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Inferior alveolar nerve transposition with involvement of the mental foramen for implant placement

Juliano de Alencar Vasconcelos [1], Gisseli Bertozzi Ávila [2], José Carlos Ribeiro [3], Sérgio Cândido Dias [3], Luciano José Pereira [3]

(1) Master degree student, Vale do Rio Verde University, Três Corações, (MG) Brazil
(2) PhD student, State University of São Paulo/USP, (SP) Brazil
(3) Professor PhD, Vale do Rio Verde University, Três Corações, (MG) Brazil

Correspondence:
Prof. Dr. Luciano José Pereira
Universidade do Vale do Rio Verde,
Três Corações, (MG), Brazil
Av: Castelo Branco, 82
Bairro: Chácara das Rosas
Três Corações, Minas Gerais, Brasil
CEP: 37410000
E-mail: lucianojosepereira@yahoo.com.br

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Abstract

Inferior Alveolar Nerve (IAN) transposition is an option for prosthetic rehabilitation in cases of moderate or even severe bone reabsorption for patients that do not tolerate removable dentures. The aim of the present report is to describe an inferior alveolar nerve transposition with involvement of the mental foramen for implant placement. The surgical procedure was performed under local anesthesia, by the inferior alveolar, lingual and buccal nerve blocking technique. Centripetal osteotomy was performed, and bone tissue was removed, leaving the nerve tissue free in the foramen area. After that, transsection of the incisor nerve was performed, and lateral osteotomy was started from the buccal direction, toward the trajectory of the IAN. The procedure was concluded, by making use of a delicate resin spatula to manipulate the vascular-nervous bundle. The drilling sequence for placing the dental implants was performed, and autogenous bone was harvested using a bone collector attached to the surgical suction appliance. After the implants were placed, the bone tissue previously collected during the osteotomies and drilling processes was placed in order to protect the IAN from contact with the implants. The surgical protocol for inferior alveolar nerve transposition, followed by implant placement presented excellent results, with complete recovery of the sensitivity, seven months after the surgical procedure.

Key words: *Alveolar nerve transposition, dental implants.*

Introduction

Inferior Alveolar Nerve (IAN) transposition is an option for prosthetic rehabilitation in cases of moderate or even severe bone reabsorption and bone defects posterior to the mental foramen for patients that do not tolerate removable dentures (1,2). It consists of a surgical technique that has been practiced for various decades for several purposes, such as alveolar ridge plasty, orthognathic surgeries and mandibular resections, before being introduced for implant placement (3,4). The first report of alveolar nerve transposition for implant placement was published in 1987 (5). There are two main variations of the technique, either involving the mental foramen or not. As a biomechanical advantage, IAN transposition presents an increase in resistance to occlusal forces and promotes a good proportion between the implant and the prosthesis (2). As regards the method of reconstruction with grafts, inferior alveolar nerve transpo-

sition is a relatively simple procedure that does not require donor areas, it is performed under local anesthesia, it has low morbidity, stable results, in addition to lower cost (1,6). As a negative point, this type of technique does not recover the alveolar ridge anatomy, temporarily weakens the mandible, and particularly, presents the risk that eventual sensory alterations may be permanent (7). IAN transposition generally causes some degrees of sensory alterations, like hypoesthesia (partial loss of sensitivity), paresthesia (abnormal response to stimuli) (8). Nerve lesion occurs due to ischemia caused by distension of the nerve during the surgical procedure or by its chronic compression/distension after surgery (9).

The aim of the present report is to describe an inferior alveolar nerve transposition with involvement of the mental foramen for implant placement.

Case Report

The position of the IAN and the adjacent anatomical structures were assessed radiographically, (Fig. 1A) and the distance between the IAN and the alveolar ridge was measured at relevant points in order to perform the osteotomies.

The surgical procedure was performed under local anaesthesia, by the inferior alveolar, lingual and buccal nerve blocking technique. For this, a 27G needle and 4% articaine with epinephrine 1:100.000, 7.2 mL (DFL – Jacarepaguá, (RJ) - Brazil) were used, associated with the pre-operative prescription of a benzodiazepine (Midazolam 7.5 mg, Dormonid ®, Roche – Rio de Janeiro (RJ) – Brazil).

A linear incision on the crest of the alveolar ridge was made with a releasing incision anterior to the mental foramen, approximately in the mesial region of the canine, in such a way so as to guarantee the coverage of the bone defect. A mucoperiosteal flap was then raised, and the surgeon obtained direct visualization of the mental foramen, which was carefully released from the periosteum.

With the purpose of preserving the anatomic characteristics of the mental foramen area, circular marks were made around this structure, only on cortical bone, with a spherical diamond bur number 2, in a low-speed handpiece (Fig. 1B). Afterwards this marking was united and deepened with a tapered trunk diamond bur number 56 (KG Sorensen – Barueri, (SP) – Brazil) until the medullary bone tissue was observed, making a ring around the mental nerve.

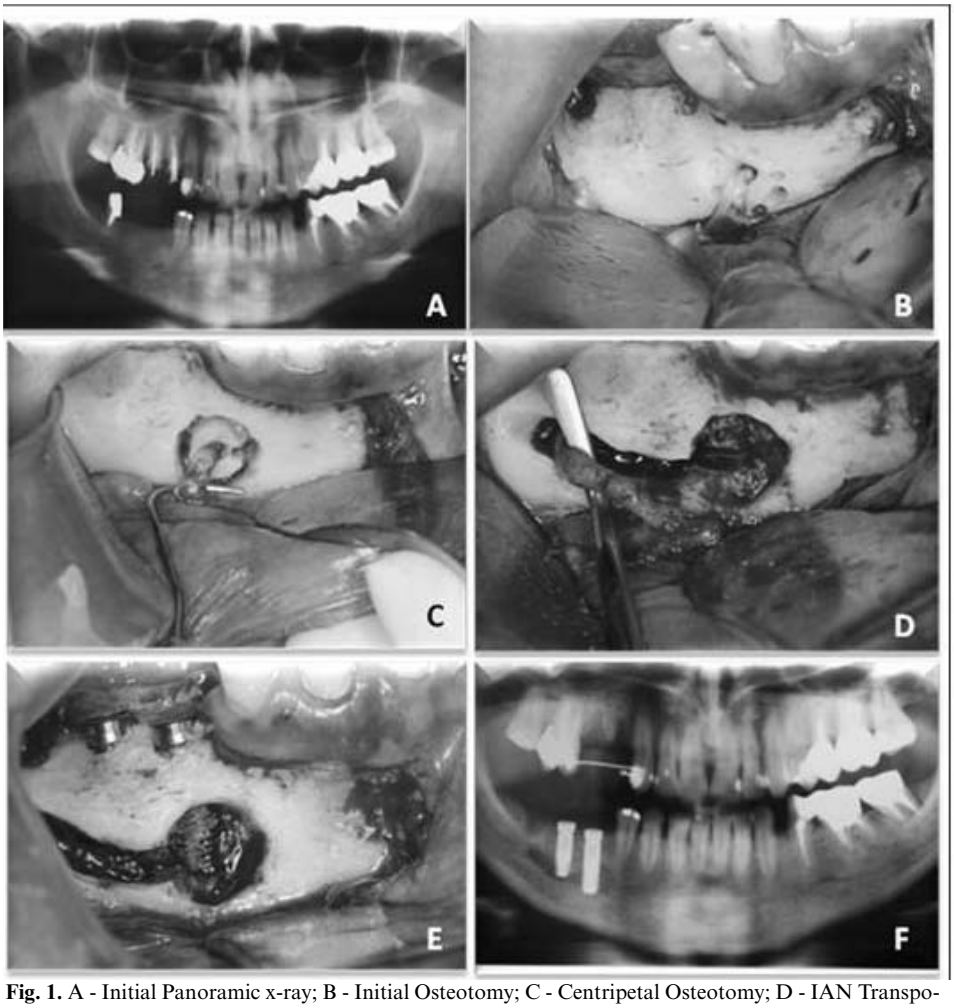

Fig. 1. A - Initial Panoramic x-ray; B - Initial Osteotomy; C - Centripetal Osteotomy; D - IAN Transposition; E - Implant Placement; F - Final Panoramic x-ray (Three mouths).

Then, a centripetal osteotomy was performed, and bone tissue was removed, leaving the nerve tissue free in the region of the foramen (Fig. 1C). After that, transsection of the incisor nerve was performed, and lateral osteotomy was started from the buccal direction, toward the trajectory of the IAN, using a spherical diamond bur Number 7 (KG Sorensen – Barueri, (SP) – Brazil), in a handpiece.

A Nabers probe with a rhomboid tip, was introduced into the mandibular canal, adjacent to the buccal wall, through the region of the previously prepared mental foramen. This penetration was used to guide the lateral osteotomy, and also as a pre-preparation for the spherical bur, to minimize the possibility of lesions to the inferior alveolar vascular-nervous bundle.

IAN transposition was concluded, by making use of a delicate spatula to manipulate the vascular-nervous bundle. (Fig. 1D). A bone collector adapted to a surgical suction appliance was used during the osteotomies and bone cutting for placement of the osseointegrated implants. After the implants were placed (Fig. 1E) the bone tissue previously collected during the osteotomies and bone cutting procedures was inserted adjacent to the implants, preventing the IAN from coming into contact with the implants.

An antibiotic (Amoxycillin 500 mg, every 8 hours, for seven days, Novaquímica Sigma Pharma Natures Plus – Hortolândia(SP) - Brasil) and an anti-inflammatory drug (Eterocoxib 120mg, every 24 hours, for three days, Arcoxia TM 120 mg – Merck Sharp & Dohme – São Paulo (SP) - Brasil) were prescribed. Sensory alterations and radiographic control were periodically monitored (Fig. 1F).

The surgical protocol for inferior alveolar nerve transposition, followed by implant placement presented excellent results, with complete recovery of the sensitivity, seven months after the surgical procedure.

Discussion

The presence of the mandibular canal close to the alveolar ridge as cause of vertical reabsorption of the alveolar crest in the posterior region of the mandible, or caused by superficial position of the canal, represents an obstacle to the placement of intraosseous implants of adequate length.

Among the options for rehabilitation with implants in the posterior region of the mandible for cases of significant vertical bone reabsorption, there are regenerative or reconstructive procedures, which have a high rate of graft reabsorption and require longer surgical appointments, increasing the time of treatment(10). The inferior alveolar nerve transposition method is presented as being less invasive, although it should be pointed out that this technique does not correct the increased distance between the arches, in addition to presenting high rates of permanent damage to the nerve bundle, thus being contraindicated when the ratio between the implant length and prosthetic crown is unfavorable (11).

Another treatment option that should be considered, taking into account the vertical discrepancy between the arches, is the use of short implants that have shown high rates of success(12). Nevertheless, it is pointed out that biomechanics is related to the denture design, which is directly associated with the mean rates of success and failure, and the use of short implants and dentures with excessive lever arms is a factor for failure (11).

When first seeking guidance as regards the presence of bone tissue above the mandibular canal, a minimum of 5 mm was suggested for performing IAN transposition and implant placement. There are reports that apply osteogenic distraction for vertical gain in the posterior region of the mandible; however, a minimum quantity of approximately 8 mm of remaining bone above the mandibular canal is required (13).

In situations with minimal bone height above the mandibular canal, autogenous bone graft before IAN transposition and implant placement must be considered. The literature describes a case in which bone height above the mandibular canal was 2 to 3 mm, and an autogenous bone graft was performed before IAN transposition and implant placement. There was a gain of 5 mm in height, totaling 7 to 8 mm of bone tissue above the mandibular canal, emphasizing the need of a thicker bone tissue in order to obtain better results (10).

The incidence of neurosensorial disturbances and the success rate of implants placed in conjunction with the inferior alveolar nerve transposition technique were evaluated in a study in which 46 implants were placed in 15 patients after IAN transposition. In 4 patients, IAN transposition was performed bilaterally, totaling 19 surgeries. Neurosensorial tests and a questionnaire were applied to investigate the patients' feelings of discomfort. With the loss of only 2 implants, the implant survival rate and the success rate were 95.7% and 90.5%, respectively. All the patients related that they would go through the surgery again and that they felt they had obtained significant benefits from the new dentures (11).

The literature presents a report of mandibular fracture after IAN transposition and implant placement in the posterior region of an atrophic mandible, more emphatically stressing the need for making small osteotomies and presence of adequate bone remainder for performing the technique (14).

The latest studies present Piezosurgery as a technique that allows precise bone cutting and preservation of soft tissues, including nerves. The tip of the instrument vibrates at different ultrasonic frequencies, propitiating a selective cut. The technique has shown to be feasible in IAN transposition, since it favors smaller osteotomies and preservation of the vascular-nervous bundle (15).

As regards osteotomies, the variations in the techniques

proposed for this procedure are congruent, indicating that they must allow the IAN to be sufficiently visualized. But the osteotomies must be as small as possible so that they do not weaken the mandible, and facilitate bone repair. Furthermore,the indications are that special attention must be paid to maintaining the bone tissue above the canal, so that implant stability is not compromised and the mandible is not weakened (2, 13, 10).

The risks of lesions to the inferior alveolar vascular-nerve bundle are minimized, by the use of mechanical pre-preparation while doing the lateral drilling, which also makes it easier to guide the surgeon with regard to the trajectory of the inferior alveolar vascular-nerve bundle.

In the technical approach presented, bone drilling is performed from the buccal direction in the region of the IAN trajectory, producing small sized bone defects and facilitating the maintenance of bone tissue above the osteotomy, adding a larger bone-implant contact area.

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