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# Aging and success of periodontal regenerative therapy using enamel matrix derivative

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## Background

The world population is aging and the proportion of older adults retaining their natural teeth is increasing. There is consequently an increasing number of older adults who have periodontal disease that potentially requires periodontal treatment. It is therefore necessary to establish the influence aging can have on the success of periodontal procedures. If age is a contributing factor to the success of these procedures, a holistic, age-appropriate treatment strategy needs to be considered for periodontal therapy.

Previous studies have shown that younger age is associated with potentially better outcomes for both non-surgical periodontal therapy and open-flap debridement. Older patients have been reported to have a significantly higher risk of residual pockets than younger patients following non-surgical periodontal therapy and a higher prevalence of deep probing depths following open-flap debridement.

While the beneficial effects of periodontal regenerative therapies (PRT) utilising enamel matrix derivative (EMD) have been previously reported, there is a lack of evidence on their relative success and outcome in older patients.

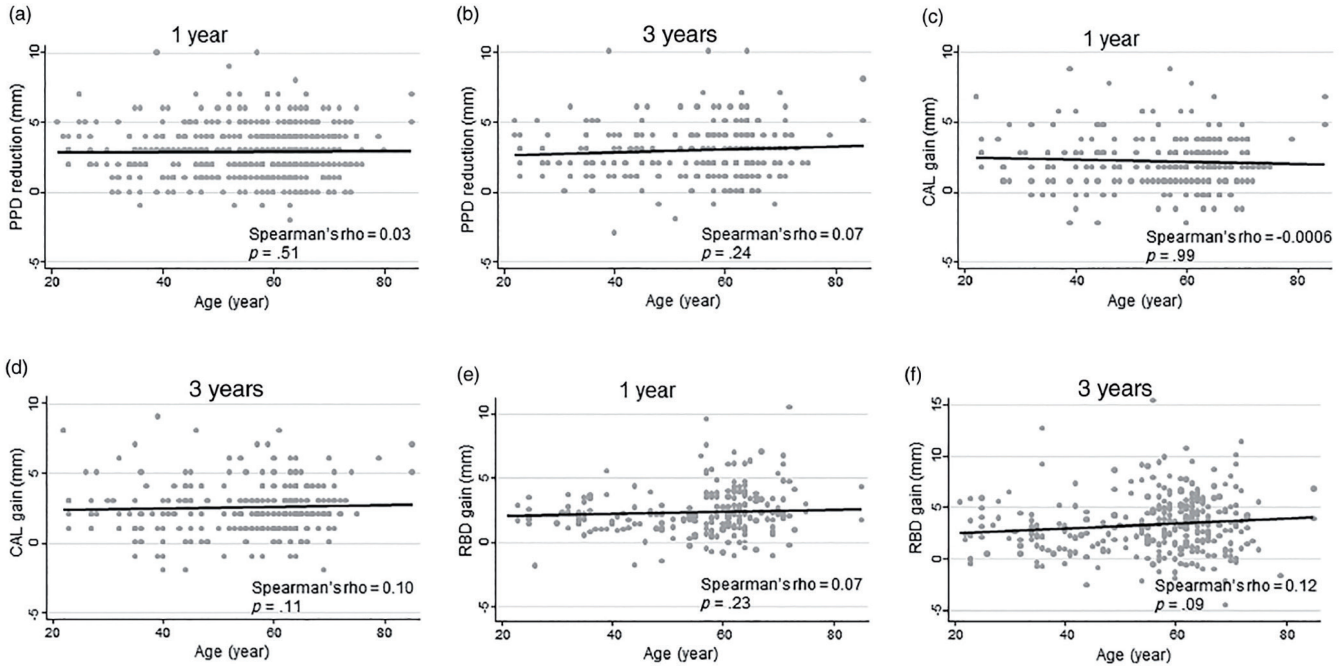
## Aim

This three-year prospective cohort study aimed to investigate the clinical outcomes of PRT using EMD in patients with a wide age range (22-85 years old) and to explore the influence of aging on the outcome of these PRT procedures.

## Materials & methods

- Prospective cohort study.
- Inclusion criteria: patients aged ≥20 years receiving PRT at Tokyo Medical and Dental University, with periodontitis and who had previously completed cause-related periodontal therapy, with residual sites with PPD ≥4mm, with the presence of intra-bony defects in the interproximal area on radiographs, and with +/- furcation involvement (degree I & II).
- Exclusion criteria: patients with diabetes mellitus, teeth with perio-endo lesions or degree-III furcation involvement.
- Medical, dental, and smoking histories were obtained.
- Periodontal examinations were carried out at six sites per tooth. Tooth mobility, pocket probing depth (PPD), clinical attachment level (CAL), and bleeding on probing (BoP) were measured at baseline and at one and three years after surgery. Pulp vitality was confirmed pre-op.
- The number of walls of the bony defect (1 and 2 walls = non-contained defect; 3 walls = contained defect) and the degree of furcation involvement were recorded during surgery.
- Intra-oral radiographs were taken at baseline, one and three years to measure the radiographic bone-defect depth (RBD).
- Surgical procedure: modified or simplified papilla-preservation technique and elevation of a full-thickness flap under local anaesthesia. The region was debrided, rinsed with saline, and EMD was applied. For non-contained defects, autologous bone graft was harvested from the adjacent site. Teeth were splinted where indicated, and antibiotics given post-op.
- Patients received monthly professional cleaning for six months, supportive periodontal therapy every three months, and an annual examination.
- Multivariate linear regression analysis was performed with PPD reduction, CAL gain, RBD gain during the one- and three-year examinations to investigate the influence of aging on these outcomes after adjusting for confounders.

**Figure:** Scatter plot to show the correlation between age and PPD reduction, CAL gain, and RBD gain at one year and three year examination. (a) PPD reduction at one year examination, (b) PPD reduction at three year examination, (c) CAL gain at one year examination, (d) CAL gain at three year examination, (e) RBD gain at one-year examination, and (f) RBD gain at three-year examination. No significant correlation was found between age and each outcome at one- and three-year examinations




## Results

- A total of 312 patients with 519 sites were included at baseline. At the one-year review, 311 patients with 518 sites attended. At the three-year review, 151 patients with 253 sites attended.
- The mean age of the 151 patients included in the final analysis was 55.9 ± 12.3 years (range 22-85 years) and 31 patients (20.5%) were ≥65 years old.
- PPD reduced by 2.84 ± 1.73mm at one year and 2.87 ± 1.87mm at three years. The change from baseline to both periods was statistically significant (p <0.05). The change from year one to year three was not statistically significant (p = 0.63).
- CAL gain was 2.40 ± 1.87mm at one year and 2.47 ± 1.89mm at three years. The change from baseline to both periods was statistically significant (p <0.05), while the change from year one to year three was not statistically significant (p = 0.32).
- Improvements in RBD were 1.76 ± 1.98mm at one year and 2.39 ± 2.41mm at three years. The difference from baseline to both time points and from year one to year three was statistically significant (p <0.05).
- Multivariate analyses, after adjusting for confounders, demonstrated that at the one-year examination, a 10-year increment in age was statistically significantly associated with a smaller PPD reduction of -0.13mm and a smaller CAL gain of -0.23mm. At three years, however, there was no statistical significance.
- No association was seen in the multivariate analyses between age and RBD at one or three years.

## Limitations

- This was a cohort study, and as such the lack of a control group limits interpretation.
- The sample size decreased by half between baseline and three years, which may have contributed to attrition bias.
- Older people were included but were generally healthy individuals (diabetes was in the exclusion criteria). Therefore, the effect of comorbidities associated with aging are unknown.
- The same surgeon who performed the surgery carried out the re-evaluation and was therefore not blinded, which could cause bias towards the post-op outcome.
- No standardisation techniques for radiographs were used.
- It is unclear if the results of this study can be applied to management of intra-bony defects using a different regenerative material.

## Conclusions & impact

- PRT with EMD resulted in significant clinical and radiographic improvements at one and three years regardless of the age of participant.
- Multivariate analysis suggested that aging may be a contributing factor to post-operative PPD reduction and CAL gain at one year. However, by three years, this influence was no longer statistically significant. Changes in radiographic bone defect depth, however, were not affected by aging.
- These results imply that although PRD with EMD is a successful procedure regardless of age, aging may slow down the rate of soft-tissue changes observed following treatment.
- In clinical practice, a longer healing period may be required for older patients than for younger patients, which highlights the importance of long-term clinical monitoring following PRT.

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