

## Mini-Review

### Brief Reminder of Mini Dental Implants

Yosra Gassara\*, Mohamed Chebil, Mohamed Ben Khalifa and Dalenda Hadyaoui

**Corresponding Author:** Yosra Gassara, Department of Fixed Prosthodontics, Faculty of Dental Medicine, Research Laboratory of Occlusodontics and Ceramic Prostheses LR16ES15, University of Monastir, Monastir, Tunisia

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#### INTRODUCTION

Implant-supported prostheses are considered as a treatment of choice for replacing missing teeth. They provide a more conservative treatment option compared to conventional prostheses. They also offer aesthetic appearance similar to natural dentition and improve function and self-esteem [1].

However, conventional implants appeared problematic in cases where edentulous ridges presented minimal bone in a mesial-distal or a facial-lingual direction, which could lead to excluding such patients from treatment. The use of mini dental implants (MDIs) has given the opportunity for those patients to gain implant therapy, without the need to bone grafting or enlarging the mesial-distal space [2].

MDIs were introduced on the market in the 1990s [3,4]. They were initially indicated for the temporary stabilization of prosthesis during the healing period of standard sized implants. However, research has shown a good osseointegration obtained with MDIs that was similar to that obtained with conventional implants [5,6].

Recently, MDIs have become more popular and have been used in several fields: orthodontics, periodontics, fixed prosthodontics and removal prosthodontics [4,7].

However, the placement of mini dental implants should be avoided in cases where the risk of osseointegration failure is important.

#### CHARACTERISTICS OF MINI-IMPLANTS

The diameters of mini dental implants vary from 1.8 to 3.3 mm and their lengths vary from 10 to 15 mm. MDIs are one piece without separate abutments (so no micro-gap issue) and have much less physical displacement, which may be responsible for their long-term survival rate.

Majority of mini-implants are composed of a titanium (Ti), Aluminum (Al) and Vanadium (V), which makes them more resistant to tensile forces than pure titanium [8,9]. However, Mini dental implants are less resistant to fracture than standard sized implants, thus specific control of transmitted occlusal loads is very important [10].

For this, occlusal conditions must be restored through the restoration of posterior wedging as well as the distribution of occlusal stresses [11]. The reduction of occlusal surfaces has been the rule. In dynamic occlusion, lateral forces should be removed at the level of mini implants, which will reduce the risk of fracture.

To perform fixed prostheses, the laboratory should use a polyurethane die material that is strong and durable for a working cast.

An additional layer of die separator may be required to ensure a passive insertion of the prosthesis [12].

#### ADVANTAGES OF MINI-IMPLANTS

The placement of mini dental implants into narrow ridges is performed by a flapless surgical procedure; which reduces bleeding, decreases post-operative discomfort and accelerates the gingival healing that is seen in 2 to 5 days. Additionally MDIs may be immediately loaded in the appropriate osseous situations and their small size can accelerate bone healing and angiogenesis for faster osseointegration. Histological evaluation showed that the bone around the MDIs appeared to be healing, in close adaptation to the MDI implant surfaces and vascular elements were apparent in the bone in the four to five month post-insertion period. The healing period is shorter than that for standard-sized implants [13].

The radiological evaluation showed the absence of interfacial radiolucency in all the MDIs. Thus, plaque formation and gingival inflammation was found to be less.

Besides, MDIs are following the trend towards minimally invasive dentistry. Small diameter or mini implants may provide solutions in patients where there is severe osseous atrophy or site-length attenuation, without need to bone grafting [12,14].

#### INDICATIONS FOR MINI-IMPLANTS

Mini implants have been extensively indicated in orthodontics as temporary anchorage; they have been used to accelerate more complex tooth movements than would otherwise be possible in a given amount of time [2].

Nowadays, Mini-implants are indicated for short- and long-term prosthodontic treatment; According to Hoos [15], narrower-diameter mini-implants (up to 2.4 mm) are indicated for stabilization of complete and partial removable denture and for fixation of fixed prostheses (bridges). Wider-diameter mini-implants (2.9 mm) are indicated for supporting single crowns in cases where softer bone is present.

A retrospective study of mini-implants for single crowns was conducted by Vigolo and Givani [6]. 44 patients received 52 mini-implants between 1992 and 1994 for subsequent restoration with single crowns. The results of this study were similar to those achieved with standard-diameter implants, either functionally or aesthetically [15].

Additionally, mini-implants have been used to stabilize fixed prostheses (bridge) with a low potential of retention. In these cases, a mini-implant has been placed under the pontic area to support the pontic, which improve the retention qualities.

Besides, in the case of complete and partial removable dentures, the use of mini dental implants can solve the problem of insufficient retention and provide stable and functional over dentures using several designs of attachments [13].

#### CONTRAINDICATIONS TO THE PLACEMENT OF MINI IMPLANTS

Mini implants like standard-diameter implants are contraindicated in patients presenting some systemic diseases as cardiac pathologies, severe osteoporosis and diabetic endocrine pathologies [11].

Uncontrolled diabetes may cause an alteration in the level of bone matrix necessary for the production of mature osteocytes that boost the osseointegration of mini-dental implants [16].

Besides, according to Gómez-de Diego et al. [16], the placement of dental mini implants is contraindicated in patients who suffer from osteoporosis with consumption of oral bisphosphonates.

Additionally, several authors have shown that excessive long-term cigarette smoking present a contraindication of placing mini-implants. In fact, the consumption of tobacco seems to be a factor associated with the increase in the loss of mini dental implants [17-19]. Susarla et al. [20] established a failure rate 2.6 times higher in patients who smokes.

#### CONCLUSION

MDIs may be used successfully in various clinical cases. They offer many benefits such as decreasing post-operative discomfort, accelerating the gingival healing and the osseointegration. MDIs show high survival rates, but specific control of transmitted occlusal loads should be done and good oral hygiene should be maintained.

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