

## Importance of diagnosis by computer tomography for mini dental implants planning: A clinical report

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Mini implant is an immediate loading implant system to stabilize lower complete denture, and its surgical protocol recommends clinicians to insert four implants between the mental foramen of edentulous mandible by self-tapping. The surgical procedure seems not so difficult. However, the clinician should take care of its diagnosis. In this article, we have indicated the importance of the diagnosis by computer tomography to check the bone quality before insert mini implant. (*Int Chin J Dent* 2007; 7: 31-34.)

**Key Words:** computed tomographic scan, implant overdenture, mini implant.

### Introduction

The efficacy of some endosseous implant systems allows patients to be successfully treated with implant-retained overdentures. Clinicians and patients like to receive the technological advances in implant dentistry that allow the least invasive and most economical approach to the best functional and esthetic result. Mini dental implants (MDI) have been in use for approximately 20 years, and now the Sendax IMTEC mini dental implant has the US Food and Drug Administration approval for both ongoing and long-term use. This implant is also authorized as medical material by Ministry of Health, Labor and Welfare in Japan. Proposed advantages to the use of MDI for stabilization of complete dentures include reduced bleeding, decreased postoperative discomfort, shortened healing time, placement into narrow ridges, and immediate loading.<sup>1-3</sup> MDI were originally used for transitional and provisional purposes,<sup>4</sup> but now the surface treatment is improved and it is observed that these implants appeared to osseointegrate. Balkin et al. reported that the bone appeared to be integrated to the surface of the MDI at the light microscopic level, and the bone appeared to be relatively mature and healthy.<sup>1</sup> Sendax MDI has advantage in flexural properties compared with Mini-Transitional Implant (MTI; Dentatus, New York, NY, USA) which have very similar shapes.<sup>5</sup> The advantages and scientific findings of the ultra small-diameter (1.8 mm) rough surfaced titanium threaded implant have provided the clinician with a predictable and financially feasible solution for loose dentures. However, surgical protocol recommends clinicians to insert four implants between the mental foramen of edentulous mandible, and the insertion should be basically self-tapping. The bone density is not equal among the patient, and sometimes it is difficult for the clinicians to insert four implants in desirable position. The purpose of this article was to indicate the importance of the diagnosis by computer tomography to check the bone quality before insert MDI.

### Clinical Report

Patient was 65 years old male who does not have any systemic problem presented to our clinic frustrated with his lower complete denture. He complained about his lower denture that it was non retentive and non-functional, always falling out during speech or during eating. He did not complain with his maxillary complete denture. Inspection and palpation revealed severe flattened mandibular ridge at the molar site (Fig. 1). Reviewing his panoramic radiograph, residual bone seemed partially reduced even between the mental foramen (Fig. 2). The

patient hoped non-surgical way to retain his denture. Crestal bone and ridge height were sufficient to receive 13 mm mini-dental implants.

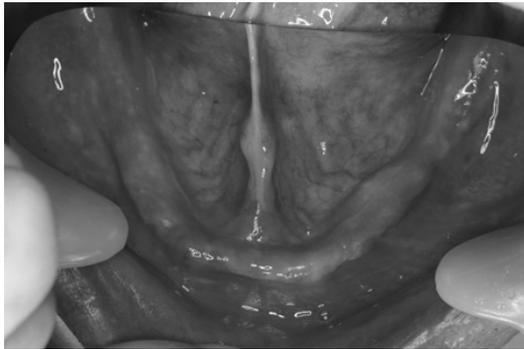


Fig. 1. Intra-oral photograph before MDI insertion.



Fig. 2. Panoramic X-ray photograph before MDI placement.

Questionnaires were sent to the patients to evaluate the visual analogue scales (VAS) value. The questionnaires had six areas of evaluation: pain, chewing ability, retention, speaking ability, ease of cleaning, and comfort. The patient marked on each 100 mm bar, with 0 mm being poor and 100 mm being excellent then the marked positions were measured as the analogue scales.

The use of a surgical template has been advocated to achieve predictable prosthetic results through accurate implant placement. Surgical stent (Fig. 3A) was fabricated from clear poly(methyl methacrylate) through duplication of the patient's complete denture. Stand on the normal insertion protocol, four implants were planned and four small holes at the #21 (left first premolar), #23 to 24, #25 to 26, and #28 (right first premolar) sites were drilled for gutta-percha insertion those between the mental foramen. Then CT was scanned and analyzed with Simplant (Materialize, N. V., Leuven, Belgium).

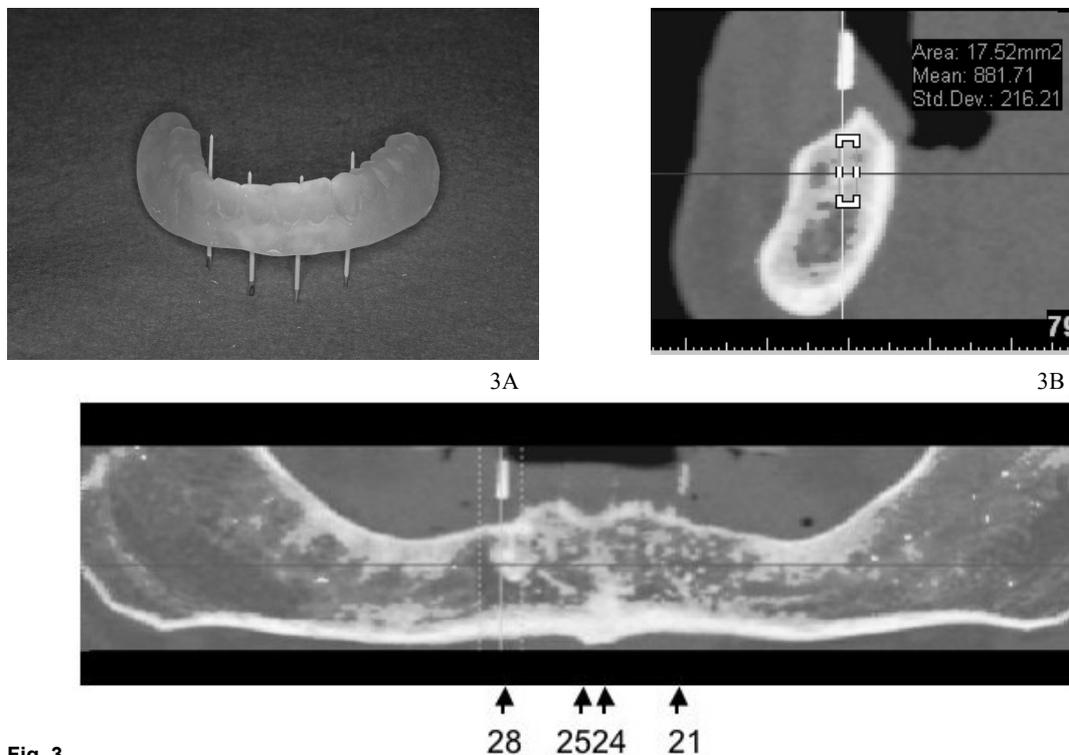
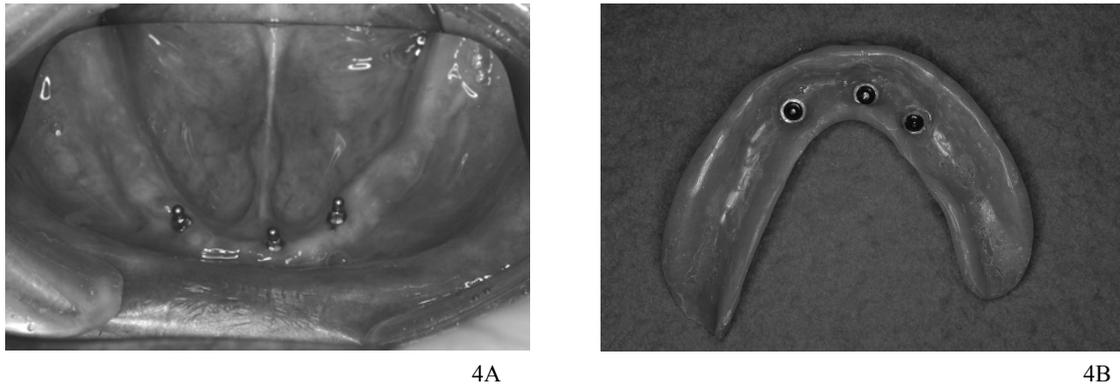


Fig. 3. Fabrication of surgical stent and the analysis of the CT scan. A, Gutta-percha insertion to the surgical stent; B, Selected cross-sectional images, where the high bone density was observed (gutta-percha rods at #28, right first premolar canine are visible); and C, Panoramic photograph based on CT scanned data. Gutta-percha rods at #21, #23 to 24, #25 to 26, and #28 are visible. High bone density is observed below the #28 point.



**Fig. 4.** Photograph after MDI placement. A, Intra-oral photograph; and B, Under-view of the denture.

The hounsfield units of cancellous bone beneath the gutta-percha point was measured with CT dicom data followed by Simplant analysis. The hounsfield units of each site was approximately 300 to 700. However the bone density at #28 site indicated mean 881.71 hounsfield units (area 17.52 cm<sup>2</sup>, SD 216.21) (Fig. 3B), showing that the hounsfield units might exceed 1,000 in some part. So, we avoided to insert MDI into #28 site but planned to insert at #22, #24, and #27 sites (Fig. 3C).

Mandibular Sendax IMTEC mini dental implants (IMTEC, Ardmore, OK, USA), with a standard diameter of 1.8 mm, and a length of 13 mm were used in this study. Patient received local anesthesia. Standard MDI 1.1-mm diameter titanium drill was used to initiate a hole through the superior cortical plate. Implants were inserted in tooth positions at #22, 24, and 27 sites using a handheld finger driver followed by a ratchet.

Patients were then treated to have the dentures retrofitted with the MDI housings with O-ring, and then immediately loading was applied (Fig. 4). The post operative questionnaires after four weeks are indicated as VAS shown in Table 1. Patients compared denture wear before having MDIs with satisfaction after MDI placement.

**Table 1.** Results of visual analogue scales (VAS) before and after MDI placement.

	Pain	Chewing ability	Retention	Speaking ability	Ease of cleaning	Comfort
Before	84	56	34	31	76	72
After	100	97	97	96	72	84

## Discussion

It is usually not convenient for the dentist to be available for the CT scan, especially if the location of the scanning equipment is a considerable distance from the dental office. So panoramic X-ray photograph is used in high frequency for diagnose the implantation position. However the anterior area of the panoramic X-ray photograph which is important for MDI planning is overlap with cervical bone. So we should take care not to make misdiagnosis of the bone density around implant insertion area using CT scan. In this case, we detected high bone density area for the insertion planned area by CT scan. So we changed the implant insertion position and also reduced the insertion number from four to three. Even with less number of MDI retention, the complete denture was quite stable, and also from the VAS (Table 1), patient satisfied the treatment. Presurgical diagnosis by CT scan is important especially for the insertion of self tapping implant.

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