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Fabrication of functional orthodontic appliances

The Bite Jumping Appliance (VDP) acc. to Sander (Sander II-Appliance)
Indications

- Therapy of class II anomalies (mandibular retrusion) with growing children.
- Single tooth movements in both jaws, retrusion of upper anteriors, protrusion of lower anteriors or e.g. transversal expansions of both arches are possible at the same time.
- Active compliance of the patient is constantly required.

Components/mode of operation

- The VDP consists of two removable active plates for maxilla and mandible with two corresponding elements – the Sander® II Maxillary Expansion Screw with integrated memory spring (Fig. 1a, b) as well as the Sander® II Mandibular Memory Expansion Screw with holder and mounting plate for the inclined plane (Fig. 2a, b).
- The springs have a deflection of 0.8 mm each, and a spring force of 500 g. A maximum expansion of 9 mm can be achieved.
- The forward movement of the mandible is created by the interaction of protrusion bars and inclined plane. When the mouth is closed, the maxillary bars are sliding over the inclined plane incorporated in the mandibular plate. Through this force transmission the lower jaw is moved forward.
Fabrication in the lab

What is required (Fig. 3)?

- Sander® II Maxillary Expansion Screw with integrated memory spring
- Sander® II Mandibular Memory Expansion Screw with holder and mounting plate
- Activation key for expansion screws
- Pre-cut wires for fabrication of clasps (ø 0.7 mm) and labial arch (ø 0.8 mm). Adams retainer clasps and triangular clasps are also available ready-made.

Procedure

Step 1: Set up the models in correct occlusion with the construction bite provided by the orthodontist. With its help it is determined to which position the mandible has to be moved. The interocclusal distance should be 3 mm and maximum protrusion 7 mm. If necessary the mandible can be further advanced in a second treatment step with a second inclined plane. Then start fabricating the mandibular plate.

Step 2: Fabrication of clasps and labial arch (Fig. 4a – k, see next page).

After blocking out all undercuts on the model, fabricate the necessary Adams clasps, triangular clasps and the labial arch and fixate them with hot wax on the model. The retentions of clasps and labial arch have to be placed distally.

All common elements of the Schwarz plate (distalizer screws, springs, etc.) can be incorporated. But it has to be considered that the more elastic elements are integrated in the plate, the more retentions are necessary. That means that Adams and triangular clasps usually are not sufficient and at least in the front additional ball head retainers (between teeth 1 and 2 on both sides) are required. The first molars should only be armed with molar retainers if the patient is in the transitional dentition.
Step 3: Inserting of a central cut and adaptation of the mounting plate (Fig. 5a–c). Insert a deep and centered cut in the model for the Sander® II Mandibular Memory Expansion Screw with holder and mounting plate by using a suitable bur. Thereafter the mounting plate has to be trimmed in width (up to 4-5 mm) in order to accommodate enough acrylic later.

Fig. 5a–c: Insertion of a centered cut with a bur and trimming of the mounting plate.
Step 4: **Setting of correct angle (inclined plane)** (Fig. 6a–g).

By means of the small tilting mounting plate the necessary angle of 60° +/- 5° (inclined plane) to the occlusal plane is set. When positioning screw and mounting plate it has to be made sure that the distance between the two of them is not too small. There should be at least a 2 mm, or even better 3 mm, space between them.

After placing of screw and plate everything is to be fixated with hot wax. Then put model in water bath.

![Step 4: Setting of correct angle (inclined plane)](image)

Fig. 6a–g: After setting the correct angle of the inclined plane, screws and mounting plate a fixated with hot wax.

Step 5: **Forming of mandibular plate** (Fig. 7a–f). After watering the model it has to be dried thoroughly. Then first the sides have to be formed. In order to prevent holes under the mounting plate, at least the front should be filled using the dough-technique. The acrylic has to be applied step by step and needs to be pressed in the cavities. It has to be made sure that the mounting plate remains free. Excess material has to be removed from below.

![Step 5: Forming of mandibular plate](image)

Fig. 7a–f: After water bath and drying form mandibular plate using salt&pepper and dough technique. Make sure that the mounting plate remains free.
Step 6:  **Polymerization of mandibular plate (Fig. 8a–c)**

*Fig. 8a–c:* After forming the plate it is polymerized in the pressure vessel.

Step 7:  **Removal of mounting plate (Fig. 9a–c).** After removing the model from the pressure vessel, lift off the plate carefully off the model. The mounting plate is to be removed.

*Fig. 9a–c:* Careful lift off of the polymerized mandibular plate. Removal of the black holder.

Step 8:  **Finishing of the mandibular plate (Fig. 10a–i).** Only the edges should be trimmed while the surface of the plate should remain as it is.

*Fig. 10a–i:* Finishing of mandibular plate.
Step 9: **Separation of the front of the plate (Fig. 11a, b).**

In order to be able to activate the mandibular expansion screw, the finished plate needs to be separated in the front with a cutting wheel. It is recommended to check with a key if the screw can be activated. After that put the plate back on the model.

![Fig. 11a, b: Separation of the front of the plate and check if the expansion screw can be activated. Plate is placed on the model.](image)

**Step 10:** **Preparation for maxillary plate (12a, b)**

![Fig. 12a, b: Blocking of undercuts with wax.](image)

**Step 11:** **Bending and fixation of clasps and labial arch (Fig. 13a–f)**

![Fig. 13a–f: Clasps and labial arch are bent and fixated with hot wax.](image)
Step 12: Insertion of slot (Fig. 14a, b). Beginning at the papilla, make a relatively wide and deep slot with a bur on the median line.

![Fig. 14a, b: Insertion of a wide and deep slot.](image)

Step 13: Positioning of maxillary screw in relation to the inclined plane (Fig. 15a–i). The slot has to be filled with a wax which is remaining soft for a longer period of time. After closing the fixator, the maxillary screw with protrusion bars should be brought in from distal in order to get it in the correct position in relation to the inclined plane.

The advancement of the mandible is generated by the angulation of the maxillary bars which meet the inclined plane in the mandibular plate. These bars should never be shortened.

In the closed Fixator use a finger to “measure” the necessary span of the inclined plane. Then place the holder of the screw slightly in the soft wax and wait until it is setting. After that, fixate the screw with hot Sticky wax. Finally the maxilla can be taken out of the fixator and watered.

![Fig. 15a–i: Filling of the slot with hot wax and positioning of the maxillary screw in relation to the inclined plane with subsequent fixation and water bath.](image)
Step 14:  
Forming of maxillary plate (Fig. 16a–f)

![Images of forming and polymerization of maxillary plate](a) (b) (c) (d) (e) (f)

*Fig. 16a–f: Forming and polymerization of maxillary plate.*

Step 15:  
Cleaning and removal of holder (Fig. 17a–c)

![Images of cleaning and removal of holder](a) (b) (c)

*Fig. 17a–c: Cleaning of maxillary plate and lifting off carefully from the model. Removal of black holder.*
Step 16: Finishing of maxillary plate (Fig. 18a–i)

Fig. 18a–i: After thorough cleaning, finishing as with the mandibular plate.

Step 17: Test activation of the expansion screw (Fig. 19)

Fig. 19: Check with a key if the screw can be activated.

Step 18: Completed Sander II-Appliances (VDP) (Fig. 20a–c)
Literature


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