Modified Mandibular Complete Denture as an Interim Implant-Supported, Cement-Retained Prosthesis: A Clinical Technique

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KEY WORDS: cement-retained, implant, interim, mandibular, prosthesis

Unstable mandibular complete dentures on severely resorbed mandibles have long been a problem for the wearers as well as the prosthodontists who have to tackle the same. Osseointegrated implants came to the rescue providing a safe and predictable solution. Long-term survival of fixed shortened arch prostheses supported by implants has been established.[1,2]

Conventionally, the surgical protocol for implant placement involves two stages. The first stage involves the installation of implants in the jaw bone, and they are submerged for a period of 3 to 6 months for the process of osseointegration. The fixtures are then exposed at the second-stage surgery, and the prosthodontic phase begins. The final prosthesis can be retained by screws or cementation.[3,4] Advances in implant treatment now allow the placement of prostheses for loading on implants immediately after their installation in suitable cases. Such immediately placed prostheses have similar results as the conventional two-stage approach.[5] Eliminating the second-stage surgery can reduce postoperative pain and can prevent bone loss due to surgical intervention. In a multicenter study in which over 3,000 implants were reviewed, the mean amount of bone loss following second-stage implant surgery was 1.2 mm.[6] Patients' benefits also include early function, less surgery and waiting time.

The success of immediate loading is associated with the fact that once the implants have attained their primary stability, they are rigidly connected by a temporary prosthesis that provides cross-arch stability as well as functional stimulation while the process of osseointegration is taking place.[7,8]

Different temporary prosthesis designs are available for immediate restoration of the implants, but they do have shortcomings. For example, the "Hong Kong Bridge" protocol involves the connection of temporary prosthesis to the abutments through the temporary cylinders. Therefore, it is difficult to provide good occlusal anatomy using self-polymerizing resin to connect temporary cylinders and temporary prosthesis with multiple access openings prepared. Furthermore, surgeons may alter the implant position and angulation when unexpected bone morphology is encountered during surgery.

Instead of using screw-retained temporary prostheses, Guichet and Beierle[9] reported five clinical cases wherein immediate complete dentures were converted into fixed cement-retained full-arch prostheses as the immediate restoration for implants placed in the edentulous jaws. Cooper and colleagues[10] also reported 10 cases of immediate loading of mandibular implants with cement-retained acrylic resin dentures for 12 weeks and replacing them with screw-retained permanent fixed prosthesis. The success rate for an 18-month period was 100%.

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DOI 10.1111/j.1708-8208.2006.00025.x

The use of existing dentures to serve as the temporary fixed prostheses requires no adaptation on the part of the patients. When a cementation technique is used instead of screw retention, the occlusal surface of the denture is undisturbed and it offers maximum masticatory efficiency. The cementation technique also provides the additional advantage of passive fit of the prosthesis, which is easier to attain than the screw-retained type.[11]

PATIENT SELECTION

The following clinical criteria should be fulfilled:

1. Patient should be medically fit for implant surgery and intravenous sedation.
2. The bone quality and quantity of the anterior mandible should be adequate for the insertion of four to six implants.
3. The jaw relation of the existing complete dentures should be correct.
4. The oral surface of the denture and tooth positions should be satisfactory.
5. There should be sufficient bulk in the mandibular complete denture to provide room for the implant abutments.

The following clinical report describes the treatment involved for the use of a patient's mandibular complete denture as immediate implant-support fixed prosthesis. The essential clinical and laboratory procedures are illustrated.

CLINICAL REPORT

A 65-year-old woman was wearing removable partial dentures. The only mandibular teeth present were mandibular left and right central incisors. Both incisors were severely periodontally involved and required extraction. Addition of teeth to the existing denture was carried out following the removal of these teeth, and the soft tissue was allowed to heal (Figure 1). A radiographic template was made 1 month after the extraction, and tomograms were taken for assessment (Figures 2 and 3). The positions of the implants were determined, and the radiographic template was converted into a surgical template according to the technique described by Wat and colleagues.[12]

A total of six Nobel Replace® tapered implants (Nobel Biocare, Göteborg, Sweden) were planned. Four 13-mm implants with hydroxylapatite coatings were chosen for the advantage of faster osseointegration. Two

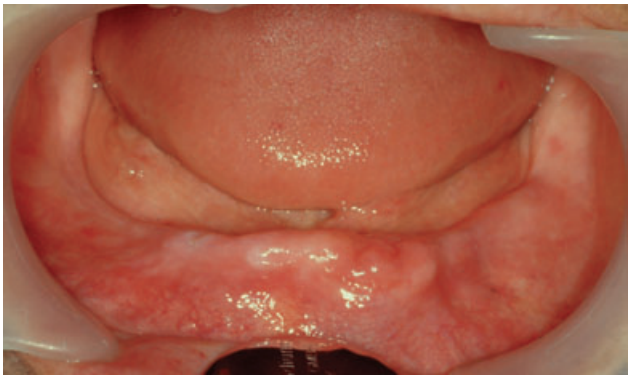

Figure 1 Edentulous residual mandibular ridge.

10-mm implants were selected for the limited vertical height of bone available above the inferior dental nerve in the left posterior mandible. The 10-mm implants allowed 2 mm of smooth collar to be set above the crest of the ridge. In the event of gingival recession, this would permit easier oral hygiene measures around these implants. All six implants were 4.3 mm in diameter.

Abutment Preparation

The surgical template was placed on a duplicated cast of the mandible. Channels in the cast were made corresponding to the planned positions, angulations and depths of the implants. Fixture replicas were inserted into the channels and secured with self-curing Duralay resin (Reliance Dental Manufacturing Co., Worth, IL). Abutment cylinders were fitted on the fixture replicas and were prepared by tungsten carbide burs so that they were slightly tapered and aligned parallel to each other (Figure 4). The modified abutments were checked

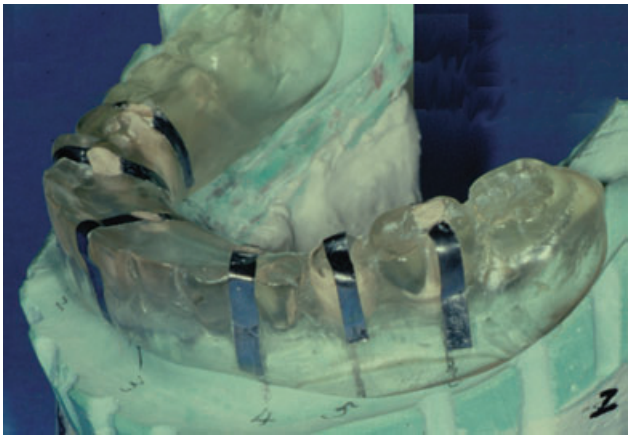

Figure 2 Radiographic template on study model.

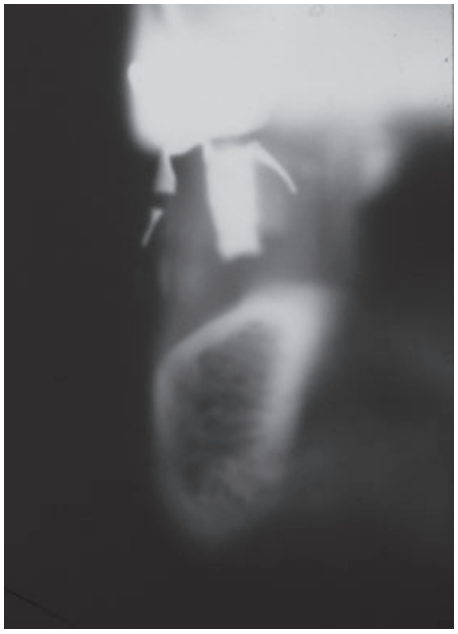

Figure 3 Tomographs of anterior mandible with radiographic template in place.

to ensure that they are within the confines of the denture.

Surgical Phase

Prior to surgery, the occlusal vertical dimension was recorded by placing reference marks on the patient's face. Intravenous sedation was administered (5-mg Dormicum [F. Hoffman-La Roche Ltd., Basel, Switzerland], 30-mg Toradol [F. Hoffman-La Roche Ltd.], and 5-mg dexamethasone), and the patient's pulse and blood pressure were monitored. Local anesthesia solution (2% xylocaine) was injected intraorally. Before making any incisions, the surgical template was placed on the mandibular ridge. Channels were made for immediate provisional implants (IPIs) with 1.5-mm twist drills through the mucosa. Three IPIs were inserted, and their respective abutment cylinders were fastened to the surgical template using self-curing Duralay resin (Reliance Dental Manufacturing Co.) (Figures 5 and 6). The surgical template with the abutment cylinders was then removed from the mouth, and crestal incision was made to expose the underlying osseous ridge. While this procedure was performed by the surgeon, the prosthodontist cut away the buccal and lingual flanges of the surgical template to facilitate the surgical preparation of implant sites. The modified surgical template was refitted onto the IPI to guide precision drilling. The fixtures were checked for primary stability according to established protocols for immediate loading.[7] The modified abutments previously prepared in the laboratory were then connected to their respective implants (Figure 7). IPIs were removed, and the soft tissue was closed with resorbable sutures.

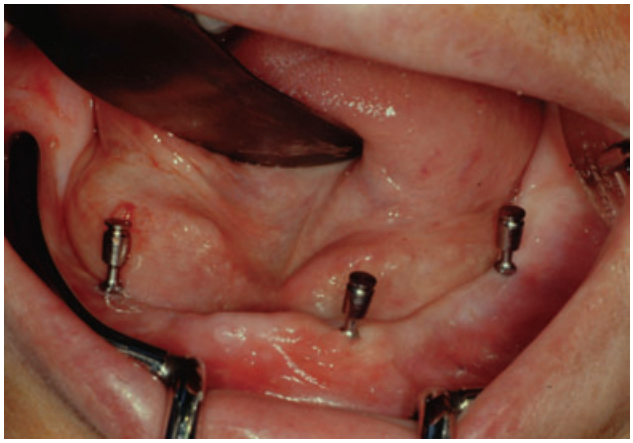

Figure 5 Immediate provisional implants in place.

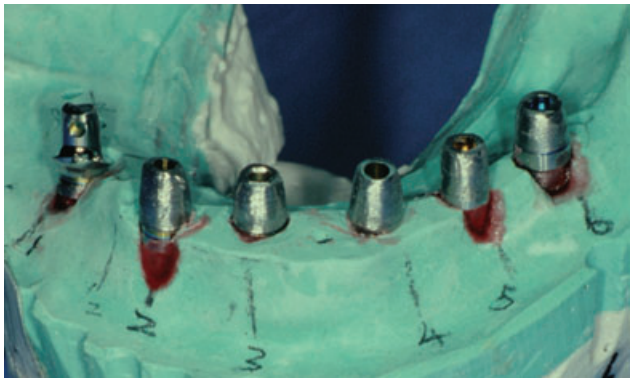

Figure 4 Prepared abutments on study model.

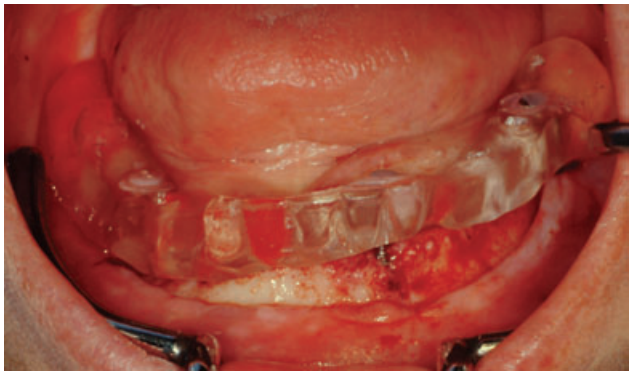

Figure 6 Surgical template supported by immediate provisional implants.

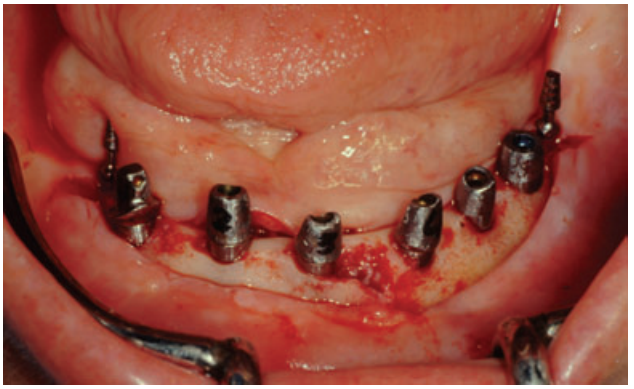

Figure 7 Prepared abutments inserted immediately after implant placement.

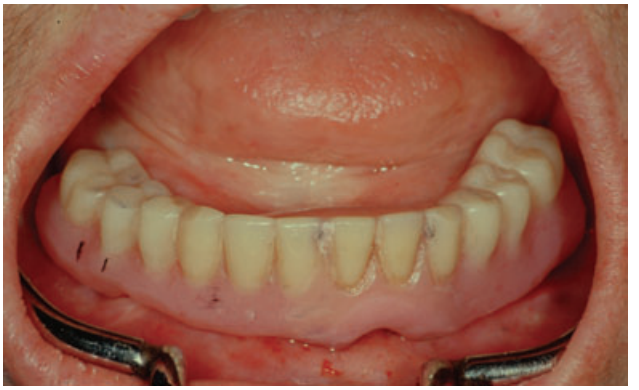

Figure 9 Cemented mandibular prosthesis.

Prosthetic Phase

The patient's denture was hollowed out over the abutments. Self-curing acrylic resin was placed in the recesses made, and the denture was placed back on the mandibular ridge. The occlusal vertical dimension was confirmed with the marked reference points on the face. After setting of the acrylic resin, the denture was removed. The distal portions of the denture were cut away to reduce the length of the cantilever. The flanges were cut back to allow easy cleaning of the prosthesis (Figure 8). The modified denture was then temporarily cemented with noneugenol based cement (ImProv®, Nobel Biocare) (Figure 9). Minor occlusal adjustment was carried out to ensure that loading was directed over the implants. The patient was instructed to avoid hard diet for a few weeks following surgery. Postoperative radiographs showed that the implants were placed precisely as planned (Figure 10).

After 3 months, the temporary prosthesis was retrieved. The two left distal abutments were replaced by taller abutments to provide better retention of the bridge. The abutments were torqued to 35 Ncm. A polyvinyl siloxane impression was taken. Following jaw registration and wax try-in, a titanium framework was made with acrylic teeth setup for a further try-in. The final prosthesis was cemented with ImProv®. A postoperative radiograph at 36 months revealed good results with no bone loss around any of the implants.

DISCUSSION

Elderly patients may find it difficult to adapt to major changes of contour and tooth position of their prostheses. By modifying the patient's existing denture, the following objectives were predictably achieved: splinting of implants, immediate function, esthetics, and comfort. The patient experienced little change except a more stable prosthesis, albeit slightly shorter.

The final prosthesis was cemented which avoided the possibility of screw loosening that was not an uncommon complication of screw-retained prosthe-

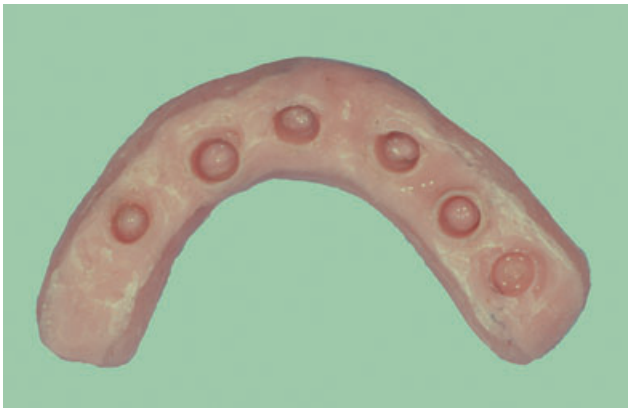

Figure 8 Tissue fitting surface of denture after modification.

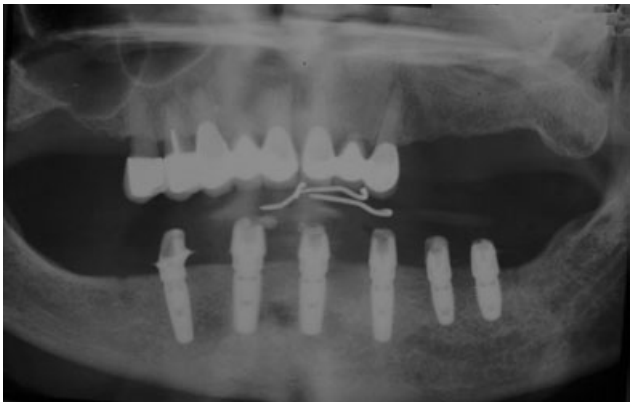

Figure 10 Radiograph of implants and abutments.

ses.[13,14] There are also no access holes that would spoil the appearance and occlusal contacts of the prosthesis. Furthermore, cementation technique negated any possibility of a misfit of the metal framework, and a totally passive fit was ensured for optimal loading of the implants. However, it should be noted that retrieval of the cemented prosthesis may not be straightforward. There is also a theoretical risk of decementation following cement washout.

CONCLUSION

Meticulous treatment planning and precision placement of implants are paramount to successful implant therapy. The use of the patient's own denture allowed immediate function and minimal adaptation by the patient while the process of osseointegration of the splinted implants took place. While all treatment options have their limitations, this technique is able to provide patient comfort and high satisfaction in suitable cases.

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