

# Dental Implantology Update™

The International Forum for Continuing Education

Volume 20, Number 12

December 2009



**AHC Media LLC**

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• All images contained within this issue are from Dr. Ganz's practice.

## **Maxillary Ridge Splitting: A New Approach**

**By Arun Garg, DMD**

### **Introduction**

Recent advancements in the field of dental implantology have led to significant changes in operative techniques. More and more options are available for implant procedures and patient inclusion criteria are ever-expanding. One technique that has vastly improved for patients with crestal bone is the maxillary ridge-splitting technique. The goal of this procedure is to widen an atrophied edentulous site horizontally in order to insert an implant, simultaneously or in a delayed fashion, in an otherwise too-narrow part of the anterior maxilla. What follows is the description of a newly modified and novel approach to this procedure that is atraumatic compared to previous methods, and elegantly performed with only minimal local anesthetic, minimal procedure time, and extremely high success rates. The gain in bone dimension, and even the cosmetic outcomes, is noted to be superb, and procedure time is extremely short in duration.

### **Procedure**

The procedure begins with administration of a local anesthetic:

1-1.5 carpules of 2% lidocaine with epinephrine (1:100,000). Anesthesia is administered to the buccal and crestal gingiva; no palatal administration is required in this technique. Ideal device positioning is guaranteed by the use of a spacer (Implant Guidance System® by Innovative Implant Technology, Aventura, FL) to center the location of the implant in the appropriate anterior/posterior dimension.

Using a number 15C blade in a round blade handle, a small incision is made midcrestally with two vertical releases. The two vertical releases are beveled incisions at a 45° angle. The vertical releases are continued superiorly to beyond the mucogingival junction. All corners of the incisions must intersect and be down to the bone or the surgeon will not be able to adequately lift the flap. At this point, the flap is carefully elevated; slow, deliberate reflection beyond the mucogingival

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Figure 1: Expander Screws

junction is necessary in order to provide adequate tissue for ample maneuverability and proper closure after the implant is placed.

The periosteum is additionally

and optionally incised to allow for more flexibility and greater flap release for good passive soft tissue closure post ridge split, implant, and graft material place-

ment. Anterior/posterior and buccolingual positioning is assured by making a hole on the crest.

Osteotomy is achieved using a piezo-surgical device (Piezon

**Dental Implantology Update™** (ISSN 1062-0346) is published monthly by AHC Media LLC, 3525 Piedmont Road N.E., Building Six, Suite 400, Atlanta, GA 30305. Telephone: (404) 262-7436. Periodicals Postage Paid at Atlanta, GA 30304 and at additional mailing offices. The statement of ownership will appear in the November issue.

**POSTMASTER:** Send address changes to *Dental Implantology Update™*, P.O. Box 740059, Atlanta, GA 30374.

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Figure 2: Handle for Screw Expanders

Master Surgery® by EMS, Nyon, Switzerland). Vertical cuts are made, being careful to stay away from the tooth roots on both sides of the edentulous area. For the ridge-splitting technique in the anterior maxilla, the bone is vertically cut 1-2 mm in depth and horizontally cut to 7-10 mm. For procedures in the posterior mandible, osseous incision depth is 2-3 mm, and an additional 1-2 mm horizontal incision is made into the cortical bone to further loosen the area. A light mist is released and suctioning applied to absorb the fine particulate of bone.

A 25 RPM bur with an initial pilot bur (1-2 mm diameter) is then used to gently penetrate the bone just past the cortical plate in order to facilitate screw placement. At this point, a new ridge-expansion technique is initiated,

using screws of increasing diameter (Figure 1) to slowly and delicately expand the implant site until the appropriate diameter is obtained. The surgeon inserts these screws with the assistance of a handle that functions as a lever (Figure 2). The smallest diameter screw is gently inserted into the socket first. Once fully placed, the screw is left in the socket for 10 seconds, after which point it is removed and the surgeon advances to the next screw. Each screw is inserted in the same manner to gradually expand the implant site. Irrigation is applied lightly as needed. When all successive screws have been placed and removed, the carrier for the implant is finally inserted. The carrier is removed and a cover screw is inserted so that the bone does not invaginate.

Freeze-dried cadaver bone is

used to fill the site and provide a ridge that is symmetric. The soft-tissue flap is pulled over the cadaver bone and the site is closed using one horizontal mattress stitch on the crest and 2 to 3 interrupted stitches on the vertical releases (suture: 4.0 Vicryl with an X1 needle).

To reduce the incidence of surgical-site infection, antibiotic is administered one hour preoperatively. An opioid analgesic may be prescribed for postoperative pain. Four to six months after the procedure, an implant can be inserted.

### Outcomes

Early implementation of the technique has yielded optimal cosmetic results, with no side effects beyond minor soft-tissue swelling at the site and mild postoperative discomfort. Because the technique does not require inva-

sive bone manipulation with a hammer and chisel, as the traditional ridge-splitting procedure does, sedation is not required.

### Discussion

Providing patients with a natural cosmetic appearance following atrophy of the anterior maxilla or posterior mandible at edentulous sites has proven to have its share of challenges. In the past, autogenous bone grafting provided the strength, support, and cosmetic enhancement necessary for a successful osseointegration of the implant; however, the procedure required extended time for healing, a donor site, and it merely simulated natural bone rather than recreating the physiologic osseous identity of the patient's original socket.<sup>1</sup> Additionally, neovascularization of the graft site remained imperfect. In order to manage these difficulties and improve implant outcomes, the concept of the ridge-splitting procedure was developed. The technique offers an appropriately-sized space for implant insertion while maintaining natural vascularity on all four surfaces of the implant site.<sup>2</sup> For stability, the ridge must be split enough for the implant to enter the basal bone; however, over-manipulation with a hammer and chisel can damage adjacent teeth and risks damaging the floor of the maxillary sinus. The new technique described above offers a unique and delicate way to penetrate basal bone with a minimum of physical force applied to the implant site. Not only does this decrease the possibility of adverse events, it actually enhances patient intra- and peri-operative comfort. It is also possible that local soft-tissue healing-time may be decreased due to the gentler technique, but this remains an area of future study. Further data on all outcomes of this technique, including short- and long-term implant failure

rates, will need to be obtained, but initial patient experiences using this method have yielded optimal cosmetic results with no incidence of implant failure. ■

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## Prevention of Post-operative Nausea and Vomiting: A Look at the Current Literature

**Dr. Arun Garg, DMD**

In a recent article in the *Journal of Maxillofacial Surgery*, three authors set out to evaluate the incidence of post-operative nausea and vomiting (PONV) in patients undergoing oral surgery to determine if prophylactic antiemetics might offer some benefit to this patient population.<sup>1</sup> Ultimately, the authors recommend the "watch-and-wait" policy as opposed to a prophylactic regimen, but suggest an antiemetic in the case of intractable PONV and for those patients who fail to respond to simple gastric lavage. Of note, this is not the first investigation into this challenging sequella. In 1999, the same journal published an article that concluded that there was no significant difference between placebo and

ondansetron to prevent PONV within the study's framework, which used two types of anesthetic agents and two operative techniques.<sup>2</sup>

The relevance of these articles, belied by the paucity of research on the topic, is as pressing now as it was ten years ago. As techniques in dental implantology continue to improve and modernize, managing one of the patient's most frustrating and troublesome post-operative complaints remains a challenge to practitioners.

### Incidence

The incidence of post-operative nausea and vomiting reported in the literature varies widely, with rates between 8% and 92%,<sup>3</sup> depending on multiple factors. Patient age, gender, and preexisting disease are all involved in the likelihood that a patient will experience PONV, as are premedication, operative procedure, anesthetic agent, and analgesic medication. A study published in *Anesthesia* investigated post-operative sequelae and determined that of the 3,850 patients surveyed, 37% vomited and 23% experienced nausea in the post-operative phase after administration of a general anesthetic.<sup>4</sup> This study included all operative procedures, with an increased risk seen in patients undergoing gynecological, general, orthopedic, and otolaryngological surgeries. A clear majority of these patients were young women. In the small collection of data on the subject, the incidence of PONV in oral-surgery patients falls somewhere between 10%-15%, depending on study size and patient population.<sup>1,6</sup> Despite newer antiemetic therapies, the incidence of PONV does not appear to be decreasing.

Special populations are at increased risk of PONV, and this fact should be considered when

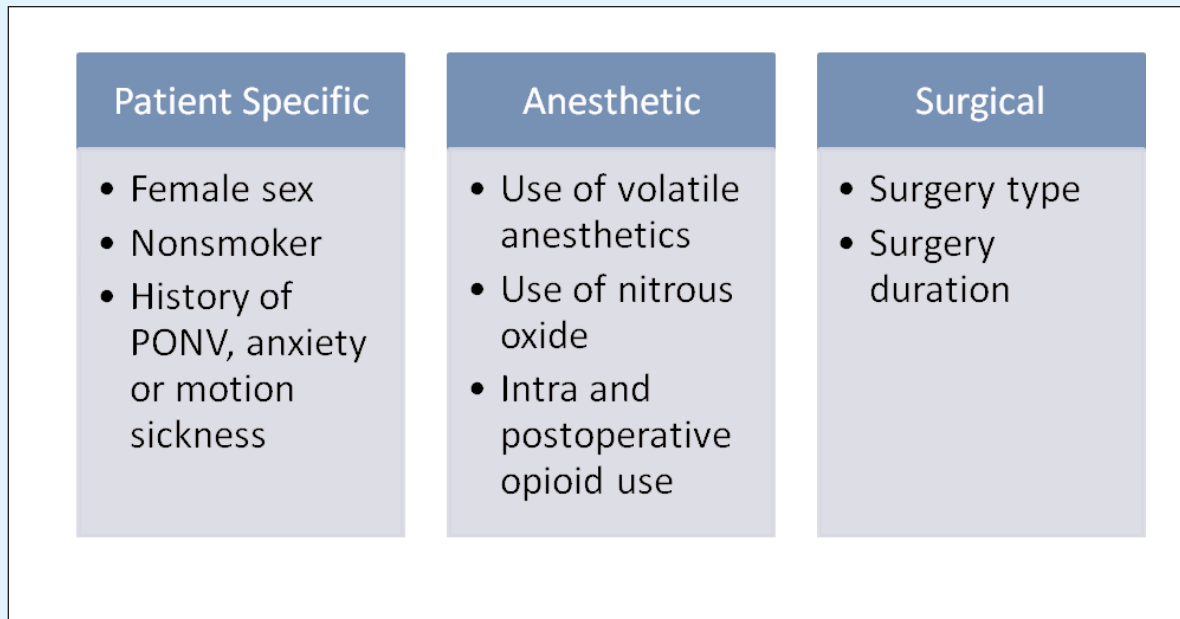


Figure 3: Risk factors for PONV (adapted from Gan et al's Consensus Guidelines 2003.)

assessing the need for a prophylactic antiemetic before dental-implant surgery. Obese individuals have higher rates of PONV, as do those more prone to anxiety or who have a history of motion sickness.<sup>7</sup> A thorough patient history in advance of general anesthesia will elucidate these risk factors. Additionally, women, who are at a much greater risk of experiencing PONV than their male counterparts, have varying rates depending on hormone levels at the time of anesthesia. Females receiving exogenous hormones for fertility treatment, as well as those in a particular phase of the menstrual cycle, appear to have very high rates of PONV as well.<sup>8</sup>

Duration of surgery also plays an important role in the incidence of postoperative nausea and vomiting. For every additional 30 minutes of increased procedure time, there is a corresponding 60% increase in PONV risk,<sup>9</sup> above a baseline risk near the risk-rate for

oral and maxillofacial surgeries.

### **Oral Surgery Studies**

Few studies are dedicated solely to the management and treatment of postoperative nausea and vomiting in the patient undergoing oral or maxillofacial surgery. Tracking the incidence of this problem remains a focus in the literature, as does optimizing treatment, or, if possible, preventing it altogether.

Some studies do show decreased rates of nausea and vomiting when using specific therapies. Dexamethasone alone, or in combination with other antiemetic agents, has been found to decrease the rates of PONV.<sup>10,11,12</sup> The most recent study published emphasizes the fact that serotonin-receptor antagonists, like ondansetron, are not useful in the prevention of PONV for the typical patient,<sup>1</sup> and this principle is echoed in other earlier reports.<sup>2,13</sup> That being said, there is evidence that some prophylactic

regimens are useful for high-risk patients.<sup>10</sup>

One author looked at the PONV problem in a sample of 150 patients seeking elective oral and maxillofacial surgical procedures and found that the incidence is increased in young female patients (aged 10-29 years) when the procedure involves the maxilla, as well as when significant intraoral bleeding occurs during the procedure.<sup>5</sup> In this study, opioid analgesics were also considered a risk factor for PONV. The author suggests that premedication of this type patient with antiemetics did not diminish the incidence of PONV.

### **Consequences of PONV: Patient Discomfort**

Nausea and vomiting remain two of the most frustrating complaints for patients in the postoperative period. In a unique, survey-based study comparing patient and practitioner preferences, antiemetic efficiency was

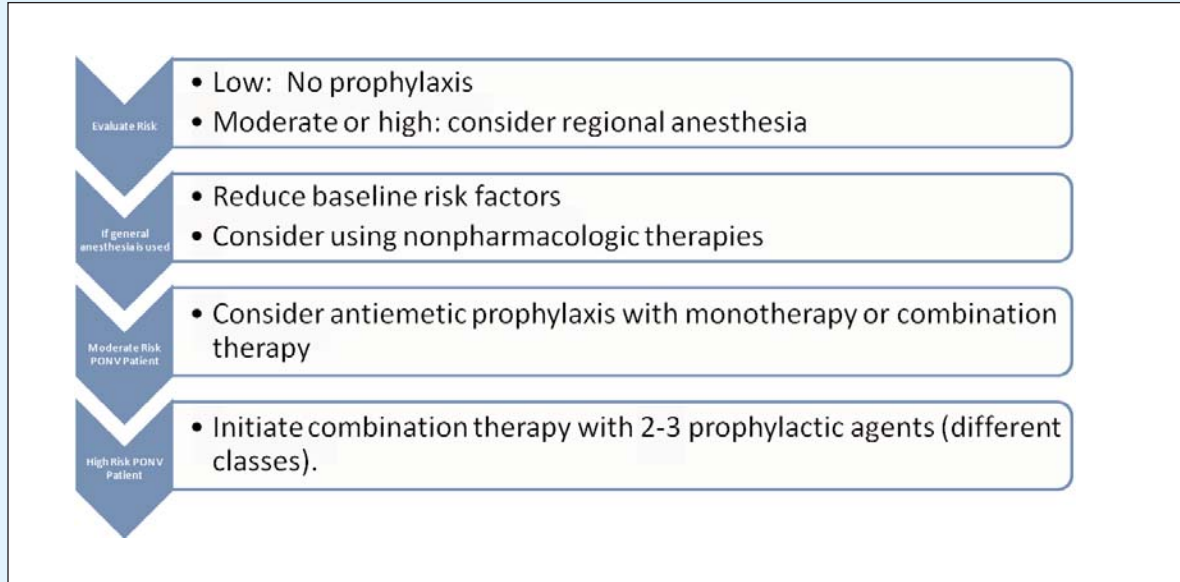


Figure 4: Algorithm for PONV management (adapted from Gan et al.'s Consensus Guidelines 2003)

rated as more important to the patient than the cost of the drug; adversely, practitioners rated the cost of antiemetic medications higher in terms of importance than antiemetic efficiency. The same study showed no preference between prophylactic treatment and symptom management for patients or practitioners.<sup>14</sup> The fact remains, however, that there is a discrepancy in the cost/benefit analysis for practitioners and for patients; this suggests that practitioners may not be maximizing treatment of PONV in certain circumstances.

### Adverse Events

Significant adverse events from postoperative nausea and vomiting, though rare, do occur in the patient seeking dental-implant surgery. Disruption of surgical repair can result from the increased pressures generated during the act of emesis. Aspiration of gastric contents into pulmonary structures and

acid/base disturbances (hypochloremia, hypokalemia, hyponatremia) are also potential adverse effects associated with this challenging complaint.

### Increased Costs

Two schools of thought on the use of prophylactic antiemetics have emerged: there are those practitioners who use them despite fewer and fewer indications to do so in the current literature, and there are those who do not use these drugs prophylactically but instead opt for symptomatic relief as needed. There are increased costs associated with the use of antiemetics, and if the patient is not considered to be at a high risk for PONV, there is no evidence to support their regular use. It is also important to note that PONV can occur despite adequate prophylaxis.

The costs associated with PONV are difficult to assess but include those incurred as a result of a prolonged ambulatory stay

with staff supervision, unanticipated hospital admission, and the costs of any additional therapeutic treatment regimens required to adequately address the problem<sup>15</sup> or subsequent problems, especially in the infrequent case of intractable vomiting.

### Conclusions

With evidence mounting against the habitual use of prophylactic antiemetics for all oral- and maxillofacial-surgery patients, the argument can be made that when treating high-risk patients, a prophylactic regimen may be given. Consensus guidelines<sup>9</sup> for the management of PONV can be used to identify these high-risk individuals and to help the dental implant surgeon implement patient-specific treatment regimens. There is, however, no guarantee that prophylactic antiemetic use will eliminate PONV, even in the high-risk patient. Further studies evaluating this challenging postoperative issue will clarify

treatment options and elucidate firmer success rates in specific patient populations. ■

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