

Research Report

The comparison of minocycline oral rinse and gel to reduce pocket depth

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ABSTRACT

Background: Infection disease is still considered as a prominent disease in many developing countries, like Indonesia. The most oral infection disease is periodontitis. Despite scaling and root planning as the main therapy, minocycline as adjunct therapy has already been used for periodontitis. There are a lot of media used, such as oral rinse and gel. Many researches even have also shown that the use of minocycline as adjunct therapy can decrease inflammation in periodontitis. Like tetracycline, minocycline as an anti inflammatory and anticollagenase is also considered to be very effective for the treatment of periodontitis. Media of minocycline that are available are gel, fiber, and oral rinse, as the newest one. **Purpose:** The purpose of this research is to examine the comparison of 0.2% oral rinse minocycline and 2% minocycline gel to reduce the pocket depth. **Methods:** The samples were divided into two groups, the first group using oral rinse and the second one using gel after scaling and therapy. **Result:** There was no statistically significant difference between the group with minocycline gel and oral rinse. **Conclusion:** Minocycline gel and oral rinse has the same effect in reducing pocket depth.

Key words: minocycline gel, oral rinse, pocket depth

ABSTRAK

Latar belakang: Penyakit infeksi masih merupakan kasus yang menonjol di banyak Negara berkembang, seperti Indonesia. Infeksi rongga mulut yang banyak terjadi adalah periodontitis. Selain terapi utama yaitu skeling dan root planning, menggunakan minosiklin sebagai terapi tambahan telah banyak digunakan, seperti obat kumur dan gel. Banyak penelitian menunjukkan bahwa penggunaan minosiklin sebagai terapi tambahan dapat menurunkan peradangan pada pasien periodontitis. Seperti tetrasiklin, minosiklin sebagai anti peradangan dan anti kolagenase, sangat efektif sebagai perawatan periodontitis. Media minosiklin yang banyak digunakan di antaranya yaitu gel, fiber, dan obat kumur yang terbaru. **Tujuan:** tujuan penelitian adalah mengetahui perbandingan antara penggunaan 0,2% obat kumur minosiklin dan 2% minosiklin gel untuk mengurangi kedalaman poket periodontal. **Metode:** Sampel dibagi menjadi dua grup, grup pertama menggunakan obat kumur, dan kelompok kedua menggunakan gel, setelah terapi skeling. **Hasil:** Tidak ada perbedaan yang signifikan antara kelompok minosiklin obat kumur dan gel. **Kesimpulan:** Minosiklin gel dan obat kumur sama-sama efektif dalam mengurangi kedalaman poket.

Kata kunci: minosiklin gel, obat kumur, kedalaman poket

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INTRODUCTION

Periodontitis actually can be defined as an infection diseases attacking periodontal tissue caused by specific microorganism with many clinical manifestation, started

from bleeding, inflammation, bone resorption, dental instability, to dental extraction. Periodontitis, moreover, manifests in various infections with many clinical manifestation of medical history as well as with many treatment responses depended on many factors, including

bacteria, response of host immune and also environmental factor.¹

Periodontitis is usually related with the increasing of the number of bacteria pathogen, such as *Porphyromonas gingivalis*, *Prevotella intermedia*, *Bacteriodes forsythus*, and *Actinobacillus actinomycetemcomitans* that has already been published widely. Periodontal disease can be classified into advanced chronic periodontitis, refractory periodontitis, and aggressive periodontitis.²

Therefore, eliminating plaque and calculus is considered to be the most prominent stage in periodontitis therapy even though the common recurrence caused by periodontophatogen invading into gingival epithel, cementum, and dentin tubuli cannot be cleaned mechanically. Many researches have already shown that the use of antibiotics either systemically or locally was very useful to support the early periodontal therapy, involving scaling and root planning. Antibiotics can be given systemically per oral or locally like in gel, encapsulated, mouthwash, and others.³ This fact becomes the base of the critical framework that antibiotics is needed to support the success of the treatment for periodontal disease, either systemically or locally.

In addition, the use of antibiotics locally is by inducing it directly into the pocket in order to make the level of medicine in pocket increasing, as a result, the medicine can also penetrate into root surface and periodontal smooth tissue, which then is expected to be more effective than systemically antibiotics.² Locally antibiotics can also prevent and minimize many side effects caused by the use of antibiotics systemically.⁴

Minocycline, as antibiotics derived from the second generation of tetracycline, has already been improved for therapy of periodontal disease since it can effectively attack periodontal phatogen.^{4,5} Minocycline, has wide spectrum that can actively attack negative and positive gram bacteria that cause chronic periodontitis. The character of minocycline actually is bacteriostatic which can constrain the protein synthesis from bacteria.⁶ Minocycline also has anti-inflammatory character which can constrain apoptosis (cell death) by increasing TNF alpha and managing cytokine regulation. The effect of this anti-inflammatory charater is also influenced by direct action of T cell in microglia which can decrease the capability of T cell in connecting with microglia, and then can affect the producing of in signal mediator of cell T and microglia.⁶

There are many treatments for periodontal disease that have already used the application of minocycline in many media. The most available media of minocycline is gel, but the media of minocycline in mouthwash has been improved, especially for curing reccurent aphthous stomatitis (RAS).⁸ Based on the results of many researchers, it is known that the use of minocycline locally can also reduce the pocket depth, bleeding during probing, and improve clinical adhesion.⁸ Locally antibiotics is a local anti-microbe that is effective for periodontophatogen, as anti inflammation.²

Based on the above explanation, the writer would like to analyze which kind of minocycline is more effective in reducing the pocket depth.

MATERIALS AND METHOD

This research is a clinical research for measuring the depth of periodontal pocket before and after the application of minocycline. This experiment was done in Periodonsia Clinic of Faculty of Dentistry Airlangga University, from November 2007 to Januari 2008. Samples are involving patients who must meet the following criteria: 30–50 years old, male or female, having no allergic history with minocycline (tetracycline), not having pregnancy on breastfeeding, not having period, having chronic periodontitis with 3–6 mm periodontal pocket, not systemically (per oral) using antibiotics or anti-inflammation and application of gel or mouthwash minimally about 30 days, in good condition or having no systemic abnormality from the beginning to the end of measuring.

The samples are divided into two groups, the first group with the application of 2% minocycline gel (Figure 1) and the second one with the application of 0.2% minocycline mouthwash. Based on the previous study, 2% of minocycline is the best concentration for reducing the pocket depth compared with other concentrations.¹² Furthermore, 2% minocycline gel is made from 2 grams of pure minocycline powder mixed with 100 grams of ungintum gel (poly propylene glycol). This mixing process must be done immediately before it is applied and then put into spuit used for inducing it into the pocket. Meanwhile, minocycline mouthwash 0.2% is made by 0.2 grams of pure minocycline powder mixed with 100 ml sterile aquadest, and then is used for mouth-washing.



Figure 1. Application of 2% minocycline gel in periodontal pocket.

Note:

- A : Group after the application of mouthwash in the 4th week
- B : Group after the application of gel in the 4th week
- C : Group after the application of mouthwash in the 6th week
- D : Group after the application of gel in the 6th week

For both groups, the measuring of the pocket depth has been done before scaling. After scaling, the application of 2% minocycline gel is done in the first group and redone one week later.¹¹ The measuring of the periodontal pocket depth

Table 1. The T test result of the difference of the pocket depth in the group with the application of mouthwash

No		N	$\bar{X}$	SD	SE	Signif. 2 tailed	T
1	Before the application of mouthwash	15	3.6667	0.61721			
	After the application of mouthwash in the fourth week	15	2.6000	0.63246		0.000	5.172
2	Before the application of mouthwash	15	3.6667	0.61721	0.15936		
	After the application of mouthwash in the sixth week	15	2.3333	0.48795	0.12599	0.000	8.367
3	After the application of mouthwash in the fourth week	15	2.6000	0.63246	0.16330		
	After the application of mouthwash in the sixth week	15	2.3333	0.48795	0.12599	0.104	1.174

Table 2. The T test result of the difference of the pocket depth in the group with the application of gel

No		N	$\bar{X}$	SD	SE	Signif 2 tailed	T
1	Before the application of gel	15	4.3333	0.61721	0.15936		
	After the application of gel in the fourth week	15	3.1333	0.74322	0.19190	0.000	6.874
2	Before the application of gel	15	4.3333	0.61721	0.15936		
	After the application of gel in the sixth week	15	2.8000	0.56061	0.14475	0.000	11.500
3	After the application of gel in the fourth week	15	3.1333	0.74323	0.19190		
	After the application of gel in the sixth week	15	2.8000	0.56061	0.14475	0.55	2.092

Table 3. The T test result of the difference of the pocket depth between the group with the application of mouthwash and that with the application of gel

No		N	$\bar{X}$	SD	SE	Signif 2 tailed	T
1	After the application of mouthwash in the fourth week	15	1.0667	0.79881	0.20625		
	After the application of gel in the fourth week	15	1.2000	0.67612	0.174517	0.610	-0.521
2	After the application of mouthwash in the sixth week	15	1.3333	0.61721	0.15936		
	After the application of gel in the sixth week	15	1.5333	0.57640	0.13333	0.334	-1.000

is redone in the fourth and sixth weeks. Meanwhile, the second group is instructed to wash their mouth with 0.2% minocycline twice a day for seven days.¹¹ The measuring of the pocket depth was also done in the fourth and sixth weeks. Before the fourth week, the measuring of the pocket depth cannot be done since the condition of periodontal tissue is still weak. Therefore, if probing is done before the fourth week, it will affect the process of recovery.

RESULT

The difference of the pocket depth before and after the application of 0.2% minocycline mouthwash can be seen in Table 1. There was significant difference between before and after the application of mouthwash in the fourth week ($p = 0.000$). Similarly, there was also significant difference between before and after the application of mouthwash

in the sixth week ($p = 0.000$). However, there was no significant difference after the application of mouthwash in the fourth week and in the sixth week ($p = 0.104$). Thus, it can be concluded that there was significant difference in the sample group before and after the application of mouthwash.

The comparison of the difference of the pocket depth between before and after the application with minocycline 2% gel can be seen in Table 2. There was significant difference between the group with the application of 2% gel in the fourth week compared with that before the application ($p = 0.000$). Similarly, it is known that there was also significant difference between the group with the application of 2% gel in the sixth week compared with that before the application ($p = 0.000$). Nevertheless, there was no significant difference between the group with the application of 2% gel in the fourth week compared with that in the sixth week ($p = 0.55$). Therefore, it can be concluded that there was significant difference in the sample group before and after the application of gel.

The comparison of the difference of the pocket depth between the group with the application of minocycline 2% gel and that with the application of minocycline mouthwash can be seen in following table 3. There was no significant difference between the group with the application of mouthwash and that with the application of gel in the fourth week, about $p = 0.610$ ($p < 0.05$). Similarly, there was no significant difference between the group with the application of mouthwash and that with the application of gel in the sixth week, about $p = 0.334$. This, there was no significant difference between the sample group with the application of mouthwash and that with the application of gel.

DISCUSSION

Periodontal disease is marked by the inflammation and the dental supporting tissue damage. This inflammation is marked by the progressive damage of periodontal ligament, alveolar bone, followed by pocket forming (the gingival sulcus pathologically becomes deeper), and gingival recession occurred (the clinical decreasing of gums).² This periodontal treatment is aimed to maintain the dental function as well as to prevent and reduce the severity of the disease. The success of this treatment can be obtained by decreasing or eliminating bacteria pathogen, and by repairing the capability of tissue in maintaining and repairing itself.²

Many clinical researchs about the use of antibiotics for treating periodontal disease have been conducted. The use of antibiotics even can be done as the single method of the treatment or combined with scaling and root planing in periodontitis treatment. The use of antibiotics is aimed to eliminate bacteria pathogen in periodontal pocket, while scaling and root planing are aimed to repair the gingival health by eliminating all factors that can cause the inflammation on the dental surface. Gel antibiotics in the

low concentration can directly applied in the dental surface without causing side effects like in systemically using.^{2,10}

In this research, scaling and root planning together with the measuring of the pocket depth was done in both groups, one group with the application of mouthwash and the other one with the application of gel. The result of the research showed that the pocket depth in the group with the application of mouthwash was decreasing in the fourth week after the application (Table 1). This result is similar with the result of the previous study in which the use of minocycline as the additional therapy together with scaling and root planing can improve the recovery of periodontitis. One of the recovery processes is the decreasing of the pocket depth.¹¹

Meanwhile, unlike before the application of mouthwash, the pocket depth in the group was decreasing after the application in the sixth week (Table 1). The result is similar with the result of the previous studies in which the additional therapy of minocycline with the application of mouthwash is proved to be able to decrease the inflammation.¹¹ Since it can cause the eliminating of bacteria, the recovery of periodontitis can become better than that only with scaling and root planing.³ However, after the application of mouthwash, there was no statistically significant difference between the pocket depth in the fourth week and that in the sixth week. But, based on the data, the bigger decreasing of the pocket depth occurred in the sixth week.

Unlike before the application, in the fourth week, the decreasing of the pocket depth was about 1.0667 mm. Meanwhile, in the sixth week the decreasing was about 1.3334 mm (Table 1). It is may be caused by the scaling before the application of mouthwash can eliminate the amount of subgingiva microorganism and can affect the health of periodontal tissue.² From the fourth week to the sixth week the sample group is predicted to be able to maintain oral hygiene well, therefore, in the sixth week the decreasing of the pocket depth would be better than that in the fourth week. By improving the health of the tissue, the pocket depth would be decreasing because of the improving of the adhesion. The decreasing of the pocket depth actually is clinically important since if the pocket is deep, plaque control will be difficultly done, thus, the abnormality can possibly recurrent.²

There was the decreasing of the pocket depth after the application of 2% minocycline gel in the fourth week (Table 2). This result was similar with the result of the previous finding that minocycline gel is effective to be applied directly in the periodontal pocket in order to effectively attack microorganism relating with periodontitis, such as *Porphyromonas gingivalis*, *T. forsythia*, *P. intermedia*, and *Aa. comitans*.¹²

The significant difference of the decreasing of the pocket depth between before and after the application of 2% minocycline gel, moreover, occurred in the sixth week (Table 2). It is also known that with the application of minocycline gel the reparation of periodontal tissue can involve the decreasing of bleeding on probing (BOP) and the decreasing of the pocket depth in the sample group compared with that in the control group.¹²

Based on the comparison of the sample group using the application of gel before and after the application in the sixth week, furthermore, there was the decreasing of the pocket depth (Table 2). This result was similar with the result of the previous researches stating that minocycline gel is effectively used for the additional therapy of periodontal disease, especially for eliminating microorganism, decreasing the pocket depth, decreasing the score of bleeding index, and repairing the adhesion.³ It is also caused by the effective character of minocycline in eliminating the growth of negative gram periodontal pathogen, by the high concentration of gingival crevicular fluid (GCF), and by the slow release in the periodontal pocket.¹³

Moreover, based on the comparison of the sample group using the application of gel in the fourth week and in the sixth week (Table 2) there was no significant difference among them. However, the decreasing of the pocket depth was bigger in the sixth week. In the fourth week, the decreasing of the pocket depth was only about 1.200 mm compared with that before the application. Meanwhile, in the sixth week, the decreasing of the pocket depth was about 1.533 mm compared with that before the application (Table 1). The reason is possibly because the patients can maintain oral hygiene as instructed by operator, thus, the decreasing of the pocket depth was better in the sixth week.

Based on the comparison between the sample group using the application of mouthwash and the one using the application of gel in the fourth week (Table 3) there was no significant difference among them. Nevertheless, it is also known that the decreasing of the pocket depth in the group with the application of gel was better, about 1.0667 mm, than the one with the application of mouthwash, about 1.200 mm (Table 3). The reason is because with the application of gel, the medicine can directly penetrate into periodontal pocket and can eliminate bacteria causing periodontitis in the pocket. Therefore, if the amount of bacteria causing the damage of periodontal tissue is decreasing, the recovery process will be better. Besides that, minocycline also has capability in constraining the protein synthesis of bacteria, and in attacking periodontal pathogen, such as *P. gingivalis*, *P. intermedia*, *F. nucleatum*, and *Aa Comitans*.⁶

Based on the result, there was no decreasing of the pocket depth in the sample group with the application of mouthwash and the one with the application of gel in the sixth week (Table 3). However, the decreasing of the pocket depth in the group using the application of gel was better, about 1.533mm, than the one using the application of mouthwash, about 1.337 mm.

It indicates that scaling and root planing therapies together with the use of minocycline gel can reduce the pocket depth as same as the result of the previous researches. It is related with bacteriostatic effect and resistance activities of metalloproteinase matrix (MMP) derived from minocycline. Minocycline considered as analog of tetracycline, actively attacks bacteria with wide spectrum from periodontal pathogen. The high

concentration of local minocycline has anti-infection effect when penetrates into biofilm of plague compared with that used systemically.⁷

Compared with the application of mouthwash, the application of gel was more useful since it was directly penetrated into the pocket, and then the release occurred slowly. But, the decreasing of the pocket depth in of group are the same of gel was also better than bouth not significant.

Based on the result of this research, it can be concluded that the use of minocycline locally either in application of 2% gel or 0.2% mouthwash after scaling and root planing can reduce the pocket depth. Nevertheless, it still needs further researches about the efficiency of the use of either the application of 2% minocycline gel or the application of 0.2% minocycline mouthwash in reducing pocket depth (more than 6 mm) so periodontal surgery demand can be minimized.

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