

PERIODONTIUM RESPONSE TO GINGIVAL DISPLACEMENT

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Summary

Aim. To evaluate the effect on post-operative results of different types of retraction techniques on periodontium. **Material and methods.** The following electronic databases sources were searched: PubMed, the Cochrane library and Researchgate. The search was carried out according to PRISMA guidelines. Due to lack of appropriate articles earliest period was not restricted, but only in vivo studies were included, articles were collected using keywords: "gingiva", "displace", "periodontal health". Studies that met the inclusion criteria were evaluated using Cochrane risk of bias tool. Only low and moderate risk articles were included into this systematic review.

Results. After duplicates removal 55 articles left from which 9 were included into this systematic review. The data from studies were collected and evaluated in a systematic manner. Data tables were created for summarisation.

Conclusion. Gingival retraction has negative, but reversible effect on periodontium, which could lead to gingival bleeding, inflammation and even recession. Conventional retraction using retraction cord has more negative effect on periodontium also it is more painful method, than retraction paste.

Introduction

Gingival retraction is displacement of the marginal gingiva away from a tooth. Lateral retraction displaces the tissues so that an adequate bulk of impression material can be interfaced with the prepared tooth. Vertical retraction exposes the uncut portion of the tooth apical to the finish line [1].

Various gingival retraction methods and materials are available nowadays. These are classified broadly as mecha-

nical, chemo-mechanical, cordless and surgical techniques. This review focuses on the rationale behind gingival retraction and a discussion of the newer modalities developed in this regard [2].

The most widely used method by 98 % of prosthodontists is the retraction cords they are mechanical form of retraction. They are predictable, effective and safe compared* to rotary gingival curettage and electrosurgery [3].

However, these retraction methods being technique sensitive and causing trauma to the soft tissues which could lead to gingival bleeding and even gingival recession [4,5].

Recently, cordless systems have been developed to save time and enhance patient compliance. The material offered is usually paste or foam that is injected into the crevicular sulcus. This removes the need for the clinician to physically compress the material into the sulcus, where it may generate high pressure and cause injury [10].

Even though there are many studies about different retraction types and its effectiveness, however there is lack of structured information about effect of different gingival retraction techniques on periodontium.

The aim of our study was systematically analyse and evaluate effect of mechanical, chemo-mechanical and cordless retraction methods on periodontium.

Methods and material

A systematic literature search was performed according to PRISMA guidelines in search of clinical trials. Electronic and manual literature searches were conducted independently by all authors in several databases, including MEDLINE (PubMed), Cochrane Central Register of Controlled Trials (Cochrane Library), Researchgate. Databases were searched using different combinations of the following keywords: gingiva, displace, periodontal health. The titles and abstracts first were analysed, followed by the selection of

complete articles for careful reviewing and analysis according to the eligibility criteria.

Studies inclusion criteria:

In vivo studies;

Studies published in English;

Studies comparing the effect of using non-impregnated retraction cord and retraction paste on the periodontium;

Studies comparing the effect of using impregnated retraction cord and retraction paste on the periodontium;

The survey sample ≥ 20 teeth

All case reports or case series, animal and in vitro studies were excluded. Publications that met inclusion criteria were drawn to the qualitative analysis study pool. From this, publications that met qualitative assessment criteria were selected into this literature review.

The quality of selected randomized clinical trials (RCT) was assessed using the Cochrane Risk of Bias Tool (Table 1).

Results

Search outcomes. The combinations of search terms identified a total of 65 titles. After removal of duplicates, 55 records remained. Of these, 44 did not meet the inclusion criteria, leaving 11 manuscripts for more detailed review. Finally, 9 manuscripts fulfilled all inclusion criteria and underwent systematic review. The article searches and selection process is presented in PRISMA flow diagram (Figure 1).

Groups of retraction methods. All included studies were in vivo and published in English. Different retraction methods were compared evaluating: bleeding after retraction [8-10,12,14], recessions [6,12,14], changes in clinical attachment level [7,13], tooth mobility [7,13], probing depth [7,13], plaque index [7,14], pain during retraction [6,13], inflammatory cytokine levels in gingival crevicular fluid (GCF) [13] and effect on the gingival sulcular epithelium [11].

Table 1. Cochrane Risk of Bias Tool

+ low risk; ± unclear risk; - high risk.

Authors	Random sequence generation	Con-founding variables	Incomplete outcome	Measurement of intervention	Selective outcome reporting	Total risk
Jen – Chang Yang et al. (6)	±	+	+	+	+	Unclear risk
Al Hamad KQ et al. (7)	±	+	+	+	+	Unclear risk
Ozlem Acar et al. (8)	+	+	+	+	+	Low risk
Parampreet Kaur Kohli et al. (9)	±	+	+	+	+	Unclear risk
Sumi Chandra et al. (10)	+	+	+	+	+	Low risk
Sushma Phatale et al. (11)	±	+	+	+	+	Unclear risk
Mahmoud Kazemi et al. (12)	+	+	+	+	+	Low risk
H. R. Sarmiento et al. (13)	+	+	+	+	+	Low risk
Ashish R Jain et al. (14)	+	+	+	+	+	Low risk

All studies were divided into two groups. First group: studies comparing impregnated retraction cord and retraction paste [6,8,10-13] (Table 2). Second group: studie comparing non-impregnated retraction cord and retraction paste [7-9,14] (Table 3).

Bleeding after retraction. Bleeding after retraction was the main evaluation criteria for the retraction effect on periodontium. It was measured in five out of nine analyzed studies [8-10,13,14].

Kohli et al. found that bleeding after retraction paste removal was statistically significantly lower compared to non-impregnated retraction cord (9). Same results were also reported in Jain AR et al. study [14].

Chandra S et al. and Sarmiento HR et al. in their studies were comparing impregnated retraction cord and retraction paste. Both studies showed that there is no statistically significant difference between groups [10,13].

However, Acar O et al. have found that bleeding after retraction in impregnated cord group was statistically lower than in non-impregnated cord group, but statistically higher than in paste group [8].

Recessions. Recessions in all studies were measured from casts [6,12,14]. Follow-up in studies ranged from one week [12] to one month [14]. Yang JC et al.

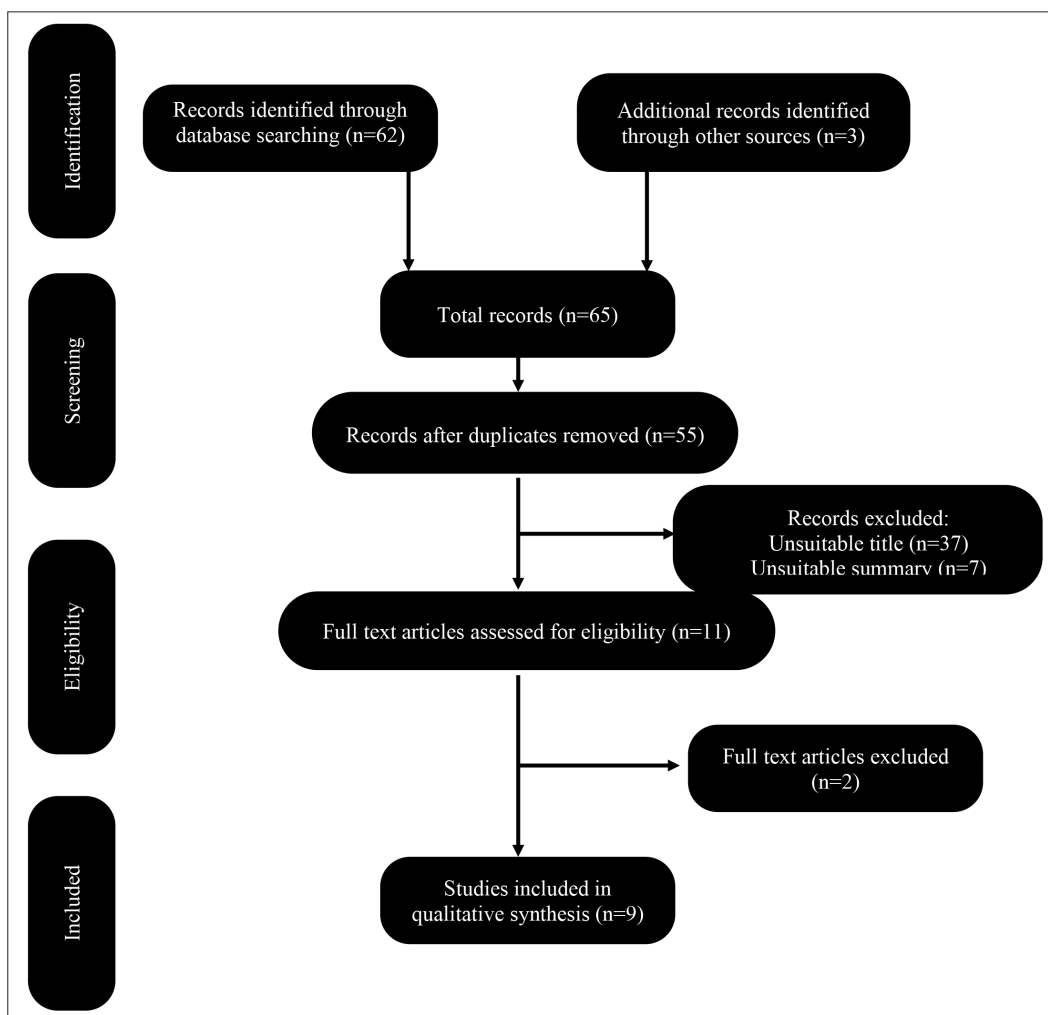


Figure 1. PRISMA flow diagrams

and Kazemi M et al. were comparing impregnated retraction cord and retraction paste [6,12].

The biggest recession (0,27 mm) was found in retraction cord group 14 days after retraction, and the slightest recession (0,03 mm) was found in retraction paste group 28 days after retraction [12].

Both studies found that recessions in impregnated retraction cord group were statistically significantly bigger than in retraction paste group [6,12].

However, Jain AR et al. have not noticed statistically significant difference between non-impregnated retraction cord and retraction paste [14].

Tooth mobility and changes in clinical attachment level. In addition to other clinical parameters Al Hamad HQ et al. and Sarmiento HR in their studies also evaluated tooth mobility and changes in clinical attachment level. Both stu-

dies suggested that there are no changes in tooth mobility and clinical attachment level after retraction [7,13].

Probing depth. Probing depth was measured in millimeters before and after retraction. No statistically significant change in probing depth was observed in any of the studies [7,13].

Plaque index. Plaque index was measured by scores from 0 (no plaque) to 2 (average amount of plaque) [7,13]. The biggest increase in plaque index 8,3% was noticed on 10th day after retraction with cord in Sarmiento HR et al. study [13]. However, statistically significant difference between groups was not noticed [7,13].

Subjective parameters. Pain is considered as subjective parameter, making it quite difficult to create standardized conditions for its assessment. In Yang JC et al. study pain was evaluated in point from 0 (no pain) to 4 (strong pain).

Authors found that pain in retraction paste group was statistically significant less compared to retraction cord group [6].

Meanwhile Sarmiento HR et al. in their study divided answers into two groups either it is painful or not painful. They have not noticed statistically significant difference between groups, however clinically less pain was observed in retraction paste group [13].

Histological parameters. A study by Van der Velden and De Vries in 1978 has shown that the epithelial attachment sustains injuries at a force of 1 N/mm² while it ruptures at 2.5 N/mm². The pressure applied by the retraction cord is between 5 and 10 N/mm². To avoid any damage to the epithelial attachment, gingival retraction should be accomplished under a pressure between 0.1 and 1 N/mm² [14].

The aim of Phatale et al. study was to determine the effect of the most used retraction materials on gingival sulcular epithelium. The histological specimen of the retraction cord revealed that the cord was pressed past the cemento-enamel junction with facial displacement of the entire gingival unit. The sulcular epithelium was present but disrupted. The junctional epithelium was sometimes missing from the outermost border. The residual junctional epithelium displayed intracellular hydropic degeneration, stripping, and desquamation of the

epithelium. However, the histological specimen of the retraction paste shows only eight cases of disrupted junctional epithelium and sulcular epithelium, as compared to the retraction cord. The remaining specimens show an intact junctional epithelium. Authors claim that there is a significant association between retraction materials and the gingival sulcular epithelium [11].

Immunological parameters. Sarmiento Hr et al. have found that both gingival displacement techniques increased the mean concentrations of the three evaluated cytokines, with the highest concentrations observed in association with conventional technique. Cordless gingival displacement resulted in statistically lower proinflammatory cytokine levels in gingival crevicular fluid compared to conventional technique [13].

Table 2. General characteristics of impregnated retraction cord and retraction paste studies
- data not specified in the article

Authors	Number of teeth examined	Examined teeth group	Retraction method			Follow up
			Cord		Paste	
			Impregnated	Size		
Yang J-C et al. (6)	24	Front	Epinefrine	1	With 15% AlCl ₃ ; Without AlCl ₃	14 days
Acar O et al. (8)	126	-	AlCl ₃	-	With 15% AlCl ₃	No
Chandra S et al. (10)	80	Front	AlSO ₄ ; Epinefrine	1	With 15% AlCl ₃	1, 7 days
Phatale S et al. (11)	30	Back	AlCl ₃	2-0	With 15% AlCl ₃	No
Kazemi M et al. (12)	20	Back	AlCl ₃	1	With 15% AlCl ₃	7, 14, 28 days
Sarmiento H-R et al. (13)	24	Front	AlCl ₃	2-0	With 15% AlCl ₃	1, 10 days

Table 3. General characteristics of non-impregnated retraction cord and retraction paste studies
- data not specified in the article

Authors	Number of teeth examined	Examined teeth group	Retraction method		Follow up
			Size of non-impregnated retraction cord	Paste	
Al Hamad HQ et al. (7)	180	Back	3-0	With 15% AlCl ₃	1, 7 days
Acar O et al. (8)	126	-	-	With 15% AlCl ₃	No
Kohli PK et al. (9)	60	Back	-	With 15% AlCl ₃	No
Jain A-R et al. (14)	78	Back - 49 Front - 29	1	With 15% AlCl ₃	1, 3 months

Discussion

From a biological point of view, it is better to choose restoration margins above the gingiva, but for aesthetic reasons, dentists are often forced to complete the margins at or below the gingiva. In such restorations, retraction is inevitable. To reduce periodontal trauma during retraction, it is recommended to:

- Choose a retraction paste - this technique

eliminates the need for the dentist to physically push the material into the sulcus and thus potentially cause excessive pressure and injury. Paste is placed more passively into the sulcus, thus reducing pain during retraction. Also, most retraction pastes contain a hemostatic, which reduces the chance of bleeding after retraction.

- If it is not possible to perform retraction with a paste - choose a hemostatically impregnated retraction cord. Keeping in mind that correct performance of the procedure needs to be done in order not to damage the epithelial connection.

- To avoid any damage to the epithelial junction of the gingival sulcus, gingival retraction should be performed with a force between 0.1 and 1 N/mm². The epithelial junction can withstand a trauma of 1 N/mm², and a force of 2.5 N/mm² break it, unfortunately pressure most used to place a retraction cord is between 5 and 10 N/mm².

Conclusion

Gingiva displacement has a negative but reversible effect on the periodontal, it can cause gingival bleeding, inflammation and even recession. Gingival retraction using cord has more negative effect on the periodontium and is more painful method compared to retraction paste, which effect on periodontium in most cases are statistically and clinically insignificant. In order to reduce periodontal trauma during retraction, it is recommended to choose retraction paste or impregnated retraction cord, which is placed into the sulcus using a force of 0.1 - 1 N/mm².

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DANTENŲ RETRAKCIJOS POVEIKIS PERIODONTUI

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Raktažodžiai: dantenos, retrakcija, retrakcinis siūlas, retrakcinė pasta, periodontas.

Santrauka

Tikslas. Įvertinti skirtingų retrakcijos metodų poveikį periodontui.

Metodai. Publikacijų paieška atlikta elektroninėse duomenų bazėse: PubMed, Cochrane Library - ResearchGate. Paieška atlikta remiantis PRISMA rekomendacijomis. Dėl duomenų stygiaus, paieška nebuvo apribota pradžios laikotarpiu, ieškota tik in vivo tyrimų, naudojant raktažodžius: „gingiva“, „displace“, „periodontal health“. Įtraukimo kriterijus atitinkančių straipsnių kokybė buvo įvertinta remiantis Cochrane atsitiktinių imčių tyrimų šališkumo vertinimo priemone. Mažos ir vidutinės rizikos straipsniai buvo įtraukti į šią sisteminę literatūros apžvalgą.

Rezultatai. Pašalinus dublikatus, buvo atrinkti 55 straipsniai, iš kurių 9 įtraukti į šią sisteminę literatūros apžvalgą. Tyrimų duome-

nys buvo susisteminti, apibendrinti ir pateikti lentelėse.

Išvados. Dantenų retrakcija turi neigiamą, bet grįžtamą poveikį periodontui, kuris gali sukelti dantenų kraujavimą, uždegimą ir netgi recesiją. Remiantis išanalizuotais tyrimais, įprastinis retrakcijos metodas su siūlu turi labiau neigiamą poveikį periodontui ir yra skausmingesnis retrakcijos metodas, lyginant su retrakcine pasta.

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