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Fabrication of functional orthodontic appliances

The class III double plate (RDP) acc. to Sander (Sander III Appliance)

Indications

- Therapy of skeletal class III (mandibular protrusion)
- Especially suitable for children in the early transitional dentition
- By using the forces of the facial muscles the RDP can be an alternative to extra-oral devices (e.g. Chin-Caps, Facemask)
- Can be used as retainer and tongue-lifter at the same time.

Components/mode of operation

- Two removable plates are effecting a step-by-step retraction of the mandible by means of corresponding inter-maxillary elements
- The corresponding elements are two bars in the maxilla (Figure 1) and two expansion screws in the mandible (Fig. 2)



Fig. 1

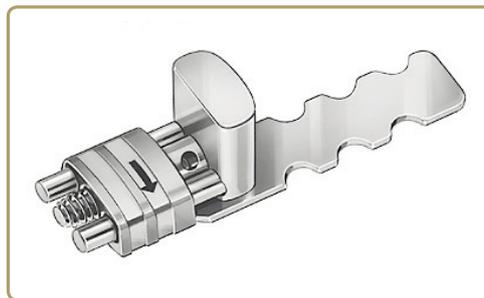


Fig. 2

- The precondition for the use of the RDP is a good anchorage. Therefore the permanent first molars should be erupted completely. The use of further clasps is recommended
- Depending on the indication (e.g. narrow jaw, lateral cross-bite) it is possible to additionally integrate a memory expansion screw in upper and lower plates.
- Adjustable and gradual retraction of the mandible is achieved by successive activation of the RDP expansion screws.
- Through the bars in the maxillary plate the bite force is transmitted to the upper jaw, where it results in a force impulse directed to the anterior. This promotes the growth of the maxilla. At the same time this force is affecting an intrusive force in the molars and therefore preventing an open bite.

Fabrication in the lab

What is required?

- 2 RDP expansion screws
- 2 bars
- 1 pair of mounting templates
- Activation key for RDP expansion screws
- Pre-cut wires for fabrication of Adams clasps, Triangular clasps, labial arch, etc. (also available ready-made) (Fig. 3)



Procedure

Step 1: *Set up the models in correct occlusion with the construction bite provided by the orthodontist. Then start fabricating the lower plate.*

Step 2: *Fabrication of clasps and labial arch (Fig. 4a – c). After blocking out all undercuts on the model, we fabricate all clasps as well as the labial arch. Since upper and lower plates are separate, all active elements of the Schwarz plate can be used. Bend all retentions of labial arch, triangular clasps, etc distally to provide enough space for positioning of the expansion screws.*



Fig. 4 a-c: *Bending of clasps and labial arch.*

Step 3: Fixation of clasps and labial arch with wax (Fig. 5).



Fig. 5: Clasps and labial arch are fixed on the model with hot wax.

Step 4: Positioning of the RDP expansion screws (Fig. 6a–f).

The RDP expansion screws have to be placed vertically to the tooth arch. At the same time the position should be as far dorsal as possible. Ideally this should be between teeth 5 and 6. You should also make sure that the RDP expansion screws are placed in the same height on both sides. The optimal position is approximately 2 – 3 mm below the occlusal plane. The frontal orientation of the RDP expansion screws is parallel to the longitudinal axis of the molars, while you have to make sure that the tongue space is confined as less as possible.

In order to enable a safe and accurate fixation of the RDP expansion screws, a small wax-mound can be used, which is placed on the bottom of the lower model. You can stick the screws in the wax. Subsequently we are watering the lower plate.

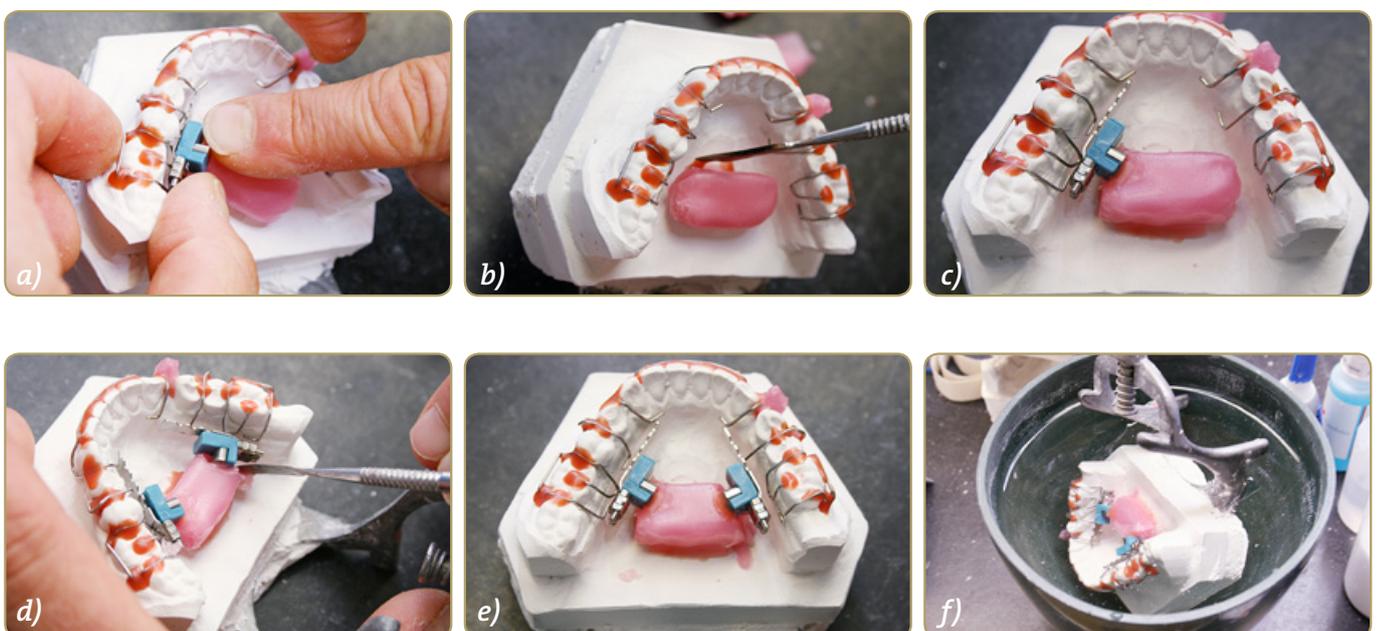


Fig. 6a–f: Positioning of the RDP expansion screws (a – e) and subsequent water bath (f).

Step 5: Mandibular plate is formed using salt&pepper or dough technique and then polymerized (Fig. 7a–e).



Fig. 7a–e: Forming of mandibular plate by using salt&pepper or dough technique and polymerization in pressure vessel.

Step 6: Removal of blue plastic holders (Fig. 8a–c).

After taking out of the pressure vessel, the polymerized lower plate can be gently taken off from the model. After that the blue plastic holders are heated with hot water until they can be removed.



Fig. 8a–c: Careful removal of the polymerized plate and subsequent removal of blue plastic holders.

Step 7: Finishing of the mandibular plate (Fig. 9a–g).



Fig. 9a–g: Finishing of the mandibular plate.

Step 8: Check if expansion screws can be activated. Finished plate is placed on the model (Fig. 10a, b).

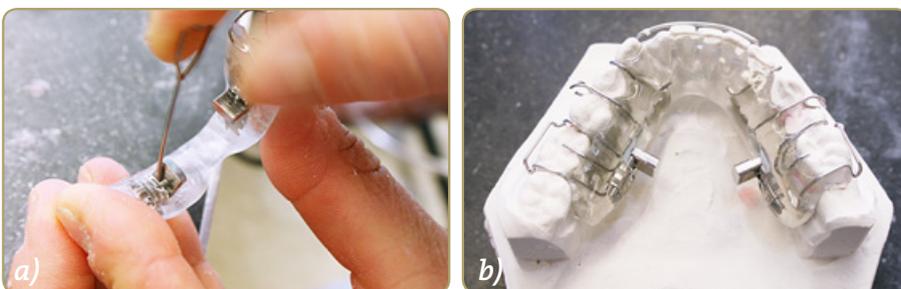


Fig. 10a, b: Check of the RDP expansion screws with an activation key. After that the plate is replaced on the model.

Step 9: Preparation of the maxillary plate (Fig. 11a–d).

After finishing the mandibular plate, the clasps and labial arch for the maxillary plate are prepared and fixated with wax on the model. After that the model is watered.

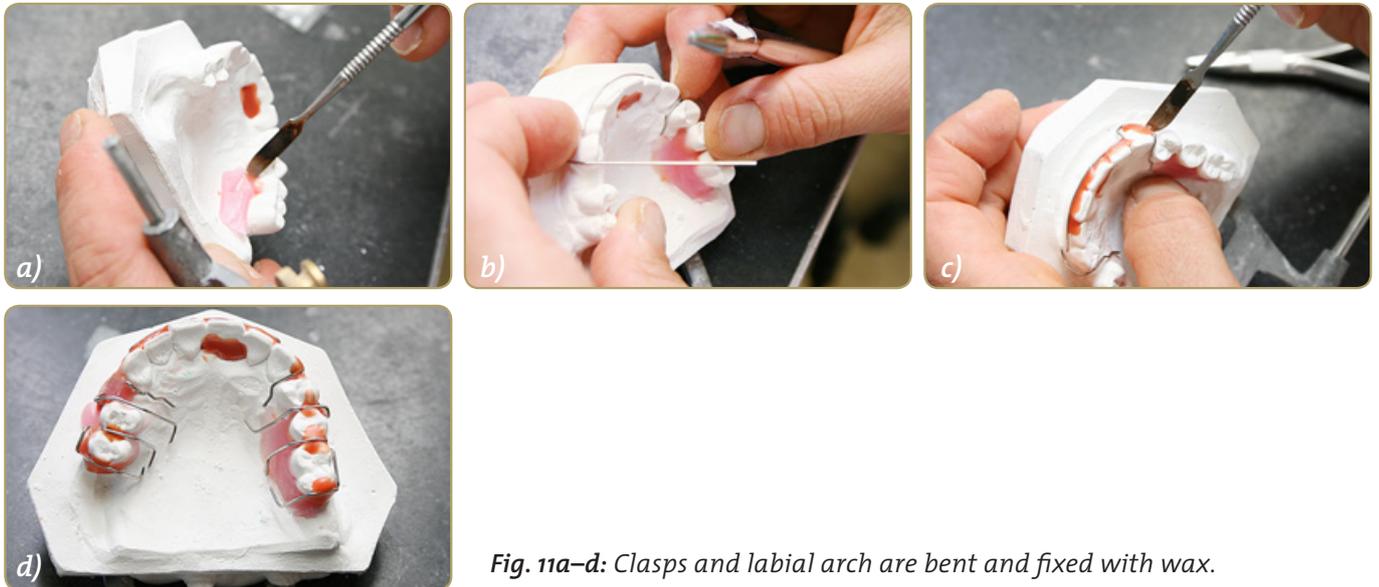


Fig. 11a–d: Clasps and labial arch are bent and fixed with wax.

Step 10: Mounting templates are slipped over the RDP expansion screws. Bars are inserted in the templates (Fig. 12a–e).

With the laterally reversed templates the two maxillary bars now have to be aligned in a 100° angle to the occlusal plane. The templates are slipped over the screws with the tipped ends pointing forward. That way the bars can be inserted into the templates. This makes sure that the bars are symmetrical and pointing in the same direction.

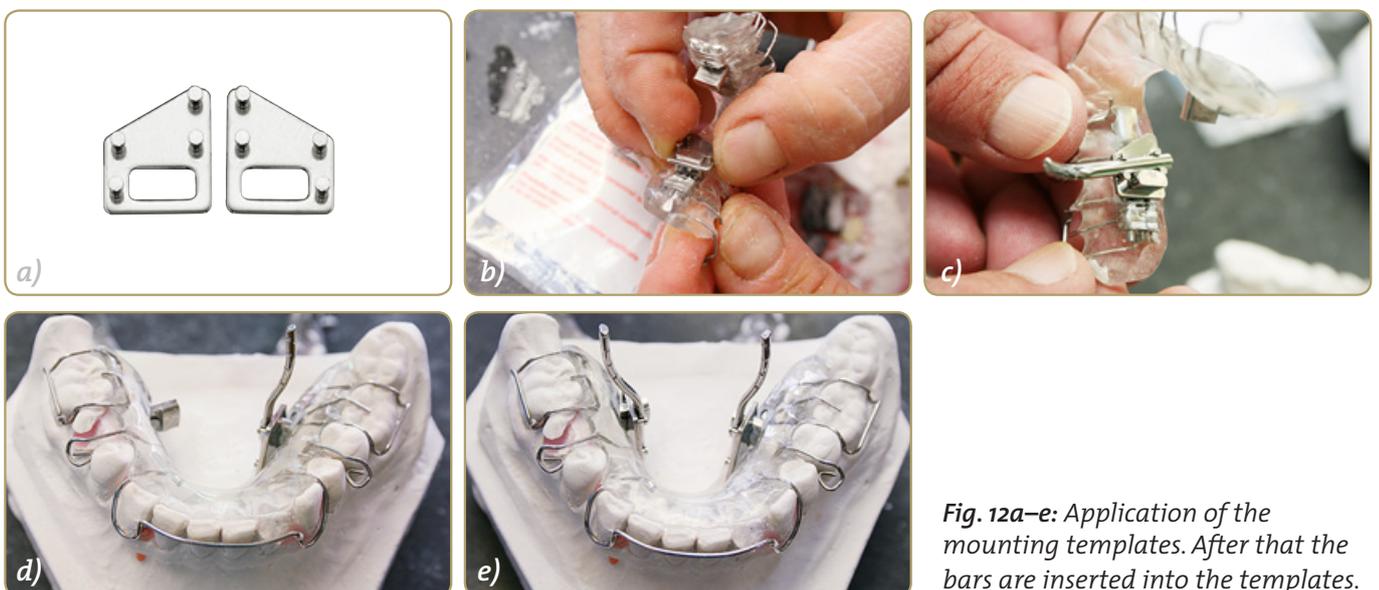


Fig. 12a–e: Application of the mounting templates. After that the bars are inserted into the templates.

Step 11: Bending of the bars to match the palatal roof and fixation (Fig. 13a–c).

In the closed fixator the bars should offer a distance of around 2-3 mm to the palatal roof. If required they can be bent to match the contour of the palate. After that the bars are fixed with wax on the mounting templates..



Fig. 13a–c: Bending of the bars to match the contour of the palate and fixation with hot wax.

Step 12: Masking of mandibular plate with wax (Fig. 14a–c).

The mandibular plate is masked completely with wax to prevent bonding of acrylic from forming the maxillary plate with the finished mandibular plate.



Fig. 14a–c: Masking of mandibular plate.

Step 13: Check in closed fixator (Fig. 15).



Fig. 15: Check carefully in the closed fixator that all parts of the mandibular plate are completely covered with wax.

Step 14: Forming of the maxillary plate (Fig. 16a–e).

Now the maxillary plate is formed. Depending on the indication an additional expansion screw can be integrated. Although, if that should be the case, bayonet bends have to be added to the bars. The acrylic is applied in a way so that the bars are sinking into it in the closed fixator. Another layer of acrylic is applied and subsequently the appliance in the closed fixator is hardened in the pressure vessel.

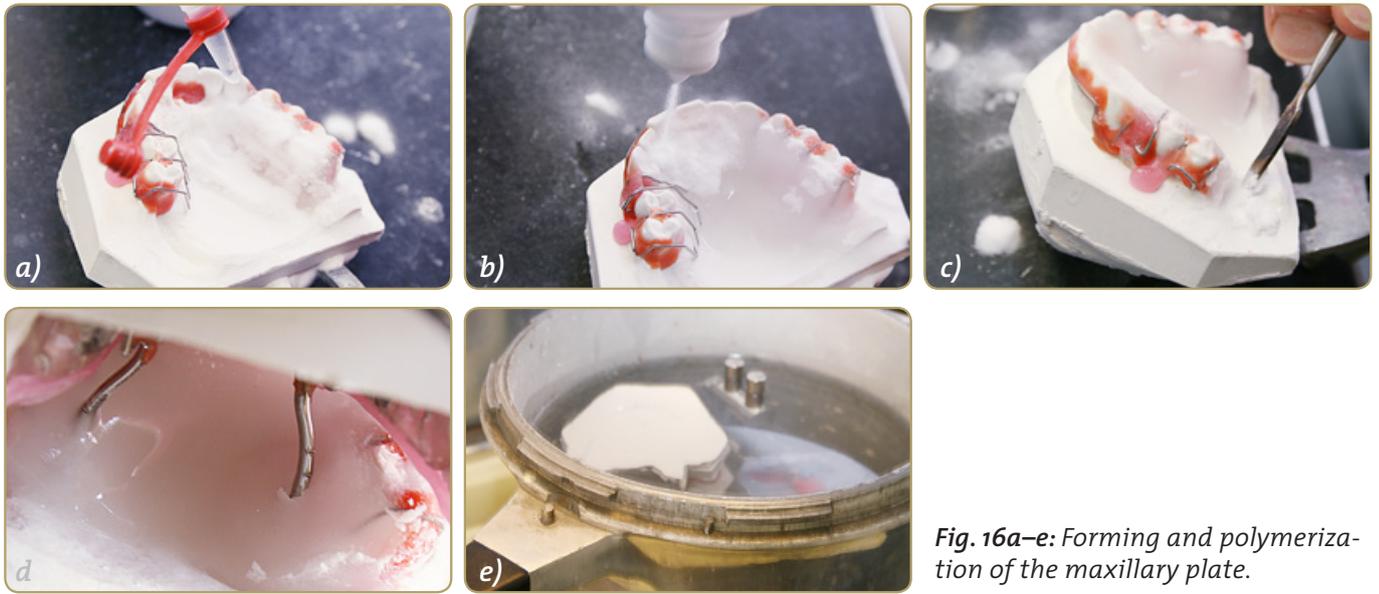


Fig. 16a–e: Forming and polymerization of the maxillary plate.

Step 15: Removal of the wax layer. Cleaning and taking off of the maxillary plate from the model (Fig. 17a–d).

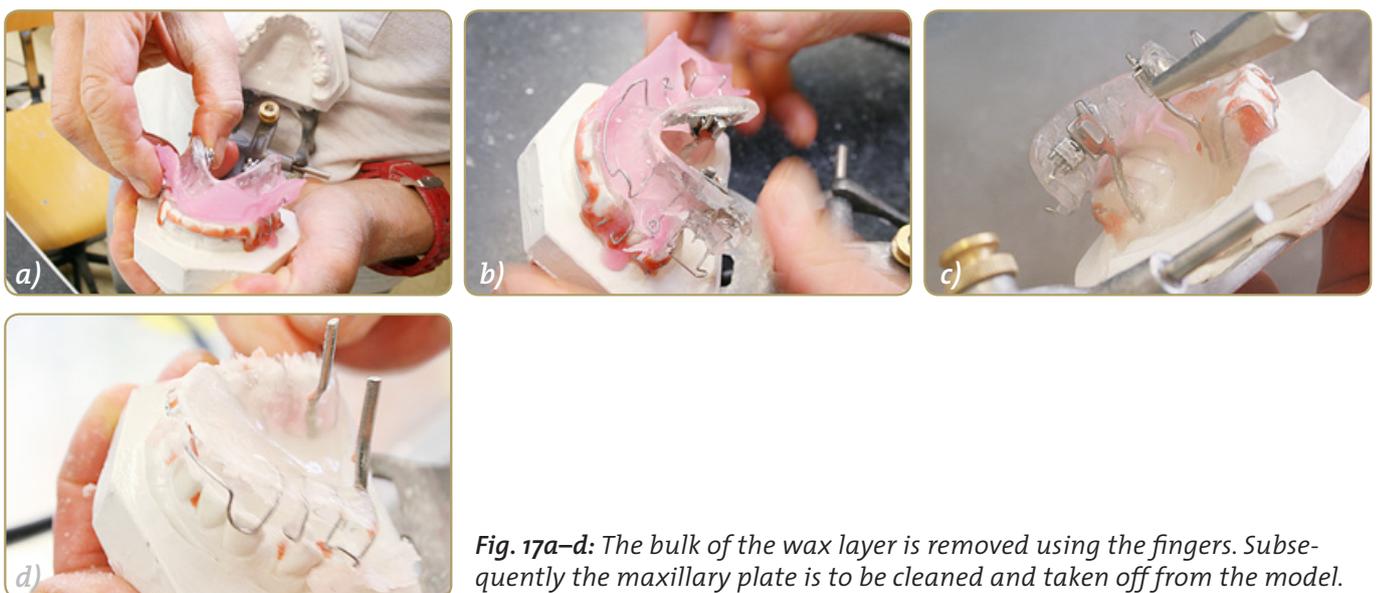


Fig. 17a–d: The bulk of the wax layer is removed using the fingers. Subsequently the maxillary plate is to be cleaned and taken off from the model.

Step 16: Finishing of the maxillary plate (Fig. 18a–l).



Fig. 18a–l): After thorough cleaning the maxillary plate is finished analog to the mandibular plate.

Step 17: Finished Class III double plate RDP(Fig. 19a–c).



Literature

- Franz Günter Sander: *Dentale und skelettale Effekte bei der Anwendung der Rückschubdoppelplatte (SIII) für die Klasse-III-Behandlung.* Inf Orthod Kieferorthop 2001; 34(4): 345–360.
- Franz Martin Sander, Michael Ehrenfeld, Norbert Schwenzer: *Rückschubdoppelplatte (S-III-Apparatur nach Sander.* Kieferorthopädie; 162ff. Thieme Verlag 2011.

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