

ADAVB Clinical update October 2026.

Long-term outcomes of regenerative periodontal therapy and orthodontic treatment: 20-year results from a prospective study. Roccuzzo A, Li Y, Salvi GE, Stähli A, Imber J JC, Roccuzzo M. J Dent. 2026 Oct;173:106799. doi: 10.1016/j.jdent.2026.106799. Epub 2026 May 28.

Introduction

Advanced periodontitis often results in pathologic tooth migration which may appear as tooth drifting, flaring and spaces resulting in aesthetic problems for the patient. The management of severely periodontally compromised teeth is a clinical challenge in periodontal, orthodontic and prosthetic treatment.

Orthodontic tooth movement in the presence of active periodontitis can worsen the microbial biofilm-induced inflammation, leading to accelerated attachment loss. This has been shown in animal studies. Orthodontic tooth movement has been demonstrated to be safe once the periodontal inflammation has been controlled. The European Federation of Periodontology (EFP) S3 clinical guidelines support the requirement that orthodontic treatment must be performed on a periodontally stable and healthy dentition. In the case of teeth with deep intrabony defects, periodontal regeneration using enamel matrix derivative (EMD) in combination with or without bone grafting materials is a reliable long-term treatment modality.

The orthodontic-periodontic approach aims to correct malocclusion, aesthetics and also create an anatomically and functionally sustainable dentition. Case series and pilot studies by other authors have shown the feasibility of moving teeth into regenerated or grafted defects. There are limited long-term studies of the outcomes beyond a decade. The aim of this study was to review the 20-year clinical outcomes of a consecutively enrolled cohort of patients treated for periodontitis using a regenerative approach, followed by orthodontic treatment and tailored supportive periodontal care (SPC).

Methods

This study is the 20-year follow-up of a prospective study performed in a specialist periodontal private practice in Italy. Forty-eight patients with stage IV periodontitis each with at least one non-molar tooth exhibiting pathologic migration and an associated intrabony defect with a pocket depth (PD) ≥ 7 mm. All patients were part of a standard multidisciplinary treatment protocol and were enrolled in a long-term SPC program.

Treatment planning involving consultation with an orthodontist was undertaken following initial control phase (periodontal treatment step I-II) involving oral hygiene instruction aiming to achieve a full mouth plaque score (FMPS) and bleeding score (FMBS) of $\leq 20\%$ and supra and subgingival debridement. Teeth were splinted and periodontal regeneration was undertaken. Depending on the anatomy of the defect, a papilla preservation technique, EMD alone or in combination with deproteinised bovine bone mineral (DBBM) and a bioresorbable collagen membrane was used.

After healing, orthodontic treatment was started 8-12 months after completion of active periodontal treatment to correct tooth malposition and establish a non-traumatic occlusion.

During orthodontic treatment, patients were given oral hygiene instructions and supragingival plaque removal every three to four months. After completion of orthodontic treatment, fixed retainers were placed and patients were enrolled in tailored SPC programs during the 20 years of follow-up.

Clinical parameters were recorded at baseline immediately before surgery (T0), 10-year follow-up (T10) and at the 20-year follow-up visit prior to the planned SPC session (T20). The following variables were recorded: FMPS, FMBS, number of sites with PD ≥ 7 mm, teeth lost. Each test tooth had PD measured at four sites, bleeding and suppuration on probing (BOP and SUP) recorded. Survival of test teeth, complications and any further treatment were recorded for the observation period.

Results

Thirty-three of the initial 48 patients completed the 20-year follow-up. The primary reason for dropout was unwillingness to attend the planned recall visit (n=8). Other reasons include deceased (n=1), severe health problems (n=3), moved abroad (n=3). The T20 estimated tooth survival was 89.1%, while complication free probability was 86.3%. If no drop-out patients were lost (44/48), then the survival rate was 91.7% and if all drop-out patients were lost (29/48), then the survival rate was 60.4%.

Over the first 10 years, two test teeth experienced complications (one pulp necrosis and root fracture). Between 10-20 years, two teeth had recurrence of periodontal disease and one had root fracture. The four extracted teeth (root fracture and recurrent periodontitis) were replaced with implant- supported single unit crowns.

FMPS decreased from 48.8% $\pm 23.5\%$ at baseline to 12.6% $\pm 6.7\%$ at T10, with a statistically significant increase to 14.6% $\pm 5.9\%$ at T20. FMBS showed a significant reduction from 55.5% $\pm 17.7\%$ at T0 to 6.8% $\pm 3.9\%$ at T10, with a slight increase to 10.2% $\pm 4.7\%$ at T20. The mean number of sites with PD ≥ 7 mm showed significant improvement decreasing from 25.8 ± 17.4 at T0 to 1.7 ± 2.1 at T10, and further reducing to 0.9 ± 1.2 at T20. Results are summarised in Table 3.

Table 3

Full mouth plaque scores (FMPS) (%), full mouth bleeding scores (FMBS) (%) and number of sites with PD ≥ 7 (mm) (n) at baseline (T0), at 10 (T10) and 20-year (T20) follow-up SPC visit (n = 33). First row: Mean $\pm$ SD (95% CI). Second row: Median (IQR).

	T0	T10	T20	Diff. T0- T10	Diff. T10- T20	Diff. T0- T20
FMPS	48.8	12.6	14.6	36.2 $\pm$	-2.0 $\pm$ 3.9	34.2 $\pm$
(%)	$\pm$	$\pm$ 6.7	$\pm$ 5.9	18.8 (29.6	(-3.4	19.3 (27.3
	23.5	10 (8	12	42.9)	-0.7)	41.0)
	40	18)	(10	30 (20 50)	-2 (-3 0)	28 (20 47)
	(30		20)	p <	p = 0.012*	p <
	70)			0.001***		0.001***
FMBS	55.5	6.8 $\pm$	10.2	48.8 $\pm$	-3.4 $\pm$ 3.9	45.4 $\pm$
(%)	$\pm$	3.9	$\pm$ 4.7	17.5 (42.6	(-4.8	18.5 (38.8
	17.7	5 (5	10 (6	55.0)	-2.0)	51.9)
	59	10)	15)	53 (38 61)	-3 (-5 0)	49 (33 59)
	(42			p <	p <	p <
	67)			0.001***	0.001***	0.001***
Sites	25.8	1.7 $\pm$	0.9 $\pm$	24.1 $\pm$	0.8 $\pm$ 1.1	24.9 $\pm$
PD $\geq$	$\pm$	2.1	1.2	16.8 (18.2	(0.4 1.2)	17.0 (18.9
7	17.4	1 (0	0 (0	30.1)	0 (0 1)	30.9)
(mm)	21	2)	1)	17 (12 32)	p =	19 (12 33)
	(12			p <	0.003**	p <
	34)			0.001***		0.001***

PD: Probing Depth.

*p < 0.05; **p < 0.01; ***p < 0.001.

Results from Wilcoxon's test corrected by Bonferroni's criteria.

Of the 29 test teeth that were still present at T20, there was no significant change in PD. Mean PD was reduced from 6.3 $\pm$ 1.6 mm at T0 to 3.0 $\pm$ 0.6mm at T10 and remained consistent at 3.0 $\pm$ 0.6mm at T20. Deepest PD reduced from 8.9 $\pm$ 1.7mm at T0 to 3.4 $\pm$ 0.9 mm at both T10 and T20. BOP at test tooth sites decreased from 80.3% $\pm$ 20.5% at T0, to 7.0% $\pm$ 13.1% at T10, and 12.1% $\pm$ 14.4% at T20. Suppuration was present in 45.5% of test teeth at T0 and was absent at both T10 and T20. Results are summarised in table 4. Mean recession showed minimal change from 0.9 $\pm$ 0.6 mm at T10 to 0.9 $\pm$ 0.7 mm at T20

Table 4

Clinical parameters at tooth site level (n = 29) at baseline (T0), at 10 (T10) and 20-year (T20) follow-up SPC visit. First row: Mean or number $\pm$ SD (95% CI). Second row: Median (IQR).

	T0	T10	T20	Diff. T0- T10	Diff. T10- T20	Diff. T0- T20
PD	6.3 $\pm$	3.0 $\pm$	3.0 $\pm$	3.2 $\pm$ 1.3	0.0 $\pm$ 0.3	3.1 $\pm$ 1.4
(mm)	1.6 6.3 (5.3 6.8)	0.6 3.0 (2.5 3.3)	0.6 3.0 (2.5 3.3)	(2.7 3.6) 3.1 (2.3 3.8) p < 0.001***	(-0.1 0.1) 0 (-0.3 0.3) p = 1	(2.6 3.7) 3.0 (2.3 3.8) p < 0.001***
Deepest PD at tooth site (mm)	8.9 $\pm$ 1.7 8 (8 10)	3.4 $\pm$ 0.9 3 (3 4)	3.4 $\pm$ 0.9 3 (3 4)	5.4 $\pm$ 1.5 (4.9 5.9) 5 (4 6.5) p < 0.001***	0.1 $\pm$ 1.0 (-0.3 0.4) 0 (-1 1) p = 1	5.4 $\pm$ 1.7 (4.7 6.0) 5 (4 6) p < 0.001***
BOP (%)	80.3 $\pm$ 20.5 75 (75 100)	7.0 $\pm$ 13.1 0 (0 12.5)	12.1 $\pm$ 14.4 0 (0 25)	72.7 $\pm$ 19.4 (65.7 79.7) 75 (50 87.5) p < 0.001***	-5.2 $\pm$ 12.3 (-9.8 -0.5) 0 (0 0) p = 0.102	66.4 $\pm$ 22.4 (57.8 74.9) 75 (50 75) p < 0.001***
SUP (%)	15 (45.5%)	0 (0%)	0 (0%)	15 (28.5 62.4) p = 0.003**	0 (0 10.6) p = 1	15 (0 10.6) p = 0.003**

PD: Probing Depth.

BOP: Bleeding on Probing.

SUP: suppuration.

p < 0.01; *p < 0.001.

Results from Wilcoxon's test corrected by Bonferroni's criteria (PD and BOP).

Results from McNemar's test (SUP).

Discussion

This is the longest known follow-up investigation evaluating periodontal regeneration and orthodontic therapy for the treatment of patients with stage IV periodontitis. Treatment resulted in long-term stability in periodontal health and tooth survival when using an interdisciplinary strategy, proper infection control, periodontal regeneration, orthodontic treatment and tailored supportive care.

The timing of the orthodontic treatment following periodontal regeneration is of clinical debate. In this study, a healing period of 8-12 months was allowed to ensure maturation of the regenerated tissues before commencing orthodontic treatment. Recent evidence suggested that earlier orthodontic treatment (i.e. 4 weeks vs. 6 months) may be feasible and does not statistically significant difference in clinical attachment level (CAL) gain between groups at 12 and 24 months follow-ups. This indicates the possibility of reducing total treatment time without affecting the regeneration. Accurate case and site selection should always be considered prior to commencing orthodontic treatment.

Other shorter retrospective studies of two to eight years have shown similar results following periodontal and orthodontic treatment of a high survival and mean PD of 2.9-3.1mm.

This study showed the overall complication rate was low. There was the absence of radiographic signs of apical root resorption which shows that orthodontic tooth movement does not increase the risk of root resorption in periodontally compromised patients. It is important to use light continuous orthodontic forces and ongoing monitoring to minimise

these risks. Adherence to the SPC is important to maintain clinical results after regeneration. Few teeth were extracted during the observation period.

Limitations of this study include the lack of a control group. There was lack of data on different regenerative materials applied and orthodontists; however this study reflects the “real world” scenario. Due to the high drop-out rate, there is the risk of positive interpretation bias. Use of only one test tooth may not encompass different site-specific responses to treatment. Radiographic outcomes were not systematically assessed and reported.

Conclusion

Predictable long-lasting results were shown in this study after combined periodontal regenerative and orthodontic treatment for the treatment of severely periodontally compromised teeth. Supportive periodontal care achieves clinical stability and periodontal regeneration can be used in suitable cases in stage IV periodontitis patients.

Questions

1. At what time point after regenerative periodontal therapy was orthodontic treatment commenced in this study?
 - a. 4 weeks
 - b. 6 months
 - c. 8-12 months
 - d. 12-24 months
2. For what reason did teeth experience complications and were extracted?
 - a. Root fracture, recurrent periodontitis and pulp necrosis
 - b. Root fracture and pulp necrosis
 - c. Pulp necrosis and recurrent periodontitis
 - d. Root fracture and recurrent periodontitis
3. The reason for waiting for improvement in periodontal health before commencing orthodontic treatment is there is accelerated attachment loss in the presence of inflammation. TRUE or FALSE
4. Orthodontic treatment may be a consideration after stage IV periodontitis to:
 - a. Improve occlusal stability and aesthetics
 - b. Improve periodontal stability
 - c. Improve the survival of the teeth
 - d. Reduce the risk of recession
5. What was the mean PD of test teeth at T0 and T20?
 - a. $1.7 \pm 2.1\text{mm}$ and $0.9 \pm 1.2\text{mm}$
 - b. $6.3 \pm 1.6\text{mm}$ and $3.0 \pm 0.6\text{mm}$
 - c. $7.0 \pm 13.1\text{mm}$ and $12.1 \pm 14.4\text{mm}$
 - d. $8.9 \pm 1.7\text{mm}$ and $3.4 \pm 0.9\text{mm}$
6. Teeth were included in this study for what reasons?

- a. Stage IV periodontitis, one non- molar tooth with pathologic migration and intrabony defect with a PD ≥ 7 mm
 - b. Stage IV periodontitis, one molar tooth with pathologic migration and intrabony defect with a PD ≥ 7 mm
 - c. Stage IV periodontitis, one non- molar tooth with pathologic migration and intrabony defect with a PD ≥ 5 mm
 - d. Stage V periodontitis, one non- molar tooth with an intrabony defect with a PD ≥ 7 mm
7. Upon completion of orthodontic treatment patients received removable retainers. TRUE or FALSE
8. What was the full mouth bleeding score (FMBS) at T10?
- a. 55.5% $\pm$ 17.7%
 - b. 48.8% $\pm$ 23.5%
 - c. 10.2% $\pm$ 4.7%
 - d. 6.8% $\pm$ 3.9%
9. Reasons for commencing orthodontic treatment earlier after completion of regenerative periodontal treatment:
- a. Reducing the risk of apical root resorption
 - b. Reducing treatment time
 - c. Preventing breakdown of the regenerated site
 - d. Reducing the need for SPC
10. When performing orthodontic treatment in patients with a history of periodontitis it is important to?
- a. Realign the drifted teeth
 - b. Move the teeth into the intrabony defect
 - c. Use light orthodontic forces and regular tailored SPC
 - d. Assess the radiographic bone levels