

# Endosseous Implant Placement in Conjunction with Inferior Alveolar Nerve Transposition: A Report of an Unusual Complication and Surgical Management

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*Inferior alveolar nerve transposition and placement of endosseous implants is one of the treatment options for patients with an edentulous posterior mandible with inadequate bone height superior to the inferior alveolar canal. The possible complications associated with this technique include prolonged neurosensory disturbances, infection, and pathologic fracture. This report presents the surgical management of a patient who sustained a mandibular fracture after inferior alveolar nerve transposition for the placement of 3 endosseous implants. INT J ORAL MAXILLOFAC IMPLANTS 2008;23:133–136*

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Jensen and Nock in 1987<sup>1</sup> were the first to describe a technique for restoration of an atrophic posterior mandible with endosseous implants in conjunction with inferior alveolar nerve (IAN) transposition. Since this date, many patients who previously were not good candidates for implant therapy have been able to benefit from these procedures. Various methods for transposition of the inferior alveolar nerve in conjunction with placement of endosseous implants have been described, and success in restoring the mandible has been reported with these methods.<sup>2,3</sup> However, a few possible complications associated with this method have caused some clinicians to express concern about the routine use of these procedures. These complications include osteomyelitis,<sup>2,3</sup> loss of implants,<sup>2,3</sup> profuse hemorrhage,<sup>3</sup> prolonged neurosensory disturbance,<sup>2-4</sup> and mandibular fracture.<sup>5,6</sup>

This report describes a patient who sustained mandibular fracture after placement of 3 endosseous implants in conjunction with IAN transposition.

## CASE REPORT

A 51-year-old white woman reported to the Campinas State University for implant rehabilitation. Her medical history was unremarkable. She was taking no medication and had no drug allergies. Dental examination revealed a completely edentulous maxilla and a partially dentate mandible. The patient had a relatively flat hard palate, as well as a greatly resorbed posterior mandible, and an unstable mandibular removable partial denture was noted. Radiographic examination revealed severe bone atrophy with pneumatization of the maxillary sinus and an atrophic mandible with less than 7 mm of bone between the osseous crest and the mandibular canal (Fig 1). The patient underwent IAN transposition in preparation for implant placement. The IAN was uncovered by removal of a segment of the buccal cortical plate and removal of a rectangular-shaped window of bone surrounding the mental foramen, and the IAN was laterally repositioned, permitting the placement of 3 endosseous implants (Neodent; Curitiba, PR, Brazil; Fig 2). During implant placement, 1 site was prepared and then abandoned, as the implant angulation was not favorable for the prosthetic requirements. A mixture of particulated autogenous cortical bone and Pro-Bone (Proline Biomédica, São Paulo, SP, Brazil) was placed in the surgical site. Primary closure of the soft tissue flaps was achieved. The initial postoperative course was uneventful, and the patient's dentures were adjusted, relined, and placed 2 weeks following surgery.

The patient returned in 3 weeks after loss of the most posterior implant and complained of pain in the

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**Fig 1** The atrophic posterior mandible.



**Fig 2** Placement of 3 endosseous implants after IAN transposition. A vertical radiolucency can be observed between the 2 most posterior implants.

right mandible. The patient denied any facial trauma. Clinical examination revealed a displaced mandibular right body fracture (Fig 3). Treatment consisted of open reduction through an intraoral approach and rigid internal fixation of the fracture with a 2.3 titanium plate (Stryker Leibinger, Kalamazoo, MI) and screws adapted to the inferior border (Fig 4). Some grade of difficulty was observed at the time of the reduction and fixation of the fractured segments, but healing of the fracture occurred without further complications, despite the poor alignment of the fracture. The patient was informed about the surgical result; however, she did not want to reoperate unless medically necessary. The patient was then sent to rehabilitation.

## DISCUSSION

Implant rehabilitation is used in an increasing number of partially edentulous patients. In most of these patients, the standard method can be used to place the implants with satisfactory results.<sup>7</sup> However, with increasing alveolar bone resorption, modifications of

the standard procedure need to be made. Bone grafting, distraction osteogenesis, and the use of smaller implants are some techniques employed to address a lack of bone height.

A potential problem experienced in the posterior region of the mandible is poor initial implant stability. If shorter implants are used to ensure that there is no encroachment of the IAN, initial implant stability will be unicortical. High failure rates have been associated with short implants (< 10 mm).<sup>8</sup> Since the mandible is wider in this region, stability usually cannot be obtained from either the lingual or buccal cortex. In addition, the cortical bone of the alveolar crest is usually thin, and the cancellous bone frequently has a very thin trabecular pattern. In addition, there is a risk of IAN damage when the longest possible implant length is selected on the basis of the measured available bone height. A high frequency of nerve complications (14% after stage-1 surgery; 4% 3 years later) has been reported for implants stabilized bicortically on the superior bony surface of the mandibular canal.<sup>9</sup> However, the progressive bone resorption that occurs after tooth loss can result in a severely resorbed mandible, with a bone

**Fig 3** Fracture of the right mandibular body 3 weeks after implant placement, involving the site of the most posterior implant.



**Fig 4** Rigid internal fixation of the fracture with a 2.3-mm-thick titanium plate and screws.



height posterior to the mental foramen that may contraindicate the placement of even short implants. The surgical technique of IAN transposition allows the engagement of more bone to support implants by means of an osteotomy of the buccal cortex of the mandible with exposure and lateralization of the inferior alveolar neurovascular bundle, which reduces the risk of nerve injury from direct implant placement.

The inherent risk of this procedure is neurosensory disturbance as a result of damage to IAN. Therefore, it is important to establish this relative risk, since avoiding such problems is the very reason for this procedure. Conflicting data in the literature from studies on the incidence of IAN dysesthesia in conjunction with this procedure have created debate as to its appropriate use. Rosenquist<sup>10</sup> reported on the neurosensory function in 10 cases of IAN transposition after a follow-up period of 1 year, and all sites tested normal. Likewise, other authors have reported similar results of subjective and objective neurosensory testing of the mental nerve region.<sup>11-13</sup> However, the reported incidence of neurosensory disturbance of the mental nerve is not always low.<sup>14</sup>

Mandibular fractures associated with the placement of endosseous implants have been well documented and are usually related with highly resorbed edentulous mandibles. In 1988, Albrektsson<sup>7</sup> was the first to report such an incident. He reported successful healing of the fracture site after implant removal. Mason et al<sup>15</sup> reported on 3 patients with fractured mandibles after implant placement and proposed that the site of an implant that was not yet osseointegrated represented an area of stress concentration and weakness and thus that routine oral activities could cause a fracture without any trauma to the mandible. Accordingly, Tolman and Keller<sup>16</sup> presented data from 7 patients who sustained mandibular fractures after receiving endosseous implants and indicated that placement of endosseous implants in the severely resorbed edentulous mandibular ridge may result in a stress fracture during the healing phase. Although there have been several reports of fracture associated with implant placement, only 2 reports associated with IAN transposition could be found.<sup>5,6</sup>

Many factors contribute to the occurrence of a mandibular fracture following an IAN transposition. There is significant loss of structural integrity when a portion of buccal cortex is removed during the nerve lateralization procedure. In addition, the posterior mandible is a flexion point that is under constant stress during function, which may be weakened by multiple implant placement to allow rehabilitation.<sup>6</sup> For the same reason, although Mason et al<sup>15</sup> advocate that the inferior border of the mandible be engaged whenever possible, the present authors believe that implant stability should not be achieved at the expense of mandibular continuity in cases in which IAN transposition is undertaken. Likewise, Karlis et al<sup>6</sup> stated that implants may engage the inferior portion of the mandible for stability but should not disrupt or penetrate the inferior border of the mandible when multiple implants are placed. Also, care must be taken in the preparation of sites for implant placement; a site should not be abandoned even if proper angulation or sufficient initial stability cannot be achieved, as an abandoned site weakens the mandible and predisposes the bone to fractures, as in the present case.

Few guidelines exist in the literature regarding the management of fractures associated with or resulting from implant placement.<sup>9,10</sup> An implant that is mobile must be considered a foreign body and should be removed at the time of the fracture management. If an open reduction with rigid internal fixation is performed, the implant may need to be removed if it interferes with the adaptation of titanium plates and screws. This was not necessary in the case presented. The decision to remove the implant remains subject to clinical judgment on a case-by-case basis at the time of presentation.

Among the surgical procedures available to create favorable conditions for endosseous implant placement in the posterior mandible, IAN transposition is a relatively simple procedure. Nevertheless, it is best reserved for cases with severe atrophy and small interarch space hampering implant placement and prosthetic rehabilitation, as may be the case if an osteopromotive procedure such as bone grafting has been undertaken.

Indeed, the risk of mandible fracture should discourage neither the clinician nor the patient, as there are few reports in the literature of this complication. Although the review of the literature offered many different treatment options for mandible fractures associated with implants, including skeletal fixation, closed reduction and liquid diets, and extraoral open reduction with internal fixation, the authors believe that intraoral open reduction and rigid internal fixa-

tion is usually the best approach. Careful case selection and treatment planning are required for this treatment option, and the patient must fully understand and accept the risks of the procedure.

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