Periodontal Regenerative Therapy Using Enamel Matrix Derivative in Patient with Chronic Periodontitis: a 3-year 6-month Follow-up Report

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Abstract

Here, we report a case of chronic periodontitis requiring periodontal regenerative therapy. The patient was a 73-year-old man who visited Tokyo Dental College Suidobashi Hospital with the chief complaint of gingival swelling and mobile tooth in the mandibular incisor region. An initial examination revealed that 33% of sites had a probing depth (PD) of ≥4 mm and 27% bleeding on probing. Radiographic examination revealed bone resorption extending as far as the root apex in #32 and 47, vertical bone resorption in #37, and horizontal resorption in other regions. Based on a clinical diagnosis of moderate chronic periodontitis, initial periodontal therapy was carried out followed by periodontal surgery. The patient’s oral health-related quality of life was also assessed at the time of each periodontal assessment. Surgical periodontal therapy was subsequently performed at selected sites. Periodontal regenerative therapy using enamel matrix derivative was performed on #37. Other sites with a PD of ≥4 mm were treated with open flap debridement, and scaling and root planing. Following reevaluation, the patient was placed on supportive periodontal therapy. The patient’s periodontal condition has remained stable over a 3-year 6-month period. The patient’s oral health-related quality of life showed a marked improvement after periodontal therapy.

Key words: Chronic periodontitis — Periodontal regenerative therapy — Enamel matrix derivative — Oral health-related quality of life

Introduction

Periodontitis is a pathological condition affecting the supporting structures of the teeth. It leads to alveolar bone loss and, ultimately, possible tooth loss. The purpose of periodontal treatment is to not only control inflammation, but also promote the regeneration of destroyed periodontal tissue to form a new attachment.

Moderate periodontitis can be successfully treated by nonsurgical therapy. In patients with severe periodontitis, residual pockets of ≥4 mm can remain after initial therapy, how-
ever\textsuperscript{3}). These pockets have been associated with intrabony defects and indicate increased risk of future periodontal destruction\textsuperscript{6}. For this reason, periodontal surgery is recommended to eliminate such pockets\textsuperscript{14}. Various regenerative therapies have been proposed for the treatment of periodontitis with intrabony defects. Enamel matrix derivative (EMD) is widely used as a material for the regeneration of periodontal tissues. It is derived from porcine tooth buds, and is currently available in a commercial formulation\textsuperscript{10}. The effect of periodontal tissue regeneration with EMD has been demonstrated in a number of studies on treatment for periodontitis\textsuperscript{11,27,33}.

Various periodontal parameters are routinely used in evaluation of clinical outcomes in such treatment. Each patient’s perceptions of periodontitis and its treatment must also be considered, however. In recent years, significant interest has been generated regarding the impact of periodontal disease on oral health-related quality of life (QoL)\textsuperscript{2,4,13,19}.

Here, we report periodontal regenerative therapy with EMD in a case of chronic periodontitis with intrabony defects. The results of a subsequent 3-year 6-month follow-up showed that the treatment had been successful. The patient’s oral health-related QoL was used as a measure of patient-reported outcome.

### Case Presentation

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

1. **Baseline examination**

   In April 2014, a 73-year-old man visited the Clinic of Conservative Dentistry at the Tokyo Dental College Suidobashi Hospital with the chief complaint of gingival swelling and a mobile mandibular incisor. The patient had previously undergone surgery for stomach cancer in 2005.

   The patient had been aware of gingival swelling and tooth mobility for approximately 20 years and had received treatment for periodontal disease at a local dental office. The symptoms worsened in 2011, however, and did not subsequently improve. His dentist referred him to our clinic for the treatment of periodontitis. Figure 1 shows an oral view obtained at his first visit.
Clinical examination (Fig. 2) revealed that 33% of sites had a probing depth (PD) of ≥4 mm and 4.8% one of ≥7 mm. Bleeding on probing (BOP) was observed at 27% of sites. The level of plaque control as assessed by the O’Leary plaque control record (PCR)\(^{20}\) was 38.4%. Tooth mobility was observed in tooth #17, 27, and 32. Radiographic examination (Fig. 3) revealed bone defects that had extended as far as the apex in #32 and 47, a vertical defect in #37, and furcation radiolucency in #17, 27, 37, 46, and 47. The diagnosis of furcation involvement was Degree 1 for #17 and Degree 2 for #27 and 47. The patient’s oral health-related QoL was assessed using an oral health-related QoL instrument (OHRQL)\(^{23}\). The total OHRQL score of this patient was 19 at first visit.

2. Diagnosis

The clinical diagnosis was moderate chronic periodontitis\(^3\).

3. Informed consent

A treatment plan was presented to the patient and his consent to the proposed plan obtained.

Clinical Procedures and Outcomes

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

Initial periodontal therapy consisted mainly of tooth brushing instruction, quadrant scaling and root planing, and root canal treatment (#37). Tooth #32 was extracted as the bone defect had extended as far as the root apex. Tooth #47 was extracted after removal of the core revealed a root fracture. After removal of an ill-fitting prosthesis, a provisional restoration was placed on #35–37. At reevaluation, sites with a PD of ≥4 mm were reduced from 33% to 5%, and prevalence of BOP from 27% to 5%. The patient’s PCR score showed an improvement, from 38% to 17%. Assessment of the oral health-related QoL revealed that the first visit total OHRQL score of 19 had been reduced to 13 following initial periodontal therapy.

2. Periodontal surgery

On reevaluation, closed pockets were observed in 84% of the teeth and BOP in 5%; the plaque score was 17%. These results were judged to be “sufficient” according to the criteria for the success of non-surgical periodontal therapy. Sites with a PD of ≥4 mm, furcation, and vertical bone defects were still present, however, so it was judged that surgical treatment was necessary. After consultation, the patient chose to undergo periodontal surgery and regeneration therapy. After obtaining informed consent, open flap debridement was performed in tooth #27. Regenerative therapy with Emdogain® Gel (Fig. 4).

3. Treatment for recovery of oral function

At 6 months postoperatively, fixed bridges (#31–33 and #35–37) were placed after confirmation of function and cleanability with provisional restoration. Implant treatment was performed on #47.

4. Supportive periodontal therapy

On reevaluation, gingival inflammation showed an improvement. Sites with a PD of

Table 1  Treatment process

| April 2014 | Initial periodontal therapy |
|-----------|-----------------------------|
| • Plaque control |
| • Quadrant SRP |
| • Provisional restoration (#35–37) |
| • Root canal treatment (#37) |
| • Extraction (#32 and 47) |
| October 2014 | (Reevaluation) |
| | Surgical periodontal therapy |
| | • Open flap debridement (#27) |
| | • Regenerative therapy with Emdogain® Gel (#37) |
| April 2015 | (Reevaluation) |
| | Treatment for recovery of oral function |
| | • Fixed bridges (#31–33, #35–37) |
| | • Dental implant (#47) |
| November 2015 to present | (Reevaluation) |
| | Supportive Periodontal Therapy |
| | • Oral hygiene instruction |
| | • Professional tooth cleaning |

SRP: scaling and root planing
≥4 mm and BOP had disappeared (Fig. 5). Furcation involvement was found in #27. The periodontal status was judged to be stable, and the patient was placed on a recall system for supportive periodontal therapy (SPT). According to the Periodontal Risk Assessment (PRA) index, risk at commencement of SPT was determined to be low. Oral hygiene instruction and professional tooth cleaning were provided during the SPT. During 3 years 6 months of SPT, furcation involvement was found in #27, but the periodontal condition remained stable (Figs. 6–8) and the PCR score was 11.5%. The total OHRQL score was 5, indicating an improvement in QoL from at first visit (Fig. 9). A 3-mm gain in average clini-
cal attachment was observed among the teeth treated with EMD (Table 2).

**Discussion**

Application of EMD has been reported to greatly improve clinical parameters and bone loss compared to open flap debridement. The type of bone defect to be treated is considered an important determinant in periodontal regenerative therapy. One study reported that the clinical attachment level (CAL) gain >3 mm was higher when the radiographic bone defect angle was $22^\circ$ compared with when it was $36^\circ$. In the present case, periodontal regenerative therapy using EMD alone yielded favorable clinical outcomes in the one- and two-wall bone defects treated. Combinations of different regenerative therapies, such as application of EMD together with bone graft materials, have been reported to be effective in the regeneration of periodontal tissue. Given that the target site
in the present case involved a wide (over 36°) and deep defect, it may have been possible to obtain an even better clinical outcome by using bone graft material in conjunction with EMD. At the site where the EMD was applied, improvement in clinical parameters compared to at first visit was confirmed over a period of 3 years 6 months (Table 2). This result is comparable to that for a gain in CAL of 3.2 mm at 2 years following EMD therapy reported by Fujinami et al.9) and other long-term studies12,26).

At the latest reevaluation in the present study (SPT, 3 years 6 months), periodontal parameters showed clinically satisfactory values. The question remains, however, as to how the patient perceived his condition and the treatment performed. Therefore, we have introduced assessment of oral health-related QoL into our periodontal treatment protocol17,23,24). In the present case, the OHRQL score showed an improvement after initial periodontal therapy. This finding is consistent with our own previous reports17,23,24) and with those of others on non-surgical periodontal therapy2,4,19). This result is presumed to be due to the removal of the chief complaint and improvement of the oral environment with initial periodontal treatment. The OHRQL score showed an improvement after surgical treatment compared with at first visit; no improvement was observed in the score from after initial periodontal therapy, however. This result may be due to the patient’s experience of postoperative discomfort, including pain, swelling, or tooth sensitivity, however. At
the start of SPT, the OHRQL score appeared to improve compared to that after surgical treatment. It is speculated that recovery of oral function through the wearing of prosthetic appliances may have contributed to this improvement in QoL. One earlier study reported that an improvement in OHRQL was observed after implant treatment in patients with a small number of lost teeth. In the present study, the OHRQL score remained stable during SPT. There are various reports on the association between clinical parameters and OHRQL. They suggest that the improvement of clinical parameters observed in the present study may have been responsible for the improvement also seen in the OHRQL score.

According to the PRA, the risk at the beginning of SPT was low. The presence of furcation involvement indicated the need for caution, however. Furthermore, it was deemed necessary to carefully monitor the site where regenerative therapy was performed.

In summary, periodontal treatment including periodontal regenerative therapy with EMD yielded a marked improvement in clinical parameters and oral health-related QoL. We will continue to perform careful SPT.

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