into the Frog appliance. This means, that the arch wire could disengage during placement of the skeletal Frog appliance. For this reason the Frog appliance and the palatinal arch wire are ligated temporarily.
In as far as this is possible, the appliance should be trial-fitted prior to final placement to detect problems in fit and remedy them.
The the appliance is placed in toto. The bands are bonded with a glass-ionomer cement, i.e. AquaCem. After removing residual cement, the palatinal arch wire is secured in the palatinal locks using ligature elastics. To prevent the skeletal Frog appliance from disengaging from the palatinal anchorage, the laboratory abutments are to be fixed to the OrthoEasy® pins with wire ligatures.
Alternatively, the laboratory abutments can also be cemented. This may however prove problematic as this connection cannot be disconnected. If errors occur during integration of the appliance, the laboratory abutments including OrthoEasy® pins would need to be removed.
This would necessitate starting all over again. For newcomers to this technique it is therefore recommended to use ligatures initially.

3.4.3. Frog appliance - application

The positioning screw is activated every four weeks by four to five rotations and after three to five months the desired distalisation is accomplished. The figure illustrates the outcome at then end of distalisation directly after removing the miniscrews. The transpalatinal arch wire can be left to act as minimal anchorage, to retain the molars or for derotation. The use of this appliance does not lead to a reactive proclination of the incisors. Despite the already incorporated activation for uprighting purposes initially, the molars may incline under circumstances. In such cases, the TMA arch wire should be reactivated for uprighting.



The skeletal Frog appliance offers numerous advantages:

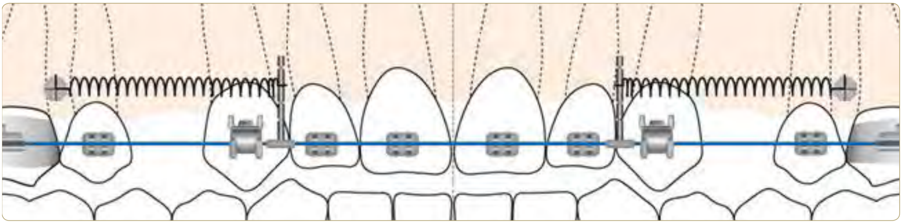
- *proven in clinical use*
- *physical distalisation of the molars without reactive side effects*
- *no proclination of anterior teeth*
- *easy fabrication in the laboratory*

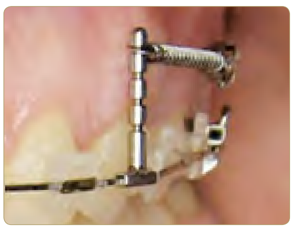
Besides these, there is also another advantage. Compared with all dentally anchored appliances, the anterior dental arch remains free for other therapeutic measures during the phase of molar distalisation. This gains time, making treatment more efficient overall. In addition to the bilateral distalisation illustrated here, unilateral distalisation is also possible.

3.4.4. Power arm – components

Power arms are used for the „en masse“ retraction of the upper anterior teeth. These are available for the 18 and 22 techniques. The Power arm consists of a cross tube and a tension arm welded at right angles. Four punctures/recesses are located here for mounting the tension spring. Distances of 1.5 mm between these punctures allow for mounting of the tension spring at the height of the resistance centre. The cross tube has a length of 4 mm. By compressing the tube (crimping) this can be fixed on the arch in a certain position.

3.4.5. Power arm – fitting





Two OrthoEasy® pins are placed in the maxilla between the second premolar and the first molar for „en masse“ retraction. As a rule there is sufficient space in this region. The pins should ideally be placed at the height of the centre of resistance of the anterior teeth to be distalised.

After the levelling phase, „en masse“ retraction can commence. Prior to placing the rectangular arch wire into the multi-bracket appliance, two Power arms are slipped onto the arch wire. Stainless steel arch wires with dimensions of at least 0.43 mm x 0.64 mm (17x25) are recommended. Then the arch wire can be incorporated and ligated. It should be noted that the Power arms should be located between the second incisor and the canine. Using pliers, the sliding tube is crimped at the appropriate point and fixed in position.

3.4.6. Power arm – application

The „en masse“ retraction is activated by placing a tension spring between the head of the OrthoEasy® pins and the Power arms. Depending on the desired movement vector, the Titanol®-Instant tension spring is hooked into one of the four punctures on the tension arm. Depending on the distance between the OrthoEasy® pin and the Power arm, a 12 mm or 18 mm tension spring is used. The use of elastic chains is not recommended, as these may develop a constant force effect over time. After completion of the „en masse“ retraction the OrthoEasy® pins can be removed. However, if they are kept until treatment is completed fully, a skeletal anchorage point remains available should the need arise.

Individual teeth can also be moved using the Power arm. Depending on the desired direction of movement, the Power arm is placed mesially or distally to the tooth to be displaced on the arch wire. In contrast to „en masse“ retraction, the Power arm is not fixed so that only the tooth in the immediate proximity is displaced. This results in a sliding mechanism (Sliding Mechanics).

JPA with palatinal screws as safe alternative to interradicular screws.

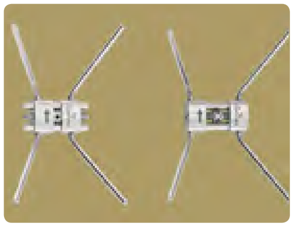
3.5. Skeletal changes – rapid maxillary expansion (RME) with the hybrid-RME

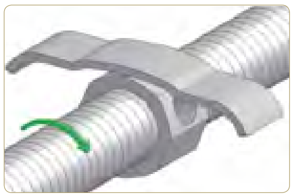
The conventional appliances for maxillary expansion employ purely dental anchorage. This allows opening of the palatal suture, but there is always a risk of inclining the anchor teeth in vestibular direction. This has been observed especially for premolars. Hybrid-RME represents an alternative. The name hybrid-RME is derived from the two combined anchorage concepts - dental and skeletal. The Snap Lock Expander is the active element. Anchorage of the appliance is via the palatinally inserted OrthoEasy® pins and the molars. In addition to the skeletal force approach, rapid maxillary expansion (RME) with this appliance also offers further advantages. Skeletal anchorage serves to avoid inclining and prevents reactive buccal inclination of the molars. Furthermore, one is offered the freedom of correcting other malpositions simultaneously in the dental arch (5-5). This type of therapy is also possible with mixed dentitions.

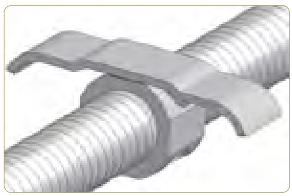
3.5.1. Snap Lock Expander – components

The Snap Lock Expander is an expansion screw, where the spindle is secured against undesired turning back using a leaf spring. The leaf spring engages after activation of the spindle. The leaf spring exerts pressure on the eccentric screw. The leaf spring engages on the flat surface of the eccentric screw and retains this in a position ideal for further activation. Engagement of the screw can be felt clearly when activating the Snap Lock Expander (rotating). The hole in the spindle is always in an optimal position for reactivation. If the screw is over-activated, it can be rotated back.

The four retention arms serve for connecting to the OrthoEasy® pins and the molars. The appliance is largely fabricated in the laboratory.







3.5.2. Snap Lock Expander – fabrication and fitting of the hybrid-RME

The hybrid-RME offers a stable four-point support. Two OrthoEasy® pins (8 mm recommended), inserted in the frontal palate, act as anchorage elements together with the first molars. The OrthoEasy® pins for the hybrid-RME are to be placed close to the palatal suture, so that the forces are effective as close as possible to the suture. A minimum distance of 6 mm between the pins should however be observed. This is necessary to ensure sufficient space for the laboratory abutments later on.

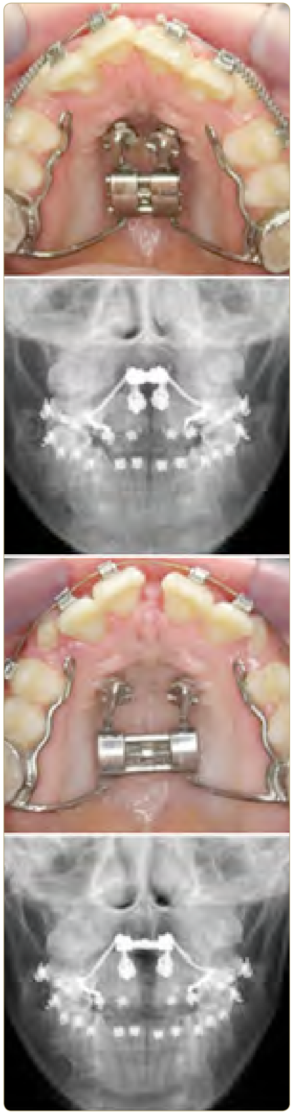
Impression taking and fabrication of the models has already been described. The centre line is marked on the model and the laboratory abutments placed. The centre of the Snap Lock Expander must conform with the centre line of model. The hole for the positioning key on the eccentric screw acts as guide. To optimally align the Snap Lock Expander, a piece of pliable silicone is placed in the roof of the palate. This is a good aid for repositioning and also acts as placeholder. The body of the Snap Lock Expander is at the height of the first molars. The arrow on the housing points in distal direction.

The front arms of the Snap Lock Expander are adjusted to the laboratory abutments. The arms should be parallel to each other and lay flat to give a wide basis for welding. Ideally, the arms should lie in the groove of the laboratory abutment. Once the Snap Lock expander has been aligned as described, the front retention arms are to be shortened. They should be flush with the anterior edge of the abutment. Using a laser, the arms and laboratory abutments are then welded together. For reasons of biocompatibility, one should refrain from soldering. Sharp edges are to be smoothed, transitions rounded off, and the weld seams polished.

The next step is fitting the posterior arms of the Snap Lock Expander to the bands. Each arm is guided distally to the band and adapted to the arch-shaped contours of the oral surface of the band over virtually the entire palatinal area. The retention arm lies at the centre of the palatinal area of the band. The silicone key allows easy and, above all, reliable repositioning of the Snap Lock Expander. If both retention arms are in the right position, they can be welded to the bands. Sharp edges are to be smoothed, transitions rounded off, and the weld seams polished. Then, opening of the Snap Lock Expander is tested using the key for turning palatinal split screws. Then the hybrid-RME can be incorporated.
In as far as this is possible, the appliance should be trial-fitted prior to final placement to detect and problems in fit and remedy them. Then the appliance is placed in toto. The bands are bonded with a glass-ionomer cement, i.e. AquaCem. The laboratory abutments are to fixed the OrthoEasy® pins using wire ligatures.

3.5.3. Snap Lock Expander – application

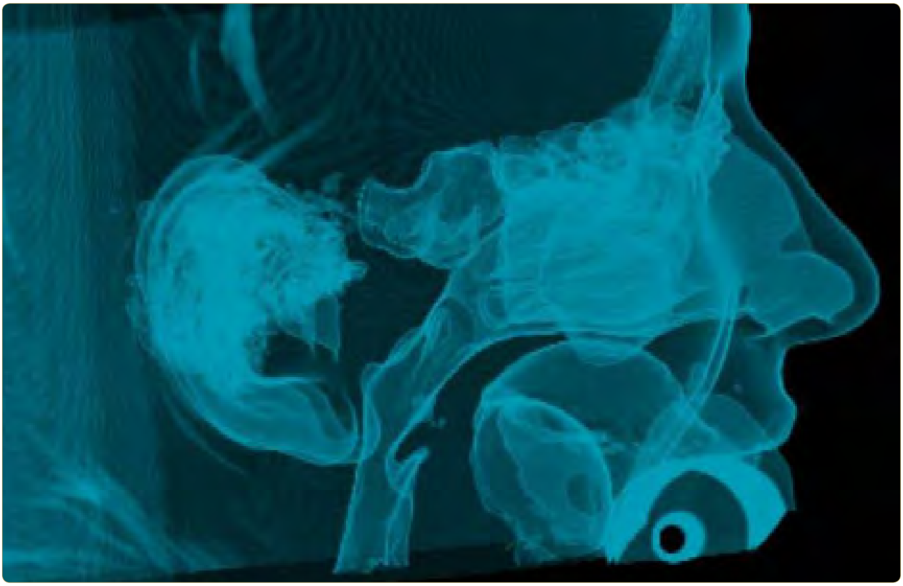
Immediately after placing the appliance, expansion of the palatinal suture can commence. The positioning screw is activated three times daily. The screw expands by 0.2 mm per 1/4 turn. The therapeutic goal is achieved after eleven days. The retention period should last for at least three months. During this time other positional corrections can be carried out in the anterior dental arch.



The skeletal force approach of the hybrid-RME leads to a primarily parallel distraction of the palatal suture. The sutura palatina opens from anterior to posterior and from caudal to cranial.

The hybrid-RME can, if necessary, already be applied at a very early stage of second dentition. The only precondition is the complete breakthrough of the first upper molars. Skeletal anchorage using OrthoEasy® pins allows rapid maxillary expansion regardless of the load capacity of milk teeth, the condition of the supporting zones or the development stage of the premolars. Experience with the treatment of hybrid-RME is documented for all phases of second dentition and permanent dentition.

The transversal expansion of the maxilla through distraction also leads to a volume increase of the upper respiratory tract.



The transversal expansion of the maxilla through distraction also leads to a volume increase of the upper respiratory tract.