

# INFERIOR ALVEOLAR NERVE TRANSPOSING IN A SITUATION WITH MINIMAL BONE HEIGHT: A CLINICAL REPORT

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## KEY WORDS

Nerve transposing  
Alveolar resorption  
Bone grafting  
Inferior alveolar nerve  
repositioning  
Neurosensory disturbance

Previous studies have indicated that at least 5 mm of bone is needed above the canal when performing transposing of the inferior alveolar nerve (TIAN). In this clinical report, TIAN was performed in a situation where minimal (<2 mm) bone height was present above the canal of the IAN. Preoperative examination with computerized tomography scan revealed 2 mm of bone above the canal at the area of teeth #18 to #20, #30, and #31. The TIAN was performed by opening a lateral access window along the lateral side of the mandible. Five threaded hydroxyapatite-coated root form implants were placed at the area of teeth #18 to #20, #30, and #31. Autogenous bone from the lateral access window that was removed en block was particulated and placed around the implants. A resorbable collagen membrane was placed around the graft material. Implants were restored with cement-retained implant-supported metal-ceramic crowns. Three-year post-loading examination revealed minimal bone loss (<1 mm).

## INTRODUCTION

Implants have become a valid treatment modality for the totally<sup>1,2</sup> or partially<sup>3,4</sup> edentulous patient. Resorption of the residual alveolar ridge has introduced the use of various bone-grafting techniques<sup>5-17</sup> in an attempt to restore the alveolus in a condition that allows placement of root form implants in situations where excessive bone resorption has occurred. Other authors have advocated the application of distraction osteogenesis for localized alveolar ridge augmentation.<sup>18-22</sup>

The posterior mandible presents a challenge to clinicians because of the presence of the inferior alveolar nerve (IAN). transposing of the IAN (TIAN) has been suggested as an alternative treatment to allow placement of longer implants, better initial stabilization, and reduced treatment time.<sup>23-34</sup>

Jensen and Nock<sup>23</sup> were the first to describe placement of dental implants in the posterior mandible in conjunction with TIAN. They used a large round bur to create a channel in the lateral mandibular cortical plate

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distal to the mental foramen to permit TIAN. Several modifications have been described since then.<sup>24,26–28,30</sup> Neurosensory disturbance has been reported after performing TIAN.<sup>24,31,34</sup> In the majority of the cases, it appears to be transient.<sup>24,34</sup> There are limited data regarding success rate of implants when performing TIAN. Rosenquist<sup>28</sup> reported an implant survival rate of 93.6%. Kan et al<sup>34</sup> reported a 93.8% success rate when the follow-up period was 41.3 months.

Several authors have reported different techniques regarding preparation of a lateral access window (LAW) that allows access to the IAN. In all the cases, the presence of bone coronally to the canal of the IAN is indicated to provide stability to the fixtures during installation (Figure 1A and B).<sup>23,24,26–28,30</sup> The literature lacks data regarding the amount of bone that is needed above the canal of the IAN when performing TIAN. Jensen and Nock<sup>23</sup> indicated that the superior part of the osteotomy for the LAW should be several millimeters below the crest of the residual mandibular alveolar ridge. Similarly, Rosenquist<sup>24</sup> suggested that the cortex lateral to the canal should be removed en block. The coronal part of the block is located several millimeters below the crest of the alveolus. Friberg et al<sup>26</sup> suggested that the osteotomy for the LAW should be performed several millimeters below the crest of the residual alveolar ridge. They also suggested that special care must be taken not to remove too much bone superior to the canal of the IAN. A close approach to the bone crest may interfere with countersinking and marginal implant bone support. Smiler<sup>27</sup> reported that the superior part of the cortical bone should be left intact during osteotomy for

LAW. Jensen et al<sup>30</sup> were the first to introduce some guidelines regarding the presence of bone above the canal of the IAN. They suggested that 5 mm of bone should be present above the canal of the IAN to perform TIAN. Rosenquist et al<sup>28</sup> reported that the presence of residual bone above the canal of the IAN was indicated when performing TIAN. Kan et al<sup>34</sup> reported that TIAN was performed in situations where a minimum of 5 mm of bone was present above the canal of the IAN (average: 6.8 mm, range: 5–10 mm).

It seems that a specific amount of bone ( $\geq 5$  mm) is needed above the canal of the IAN to perform TIAN. However, and to the author's best knowledge, no suggestion has been provided for cases where bone above the canal is minimal.

The purpose of this clinical report is to describe treatment of a patient where minimal crestal bone was observed coronal to the canal of the IAN. Autogenous bone graft was placed around the implants and covered with a collagen membrane.

#### CLINICAL REPORT

A 56-year-old woman presented at the Center for Prosthodontics and Implant Dentistry, Loma Linda University, for treatment of her partial mandibular edentulism (Figure 1). Clinical examination revealed edentulism at the area of teeth #18 to #20, #30, and #31. Extensive resorption was observed. A computerized tomography scan taken from the mandible indicated that the IAN was 1 to 2 mm below the crest of the residual alveolar ridge. At the area around the mental foramen, the canal of the IAN was at the same level with the crest of the

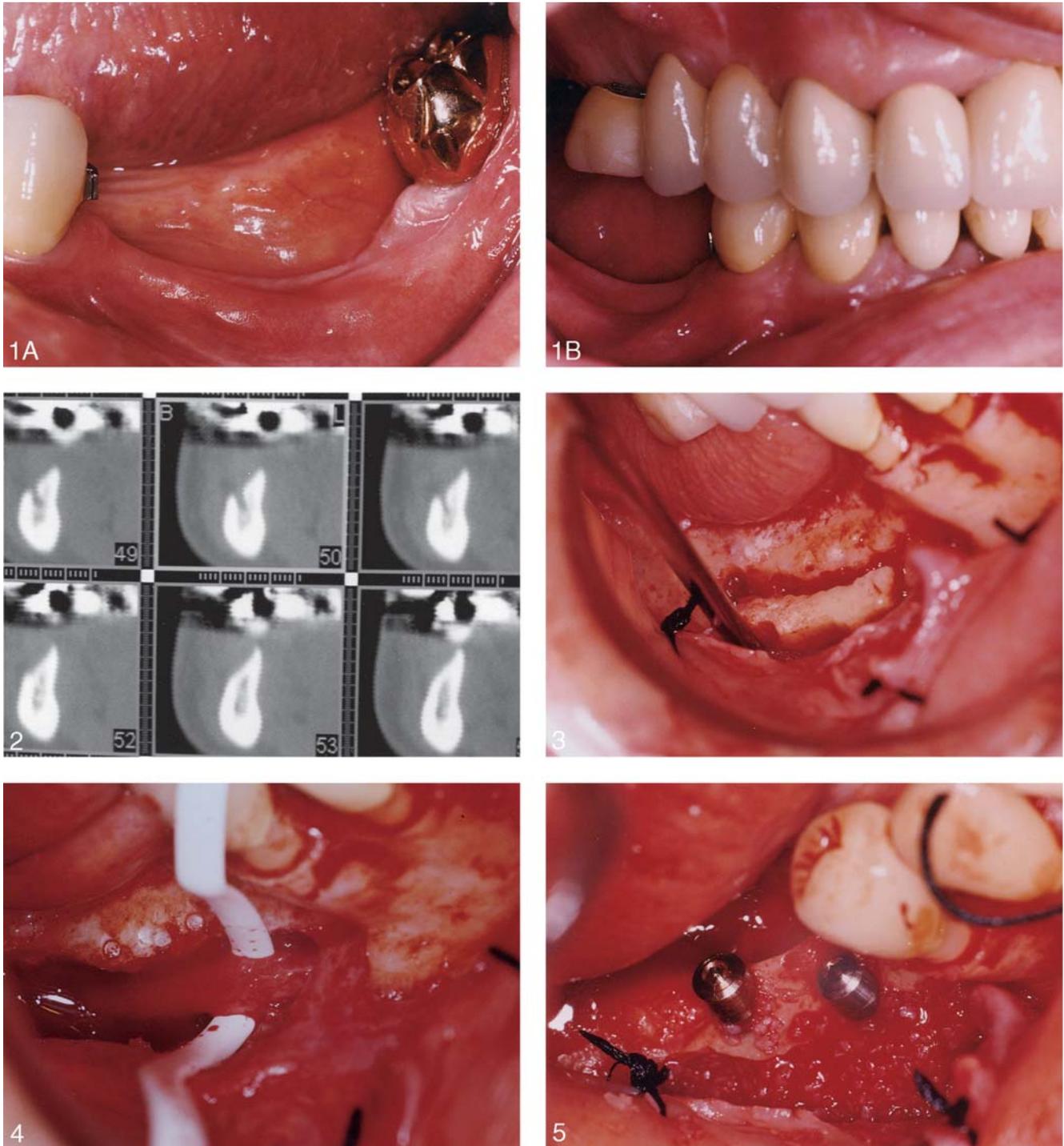
residual alveolar ridge (Figure 2). The patient had a history of dissatisfaction with removable partial denture. The decision to perform TIAN was made.

After performing crestal incision, full-thickness labial and lingual flaps were reflected. Osteotomy of the LAW was performed (Figure 3). Two vertical and 2 horizontal osteotomies were performed. The IAN was retracted (Figure 4).<sup>23,24,26–28,30</sup> With an acrylic resin, surgical stent threaded hydroxyapatite-coated root form implants (Steri-Oss, Nobel Biocare, Yorba Linda, Calif) were placed at the area of teeth #18 to #20, #30, and #31. The autogenous bone from the LAW was particulated and placed around the implants (Figure 5). Resorbable collagen membrane (BioGuide, Osteohealth Co, Shirley, NJ) was placed above the graft material (Figure 6). The flaps were sutured. A panoramic radiograph was taken after implant surgery (Figure 7).

Second-stage surgery was performed 6 months after implant surgery. Implants appeared clinically osseointegrated as tested with the Perio-Test Unit (Perio-Test, Siemens, Bensheim, Germany). Implants were restored with cement-retained metal-ceramic restorations (Figure 8). Three-year postloading radiographic examination (nonstandardized periapical radiographs) revealed minimal marginal bone loss ( $< 1$  mm). The patient reported transient hypesthesia that lasted for 3 months, but no further symptoms of neurosensory disturbance were observed.

#### DISCUSSION

Implant dentistry is based on a team approach between surgeons and prosthodontists.<sup>1,2</sup>



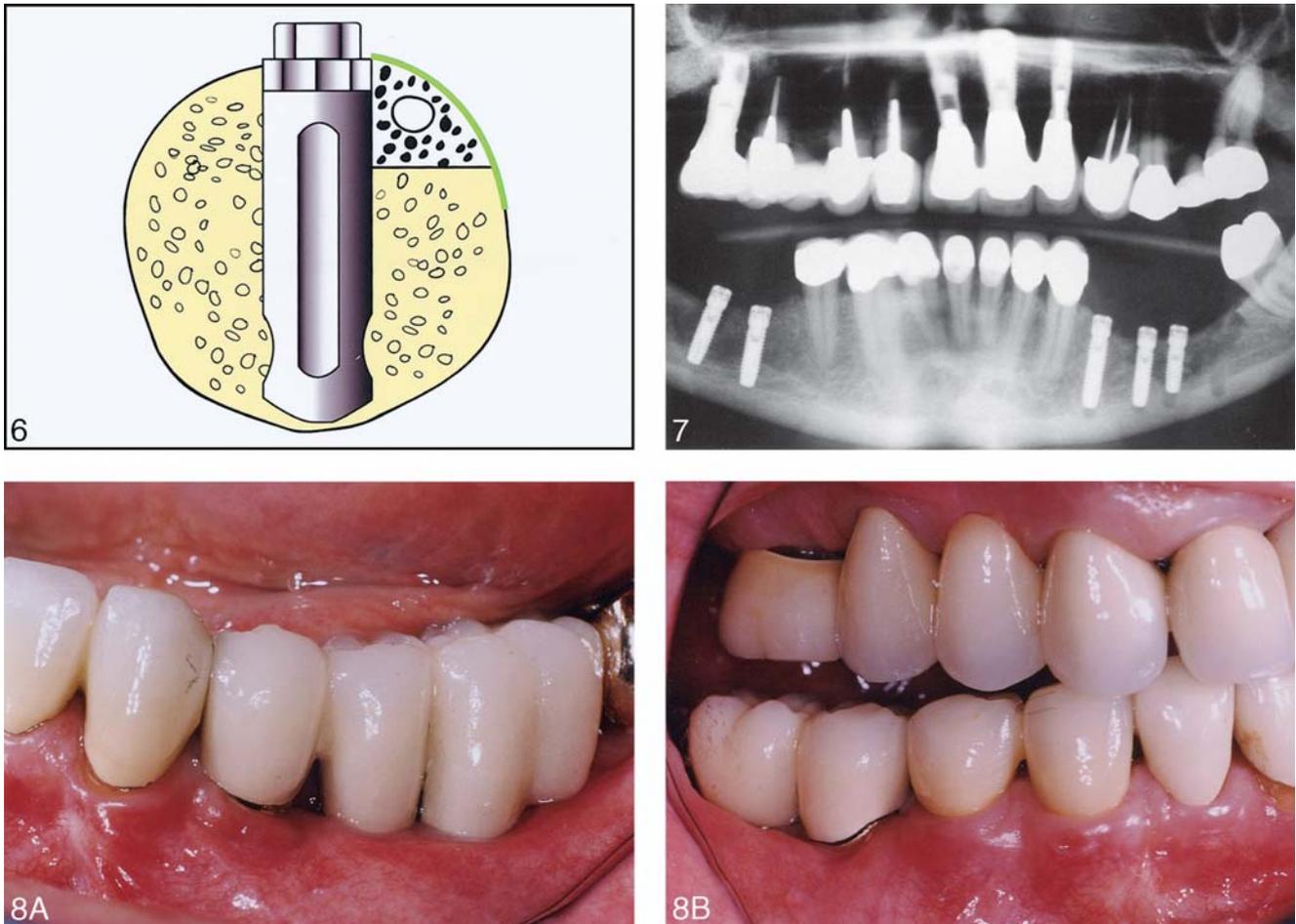
FIGURES 1-5. FIGURE 1. (A) Preoperative view, left side. (B) Preoperative view, right side. FIGURE 2. Computerized tomography scan revealing minimal bone height above the inferior alveolar nerve. FIGURE 3. After 2 vertical and 2 horizontal osteotomies, the cortical bone is removed from the lateral access window. FIGURE 4. The inferior alveolar nerve is retracted. FIGURE 5. Autogenous particulate bone graft is placed around the implants. Resorbable collagen membrane will cover the bone graft.

The described clinical report offers some alternative suggestions when planning treatment for a patient with an excessively resorbed

posterior mandible. Prosthodontists need to be familiar with different surgical treatment options in order to refer patients

appropriately and coordinate treatment with the surgeons.

In the presented case, TIAN was performed in a situation with



FIGURES 6–8. FIGURE 6. After lateral osteotomy and the retraction of the inferior alveolar nerve, the 4–5 coronal implant threads are exposed. Autogenous bone graft will cover the exposed threads, and a collagen membrane will be placed above the graft and the implants. FIGURE 7. Panoramic radiograph, postoperative view. FIGURE 8. Final result left (A) and right side (B).

minimal bone height above the canal of the IAN. Some authors have demonstrated the potential of placing dental implants several millimeters above original bone level in conjunction with 1-stage bone grafting.<sup>13–15</sup> In these cases, vertical ridge augmentation and implant placement are performed simultaneously. However, to follow this technique, a minimum of 6 to 8 mm original bone height is needed above the canal of the IAN to provide primary implant stability. In situations with excessive resorption of the posterior mandible, as in the presented case, application of this technique is not feasible because of the lack

of adequate bone volume to provide primary implant stability.

Mandibular block autografts have been used for vertical alveolar ridge augmentation before placing dental implants.<sup>5,8,11</sup> Anticipated vertical augmentation is 5 mm 6 months after bone grafting.<sup>11</sup> In a severely resorbed mandible, as in the presented case, 10-mm vertical ridge augmentation would be needed. Two-stage bone grafting offers inadequate results in severely resorbed cases.

Distraction osteogenesis is a technique described in the literature for alveolar ridge augmentation.<sup>18–22</sup> Although this technique has been studied pri-

marily for the resorbed premaxillary area,<sup>22</sup> several reports<sup>18–20</sup> have demonstrated its potential use for vertical ridge augmentation in the posterior mandible. With this technique, a bony segment needs to be released by performing vertical and horizontal osteotomies. A distraction device is placed along the horizontal osteotomy. The surgeon must have at least 8 mm of bone above the canal of the IAN to make horizontal and vertical osteotomies and have a large-enough segment to fixate to and transport with a given device.<sup>47</sup> Situations with minimal bone height (<7mm) above the canal

of the IAN are not suitable for the distraction osteogenesis technique.<sup>47</sup>

In the presented case, the autogenous bone from the LAW was particulated and placed in particulate form around the implants. Rosenquist<sup>24</sup> recommended positioning of the cortical bone en block. Particulate graft was used to avoid mechanical trauma to the IAN from fixation process of the block. In addition, incorporation of graft material and bone loss around implants placed in conjunction with particulate bone graft appears to be favorable.<sup>6,9,10,13-15</sup>

A concern has been reported regarding the morbidity of TIAN.<sup>31</sup> Davis et al<sup>25</sup> surveyed 22 practitioners performing TIAN; 9 of 190 patients experienced a disconcerting level of burning dysesthesia. Friberg et al<sup>26</sup> reported a 7-month evaluation of 10 patients and found hypesthesia and paresthesia in 30% of the jaws. Rosenquist<sup>28</sup> noted that 6 of 100 patients had either diminished or no neurosensation at 18 months postoperatively. Jensen et al<sup>30</sup> reported 10% of the patients had signs of neurosensory disturbance. Haers and Sailer<sup>29</sup> reported light paresthesia in 76.5% of their patients at 12 months. Kan et al<sup>34</sup> reported a 52.4% incidence of neurosensory disturbance 41.3 months after surgery. Risks regarding neurosensory disturbance should be considered and explained to the patient during treatment planning.

#### CONCLUSION

In a clinical situation with minimal bone height above the canal of the IAN, implant placement and TIAN may be considered in conjunction with autogenous par-

ticulate bone grafting. A prospective clinical study and long-term follow-up are needed in order to validate the use of this technique in cases with excessive alveolar ridge resorption.

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