

Bimaxillary Transverse Osteodistraction

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Transpalatal osteodistraction

Introduction

Tooth-borne surgically assisted rapid palatal expansion (SARPE) is an established technique to correct maxillary constriction, buccal cross-bite (unilateral or bilateral), anterior crowding, and large buccal corridors in adult patients.

Dental anchorage by tooth-borne expanders present a number of complications, such as the following:

- Possible loss of anchorage
- Periodontal membrane compression and buccal root resorption; cortical fenestration
- Skeletal relapse during and after the expansion period, which makes overcorrection necessary
- Anchorage-tooth tipping and segmental tipping instead of parallel expansion

The TransPalatal Distractor (TPD; Surgi-Tec NV, Brugge, Belgium), a bone-borne device fixed on the palatal shelves, avoids the following problems¹:

- There is no loss of anchorage, since the abutment plates are fixed in the palatal bone.
- There is no or very little skeletal relapse, since the action of expansion and retention are immediately on the bone.
- There is no periodontal membrane compression, root resorption, or cortical fenestration, since the teeth are left untouched.
- There is no or very little tipping of the segments, since action is in a higher level on the vault.

Extra advantages include the following:

- Interchangeable modules make large expansions possible in narrow palates.
- The distractor is turned into a retainer with a locking screw.
- The TPD as retainer is tissue friendly, since it is entirely made of titanium grade 2.
- Using a distraction policy and having all teeth free for conventional bands and brackets makes commencement of alignment possible after 1.5 months of consolidation.

Step-by-Step Procedure

1. Corticotomies are performed as usual for SARPE, with transection of the median, anterior, and lateral supports (Figure 21-1). The median support is split by a median buccal sulcus approach. Septal release is not performed, even in unilateral expansion. Bleeding from a small artery within the osseous triangle forming the lateral nasal wall and lateral maxillary walls frequently occurs and must be treated adequately to avoid postoperative bleeding problems. The transection can be performed with a round bur (preferably 3.3 mm, to allow drainage into

the sinus) for the lateral support, a small Lindemann bur or a smaller round bur for the anterior support, and a 1-cm-wide sharp osteotome for the median support. Mobilization of the segments is done by prying motions with the 1-cm-wide thin osteotome (see Figure 21-1D).

2. After application of local anesthesia with a vasoconstrictor, two incisions of 1 cm length are made in the palatal gingival over the roots of the second premolars (3/2 expansion canine/first molar) or the first molars (parallel expansion when the pterygomaxillary junction is also released) (Figure 21-2).^{2,3}

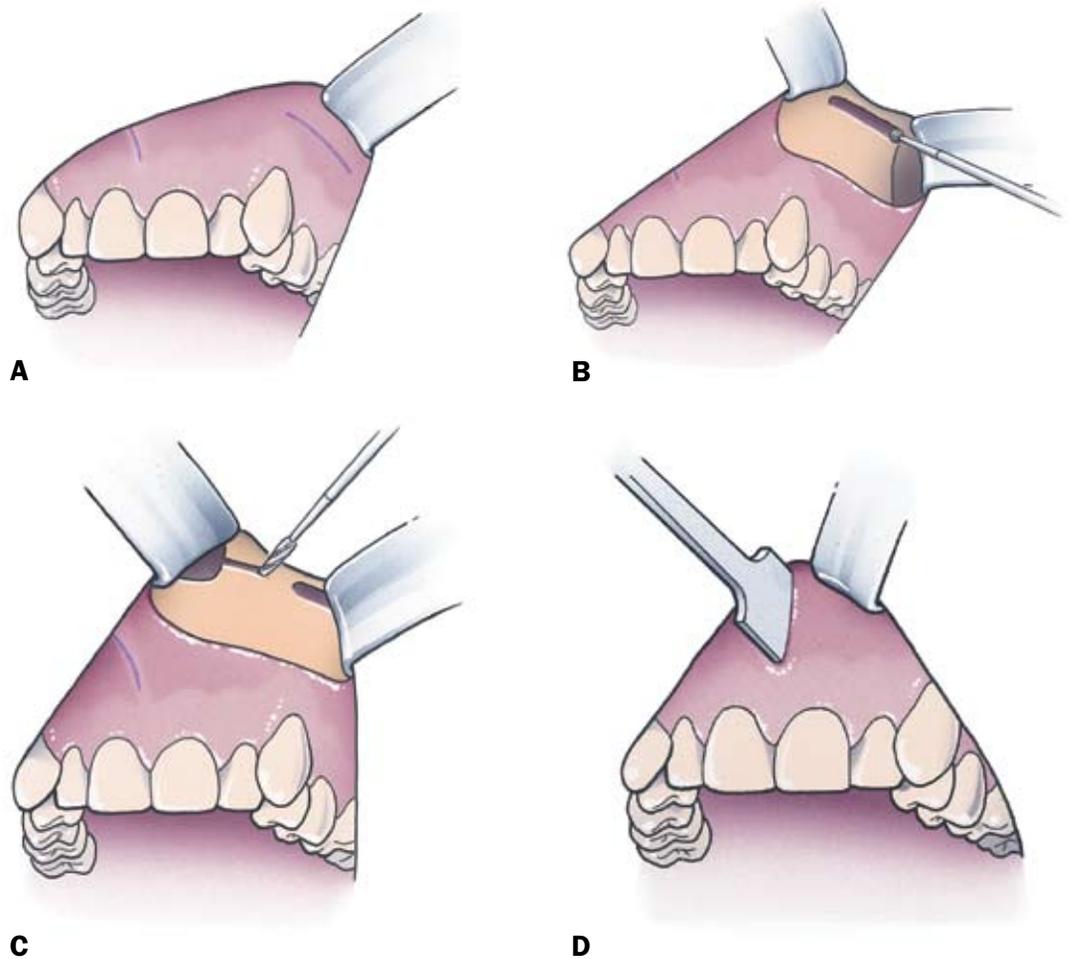


FIGURE 21-1 Corticotomies for transpalatal osteodistraction. A, Lateral buccal sulcus incision, from canine to second premolar. B, Corticotomy with round bur, rather wide at the zygomatic buttress. C, Corticotomy at the piriform aperture with Lindemann bur. D, Midline chisel osteotomy by anterior buccal sulcus approach.

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2 Maxillary Deficiency – Lengthening and Widening the Maxilla

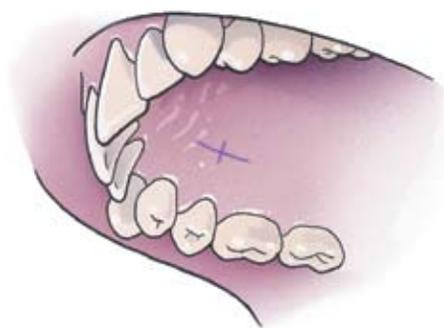


FIGURE 21-2 Cross-shaped mucoperiosteal incision at the level of the first premolar or first molar.



FIGURE 21-3 Placement of the abutment plates with safety sutures.

A small relieving incision is made perpendicular to and in the middle of the first incision.

3. The abutment plates are placed subperiosteally, on the bone surface (Figure 21-3). Care should be taken to place the box-line extensions, which are positioned 30° on the base plate, in a horizontal fashion and opposite to each other. The abutment plates are marked left (L) and right (R). Holes for the osteosynthesis screws are made with a long bur with drill bit of diameter 1.65 mm, mounted on a handpiece (Figure 21-4). The plates are fixed with 7 (or 5) mm monocortical screws of 2.3 mm diameter (Figure 21-5).



FIGURE 21-4 Drilling with a 1.65 mm drill bit.



FIGURE 21-5 Fixation of the abutment plates with 7 or 5 mm osteosynthesis screws.



FIGURE 21-6 Safety resorbable suture over the posterior incision.

4. One resorbable suture on the posterior incision line is a safe measure against postoperative bleeding from the branches of the palatal artery (Figure 21-6).
5. The proper module is installed preoperatively (Figure 21-7). Placement requires some prying of the segments and adjustment of the wings of the module. The module insertion tool can be used advantageously for this purpose (see Figures 20-7B and 20-7C). The module should be placed such that expansion will occur when the patient rotates from cranial to caudal positions. This means with the holes for the locking screw to the right. The module is secured with a locking screw. This is best done by adjusting the screw in

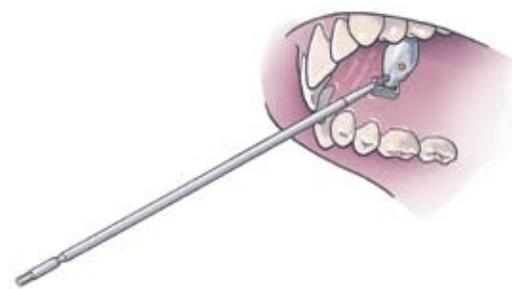


FIGURE 21-8 Placement of the locking screw, first with the screwdriver insert, and then with the handle to apply extra torque.

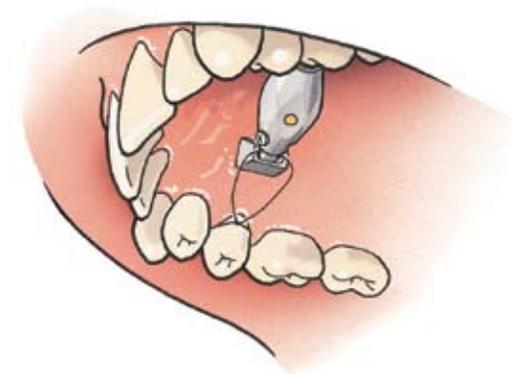


FIGURE 21-9 Safety titanium ligature around a cervix.

the bone with the screwdriver insert and then mounting the straight handpiece, only to tighten the screw (Figure 21-8).

6. The module is preferably fixed to a bicuspid with a fine titanium ligature, for safety reasons. Small holes are provided in the distraction screws for that purpose (Figure 21-9).⁴
7. The patient is asked to activate the device about 0.3 mm (1 color code) daily with a spanner, starting 1 week postoperatively (1 full turn = 1 mm) (Figure 21-10). The head of the spanner is turned upside down after every rotary movement. In difficult cases (restricted mouth opening), the hinge key can be useful (Figure 21-11).

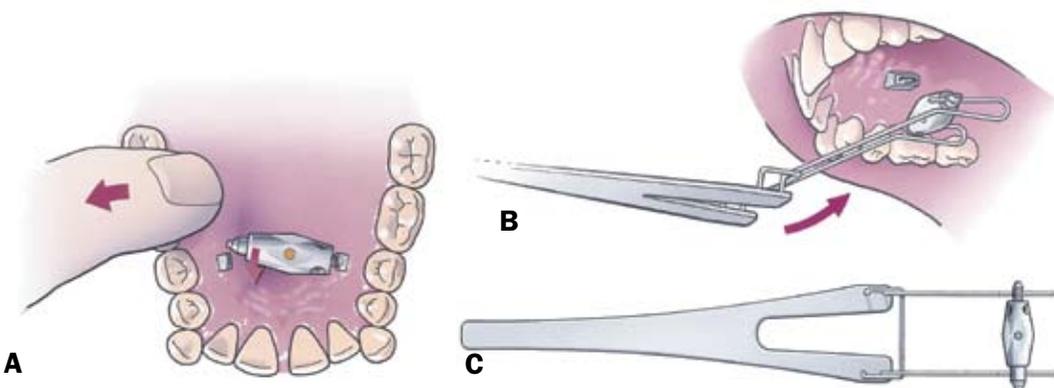


FIGURE 21-7 Placement of the appropriate distractor module. A, The fastest way is by finger manipulation. B, C, A special device can be used by the inexperienced surgeon.

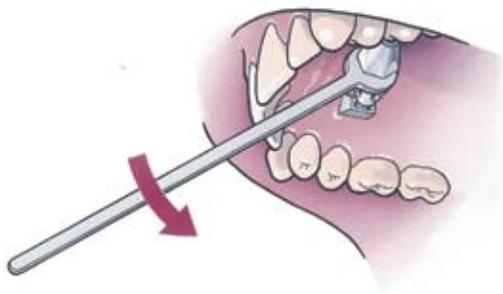


FIGURE 21-10 Activation with a simple spanner.

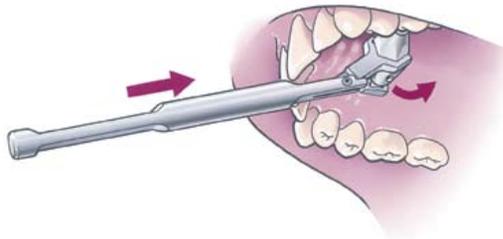


FIGURE 21-11 Activation with a hinged spanner (for patients with restricted mouth opening).

8. The module can easily be changed for a larger model, when deemed necessary.
9. Once the necessary expansion is achieved, the system is locked with a small screw, with counter pressure of the index on the module.
10. Orthodontic alignment can start at 1.5 months or longer after the end of activation. Removal of the device occurs under local anesthesia, 2 months or longer after the start of the orthodontic treatment.

Transmandibular Osteodistraction

Introduction

The inviolability of the mandibular intercanine distance is an old orthodontic dogma that continues to be re-inforced by current research. Osteotomy techniques to narrow or angulate the symphysis are known, but infrequently used. Symphyseal widening without recurring to osteodistraction techniques is practically impossible. Immediate widening by osteotomy techniques would cause gingival trauma and denudation of the necessary bone graft and osteosynthesis material. Osteodistraction enables symphyseal broadening and allows for incisor alignment without moving the canines out of their periodontal envelope.

In the clinical setting, anterior mandibular widening by osteodistraction has been generally accomplished with tooth-borne devices. Similar problems as with tooth-borne expanders used in SARPE have been encountered in the experimental setting. These include device loosening, tipping of teeth and segments, and more dental expansion in relation to skeletal widening.

The TransMandibular Distractor (TMD),⁵ a bone-borne device fixed on the symphyseal surface, avoids these problems.⁵

Its advantages are as follows:

- There is no loss of anchorage, since the footplates are fixed with 2 monocortical and 1 bicortical screws, at both sides of the midline.
- There is no or very little skeletal relapse, since the actions of expansion and retention are immediately on the bone.
- There is no periodontal membrane compression or root resorption, since the teeth are left untouched.
- There is no tipping of the segments, since the action is at the level of the centre of resistance.
- The activation mechanism is extramucosal; it is easy accessible for activation, it helps to control the activation rate, and it is helpful in case of a mechanical problem; it does not interfere with callus formation and maturation; removal is possible without denudation of the newly formed bone.
- Differential expansion is possible by activating one rod more than the other.
- TMD allows for symphyseal distraction along an arched segment, without the fear for instability of the fixation or for translational condylar movements, because of the helical weakening in the middle part of the rods.
- TMD is maximally tissue compatible, since it is entirely made of titanium grade 2.
- The labial sulcus incision can be kept to 15 mm, and the subperiosteal dissection can be performed medial to the mentalis muscles.

Step-by-Step Procedure

1. A horizontal labial sulcus incision of 15 mm width exposes the symphyseal surface (Figure 21-12). Subperiosteal dissection is performed

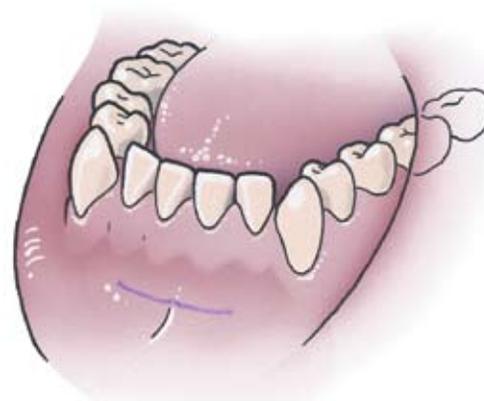


FIGURE 21-12 Horizontal incision in lower buccal sulcus, about 1.5 cm long.



FIGURE 21-13 Subperiosteal degloving in between the mentalis muscles. Sectioning of the symphysis with a reciprocal saw, marking the interradicular osteotomy with a small round bur.

in the midline, between the mentalis muscles. The mentalis muscles are not transected. A chin hook or nasal freer dissector protects the soft tissues during the osteotomy procedure. This is performed with a reciprocating saw in the chin region. In the apical region, cortical perforations are made with a small round bur. An osteotome connects them with gentle tapping and is wedged between the roots. The lingual cortex is transected with the reciprocating saw, which can now be done entirely safely in the interdental osteotomy gap. Care is taken not to tear or even to dissect the fixed gingiva (Figure 21-13).

Alternatively, with wider exposure, a vertical osteotomy can be performed between the lateral incisor and canine roots, and a vertical midline osteotomy in the symphysis. Both are then connected by an oblique horizontal osteotomy under the roots of the lateral and central incisors. The mentalis muscle at the side of the step osteotomy then needs to be reconstructed. This design is favored when the roots of the incisors are very convergent.

2. The footplates are placed very close to the midline osteotomy (Figure 21-14). Holes for the osteosynthesis screws can be made with a bur mounted on a handpiece. The plates are fixed with five monocortical screws of 2.3 mm diameter in the upper and lower holes. A bicortical screw is placed in the middle hole. The incision is closed with resorbable sutures and the activation rods are covered with wax (Figures 21-15 and 21-16).
3. The patient is asked to activate the device 0.5 mm daily with a spanner (1 full turn = 1 mm) (Figure 21-17). The spanner can be used at both sides. A control OPG can help to

4 Maxillary Deficiency – Lengthening and Widening the Maxilla

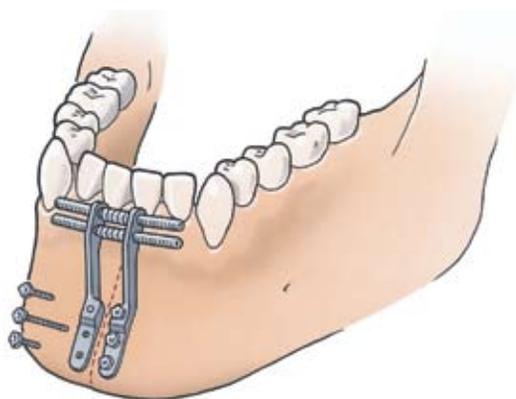


FIGURE 21-14 Placement of the distractor with four monocortical screws and two bicortical screws.

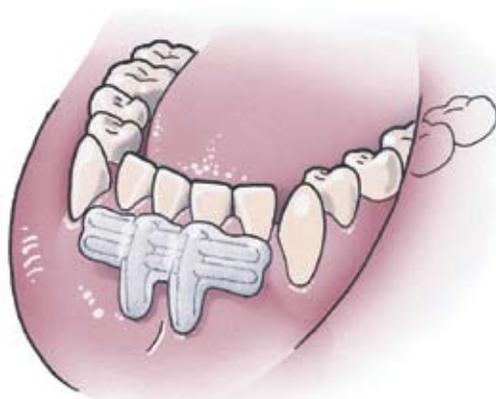


FIGURE 21-16 Protection by orthodontic wax.

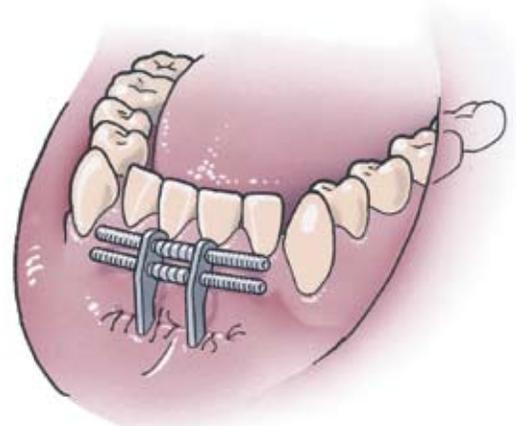


FIGURE 21-15 Water-tight closure.



FIGURE 21-17 Activation.

decide whether to activate one rod more than the other.

4. The device is usually removed after 2 months of consolidation, and only when radiography or echography shows callus consolidation.⁶

Bimaxillary Transverse Osteodistraction

Severe crowding due to narrow upper and lower apical bases can be corrected by the extraction of four premolars, or by bimaxillary transverse osteodistraction.^{7,8} The first strategy is prone to unesthetic changes in lip posture, nasolabial angle, and buccal corridors. Life-long retention is necessary because of the known correlation between increased intercanine distance and relapse of crowding. The second strategy involves surgery, and the final outcome regarding stability is not yet known. Theoretically, because the canines have not been moved outside of the skeletal envelope, and because the functional matrix positively influences the dental arches, relapse of crowding should be less. Facial appearance is improved because of the reduction of the buccal corridors and the fullness of the mouth, both at rest and upon smiling.

Case Report

A 32-year-old female was referred by her orthodontist for a combined orthodontic-surgical treatment of her unesthetic malocclusion, which involved tapered maxilla and mandible, with



9 **FIGURE 21-18** Case report. Facial views. A, Before treatment (June 2001). B, During osteodistraction (July 2001). C, Three months after debanding (September 2003)



FIGURE 21-19 Case report. Occlusal views of the maxilla. A, Before treatment (June 2001). B, During osteodistraction (July 2001). C, Three months after debanding (September 2003).



FIGURE 21-20 Case report. Occlusal views of the mandible. A, Before treatment (June 2001). B, During osteodistraction (July 2001). C, Three months after debanding (September 2003).

anterior crowding, large buccal corridors, and mandibular hypoplasia with resulting Angle Class II malocclusion (Figures 21-18 through 21-20)

The patient underwent osteodistraction day-case surgery in June 2001, comprising placement of a transpalatal distractor at the level of the second premolars, corticotomies without pterygomaxillary disjunction, placement of a transmandibular osteodistractor, vertical osteotomy in the symphysis, and removal of the right lower third molar. Distractor activation started 1 week later and was ended in the beginning of July 2001. The transmandibular distractor was removed in October 2001, and the transpalatal distractor was removed in November 2001, both in an

office-based procedure using local anesthesia only. Fixed orthodontic appliances were applied in October 2001 for alignment, decompensation, and coordination of the arches. In February 2003, the patient underwent mandibular advancement and genioplasty surgery. The orthodontic appliances were removed in June 2003 (see Figures 21-18 through 21-20).

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Chapter 21: Author Query Form

Author: Maurice Y. Mommaerts

Chapter: Bimaxillary Transverse Osteodistraktion

- 1 AU: pls verify manufacturer input
- 2 AU: is this a ratio? if yes, preferably set as 3:2, expansion canine:first molar
- 3 AU: as meant?
- 4 AU: conversion okay?
- 5 AU: is this a trademark name? Pls provide manufacturer details if so. PE/PR: note to set as sentence case of not TM name
- 6 AU: pls provide full text
- 7 AU: pls update or provide prepress DOI number
- 8 AU: missing text
- 9 AU: if applicable, pls note to send BC Decker all patient permission letters for printing of full recognizable face