

# Palatal Anchorage for the Retention of Interim Removable Prostheses

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#### Keywords

## Abstract

Implant; maxillary; orthosystem; graft; grafting; maxilla; dentures; temporary; attachment; locator; O-ring; overdentures.

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Alberto J. Ambard, 6900 SW 105th Ave, Beaverton, OR 97008. E-mail: albertoambard@mac.com This paper describes a technique that involves the use of palatal implants to retain a maxillary interim prosthesis when extensive bone graft procedures are performed. The rationale is that some bone graft procedures require the removal of the denture flanges for graft success. Once the denture flanges are removed, the denture loses all its retention capabilities, making this lengthy interim phase difficult for the patient. While the use of palatal implants has been documented extensively, limited information is available to describe the use of palatal implants for prosthetic reasons.

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Wehrbein et al first described the use of palatal implants for orthodontic anchorage.<sup>1</sup> Since then, many clinicians have adopted the technique, implants for orthodontic use have become commercially available, and several studies have looked at the surgical and orthodontic success of this technique.<sup>2-5</sup> In addition, comprehensive reviews of the literature have been published.<sup>6</sup> Surgically speaking, the technique has proven to be safe.<sup>4</sup>

This paper reports a technique using palatal implants for prosthetic reasons. The technique presented employs implants to help retain a maxillary removable interim prosthesis during significant grafting therapy. The rationale is that during certain extensive bone grafting procedures, without prosthetic flange removal, the graft tends to collapse rapidly as it receives constant pressure from the denture flanges. When the flanges are removed, the prosthesis loses most of its retention capabilities, and the lengthy interim phase, which can last many months, becomes difficult for the patient. Examples of such extensive surgical procedures include maxillary split crest techniques and major bone grafting of the thin anterior maxilla using collagen sponges and bone morphogenic protein materials, and interpositional bone grafting techniques.

To improve clarity, the following terms are defined: (1) *Palatal orthodontic implant*: a fixture that is narrow (ranging from 1.5 to 2.5 mm wide) and fairly short (ranging from 4 to 9 mm in length). These fixtures have been marketed as minimplants, orthodontic implants, micro implants, and palatal implants. (2) *Conventional dental implant*: an endosseous dental

implant typically used for tooth replacement or to retain or support a removable prosthesis and having more conventional dimensions, ranging on an average from 3.25 mm to 7 mm wide and 5.5 mm to 15.0 mm in length, and (3) *Implant:* in the context of this paper this refers to both a palatal or a dental implant.

## Technique

- 1. Preoperative phase
  - a. *Position of the implant:* Once the surgeon has determined that a reduction of the denture flanges will be necessary to protect an extensive bone graft, available bone for palatal implant placement is determined by means of a CT scan. A marker such as gutta-percha may be used at the position that would work best clinically; however, since bone is limited, the prosthodontist must often adjust to the best surgical position of the implant instead, making the use of markers less important.
  - b. *Number of implants:* Usually one implant is enough and all that may be placed; however, two implants can be considered if bone is available, if found to be necessary to improve retention, or if during surgery, there is concern regarding implant survival due to poor bone quality or poor insertion torque at placement.

Table 1 Commercially available implants suitable for palatal anchorage

Implant	Manufacturer	Diameter	Length	Prosthetic connection
Branemark Shorty	Nobel Biocare, Yorba Linda, CA	7 mm	5.5 mm	Yes
Imtec Ortho	Imtec Co, Ardmore, OK	1.8 mm	6 mm	Yes
Orthoimplant	Straumann USA, Andover, MA	3.3 mm	4 mm	No

There are other palatal and conventional dental implants in the market with prosthetic connections, but of 7 mm length or longer. They may be used if bone is available.

There are few palatal orthodontic implants in the market with no prosthetic connection and longer than 6 mm. They should not be used, given that better options are available.

- Implant type: An implant that is of adequate height C. (6.0 to 10.0 mm depending upon available bone) and that provides an attachment connection is necessary for this technique. In most cases, available bone height will be 6.0 mm or less. See Table 1 for specific information regarding commercially available implants for this purpose. Only when bone of less than 5.0 mm in height is available should an implant without a prosthetic connection be used. In such a scenario, the prosthodontist would have to perform additional steps for prosthetic retention (Refer to step 3d).
- 2. Surgical phase

Other papers, such as Thomas et al's comprehensive review,<sup>6</sup> have described the surgical technique. In short, the implant is placed using a flapless technique following a tissue punch. The length of the implant is obtained from the CT scan. While a surgical template may be used, most often the implant is placed without any guidance. The collar (if present) is left above the bone, and a healing abutment (in the case of a conventional dental implant) is placed to avoid tissue growth on top of the implant. If the implant is placed in the premaxilla, a tall healing abutment is needed due to the amount of soft tissue present in that area. The implant is normally removed by counter torquing. With this said, sometimes even small palatal orthodontic implants integrate and must be removed using a trephine bur. After removal, the area is left alone so tissue granulates and closes the area. If the diameter of the implant is wide, then grafting (bone/gingival) may be considered, but this is almost always unnecessary.

- Interim phase 3.
  - After surgical placement of the palatal implant, if a conventional dental implant is used, the depth of the implant in relation to the gingiva should be measured to obtain abutment height. Then it should be determined if an angled or straight attachment is indicated. In most occasions, a balltype attachment is recommended because it allows movement in all directions; however, newer systems provide an attachment patrix that, according to the manufacturer (Locator, Zest Anchor, Escondido, CA), can compensate up to  $40^{\circ}$ or make an actual attachment abutment that is pre-

angled to 17°, compensating up to 30 to 35° (Micro ERA 17° patrix, Sterngold, Attleboro, MA) (Fig 1). On the other hand, some palatal orthodontic implants offer their own connection, which is a ball attachment.

- b. After the extensive bone grafting procedure is performed in the maxillary ridge and before the interim prosthesis is placed in function, all flanges of the dentures are removed, and the intaglio is heavily relieved at the area corresponding to the surgical site (Fig 2). At this point, the denture must be well seated to the primary bearing area to provide proper support.
- Once the attachment is available, the abutment c. is torqued per manufacturer's recommendations, and the patrix component of the attachment is picked up intraorally with autopolymerizing resin (Fig 3).
- d. If a palatal orthodontic implant without a prosthetic connection has been used due to limited bone, a ball attachment of minimal height that fits an external connection implant may be used. In the case illustrated in this paper, an old Branemark ball attachment without the ring that gives the attachment its height was used (Ball attachment, Branemark System, Nobel Biocare, Yorba Linda, CA). The attachment is attached to the superior coronal surface of the implant using self-curing resin (Pattern Resin LS, GC America, Alsip, IL) (Figs 4-6). The connection is shaped as a pyramid with its base closer to the implant to avoid undercuts. With this technique, a very good support at the primary bearing areas must be accomplished to diminish lateral forces to the attachmentimplant system. In addition, the patrix may be relieved to reduce excessive retention as needed.

4. Postinterim phase

Once the implants for the definitive prosthesis have been placed and uncovered in the maxillary ridge, the palatal implant(s) can be removed, and a soft liner is applied to capture the healing caps for proper retention, along with new addition of denture flanges. Then prosthetic rehabilitation is resumed, and the palatal implants are removed. Once the implant(s) are removed, the soft tissue should heal normally and close the remaining



**Figure 1** Because these implants (Replace Select, 4.3 mm, Nobel Biocare) were placed in the descending premaxilla, attachments that compensate for such angle were needed. The attachment on the left has a vinyl patrix that compensates up to 30° angle (Locator extended range, Zest Anchor). The attachment on the right side is a preangled abutment of 17° (Micro ERA 17° patrix, Sterngold). The patrix also compensates for about 15 to 20°.



Figure 2 Note the strong relief at midline premaxillary area and ridges bilaterally (surgical site). The space in the premaxilla will later be adequate for attachment patrix pick-up. The next step is to remove the buccal flanges completely.



**Figure 3** Patrix picked up in the denture. In this case, black processing patrix were left, as they were enough for proper retention (Locator extended range, Zest Anchor; Micro ERA 17° patrix, Sterngold). Notice that the buccal flanges have been removed.



**Figure 4** A palatal orthodontic implant with no prosthetic connection (Stryker Leibinger micro implant, Stryker Biotech, Hopkington, MA) in place. No room for any other implant was available. This particular implant served for 3 months and then failed.



**Figure 5** A ball attachment has been added to the system using selfcuring resin pattern (Ball attachment, Branemark system, Nobel Biocare). Note the conical shape of the base to minimize problems during pick-up and insertion/removal of the prosthesis.



Figure 6 The corresponding patrix has been picked up (Ball attachment, Branemark system).

defect, which may have been grafted per surgical decision.

# Discussion

## Rationale

Advances in guided bone regeneration techniques have opened new horizons for solving even severe bone resorptions in the maxillary arch. Unfortunately, while these techniques offer new opportunities to our patients in terms of implant therapy, in practice they require very careful care during a long postoperative term to allow the graft material to mature. While most surgical literature says little about the prosthetic management of our patients during this critical phase, it is well known that most surgeons prefer flange elimination to achieve better results.

#### Implants: number, type, and location

The determining factor for implant placement is bone quantity. On average, 4 to 6 mm of vertical bone is available for implant placement. Therefore, a very short implant is recommended.<sup>5</sup> Unfortunately for prosthetic function, the shortest implants (both conventional dental and palatal orthodontic) with prosthetic connections commercially available are 5.5 to 8 mm long. It is not known what implant diameter would be best for this application. While a narrower implant seems logical due to its simple placement/removal, stabilization must be considered, given the excessive lateral forces the implant will be exposed to. On the other hand, if an implant of over 4 mm diameter is placed, additional tissue plugging may be necessary after removal of the implant to ensure proper closure of the implant socket. The author of this paper has used diameters from 2.0 to 7 mm. Ultimately, the implant should be selected based upon bone height and commercial availability. One conventional dental implant appears to be enough for interim prosthetic service.

Palatal orthodontic implants have reported success rates that vary from 75% to 100%.<sup>2-4</sup> In the author's experience, they tend to fail more often than conventional dental implants. Thus, when they are used, at least two implants should be considered not only for proper retention but also to help distribute stress and avoid early failure. Implants without prosthetic connections should be considered only if no other option is available, given that they always require a connection with self-cured resin that is clinically challenging (Fig 5).

While the mid-palatal area is the recommended site per existing literature, the author has used the premaxilla successfully (Fig 1). The disadvantage of this area is its descending angle, which makes the prosthetic management more challenging due to discrepancy between prosthetic insertion angle and implant angle; however, as previously described, angulation problems are managed by using the proper attachment system (Fig 3). Thus, if an implant is placed in the premaxilla, a conventional dental implant should be considered, because an abutment that corrects implant angle will be used, and those are not available for palatal orthodontic implants.

#### Loading time

It is not clear what loading time is adequate for these techniques. Crismani et al argued that the 3-month wait recommended in the literature for palatal orthodontic implants was not founded and was unnecessary; instead they recommended 6 weeks.<sup>2</sup> The author of this paper has loaded conventional dental implants placed in the palate immediately to decrease costs and number of surgeries. If at least 40 Ncm of insertion torque is achieved, this could be the treatment of choice. The problem is that if such insertion torque is not achieved, the grafting procedure must be cancelled or the patient must be without retention aid during the interim phase. This can be a logistical problem.

#### **Risks and complications**

Other than implant failure, risks with these procedures include minor soft tissue complications and communication with nasal floor and/or maxillary sinuses if the case is not properly planned and the surgical technique is poor. Therefore, lateral cephalograms, CT scans, and sometimes CT prosthetic templates are highly recommended for proper planning. With this said, even bone perforations up to 1.3 mm rarely result in perforation of the nasal mucosa.<sup>7</sup>

#### Advantages, disadvantages

We believe palatal anchorage techniques provide the patient with adequate prosthesis retention during the healing phase of major bone grafting. This is a major advantage, as patients with severe bone resorption lack alternatives to help them "survive" the interim phase.

Surgically speaking, the procedure is predictable when well planned. Most patients report some discomfort during the first 2 to 3 days after surgery and may complain of a bulky feeling on the palatal area. Therefore, case selection is an important consideration. The procedure itself may cause discomfort and requires additional surgical time and costs. Prosthetically, the technique can be particularly difficult, especially for an inexperienced clinician.

#### Indications and contraindications

Generally speaking, as long as there is enough bone height, implant placement is indicated. Due to the addition of an extrasurgical site, the risks associated with this procedure and its cost, this technique should be reserved for those cases where retention of the interim prosthesis will be significantly compromised and increased retention is needed by clinician, patient, or both. At times, hypertrophic posterior alveolar ridges and tuberosities may provide enough retention even after removal of the anterior buccal flange when bone augmentation is needed at the anterior aspect of the maxilla only. In the author's experience, if bone is available, when extensive bone augmentation is indicated and flange removal is expected, this technique is always recommended, as the comfort and ability to continue with normal life for the patient during a lengthy interim phase is greatly improved.

#### **Alternative therapies**

In the "techniques steps" section, an alternative technique has been described when palatal anchorage is considered for prosthetic management during the interim phase and a conventional implant is not an option due to lack of bone (Step 3d). Therapies other than the use of palatal anchorage to help patients during the interim phase are available; however, for large bone grafting procedures, the author finds them inferior to the technique described here. Indeed, zygomatic implants have proved to be technique-sensitive and expensive. In any case, they require additional implants in the anterior maxilla. The clinician may opt to have the denture with flanges. This, in the author's experience, has proved to be detrimental for the bone grafting, and in many cases has compromised the overall outcome. The patient may also opt to avoid the use of the prosthesis or to use denture adhesive; however, most patients are not willing to be without a prosthesis socially, and the denture adhesive is often ineffective and messy.

# Conclusion

A new technique to help retain an interim maxillary denture during implant therapy has been described. While this protocol appears to greatly help patients during the healing phase, further research is necessary. In addition, implant companies could consider smaller implants that support prosthetic management for special cases such as those described in this paper.

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