

# Benign Paroxysmal Vertigo Secondary to Placement of Maxillary Implants Using the Alveolar Expansion Technique with Osteotomes: A Study of 4 Cases

Miguel Peñarrocha-Diago, MD, PhD, MS<sup>1</sup>/Javier Rambla-Ferrer, DDS, MDS<sup>2</sup>/  
Vanessa Perez, MD<sup>3</sup>/Herminio Pérez-Garrigues, MD, PhD<sup>4</sup>

*The osteotome method is an often-used technique of great utility in certain patients with maxillary bone atrophy. However, it has been associated with the provocation of benign paroxysmal positional vertigo (BPPV), which has been described as a consequence of working the implant bed with osteotomes. During the placement of maxillary dental implants using the osteotome technique, the trauma induced by percussion with the surgical hammer, along with hyperextension of the neck during the operation, can displace otoliths and induce BPPV. Four cases of BPPV occurring after the preparation of maxillary implant beds are presented. Treatment consists fundamentally of maneuvers to move the calcium carbonate crystals from their anomalous location in the semicircular canal to their correct place in the utricle. INT J ORAL MAXILLOFAC IMPLANTS 2008;23:129–132*

**Key words:** benign paroxysmal positional vertigo, dental implants, osteotomes

Summers described a bone expansion technique in atrophic maxillae using osteotomes to prepare the implant bed.<sup>1</sup> The technique required striking the bone with a surgical hammer until the desired depth was reached. The osteotome method is an often-used technique of great utility in certain patients with maxilla bone atrophy. The provocation of benign paroxysmal positional vertigo (BPPV) has

been described as a consequence of working the implant bed with osteotomes and is characterized by short, recurrent episodes of vertigo when carrying out certain lateralization and extension movements of the head.<sup>2–4</sup>

Four cases of BPPV are presented; each occurred after the preparation of sites for maxillary implant placement using the osteotome technique. Etiology, diagnosis, treatment, and prevention are discussed.

<sup>1</sup>Professor of Oral Surgery and Director of the Master of Oral Surgery and Implantology Program, Faculty of Medicine and Dentistry, University of Valencia, Spain.

<sup>2</sup>Master of Oral Surgery and Implantology, Faculty of Medicine and Dentistry, University of Valencia, Spain.

<sup>3</sup>Doctor of Medicine, Otorhinolaryngology Service, Hospital Universitario la Fe, Valencia, Spain.

<sup>4</sup>Head of Department, Otorhinolaryngology Service, Hospital Universitario la Fe Valencia, Spain.

**Correspondence to:** Dr. Miguel Peñarrocha-Diago, c/ Gasco Oliag, 1, Unidad Médico-Quirúrgica, Clínica Odontológica, 46021 Valencia, Spain. Fax: +34 963 864 144. E-mail: M.Penarrocha@uv.es

## CLINICAL CASES

In the Medical-Surgical Unit of the Faculty of Medicine and Odontology of Valencia, 812 implants were placed in 320 patients between 1996 and 2004 using the osteotome technique (Figs 1 and 2). Four patients are presented in whom BPPV developed following the use of osteotomes and percussion with a surgical hammer to form the implant bed. These cases constitute 1.25% of the patients treated with this technique (Table 1).



**Fig 1 (Left)** Osteotomes and surgical hammer.

**Fig 2 (Below)** Use of osteotomes with hammer.



Case	Age (y)	Sex	Edentulism	No. of implants	History of vertigo	Appearance of vertigo	Treatment	Evolution
1	60	M	Total	6	No	Following surgery	Rest and antivertigo	2 mo
2	57	F	Total	8	No	Following surgery	Rest, antivertigo, and Epley maneuver	2 wk
3	82	M	Total	6	No	1 week after surgery	Rest and antivertigo	4 mo
4	48	F	Partial (maxillary left)	3	No	Following surgery	Rest, antivertigo, and Epley maneuver	1 wk

**Case 1**

Six implants were placed in a 60-year-old man with a completely edentulous maxilla. The patient had no medical conditions or history relevant to his treatment. There were no complications during the operation; however, on sitting up, vertigo appeared for a few seconds. Vertigo reoccurred on successive days in connection with sitting up and lying down in bed and with the lateral decubitus position. The symptoms remitted definitively 2 months after their appearance; the patient remained asymptomatic throughout the following 3 years.

**Case 2**

Eight implants were placed in the atrophic alveolar process of a completely edentulous 57-year-old woman with no medical contraindications. On sitting up after surgery, the patient experienced intense vertigo, with dizziness and disorientation when the head was rotated to the left, accompanied by distress, nausea, and vomiting. Otoneurological clinical exploration was normal except for a positive Dix-Hallpike maneuver, provoking a nystagmus response and vertigo on cephalic hyperextension with left lateralization. These symptoms disappeared later after

Epley maneuvers had been performed to reposition the utricular otoliths. Epley's canalith repositioning procedure is based on the free-floating particle theory of BPPV. The patient is seated on an examining table, and the head is turned 45 degrees to the affected side before the patient is rotated backward over the end of the table. This maneuver allows the particles to settle closer to the common membranous crus of the semicircular duct. The examiner observes the nystagmus response and, after resolution of the nystagmus, the patient is rolled laterally onto his or her opposite side, with the head turned 45 degrees. This allows the free-floating particles to go through the common crus into the utricle, while the posterior canal rotates a full 180 degrees. The patient is then returned to the original sitting position. After the performance of Epley maneuvers in the case presented, the patient became asymptomatic; she remains asymptomatic 4 years later.

**Case 3**

BPPV appeared 1 week following surgery in the case of a completely edentulous 72-year-old man with no medical history of interest. The patient presented with a severely atrophic maxilla. After radiologic

exploration, panoramic radiography, and computerized tomography, 6 implants were placed in the anterior and premolar areas. When sitting up in the chair the patient experienced episodes of light vertigo, with a sensation of movement and dizziness each time he sat up or adopted the right lateral decubitus position. The vertigo remitted spontaneously after 2 days. Two years after the patient's recovery, he has had no repeat episodes of vertigo.

#### Case 4

A 48-year-old woman with no medical history of interest was edentulous in the maxillary left quadrant, with an atrophic alveolar crest. Three implants were placed in this quadrant. On sitting up after surgery, the patient experienced dizziness, distress, and the sensation of objects moving around her. These sensations remitted after a few seconds when she changed position. After a positive Dix-Hallpike maneuver, BPPV was diagnosed. The Epley maneuver was carried out, and the vertigo remitted. Three years later, the patient remains symptom-free.

## DISCUSSION

BPPV is characterized by short, recurrent episodes of vertigo initiated by certain head lateralization and extension movements toward the affected side. These disturbances are almost always in the plane of the posterior semicircular canal, although in some cases the other semicircular canals can participate. The diagnosis of BPPV is supported by the coexistence of ageotropic nystagmus at the time of the vertigo.<sup>3</sup> BPPV is usually idiopathic, although cases have been discovered after traffic accidents or otologic surgery,<sup>5,6</sup> cranial trauma,<sup>7</sup> and other surgical interventions with prolonged periods of bed rest.<sup>8</sup> It usually presents in middle age and could therefore have a degenerative component. It is believed that this vertigo is caused by the displacement of otoliths from the macula utriculi to the nonampullar end of the posterior semicircular canal. When the patient sits up, these particles are deposited on the ampullar crest, which triggers vertigo.<sup>5</sup> Lorne et al<sup>9</sup> surgically observed the presence of otoliths in the posterior semicircular canal in patients affected by BPPV, which would explain the physiopathology of the condition. The most accepted theory is that of *canalithiasis* (ie, that free-floating particles detach from the macula and gravitate into the endolymph of the semicircular canal). The displacement of the particles toward the lower part of the posterior semicircular canal would in turn involve ampullofugal displacement of the endolymph and, consequently,

excitatory stimulation of the posterior semicircular canal, which would trigger vertigo. On the other hand, *cupulolithiasis* postulates that particles detached from the otoconial membrane are deposited in the cupula of the semicircular canal and not in the canal per se.<sup>5</sup> The detached otoconial material can remain free in the utricle until by chance it enters the semicircular canal. Days or months can pass from the detachment of the otoliths until the appearance of BPPV.<sup>9</sup>

Treatment consists fundamentally of maneuvers to restore the calcic carbonate crystals from the anomalous location in the semicircular canal to their correct place in the utricle. Among the reinstatement maneuvers, the most well known is the Epley maneuver.<sup>10</sup> The treatment is most successful in cases where particles are situated in the posterior semicircular canal rather than in the external or upper semicircular canal. Honrubia et al<sup>11</sup> obtained improvement in 88% of cases with posterior semicircular canal involvement, of which 50% originated in the upper semicircular canal.

During the placement of maxillary dental implants using the osteotome technique, the trauma induced by percussion with the surgical hammer, along with hyperextension of the neck during the operation, can displace otoliths and result in the appearance of BPPV.<sup>2</sup> Four patients, representing 1.25% of the patients treated, suffered vertigo when trying to sit up immediately after surgery and were diagnosed with BPPV. However, incidence of this complication may have been higher. If there were cases where the vertigo did not appear for days or weeks after dental implant surgery (the trauma that provoked the detachment of the otoconial material), the BPPV may not have been associated with the surgery. Such a delay would make diagnosis more difficult.

Because implant treatment is increasingly being carried out with older patients, and because of the widespread use of the bone expansion technique with osteotomes, incidence of BPPV can be expected to increase. To prevent this complication, care should be taken when using the osteotome technique. The application of manual force instead of hammer percussion, and the use of a surgical fraise in combination with osteotomes, can minimize the trauma to the craniofacial area as much as possible, especially in older patients. In suspected cases of BPPV, the patient should be informed about the condition and then remitted to an otoneurological specialist to determine which semicircular canal is affected and to carry out the appropriate otolithic reinstatement maneuver.

## REFERENCES

1. Summers RB. A new concept in maxillary implant surgery: The osteotome technique. *Compendium* 1994;15;2:152, 154–156.
2. Peñarrocha M, Pérez H, García A, Guarinos J. Benign paroxysmal positional vertigo as a complication of osteotome expansion of the maxillary alveolar ridge. *J Oral Maxillofac Surg* 2001;59:106–107.
3. Pérez Garrigues H, Mateos Fernández M, Peñarrocha M. Vértigo posicional paroxístico benigno secundario a maniobras odontológicas sobre el maxilar superior. *Act Otorrinolaringol Esp* 2001;52:343–346.
4. Saker M, Ogle O. Benign paroxysmal positional vertigo subsequent to sinus lift via closed technique. *J Oral Maxillofac Surg* 2005;63:1385.
5. Brandt T, Stedden S. Current view of the mechanism of benign paroxysmal positioning vertigo: Cupulolithiasis or canalolithiasis? *J Vestib Res* 1993;3:373–382.
6. Baloh RW, Honrubia V, Jacobson K. Benign positional vertigo: Clinical and oculographic features in 240 cases. *Neurology* 1987;37:371–378.
7. Hanci D, Altun H, Ozbilgen S. Boksorlerde Benign paroksizmal pozisyonel vertigo sikligi ve tedavisi: Prospektif calisma. *Istanbul Tip Dergisi* 2004;1:13–17.
8. Gyo K. Benign paroxysmal positional vertigo as a complication of postoperative bedrest. *Laryngoscope* 1998;108:332–333.
9. Lorne S, Parnes M, McClure JA. Free-floating endolymph particles: A new operative finding during posterior semicircular canal occlusion. *Laryngoscope* 1992;102:988–992.
10. Epley JM. The canalith repositioning procedure: For treatment of benign paroxysmal positioning vertigo. *Otolaryngol Head Neck Surg* 1992;107:339–340.
11. Honrubia V, Baloh RW, Harris MR, Jacobson KM. Paroxysmal positional vertigo syndrome. *Am J Otol* 1999;20:465–470.