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Case Report

Non-surgical management of periodontitis influenced by polycystic ovarian syndrome (PCOS): A case report

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ABSTRACT

Polycystic ovary syndrome (PCOS) and periodontal disease are linked through hormonal imbalances and systemic inflammation. Hormones like estrogen and progesterone, which are elevated in PCOS, affect periodontal tissues by promoting inflammation and altering the oral microbiota. PCOS patients are more prone to periodontitis due to these hormonal changes, which increase gingival inflammation even in the absence of bacterial plaque. Both conditions share common inflammatory pathways, with PCOS contributing to low-grade systemic inflammation and insulin resistance, further exacerbating periodontal disease. This case report highlights the bidirectional relationship between PCOS and periodontitis, emphasizing the importance of non-surgical management approaches in treating these conditions.

1. Introduction

Hormones are key regulatory molecules that control a wide range of bodily functions, such as reproduction, growth, and development. They also play a crucial role in maintaining internal homeostasis and managing energy production, usage, and storage. The maintenance of periodontal health involves complex, multifactorial relationships, with the endocrine system playing a significant role.[1]

The ovaries produce estrogen, which maintains secondary sex characteristics and promotes uterine growth. Progesterone influences the latter half of the menstrual cycle and pregnancy, affecting gingival and periodontal tissue vascularity through its receptors, leading to increased inflammation via prostaglandin production and leukocyte migration. Elevated hormone levels can also promote the growth of black-pigmented bacteria like Bacteroides, Prevotella intermedia, and Capnocytophaga species, enhancing gingival inflammation even without bacterial plaque.[2]

Various systemic factors in the host influence the development, severity, and prevalence of periodontal diseases. Notably, sex hormones affect the pathogenesis of these diseases by altering host-parasite interactions in the oral cavity. Estrogen and progesterone influence the microcirculatory system by causing endothelial cell and venous pericyte swelling, promoting granulocyte and platelet adherence to vascular walls, forming microthrombi, disrupting perivascular mast cells, increasing vascular permeability, and stimulating vascular proliferation.[3]

Pro-inflammatory mediators in periodontal disease are believed to contribute to the development of conditions like diabetes, cardiovascular diseases, obesity, preterm delivery, and preeclampsia. Recently, the link between periodontal diseases and polycystic ovarian syndrome (PCOS) has gained attention in reproductive endocrinology and periodontology. Polycystic ovarian syndrome (PCOS) is a common endocrine disorder in women, linked to various

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reproductive and metabolic abnormalities.[4]

PCOS prevalence varies globally, ranging from 2.2% to 26% in Western countries, 2% to 7.5% in China, 6.3% in Sri Lanka, and 9.13% to 36% in India. Recent evidence suggests that PCOS patients are more susceptible to periodontitis. Elevated androgen and estrogen levels in PCOS affect subgingival microbiota and gingival cells, impairing epithelial efficiency and leading to gingivitis and periodontitis.[5]

PCOS is linked to low-grade systemic inflammation, evidenced by elevated levels of markers such as C-reactive protein (CRP), interleukin 18 (IL-18), monocyte chemoattractant protein-1, macrophage inflammatory protein-1, and white blood cells. Increased oxidative stress and its biomarkers further support the classification of PCOS as an inflammatory condition. Similarly, periodontitis is a chronic inflammatory disease, and inflammation is the common factor connecting periodontitis with various systemic diseases.[6]

Literature suggests several pathophysiological links between PCOS and periodontal disease, including low-grade systemic inflammation, insulin resistance (IR), oxidative stress, advanced glycation end products, and systemic hormonal levels. Periodontal disease can cause chronic subclinical inflammation, leading to Insulin resistance and potentially triggering type 2 diabetes, which is common in PCOS. Additionally, hormonal imbalances in PCOS, such as hyperandrogenism, hyperestrogenism, and hyperprogesteronism, induce chronic low-grade inflammation that affects the capillary system and angiogenesis. This disrupts the periodontal tissues defence against microbial plaque by altering oral flora and inducing pro-inflammatory cytokines, creating a bidirectional relationship between PCOS and periodontitis.[7]

Dentists must be familiar about PCOS, its effects on periodontitis, and the bidirectional relationship between these conditions and management. Non-surgical management of such case is reported here.

2. Case Presentation

A18 year old female patient reported to the department of periodontics and oral implantology with complaint of generalized bleeding gums while talking, brushing, chewing food (spontaneous in nature) since 2 to 4 months. Her medical history was not significant, personal history revealed that she has a mixed diet. In the extra oral examination, no abnormality was detected.

Intra oral examination revealed reddish pink gingiva with rolled and rounded margins, soft and edematous consistency, reduced stippling was observed, generalised grade **II** gingival enlargement was observed (Bokenhamp and Bohnhorst 1994), Position of marginal gingiva is apical to CEJ i.r.t 11, 16, 21, 31, 32, 41, 42 and bleeding on probing is positive, pocket depths were in the range of 6-8mm. OHI -S (Greene and Vermillion) gave a score of 3.16 which is poor, Plaque index (Sillness and Loe) gave a score of 2 which is poor, gingival index (Loe and Sillness) gave a score of 2.70 which indicates severe gingivitis, Russell's periodontal index gave a score of 4.8 which indicates established disease. Preoperative pictures (Figures 1, 2 and 3)

Upon further questioning, considering the extent of destruction and her age, the patient revealed that she experiences irregular menstrual cycles, occurring once every 3 to 4 months. Based on clinical examination a provisional diagnosis of Generalised stage **III** grade B periodontitis was made. Patient was referred to gynaecologist for further evaluation suspecting polycystic ovarian syndrome. Ultrasound scan of abdomen gave impression of bilateral polycystic ovarian disease. Patient reported back to the department of periodontics and oral implantology after one day, and the final diagnosis of generalized stage **III** grade B periodontitis with periodontitis as manifestation of systemic condition was made. Non- surgical periodontal therapy was performed after which the patient was prescribed chlorhexidine 0.12% mouthwash and metrogyl DG gel.

Patient was recalled for follow up after 14 days and 3 months and there was significant reduction in all the clinical parameters. post-operative pictures (Figures 4, 5 and 6)

Figure 1: Frontal view at baseline

3. Discussion

Polycystic ovary syndrome (PCOS) is a multifaceted condition marked by high androgen levels, irregular menstrual cycles, and/or small cysts on one or both ovaries. This disorder can manifest as either morphological changes (polycystic ovaries) or primarily biochemical alterations (hyperandrogenemia). Hyperandrogenism, a key feature of PCOS, can lead to inhibited follicular development, the formation of ovarian microcysts, anovulation, and menstrual irregularities. Different criteria can be used to diagnose

Figure 2: Right lateral view at baseline

Figure 3: Left lateral view at baseline

Figure 4: Frontal view at 3 months follow up

Figure 5: Right lateral view at 3 months follow up

Figure 6: Left lateral view at 3 months follow up

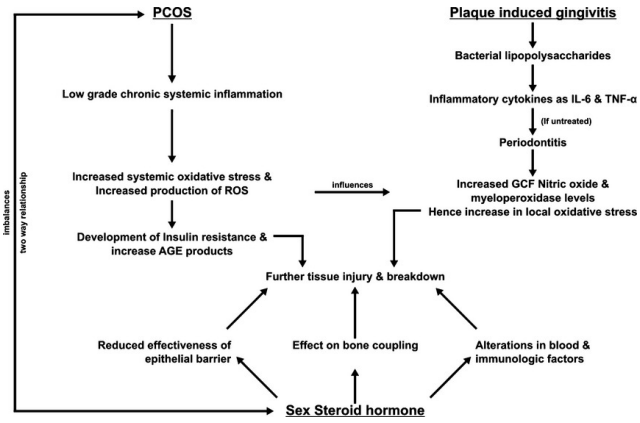

Figure 7: Two-way relationship of PCOS and periodontics. PCOS – Polycystic ovarian syndrome, ROS- Reactive oxygen species, AGE – Advanced Glycated End prosducts
IL-6 – Interleukin – 6, TNF-α – Tumer necrosis factor alpha,

PCOS. According to the NICHD/NIH criteria (1990), the diagnosis requires hyperandrogenism, oligo-ovulation or anovulation, and the exclusion of other related disorders. Later, the European Society of Human Reproduction and Embryology (ESHRE) and the American Society for Reproductive Medicine (ASRM) held a workshop in Rotterdam, where polycystic ovarian morphology on pelvic ultrasound was added to the criteria. It was determined that meeting any two of these three criteria would be sufficient for a PCOS diagnosis.[8]

PCOS is associated with menstrual irregularities, pregnancy complications, metabolic disorders, cardiovascular diseases, and increased cancer risk. Periodontal diseases (PDDs) are chronic inflammatory conditions of the oral cavity, influenced by a dysbiosis of the oral microbiota, which affects tooth-supporting tissues and can lead to tooth loss. Systemic conditions such as diabetes mellitus (DM), obesity, and metabolic syndrome (MS) are known risk factors for PDD. Notably, PCOS and PDD share common risk factors, including metabolic syndrome, obesity, DM, and cardiovascular disease. Recent studies have confirmed the association between PCOS and PDD, highlighting their interconnected nature.[9]

PCOS, through pathways involving reactive oxygen species, insulin resistance, AGE, and hormonal levels, could affect periodontal conditions already influenced by plaque, establishing a link between systemic hormonal disorders and periodontal health. (Figure 7) explaining the two-way relationship of PCOS and periodontics.[10]

Cecilia Fabiana Márquez-Arrico et al in their systematic review have concluded that there is a proven link between periodontal diseases and PCOS, specifically gingivitis and chronic periodontitis (CP). This association is likely driven by a shared pro-inflammatory environment, both locally and systemically, which promotes oxidative stress and leads to irreversible damage of periodontal tissues over time.[11]

Ozcaka et al. (2013) found higher levels of specific pathogens (Porphyromonas gingivalis, Fusobacterium nucleatum, Streptococcus oralis, and Tannerella forsythia) in saliva and increased serum antibody responses in women diagnosed with PCOS. This suggests that women with PCOS may have a greater prevalence of these oral bacteria and a heightened immune response to them, potentially contributing to the increased risk of periodontal disease observed in this population.[12] Akali et al. (2014) found higher levels of Porphyromonas gingivalis, Fusobacterium nucleatum, Streptococcus oralis, and Tannerella forsythia in saliva of women with PCOS compared to healthy subjects. PCOS also correlated with increased serum antibody levels against these bacteria, suggesting a potential link between PCOS, altered oral microflora, and heightened gingival inflammation.[13]

Rahiminejad et al. (2015) conducted a cross-sectional study to determine the prevalence of periodontitis in women with PCOS. They found that the prevalence of periodontal disease parameters was higher in non-obese women with PCOS compared to healthy controls. This suggests that PCOS may contribute to a greater incidence of periodontal disease in non-obese women, highlighting the importance of periodontal screening and management in this population.[14]

4. Conclusion

In conclusion, the case report reviewed highlights of7 significant associations between polycystic ovary syndrome (PCOS) and periodontal health. Studies consistently show that women with PCOS are at increased risk for periodontal diseases such as gingivitis and periodontitis. This increased risk is attributed to hormonal imbalances, which can alter oral microflora and promote a pro-inflammatory environment conductive to periodontal disease. Additionally, PCOS-related factors such as hyperandrogenism and insulin resistance exacerbate systemic inflammation, further impacting periodontal health. Understanding these connections underscores the importance of comprehensive oral health care and regular periodontal assessment for women with PCOS to mitigate potential oral and systemic health complications. Gynaecologists should be knowledgeable about the diverse risk factors linked to PCOS and its oral manifestations. An interdisciplinary collaboration between gynaecologists and periodontists can significantly enhance patient treatment outcomes.

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6. Conflict of Interest

None.

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