Dental Implants Installation Laterally to the Inferior Alveolar Nerve Canal Guided Tomography: A Case Report

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Abstract

When severe atrophy in posterior portion of the mandible is present, lateralization of the alveolar nerve might be an option that allows implant installation in the area. However, this technique is complex and can produce some sequelae to patient, as paresthesia. Planning the implant installation using Cone-Beam Computed Tomography (CBCT)-guided surgery might prevent inferior alveolar nerve lateralization. The current report presents a clinical case of implants placement in posterior mandible area with severe alveolar ridge atrophy using CBCT-guide. The reported clinical case refers to a patient (female; 65 years old), partially edentulous, who sought dental rehabilitation complaining lack of efficiency of the removable inferior prosthesis. Clinically, it was observed that the remaining inferior teeth included 34, 33, 32, 31, 41, 42 and 43, and two dental implants in 35 and 44 positions. Moreover, severe bilateral alveolar ridge atrophy was noted. However, tomographic exams revealed bilateral proximity to inferior alveolar nerve canal where further implants should be placed. In order to avoid complications, a CBCT with surgical guide was obtained. At surgery with the surgical guide, 2 Cone Morse 3.5 × 10 mm dental implants were installed in the position of teeth 36 and 46. After implants placement, a new tomographic exam was performed. It was possible to verify the correct positioning to the implants laterally to the inferior alveolar nerve canal. Through the technique employed, it was possible to avoid manipulation of the inferior alveolar nerve bilaterally.

Key Words: Computed tomography guided surgery, Implant dentistry, Dental implants, Inferior alveolar nerve

Introduction

The rehabilitation of the posterior teeth with a fixed prosthesis in a mandible with alveolar ridge atrophy can be a challenge [1,2]. Mainly, because dental implant installation can result in an increased risk to damage the Inferior Alveolar Nerve (IAN) during the implant drilling or the implant insertion itself. This damage leads to neurosensory impairment, from mild paresthesia to complete anesthesia and/or hyperesthesia, that affects oral functions such as drinking and speech, or skin preparation such as make-up application and shaving [3].

The surgical procedure of IAN lateralization can be an option to avoid damage to the IAN [3,4]. However, there are reports showing that this surgical procedure can also cause neurosensory impairment complications that begins to recovery only after 6 months [3,5], which may translate in loss of quality of life for those patients. Although some techniques are proposed to enhance IAN identification to decreased intra-operative time and risks for IAN injury [2], the lateralization procedure is still related to post-operative IAN dysfunction.

An alternative to IAN direct manipulation is the use of imaging studies to plan where implants should be positioned [6,7]. Computed tomography and virtual planning are tools that are been explored to improve surgery effectiveness and decrease damages to oral tissues, as IAN [6-9]. Computed tomography, for instance, can be employed to determine the best position in an atrophic mandible to install dental implants with the objective to preserve IAN canal. Having that in mind, the clinical case reported here presents a sequence of simple planning with computed tomography before and during the procedure of dental implants installation in a partially and atrophic mandible.

Case Report

The reported clinical case refers to a female patient, 65 years old, partially edentulous, with no systemic diseases, who sought treatment at the Specialization in Implantology Clinic (Centro de Pesquisa Implantodontia/Faculdade do Centro Oeste Paulista) complaining of the lack of efficiency of the removable inferior prosthesis and the desire to receive dental implants. Clinically, it was observed that the remaining inferior teeth comprehended #34, #33, #32, #31, #41, #42 and #43 and bilateral severe mandibular alveolar ridge atrophy. There were 2 implants previously installed at #35 and #44 teeth positions.

Impressions were taken to preview molars position and a tomographic guide was obtained using radiopaque gutta-percha markers. Tomographic exam revealed bilateral proximity to IAN canal where implants should be placed at #45 position (*Figure 1*). In order to avoid complications, it was planned to place 2 implants at #36 and #46 positions. The initial implant insertion direction marked with gutta-percha was adjusted to be used as a surgical guide. Using the surgical guide, 2 Cone Morse 3.5×10 mm dental implants (Emfils, Itu, São Paulo, SP, Brazil) were installed in the position of the teeth 36 and 46 using the flapless technique under local anesthesia (*Figure 2*). Finally, a new tomographic exam was performed to verify the position of the implants laterally to the IAN canal (*Figure 3*). Interestingly, it can be observed that the dental implant installed at #36 was positioned buccally to the mandibular canal while the dental implant previously installed at #35 was positioned in a lingual position in relation to the mandibular canal. In *Figure 4* it is possible to see the position of the screw access holes in the final prosthesis.

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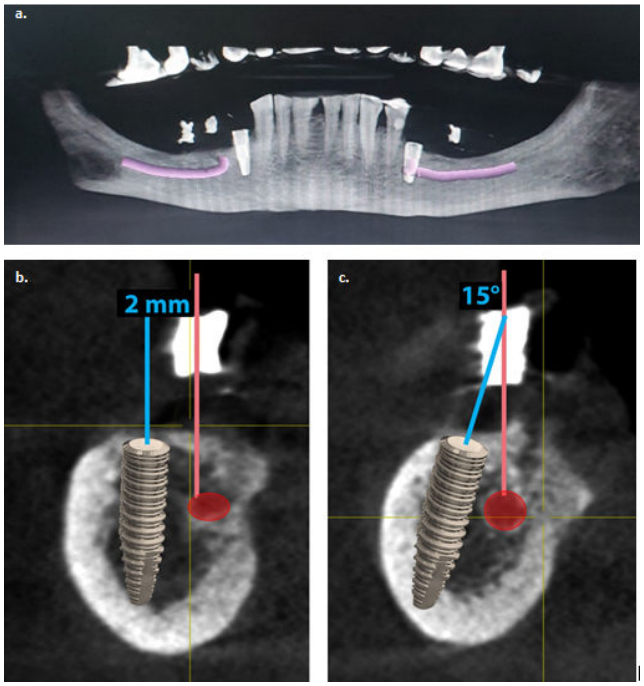

Figure 1. *Based on the tomographic images (a), the direction of osteotomy was corrected to avoid injury to inferior alveolar nerve with insertion of dental implants in regions #46 (b) and #36 (c).*

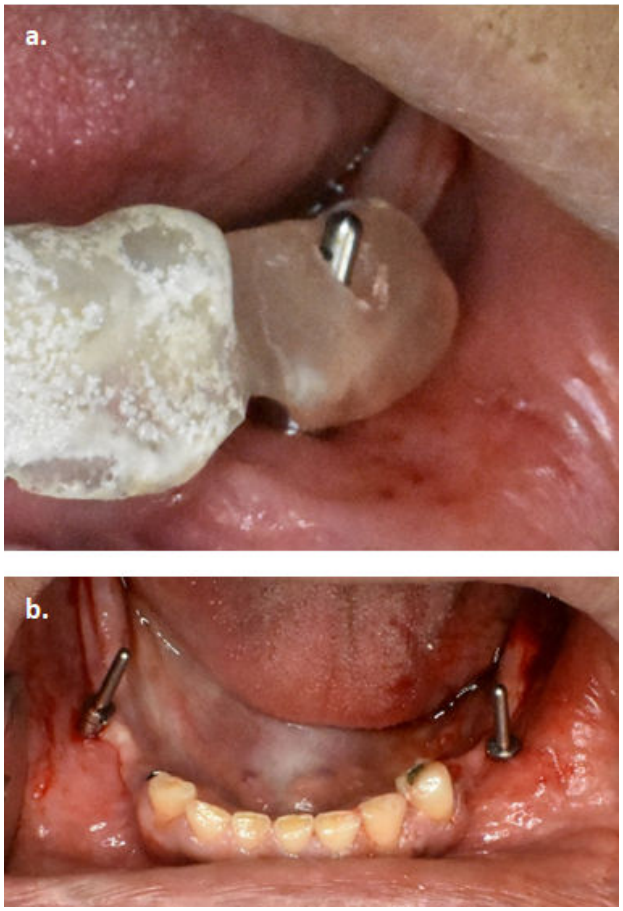

Figure 2. *(a): Tomographic guided used as surgery guide; and (b): parallel posts to check the direction of osteotomy.*

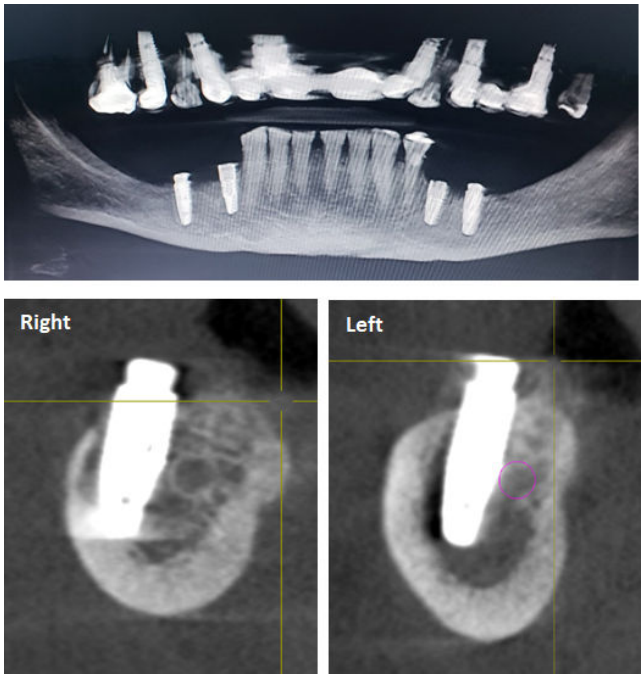

Figure 3. *Tomographic image to check final implant positioning.*

Figure 4. *Screw access holes of the implant-supported prosthesis.*

Discussion

Alveolar ridge atrophy is a natural process that occurs after teeth loss [1]. Especially in mandible, the morphology of the residual bone, in edentulous and in partially edentulous individuals, may play an important role in oral rehabilitation [10]. In fact, rehabilitation planning will depend on the remaining ridge. Furthermore, it will influence the need of additional surgical intervention other than the dental implant installation [2-4].

In atrophic mandible, the position of IAN canal can be a challenge to implant installation. The lateralization of IAN is an alternative to enable dental implants treatment in those cases. In that technique, the main criteria to elect IAN repositioning is an insufficient height of alveolar bone above the IAN for implant placement [11]. To access the IAN canal, it necessary to open a window through osteotomy to gain access to the nerve [2,11]. Then, the nerve is dislodged, and, after dental implant installation, it is replaced to its canal [2,11]. The evident advantages of that technique is that there

is no need for bone grafting, and the dental implant can be inserted immediately [2]. However, there are some drawbacks, including the risk of IAN injury by cutting or damaging it during procedure, and the temporarily weakening of the mandible due to the removal of a buccal cortical bone, since it can lead to mandibular fracture [2].

Methods of dental imaging technology utilizing, for example, computed tomography are being used to improve the accuracy of the surgical placement of dental implants [7]. Despite the well-described qualities of the imaging planning, the movements of the surgical instruments during procedure may displace the drilling from the intended location [6].

Conclusion

In the current case report, it was demonstrated that a CT taken just after the dental implant placement was important to verify the proximity do the IAN canal walls, leading to success in the procedure, and preventing manipulation of the IAN bilaterally. It is noteworthy to mention that this technique can be used to plan installation in posterior atrophic mandible as well as in the proximities of mental foramen.

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