

Necrotizing Ulcerative Gingivitis in the Setting of Vitamin B12 Deficiency: A Case Report

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Abstract

Necrotizing gingival disorders are rare conditions of the gingival tissues. Patients typically present with severe discomfort, halitosis, bleeding, and ulcerated oral tissues. This condition will typically present in patients who are under psychological stress, malnourished, and/or who are immunosuppressed. This case report will present a patient with acute ulcerative necrotizing gingivitis (ANUG) who was later diagnosed with vitamin B12 deficiency. This case emphasizes the importance of investigating underlying conditions in patients who present with necrotizing gingival disorders.

Key Words: B12 deficiency, Necrotizing ulcerative gingivitis, Necrotizing ulcerative periodontitis, Acute necrotizing ulcerative periodontitis, Acute necrotizing ulcerative gingivitis, B12

Introduction

Acute necrotizing ulcerative gingivitis (ANUG), acute necrotizing ulcerative periodontitis (ANUP), and necrotizing stomatitis (NS) are classified under necrotizing periodontal diseases (NPD) [1]. These disorders have been described using other names, including: trench mouth, Vincent's gingivitis, ulceromembranous gingivitis, and necrotizing gingivostomatitis (NOMA) [1,2]. While NPD may occur in otherwise healthy patients, with neglected oral hygiene, these conditions typically develop in patients with suppressed immune systems after viral infections, including HIV, or severe malnutrition. These conditions may represent various stages of the same disease but with different severities. Acute gingival diseases are classified according to the location of the tissues affected: necrotizing gingivitis only affects the gingival tissues; necrotizing periodontitis occurs when the necrosis affects the periodontal ligament and alveolar bone, leading to attachment loss; and necrotizing stomatitis occurs when necrosis progresses to deeper tissues beyond the mucogingival junction, such as lip or buccal mucosa [1].

Clinical findings include a greyish-white pseudomembrane over necrotic gingival areas, bleeding that occurs from exposed ulcerated tissue, and severe halitosis. Necrotic ulcers that start at the interdental papilla have a "punched out" appearance. Patients will typically present due to pain on eating or when performing oral hygiene. Although general malaise and an elevated temperature may be present, this is not a common finding among patients with NPD [3].

A mixed flora of spirochete and fusiform bacteria appear to be the etiology for NPD. *Treponema* sp., *Fusobacterium* sp., *Actinomyces* sp. and *B. melaninogenicus* subsp. *intermedius* are specifically implicated [4,5]. The exact pathogenesis of NPD is not understood [1].

Although NPD are caused by infectious agents, predisposing factors are frequently identified. Predisposing factors include psychological stress, insufficient sleep, inadequate oral hygiene, high plaque levels, pre-existing gingivitis, previous history of NPD, alcohol and tobacco consumption, immunosuppression, recent systemic viral infection and young age [3,6]. Emotional or psychological

stress has frequently been identified as a contributing factor to NPD [6]. An increased incidence is seen among new military recruits, deployed military personnel, college students during exam periods, depressed patients, and patients that feel overwhelmed by life situations [3]. The mechanism of this predisposing factor may involve the increase of endogenous corticosteroid levels, which can depress important immune processes [1,3].

The prevalence of ulcerative gingivitis has declined significantly since World War II when as much as 14% of the military personnel were reported to have ulcerative gingivitis. Recent studies in industrialized countries report prevalence as low as 0.5 to 0.19% [2]. NPD is uncommon, with most cases being reported from HIV-positive patients. Therefore, HIV should be ruled out in patients diagnosed with ANUP [1,2].

The objectives of treating Acute NPD are managed by removing diseased, necrotic tissue and eliminate the patient's pain and discomfort. Treatment should begin with local debridement of soft and mineralized deposits. Typically, ultrasonic instruments are recommended. Local and topical anesthetics are frequently required as part of providing treatment. The patient is advised to use 0.12% - 0.2% chlorhexidine rinse twice per day [1]. Diluted hydrogen peroxide can also be used [6]. Treatment using antibiotics has been shown to be effective especially when there is fever. The first choice of treatment should be metronidazole 250 mg tablets three times per day [1]. Penicillin, amoxicillin, tetracycline, and clindamycin, have also been shown efficacy. Patients should be followed up to ensure healing is occurring. As the patient improves, oral hygiene instructions and patient motivation is imperative.

Case Report

A 22 year old Indian male reported to the University of Mississippi School of Dentistry with the chief complaint: "My teeth are bleeding and they hurt. It stings and makes it hard to eat". The patient stated that this problem has occurred on and off for the past year and has gotten worse over the past two months. The patient did not report drug allergies, current medications, or significant health problems.

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Figure 1. Severely inflamed and ulcerated gingiva (1A).



Figure 2. Severely inflamed and ulcerated gingiva (1B).



Figure 3. Severely inflamed and ulcerated gingiva (1C).

Oral evaluation revealed severely inflamed and ulcerated gingiva, particularly on the facial aspect of the maxillary anterior teeth (*Figures 1-3*). There was a characteristic pseudomembrane present along with spontaneous hemorrhaging and halitosis. The patient was prescribed metronidazole 500 mg tablets three times per day for 10 days, alcohol free 0.12% chlorhexidine rinse, oral hygiene instructions, and a follow up appointment was scheduled.

An oral exam at the two week follow-up appointment revealed no change to the severity of this patient's condition. The patient reported that he did not purchase the antibiotics or oral rinse prescribed at the initial visit due to financial concerns. Further inquiry into the patient's social history revealed no tobacco or alcohol use and adequate nutritional intake. However, the patient reported that he does not eat meat as part of his religious practices. The patient is a foreign exchange student from India and an undergraduate at a local college. The patient's condition was initially thought to be a combination of various factors, including psychological stress and poor oral hygiene. The patient did not report that he was under stress; however, his non-compliance with initially prescribed medications due to finances gave the impression

that he may have financial stresses that were not disclosed. The patient was debrided with ultrasonic instruments under local anesthesia and was prescribed a 10 day course of metronidazole 500 mg, amoxicillin 500 mg and 0.12% chlorhexidine non-alcoholic rinse.

At the follow-up appointment, the patient reported, "My mouth feels better. I took the medications this time and used the mouth wash. It doesn't bleed when I brush anymore, and it doesn't hurt when I eat". Oral exam revealed a much improved gingival appearance (*Figure 4*). The patient was cleaned again using ultrasonic instruments and given oral hygiene instructions. The patient was re-scheduled for a three month follow-up appointment, but he re-scheduled which resulted in a five month interval for follow-up and cleaning. At this appointment he presented with recurring gingival inflammation and poor plaque control (*Figure 5*). We suspected that there could be an underlying condition promoting susceptibility to gingival inflammation and bleeding. Underlying conditions including HIV infection, vitamin deficiency, or malignancy that display inflamed and hemorrhagic gingiva. The patient was instructed to see his physician and reported three weeks later for follow-up.



Figure 4. Improved gingival appearance after 10 day follow-up.



Figure 5. Five month follow-up and cleaning.

The patient returned in three weeks and reported that his physician diagnosed a vitamin B12 deficiency. The patient had an elevated homocysteine value of 24.5 (normal <11.4), an elevated methylmalonic acid value of 1214 (normal 87-318), and low vitamin B12 value of 180 (normal 211-946). The patient was not anemic as can often be the case in B12 deficiencies. The lab values for the patient's mean corpuscular volume (MCV), red blood cell (RBC) count, hemoglobin (Hgb), and hematocrit (Hct) were all within normal range (*Table 1*). The patient reported that his physician recommended over the counter (OTC) vitamin B12 and folate supplements to address the vitamin deficiency. Patient was then placed on three month recall appointments.

Table 1. Patient lab values.

Description	Result	Range
Homocysteine	24.5	<11.4
Methylmalonic Acid	1214	87 - 318
Vitamin B12	180	211 - 946
RBC count	5.36	4.6 - 6.2
Hgb	15	13.5 - 17.5
Hct	46.4	41 - 53
MCV	86.5	80 - 96

Discussion

Initial management focused on treatment of the acute gingival inflammation. Treatments included scaling with ultrasonic instruments under local anesthesia and amoxicillin and metronidazole was prescribed for 10 days. This antibiotic combination, along with ultrasonic scaling, has been shown to improve the outcome compared to ultrasonic scaling alone [7,8]. Follow up revealed successful reduction in the patient's discomfort and showed resolution of the acute gingival inflammation. The subsequent phases of treatment should focus on addressing underlying causes and to maintain the patient in a state of health [1]. Following the acute phase treatment, the patient was given oral hygiene instructions and was referred to his physician to investigate any potential underlying system problems. Once it was revealed that the patient had vitamin B12 deficiency, the patient could be counseled appropriately on proper oral hygiene, vitamin supplementation, and was placed on an appropriate hygiene recall schedule. The patient was placed on a three month recall interval to monitor healing and maintain health.

Deficiency of Vitamin B12, an essential dietary nutrient, produces serious complications. Vitamin B12 is only found in foods of animal origin and is absent in vegetables and fruit [9,10]. Once B12 containing food is ingested, the vitamin must be released by gastric enzymes then it must be bound by the protein intrinsic factor (IF) for B12 to be absorbed by the distal ileum [9]. Vitamin B12 deficiency can arise from various causes such as malabsorption, autoimmune disorders, medications, vegetarianism and inadequate nutrient intake. Pernicious anemia, an autoimmune disorder, occurs when the IF producing gastric cells are destroyed, resulting in an inability of the body to absorb B12 [11]. Pernicious anemia is

the most common cause of severe B12 deficiency worldwide [12].

Oral health practitioners should be aware of both the oral and systemic manifestations of B12 deficiency and the importance of proper referral if detected. Common signs of B12 deficiency in the oral cavity consist of a "beefy" red tongue, taste alterations, angular cheilitis, pale oral mucosa, burning mouth syndrome, and recurrent oral ulcerations [10,11]. Severe B12 deficiency can result in macrocytic anemia and other hematologic disorders, alterations in mental status, memory loss, paresthesia, and myelopathy [12]. Breast fed infants of B12 deficient mothers can develop growth abnormalities, anemia, and convulsions [9].

Vitamin B12 and folate are important cofactors within cells and play a crucial role in DNA synthesis and cell maturation. Both B12 and folate play a role in the metabolism of homocysteine to methionine; however, only B12 converts methylmalonyl CoA to succinyl CoA. Therefore, elevated serum levels of methylmalonic acid and homocysteine is more specific for B12 deficiency than homocysteine alone [12]. Additionally, a peripheral blood smear can be used to determine a patient's mean corpuscular volume (MCV) which can be evaluated to determine macrocytosis [13]. A MCV of 80-100fl is considered normal and a value above 100 is characteristic of macrocytosis. However, it is important to remember that macrocytosis is not always associated with a pathological process [13].

Macrocytic anemia is a disease state characterized by the presence of abnormally larger red blood cells (RBC) in the peripheral blood. Macrocytosis due to B12 deficiency is associated with impaired erythropoiesis. Bone marrow exam reveals hypocellularity and morphological abnormalities can be seen in multiple myeloid precursor cells. Abnormalities are most apparent in erythroid precursors cells, which display a large or "megaloblastic" appearance throughout the bone marrow [13].

Chronic vitamin B12 deficiency can lead to subacute combined degeneration (SCD). This disease is characterized by demyelination of the dorsal and lateral columns of the spinal cord [14]. SCD is a reversible condition when identified and treated early. Clinically, patients will present with paresthesias, diminished proprioception and vibration sensation, weakness, and gait disturbance [14]. Impaired memory and depression is also frequently seen in SCD [11].

Although this patient was not diagnosed with anemia or neurological dysfunction related to B12 deficiency, he is at risk for developing these problems in the future if left untreated. The patient is from India and his cultural practices prevent him from eating meat, which is a significant source of dietary B12. Hyperhomocysteinemia and low plasma B12 is not uncommon amongst people from India [15]. A majority of the people from India are vegetarians and low levels of B12 have been reported in this population [9,15-17].

A deficiency in vitamin C is traditionally associated with gingivitis and bleeding gums [18]. Our patient's ascorbic acid levels were not measured; however, he reported that he ate fruit, which is a common source of vitamin C. Although vitamin C deficiency is not expected, it cannot be completely ruled out. Our patient did not present with the traditional oral

signs of B12 deficiency; however, due to the severity of his periodontal condition was exacerbated by his nutritional deficiency or other systemic condition. Cases of destructive periodontitis associated with a deficiency in B12 have also been reported in the literature¹⁸. Ulcerative gingivitis is a less common presentation for patients with low serum levels of B12. However, studies report that B12 reduces cellular immunity which could be what lead to the patient's presentation [19,20]. It may be prudent for clinicians to evaluate for Vitamin B12 deficiency if patients present with refractory NPD.

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