Apicoectomy of an Endosseous Implant to Relieve Paresthesia: A Case Report

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Various radiographic and surgical techniques have been recommended to avoid paresthesia following mandibular implant placement. However, nerve impingement is sometimes inevitable, and when lingering numbness is reported, clinicians have a limited number of corrective options. This report describes a technique for cutting-back the apex of the implant, a technique that may be useful when lingering numbness persists after osseointegration has occurred. (Implant Dent 2003;12:202–205)

Key Words: nerve impingement, nerve lateralization, paresthesia

The reported prevalence of long-term altered sensation of the mental nerve after mandibular implant placement is as high as 13%.[1,2] Various surgical and radiographic techniques have been utilized to avoid this complication. The radiographic methodologies range from simple to complex and include periapical and panoramic radiographs, tomography, and computed tomography. Sophisticated computer-aided measurement techniques may also be used, including barium-coated templates, computed tomography–generated templates, and three-dimensional reformatted images.[3,4] Unfortunately, even the best radiographs and computer enhancement do not always clearly show the location of the canal. Schropp et al[5] reported that even with tomographic techniques, the discrepancy between the implant sizes that were radiographically selected and those actually placed was 13% in a group of experienced implant surgeons. Surgical exposure of the mental foramen to allow direct visualization and measurement is sometimes recommended. Unfortunately, the distance from the alveolar crest to the inferior alveolar canal is not always identical to the depth of the foramen.[6,7] Some graduate-training programs even recommend the use of infiltration rather than block anesthesia so that patient discomfort may serve as a guide to canal location. However, this method is not always satisfactory because bone has sensory nerve endings,[8] making the procedure intolerable to many patients. Finally, nerve lateralization may be done before implant placement in those cases where bone height is clearly inadequate. This procedure carries its own significant risk of paresthesia.[9]

It is imperative that the practitioner use as many methods as seems necessary to avoid nerve involvement in any particular case. Because none of the methods is perfect, it follows that a significant potential for violation of the canal may still exist. A postoperative radiograph and instructions to the patient to report any "lingering numbness" are prudent cautions. If nerve impingement is suspected, the choices include removal of the implant, reverse torquing of the implant by several turns to move the apex away from the nerve, or no treatment. The first two procedures must be accomplished during the healing phase, before the implant has integrated with the bone. This article describes an additional option that may be used after osseointegration has occurred: apicoectomy of the implant.

Case Report

The patient was an 83-year-old woman with a noncontributory health history. Her chief complaint was lack of a chewing surface in the lower right mandibular quadrant due to the loss of her bicuspids and first molar. The patient elected to have two implants placed to support a three-unit fixed partial denture in that quadrant. Periapical and panoramic radiographs were taken preoperatively. Under local anesthesia consisting of an inferior nerve block and a long-buccal block, an incision was made on the crest of the ridge and full-thickness flaps were reflected. The mental foramen was located by blunt dissection and used as a guide to the location of the inferior alveolar canal. Two Replace implants (Nobel Biocare, Yorba Linda, CA) were placed in the first molar and first bicuspid regions respectively. No unusual bleeding was noted, indicating that the nerve bundle had not been violated.

When the patient returned for suture removal, she noted altered sensation covering the distribution of the right mental nerve. Significant postoperative swelling was noted, suggestive of temporary paresthesia due to soft-tissue edema. A peri-apical radiograph (Fig. 1) was ambiguous as to nerve impingement. At first glance, it appeared to show that the posterior implant was 1 or 2 mm above the inferior alveolar canal. Figure 2, a computer-enhanced version of Figure 1, further

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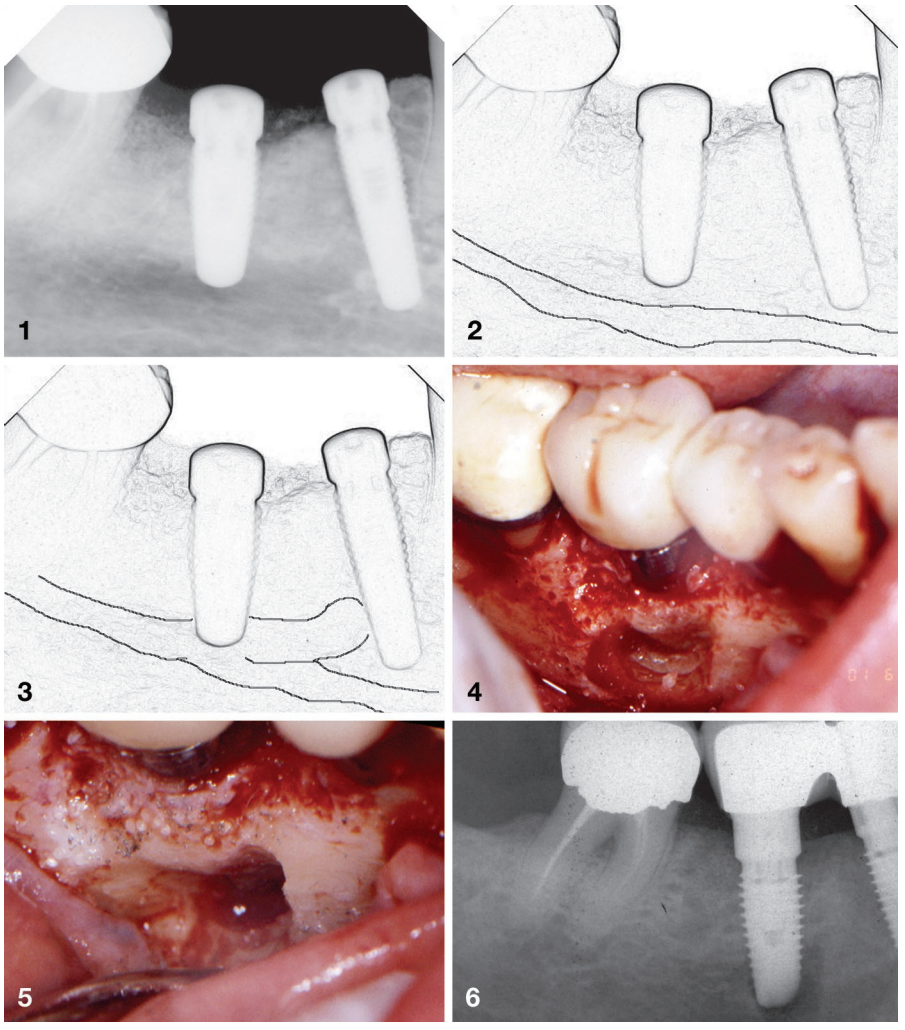

Fig. 1. Periapical radiograph of first and second bicuspid implants.
Fig. 2. Computer-enhanced periapical radiograph of first and second bicuspid implants.
Fig. 3. Computer-enhanced periapical radiograph of first and second bicuspid implants.
Fig. 4. Surgical exposure of the inferior alveolar nerve.
Fig. 5. Surgical exposure of the inferior alveolar nerve canal after implant apex is removed.
Fig. 6. Periapical radiograph of second bicuspid implant with apex removed.

illustrates this interpretation. However, Figure 3, another computer-enhanced radiograph, shows a different interpretation of the nerve location, one that suggests impingement. Note, as well, in Figure 3 the bifurcation of the canal and the angulation of the anterior implant to avoid the mental foramen.

The patient was told to use cold compresses and nonsteroidal anti-inflammatory drugs for discomfort and return in 2 weeks. Upon her return, all swelling had subsided. The distribution of the paresthesia had reduced and the patient reported "more feeling." It was again elected to follow the patient's progress without further intervention. One month after implantation, a significant paresthesia still existed without objective or subjective findings of improvement. Reverse torquing of the implants to reposition the apex was recommended. The patient declined the procedure when the risk of the implant loosening, necessitating removal or replacement, was discussed. Three months later, the patient returned for restoration of the implant. She complained that the paresthesia was causing her to chronically bite her lip. She also reported a dysesthesia of the teeth anterior to the first bicuspid. The possibility of nerve decompression via apicoectomy of the implant was discussed, and the patient appointed for the procedure.

*Procedure.*Local anesthesia consisting of an inferior alveolar nerve block and a long-buccal block was administered. After the anesthetic took effect, the patient reported immediate cessation of the dysesthesia. An enveloping incision was made from the lower right cuspid to the retromolar pad. A full-thickness buccal flap was elevated, exposing the lateral wall of the mandible. The mental nerve was fully visualized. A 13-mm implant had been placed in the first molar location. Therefore, an osteotomy was started 6 mm from the shoulder of the implant at a 30-degree angle in order to locate the apex while avoiding the canal. Figure 4 shows what appears to be the most superior aspect of the nerve bundle with some displacement to the buccal.

The implant apex was visualized, and a 45-degree cut was made from the buccal to the lingual. During this procedure the bundle was freed enough to allow placement of a periosteal elevator between the nerve and the handpiece to act as a shield. Copious irrigation was used to remove metal shavings and prevent heat generation while cutting the titanium. The segment was removed by elevating it superiorly with a spoon excavator, taking care that the threads did not engage the bundle in any way. [Figure 5 shows the same area after the segment was removed. Note that the canal is no longer visible on the buccal, appearing to have repositioned medially. Figure 6 shows the postoperative radiograph (compare to Fig. 1). Note the change in the apical contour of the implant similar to the classic apicoectomy cut seen in surgical endodontic procedures.] The patient's postoperative course was uneventful. Within 1 month of the procedure, she noticed significant improvement of her paresthesia.

Discussion

The surgeon must weigh the benefit of a longer implant, with its increased surface area and support, against the possibility of impinging on a vital structure. The surgical manuals of most implant manufacturers carry the following statement: "allow 2 mm of bone apical to the implant." This is

an excellent guideline, but is often not possible if an implant of adequate surface area is to be placed. Although there is no perfect method for determining how much support is needed in a given situation, a reasonable guide is to compare the surface area of the implant to the root it is replacing. The surface area of a lower bicuspid root is between 180 and 207 mm^2. The surface area of a 4.3-mm × 13-mm threaded implant is equivalent at approximately 200 mm^2. An option in this case might be to place a shorter but wider implant, thus achieving an equivalent surface area. A 5.0-mm × 10-mm threaded implant has approximately the same surface area as a 4.3-mm × 13-mm implant. Implant restorations must follow the generally accepted principals of crown/root ratio, with a 1:1 being the minimum requirement for implants opposing natural teeth. A 10-mm implant stays within these guidelines. Esthetics must also be taken into account. For an ideal emergence profile, the implant diameter should be one millimeter less than the tooth being replaced at the cementoenamel junction.[10] Lower bicuspids have a diameter at the cementoenamel junction of 4.8 to 5.0 mm. Hence, a shorter and wider implant would compromise esthetics. If the tooth is not in an esthetic area, this might be the best solution if adequate bone width exists. In this case, the width was not adequate for a 5.0-mm-diameter implant.

The surgical procedure described in this article is not without risk. Generous flap reflection providing adequate visualization is a necessity. If the neurovascular bundle cannot be clearly seen, the procedure should not be undertaken because blind sectioning of the implant could easily worsen the nerve injury. The sectioning of the implant must be done slowly to avoid heat generation above 37°C and concomitant denaturing of the osseous proteins and potential implant loss. An option that was not mentioned was removing the implant with a trephine. In this case, the patient wanted to keep the implant. Trephine removal of an implant requires a trephine with an outer diameter 1 mm wider than the implant itself. This would have created a defect that obliterated the cortical plates. The apicoectomy procedure is far less destructive. In addition, there are no data available that would indicate that the removal of the implant would carry a higher chance of success.

Conclusion

A technique for decompressing an inferior alveolar nerve compromised by implant placement has been discussed. The technique is useful in those situations where impingement exists and the implant is already fully osseointegrated.

Disclosure

The author claims to have a financial interest in Nobel Biocare, whose product, Replace implants, is mentioned in this article.

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Abstract Translations [German, Spanish, Portuguese, Japanese]

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Wurzelspitzenresektion eines im Knochengewebe befestigten Implantats zur Linderung einer vorliegenden Parästhesie: eine Fallstudie

ZUSAMMENFASSUNG: Es wurden bereits vielfältige röntgenologische sowie chirurgische Methoden zur Vermeidung des Auftretens einer Parästhesie nach Implantationsbehandlung im Unterkiefer empfohlen. Allerdings lässt sich nach wie vor manchmal eine Nervenreizung nicht vermeiden. Klagt der Patient dann über zunehmendes Taubheitsgefühl, so stehen den behandelnden Zahnärzten leider nur wenige Behandlungsoptionen offen. In vorliegendem Bericht wird eine Technik eingehender beschrieben, bei der die Spitze des eingesetzten Implantats eingekürzt wird. Diese Behandlungsmethode empfiehlt sich besonders, wenn ein weiter zunehmendes Taubheitsgefühl nach erfolgreicher Knochengewebsintegration festgestellt wird.

SCHLÜSSELWÖRTER: Nervenreizung, Nervlateralisation, Parästhesie

Apicoectomía de un implante endooóseo para aliviar la parestesia: Informe de un caso

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ABSTRACTO: Varias técnicas quirúrgicas y radiográficas han sido recomendadas para evitar la parestesia luego de la colocación de un implante mandibular. Sin embargo, algunas veces es inevitable afectar al nervio y cuando se reporta un adormecimiento continuo, los clínicos tienen una cantidad limitada de medidas correctivas. Este trabajo describe una técnica para cortar la punta del implante; una técnica que puede ser útil cuando el adormecimiento persiste luego de que ha ocurrido la integración ósea.

PALABRAS CLAVES: afectar al nervio, lateralización del nervio, parestesia

Apectomia de um Implante Endósseo para Aliviar Parestesia: Relatório de Caso

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SUMÁRIO: Várias técnicas cirúgicas e radiográficas tem sido recomendadas para evitar a parestesia que segue a colocação de implante mandibular. Entretanto, o impacto no nervo é algumas vezes inevitável, e quando é relatado um caso de insensibilidade prolongada, os clinicos tem um número limitado de opções corretivas. Este trabalho descreve uma técnica para diminuir o apex do implante; uma técnica que pode ser útil quando a insensilidade prolongada persiste depois de haver ocorrido a ósteo-integração.

PALAVRAS-CHAVE: impacto no nervo, lateralização do nervo, parestesia

骨内インプラントによる錯感覚軽減のための歯根尖切除術：症例報告

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要約：上顎インプラント設置後の錯感覚を避けるために、これまで各種のX線撮影・外科的方法を用いた処置が推薦されてきた。しかし神経侵害は時には避けがたく、しびれ感が続く場合にはその処置法に限界があった。本論文は、骨統合後にもしびれ感が続く場合に有効でありうるインプラント尖端部切除術を説明する。

キーワード：神経侵害、nerve lateralization、錯感覚

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