



## Clinical case study

# Periodontal Implications of Cannabis Abuse. Review and Clinical

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## ABSTRACT

Cannabis abuse, especially in its most common form, marijuana, has commonly been associated with poor oral hygiene for many years. Cannabis addicts tend to have higher levels of plaque, xerostomy and cavities. However, few publications link marijuana to periodontal disease, except for isolated clinical cases. This article reviews the literature on the subject and presents three clinical cases of habitual marijuana smoking patients with periodontitis.

## KEYWORDS

Periodontal disease; Periodontitis; Necrotizing periodontitis; Necrotizing gingivitis; Cannabis; Marijuana; Drugs.

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## INTRODUCTION

Cannabis is one of the most highly used recreational illicit drugs<sup>1,2</sup>. It contains a family of chemicals called cannabinoids, some of which are psychoactive. Although it seems to possess potentially beneficial effects, as cannabinoids attenuate the production of some inflammatory mediators<sup>3</sup>, non-medical use can cause adverse side effects on both general health (including the oral cavity) and mental health, especially when consumed regularly and for long periods of time.

Cannabis for consumption is derived from the Cannabis sativa plant. The plant contains over 400 compounds, including 60 types of cannabinoids. Cannabinoids are a heterogeneous family of molecules which act on cannabinoid cell receptors, the principal one being the delta-9-tetrahydrocannabinol (THC) cannabinoid. The three main forms of cannabis are marijuana, hashish, and hash oil<sup>1</sup>.

Smoking marijuana is the most common and efficient way to consume cannabis. When smoked, approximately 50% of the THC is absorbed through the lungs and enters the bloodstream. From there it enters the brain in a matter of seconds. The results from the latest epidemiological study from the Spanish Observatory on Drugs and Drug Addiction (EDADES: Survey of Alcohol and Drug Abuse in Spain, conducted in 2015)(4) shows that 31.5% of the Spanish population aged between 15 and 64 has used cannabis at some time, 9.5 per cent in the last year, 7.3 per cent in the last month, and 2.1 per cent on a daily basis during the last month. The demographic with the highest rate of abuse consists of young males under the age of 25, who on average smoke three joints of marijuana a day.

One major social concern is that the onset of cannabis use normally occurs during adolescence. The earlier in life young people start using marijuana, the more likely they are to become regular users or end up developing a dependency. Teenagers start experimenting with cannabis on average at the age of 18. In addition, the Survey on Drug Abuse in Spanish Secondary Education (ESTUDES, 2014-2015, involving students aged 14 to 18)<sup>5</sup> found that 29.1% admit to having smoked cannabis

at some time, 18.6% in the last month, and 1.8% daily. In addition, of those who smoke it daily, 13.8% have substance abuse issues (3 joints per day, according to the Survey), with the negative consequences that this implies.

The negative effects of cannabis use affect almost all systems in the body, as well as overall user health<sup>1,6</sup>. With respect to the cardiovascular system, dose-dependent tachycardia and generalized vasodilation occur. This increase in heart rate causes an increase in heart work and increased oxygen demand, which can lead to cardiac ischemia. In addition, as the ingestion method is via deep inhalation, a very high concentration of carboxyhemoglobin is absorbed from carbon monoxide, which reduces oxygen levels in the heart.

The effects of cannabis use on the respiratory system are mainly associated with long-term abuse of marijuana. A marijuana cigarette (rolled joint) contains the same substances as would regular tobacco, except nicotine. This includes carbon monoxide, bronchial irritants, tar, and higher levels of other carcinogens. Regular marijuana smokers have a higher prevalence of bronchitis and emphysema than nonsmokers. In addition, it is very important to note that the long-term consumption of 3-4 marijuana cigarettes is equivalent to smoking 20 cigarettes a day, or more<sup>1</sup>. This difference stems from the deep inhalation use pattern and the absence of any filter. Three times more tar is absorbed through deep inhalation than is the case with normal cigarettes.

THC, on the other hand, has an immunosuppressive effect on macrophages, natural-killer cells and B and T lymphocytes, which causes a reduction in host resistance to infections, and also increases the secretion of proinflammatory cytokines, such as IL-1<sup>6</sup>.

For some years now, it has been often reported that regular cannabis users have worse oral health than do non-smokers, with a higher presence of cavities, especially cervical, higher rates of missing teeth and levels of plaque. One of the most significant effects of cannabis is xerostomy, which can increase the risk of cavities<sup>6-8</sup>. So-called cannabinoid hyperemesis is also

typical of cannabis abuse, characterized by frequent episodes of vomiting. This can cause acid erosion of dental enamel<sup>9</sup>. There has been little scientific evidence linking periodontal disease to cannabis addiction; there is only a handful of clinical case studies, one experimental study in rats and, in recent years, several epidemiological studies.

The first references found in the literature on this subject were published by Darling and Arendorf in 1992 and 1993<sup>7,8</sup>. These authors observed how their cannabis smoking patients had painful, “fire-red” gingivitis with associated white patches, as well as diffuse gingival hyperplasia with concurrent alveolar bone loss. So-called cannabis stomatitis has also been described in the literature, characterized by a number of changes in the oral epithelium, including oral mucosa leukoedema and hyperkeratosis<sup>6</sup>, which can evolve into leukoplakia and subsequently progress to oral cancer<sup>8</sup>. In an experimental 2011 study of periodontitis in 30 rats, Nogueira-Filho and et al.<sup>3</sup> demonstrated a statistically significant increased loss of bone support and bone density in the jaw in the experimental group (15 rats subjected to daily inhalations of cannabis for one month).

Cannabis use is more common at an early age, most consumers drop the habit relatively early when they reach adulthood<sup>10</sup>. However, individuals who continue to smoke cannabis at the age of 30 are classified as “long-term” users, and may be at risk of developing what is known as amotivational syndrome<sup>11</sup>, characterized by general apathy, emotional withdrawal, and lack of fluidity and spontaneity in conversation<sup>2</sup>. In addition, the subjects do not usually take proper care of personal hygiene or appearance, including oral hygiene, nutrition, and general health. In these cases, dental and periodontal disease may occur<sup>9</sup>. Another factor to bear in mind that favors the development of periodontitis among cannabis addicts is deficient nutrition. Such individuals tend to have poor eating habits, with an erratic and irregular meal pattern along with a below-normal body mass index<sup>9</sup>.

Given the limited information regarding the association of marijuana abuse and the presence of periodontal

pathologies, we wish to present three clinical cases of habitual marijuana smokers who suffered from necrotizing periodontitis.

## CLINICAL CASES

### Case 1

A 34-year-old male who came in for a visit complaining of significant gingival-related pain. After taking his medical history, he acknowledged that he smoked eight<sup>8</sup> cannabis joints every day. Complete blood work was requested to rule out other associated pathologies, which showed high levels of C-reactive protein (0.82 mg/dL, < 0.1 mg/dL being the norm), an acute phase protein that indicates systemic inflammation and may be increased in severe cases of periodontal disease.

Upon examination, the patient was found to suffer from necrotizing periodontitis, with ulceration and necrosis of interdental papillae, especially in the lower incisors. A large amount of supra and subgingival calculus was also observed. Areas with necrosis were painful in response to catheterization, and the patient referred to experiencing pain in these locations when eating and brushing (Figure 1).

As periodontal treatment, the patient was instructed in oral hygiene techniques (appropriate tooth brushing plus use of interdental brushes) while stressing the need to eliminate harmful habits, such as tobacco and cannabis smoking. Perio scaling and root planing per quadrant was applied, along with empirical antibiotic treatment (metronidazole 500 mg every 8 hours), in addition to the use of 12% chlorhexidine gel and mouthwash every 12 hours for a month. After one month, his oral hygiene had improved considerably, inflammation and areas of gingival necrosis had disappeared, and response to periodontal catheters was normal. In addition, he had managed to reduce his cannabis intake to one joint per day. It was therefore decided to move the patient to the periodontal maintenance phase, the treatment regime he is currently under (Figure 2).



Figure 1. Necrotizing periodontitis, Case 1 patient.



Figure 2. Case 1 patient clinical status upon reexamination following the basic periodontal treatment phase.

### Case 2

A 31-year-old male whose motive for consultation was the significant and extensive pain he was experiencing in his gums, which even prevented him from eating (Figure 3 and 4). During anamnesis, he acknowledged that he smoked 2 cannabis joints and 30 tobacco cigarettes a day. A blood test was performed, and the results showed he was positive for the hepatitis C virus; the patient had been unaware of being a carrier until that time.

The patient's diagnosis was chronic, moderate-severe periodontitis, with large regions of necrotizing periodontitis, both in incisors and upper molars. The patient was treated by modifying his oral hygiene habits, Perio scaling and root planing per quadrant and systemic antibiotics, consisting, in this case, in Vibramycin 100 mg every 12 hours due to his liver problems. The patient, however, was unable to change



Figure 3. Patient Case 2 periodontal status when he first came in for an appointment. Note the necrosis of gingival papillae in the anterior region.



Figure 4. Papillary necrosis and palatine suppuration of the upper teeth in the Case 2 patient prior to treatment.

his habits, nor did we manage to motivate him to do so, and shortly after starting he ceased seeking treatment.

### Case 3

A 28-year-old male who visited the clinic accompanied by his mother, apathetic and poorly motivated to improve his oral health. Examination showed he had cavity lesions in almost all his teeth, some already impossible to restore, and the presence of moderate-severe periodontitis, with regions of necrotizing periodontitis (Figure 5).

He acknowledged that he smoked over 30 cigarettes and 2 joints per day. A blood test was ordered to rule out some other systemic pathology, finding that all blood parameters were within normal limits.



Figure 5. Initial Case 3 patient status, gingival inflammation, suppuration, papillary necrosis, major loss of periodontal insertion in lower incisors, as well as cavities in various teeth can be observed.



Figure 6. Case 3 patient status following reexamination, showing improved gums, although no restorative treatment had been carried out.

He was encouraged to change his oral hygiene habits. An attempt was made to eliminate or at least reduce his harmful habits. Periodontal treatment consisted in Perio scaling and root planing per quadrant, along with antibiotic treatment (metronidazole 500 mg every 8 hours for a week) and antiseptic (chlorhexidine at 0.12% every 12 hours for a month). In addition, he was advised to undergo restorative treatment consisting of filling cavities and extracting the teeth that were beyond repair. During reexamination following the basic periodontal treatment phase (Figure 6), he was observed to have managed to reduce his smoking habit to 12 cigarettes a day. However, he did not return soon thereafter, and not until a year had passed. At that time, he had not performed the rest of the required treatment.

## DISCUSSION

Cannabis use, as highlighted by the surveys by the Spanish Observatory on Drug Use and Addiction, is very common in the population aged 15 to 34. Between 15 and 20% of young people in these age groups admit to having consumed cannabis at some point. In terms of gender, consumption is more widespread in males. Among females, the prevalence is lower, ranging from 2 to 11 points less, depending on the age range. As we have seen, the three cases of necrotizing gingival lesions we present had been observed in males.

Apart from some isolated clinical cases<sup>12,13</sup> and those presented in this paper, there is very little literature on the effects of cannabis use on periodontal health. The few cases described to date may be due to the ethical and legal ramifications involved in this addictive conduct. Also, identifying this use as an exclusive risk factor for periodontal disease is difficult, as there are other predisposing factors that can influence susceptibility to necrotizing periodontitis, such as age, oral hygiene, tobacco use, general health, or combined use with other types of drugs. Above all, it should be borne in mind that cannabis is usually mixed with tobacco in hand-rolled cigarettes in Spain<sup>6</sup>, a factor which prevents determination of the precise influence of each component in gingival pathologies. In the case of the patients we discuss, the first patient only smoked cannabis, while the other two were both cannabis and tobacco users.

In 2008, the first longitudinal study attempting to link the use of cannabis to periodontal disease was published<sup>14</sup>. Thomson et al. conducted a longitudinal cohort study of all children born in a New Zealand hospital between 1972 and 1973 which continued until they were 32 years old.

From the time they turned 18, the study classified the 1,037 children into three groups: non-cannabis smokers, moderate cannabis smokers (<40 times/year), and heavy cannabis smokers (>41 times/year). At age 32, they found that cannabis use was a risk factor for periodontitis. Patients with high exposure to cannabis had a 7-fold higher risk of periodontal disease

than those who did not. In addition, the severity of periodontitis was also significantly higher among heavy users after adjusting for tobacco use as a contributing factor. They concluded that smoking cannabis could be an independent risk factor for developing periodontitis, as in the case of tobacco. In addition, it is interesting to note that in New Zealand, cannabis is not habitually mixed with tobacco, so the results of this study eliminate this obfuscating factor. They attributed their findings to exposure to the more than 400 deleterious substances contained in cannabis, some cannabinoids, and others similar to tobacco.

This longitudinal study was prolonged for 5 additional years<sup>15</sup>. Previous subjects were re-evaluated at the age of 38 to see if continued cannabis use over the course of 20 years could worsen their overall health. Various periodontal health, lung function, inflammation, metabolic syndrome, HDL cholesterol, triglycerides and glycosylated hemoglobin parameters were considered. Of all the factors analyzed, only periodontal health was related to the continued use of cannabis, even after controlling for tobacco use, brushing, flossing, and alcohol use as contributing factors. Thus, they serve to confirm that cannabis can be an independent risk factor for periodontal disease.

On the other hand, in 2017 Shariff et al.<sup>16</sup> published a major epidemiological study, part of the U.S. National Health and Nutrition Examination Survey (NHANES) conducted between 2011-2012. Nine hundred eighty (980) men and nine-hundred fifty-eight (958) women aged between 30 and 59 were examined periodontally in six<sup>6</sup> locations per tooth and divided into two groups: cannabis users ( $\geq 1$  use per month during the last year), and non-cannabis users. In this representative sample, 27% reported smoking cannabis at least once per month. The findings of the study showed a significant association between cannabis use and worse periodontal condition (greater depths and worse levels of catheter insertion) with respect to non-users. In addition, after adjusting for all significant contributing factors, cannabis users were more likely to suffer from severe periodontitis than were non-users. The most significant contributing factor was tobacco,

and once eliminated, the study created a second model that included only participants who had never smoked tobacco. In this case, cannabis users who never smoked tobacco were twice as likely to present worse periodontal health than were non-cannabis users. This led them to corroborate the data from Thomson et al.<sup>14</sup> and Meier et al.<sup>15</sup> and conclude that the use of cannabis is an independent risk factor from tobacco for periodontitis in young adults.

However, there are other studies, such as the one published by López and Baelum<sup>17</sup> in 2009, that do not find a significant relationship between cannabis use and periodontal disease. This work consists of a cross-sectional study of 9,163 students from Santiago de Chile which evaluated these patients periodontally. This study has differences with respect to the prospective study of Thomson et al.<sup>14</sup> in that patients are younger (12-21 years), only periodontal health is evaluated, and in addition the duration of exposure to cannabis was much shorter. Lopez and Baelum<sup>17</sup> suggest that the effect of cannabis on periodontal health may be greater in patients who have used cannabis over a long period of time. In this regard, three patients in our clinical study were all young adults, aged close to 30 years, and heavy users since adolescence. The effects of the drug on their periodontal hygiene may be more severe than in the case of much younger cannabis users where such long-term exposure has not yet occurred. It should also be borne in mind that the persistence over time of this habit makes behavioral modification all the more challenging.

Finally, we wish to emphasize that, although periodontal treatment and hygiene motivation were equally applied in all three patients, we only managed to reduce cannabis use and encourage a lasting motivation to modify behavior associated with proper and suitably periodic periodontal care in the case of the first patient. In contrast, the other two patients clearly suffered from amotivational syndrome, characterized by apathy, deficient social interaction with clinic professionals and complete lack of discipline in terms of plaque control. This made it very difficult for the periodontists and hygienists who cared for the patients to do so.

We can conclude that there is scant yet highly relevant data that show that cannabis users possess deeper periodontal sacks, higher levels of periodontal insertion loss and therefore higher likelihood of severe periodontitis than do non-users. In addition, the use of cannabis in the absence of tobacco use appears to influence periodontal pathology, although the biological mechanisms that link the two processes are unknown. On the other hand, we have seen that this risk factor is time-dependent, since it has been observed that the longer the habit lasts, the greater loss of ensuing periodontal insertion. We believe it necessary, given that there are few publications on periodontal disease and cannabis abuse, that more studies on this subject be conducted, as well as developing dental protocols

and guidelines for such patients, similar to those that exist for habitual tobacco users. In addition, dental professionals should be aware of and bear in mind the deleterious effects of cannabis abuse on general, psychological, and oral health. It is advisable to take this risk factor into account when putting together a medical history, consistently inquiring about cannabis use as a conduct with repercussions on oral hygiene. Moreover, in such cases there is greater reason to consider motivation critical to the overall treatment protocol since it is essential to achieving both an improvement in the periodontal health of such patients, as well as in their habitual behavior and consequently their overall physical and emotional health.



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