Periodontal Regenerative Therapy in Patient with Chronic Periodontitis and Type 2 Diabetes Mellitus: A Case Report

Fumi Seshima¹, Makiko Nishina², Takashi Namba³ and Atsushi Saito¹

¹Department of Periodontology, Tokyo Dental College, 2-9-18 Misaki-cho, Chiyoda-ku, Tokyo 101-0061, Japan
²Department of Internal Medicine, Tokyo Dental College Ichikawa General Hospital, 5-11-13 Sugano, Ichikawa, Chiba 272-8513, Japan
³Namba Dental Clinic, 3-11-1 Akasaka, Minato-ku, Tokyo 107-0052, Japan

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Abstract

We report a case of generalized chronic periodontitis and type 2 diabetes mellitus requiring periodontal treatment including regenerative therapy. The patient was a 66-year-old man who presented with the chief complaint of gingival inflammation and mobile teeth in the molar region. He had been being treated for type 2 diabetes mellitus since 1999. His glycated hemoglobin (HbA1c) level was 7.8%. An initial examination revealed sites with a probing depth of \( \geq 7 \) mm in the molar region, and radiography revealed angular bone defects in this area. Based on a clinical diagnosis of generalized chronic periodontitis, the patient underwent initial periodontal therapy. An improvement was observed in periodontal conditions on reevaluation, and his HbA1c level showed a reduction to 6.9%. Periodontal regenerative therapy with enamel matrix derivative was then performed on #16, 26, and 27. Following another reevaluation, a removable partial denture was fabricated for #47 and the patient placed on supportive periodontal therapy (SPT). To date, periodontal conditions have remained stable and the patient’s HbA1c level has increased to 7.5% during SPT. The results show the importance of collaboration between dentist and physician in managing periodontal and diabetic conditions in such patients.

Key words: Chronic periodontitis — Diabetes mellitus — Periodontal regeneration — Enamel matrix derivative

Introduction

The signs and symptoms of periodontal disease are recognized as the sixth complication of diabetes mellitus (DM)⁶. Increasing prevalence of type 2 (T2) DM is a major health concern in Japan⁵. In one study, the rate of periodontal disease in individuals with T2DM was found to be 2.6 times that observed in those without⁷. Diabetes mellitus has an adverse effect on periodontal health, and periodontal disease in turn affects glycemic
control and the incidence of complications from diabetes\textsuperscript{13}.

Periodontal medicine is defined as “a rapidly emerging branch of periodontology focusing on the wealth of new data establishing a strong relationship between periodontal health or disease and systemic health or disease”\textsuperscript{14}. Therefore, the two-way relationship between DM and periodontitis\textsuperscript{10} is a prime issue in the field of periodontal medicine, with effective periodontal treatment important in diabetic care and vice versa.

Here we report a case of chronic periodontitis and T2DM requiring periodontal treatment including regenerative therapy.

\textbf{Case Report}

Written informed consent was obtained from the patient for inclusion in this report.

\textbf{1. Examination at first visit}

In February 2014, a 66-year-old man was referred to the Clinic of Conservative Dentistry at Tokyo Dental College Suidobashi Hospital with the chief complaint of gingival inflammation and mobile teeth in the molar region. The patient had been receiving treatment for T2DM since 1999. Treatment had included educational hospitalization (twice) and medication for glycemic control. At the time of his first visit to our clinic, the patient had been visiting his physician regularly, and had been prescribed glimepiride, metformin hydrochloride, sitagliptin, and pioglitazone hydrochloride. His glycated hemoglobin (HbA1c) level was 7.8\% and fasting plasma glucose level 183 mg/dl. The patient also had hepatitis B, which had been treated with antiviral entecavir. The virus was below detection level, however, at the first visit to our clinic.

The patient had been receiving regular dental check-ups since his early 40’s. In 2013, however, he experienced pain in the molar area. His dentist referred him to our clinic for the treatment of periodontitis. Figure 1 shows an oral view obtained at his first visit.
Gingival inflammation was mostly evident in the molar region. Extrusion of #17 due to the loss of #47 and premature occlusal contact of #27 and 37 were observed.

The results of the periodontal examination are shown in Fig. 2. Thirty-one percent of sites had a probing depth (PD) of ≥4 mm and 4.9% a PD of ≥7 mm. Bleeding on probing was observed in 15% of sites. The level of plaque control as assessed by the O'Leary plaque control record (PCR) was 32%. Radiographic examination (Fig. 3) revealed generalized horizontal and angular bone loss in #16, 26, 27, and 37. As a measure of patient-reported outcome, oral health-related quality of life (QoL) was assessed using an oral health-related QoL instrument (OHRQL). The total OHRQL score in this patient was 10.

A clinical diagnosis of generalized chronic periodontitis was made according to the classification of the American Academy of Periodontology.

2. Treatment plan

1) Initial periodontal therapy
   This comprised instruction on maintaining oral hygiene, quadrant scaling and root planing (SRP), extraction of an impacted third molar (#38), and occlusal adjustment for #27 and 37.
2) Reevaluation
3) Periodontal surgery for sites with a PD of ≥4 mm
4) Treatment for recovery of oral function
   This comprised prosthetic treatment for loss of #47.
5) Supportive periodontal therapy (SPT) or maintenance

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Fig. 2 Periodontal examination at first visit

Fig. 3 Radiographic view at first visit
3. Treatment process

An outline of the treatment process is shown in Table 1.

1) Initial periodontal therapy

After obtaining informed consent for the proposed treatment plan, instruction was given on maintaining oral hygiene and quadrant SRP performed. Occlusal adjustment was implemented for #27 and 37. Subsequent reevaluation revealed a reduction in the PCR score to 18% and a decrease to 12 and 4% for sites with a PD of ≥4 mm and ≥7 mm, respectively. The OHRQL total score was 4. The patient’s HbA1c level showed a reduction to 6.9%. Therefore, it was decided to extract #38 for prophylactic reasons. The extraction was performed at the Department of Oral Surgery of our hospital. Re-SRP was implemented for #11–14, 37, and 41.

2) Periodontal surgery

Tooth #16 contained a deep intrabony defect 8 mm in depth and 3 mm in width. Therefore, regenerative therapy with enamel matrix derivative (EMD; Emdogain® Gel, Straumann Japan, Tokyo) was implemented in combination with a autogenous bone graft (Fig. 4). The autogenous bone was harvested from the adjacent area using a bone scraper. Regenerative therapy with application of EMD alone was performed in #26 and 27.

3) Treatment for recovery of oral function

The mandibular right molar area was treated with a removal partial denture, as the patient chose not to have dental implant treatment.

4) Supportive periodontal therapy

An improvement was observed in gingival inflammation and PD at reevalulation. Various
levels of improvement were observed radio-
graphically at those sites selected for regen-
erative therapy. There was resolution of tooth
mobility in #37. The periodontal conditions
were judged to be stable, and the patient
was placed in a recall system for SPT. The
total OHRQL score was 4, indicating an
improvement in QoL from the first visit. During
the first 3 months, the patient was recalled
monthly.

At 7 months from the start of SPT, peri-
odontal conditions were still stable (Figs. 5–7).
In terms of clinical outcome of regenerative
therapy, PD showed a reduction of ≥4 mm
from the values at first visit at all sites treated
(Table 2). The level of gain in clinical
attachment at the treated sites varied from
1 to 4 mm.

During SPT, the patient’s HbA1c level
showed a tendency to increase (Table 3), and
his physician placed him on repaglinide
instead of glimepiride (Table 1). Professional
tooth cleaning including subgingival plaque
control has been being performed on teeth
with a PD of ≥4 mm at each visit for SPT.

Discussion

The present case was one of generalized
chronic periodontitis accompanied by T2DM.
Periodontal treatment including regenerative
therapy was implemented to reduce inflam-
mation and periodontal pockets. The patient
had a history of educational hospitalization
due to poor glycemic control. On the patient’s
first visit to our hospital, it was surmised that a
combination of DM and less than optimal oral
hygiene had contributed to the periodontal
destruction observed.

One meta-analysis investigating the effect
of periodontal therapy on glycemic control
in T2DM patients revealed a mean decrease
of 0.36% in HbA1c compared to with no
treatment\(^3\). The present patient showed an
improvement of −0.9% in his HbA1c fol-
lowing initial periodontal therapy, which is
consistent with this earlier finding. As we
reported previously\(^9\), such an improvement
could be attributed to a combination of
non-surgical periodontal therapy and diabetic
treatment by a physician.

The status of glycemic control is an impor-
tant factor in selecting options for periodontal
treatment. According to the guidelines of
the Japanese Society of Periodontology\(^5\), an
HbA1c level of 6.9% is suggested to be the
adequate threshold level of glycemic control
for periodontal surgery. In the present case,
we implemented periodontal surgery after
confirmation of an improvement in HbA1c
following non-surgical periodontal therapy.
On the other hand, the guidelines recom-
mand that regenerative therapy be avoided
in patients with DM if glycemic control is
poor. Indeed, they state that evidence is still
lacking on the long-term clinical outcome
of regenerative therapy in individuals with
DM. In a recent study employing an \textit{in vivo} diabetic model, Bizenjima \textit{et al.} reported that regenerative therapy using fibroblast growth factor (FGF)-2 had a beneficial effect on new bone formation in surgical periodontal defects, increasing cell proliferation and regulating angiogenesis$^{2}$. On the other hand, no beneficial effect was observed on new bone and cementum formation during short-term healing with application of EMD in a similar \textit{in vivo} diabetic model$^{12}$. More pre-clinical and clinical studies are necessary to optimize periodontal regeneration in patients with various levels of glycemic control.

It is important to assess the patient’s systemic condition at each phase of periodontal treatment. In this regard, it has been reported that sharing of information between

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\multirow{2}{*}{Tooth mobility} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\multirow{2}{*}{Furcation} & \multicolumn{12}{|c|}{P D} \\
\hline
B & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
P & 3 & 3 & 3 & 3 & 3 & 3 & 3 & 3 & 3 & 3 & 3 \\
\hline
8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 \\
7 & 6 & 5 & 4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 & 5 \\
6 & 5 & 4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 & 5 & 6 \\
5 & 4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\
4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\hline
\end{tabular}
\caption{Oral view after 7 months of supportive periodontal therapy (SPT)}
\end{table}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\multirow{2}{*}{Tooth mobility} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\multirow{2}{*}{Furcation} & \multicolumn{12}{|c|}{P D} \\
\hline
B & 3 & 3 & 3 & 3 & 3 & 3 & 3 & 3 & 3 & 3 & 3 \\
P & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
\hline
8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 \\
7 & 6 & 5 & 4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 & 5 \\
6 & 5 & 4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 & 5 & 6 \\
5 & 4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\
4 & 3 & 2 & 1 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\hline
\end{tabular}
\caption{Periodontal examination after 7 months of SPT}
\end{table}
the periodontist and physician is critical in effectively treating periodontitis and DM\textsuperscript{9}. In the present case, such cooperation resulted in an improvement in both periodontal and diabetic conditions. An increase was observed, however, in the patient’s HbA1c level during SPT, the exact cause of which is unclear. One of the goals in providing periodontal treatment is to reduce PD to $\leq 3$ mm at all sites requiring surgery. This was not possible, however, in the present patient as periodontal breakdown was too advanced at such sites at his first visit, and even included furcation involvement. The present case supplies further evidence that careful SPT and continuous close collaboration between dental and medical professionals are essential in providing optimal periodontal and diabetic care.

Table 2  Clinical outcome of regenerative therapy with EMD: change in PD and CAL

<table>
<thead>
<tr>
<th>Treated tooth</th>
<th>PD (mm)</th>
<th>CAL (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First visit</td>
<td>7M SPT</td>
</tr>
<tr>
<td>#16</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>#26</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>#27</td>
<td>9</td>
<td>5</td>
</tr>
</tbody>
</table>

Measured at target (deepest) site
EMD: enamel matrix derivative; PD: probing depth; CAL: clinical attachment level; SPT: supportive periodontal therapy

Table 3  Change in HbA1c and FPG levels during periodontal treatment

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>HbA1c (%)</td>
<td>7.8</td>
<td>6.9</td>
<td>7.0</td>
<td>7.3</td>
<td>7.5</td>
</tr>
<tr>
<td>FPG (mg/dl)</td>
<td>183</td>
<td>118</td>
<td>118</td>
<td>127</td>
<td>147</td>
</tr>
</tbody>
</table>

IP: initial periodontal therapy; SPT: supportive periodontal therapy; HbA1c: glycated hemoglobin; FPG: fasting plasma glucose

Fig. 7  Radiographic view after 7 months of SPT
References


Correspondence:
Dr. Atsushi Saito
Department of Periodontology,
Tokyo Dental College,
2-9-18 Misaki-cho, Chiyoda-ku,
Tokyo 101-0061, Japan
E-mail: atsaito@tdc.ac.jp