Introduction

Transverse maxillary hypoplasia in adolescents and adults is frequently seen in non-syndromal and syndromal patients including cleft patients. The uni- or bilateral transverse hypoplasia can be corrected by means of a surgically assisted rapid maxillary expansion.

The treatment is an association of orthodontics and surgical procedures and provides dental arch space for lining up the teeth. The procedure also causes a substantial enlargement of the maxillary apical base and of the palatal vault, providing space for the tongue for correct swallowing and thus preventing relapse. In addition, a distinct subjective improvement in nasal breathing associated with enlargement of the nasal valve towards normal values is seen with an increase of nasal volume in all compartments.

Traditionally, the distractors for expansion are tooth-borne devices, i.e. hyrax appliances, which might have some serious disadvantages:

1. periodontal problems like buccal root resorption and cortical fenestration
2. segmental tipping and anchorage-tooth tipping
3. dental caries in syndromal patients with poor oral hygiene

In contrast, with bone-borne distractors applied at a higher level in the palatal vault, most of the maxillary expansion is orthopaedic and at a more mechanically desired level.

In addition, the forces are directly on the bone and no tooth tipping and other unwelcome side effects are to be expected.
The Rotterdam Palatal Distractor

Developed in cooperation with
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Indications

■ (Extreme) transverse maxillary hypoplasia
  - uni- or bilateral
  - in syndromal and non-syndromal patients
■ Anterior crowding and buccal corridors

Relative contra-indication

■ Class II deep bite; the distractor or the small activation rod on the palate may interfere with the teeth of the mandible. This can be overcome by placing the Rotterdam Distractor more distally or by wearing an occlusal splint during the distraction and consolidation period.

Absolute Contra-Indications

■ (Extreme) transverse maxillary hypoplasia
  - uni- or bilateral
  - in syndromal and non-syndromal patients
■ Anterior crowding and buccal corridors

Benefits

■ Easily placed and activated
■ No dental anchorage
■ No screw fixation with possible damage to the (pre-)molar roots
■ Easily blocked with a stainless steel wire
■ Allows simultaneous orthodontic treatment with fixed appliances
■ Easily removed with local anaesthesia

Special Notes

■ For primary stabilization, the Rotterdam Palatal Distractor has to be slightly activated.
■ One should realize that due to the mechanical principle of a car jack equal activation during the distraction period will result in a progressively decreasing distraction length. Therefore, in the course of the distraction the rhythm may change from activation one turn per day to two turns per day.
■ Patients with the Rotterdam Palatal Distractor have to keep up oral hygiene; regular visit to the oral hygienist is recommended.
Intraoperative procedure

**Intraoperative approach**

Standard corticotomies of the anterior, lateral and median bony supports of the maxilla are performed. The palatal gingiva of the premolars is infiltrated with local anaesthesia including a vasoconstrictor.

Firstly, the Rotterdam Palatal Distractor is positioned temporarily with the abutment plates on the mucosa over the roots of the first or second premolars. The activation rod is in the midline and must not interfere with the lower teeth in occlusion. The distractor is slightly activated. Thus the print of the plates is clearly visible on the mucosa. Now the palatal mucosa on the anterior and occlusal side directly around the abutment plates is incised. The distractor is deactivated and removed.

The palatal mucosa slightly smaller than the abutment plate is removed. Local haemostasis is performed.

The Rotterdam Palatal Distractor is placed again with the plates now on the bone. The distractor is slightly activated so the pins penetrate the bone stabilizing the distractor and, as a consequence, the vector.

**Note:**

Do not intend to place the distractor epimucosally (on the mucosa), as its sharp spikes might irritate the palatal mucosa and may cause pain and discomfort for the patient.

The number of turns is counted in order to know where to start in the distraction protocol. Finally, the distractor is secured with stainless steel wires around the premolars on both sides.
It is very important to note the opening length (amount of turns) of the distractor during the placement in order to know where to start in the scheme: in the first or second interval.

- Latency period: 7 days
- Distraction of approximately 1 mm per day with patient screwdriver (Art.-No. 51-505-90-07) or hockey-stick-like activator (Art.-No. 51-555-90-07), see scheme for amount of turns:
  - First interval: one turn
  - Second interval: two turns
- Retention period after distraction: 3 months
- Orthodontic treatment can already be started or continued during the consolidation period

### Distraction Protocol

Due to the mechanical principle (trigonometric function) of a car jack, equal activation will result in a progressively decreasing distraction length (see figure). Activation with 0.6 turn ($0.6 \times 360^\circ = 216^\circ$) at the start of the distraction will result in a distraction length of 1 mm. For example, after 5 mm distraction, 1.3 turn ($1.3 \times 360^\circ = 468^\circ$) is necessary to achieve the same distraction length of 1 mm. In the graphic, the changing length during the distraction period is demonstrated. As a result a distraction of exactly 1 mm per day is not feasible. To come close to the 1 mm and to achieve optimal patient's comfort, two different distraction rhythms for two intervals have been selected:

**First interval:**
Distractor closed until 7 complete turns: one turn per day

**Second interval:**
From 7 turns (the distractor is opened for approx. 7 mm): two turns per day

* showing the width of a 9 mm Rotterdam car jack distractor in relation to active distraction time

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**Distraction Diagram**

- blue = linearized distraction curve
- red   = real distraction curve

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* Distraction Diagram*
Clinical examples

Case 1 – Non-syndromal patient
Non-syndromal patient with mandibular retrognathia and transverse maxillary hypoplasia

Case 2 – Non-syndromal patient
Non-syndromal patient with mandibular prognathia, open bite and narrow-tapered arch form

Case 3 – Non-syndromal patient
Non-syndromal patient with mandibular retrognathia and transverse maxillary hypoplasia

Case 4 – Syndromal patient
Syndromal patient with Treacher Collins including transverse maxillary hypoplasia

Removal of the distractor
Non-syndromal patient with mandibular retrognathia and transverse maxillary hypoplasia

At the end of the consolidation period, the distractor can be removed in an out-patient clinic. The palatal mucosa surrounding the distractor is infiltrated with local anaesthesia including a vasoconstrictor. The stainless steel wires are removed, the distractor is deactivated and removed (picture 1). The healing of the mucosa is normally complete within a week (picture 2).
Design of the Distractor

The Rotterdam Palatal Distractor is a bone-borne distractor and is very easily placed and activated. It has the design of a car jack and is totally made of titanium grade II. By activating the distractor, the 2 mm long pins of the two abutment plates will penetrate the bone and the device is stabilized automatically. No screws are necessary to fixate the distractor to the bone. At the end of the distraction period, the distractor is easily blocked with a stainless steel wire.

References


Ordering details and Literature

51-555-09-09
Rotterdam Palatal Distractor for patients with congenital deformities
For extreme narrow maxillae particular in syndromal patients. Especially in these cases, there is no space for a conventional hyrax appliance or bone-borne type distractors that have to be fixated with screws.
closed: 9 mm (distance from plate to plate)
maximal open: 28 mm

51-555-13-09
Rotterdam Palatal Distractor for patients with congenital deformities
closed: 13 mm (distance from plate to plate)
maximal open: 32 mm

51-555-90-07
10 cm/3 3/4
Patient screwdriver hockey stick-like

51-555-85-07
14 cm/5 3/4
Patient screwdriver straight

51-555-95-07
14.5 cm/5 3/4
Patient screwdriver angled