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Case Report

Combining the Non-Surgical Treatment with Extracts of Croton Lechleri and Myrciaria Dubia to Solve Gingival Cleft

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Abstract: Nowadays, the "pink" aesthetic possesses a significant role in the success of a dental treatment. Extended or small recessions should be solved to achieve harmony between tooth and gingival tissue. Gingival cleft (GC) is a condition that can lead to unpleasant gingival recession in the anterior area. The etiology of GC is still not clear and is often resolved using surgical treatments that, although minimal, are still interventions which can cause risks and discomfort to the patient. Therefore, this case report aims to propose a non-invasive treatment for GC, consisting of a combination of a non-surgical technique with herbal extracts therapy. A non-smoker, healthy patient was subjected to professional oral hygiene treatment supported by Croton Lechleri resin application and at-home supplementation with natural vitamin C (Myrciaria Dubia). The patient entirely followed the instructions and, after 12 months, the GC almost disappeared. In spite of its limitations, since further clinical cases are needed, the proposed non-surgical periodontal technique combined with herbal extracts therapy can represent a promising way to solve or at least reduce GC, before considering surgical treatment.

Keywords: gingival recession; gingival cleft; herbal medicine; phytotherapy; plant extract; Croton Lechleri; Myrciaria Dubia; case report

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1. Introduction

Gingival recession is defined as the apical shift of gingival margin with respect to the cement–enamel junction [1]. This condition is associated with attachment loss and with exposure of the root surface to oral cavity [2,3]. It is estimated that more than fifty percent of the population has one or more sites with gingival recession of 1 mm or more [4]. These recessions are found more frequently on buccal surfaces than on other dental surfaces [4] and, in the early stage, they may appear as a gingival cleft (GC) [5,6].

GC is a sharply defined depression or fissure that may extend up to 5–6 mm in length and is characterized by an acutely inflamed, ulcerated, and symptomatic linear or V/triangular-shaped cleft (Stillman's cleft) [5,6]. At the histological level, GCs are lined by stratified squamous epithelium and the base of the cleft may have a bifurcated appearance and exhibit varying degrees of epithelialization [6]. The GC occurs as single or multiple cleft and it can be classified as simple (one direction shape) or composed (multiple and differently direction shape) [7].

Possible etiological factors of GC may be anatomical, physiological, or pathological factors [2]. Anatomical factors include: an aberrant path of eruption of the tooth, abnormal tooth position in the arch, the shape of the tooth, occlusal forces, fenestration and dehiscence of the alveolar bone, and frenula. Physiological factors include: the orthodontic movement of teeth to positions outside the labial or lingual alveolar plate, leading to dehiscence formation. Pathological factors range from incorrect oral homecare procedures to a severe malocclusion [8,9]. In addition, there are other factors that may increase susceptibility to gingival recession or periodontitis after GC: thin gingival tissue; mucogingival

conditions, and/or a positive history of progressive gingival recession, and/or inflammatory periodontal disease in teeth presenting with either or both of the first two factors; inadequate toothbrushing; orthodontic treatment; cervical restorative margins; chronic stress or depression; and dietary habits [3,10–13].

To date, the etiology and pathogenesis of GCs remain unclear, even though these are assumed related to chronic factors that ulcerate the epithelium and, subsequently, healing occurs through the anastomosis of the external and internal epithelium in the gingival sulcus, creating a triangular defect [14]. Cassini et al. hypothesized that inflammation leads to proliferation of the pocket epithelium and its subsequent anastomosis with the outer epithelium [15].

Solving GC or mitigating their causes may reduce the incidence and severity of the subsequent gingival recession. In recent years, literature has focused mainly on different surgical techniques with autogenous or heterogenous products [16], such as double papillae flap procedures [17], coronally advanced flap procedures [18], or modified coronally advanced tunnel technique [19], rather than non-surgical ones to prevent and solve gingival recessions and GCs.

Clinically, the non-surgical treatment is often combined with recommendations to patients for the at-home oral care, including written instruction on the use of toothbrush and products to be purchased, such as toothpastes or mouthwashes. However, most of these products are conventional drugs that are made artificially and cause various side effects; one of the most important side effects being antibiotic resistance. Moreover, pharmaceutical ingredients, such as chlorhexidine, are released to the natural environment during their manufacture, use, and disposal [20], having deleterious effects on the health of ecosystems and humans [21,22]. Similarly, new biomaterials and techniques have been developed to repair or regenerate soft and hard tissues. In this regard, remineralizing agents [23], barrier membranes, and grafting materials [24] have been used, and more sophisticated approaches such as stem-cell-based therapy, which would ideally repristinate physiological periodontal and dental tissues conditions [25]. In addition, since all these products and procedures are constructed by artificial and expensive processes, the efforts of scientific research have also moved toward development of ready-to-use materials with natural ingredients that would also benefit the ecosystem.

Indeed, new biomaterials containing herbal medicines are starting to spread worldwide. Herbs, herbal preparations, and finished herbal products, containing parts of plants or other plant materials as active ingredients, have been clearly reported to exert therapeutic benefits [26]. Thus, herbal medicine may be preferred over conventional drugs due to wide biological activity, higher safety margin, and lower costs [27].

Herbal medicines are being increasingly used as dietary supplements to combat or prevent common diseases, but, recently, they are also receiving attention in the dental field, where, in fact, clinical trials are being carried out, showing promising results, especially in periodontology [27,28]. Herbs are known to have anti-inflammatory, antimicrobial, and antioxidant effects, and herbal products can be based on a single natural component or on a mixture of several medicinal plants in the form of toothpastes or mouthwashes [29].

The aim of this case report is to propose a potential protocol for solving GCs based on a non-surgical periodontal technique combined with herbal extracts therapy, consisting of Croton Lechleri and Myrciaria Dubia extracts. Croton Lechleri (also known as Sangre de Drago) is an ethnobotanical medicine harvested from the Croton Lechleri tree and is constituted of alkaloid (taspine), proanthocyanidins, and diterpene lignans. Myrciaria Dubia is a particularly versatile berry, and its constituents have antioxidant potential in different degrees, once processed.

2. Detailed Case Description

Clinical Presentation and Case Management

A 27-year-old female patient, non-smoker and without systemic pathologies, came to our attention for an aesthetic problem provoked by the GC of 1.5 (Figure 1a). The examination revealed localized Stage I Grade A periodontitis [30].

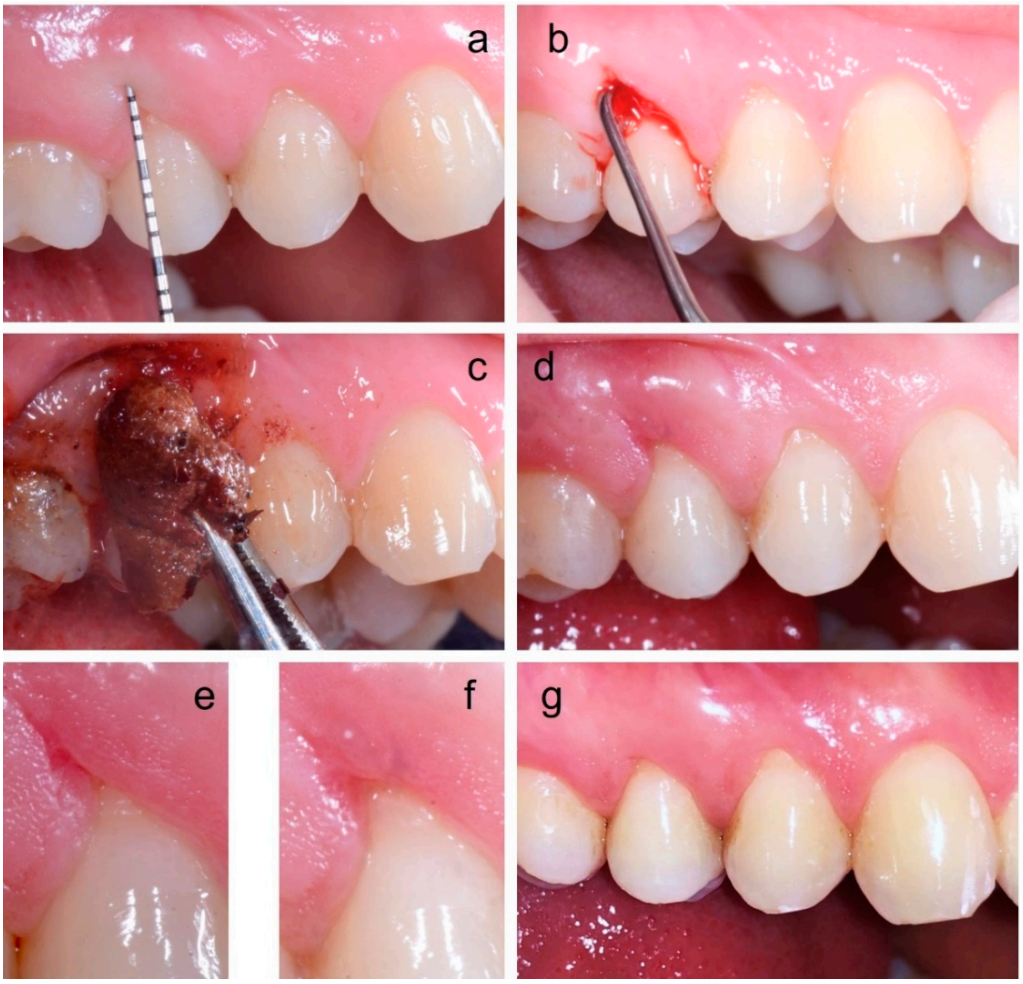

Figure 1. Clinical case: Probing of the gingival cleft (**a**); scaling and root planning of the lesion (**b**); application of a cotton wool pad with Croton Lechleri extract (**c**); gingival cleft after 14 days from the non-surgical treatment (**d**); details of the gingival cleft before (**e**), after 3 months from treatment (**f**), and after 12 months from treatment (**g**).

After explaining all possible treatments to resolve the GC, the patient decided to start with non-surgical treatment, being aware that, in case of failure, a surgical approach would be used. Before the patient enrolled, each step of treatment plan was accurately explained. The patient accepted the proposed treatment plan and signed the informed consent. The entire treatment, divided in clinical and at-home procedures, involved non-traumatic phases and an oral homecare education (Table 1). Moreover, patient care and research were conducted in compliance with the Case Report guidelines and the Declaration of Helsinki.

Table 1. Summary of the clinical and at-home procedures.

	Clinical Procedures
1	Biofilm staining
2	Airflow with erythritol powder
3	Debridement with mechanical and manual instrumentation
4	Airflow/Perio-flow with erythritol powder
5	Application of a cotton soaked with Croton Lechleri extract for 30 s
	At-Home Procedures
6	Brush teeth with soft toothbrush
7	Application of a cotton soaked with Croton Lechleri extract, 3 times a day for 15 days
8	Taking 2 tablets of Myrciaria Dubia 3 times a day for 3 months and then 1 time a day for 1 year.

Initial periodontal therapy: (1) staining of the biofilm by means of a plaque detector; (2) using airflow with erythritol powder; (3) debridement with mechanical and manual instrumentations, including soft scaling and root planning with Langer curette and piezoelectric scaler (where necessary) (Figure 1b); (4) airflow/Perio-flow with erythritol powder; (5) placement of a cotton wool soaked with Croton Lechleri extract on the cleft for 30 s (Figure 1c), without rinsing. If the bleeding does not stop, it can be suggested to apply the Croton Lechleri extract once again. After the oral hygiene session, the patient was provided with Croton Lechleri extract in order to replicate this procedure at-home with a frequency of three times a day for 15 days. The patient was also informed to take vitamin C tablets, Myrciaria Dubia (Camu-Camu), three times a day for 3 months and then one time a day for 1 year. The patient was informed to use a soft toothbrush and was recommended not to use chlorhexidine, alcohol, or other mouthwashes. Figure 1d shows the control at 14 days. Figure 1f,g shows the follow-up after 3 and 12 months, showing the progressive healing of GC, which seems to almost disappear after 12 months of treatment.

3. Discussion

In the last several years, several surgical approaches were developed to solve gingival recessions; however, few studies have proposed non-surgical approaches to treat gingival problems [31–33]. This case report describes a combination of professional and at-home procedures to solve GC in a non-surgical and natural way.

The principle clinical procedures of the proposed protocol involved the debridement with mechanical and manual instrumentation, airflow/Perio-flow with erythritol powder, and the application of Croton Lechleri extract.

Subgingival instrumentation to remove the biofilm and calculus is the cornerstone to perform a causative periodontal treatment, removing the biofilm and bacteria that contaminated the dental surface [34]. In addition, erythritol powder was included in the protocol before and after the debridement with mechanical and manual instrumentation. Erythritol powder is an artificial sweetener and a food additive and is a chemically neutral, non-toxic, water-soluble polyol. Compared to glycine, it is more stable and more acceptable and tolerant to the patients [35]. Furthermore, erythritol powder showed a smooth surface on dentin compared with $NaHCO_3$ and glycine powder [36]. Erythritol powder showed no significant damage to soft or hard tissue and, in a 12-month follow-up period, it resulted in significant reduction in probing pocket depth and bleeding on probing [36].

Few in vitro studies reported that subgingival air-polishing can influence cell viability, morphology, and proliferation, as well as wound closure [37,38]. For this reason, after the debridement with mechanical and manual instrumentation, a second application of air-polishing was included in the proposed protocol. Indeed, the removal of calculus and plaque allows a direct stimulation of the gingival tissue, thus assuming a kind of healing stimulator by means of the air-polishing.

After the clinical phase, the home intake of Croton Lechleri extract and tablet of Myrciaria Dubia aimed to promote the wound resolution. The medical application of Croton

Lechleri was first documented in 1979 [39]. As we described above, Croton Lechleri extract is constituted of alkaloid (taspine), proanthocyanidins, and diterpene lignans. Taspine hydrochloride appears to be the active healing component that increases the migration of fibroblasts [40]. The structural formula of taspine contains two lactone ring structures and belongs to the apophyllic alkaloids. Studies have shown that taspinine also has a variety of pharmacological effects, including antibacterial, wound repair, anti-inflammatory, antiviral, and cytotoxic effects [39]. Proanthocyanidins were found to have very strong antioxidative activities. The mechanism of antioxidative action was shown to involve a radical scavenging action, quenching action, and enzyme-inhibiting action. It was clarified that proanthocyanidins have overall antioxidative mechanisms [41]. Moreover, proanthocyanidin precipitation, caused by serum proteins, stimulates rapid formation of a dark crust [42]. The diterpene lignans contain a dimethylcedrusin-like substance that protects cells from degradation, inhibiting thymidine incorporation [43]. Previous studies have demonstrated significant chemical and pharmacological properties [44] of Croton Lechleri extract, such as anti-inflammatory [45], healing [46], antimycotic, antiviral, antifungal, antibacterial [47,48], and antioxidant [49] activities. In addition, these extracts demonstrated the potential to improve osteogenesis, mineralization, and bone formation [50]. In a randomized, double blind, placebo-controlled clinical trial, Namjoyan et al. suggest Croton Lechleri extract is a potent, available, affordable, and safe healing agent [51]. The authors hypothesized that the exact role of Croton Lechleri extract in the pathogenesis of wound healing regarded its effect on stimulation or hindering mediator's synthesis; however, its exact role is still unknown and further studies are required. Two other studies investigated the healing effect of Croton Lechleri extract on rats. One of these studies showed the wound-healing effect of the alkaloid taspine in rats, stimulating the chemotaxis of fibroblasts [52]. Another study showed the wound-healing activity of Croton Lechleri extract, due to the high percentage of polyphenolic compounds in this plant [42].

In this case report, in addition to the application of Croton Lechleri extract on the GC, the intake of vitamin C, using tablets of Myrciaria Dubia, has been associated with clinical treatment in order to stimulate systemic collagen formation.

Myrciaria Dubia (Camu-Camu) is a particularly versatile berry [53] and the vitamin C inside Myrciaria Dubia pulp remains stable; after 335 days of storage, the content of vitamin C was 1.16 g/100 g [54]. Vitamin C is an important nutrient that exerts a reducing and antioxidant effect, eliminates free radicals, and acts as an enzymatic cofactor in cells. Since vitamin C eliminates excess reactive oxygen species, this nutrient is considered an important oxidant for periodontal health. Vitamin C promotes hydroxylation of eleven enzymatic proteins, three of which participate in the collagen hydroxylation and two in the carnitine biosynthesis [55,56]. Moreover, vitamin C supplies micronutrients (ascorbic acid and flavonoids) active for proline and lysine hydroxylation; they are essential amino acids for collagen chain maturation and stability. Vitamin C also plays a crucial role in preventing and slowing the progression of periodontal disease by inducing the differentiation of periodontal ligament progenitor cells [57]. In addition to vitamin C, Myrciaria Dubia includes many polyphenols (flavonoids, phenolic acids, tannins, stilbenes, and lignans) that possess an important role in the recruitment of inflammatory cells to the site of inflammation, accelerating the entire healing process [58]. In the reported case, the patient had taken a supplementation of vitamin C for 12 months, in agreement with Zhan's study [59], which reinforced the need to maintain supplementation of vitamin C from 6 to 20 months for the treatment of a gingival Stillman's cleft.

The described approach is characterized by the use of natural products rather than conventional drugs [60,61]. Several in vivo and clinical trial studies proved that extracts of medicinal plants and their purified active components possess high potential to be used as wound-healing remedies, owing to their acceptable level of safety, multiple mechanisms of action, and antibacterial activity. Recently, novel wound-dressing formulations have been claimed to have many advantages over conventional dressings and can be used to

address some drawbacks of natural products, including solubility and limited activity on the wound site [62].

As previously described by Adams and other authors, although this article is limited on the evaluation of one clinical case, it intends to share an encouraging clinical experience that may be taken into account to develop further research [63]. Further clinical research should be performed to validate the here-presented non-surgical treatment combined with herbal extracts supplement to solve or at least reduce GC. Moreover, limitations for the applicability of this protocol, as the precise timing and duration of the at-home procedures, should be better defined. Future studies are also needed to unravel the mechanism of action of the proposed herbal products, which may be used for new and eco-friendly products in the dental field.

4. Conclusions

Gingival recession and GC are often solved by surgical treatment, without considering the prevention of such a disease or the possibility of action in its initial stage. This case report proposes a potential non-surgical treatment to solve GC. The proposed protocol is based on the initial lesion decontamination, with scaling and root planning, followed by the topical and systemic herbal supplements. The topical application of Croton Lechleri extract promotes the wound contraction, new collagen formation, and the epithelial layer regeneration. Then, vitamin C from tablets of Myrciaria Dubia is an important nutrient that exerts a reducing and antioxidant effect, eliminating free radicals and acting as an enzymatic cofactor in cells. Although evidence is still lacking, the authors emphasize the importance of continuity of vitamin C supplementation through time and adequate oral hygiene education, which may influence treatment outcomes. Thus, constant oral health maintenance programs are critical and necessary for achieving the best clinical results.

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