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CLINICAL REPORT

All-on-4 concept implantation for mandibular rehabilitation of an edentulous patient with Parkinson disease: A clinical report

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ABSTRACT

Parkinson disease (PD) is a progressive neurologic disorder. Compromised voluntary and involuntary muscle control of the orofacial-pharyngeal muscles of patients with PD may lead to difficulty in mastication, dysphagia, and tremor of the mouth and chin. All of these problems represent major challenges for the clinician with respect to the oral rehabilitation. This clinical report describes the use of the All-on-4 concept implantation for mandibular rehabilitation with a fixed detachable dental prosthesis in an edentulous patient with PD. The treatment steps, outcome, and limitations are discussed. (J Prosthet Dent 2015;114:745-750)

Parkinson disease (PD) is a progressive neurologic disorder caused by the degeneration of dopamine-producing nerve cells in the brain, specifically in the substantia nigra and the locus coeruleus.[1] However, the etiology of this disorder has not yet been established. Disease onset before age 40 is rare; it is equally prevalent in men and women before age 60 but is more common in men thereafter.[2]

The 3 cardinal signs of PD are dyskinesia (involuntary movement), bradykinesia (slow movement), and akinesia (muscular rigidity).[3,4] People with PD may experience several oral health problems, such as xerostomia or sialorrhea, dry-mouth and/or burning-mouth syndrome, poor oral hygiene, and denture problems.[5-8] Furthermore, compromised voluntary and involuntary muscle control of the orofacial-pharyngeal muscles may lead to difficulty in mastication, dysphagia, and tremor of the mouth and chin. All of these problems represent major challenges for the clinician with respect to the oral rehabilitation of patients with PD.

PD is chiefly managed pharmacologically. Levodopa and several dopamine agonists are the standard treatment for PD and can provide adequate symptomatic control in the first 5 to 10 years of therapy.[4] However, motor complications such as fluctuations in the motor state ("wearing-off" phenomenon) and dyskinesia increase after long-term medication.[9] In recent years, deep brain stimulation (DBS) surgery to the subthalamic nucleus (STN) was found to be a promising therapeutic option,[10-13] allowing improvement of parkinsonian motor disability and levodopa-related motor complications in addition to a significant reduction of antiparkinsonian medication.

This clinical report describes the use of the All-on-4 concept implantation for mandibular rehabilitation with a fixed detachable dental prosthesis in an edentulous patient with PD who underwent DBS surgery 6 years earlier.

CLINICAL REPORT

A 76-year-old Asian man whose PD (diagnosed 14 years earlier) had progressed to stage V on the Hoehn and Yahr scale[14] requested fixed-prosthesis dental treatment. He had been completely edentulous for more than 10 years and was currently wearing a 2-year-old complete denture. Although his PD-related symptoms had improved considerably after DBS to the bilateral STN in 2008, he still felt discomfort wearing his complete denture because of a lack of mandibular denture retention caused by involuntary tongue movement and sialorrhea,

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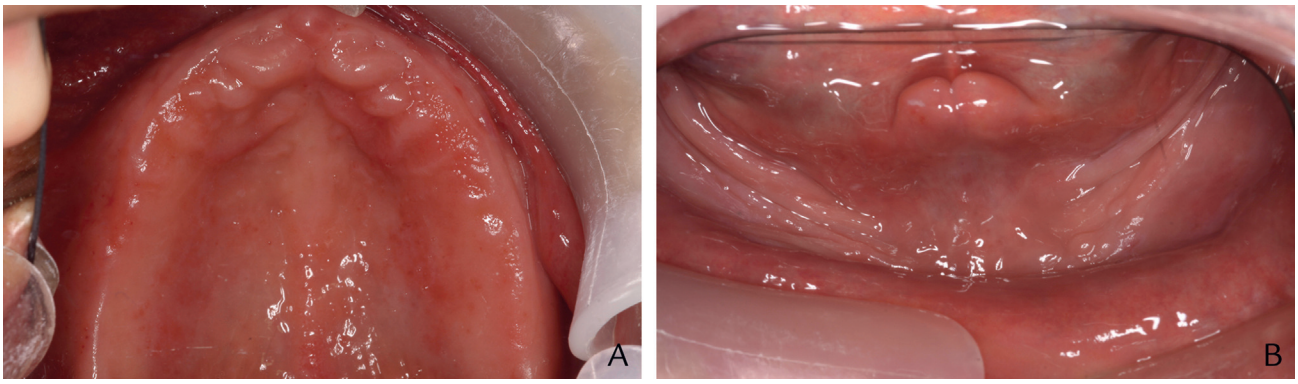

Figure 1. Before treatment. A, Maxillary occlusal view. B, Mandibular occlusal view.

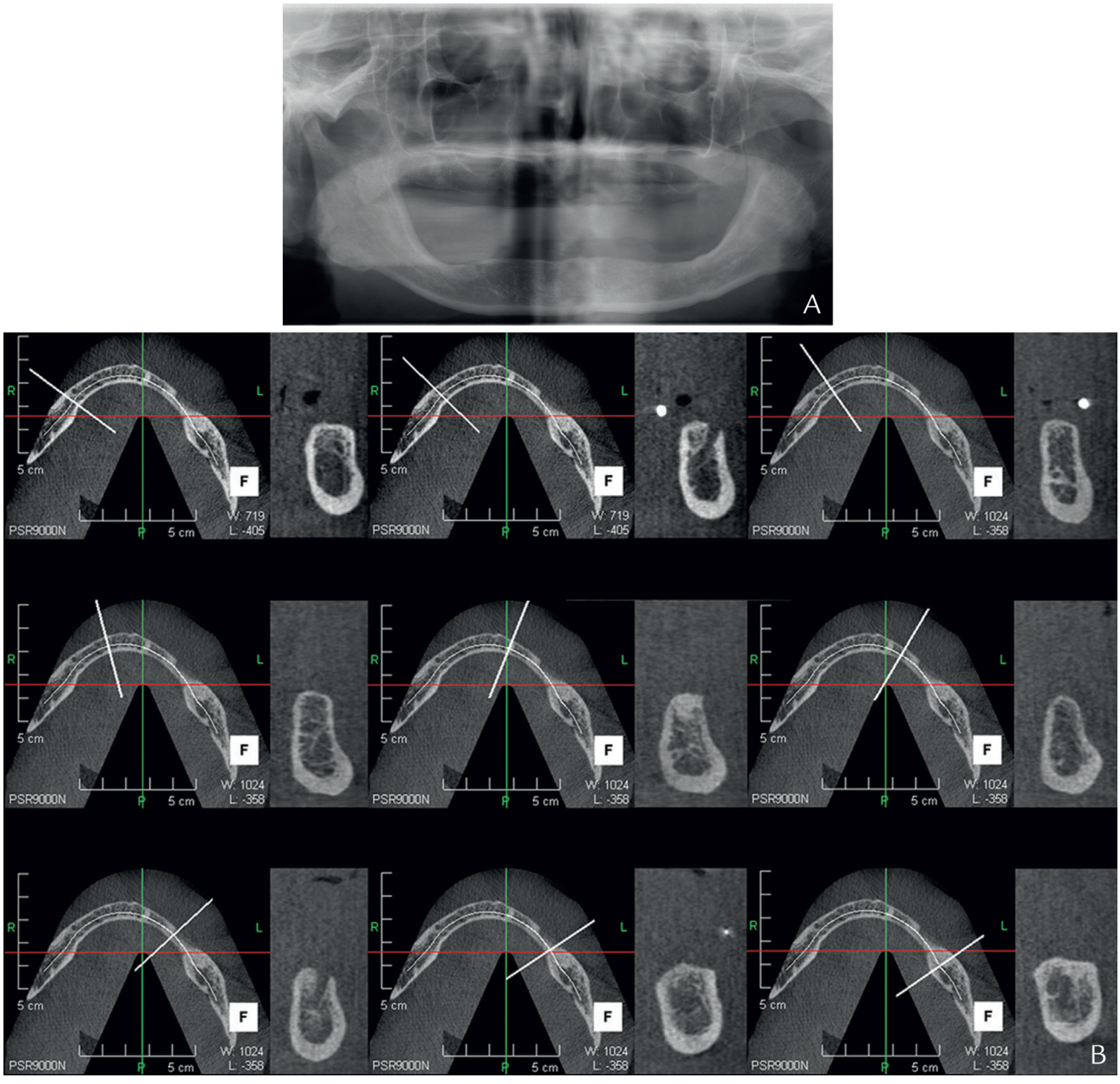

Figure 2. A, Pretreatment panoramic radiograph. B, Pretreatment mandibular computed tomography.

Figure 3. NobelGuide surgical template.

as well as a sharp pain and a numbness sensation over the mandibular area when masticating food with the mandibular denture. The dentist had attempted to reline the mandibular denture several times, but the resulting improvements were limited.

A physical examination revealed akinesia and bradykinesia but not resting tremor. An intraoral clinical examination revealed severe bone resorption of the maxillary and mandibular edentulous ridge, minimal keratinized tissue over the mandible (Fig. 1), a decreased vertical dimension of occlusion, and mental nerve paresthesia caused by denture pressure. A radiographic examination (panoramic radiograph and computed tomography) revealed severe atrophy of the alveolar ridge and sinus pneumatization over the maxilla (Fig. 2). Different treatment options were discussed, including implant-retained overdenture and implant-supported fixed detachable denture (All-on-4 concept). After consultation with the patient and his family, an implant-supported fixed detachable dental prosthesis was selected for mandibular rehabilitation to solve the problem.

The implant surgery was carried out under general anesthesia in an operating room after a thorough preoperative anesthesia evaluation of the patient. A NobelGuide (Fig. 3) was fabricated preoperatively using a 2-scan technique and then applied with flapless surgery (Fig. 4). Two axially oriented implants (4.0×11.5 mm, NobelSpeedy Groovy RP; Nobel Biocare) were placed in the position of bilateral mandibular lateral incisors; another 2 tilted implants (4.0×15.0 mm, NobelSpeedy Groovy RP; Nobel Biocare) were placed in the position of the bilateral mandibular first premolars. An insertion torque of 45 Ncm was applied to the implant over the left mandibular lateral incisor, while a torque of approximately 50 Ncm was applied to the other 3 implants. An immediate-loading interim prosthesis designed and fabricated before the surgery was delivered at the end of the operation (Fig. 5). Artificial dentition arrangement extended only to the second premolar in order to minimize the distal cantilever effect during the healing period. The implants were allowed to integrate for a period of 4 months in the mandible, followed by placement of a definitive metal-resin implant-fixed complete dental prosthesis with a titanium framework (Figs. 6, 7).

At the 1-year follow-up examination, the periimplant mucosal soft tissues remained in good condition, and no obvious periimplant bone loss was noted. The patient reported that his quality of life had improved considerably as a result of this treatment.

DISCUSSION

People who wear removable dentures and particularly complete dentures must learn to control the dentures with their lips, cheeks, and tongue if the prostheses are to function successfully.[15] However, not everyone is able to develop this skill, especially patients with PD. The development of osseointegrated implants has revolutionized the treatment of missing teeth and thereby reduced these problems associated with dentures. Several clinical reports have demonstrated the use of implant-supported overdentures or implant-fixed prostheses for the rehabilitation of patients with PD.[16-18] Improvements have been observed in both masticatory and predigestion capacity.[19] However, those patients still

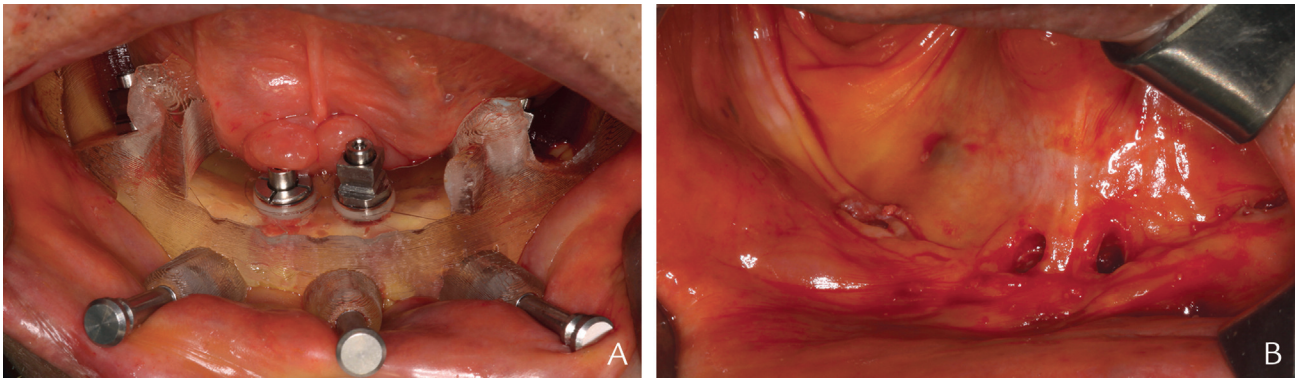

Figure 4. Flapless surgery performed with aid of NobelGuide. A, NobelGuide fixation with pin. B, After implant placement.

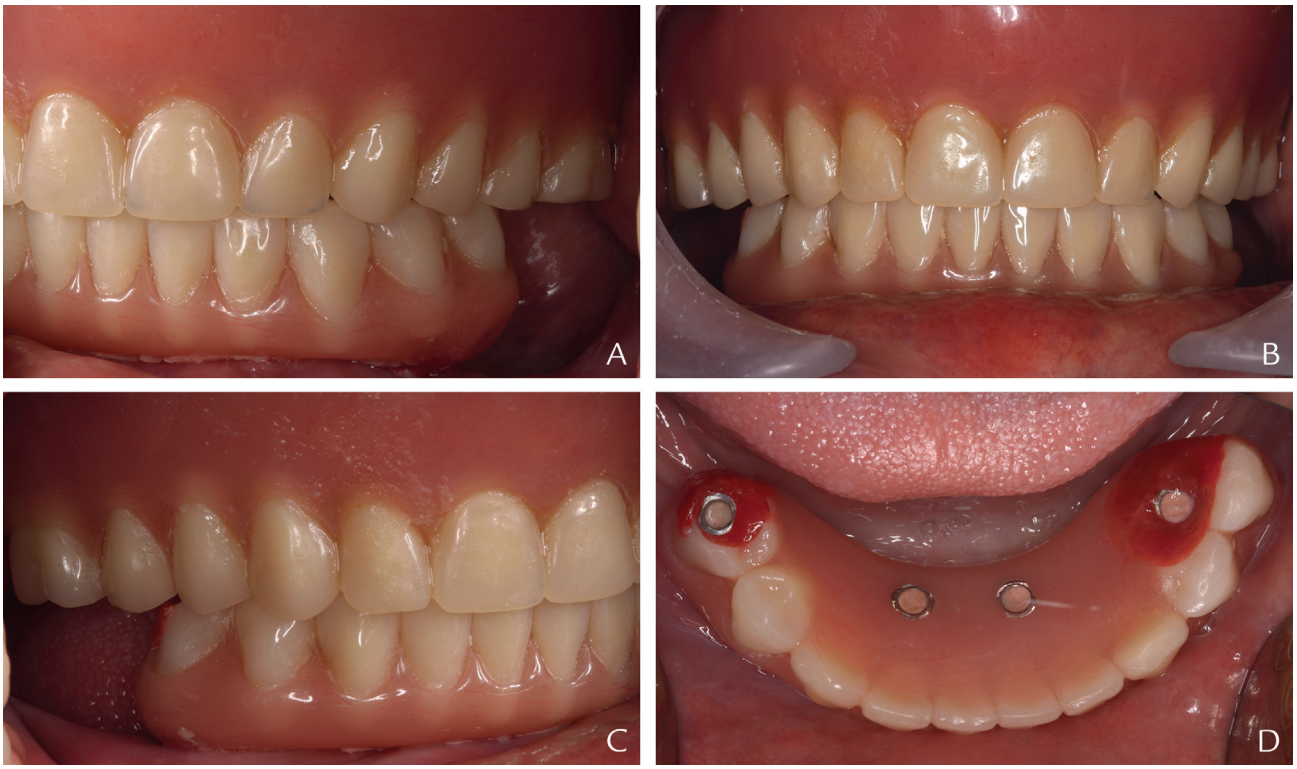

Figure 5. Postoperative photographs showing immediate-loading interim mandibular prosthesis. A, Left lateral view. B, Frontal view. C, Right lateral view. D, Mandibular occlusal view.

encounter difficulties managing the prostheses, including their removal and oral hygiene maintenance and gingival hyperplasia below the overdentures. Therefore, in the present treatment, an implant-fixed complete dental prosthesis was provided rather than an implant-retained overdenture for mandibular rehabilitation. As the patient's resting tremor was improved by DBS, the clinician found it much easier to manage the prosthetic procedures, including making impressions and occlusal registration. This represents a favorable outcome given that clinicians should be able to assess the difficulty of prosthetic rehabilitation in patients with PD.

The patient's bone height over the posterior mandibular residual ridge was inadequate for implant placement. However, the patient's anterior mandibular residual ridge was approximately 15-mm high and 5-mm wide, making the All-on-4 implant concept more suitable than the traditional implant placement in this particular situation: there was no need for bone grafting or multiple surgeries, the implant-to-bone contact could be increased by using longer implants over the posterior area, and the load distribution could be improved and cantilever forces on the prosthesis could be reduced by using a tilted implant design. According to Malo et al,[20] the cumulative success rate of All-on-4 implants in the mandible of patients without PD was about 98.1% after 5 years and 94.8% after 10 years, and the survival rate of the prostheses was 99.2% after up to 10 years. Another study[21] also indicated that the use of tilted implants for the immediate rehabilitation of fully edentulous jaws was safe and not associated with a higher marginal bone loss compared with axially placed implants. Furthermore, the NobelGuide and the interim prostheses were fabricated preoperatively by the dental laboratory technician. The surgery was minimally invasive so that the implant surgery itself and the placement of the interim prosthesis were possible on the same day, rendering the procedure both time- and cost-effective. Both function and esthetics could be taken into account, which improved the patient's satisfaction.

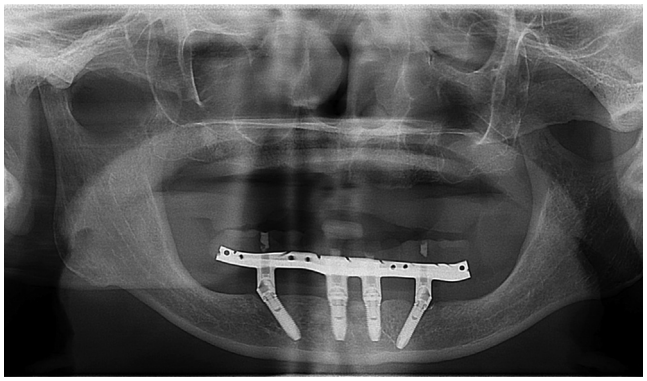

Figure 6. Panoramic radiograph after definitive prosthesis placement.

Figure 7. Definitive prosthesis after placement. A, Right lateral view. B, Left lateral view. C, Frontal view. D, Mandibular occlusal view.

However, differentiating or locating the position of the mucosa in relation to the bony foundation by the computer-aided design (CAD) program was difficult preoperatively. In the present treatment, using a surgical guide with flapless surgery may sacrifice the remaining keratinized mucosa. The lack of keratinized mucosa and vestibular depth, especially on the lingual frenal area, might cause soft tissue irritation to the periimplant area and lead to periimplantitis.[22] To overcome this problem, other surgical treatment options could be considered. For example, a connective tissue graft (CTG) or free gingival graft (FGG) before implant surgery is able to increase the width of the attached soft tissue. Vestibuloplasty is another way to gain vestibular depth. During the implant surgery, raising an additional miniflap would be an alternative method to preserve more keratinized tissue before anchoring the surgical guide.

In the present treatment, without additional soft tissue correction before or during implant surgery, thorough oral hygiene instruction and routine follow-up are crucial to alleviate potential complications in the future. The patient's caregiver can easily maintain good oral hygiene around 4 implants and the associated prosthesis because of the hygienic pontic design. The spaces around the prosthesis allow the caregiver to use an interdental brush easily and reduce the risk of food impaction.

SUMMARY

Applying the All-on-4 implant concept enabled the successful mandibular rehabilitation of a patient with PD using a minimally invasive and time- and cost-effective technique. After a 1-year follow-up, no complications were observed, and the patient's mastication ability and life quality had improved considerably.

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Noteworthy Abstracts of the Current Literature

Comparison of design and torque measurements of various manual wrenches

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Int J Oral Maxillofac Implants 2015;30:526-33

Purpose. Accurate torque application and determination of the applied torque during surgical and prosthetic treatment is important to reduce complications. A study was performed to determine and compare the accuracy of manual wrenches, which are available in different designs with a large range of preset torques.

Materials and methods. Thirteen different wrench systems with a variety of preset torques ranging from 10 to 75 Ncm were evaluated. Three different designs were available, with a spring-in-coil or toggle design as an active mechanism or a beam as a passive mechanism, to select the preset torque. To provide a clinically relevant analysis, a total of 1,170 torque measurements in the range of 10 to 45 Ncm were made in vitro using an electronic torque measurement device.

Results. The absolute deviations in Ncm and percent deviations across all wrenches were small, with a mean of -0.24 ± 2.15 Ncm and -0.84% ± 11.72% as a shortfall relative to the preset value. The greatest overage was 8.2 Ncm (82.5%), and the greatest shortfall was 8.47 Ncm (46%). However, extreme values were rare, with 95th-percentile values of -1.5% (lower value) and -0.16% (upper value). A comparison with respect to wrench design revealed significantly higher deviations for coil and toggle-style wrenches than for beam wrenches.

Conclusion. Beam wrenches were associated with a lower risk of rare extreme values thanks to their passive mechanism of achieving the selected preset torque, which minimizes the risk of harming screw connections.