ORIGINAL RESEARCH

Evaluation of Implants Using Flapless Technique To Retain Mandibular Overdentures In Controlled Type 2 Diabetic Patients

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Abstract

Aim and Objectives- To evaluate clinically the success of placing two implants in the mandibular interforaminal region using flapless implant surgery (punch technique) to retain mandibular overdentures in controlled type 2 diabetic patients.

Materials and Method- Dental implants and diabetes may not be such a poor combination if done in individuals who have their diabetes well under control. Four controlled type 2 diabetic patients were selected every patient received 2 implants with flapless (punch) technique. The eight implants evaluated clinically and radiographically after six months of loading under mandibular overdenture.

Results- Implant survival rate of 100% was attested. All eight implants had Absence of mobility, absence of painful symptoms, absence of peri-implant radiolucency and the marginal bone loss was 1.6 mm which within the conventional limit for six months of loading which were the criteria for successful implant.

Conclusion- Flapless implant with controlled type 2 diabetic patients is successful and has many advantages of being, less chair time, and a more comfortable postsurgical period, without compromising the treatment outcome and with a low level of complications and with great patient acceptance.

Keywords: Implant with Diabetic Patients, Flapless Technique, Overdenture, Implant Supported Overdenture.

Introduction

Dental implants and diabetes may not be such a poor combination if done in individuals who have their diabetes well under control. Several clinical reports have suggested that dental implant success rates (92-100 percent) in patients with “well controlled” type 2 diabetes mellitus.¹⁻⁵

In addition, a large multicenter study of dental implant success reported an implant failure rate of only 6⁻7 percent for 255 implants placed in “selected” patients with type 2 diabetes mellitus. In this study, the number of implant failures for patients with diabetes was not significantly different from that found for patients without; diabetes (6.8 percent).⁸ It seems clear from the studies that if dental implants and diabetes are to be successfully merged, the individuals getting the implants will have to get their diabetes under control prior to the first implant surgery, and maintain that control throughout the entire implant process.¹⁻⁸ Doing so will give them the best chance of having their titanium implant become fully integrated with their jawbones, forming a solid foundation for their prosthesis.

The primary complication of diabetes mellitus in the integration of dental
Implants include traumatic surgery in which the flap reflection and the frictional heat generated during placement of implants causes necrosis to the surrounding tissues and consequently lack of healing and integration. Also, the second complication is that, the implant recipient site of low healing potential.

Minimally invasive implant surgery (with normal individual) may have several advantages over conventional surgery, including less postoperative bleeding, less discomfort, minimized crestal bone loss, and shorter surgery and recovery time.

The results of a retrospective study using flapless surgery reported an implant survival rate of 74.1% the first year the procedure was used which increased to 100% at the tenth year. Others used a punch technique when placing implants in predetermined positions. Using retrospective analysis, at 3 years, the survival rate was 91%, with an average of 1.0 mm marginal bone resorption during the first year and 0.4 mm after the second year and 0.1 mm for the third year.

The aim of the present study was to evaluate clinically the success of placing two implants in the mandibular interforaminal region using flapless implant surgery (punch technique) to retain mandibular overdentures in controlled type 2 diabetic patients.

Materials and Methods

Patient Selection Criteria: Four patients were males with comparable age, were controlled type 2 diabetic patients who were diagnosed medically as cases of non-insulin dependent treated by oral anti-diabetic preparations, free from any other metabolic, systemic and endocrine diseases. The anterior mandibular alveolar ridge height and width were not less than 15 mm and 6 mm, respectively and have adequate amount of keratinized tissue (1.5mm).

Presurgical measures: Was focused on maintaining blood-glucose at normal or near normal levels. This was best measured by keeping the glycosylated hemoglobin (HbAc1); less than 7% for measured over the previous 6-8 weeks was considered a good level of glycemic control. Patient was instructed to use antibiotic. The antibiotic of choice was amoxicillin (2 gr per os 1 hour previously). In addition to antibiotic prophylaxis, the use of 0.12% chlorhexidine mouthwash (hexitol) was instructed to use one day before the surgery and will be continued for the next three month. Surgical template was prepared to select the implant sites.

First stage: The implant placement (microdent system) was performed under local anesthesia with a flapless approach. Punching was performed. The drilling sequence followed the recommendation of the manufacturer.

The premounted fixtures were then placed in the prepared sites (Figure 1), first by finger then by the wrench in a clock-wise direction.

When the fixture has assumed its final position, the mount was loosened and removed with the screw driver.

(Figure 1: implant installed to its final position and the second implant site was punched)

Fixture installation was then completed by applying the implant healing collar with the screwdriver (Figure 2 & 3).

Immediately after surgery, the old mandibular denture of the patient was
relieved and refitted using tissue conditioning material which was replaced every two weeks till the end of the healing period. Patient was instructed to take the antibiotic for the next 10 days and to keep his oral hygiene and to use hexitol mouth wash for the next three months (Figure 4).

Second stage: A new denture was constructed for the patient. The implant ball abutments were connected to their implant fixtures the positions of the abutments were transferred to the fitting surface of the lower denture by tipping the heads with a marker, to reveal the location of the heads.

An acrylic bur was used to grind a 5 mm opening around the locations on the denture where the abutment heads was resided (Figure 5) and the denture was tested intra- orally to confirm seating of the denture while in maximum intercuspation. The two Teflon housing were connected to the implant ball abutments (Figure 6), and the lower denture was tested again intra-orally to verify that clearance is totally passive with maximum intercuspation.

The lower denture was removed, washed then dried. The space provided in the acrylic base over the Teflon housing was wetted with auto polymerized acrylic resin monomer.

A mix of auto-polymerized acrylic resin was made, and approximately 2/3 of the space was filled with the mix using a plastic filling instrument.

The denture was then seated and stabilized in the mouth; the patient was
gently guided into centric occlusion and was asked to hold this position with light occlusal contact until the acrylic resin polymerized.

The denture was removed and cleaned (Figure 7), and then any acrylic voids that may exist were filled in. Denture borders were finished; flash material was removed, and then was polished. Finally, the denture was inserted into the patient’s mouth and final occlusal adjustment was performed.

(Figure 7: Taflon housings were imbedded in the tissue surface of the denture)

Clinical assessment: Clinical assessment was performed immediate, three and six months after final prosthesis insertion. It included the assessment of the alveolar mucosa around the implants and mobility. Gingival health, dental plaque accumulation, and attachment loss were assessed in terms of modified gingival index and plaque index according to Silness and Löe, and clinical attachment level as recommended by Manz radiographic evaluation was done to evaluate marginal bone loss.

Results

I- Clinical evaluation

Plaque index (PI): The mean plaque index scores from immediately after denture insertion to the third month was (1.85±0.51) and this increase was found to be statistically insignificant. There was a subsequent insignificant decrease in the mean, shown in Table I & Table II.

Gingival index (GI): There is decrease in the mean of gingival index from immediate, third month and six month which was statistically insignificant. (Table III & Table IV)

Clinical attachment level (CAL): There was a mean increase in clinical attachment levels from immediately after denture insertion to the third month which was statistically significant. Also the mean increase in clinical attachment levels from third to six month which was statistically significant. (Table V & Table VI)

Mobility: None of the 8 succeeded implants showed any signs of mobility throughout the evaluation period, i.e. mobility scores were 0.

Marginal bone level changes: The mean difference between immediately after denture insertion and the sixth month was 1.6 mm, this is within the conventional limits generally accepted for implants throughout the six months study period. (Table VII)

Discussion

Type 2 diabetes mellitus is a multifactorial disease resulting from environmental effects on genetically predisposed individuals and is related with obesity, age and a sedentary way of life. The treatment of type 2 includes measures relating to diet and lifestyle, oral hypoglycemic drugs either alone or in combination with insulin. Diabetes is currently classified as a relative contraindication for implant treatment.

Reviewing the literature published in the last10 years, the survival rate for implants in controlled diabetic patients ranges between 88.8% and 97.3% one year after placement, and 85.6% to 94.6% in functional terms one year after the prosthesis was inserted. In a retrospective study with 215 implants placed in40 diabetic patients, 31 failed implants were recorded, 24 of
which (11.2%) occurred in the first year of functional loading. This analysis shows a survival rate of 85.6% after 6.5 years of functional use\(^{(18)}\). The therapeutic goal focused on maintaining blood-glucose at normal or near normal levels. This was best measured by assaying the glycosylated hemoglobin (HbAc1); a figure of less than 7% for HbAc1 measured over the previous 6-8 weeks was considered a good level of glycemic control. The normal value for healthy individuals is 3.5% - 5.5%, depending on the laboratory.\(^{(19)}\)

Although there is some controversy over the use of antibiotics in healthy patients, these are recommendable in diabetic patients about to be subjected to implant surgery.\(^{(2)}\) The antibiotic of choice was amoxicillin (2 gr per os 1 hour previously), as the pathogens most frequently causing post-operative complications following the placement of implants are Streptococci, Gram-positive anaerobes and Gram-negative anaerobes.\(^{(20)}\)

In addition to antibiotic prophylaxis, the use of 0.12% chlorhexidine mouthwash has shown a clear benefit by reducing the failure rates from 13.5% to 4.4% in type 2 diabetics, during a follow-up period of 36 months. This same study observed a reduction of 10.5% in the failure rate when antibiotics were administered pre-operatively.\(^{(6)}\) Flapless implant technique allows the procedure to be simplified for both the patient and the clinical team, through a minimally invasive flapless procedure, less chair time, and a more comfortable postsurgical period, without compromising the treatment outcome and with a low level of complications. Following flapless implant surgery, the peri-implant mucosa heals with little scar formation, and there is an increase in blood vessels and a decrease in peri-implant bone loss resulting in the soft tissue health around the implant.\(^{(21)}\) Surgical operation and anesthesia cause a neuroendocrine stress response characterized by increased release of the counter-regulatory hormones such as cortisol, glucagon, epinephrine, and the growth hormone. These hormones, by stimulating the processes of gluconeogenesis and glycogenolysis, rapidly shift carbohydrate, protein, and fat metabolism to provide increased levels of glucose. At the same time, resistance to the effects of insulin increase. Hyperglycemia also inhibits host defenses against infection by suppressing many leukocyte functions and delays wound healing due to its detrimental effects on collagen formation.\(^{(22)}\) The fact that most failures occur after the second-phase surgery and during the first year of functional loading might indicate microvascular involvement is one of the factors implicated in implant failures in diabetic patients.\(^{(4)}\)

The implant of choice for this study was implant microdent system with Teflon housing attachment that was incorporated into the fitting surface of the lower denture. The resilient Teflon housing attachment was used in this study instead of the O-ring attachment as it appears to transfer stress in a more favorable manner, being a shock-absorber, pressure and torque reducer, doesn’t wear by time and so doesn’t need to be changed. Also offer more patient satisfaction, less expensive and more hygienic, thus enhance success and longevity.\(^{(23)}\) In this study all 8 implants has all Albrektsson’s\(^{(24)}\) criteria for success of an implant which include: Absence of mobility, Absence of painful symptoms, Absence of peri-implant radiolucency and Absence of progressive marginal bone loss. The mean difference of marginal bone loss of present study between immediately after denture insertion and the sixth month was 1.6 mm, which is within the conventional limits generally accepted for implants throughout the six months study period.
The 100% success rate of the present study illustrated that flapless implant technique present the opportunity to provide a minimally invasive, less complicated, and less surgically intensive treatment in a high percentage of cases with high success rate with type 2 controlled diabetes.

These results were in agreement with several studies described the use of dental implants in diabetic patients and concluded that dental implants could be used safely as a successful treatment for type 2 diabetic patients whose disease was under control, such as Balshi et al., Shernoff et al., Kapur et al., Olsen et al., Morris et al., and Peled et al.

Table (I): Plaque index scores taken immediately after denture insertion

<table>
<thead>
<tr>
<th></th>
<th>Immediate</th>
<th>3rd month</th>
<th>6th month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>1.0</td>
<td>1.1</td>
<td>1.4</td>
</tr>
<tr>
<td>Max</td>
<td>2.5</td>
<td>2.7</td>
<td>1.7</td>
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<tr>
<td>Mean</td>
<td>1.80</td>
<td>1.85</td>
<td>1.60</td>
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<tr>
<td>S.D.</td>
<td>0.54</td>
<td>0.51</td>
<td>0.09</td>
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Table (II): Paired Sample t-test for Plaque Index Scores

<table>
<thead>
<tr>
<th>Test Condition</th>
<th>Groups</th>
<th>Paired Differences Mean (SD)</th>
<th>t-test</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque Index Scores</td>
<td>Immediate Vs. 3rd month</td>
<td>-0.053 (0.676)</td>
<td>0.83</td>
<td>2</td>
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<tr>
<td></td>
<td>Immediate Vs. 6th month</td>
<td>0.201 (0.522)</td>
<td>1.090</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>3rd month Vs. 6th month</td>
<td>0.254 (0.470)</td>
<td>1.529</td>
<td>0.17</td>
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</tbody>
</table>

Table (III): Gingival index scores taken immediately after denture insertion

<table>
<thead>
<tr>
<th></th>
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<th>6th month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Max</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Mean</td>
<td>0.75</td>
<td>0.63</td>
<td>0.50</td>
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<tr>
<td>S.D.</td>
<td>0.46</td>
<td>0.52</td>
<td>0.53</td>
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Table (IV): Paired Sample t-test for Gingival Index Scores

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<tr>
<th>Test Condition</th>
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<th>Paired Differences Mean (SD)</th>
<th>t-test</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>Gingival Index Scores</td>
<td>Immediate Vs. 3rd month</td>
<td>0.125 (0.641)</td>
<td>0.552</td>
<td>0.598</td>
</tr>
<tr>
<td></td>
<td>Immediate Vs. 6th month</td>
<td>0.250 (0.463)</td>
<td>1.528</td>
<td>0.170</td>
</tr>
<tr>
<td></td>
<td>3rd month Vs. 6th month</td>
<td>0.125 (0.354)</td>
<td>1.000</td>
<td>0.351</td>
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</table>

Table (V): Clinical attachment level measurements (mm) taken immediately after denture insertion.

<table>
<thead>
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<th>Immediate</th>
<th>3rd months</th>
<th>6th month</th>
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<tbody>
<tr>
<td>Min</td>
<td>3.54</td>
<td>3.75</td>
<td>3.81</td>
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<tr>
<td>Max</td>
<td>4.55</td>
<td>4.63</td>
<td>4.98</td>
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<tr>
<td>Mean</td>
<td>4.05</td>
<td>4.20</td>
<td>4.41</td>
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<tr>
<td>S.D.</td>
<td>0.40</td>
<td>0.34</td>
<td>0.39</td>
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Table (VI): Paired Sample t-test for Clinical Attachment Level Measurements

<table>
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<th>Test Condition</th>
<th>Groups</th>
<th>Paired Differences Mean (SD)</th>
<th>t-test</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Attachment Level Measurements</td>
<td>Immediate Vs. 3rd month</td>
<td>-0.146 (0.130)</td>
<td>-3.186*</td>
<td>0.015</td>
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<tr>
<td></td>
<td>Immediate Vs. 6th month</td>
<td>-0.363 (0.267)</td>
<td>-3.839*</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>3rd month Vs. 6th month</td>
<td>-0.216 (0.222)</td>
<td>-2.756*</td>
<td>0.028</td>
</tr>
</tbody>
</table>

*: Clinically significant (p ≤ 0.05)
Table (VII) Marginal bone level changes

<table>
<thead>
<tr>
<th></th>
<th>Immediate</th>
<th>3rd months</th>
<th>6th month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>3.10</td>
<td>3.91</td>
<td>4.67</td>
</tr>
<tr>
<td>Max</td>
<td>3.80</td>
<td>4.66</td>
<td>5.66</td>
</tr>
<tr>
<td>Mean</td>
<td>3.511</td>
<td>4.196</td>
<td>5.112</td>
</tr>
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</table>

Conclusions

Flapless implant with controlled type 2 diabetic patients allows the procedure to be simplified for both the patient and the clinical team, through a minimally invasive flapless procedure, less chair time, and a more comfortable postsurgical period, without compromising the treatment outcome and with a low level of complications and great patient acceptance.

References


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