

# Topical doxycycline after nonsurgical instrumentation of deep periodontal pockets: Results from a prospective case series with 12 months' follow-up

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## Abstract

### Objective

The objective of this paper was to evaluate the clinical results at 12 months of a topical application of doxycycline after nonsurgical instrumentation of deep periodontal pockets.

### Materials and methods

Forty healthy patients previously treated for periodontal disease, with 1 or more residual periodontal pockets of at least 6 mm in depth around nonmolar teeth, were enrolled. After registration of pocket depth (PD), clinical

attachment loss (CAL) and bleeding on probing (BOP), the pockets were nonsurgically treated with hand and ultrasonic instruments, then a single topical application of 14% doxycycline hyclate gel was performed. At 12 months, measurement of PD, CAL and BOP was repeated. The results underwent statistical analysis by means of the Student *t* test for paired data (PD and CAL) and the chi-square test (BOP).

## Results

Of the 40 enrolled patients, 35 (14 males and 21 females; mean age: 59.94 years) attended the 12-month clinical reevaluation. The analysis was therefore based on the data from 87 pockets. The initial values were: PD =  $7.28 \pm 1.69$  mm, CAL =  $9.00 \pm 2.40$  mm and BOP = 78.16%. The 12-month values were: PD =  $4.62 \pm 1.77$  mm, CAL =  $6.75 \pm 2.54$  mm and BOP = 22.99%. The difference was of high statistical significance ( $P < 0.001$ ) for all clinical parameters.

## Conclusion

Nonsurgical treatment by means of hand and ultrasonic instruments plus a single topical doxycycline application showed high efficacy in deep periodontal pockets ( $\geq 6$  mm).

**Keywords:** Periodontal disease; nonsurgical periodontal therapy; periodontal pocket; topical doxycycline.

## Introduction

The first goal of periodontal therapy is to remove the biofilm on supra- and subgingival dental surfaces. This decontamination, which is the result of correct at-home plaque control and of sound professional instrumentation of root surfaces, is able to eliminate the bacterial infection which is the cause of periodontitis, reducing inflammation and pocket probing depth



Fig. 1

and allowing regaining of the clinical attachment of affected and treated teeth.<sup>1</sup> Nonsurgical debridement is not always able to achieve the ideal results just mentioned, especially when deep pockets require treatment.<sup>2</sup> When nonsurgical therapy is not appropriate, surgical procedures are indicated.<sup>3</sup>

In serious cases of generalized aggressive periodontitis, the association of systemic antibiotics has proved to be very effective after nonsurgical pocket instrumentation.<sup>4,6</sup> In order to improve the results of nonsurgical therapy, the topical application of antibiotics in addition to conventional instrumentation has also been proposed,<sup>7-13</sup> in particular for the treatment of isolated sites with severe periodontitis, as can often be found during maintenance therapy<sup>11</sup> in subjects also previously successfully treated.

Specifically, slow-release 14% doxycycline hyclate gel was able to release therapeutically effective doses for more than 10 days even after a single local administration.<sup>11</sup> The aim of this study was to evaluate the clinical outcome of nonsurgical periodontal instrumentation associated with a single topical application of doxycycline in deep pockets.

## Materials and methods

This prospective case series was conducted according to the guidelines of the STROBE statement for observational studies.<sup>14</sup> All procedures followed in this study were in accordance with the ethical standards of the Declaration of Helsinki of 1975 as revised in 2013.

From the same private practice for the treatment of periodontal disease, 40 patients (18 males and 22 females) were selected from Jan. 2 to Feb. 28, 2017, using the following inclusion criteria: age between 35 and 75 years, absence of systemic diseases, previously diagnosed and treated periodontal disease (through oral hygiene motivation and instruction, professional nonsurgical periodontal debridement and, eventually, surgical therapy), nonsmoker or smoking less than 10 cigarettes/day, plaque index of lower than 25%, enrollment in a regular periodontal maintenance therapy program, and 1 or more residual periodontal pockets of at least 6 mm around nonmolar teeth, which were the subject of this study. In the sites to be treated, the clinical parameters of pocket depth (PD), clinical attachment loss (CAL) and bleeding on probing (BOP) were registered by calibrated clinicians (2 dentists and 2 dental hygienists; **Fig. 1**).

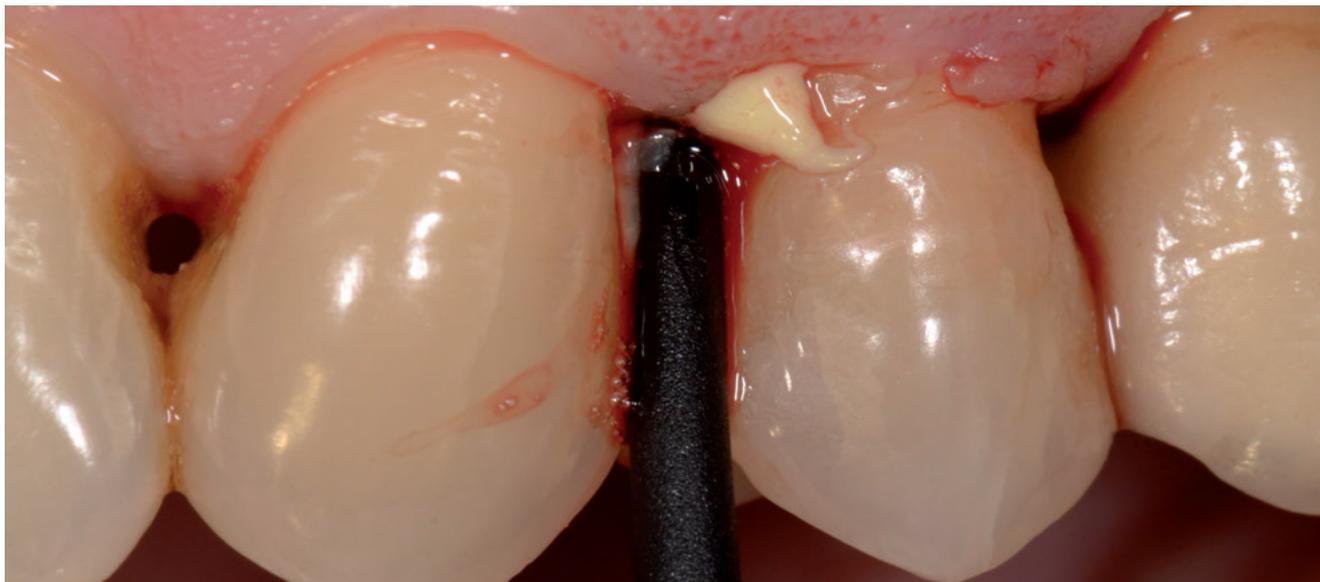


Fig. 2



Fig. 3

After local anesthesia with articaine plus 1:100,000 epinephrine, the selected pockets underwent a single nonsurgical periodontal debridement using hand (curettes) and ultrasonic (XO Odontogain, XO CARE) instruments. For each tooth, every root aspect (mesial, distal, buccal and lingual) included in the study was instrumented for 3–5 min, according to the operator's assessment during the instrumentation and a single topical application of a 14% doxycycline hyclate gel (Ligosan, Heraeus Kulzer) was then performed (Fig. 2).

In the postoperative period, the patients were to avoid at-home oral hygiene for 1 day, replacing it with

chlorhexidine spray applications (Corsodyl Spray, GlaxoSmithKline) after meals, and to avoid chewing at the sites being treated. The patients followed a regular personalized program of professional oral hygiene sessions every 3 or 4 months, but no subgingival instrumentation of the treated sites was performed during such recalls. Twelve months after treatment, the previously recorded clinical parameters (PD, CAL and BOP) were reregistered (Fig. 3).

The results underwent statistical analysis by means of the Student *t* test for paired data (PD and CAL) and the chi-square test (BOP). P values of < 0.005 were considered statistically significant.

|           | PD (mm)     | CAL (mm)    | BOP (%) |
|-----------|-------------|-------------|---------|
| Baseline  | 7.28 ± 1.69 | 9.00 ± 2.40 | 78.16   |
| 12 months | 4.62 ± 1.77 | 6.75 ± 2.54 | 22.99   |

**Table 1:** Initial and final values for pocket depth (PD), clinical attachment loss (CAL) and bleeding on probing (BOP). The difference was of high statistical significance ( $P < 0.001$ ) for all clinical parameters.

## Results

Of the 40 patients enrolled in the study, 35 (14 males and 21 females; mean age:  $59.94 \pm 9.34$  years) attended the 12-month clinical reevaluation. The 5 dropouts were due to missing a periodontal recall scheduled for maintenance therapy (3 patients), to a periapical lesion needing endodontic therapy of the tooth involved in the study (1 patient) and to moving abroad (1 patient). The analysis was therefore based on data from 87 pockets. The mean initial and final values are reported in **Table 1**. A mean PD reduction of  $2.66 \pm 1.52$  mm, a mean CAL gain of  $2.25 \pm 1.45$  mm and a mean BOP reduction of 55.16% were recorded. The difference was of high statistical significance ( $P < 0.001$ ) for all clinical parameters.

## Discussion

The results of the study showed a significant improvement in all periodontal parameters (PD, CAL and BOP) after nonsurgical treatment and a single topical doxycycline application in deep pockets of  $\geq 6$  mm around nonmolar teeth, confirming what has already been reported in literature<sup>9</sup> for clinical parameters. Also in this case, it is emphasized that the long time dedicated to root debridement, with manual and ultrasonic instruments, may have contributed to the good results, as well as in previous works,<sup>1,9</sup> compared with those reported for studies in which less time was devoted to this important step of the therapy.<sup>12</sup>

Very interesting in the results was the minimum amount of postoperative recession (PD reduction—CAL gain) reported in the present study. The same treatment modality investigated in this study had already been described to provide a high possibility of reducing pocket depth from  $\geq 6$  mm to  $\leq 5$  mm than subgingival instrumentation alone, without the application of topical doxycycline.<sup>11</sup>

The data presented in this study can therefore orient toward a possible association between nonsurgical periodontal therapy and a single topical application of doxycycline as an alternative to surgical procedures, thus providing a valid therapeutic option in all those situations in which clinicians and patients prefer or have to limit the invasiveness of the treatment. Caution is recommended in the use of antibiotics owing to possible development of resistance to antimicrobial agents;<sup>15</sup> however, in a previous study, application of 14% doxycycline gel demonstrated high efficacy toward periodontal pathogens without any induced resistance.<sup>16</sup> The stability of the results after the treatment needs to be evaluated in studies with longer follow-up and with a control group.

## Conclusion

In patients that follow a regular periodontal maintenance therapy program, nonsurgical treatment by means of hand and ultrasonic debridement plus a single topical doxycycline application showed high efficacy in deep periodontal pockets ( $\leq 6$  mm) around nonmolar teeth.

## Competing interests

The authors declare that they have no competing interests.

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## Legends

**Fig. 1** – Recording of the initial values of pocket depth, clinical attachment loss and bleeding on probing.

**Fig. 2** – Single application of locally delivered controlled-release 14% doxycycline gel after nonsurgical instrumentation.

**Fig. 3** – Recording of the values of pocket depth, clinical attachment loss and bleeding on probing at the 12-month reevaluation.

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