

Case Report

Effects of Sex Hormones on the Gingiva in Pregnancy: A Review and Report of Two Cases

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Abstract

Pregnancy is a physiological state that brings a wide range of changes in a woman's life, including a susceptibility to periodontal disease, probably due to hormonal changes associated with pregnancy. The metabolism and immunology of the body are modified by hormones like progesterone and estrogen as well as other local factors. These sex hormones may modify the oral mucosa and may lead to various periodontal diseases. The hormonal changes occurring during pregnancy may be associated with pregnancy gingivitis, gingival bleeding, and generalized or localized gingival enlargement in the presence of local factors that may accentuate the gingival response. This article reviews the condition and presents two cases.

Key words: Estrogen, excision, gingivitis, progesterone, tumor.

Introduction

Pregnancy has far reaching systemic effects extending beyond the reproductive system, involving various complex physical and psychological changes that have an impact even on the healthy woman. These effects occur mainly due to hormones on almost every organ.^{1,2} Estrogen and progesterone are the main sex pregnancy hormones. Their level rises until the eighth month of pregnancy and after that it becomes stable until birth. The estrogen level rises slowly until the end of the pregnancy.³ The high

level of hormones in blood and saliva may cause gingival reactions that may increase or cause gingival and periodontal disorders.

The pregnant women are particularly more prone to periodontal disease due to hormonal changes associated with pregnancy. Research has found that woman with periodontal disease may be at higher risk for delivering preterm low birth weight infants. Pregnancy gingivitis and gingival enlargement have been associated with a variety of local and systemic factors, and therefore, the differential diagnosis becomes an important aspect for complete management of the

lesion. Most of the causative factors lead to an unusual hyperplastic tissue response to chronic inflammation associated with local irritants such as plaque, calculus or bacteria and their products.⁴ Hormonal changes occurring during pregnancy and puberty significantly potentiate the effects of local irritants on gingival connective tissue.⁵

The levels of sex steroid hormones in saliva increases during pregnancy.^{6,7} Some of the most remarkable endocrine related oral alterations occur during pregnancy due to increased plasma hormone levels.⁸ Upon fertilization and implantation, the corpus luteum continues to produce estrogen and progesterone while the placenta develops. Progesterone and estrogen reach their peak plasma levels of 100ng/ml and 6ng/ml, respectively, by the end of the third trimester, and the potential biological impact of estrogen and progesterone take place in periodontal tissues during this period.

Mechanisms of Action of Sex Hormones

Effects of estrogen on the periodontal tissues include the following:⁹

1. Decreases keratinization while increasing epithelial glycogen that results in the diminution in the effectiveness of the epithelial barrier.
2. Increases cellular proliferation in blood vessels.
3. Stimulates Polymorphonuclear Leukocyte (PMNL) phagocytosis.
4. Inhibits PMNL chemotaxis.
5. Suppress leukocyte production from the bone marrow.
6. Inhibits pro-inflammatory cytokins released by human marrow cells.
7. Reduces T-cell mediated inflammation.
8. Stimulates the proliferation of the gingival fibroblasts.
9. Stimulates the synthesis and maturation of gingival connective tissues.
10. Increases the amount of gingival inflammation with no increase of plaque.

Also, progesterone has the following effects on the periodontal tissues:⁹

1. Increases vascular dilatation, thus increases permeability.
2. Increases the production of prostaglandins.
3. Increases PMNL and prostaglandin E2 in the gingival crevicular fluid (GCF).
4. Inhibits collagen and non-collagen synthesis in the periodontal ligament (PDL) fibroblasts.
5. Inhibits proliferation of human gingival fibroblast proliferation.

6. Alters rate and pattern of collagen production in gingiva resulting in reduced repair and maintenance potential.
7. Increases the metabolic breakdown of folate which is necessary for tissue maintenance and repair.

Influences on Gingival Vasculature

The effects of estrogen and progesterone on the gingival vasculature could potentially explain the increased edema, erythema, gingival crevicular exudate, and hemorrhagic gingival tissues, noted during pregnancy as well as other stages of the reproductive cycle. An increase in gingival crevicular fluid flow has been correlated to elevated sex steroid levels, which indicates that these hormones may affect vascular permeability in the gingival sulcus.⁹

Microbial Changes during Pregnancy

Microorganisms such as *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, and *Prevotella intermedia* are known to synthesize steroid metabolizing enzymes needed for steroid synthesis and catabolism. The steroid metabolites may also contribute to nutritional requirements of the pathogens, which may lead to gingival changes during pregnancy.¹⁰

Gingival Changes during Pregnancy

Pregnancy gingivitis is characterized by erythema, edema, hyperplasia, and increased bleeding. Cases range from mild inflammation to severe hyperplasia and hypertrophy, pain and bleeding. Increased gingival probing depths, increased gingival inflammation, increased gingival crevicular fluid flow, increased bleeding upon probing and increased tooth mobility are the clinical periodontal manifestations described during pregnancy. The anterior region of the mouth is more commonly affected and the interproximal sites tend to be the most involved areas.¹¹

There is also an increased incidence of pyogenic granulomas during pregnancy at a prevalence of 0.2–9%. The ‘pregnancy tumor’ or ‘pregnancy associated pyogenic granuloma’ appears most commonly during the second or the third month of pregnancy. Gingiva is the most common site involved (70%), followed by tongue, lips, buccal mucosa and the palate. The pregnancy tumor develops as a result of an exaggerated inflammatory response to local irritations, then enlarges rapidly, bleeds easily, and becomes hyperplastic and nodular. The tumor may be sessile or pedunculated and may range from purplish red to deep blue in color with small fibrin spots. It has a tendency to

recur if not completely removed after pregnancy.¹²

Management

Pregnancy gingivitis and localized gingival enlargement occurs usually in the first trimester of pregnancy and extends onto third trimester. In pregnancy gingivitis and all forms of enlargements, good oral hygiene is necessary to minimize the effects of systemic factors. Gingivoplasty or gingivectomy may be required after pregnancy but should be done in combination with prophylaxis and oral hygiene instructions.

Case Report

Case 1

A 25-year-old female patient with 6 months pregnancy first examined by a gynecologist was referred to the Department of Periodontology. The chief complaint included profuse bleeding from gums while brushing and on having food. Patient was having semisolid and liquid diet, as bleeding occurred on having rigid food items. On intraoral clinical examination, deposits of calculus and bacterial plaque as well as excessive generalized gingival enlargement nearly covering the surfaces of the teeth were noted (Figure 1). According to the past history, the patient was hav-

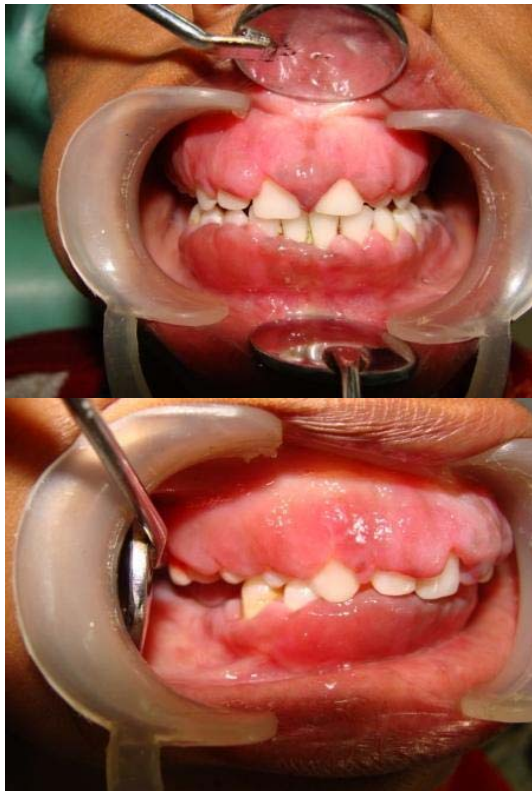


Figure 1. Genralized gingival enlargement in front (upper) and lateral views (lower).

ing mild gingival bleeding and swelling before conception, but gingival swelling and bleeding had continuously increased since the first month of pregnancy.

During pregnancy, surgical treatment was not attempted, and only scaling and oral prophylaxis were performed to remove local irritants. Patient was instructed to maintain a strict oral hygiene to reduce gingival inflammation and was called after delivery if to perform surgical treatment.

Case 2

A 23-year-old female patient with 8 months pregnancy was referred to the Department of Periodontics, presenting with a localized massive gingival overgrowth on the upper left anterior region in relation to maxillary left central incisor, lateral incisor, and canine, with protruding lips (Figure 2). There was no history of drug intake or any hereditary reasons. According to the past history, patient had begun bleeding on brushing since three months of pregnancy, but the enlargement came to the present size at the time of examination. The patient reported difficulty in chewing, speech and closing of the lips; the esthetics was also compromised because of the enlargement. The gingival swelling was evident extraorally. On intraoral examination, the lesion was approximately 3.5×2 cm in size and pedunculated. The soft tumor was bright red in color, bleeding on slightest provocation. Subgingival calculus and plaque was present. Patient was unable to maintain oral hygiene in this area, because of the gingival enlargement.

Oral prophylaxis was performed after routine hematological investigation. Instructions regarding maintenance of oral hygiene and to prevent injury or biting of tumor were given and advised to return postpartum. The patient returned one month after delivery. The dimension of the tumor was the same as before delivery. The gingival overgrowth was excised with a No. 15 blade and electrocautery. Bleeding was controlled by the ball tip of the electrocautery (Figure 3a). Periodontal dressing was applied in the involved region. The excised lesion (Figure 3b) was sent for histopathological examination, which revealed epithelial proliferation and underlying capillary proliferation along with marked inflammatory cell infiltration (Figure 3c). The healing was uneventful and no relapse was seen on 6-month follow-up (Figure 3d).

Discussion

Gingivitis in pregnancy is caused by bacterial plaque,



Figure 2. Localized massive gingival enlargement (left), protruding out of lip avoiding lip closure (right).

like in non-pregnant individuals. Pregnancy accentuates the gingival response to plaque. The incidence of gingivitis in pregnancy varies from around 50 to 100%.

Although pregnancy does not alter the healthy gingiva, it affects the severity of previously inflamed areas. In some cases, the inflamed gingiva forms a discrete mass referred to as pregnancy tumor.¹³ The subgingival flora changes to a more anaerobic flora as pregnancy progresses and *Prevotella intermedia* is the microorganism that increases significantly during pregnancy.¹⁴ The increase is due to elevations of lev-

els of systemic estradiol and progesterone.¹⁴ It has been suggested that the altered tissue response to plaque is due to depression of the maternal T lymphocyte.¹⁵ The gingiva has been shown to be a target organ for female sex hormones.¹⁶ Therefore, the maintenance of oral hygiene before and during pregnancy is very important in order to reduce the incidence and the severity of gingival inflammation. It is generally accepted that increase in gingival inflammation typically begins in the second month and reaches the maximal level during the eighth month of pregnancy. These inflammatory changes may lead to gingivae



Figure 3. Excision of tissue and hemostasis achieved with electrocautery (a). The excised lesion (b). Histopathological view of the excised tissue (c). Surgical site 6 months after surgery (d).

that appear edematous, hyperplastic and erythematous; the changes may be localized or generalized, and are usually noted on the marginal gingiva and interdental papilla.^{17,18} As discussed in the reported cases, gingival enlargement during pregnancy is a matter of concern. The improper and insufficient diet in the first presented case, chosen to prevent gingival bleeding, would definitely influence growth of the fetus and the hemoglobin of the pregnant mother.

In conclusion, the local factors including plaque and calculus, containing an accumulation of bacteria, are known to be responsible for gingival enlargement during pregnancy. The hormonal factors also play a role in aggravating the hyperplasia. Therefore, the importance of regular dental check up and oral prophylaxis cannot be overlooked. In all forms of gingival enlargements, good oral hygiene is necessary to minimize the effects of systemic factors.

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