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Effect of periodontal dressing on non-surgical periodontal treatment outcomes: a systematic review

Abstract: *Background:* Periodontal dressing has been advocated and showed some positive outcomes for placing over the surgical site after periodontal surgery. However, little is known about its effect on non-surgical therapy. *Purpose:* The aim of this review was to assess the clinical effect of periodontal dressing when used after non-surgical therapy. *Material and methods:* Two examiners performed an electronic search in several databases for relevant articles published in English up to November 2013. Selected studies were randomized human clinical trials (prospective or retrospective trials) with the clear aim of investigating the effect of periodontal dressing placement upon periodontal non-surgical mechanical therapy. Data were extracted from the included articles for analysis. *Results:* Three randomized clinical trials fulfilled the inclusion criteria and thus were included in the data analysis. Statistical analysis could not be carried out due to the lack of clear data of the included studies. However, descriptive analysis showed its effectiveness in improving clinical parameters such as gain of clinical attachment level and reduction of probing pocket depth. *Conclusion:* Placement of periodontal dressing right after non-surgical mechanical therapy can be beneficial in improving overall short-term clinical outcomes, although more controlled studies are still needed to validate this finding.

Key words: evidence-based dentistry; non-surgical debridement; periodontal attachment loss; periodontal dressing(s)

Introduction

Periodontal treatment causes tissue injury, triggering haemorrhage and thus leading to a blood clot formation. The blood clot is populated by inflammatory cells to prevent bacterial colonization or wound infection (1). Subsequently, several healing events occur in an attempt to regenerate/repair the wound (2). Nonetheless, unlike other parts of the body, the oral cavity is continuously exposed to a septic environment that might jeopardize the formation/maturation of a new connective tissue attachment. Furthermore, it is noteworthy to bear in mind that the oral cavity is steadily undergone mechanical, thermal and chemical insult constantly that may lead to treatment failure (3). As a precaution, some clinicians have suggested to use a periodontal dressing to not only isolate but also protect the wound against outer bacterial insult.

Periodontal wound dressing was firstly introduced by Ward in 1923 with the purpose of immobilizing the tissues, reducing pain, preventing haemorrhage and excluding unwanted microorganisms (4). As then, many

other studies have been carried out. In general, periodontal wound dressing has been advocated for improvement of patient comfort (5), protection of surgical wound and adaptation of soft tissue (6, 7). In addition, some of the periodontal dressing contains eugenol which possesses antibacterial function (8); however, due to potentially of increasing tissue inflammation, soft tissue necrosis, allergic reactions and possible delay healing, the usage of eugenol in periodontal wound dressing has been dropped (9). Furthermore, periodontal dressing can protect the blood clot against insult from internal and/or external forces during function and therefore, pave the road for better cell migration as a result of stable blood clot (4).

The application of periodontal dressing after periodontal treatment has been utilized not only for surgical but recently also non-surgical mechanical treatment. Firstly, it was advocated for usage after gingivectomy and gingivoplasty to seal the open wound and to ensure tight tissue adaptation (10–12); later on, it was further recommended to aid positioning the flap and to protect denuded bone areas in the case of flap surgery (4). Secondly, it has shown its suitability in preventing loss of graft material and flap displacement during regeneration surgery (13), and also to protect the palatal soft tissue donor sites (14). Recently, periodontal dressing has been placed after non-surgical scaling and root planing (SRP) to apply pressure to the treated area so the tissue can adapt to underlying structure, which in turn provides more stability as well as prevents colonization of unwanted bacteria (15–17). Promising results have been demonstrated from these studies; however, the effectiveness of the dressing following SRP remains to be determined.

On the other hand, it is important to point out that when the dressing is applied the wound is isolated and as consequence, wound is potentially deprived of saliva. After periodontal treatment, there is an increase in epidermal growth factor in the saliva (which is its primary source in humans). Its continuous flow in the saliva was shown to accelerate the healing process (18–20). Therefore, the absence of saliva around the wound created by the periodontal dressing might actually delay the healing process.

Therefore, this review aimed to study the benefits, in terms of clinical parameters, of the application of a dressing following non-surgical periodontal mechanical therapy.

Materials and methods

Information sources and development of focused question

An electronic literature search was conducted by two reviewers (AM & EC) in several databases (MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials, Cochrane Oral Health Group Trials Register databases and Google Scholar) for articles written in English up to November 2013. The PICO (Patient, Intervention, Comparison, Outcome) question was as follows: Does the use of periodontal dressing enhance the clinical outcomes of non-surgical periodontal therapy (e.g. gain of clinical attachment level and reduction of probing

pocket depth) in dentate patients? The reporting of this systematic review adhered to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement (21).

Screening process

Combinations of controlled terms (MeSH and Emtree) and keywords were used whenever possible. The search terms used, where '[mh]' represented the MeSH terms and '[tiab]' represented title and/or abstract, for the PubMed search were as follows: (periodontal dressing [mh]) AND periodontal attachment loss [mh] OR (periodontal dressing [mh]) English [la] NOT (letter [pt] OR comment [pt] OR editorial [pt]) NOT ('animals'[mh] NOT 'humans'[mh]). In addition, the search of (nonsurgical periodontal debridement [mh]) AND (periodontal dressing [mh]) OR (periodontal dressing [mh]) AND (scaling and root planing [tiab]) was further conducted to ensure a comprehensive screening process. Lastly, a manual search of periodontal-related journals, including *Journal of Periodontal Research*, *Journal of Clinical Periodontology*, *Journal of Periodontology* and *The International Journal of Periodontics and Restorative Dentistry*, from June 2010 up to November 2013, was also performed.

Study selection

Selected studies were randomized clinical trials, human clinical trials (cohort/case series prospective/retrospective trials) with the clear aim of examining the effect of placement periodontal dressing during non-surgical periodontal mechanical therapy. Studies included in the analysis should have to have a minimum sample size of 10 healthy patients. Animal studies and human trials with insufficient information were not considered to avoid potential risk of bias. Furthermore, studies involving any surgical periodontal treatment (e.g. modified Widman flap or gingivectomy) were further excluded to focus only on the influence upon non-surgical treatment. Factors such as study design, total sample size, distribution by test/control groups, type of periodontal dressing, removal of periodontal dressing (in days), entity of periodontal disease, approach of non-surgical periodontal treatment, follow-up after removal and change in clinical parameters (probing pocket depth and clinical attachment level) were extracted from the selected studies and then analysed.

Study quality

The criteria used to evaluate the quality of the selected randomized controlled trials (RCTs) were modified from the randomized clinical trial checklist of the Cochrane Center and the Consolidated Standards of Reporting Trials (CONSORT) statement, which provided guidelines for the following parameters: (i) sequence generation; (ii) allocation concealment method; (iii) masking of the examiner; (iv) address of incomplete outcome data; and (v) free of selective outcome report-

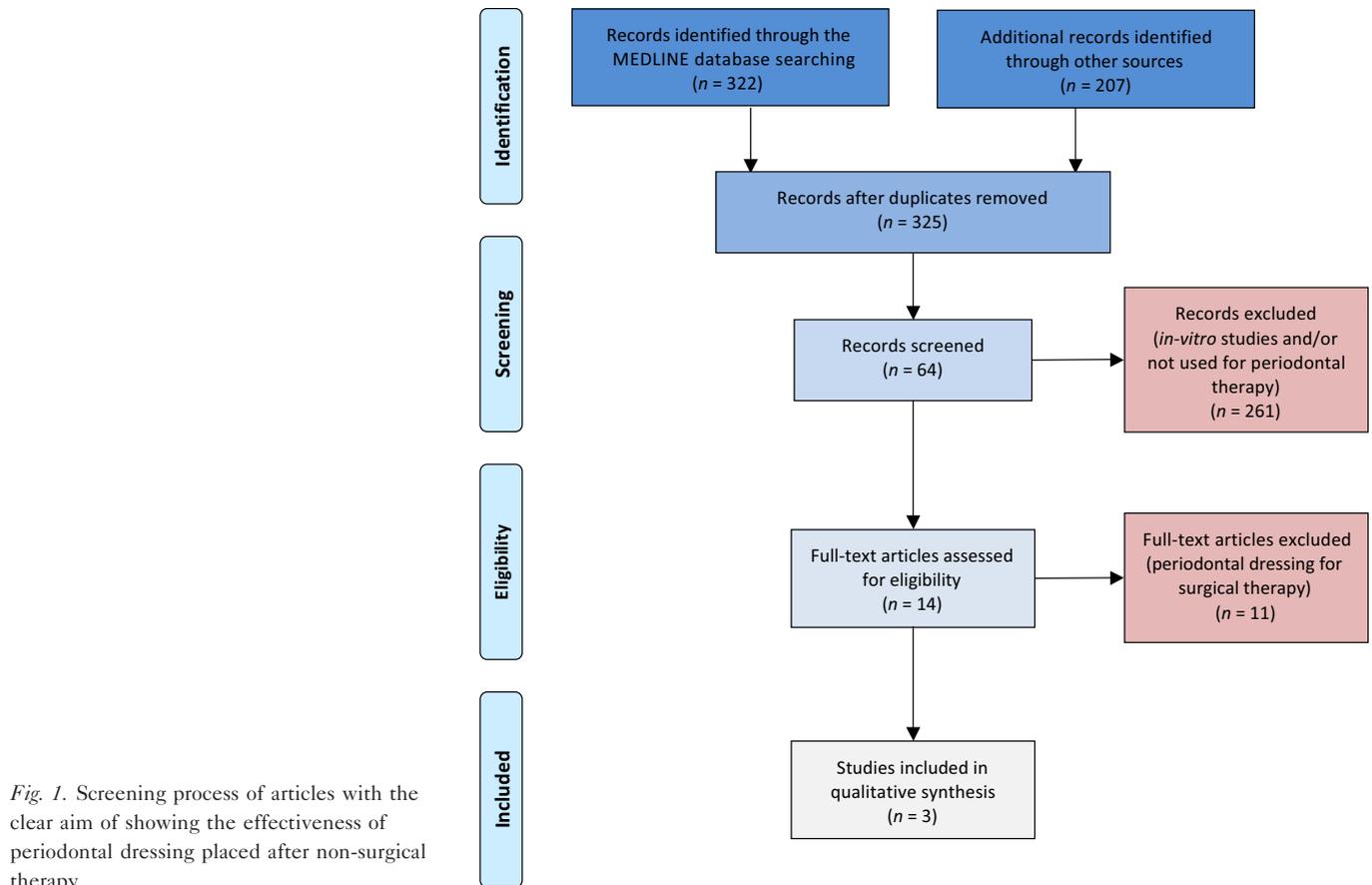


Fig. 1. Screening process of articles with the clear aim of showing the effectiveness of periodontal dressing placed after non-surgical therapy.

ing. The degree of bias was categorized as low risk if all the criteria were met, moderate risk when only one criterion was missing, and high risk if two or more criteria were missing (22, 23). Two independent reviewers (AM and CGP) evaluated all the included articles.

Results

Study selection

An initial screening yielded a total of 325 articles, out of which 14 potentially relevant articles were selected after an evaluation of their titles and abstracts. Only three articles meet the inclusion criteria (Fig. 1). Details of all included studies were summarized in Table 1. All three studies included were randomized clinical trials. While one study aimed at showing the effectiveness of periodontal dressing in aggressive periodontitis (16), the other two focused in chronic periodontitis patients (15, 24).

Study quality

All the articles included in the present review were prospective human randomized clinical trials evaluating the effect of periodontal dressing after non-surgical periodontal treatment. Table 2 displays the risk assessment for publication bias for the included RCTs.

Summary of the included studies according to the subtype of periodontal disease (Table 3)

Effectiveness of periodontal dressing placement during non-surgical therapy in aggressive periodontitis patients

In Sigusch's *et al.* (16) study, Thirty-six severe generalized aggressive periodontitis non-smoker patients were studied. Patients were recruited if they had at least one site with a bone loss of $\frac{3}{4}$ of the root as displayed by radiographic examination. In the subgingival plaque of these patients, the following bacterial species were detected: *Porphyromonas gingivalis* (Pg), *Tannerella forsythia* (Tf) and *Aggregatibacter actinomycetemcomitans* (Aa) either separately or together. All patients received an initial treatment of SRP, polishing in 3–4 sessions and meticulous instruction of the Bass tooth-brushing technique. Three weeks after initial therapy, the clinical parameters (CAL and PPD) were obtained as those collected at baseline. Subsequently, full-mouth SRP was conducted and all patients began therapy with systemic metronidazole. The patients then were randomly divided into three groups of 12 subjects each. The groups 1 and 2 were the test groups, and the difference was the time of application of the periodontal dressing 3–4 days (group 1) and 7–8 days (group 2). The third group (control group) received no periodontal dressing. At the first follow-up evaluation (6 months), plaque and inflammation were drastically reduced in all patients.

Table 1. Characteristics of the selected studies

Author	Study design	Time frame	Diagnosis	Sample size (patients)	Age (SD)	Treatment (Periodontal dressing type)	Conclusion
Keestra et al. (2013)	Split-mouth RCT	7 days	Moderate-Severe Generalized CP	24 (11F/13M)	48.4 years (9.2)	OSFMD (SRP + CHX) with/without periodontal dressing (Zinc oxide eugenol free)	Periodontal dressing provides increased PDR, wound protection, soft tissue stabilization, blood clot availability, pain intensity reduction and additional antimicrobial effects
Genovesi et al. (2010)	Split-mouth RCT	7 days	Moderate-Severe Generalized CP	30 (18F/12M)	52.3 years (6.0)	SRP + SC with/without periodontal dressing (zinc oxide eugenol free)	Periodontal dressing improves the outcomes of non-surgical periodontal treatment
Sigusch et al. (2005)	Parallel-arm RCT	Test Group 1: 3-4 days Test Group 2: 7-8 days	Severe Generalized AG	36 (23F/13M)	34.6 years (N/A)	Four quads SRP + OSFMD (SRP + MTZ) with/without periodontal dressing (zinc oxide eugenol free)	Periodontal dressing for 7-8 days leads to better long term results in a two step non-surgical therapy

F, females; M, males; N/A, not available; CHX, chlorhexidine; OSFMD, one-stage full-mouth disinfection; SC, subgingival curettage; MTZ, metronidazole; RCT, randomized clinical trial; SRP, scaling and root planing; CP, chronic periodontitis; AP, aggressive periodontitis; PDR, pocket depth reduction; AL, attachment level; SS, statistical significance.

Table 2. Risk assessment for publication bias for the included randomized control trials (RCTs)

Criteria	Genovesi et al. (15)	Keestra et al. 2013	Sigusch et al. (16)
Sequence generation	N/A	Yes	Yes
Allocation concealment method	Yes	Yes	Yes
Examiner masked	Yes	UC	Yes
All patients accounted for at the end of the study	Yes	No	Yes
Incomplete or selective outcome reporting	UC	Yes	Yes
Free of suggestion of selective outcome reporting	Yes	Yes	Yes
Estimated potential risk of bias	Moderate	Moderate	Low

N/A, not available; UC, unclear.

The plaque index showed no significant difference up to 24 months. Twenty-four months after the second therapeutic phase, the authors observed a significant reduction in the average value of sulcus bleeding index (SBI) when compared with the control group ($P < 0.05$). Compared with the initial values differences were found in all three groups, but they were only significant in the second group ($P < 0.01$). The minor reduction of PPD and minimal gain of CAL were achieved only in the control group. Furthermore, group 2 had significantly higher mean CAL gain than the control group ($P < 0.01$). The highest CAL gain was reached in group 2 after 6 and 24 months.

Effectiveness of periodontal dressing placement during non-surgical therapy in chronic periodontitis patients

In Genovesi's et al. (15) study, 30 non-smokers healthy subjects with moderate to advanced chronic periodontitis were included. All patients received an initial treatment of motivation and removal of plaque and supra-gingival calculus. This was then followed by a periodontal treatment consisting of SRP and curettage of the gingival epithelium within 24 h. Following a split-mouth design, periodontal dressing was randomly assigned after SRP (SRP+ periodontal dressing placement versus SRP alone). The dressing was removed after 1 week. Two months after treatment, all clinical parameters including the level of oral hygiene, were single-blinded evaluated. The results showed a reduction in the full-mouth plaque score (FMPS), from 24.7% at the start to 4.8% at 2 months. However, this might be mostly due to the strict hygienic regimen to which patients were adopted. The full-mouth bleeding score (FMBS) was also reduced from 35.5% to 5.3% at 2 month. Additionally, both treatment groups obtained a significant PD reduction and CAL gain when compared to the baseline. The non-dressing treated sites showed a reduction of PPD of 1.6 ± 0.6 mm, while the dressing applied sites had a reduction of 2.4 ± 0.6 mm. For CAL, the differences were 1.4 ± 0.4 on the control side and 2.5 ± 0.4 mm on the test side and the differences were statistically significant ($P < 0.05$).

Table 3. Summary of main findings in the selected studies

Author Time-points	BOP (%)						PPD (mm)						CAL Gain (mm)						PS (%)												
	Control			Test			Control			Test			Control			Test			Control			Test									
	BL	FU	DF	BL	FU	DF	BL	FU	DF	BL	FU	DF	BL	FU	DF	BL	FU	DF	BL	FU	DF	BL	FU	DF	BL	FU	DF	BL	FU	DF	P-value
Keestra <i>et al.</i> (2013)	72.2 (44.8)	34.0 (47.4)	38.5 (3.01)	74.3 (43.7)	24.3 (42.9)	50.6 (3.01)	<0.001	5.29 (NA)	3.22 (NA)	2.07 (NA)	2.93 (NA)	2.38 (NA)	NA	2.07 (NA)	2.38 (NA)	NA	1.24 (NA)	1.50 (NA)	NA	70.8 (45.5)	33.4 (47.4)	37.4 (NA)	73.0 (44.4)	25.1 (43.4)	48.2 (NA)	<0.001					
Genovesi <i>et al.</i> (2010)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.6 (0.6)	2.4 (0.6)	NA	1.4 (0.4)	2.5 (0.4)	<0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sigusch <i>et al.</i> (2005)	NA	NA	NA	NA	NA	NA	NA	5.9 (NA)	4.6 (NA)	1.3 (NA)	6.2 (NA)	3.6 (NA)	2.6 (NA)	1.3 (NA)	2.6 (NA)	NA	1 (NA)	2.2 (NA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
								6.4 (NA)	2.4 (NA)	4 (NA)	6.4 (NA)	2.4 (NA)	4 (NA)	<0.01	NA	NA	NA	3.4 (NA)	3.4 (NA)	<0.01											

BOP, bleeding on probing; PPD, periodontal pocket depth; PDR, pocket depth reduction; CAL, clinical attachment level; PS, plaque score; BL, baseline; FU, longer follow-up; DF, difference, NA, not available.

Similar research design was performed by Keestra *et al.* (24) but in this study, the aim was to investigate up to 3 months the effectiveness of periodontal dressing removed 7 days after one-stage-full-mouth disinfection as described by Quirynen *et al.* (25) The periodontal dressing group showed a significant ($P < 0.05$) additional reduction of PD and gain of CAL for the moderate pockets of single- and multirooted teeth compared to non-dressing treated control group. Furthermore, a significant ($P < 0.05$) lower percentage of sites with PD ≥ 5 mm were shown for the periodontal dressing group compared to control group ($2.7\% \pm 16.3$ versus $4.8\% \pm 21.4$). In addition, the pain intensity (using a scale from 0 to 10) was significantly reduced when a periodontal dressing was used (5.13 ± 0.89 versus 3.42 ± 1.27).

Discussion

The rationale behind the application of a periodontal dressing is mainly based on the protection and stabilization of the blood clot. When the wound is stable, a proper wound healing can then take place (15, 26–28). The dressing pressure over the healing site could enhance soft tissue adhesion to the root/bone surface and prevent future bacterial infiltration, thus, improving the wound stability and the healing process, in addition to minimize the tissue rebound (15, 28) (Fig. 2). Significant reduction of root sensitivity and plaque deposit formation within the wound site has been also reported as potential advantageous properties (29). Conversely, Stahl *et al.* (30) observed no differences regarding the healing pattern after gingivectomy in a 8-week period. As a matter of fact, they found out higher plaque accumulation and more irritation to the soft tissues in the dressing group.

Scaling and root planing represents the most common and widely accepted procedure for the treatment of periodontitis (31). Recently, the use of dressing has been advocated to

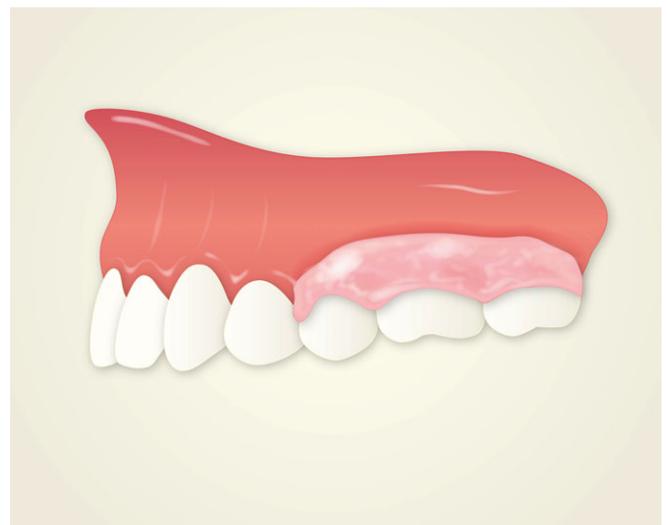


Fig. 2. Illustration of periodontal dressing placed after non-surgical therapy.

enhance non-surgical periodontal treatment outcomes due a significant reduction of PD and gain of CAL (15, 16, 24). Nevertheless, these findings must be carefully interpreted because such results must not be solely addressed by the application of the periodontal dressing. Data included in this review showed the short-term benefits, and the effects on clinical parameters when periodontal dressing was applied right after non-surgical SRP within different treatment modalities for periodontitis. Although the benefits of periodontal dressing during non-surgical therapy are often questioned, the potential advantages after surgical therapy have been critically acclaimed (4, 13, 14, 32, 33).

The impact of the periodontal dressing composition has been subject of concern due possible allergic reactions in the oral cavity. Numerous reviews had addressed the potential benefits and disadvantages of dressings (34, 35). Zinc oxide dressings containing eugenol have reported to have additional anaesthetic effects for pain reduction but may also induce contact allergies and risk of cytotoxicity at low and high dosages, respectively (36, 37). Although eugenol-free dressings had the intention to reduce those risks, an animal model reported an intense inflammatory reaction after dressing application when compared to the control group (38). On the other hand, cellulose-based dressings have shown less inflammatory reactions and better patient compliance due improved aesthetics (35). The superiority of one specific material upon clinical parameters had not been reported.

Commonly, dressings manufacturers suggest a 7-day regimen of application to maintain physical and mechanical properties of the dressing. Dimensional changes occur in all dressing materials that could lead to wound distortion (39). Long-term exposures may increase levels of cytotoxicity and plaque accumulation to the healing site due shrinkage of the dressing and thus, a detrimental effect on the healing process (40).

An antimicrobial agent in conjunction to non-surgical therapy is often limited to patients with systemic diseases or habits contributing to the periodontal disease status such as diabetes and smoking. Furthermore, antibiotic therapy is necessary to target periodontopathogens when dealing with according to the severity of the disease and entity of periodontitis. The prophylactic effect of local or systemic antibiotic delivery may overlap the therapeutic outcomes of periodontal dressing as observed in the treatment modalities of two of the included articles (24). In other words, periodontal dressings simply act as a physical barrier (41). Future studies should contain larger sample size, longer follow-up and better control to verify the observations noted in this paper.

Conclusion

The dearth of available evidence does not allow us to draw clear conclusions. However, within the limitation of this review, placement of periodontal dressing right after non-surgical mechanical therapy could be beneficial in improving overall short-term clinical outcomes, although more controlled

studies are still needed to validate this finding. The reasons for these clinical improvements remain to be determined.

Clinical relevance

Scientific rationale

Periodontal dressing has been advocated for surgical periodontal therapy. However, limited study has examined its effect on the non-surgical periodontal treatment. Hence, this systematic review was aimed at examining the effect of placement periodontal dressing after non-surgical mechanical therapy. This is because dressing not only protects the wound against outside insult but also pressures the tissue in attempt to minimize tissue rebound. This study demonstrated the clinical benefits of using periodontal dressing during non-surgical therapy and also pointed out more controlled studies are needed to further validate the observation noted in this study.

Principal findings

The systematic review showed that periodontal dressing applied after non-surgical periodontal therapy was effective in improving periodontal clinical parameters (e.g. reduction of probing pocket depth reduction and gain of clinical attachment level).

Practical implantations

Placement of periodontal dressing right after non-surgical mechanical therapy can be beneficial in improving overall clinical outcomes, although more controlled studies are still needed to validate this finding.

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References

- 1 Martin P. Wound healing—aiming for perfect skin regeneration. *Science* 1997; **276**: 75–81.
- 2 Polimeni G, Xiropaidis AV, Wikesjo UM. Biology and principles of periodontal wound healing/regeneration. *Periodontol 2000* 2006; **41**: 30–47.
- 3 Othman S, Haugen E, Gjermo P. The effect of chlorhexidine supplementation in a periodontal dressing. *Acta Odontol Scand* 1989; **47**: 361–366.
- 4 Sachs HA, Farnoush A, Checchi L, Joseph CE. Current status of periodontal dressings. *J Periodontol* 1984; **55**: 689–696.
- 5 Baer PN, Sumner CF 3rd, Miller G. Periodontal dressings. *Dent Clin North Am* 1969; **13**: 181–191.
- 6 Eaglstein WH, Mertz PM, Falanga V. Wound dressings: current and future. *Prog Clin Biol Res* 1991; **365**: 257–265.

- 7 Ramfjord SP. Root planing and curettage. *Int Dent J* 1980; **30**: 93–100.
- 8 Haugen E, Gjermo P, Orstavik D. Some antibacterial properties of periodontal dressings. *J Clin Periodontol* 1977; **4**: 62–68.
- 9 Koch G, Magnusson B, Nyquist G. Contact allergy to medicaments and materials used in dentistry. II. Sensitivity to eugenol and colophony. *Odontol Revy* 1971; **22**: 275–289.
- 10 Loe H, Silness J. Tissue reactions to a new gingivectomy pack. *Oral surgery, oral medicine, and oral pathology* 1961; **14**: 1305–1314.
- 11 Greensmith AL, Wade AB. Dressing after reverse bevel flap procedures. *J Clin Periodontol* 1974; **1**: 97–106.
- 12 Allen DR, Caffesse RG. Comparison of results following modified Widman flap surgery with and without surgical dressing. *J Periodontol* 1983; **54**: 470–475.
- 13 Yukna RA, Mellonig JT. Histologic evaluation of periodontal healing in humans following regenerative therapy with enamel matrix derivative. A 10-case series. *J Periodontol* 2000; **71**: 752–759.
- 14 Farnoush A. Techniques for the protection and coverage of the donor sites in free soft tissue grafts. *J Periodontol* 1978; **49**: 403–405.
- 15 Genovesi AM, Ricci M, Marchisio O, Covani U. Periodontal dressing may influence the clinical outcome of non-surgical periodontal treatment: a split-mouth study. *Int J Dental Hygiene* 2012; **10**: 284–289.
- 16 Sigusch BW, Pfitzner A, Nietzsche T, Glockmann E. Periodontal dressing (Vocopac) influences outcomes in a two-step treatment procedure. *J Clin Periodontol* 2005; **32**: 401–405.
- 17 Wikesjo UM, Nilveus RE, Selvig KA. Significance of early healing events on periodontal repair: a review. *J Periodontol* 1992; **63**: 158–165.
- 18 Oxford GE, Jonsson R, Olofsson J, Zelles T, Humphreys-Beher MG. Elevated levels of human salivary epidermal growth factor after oral and juxtaoral surgery. *J Oral Maxillofac Surg* 1999; **57**: 154–158; discussion 8-9.
- 19 Oxford GE, Nguyen KH, Alford CE, Tanaka Y, Humphreys-Beher MG. Elevated salivary EGF levels stimulated by periodontal surgery. *J Periodontol* 1998; **69**: 479–484.
- 20 Dayan D, Bodner L, Horowitz I. Effect of salivary gland hypofunction on the healing of extraction wounds: a histomorphometric study in rats. *J Oral Maxillofac Surg* 1992; **50**: 354–358.
- 21 Liberati A, Altman DG, Tetzlaff J *et al*. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med* 2009; **6**: e1000100.
- 22 Moher D, Hopewell S, Schulz KF *et al*. CONSORT 2010 Explanation and Elaboration: updated guidelines for reporting parallel group randomised trials. *J Clin Epidemiol* 2010; **63**: e1–e37.
- 23 Schulz KF, Altman DG, Moher D, Fergusson D. CONSORT 2010 changes and testing blindness in RCTs. *Lancet* 2010; **375**: 1144–1146.
- 24 Keestra JA, Coucke W, Quirynen M. One-stage full-mouth disinfection combined with a periodontal dressing: a randomized controlled clinical trial. *J Clin Periodontol* 2014; **41**: 157–163.
- 25 Quirynen M, Bollen CM, Vandekerckhove BN, Dekeyser C, Papaioannou W, Eyssen H. Full- vs. partial-mouth disinfection in the treatment of periodontal infections: short-term clinical and microbiological observations. *J Dent Res* 1995; **74**: 1459–1467.
- 26 Pritchard JJ. The control or trigger mechanism induced by mechanical forces which causes responses of mesenchymal cells in general and bone apposition and resorption in particular. *Acta Morphol Neerl Scand* 1972; **10**: 63–69.
- 27 Leknes KN, Lie T, Selvig KA. Root grooves: a risk factor in periodontal attachment loss. *J Periodontol* 1994; **65**: 859–863.
- 28 Farman M, Joshi RI. Full-mouth treatment versus quadrant root surface debridement in the treatment of chronic periodontitis: a systematic review. *Br Dent J* 2008; **205**: E18; discussion 496-7.
- 29 Cheshire PD, Griffiths GS, Griffiths BM, Newman HN. Evaluation of the healing response following placement of Coe-pak and an experimental pack after periodontal flap surgery. *J Clin Periodontol* 1996; **23**: 188–193.
- 30 Stahl SS, Witkin GJ, Heller A, Brown R Jr. Gingival healing. 3. The effects of periodontal dressings on gingivectomy repair. *J Periodontol* 1969; **40**: 34–37.
- 31 Socransky SS, Haffajee AD, Smith C, Duff GW. Microbiological parameters associated with IL-1 gene polymorphisms in periodontitis patients. *J Clin Periodontol* 2000; **27**: 810–818.
- 32 Mellonig JT, Valderrama P, Gregory HJ, Cochran DL. Clinical and histologic evaluation of non-surgical periodontal therapy with enamel matrix derivative: a report of four cases. *J Periodontol* 2009; **80**: 1534–1540.
- 33 Melcher AH. On the repair potential of periodontal tissues. *J Periodontol* 1976; **47**: 256–260.
- 34 Freedman M, Stassen LF. Commonly used topical oral wound dressing materials in dental and surgical practice—a literature review. *J Ir Dent Assoc* 2013; **59**: 190–195.
- 35 Baghani Z, Kadkhodazadeh M. Periodontal dressing: a review article. *J Dent Res Dent Clin Dent Prospects*. 2013 Fall; **7**: 183–191.
- 36 Sarrami N, Pemberton MN, Thornhill MH, Theaker ED. Adverse reactions associated with the use of eugenol in dentistry. *Br Dent J* 2002; **193**: 257–259.
- 37 Wright DA, Payne JP. A clinical study of intravenous anaesthesia with a eugenol derivative, G.29.505. *Br J Anaesth* 1962; **34**: 379–385.
- 38 Saito CT, Bernabe PF, Okamoto T, Murata SS, Hamata MM, Sundfeld ML. Evaluation of tissue response to periodontal dressings: histological study in tooth sockets of rats. *J Appl Oral Sci* 2008; **16**: 219–225.
- 39 Rubinoff CH, Greener EH, Robinson PJ. Physical properties of periodontal dressing materials. *J Oral Rehabil* 1986; **13**: 575–586.
- 40 Heaney TG, Appleton J. The effect of periodontal dressings on the healthy periodontium. *J Clin Periodontol* 1976; **3**: 66–76.
- 41 O’Neil TC. Antibacterial properties of periodontal dressings. *J Periodontol* 1975; **46**: 469.
- 42 Keestra JA, Coucke W, Quirynen M. One-stage full-mouth disinfection combined with a periodontal dressing: a randomized controlled clinical trial. *Journal of clinical periodontology* 2014; **41**: 157–163.
- 43 Genovesi AM, Ricci M, Marchisio O, Covani U. Periodontal dressing may influence the clinical outcome of non-surgical periodontal treatment: a split-mouth study. *International journal of dental hygiene* 2012; **10**: 284–289.