Role of HBA1C levels and Anti Diabetic Medication on Crown/root ratio of Maxillary/Mandibular Abutment Teeth and on Residual Mandibular bone Height among young Saudi University Diabetic and non Diabetic Students in King Khalid University, Kingdom of Saudi Arabia

Leoney Antony
Department of Prosthetic Dentistry, College of Dentistry, King Khalid University, Kingdom of Saudi Arabia
Department of Prosthodontics, Rajah muthiah dental college and Hospital, Annamalai University, Chidambaram, Tamil Nadu, India
antony.leoney@gmail.com

Available online at: www.isca.in, www.isca.me
Received 28th April 2016, revised 2nd June 2016, accepted 30th June 2016

Abstract

The advancement in science and technology is indispensable to mankind but the very boon to mankind has become a bane due to the fact that man has become addicted to modern gadgets and his life has changed. This drastic change in life style has led to many life style diseases namely diabetes, hypertension, cardiovascular diseases to name a few. One of the most common types of life style related diseases is diabetes mellitus. The incidence of diabetes mellitus especially Type 2 diabetes mellitus i.e. Non insulin dependent diabetes mellitus (NIDDM) is of epidemic proportions. Insulin dependent diabetes mellitus (IDDM) is also on the rise. Diabetes mellitus has a potential resorptive effect on dental alveolar bone because of the fact that periodontitis is a common manifestation in this disease. Loss of tooth is a sequelae of periodontitis. Hence diabetic patients require frequent requirement for prosthodontics treatment for replacement of missing teeth. Various antidiabetic drugs have also come into routine use by both IDDM and NIDDM patients. This present study will bring to light the influence of glycosylated haemoglobin (HbA1c) levels and antidiabetic usage on crown root ratios of abutment for fixed prosthodontic treatment. The study also will throw a light on residual mandibular alveolar bone height which could be used for implant placement.

Keywords: Crown root ratio, Abutment teeth, Mandibular bone height, Diabetes mellitus, Antidiabetic drugs.

Introduction

The advancement in science and technology is indispensable to mankind but the very boon to mankind has become a bane due to the fact that man has become addicted to modern gadgets and his life has changed. This drastic change in life style has led to many life style diseases namely diabetes, hypertension, cardiovascular diseases to name a few. These diseases are called life style related diseases. These diseases have a potential restorative effect on dental alveolar bone because of the fact that periodontitis is a common manifestation in all these diseases. Loss of teeth is common sequelae of periodontitis. One of the most common types of life style related diseases is diabetes mellitus. The incidence of diabetes mellitus (DM) especially Type 2 DM i.e. Non insulin dependent diabetes mellitus (NIDDM) is of epidemic proportions. Insulin dependent diabetes mellitus (IDDM) is also on the rise. NIDDM is mainly due to life style habits such as increased processed food intake and decreased physical activity. The boundaries between IDDM and NIDDM is becoming very thin as insulin usage has become more common in NIDDM. Various antidiabetic drugs have also come into routine use by both IDDM and NIDDM patients throughout the world and especially in Saudi Arabia. Saudi Arabia is a country where agricultural produce is negligible. Hence they have to depend agricultural imports mostly in the form processed foods. These readily available processed foods have high caloric value and poor in fibre. To add to this Saudis engage in physical activity to a very minor level as most of the work is done by expatriates. The availability of cheap petroleum products also have made them to rely on motor vehicles rather on simple walking to even to smaller distances. As a result prevalence of diabetes is at an alarming rate among Saudi population.

The onset of diabetes mellitus starts at a very early age even among university level students. HbA1c has been the gold standard to know the glycaemic control of the patients. The present study will bring to light the influence of glycosylated haemoglobin (HbA1c) and the various antidiabetic drugs usage on crown root ratios of abutment for fixed prosthodontic treatment among young university diabetic and non-diabetic students. The study also will throw a light on residual mandibular alveolar bone height which could be used for implant placement.

Objectives of the Study: Include the following: To know osteoprotective role of diabetic medications, to know the
crown/root ratios in healthy Saudi population, to compare
crown/root ratios of healthy Saudi population and diabetes
patients and to know the mean residual mandibular bone height
in normal patients and in diabetes patients so that we come to
know the average bone height for implant.

Sample Size: Patients with age group ranging from 15 to 40
were chosen for the study. During the study a total of 100
diabetic male/female patients were included as cases and 80
healthy male /female patients were included as controls.

Inclusion Criteria: Include the following: Healthy Saudi
male/female patients (free of systemic disease and periodontitis)
who need fixed prosthodontic treatment, Diabetic Saudi
male/female patients who need fixed prosthodontic treatment,
Patients with good oral hygiene and Patients who are willing to
consent for obtaining blood samples and radiographs.

Exclusion Criteria: Include the following: Patients with very
poor oral hygiene, Patients with smoking habit and Patients who
had undergone recent periodontal or surgical procedures
adjacent to the abutment teeth.

Materials and Methods

The study involves Questionnaire Survey and Radiographic
Measurements.

Questionnaire Survey: Detailed questionnaire regarding
medical history, physical activity, diet intake, medications and
duration of diabetes status were obtained through the
questionnaire (Annexure-1).

Radiographic Measurements: Panoramic radiographs were
made using digital orthopantogram machine. Panoramic
radiographs are analysed using the clinic view software and
values are recorded in the worksheet (Annexure-2) by 2
examiners to avoid examiner bias and average value of both the
examiners is taken into consideration.

Measurements: Made include: Crown root ratio and residual
alveolar mandibular bone height.

Crown Root Ratio (C/R): C/R=Mean of A/B and A’/B’.

Measurements of residual alveolar mandibular bone height
(RAMBH): Total height of RAMBH: Height measured from
crest of alveolar ridge to inferior border of mandible. i. Total
available RAMBH for implant placement: Height measured
from crest of alveolar bone to superior margin of inferior
alveolar canal.

Results and Discussion

Data obtained from questionnaire and clinical records reveals
that the most common antidiabetic drugs used in saudi arabia
are as follows: Insulin (Lispro, Actrapid, Isophane), Biguanides
(Metformin) and Sulphonylureas (Glimepride, Glipizide,
Glicizide).

Statistics: The statistics will include descriptive statistics and
logistic regression tests using SPSS Software.

Discussion: From the questionnaire it was found that 65 % of
diabetic subjects did not do any physical activity, 25% of
diabetics did moderate physical activity and only 10 % of
diabetics did good amount of physical activity. Questionnaire
also reveals that only 30 % of diabetic patients resort to foods
with high fibre content whereas rest of others rely on some
form of processed foods.

Radiographic measurements were subjected to statistical
analysis and the following inferences were arrived at. The mean
(SD) of crown ratios of maxillary, mandibular anterior/posterior
teeth are illustrated in Table-1. Spearman’s correlation
coefficient test was done to find the correlation between the
various variables and it was found that C/R ratio of maxillary
anterior and insulin usage has a positive correlation (r=0.455,
p<0.001) as seen in Figure-1. Positive correlation was also
found between C/R ratio of maxillary anteriors and high HbA1c
values (r=0.276, p<0.05) as seen in Figure-2. Correlation was
found between C/R ratio of mandibular anteriors and insulin
usage (r=0.219, p<0.05) as seen in Figure-3. Negative
correlation was found between C/R ratio of mandibular
posteriors and sulphonylureas usage (r= - 0.198, p<0.05) as seen
in Figure-5.

The mean Residual Mandibular Alveolar Bone Height
(RMABH) in diabetics across the age groups is illustrated in
Figure-6. The mean (SD) RMABH in Diabetics is 13.82(1.9)
whereas mean (SD) RMABH is 15.5(2.58) illustrated in Table-
2.

<table>
<thead>
<tr>
<th>Crown Root Ratios</th>
<th>Number of Patients</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/R Ratio of Maxillary Anteriors in Diabetics</td>
<td>100</td>
<td>.9294</td>
<td>.29171</td>
</tr>
<tr>
<td>C/R Ratio of Maxillary Posteriors in Diabetics</td>
<td>100</td>
<td>1.0558</td>
<td>.33245</td>
</tr>
<tr>
<td>C/R Ratio of Mandibular Anteriors in Diabetics</td>
<td>100</td>
<td>1.0040</td>
<td>.38412</td>
</tr>
<tr>
<td>C/R Ratio of Mandibular Posteriors in Diabetics</td>
<td>100</td>
<td>1.1510</td>
<td>.37751</td>
</tr>
<tr>
<td>C/R Ratio of Maxillary Anteriors in Non Diabetics</td>
<td>80</td>
<td>.5739</td>
<td>.17769</td>
</tr>
<tr>
<td>C/R Ratio of Maxillary Posteriors in Non-Diabetics</td>
<td>80</td>
<td>.6474</td>
<td>.18442</td>
</tr>
<tr>
<td>C/R Ratio of Mandibular Anteriors in Non-Diabetics</td>
<td>80</td>
<td>.6855</td>
<td>.19181</td>
</tr>
<tr>
<td>C/R Ratio Of Mandibular Posteriors In Non- Diabetics</td>
<td>80</td>
<td>.7391</td>
<td>.17190</td>
</tr>
</tbody>
</table>
Table-2
C/R Mandibular Bone Height in Diabetics and Non-Diabetics

<table>
<thead>
<tr>
<th>Mandibular bone height</th>
<th>Number of patients</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandibular Bone Height in Diabetics</td>
<td>100</td>
<td>13.8250</td>
<td>1.92324</td>
</tr>
<tr>
<td>Mandibular bone height in nondiabetics</td>
<td>80</td>
<td>15.5000</td>
<td>2.58035</td>
</tr>
</tbody>
</table>

Figure-1
C/R ratio of maxillary anterior (Vs) insulin usage in diabetics

Figure-2
C/R Ratio of Maxillary Anteriors in Diabetics (Vs) Hba1c values
Figure 3
C/R ratio of maxillary posteriors in diabetics (Vs) insulin group (lispro, actrapid, isophane)

Figure 4
C/R Ratio of Mandibular Anteriors in Diabetics (Vs) Insulin Group (Lispro, Actrapid, Isophane)
C/R ratio of mandibular posteriors in diabetics (Vs) sulphonylureas group (Glimepride, Glipizide, Glicizide)

Mean Residual Mandibular Alveolar Bone Height (RMABH) in diabetics across the age groups
Annexure-1
Questionnaire

<table>
<thead>
<tr>
<th>File number</th>
<th>Contact number</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Patient name</th>
<th>Age</th>
<th>Sex</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DIABETIC:</th>
<th>NON-DIABETIC:</th>
</tr>
</thead>
</table>

Drugs taken (if diabetic):

1) __________ Dose __________
2) __________ Dose __________
3) __________ Dose __________

Period of diabetic: __________________________

Fasting blood glucose level: __________________

Postprandial blood glucose level: __________________

Hba1c level(if available): __________________

Physical activity:

a) Score 0—nil physical activity

b) Score 1—moderate physical activity

c) Score 2—good physical activity.

Diet intake:

a) Score 0—predominatly junk foods

b) Score 1—junk foods and fibre rich diet

c) Score 2—high fibre rich diet

Annexure-2
Radiographic Worksheet

<table>
<thead>
<tr>
<th>Abutment tooth Number</th>
<th>Crown Height (mm)</th>
<th>Root Height (mm)</th>
<th>C/R Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examiners 1 and 2</td>
<td>Exam1 D</td>
<td>Exam2 D</td>
<td>Exam1 D</td>
</tr>
<tr>
<td>Mesial/Distal measurement on Radiographs</td>
<td>M D</td>
<td>M D</td>
<td>M D</td>
</tr>
<tr>
<td>Missing tooth number</td>
<td>Anterior/Posterior</td>
<td>Height of mandibular Bone in edentulous segment</td>
<td>Healing in extracted Socket</td>
</tr>
<tr>
<td></td>
<td>Exam1</td>
<td>Exam2</td>
<td>Exam1</td>
</tr>
</tbody>
</table>

International Science Community Association
Conclusion

From the present study it was found that only patients who use sulphonylureas have a mild osteoprotective effect as evident from the C/R ratios. Whereas patients who use insulin, biguanides, insulin together with biguanides show no significant reduction of C/R ratios. It was also found that when HbA1c values were more than 7 i.e. uncontrolled diabetes mellitus higher C/R ratios were evident especially in maxillary anterior teeth. Significant residual mandibular bone loss was present in diabetic patients between age groups 15 to 40. Further interventional studies are needed to confirm the osteoprotective effect of various antidiabetic drugs.

Acknowledgment

I wish to thank Professor Dr. Adel Mustafa Almonheim, Head of Department, Department of Prosthetic Dentistry, College of dentistry, King Khalid University, Kingdom of Saudi Arabia for giving me the encouragement and support in my research work. I also wish to thank Professor Dr. Suma Karthikeyan, Head of Department, Department of prosthodontics for extending all the help needed in my research work.

References