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CASE REPORT

'Teeth in a Day'—An Innovative, Cost-Effective Technique for Immediate Loading of Implants

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ABSTRACT

Traditional loading protocols required the patient to wait 3 to 6 months for the implants to integrate into the jaw bone before the final prosthesis was placed on it.

Newer techniques have advised placing of implants and loading them immediately or even at the same appointment. Such procedures utilize guided implant placement stents and CAD/CAM for fabrication of the final prosthesis. This results in increased treatment cost for an average Indian patient.

Thus, developing a popular, cost-effective technique for fixed implant supported prosthesis is the need of the hour.

This paper presents an innovative method for stent fabrication and prosthetically driven implant placement and fabrication of fixed implant supported prosthesis within 24 hours following implant placement.

Keywords: Immediate loading, Hybrid denture, Teeth in a day.

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INTRODUCTION

The use of dental implants in the completely or partially edentulous jaw has become a common treatment modality in restorative dentistry. It has become particularly common in the edentulous mandible where the use of implants for improved retention of prostheses is a successful and well-documented treatment option.[1-4]

Conventional techniques for treating edentulous patients involve a two-stage surgical approach with a healing time for implant integration and a transitional period during which the patient wears a temporary, removable prosthesis. This results in reduced quality of life and, for many patients, a great psychological stress during the interim period.[5]

Recently, some investigators proposed the loading of implants immediately or very early after their placement, reporting implant survival rates similar to those for implants placed using the delayed-loading procedure.[6-8] However, these protocols still include the use of a provisional removable denture during the healing period between implant placement and implant loading. Soft tissue borne prostheses used during healing can cause uncontrolled implant loading leading to implant exposure, marginal bone loss and/or failed integration.[9]

Several authors advocate the immediate loading of splinted multiple implants in the anterior mandible.[10-15] Literature has reported osseointegration does occur in immediately loaded implants in this region.[16,17] Immediate loading of implant-supported dental prostheses is documented in the literature with a high and predictable success rate for the edentulous mandible. Also, the clinical performance and prognosis of immediate loading with different restorative options were comparable to the conventional two-stage.[6,18]

Various techniques have been reported for immediate loading of implants in the edentulous mandible.[6,19-22]

In one of the techniques, multiple implants are inserted into the mandible.[13,19-22] Some of the implants are designated for immediate loading and are considered expendable, while the other implants are allowed to heal unloaded. Following prescribed healing period, the implants that have integrated are all used to support the final prosthesis.

One of techniques of immediate loading in the edentulous mandible was described by Branemark known as the Novum System (Nobel Biocare USA, Yorba Linda, CA). This significant modification to the standard fixed-detachable prosthesis technique uses a rigid surgical template to ensure precise implant placement. It allows the use of a prefabricated prosthetic bar to which denture teeth are easily connected. However, this technique is not readily adaptable to variations in arch form, location of the mental nerve and lacks surgical precision.[13]

Another innovation recently developed uses of computed tomography scanning with computer-guided planning and implant surgery that allows the final prosthesis to be fabricated before surgery and delivered following implant insertion (Teeth in an hour; Nobel Biocare).[22] These techniques require fabrication of provisional prostheses and/or guided surgical stent, complex diagnostic procedures and equipments which increase significantly the cost of the procedure.

There is a need of a simple convenient technique that could be used successfully with any implant system using conventional surgical inventory in a routine day to day practice for any patient.

This paper presents a simple, convenient and cost-effective technique of immediately loading of dental implants in the edentulous mandible by using a screw retained hybrid prosthesis.

The technique of full-arch, immediate loading of immediate implants in the mandible proposed in this protocol is a simple procedure with 100% success rate at 2 years of follow-up.

CASE REPORT

The patient whose treatment protocol is reported here had an edentulous mandibular arch with adequate ridge width and height for implant placement. Her systemic medical history was uneventful. Routine blood investigations revealed that all the values were in the normal reference range.

Initial therapy consisted of oral hygiene instructions and oral prophylaxis for the maxillary teeth, preliminary impression was made in medium fusing impression compound (Y-Dents impression compound; MDM Corporation, New Delhi, India).

Maxillomandibular relationship records and diagnostic arrangement of teeth were done to determine the distance between the mandibular residual ridge and the maxillary dentition. Other parameters, like occlusion, esthetics and phonetics, were also evaluated.

Gutta-percha points were then attached to midfacial surfaces of all the teeth from molar to molar (Fig. 1).

A CBCT scan was then performed with the trial denture *in situ* to evaluate the anatomical landmarks and bone condition. The images were evaluated for the quality and quantity of bone (Fig. 2).

Fig. 1: Diagnostic arrangement of teeth

The case was then planned for immediate loading of the edentulous mandible with five implants in the intermental foramina region.

A putty index was then fabricated with the trial denture placed onto the cast. The mandibular cast was then analyzed and the final arch form was determined. The location of the mental foramina marked on the casts.

A laboratory analog (D3.7, Uniti, Equinox, Medical technologies, BV, Ziest, Holland) was placed exactly in the center of the ridge. The transmucosal abutment was then attached and the waxable sleeve stabilized (Fig. 3).

Castable pattern resin (GC pattern resin) was used to fabricate a framework (modified form of OSU frame) to fit the arch form.[6] Pattern resin framework was tried over the cast to verify its shape with the arch form and width.

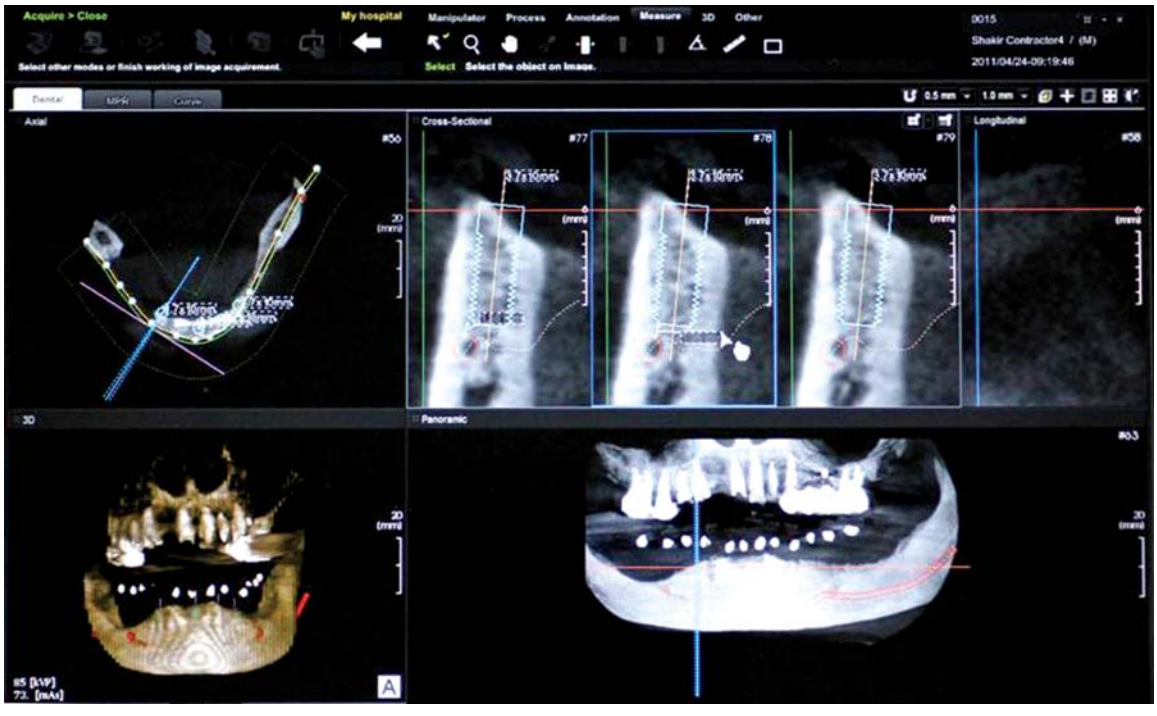


Fig. 2: CBCT images and planning of implant position

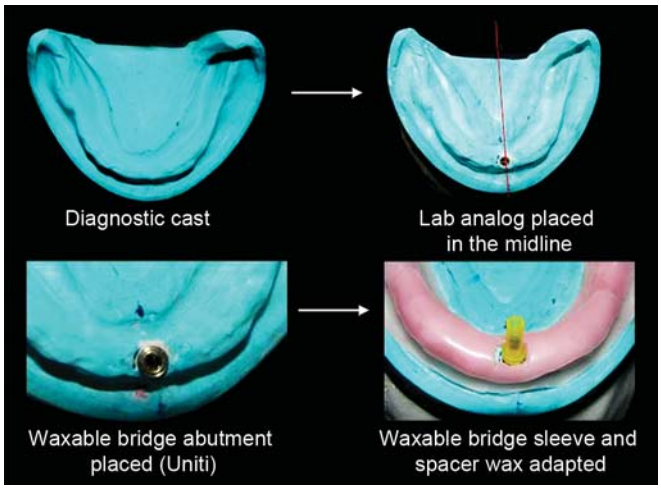


Fig. 3: Fabrication of the pattern resin stent/framework

Fig. 5: Implant placed in the midline (Uniti D3.7 × L15)

Fig. 4: Customized pattern resin framework/surgical stent

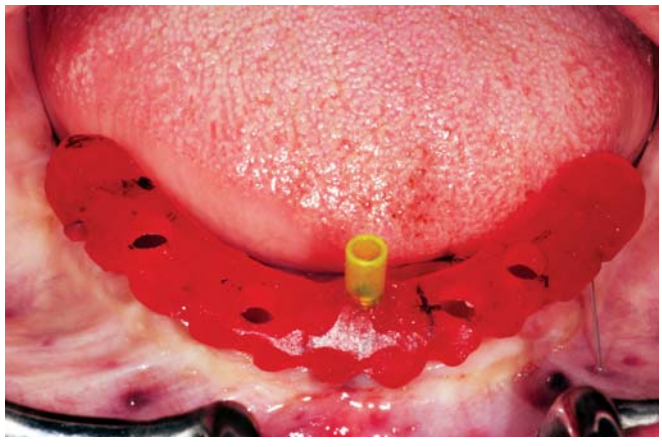


Fig. 6: Stent stabilized by the midline implant

Using the putty index made from the wax-up indentations were made on the labial aspect of the framework corresponding to the interdental areas of each tooth.

A hole was then drilled in the center of the framework using a straight fissure bur over the marked position on the cast such that it has a very close contact with a plastic waxable bridge abutment sleeve to be used during the surgical procedure.

Based on the diagnostic data, the location of the mental foramina was transferred onto the pattern resin framework. Osteotomy sites were planned. Corresponding holes were made into the framework for the pilot drilling. The same framework was used as a surgical guide to position the other four implants once the midline implant is placed (Fig. 4).

This treatment protocol allows the loading of implants with fixed definitive prostheses in 24 hours of implant placement in four appointments.

Appointment 1: Using routine surgical protocol, a full thickness flap was raised and a Uniti Implant (Equinox, Medical technologies, BV, Ziest, Holland) measuring 3.7 mm in diameter and 15 mm in length was placed in the midline (Fig. 5). The surgical stent was then stabilized on the midline implant using a transmucosal abutment, waxable sleeve and screw (Fig. 6).

The remaining four osteotomies were then prepared using pilot drills at the planned sites using the framework as a guiding stent (Fig. 7).

This resin framework, which doubles as a surgical template and the pattern for casting, can be modified at the time of surgery should an implant position need to be adjusted for any reason.

The stent was then removed and osteotomies further prepared till the desired diameter and depths and implants placed (Fig. 8). Paralleling pins were placed into the osteotomy sites to verify implant positioning. The primary stability of the implants was then confirmed/tested using a Periotest (Medizintechnik Gulden eK, Modataul, Germany) (Fig. 9).

The waxable sleeves were then placed onto each of the implants (Fig. 10) and the framework was then repositioned back *in situ*. Care should be taken at this time that the vertical position of the frame allows for adequate hygiene (3 mm).

Fig. 7: Stent doubling up as a surgical guide

Fig. 8: All implants placed [three (Uniti D3.7 × L15) and two (Uniti D3.7 × L10)]

Fig. 9: Evaluation of primary stability using periotest

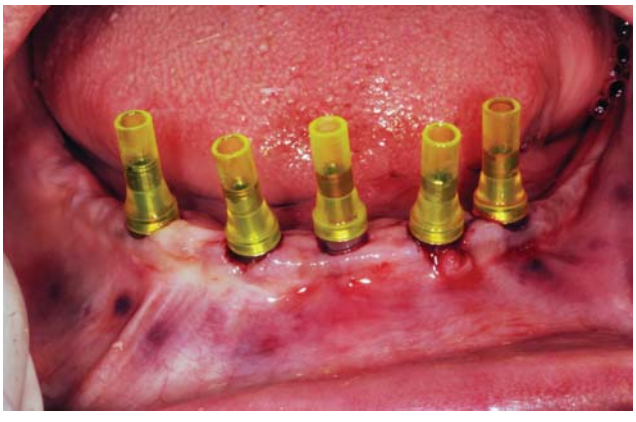


Fig. 10: Waxable sleeves positioned over the implants

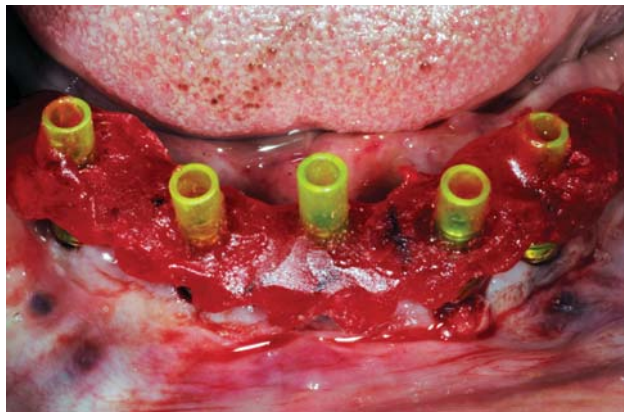


Fig. 11: Modified OSU framework with pattern resin

Fig. 12: Laboratory analogs attached to the modified OSU framework

Fig. 13: Cast poured and retentive beads placed on the framework

Fig. 14: Framework cast in Ni-Cr (Hichrom soft-7, High Dental, Japan)

The waxing sleeves were then connected to the framework using pattern resin (Fig. 11).

The OSU frame and the sleeves from the implants were removed as a single unit. The healing caps were attached and the patient dismissed for the day (Fig. 12).

Laboratory analogs (Equinox, Medical technologies, BV, Ziest, Holland) were then attached onto the waxing sleeves and set in stone. The cast obtained served as an index to assess framework fit and was used later for articulator mounting after definitive maxillomandibular relations were made.

The framework was then finished and retentive beads added so as to enhance retention of acrylic resin (Fig. 13). The framework was then cast in nickel chromium alloy (Hichrom soft-7, High Dental Japan) using standard laboratory protocols (Fig. 14).

Appointment 2: The passive fit of the framework was ensured (Fig. 15). Facebow records and final maxillo-mandibular relations were recorded using bite registration recording material (Fig. 16). The jaw relations were then transferred to a semiadjustable articulator (Hanau Wide-Vue II) and returned to the laboratory for arrangement of teeth.

Appointment 3: The tryin denture was evaluated for esthetics, phonetics, occlusion and patient approval (Fig. 17). The tryin denture was then processed using injection molding technique (BPS: Biofunctional prosthetic system, Ivoclar Vivadent AG, Liechtenstein) (Fig. 18).

Appointment 4: The processed hybrid denture was then placed over the transmucosal abutments and the screws hand torqued. The access holes were then blocked with Fermit (Ivoclar Vivadent) (Figs 19 and 20A to C). At the time of prosthesis delivery, a panoramic radiograph was taken to check implant position and the coupling between prosthetic components (Fig. 21).

Patients were instructed to eat a soft diet during the healing period of 3 months. Oral hygiene instructions, including the use of toothbrushes, interdental brushes, Water-pik (Water Pik Inc, USA) and chlorhexidine mouth rinse were given.

The sutures were removed after 7 days. Patients were told to promptly report to the clinic, if any loosening or fracture of the prosthesis is noted during the healing phase. Routine follow-up visits were scheduled every 1 to 2 weeks, the first month and monthly thereafter to evaluate the stability of the prosthesis. The prosthesis should not be removed during the 2 to 3 months implant healing period. Following this time frame, the prosthesis was removed to

Fig. 15: Metal framework trial

Fig. 16: Maxillomandibular relations recorded using bite registration recording material

Fig. 17: Arrangement of teeth

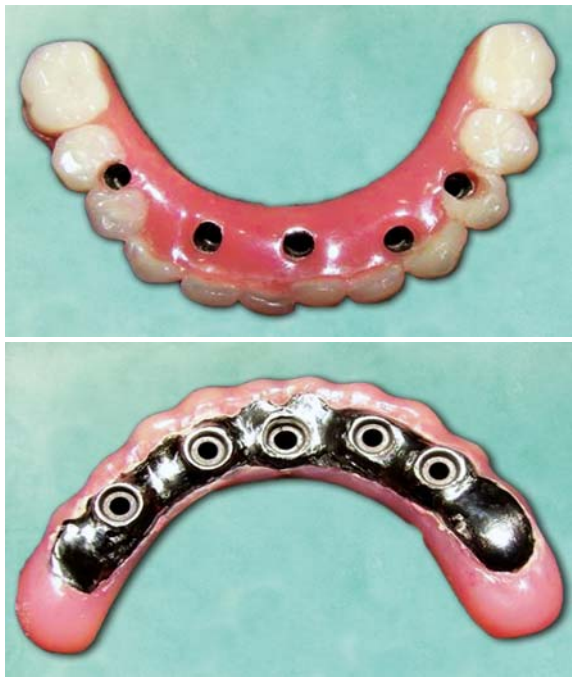
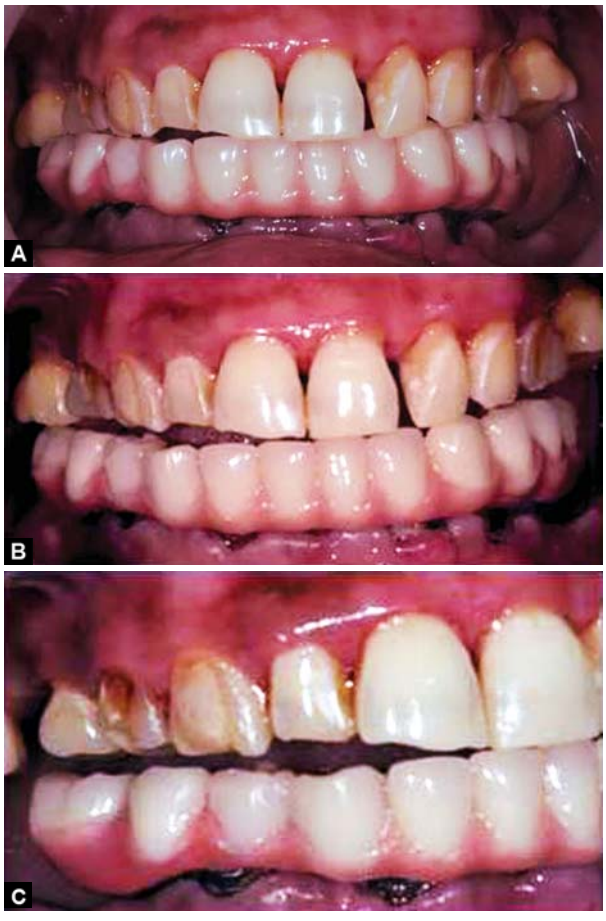


Fig. 18: Final prosthesis

Fig. 19: Occlusion in centric relation and protrusive and lateral excursive movements



Figs 20A to C: Access holes blocked with Fermit: (A) Centric occlusion, (B) protrusive, (C) lateral excursion

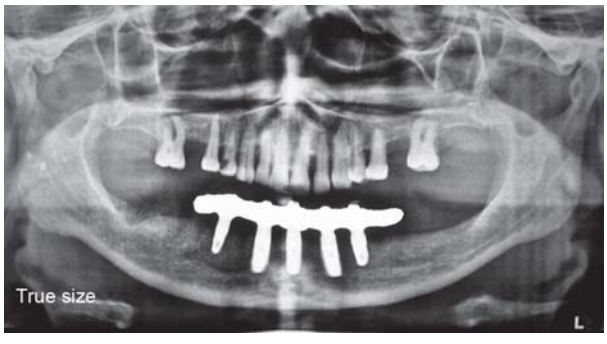


Fig. 21: Postoperative orthopantogram

assess implant integration and routine maintenance. The abutment screws were then torque to 25N/m^2 and the prostheses delivered.

DISCUSSION

Although the success rates of immediately loaded implants in the edentulous mandible are comparable to a staged healing protocol, there are greater risks with this approach. Screw loosening, prosthesis breakage, overloading and/or parafunction can lead to significant micro movement of the implant resulting in failure. The patient needs to be educated regarding these concerns and must maintain regular postoperative visits for periodic evaluation. If the patient is unwilling to accept these risks or is noncompliant, a staged technique should be used. Proper case selection for immediate loading is important.

The many unique advantages of 'teeth in 24 hours' technique for immediate loading in the edentulous mandible are as follows:

1. Simple and convenient technique
2. Impression less procedure
3. Cost effective
4. Compatible with any implant system
5. Requires the basic inventory and materials that are needed for routine implant surgical procedures.
6. The pattern resin framework is easily modifiable and can accommodate any anatomic situation.
7. Facilitates immediate implant loading with the final prosthesis for most edentulous implant patients.
8. The system can also compensate for suboptimal implant placement.
9. If any of the implant fails the prosthesis does not require to be remade/modified.
10. Being a screw-retained type of prostheses requires less interarch space for retention of the prosthesis. It is critical that the prosthesis does not loosen during the healing phase. Screw retention allows easier retrieval and screws tightened to the proper torque rarely loosen. Cement retention during the healing period can be unpredictable and difficult to maintain.

Successful reports on the immediate loading of dental implants continue to proliferate in the literature. In many clinical situations, the immediate loading of implants in the edentulous mandible has become a preferred approach.

The 'teeth in 24 hours' technique offers a simplified, cost-effective and versatile approach to immediate loading that may be easily incorporated into most clinical practices.

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