

## Comparison Between Two Treatment Options for screw-retained Mandibular Dentures Regarding Implant Stability

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### ABSTRACT

This study aimed to compare between using four implants in the inter foraminal region and using four implants (two in the anterior region and two short implants in the posterior region) to retain mandibular dentures regarding implant stability.

Fourteen completely edentulous patients were selected and divided into two groups (seven patients for each group). Group A, Each patient was rehabilitated with four implants in the inter-foraminal region retaining mandibular denture. Group B, Each patient was rehabilitated with four implants (two conventional were inserted in the inter foraminal region and two short implants were inserted on each side at the first molar regions) retaining mandibular denture. Immediate loading was done. Implant stability was evaluated using osstell at time of insertion, after two months, and after four months. Independent sample t-test was used to compare between two groups in non-related samples. Repeated measure was used to compare between follow-up periods within groups.

Group A showed higher implant stability compared to group B. However, the t-test showed no statistically significant difference. Also, there was an increase in implant stability throughout the study period.

Implant stability has no relation with their distribution or length. So, using of short implants in the resorbed posterior mandible is a reliable treatment option.

*Keywords: Screw-retained dentures, Implant stability, Mandibular denture.*

## **1- Introduction:**

Conventional dentures are not an ideal treatment for mandibular edentulism.<sup>(1,2,3)</sup> When considering contemporary treatment of the edentulous patient, endosseous dental implants can offer an alternative treatment to complete denture therapy.<sup>(4)</sup>

Among the advantages of mandibular implants are the improvements in mandibular function, the prevention or reversal of alveolar bone loss, and the measurable improvement in self-reported satisfaction with treatment.<sup>(5,6)</sup>

Screw-retained dentures on implants is a type of implant supported prosthesis. This type of prosthesis is dependent totally on the implants for support and the forces of occlusion are borne by the implants. Some patients will prefer fixed prosthesis for psychological reasons. Most patients, however, are unaware of the most common problems associated with the use of fixed prosthesis in the mandible. Before this type of prosthesis is fabricated, the patient must be informed of its cost, the challenge associated with oral hygiene, the esthetic limitations.<sup>(7)</sup>

The oral rehabilitation of atrophic edentulous jaw with dental implants is limited by anatomic conditions. Insufficient alveolar bone height is a common clinical situation encountered more in the posterior jaws. Advanced surgical procedures such as bone grafting, sinus lifting, and nerve repositioning are required to overcome this condition and make implant treatment possible for such patients.<sup>(8)</sup>

Short implants are considered as a viable alternative in patients with reduced alveolar bone height to avoid more invasive surgical procedures. They simplify the implant treatment, reduce patient morbidity, shorten the duration of treatment, and make it less expensive.<sup>(9-13)</sup>

Many dentists prefer to position implants in the interforaminal region of edentulous patients to avoid advanced surgical procedures. Nowadays, by the innovation of short implants which are considered as a viable alternative in patients with reduced alveolar bone height and with the improvements in the surface topography of implants, which increase the bone implant

contact, and use of adapted surgical protocols similar survival rates as that of regular implants have been reported even with short implants. The question is whether to use four conventional implants in the interforaminal region is better regarding implant stability or to use two conventional interforaminal implants with two short implants.<sup>(14)</sup>

## **2- Materials and methods:**

Fourteen completely edentulous male patients were selected to share in this study. Patients with bone height not less than 15 mm at the interforaminal region and not less than 9 mm at the posterior region above the mandibular canal and bone width not less than 7 mm were selected.

CBCT was taken twice before the surgery, one for the patient wearing the denture and the other for the denture alone. Using the computer data files, virtual implant planning was done and stereolithographic surgical guide was constructed of a light-sensitive resin and implants were inserted with completely limiting design. In **group A** four equidistant implants (3.5x12) were inserted in the interforaminal region. In **group B** four implants were inserted, two of them in the canine regions bilaterally (3.5x12) and two short implants in the lower first molar region posteriorly bilaterally (4x7). After complete installation of implants, smart peg was screwed over each implant and primary stability was measured by Osstell.

The screw-retained non-engaging abutments were positioned and tightened at torque 30 Ncm. Slots were created in the prosthesis and the prosthesis has been placed on the abutments and checked that it was properly seated. Attachment of the prosthesis with the temporary abutments by pick up material (self-cured acrylic resin) and the patient has been instructed to close at centric occlusion during setting of acrylic resin. Occlusion with upper denture has been checked. Then abutments were unscrewed and prosthesis was withdrawn with abutments attached to it. The flanges of the prosthesis were removed to create enough space beneath the prosthesis for cleaning and hygienic measures by the patient. Finishing and polishing of the prosthesis were done (Figures 1, 2). Passive fit of the converted prosthesis was checked using a screw resistance test. Each screw was tightened, starting with the closest implant to the midline until initial resistance was encountered. A maximum of one-half turn (180 degrees) was then allowed to completely seat the screw and achieve a torque of 10 to 15 Ncm. A misfit was considered when more than a half-turn was needed to achieve the desired screw seating and torque measurement. The occlusion was checked

again and high spots were removed. Patients were recalled after two months and after four months for evaluation of implant stability using Ostell.



**Figure 1.** The occlusal surface of screw-retained denture for the group (A)



**Figure 2.** The occlusal surface of screw-retained denture for the group (B)

**3- Results:**

Patients expressed satisfaction with their prosthesis. Clinically, no pain was elicited with palpation or percussion, and no exudates were observed in relation to the implants.

Variables	Implant stability				p-value
	Group A		Group B		
	Mean	SD	Mean	SD	
Baseline	69.25	3.20	68.25	1.49	<b>0.436ns</b>
After 2 months	70.75	2.49	69.13	3.87	<b>0.335ns</b>
After 4 months	72.00	3.25	70.00	2.93	<b>0.217ns</b>

p-value	0.256ns	0.419ns	
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**Table (I): Relation between different time periods within each group**

**Studying the effect on implant stability in the two studied groups showed:**

**a) Baseline:**

**Table (I)** shows that the highest mean value of bone height was found in group (A) ( $69.25 \pm 3.20$ ), and the lowest mean value of bone height was found in group (B) ( $68.25 \pm 1.49$ ). However, by using an independent sample t-test this difference was statistically insignificant.

**b) After 2 months:**

**Table (I)** shows that the highest mean value of bone height was found in group (A) ( $70.75 \pm 2.49$ ), and the lowest mean value of bone height was found in group (B) ( $69.13 \pm 3.87$ ). However, by using an independent sample t-test this difference was statistically insignificant.

**C) After 4 months:**

**Table (I)** shows that the highest mean value of bone height was found in group (A) ( $72.00 \pm 3.25$ ), and the lowest mean value of bone height was found in group (B) ( $70.00 \pm 2.93$ ). However, by using an independent sample t-test this difference was statistically insignificant.

**Table (I)** shows that there was an increase in implant stability throughout the study period. Where stability after four months showed the highest stability. However, by using ANOVA for repeated measures to compare between the three lines intervals the result was statistically insignificant.

**4- Discussion:**

**Discussion of methodology:**

All implants for both groups were planned digitally to ensure Identification of the bone in relationship to the tooth position in the prosthesis via three-dimensional CT before surgery and installed using a completely limiting stereolithographic surgical guide to ensure precise placement of implants especially Implants placed posterior to the mental foramen to be done

with more confidence. Also, this helps to decrease the postoperative recovery period from the minimally invasive procedure as the use of a flapless surgery decreases the amount of swelling and inflammation, thereby resulting in less discomfort and pain.<sup>(15)</sup>

Ostell was used to evaluate the implant stability as it allows objective assessment and quantification of fixation stability of the implant and, thus osseointegration.<sup>(16)</sup>

### **Discussion of Result:**

Analysis of different studies showed higher survival rates for short implants with improvement of surface treatment of implants from machined to rough which led to better clinical outcomes using short implants and avoiding the complications, time, and cost of bone augmentation procedures.<sup>(17)</sup>

Thus, it can be concluded that, in the presence of vertically resorbed bone in the mandibular molar region, instead of placing a long-inclined implant, a shorter implant with the same diameter would decrease the amount of force transmitted to the supporting tissues. It is believed that with an optimized implant design and insertion protocol, short implants may play a more important role in the rehabilitation of the severely resorbed mandible.<sup>(18)</sup>

Although there was an insignificant difference between group (A) and group (B), group (A) shows higher primary stability as primary stability depends on bone quality. Thus, in group (A) all implants were placed in D1 bone while in group (B) some implants were placed in D1 and others in D2<sup>(19)</sup>. However, placement of short implants in D2 bone has given the benefit of decreasing the length of the cantilever of the prosthesis.<sup>(20)</sup>

### **Conclusion:**

It could be concluded that:

- 1- Implants stability has no relation with their distribution or length.
- 2- Using short implants in the resorbed posterior mandible is a reliable treatment option.
- 3- Using short implants in the posterior regions for retaining screw-retained prosthesis gives the benefit of decreasing the length of the cantilever of the prosthesis.

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