

Mini Dental Implants: The Attractive Minimally Invasive Prosthetic Approach for Edentulous Patients

Yasser A Araby*

Prosthetic Dental Sciences, College of Dentistry, Qassim University, Saudi Arabia

***Corresponding Author:** Yasser A Araby, Prosthetic Dental Sciences, College of Dentistry, Qassim University, Saudi Arabia.

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In the 21st century, minimally invasive devices and procedures are becoming the fastest growing segment of the medical and dental device industry. Research and development have been directed at the use of smaller and smaller components.

Mini dental implants (MDIs) are an excellent example of this trend which have become popular in use for orthodontic anchorage, periodontal therapy and fixed prosthetics, but the most effective use of this unique dental product is the stabilization of complete denture specially the mandibular one [1]. They dramatically broaden the spectrum of mandibular overdenture patients who can be successfully treated [2].

Mini dental implants are sometimes referred to as MDIs or small diameter implants (SDIs) or narrow body implants (NBIs). The narrow diameter or mini-implants are one-piece endosseous implants made of titanium alloy and less than 3 mm in diameter and are placed through less-invasive techniques than the conventional implants. They were introduced commercially to the dental profession in the 1990s and were first used for transitional prosthesis support.

For approximately 20 years mini-dental implants were used as a provisional treatment, were placed next to the definitive implants and were immediately loaded to support and retain a transitional prosthesis until the definitive implants are osseointegrated [3].

In using the Sendax mini-dental implants for purpose of provisionalization, it was observed that, at times, implants appeared to integrate clinically and were difficult to remove. Sendax hypothesized that if mini-implant are inserted into mature bone and when the implant fed itself into the bone without a prepared implant receptor site "auto-advance insertion" they can be used for permanent applications and can be immediately loaded [4].

Overdenture retained by mini implants is a relatively new treatment option for edentulous patients who are dissatisfied with conventional complete dentures. It became apparent that mini implants could provide satisfactory prosthodontic rehabilitation with a minimally invasive implant insertion protocol, in particular for patients with severely narrow resorbed alveolar ridges and lacking keratinized mucosa [5].

The Mini Dental Implant System consists of a miniature titanium implant that acts like the root of the tooth and a retaining fixture that is incorporated into the base of the denture. The head of the implant is shaped like a ball, and the retaining fixture acts like a socket that contains a rubber O-ring. The O-ring snaps over the ball when the denture is seated and holds the denture at a predetermined level of force. When seated, the denture gently rests on the gum tissue. The implant fixtures allow for micro-mobility while withstanding natural lifting forces.

Christensen, 2006 stated that; with the proper training, consideration for prosthetic subtype, implant location, size, and patient variables, mini dental implants can provide exceptional outcomes [6].

Mini dental implants are predictable devices with several advantages when used to retain the complete overdenture [7,8], Their advantages included but not limited to; Their configuration of the implant permits a more conservative placement protocol, no tissue flaps or tapping procedures are required, which results in less trauma to both gingival tissue and bone. Their smaller size permits placement in ridges that might not otherwise be suitable for full- sized implants. The implants are firmly seated in place in intimate contact with bone. Once they have been fixed in place, they can be immediately loaded. There is no need for a long waiting period or second stage surgery. The simplified protocols, conservative procedures and elimination of surgery make this implant ideal for medically, anatomically, financially compromised patients. When using the mini dental implants less cost and more patient satisfaction is anticipated.

On the other hand, the mini dental implants cannot be used if they will be subjected to high occlusal stresses. Also, their unchangeable abutment type, not as versatile for later upgrade.

The conventional clinical Protocol for mini implant retained mandibular overdenture using the one stage surgical approach can be summarized as follows;

- Fabrication of the acrylic complete denture using the conventional standardized technique.
- The patient's mandibular denture is duplicated and processed in a clear heat cured acrylic resin in order to construct a radiographic template with radio opaque markers at the desired implant locations to evaluate the implant sites.
- After the radiographic evaluation, the radiographic template is converted to surgical template by drilling through the template to produce parallel canals at the desired implant locations for guiding the surgical drill to its desired location in the mandible at the optimum angulations.
- The surgical template is used to assist in positioning the implant fixture in the proper location in the correct alignment.
- Four mini dental implants are usually placed and loaded to retain the mandibular overdenture.
- The entry point for each implant is marked on the patient's tissue via bleeding points. Then, the pilot drill is delicately placed over the entry point and lightly pumped up and down until the cortical plate is penetrated.
- The finger driver which has a friction grip to be used as a carrier for the implant to the pilot opening and is rotated clockwise while exerting downward pressure. This process initiates the self tapping process and is used until noticeable bony resistance is encountered.
- The winged thumb wrench which is designed to deliver a greater amount of torque is used to thread the implant into place until the wrench become difficult to turn.
- The ratchet wrench and adapter are used to finalize the insertion process by small incremental carefully controlled ratchet turns for final seating. The ideal length allowed the abutment head to protrude from the gingival soft tissues at its full length, but with no neck or thread portions visible.
- Finally, stabilization and the connection of the O-ring attachments to the existing mandibular complete denture is done as a direct intra oral clinical chair side procedure using a cold-curing, MMA free, hard relining material for the pick-up procedure after

creation of suitable spaces in the fitting surface of the denture to accommodate the attachment assemblies while the patient gently guided into centric occlusion and asked to keep light occlusal contact until polymerization of the hardliner.

- The patients should be instructed for routine postoperative care, denture use and implant - overdenture hygiene and scheduled for follow up.

Although mini dental implants are described as simple, predictable, minimally invasive, and relatively inexpensive [9] to date, there is relatively limited scientific evidence regarding the clinical outcome of mini implant retained overdentures. Hence, well controlled, randomized clinical trials are needed to evaluate prosthetic aspects, as well as patients overall satisfaction with mini implants in comparison to conventional diameter implants used to retain overdentures.

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