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## **New device for palatal expansion in conjunction with the Le Fort I osteotomy**

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## **Introduction**

In orthognathic surgery, posterior crossbite caused by a skeletal width deficiency should be corrected to establish proper postoperative lateral guidance. When the basal arch of the alveolar bone in the molar region of the maxilla is absolutely narrow and orthodontic treatment alone will be unlikely to improve the posterior crossbite while maintaining a desirable range for tooth axis, improvement should be achieved by segmental alveolar osteotomy in conjunction with jaw osteotomy rather than by aggressive torque control of the tooth axis. Surgically assisted rapid palatal expansion (SARPE) is one of the options frequently performed nowadays, but the expansion modality is a fan-shaped opening of the palate, and it brings about greater expansion in anterior region than in posterior region. It is not a desirable strategy particularly when transverse expansion in molar region is required.<sup>1</sup> Therefore, three-piece Le Fort I osteotomy by employing horseshoe-shaped circumpalatal osteotomy is often performed.<sup>2</sup> Although a small amount of expansion can indeed be achieved using only this method, it does not always accomplish the planned expansion, which is wider than 3~4 mm in our experience, due to the limitations to stretching the palatal mucoperiosteum by local manual manipulation alone. We have developed a novel device for this acute palatal expansion, the palatal expander, to efficiently stretch the palatal mucoperiosteum widely, irrespective of tooth and gingival conditions.

## **Device and Method**

The device is like a self-retaining retractor with a pair of self-rotating lateral blades on the top that have two pawls, between which the edge of the osteotomized dentoalveolar segment should be engaged (Fig. 1). With the maxilla in the downfractured position, horseshoe-shaped circumpalatal osteotomy is performed using a thin carbide burr (Fig 2). The mucoperiosteum at the right and left margins of the dentoalveolar segments should be sufficiently detached by inserting the furrier from above through the osteotomy line, and the undermining should be extended down along the curved underlying alveolar bone, beyond the juncture of the horizontal palate and vertical alveolar process. The left and right tips with a pair of hooks on the top of the device are then inserted along the sagittal osteotomy line in each nasal floor from above, and, after confirming that the bone edge is firmly engaged to the fissure between the hooks, expansion is gradually implemented until the planned width is obtained (Fig. 3). In authors' experience, about 8~10 mm expansion can be achieved although depending on the original arch size. Within this range of maneuver, we have never encountered tearing of the mucoperiosteum and ischemic events so far.

### **Conflict of interest**

We have no conflict of interest.

### **Ethics statement/confirmation of patients' permission**

Ethical approval not required.

### **References**

1. Bailey LJ, White RP Jr, Proffit WR, Turvey TA. Segmental LeFort I osteotomy for management of transverse maxillary deficiency. *J Oral Maxillofac Surg* 1997;55:728-31.
2. Bell WH, Proffit WR, Jacobs J. Surgical widening of the Maxilla. In: Bell WH, Proffit WR, White RP, eds. *Surgical Correction of Dentofacial Deformities*. Vol 1. 1st ed. Philadelphia, PA: WB Saunders, 1980: 538-548.

## **Legends**

**Fig 1.** The palatal expander, a novel device for palatal expansion. **Insert:** Magnified view of the pair of top blades, which are self-rotational and have two pawls between which the wedge of the osteotomized bone is engaged.

**Fig 2.** Intra-operative view of the horseshoe osteotomy. Interincisal osteotomy has not yet been carried out.

**Fig 3.** Intra-operative view of the expansion maneuver with this novel device. The clasps are inserted along the osteotomy line. Planned expansion is achieved as shown here, with obvious cleavage at the interincisal union. This device works not for a gradual expansion of the soft tissue like a distraction, but for an acute expansion of it in place of the manual manipulation such that tying a wire around the upper contiguous premolar and molar teeth (Ernst ligature) on both the right and left sides, and then repeatedly pulling on each wire strongly in opposing directions.







