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Review Article

Oral contraceptives and oral health: an insight

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ABSTRACT

Oral contraceptive pills are a safe and effective means of avoiding pregnancy followed by women worldwide. These drugs were first introduced in 1960s and 70s and contained higher dose of estrogen and progesterone and were reported to cause unwanted side effects like gingival inflammation, localized osteitis, alterations in salivary flow rate, changes in salivary components and gingival melanosis in oral tissues. With the advent of new generation formulations of low dose oral contraceptive pills, the effects on oral health is minimized and presently users are not considered as risk group for developing gingival and periodontal disease. This review briefs the effects of oral contraceptive pills on general health and oral health in particular and controversies surrounding their use.

Keywords: *Oral contraceptives, gingivitis, loss of attachment, estrogen, progesterone, oral health, adverse effects, side effects*

Introduction

Oral contraceptives pills (OCPs) are one of the most commonly used methods of birth control by women worldwide. They are used for prevention of pregnancy, also non-contraceptive uses include in treatment of polycystic ovary syndrome, dysmenorrhea, menorrhagia and hirsutism. [1] Currently available OCPs have low doses of estrogen (0.05mg/day) and progestins (1.5mg/day) compared to the formulations available in the past with higher concentrations of sex hormones (20-50µg estrogen and 0.15 - 4mg progesterone). [2] OCPs are available as two types - one with only progesterone and other with a combination of estrogen and progesterone called as combined oral contraceptive pills (COCs). Emergency contraceptive pills are as well available. They are classified as first, second, third and recently fourth generation OCPs. They are also marketed as monophasic or multiphasic depending on frequency and

dosage of hormone given over a cycle of therapy. [1]

Mechanism

The exact pathogenesis and the role of irritants still remain to be fully elucidated. There is substantial evidence to suggest that oestrogen receptors do exist in gingival tissues and that the gingival tissues metabolise the sex hormones. Estrogen receptors are also found on periosteal fibroblasts, scattered fibroblasts of the lamina propria, and also periodontal ligament fibroblasts and osteoblasts. [3]

The effects of oestrogen and progesterone on the oral mucosa and periodontal tissues have been extensively studied. The effects of estrogen and progesterone on the periodontium are summarized as follows:

Effects of estrogen on the periodontal tissues

- Stimulates the proliferation of the gingival fibroblasts. [4,5]
- Stimulates the synthesis and maturation of gingival connective tissues. [4]
- Increases the amount of gingival inflammation with no increase of plaque. [6]
- Increases cellular proliferation in blood vessels. [7,8]
- Decreases keratinization while increasing epithelial glycogen that results in the diminution in the effectiveness of the epithelial barrier. [9]
- Increases in the acid mucopolysaccharide content of connective tissue in human oral mucosa. [9]
- Reduces T-cell mediated inflammation. [10]
- Suppress leukocyte production from the bone marrow. [11]
- Stimulates PMNL phagocytosis. [4,12]
- Inhibits PMNL chemotaxis. [13]
- Inhibits pro-inflammatory cytokines released by human marrow cells. [14]

Effects of progesterone on the periodontal tissues

- Inhibits collagen and non-collagen synthesis in PDL fibroblast. [15]
- Inhibits proliferation of human gingival fibroblast proliferation. [16]
- Alters rate and pattern of collagen production in gingiva resulting in reduced repair and maintenance potential. [17]
- Increases vascular dilatation, thus increases permeability and increase in gingival fluid volume and GCF. [4,7,8]
- Increases the production of prostaglandins. [4,18]
- Increases Polymorphonuclear leukocytes and prostaglandin E2 in the gingival crevicular fluid (GCF). [4,18,19]
- Reduces glucocorticoid anti-inflammatory effect. [20]
- Increases the metabolic breakdown of folate which is necessary for tissue maintenance and repair.

Oral side effects of OCPs

Several case reports have described a hyperplastic edematous gingivitis following the use of oral contraceptives, which resolves when the drugs are withdrawn. [21]

In overdose, oral contraceptives have been reported to give rise to a hypertrophic gingivitis, marked gingival erythema and bleeding and pregnancy type epulis. In normal dose they may cause gingivitis with an increase in gingival exudate and increase in the number of inflamed papillae. [22,23] Gingival changes may be due to increased vascularization and increased vascular permeability caused by progesterone. These effects appear to be related to the type of oral contraceptive

taken. With a combination type of pill, the level of gingival exudate increases over the first six months of ingestion and then decreases, whereas with sequential types the increase in exudate only arises after six months of medication. [23]

Where there is an increase in circulating sex hormones from taking the oral contraceptive, the patient's gingival tissues are more susceptible to plaque induced inflammatory changes inducing the development of the so called pregnancy epulis. It is therefore essential that such patients maintain optimal plaque control to reduce the risk of further periodontal damage.

Early reports showed that hormonal contraceptives are associated with an increase in the severity of gingival inflammation. [24] However, Knight and Wade failed to demonstrate significant differences in either plaque or gingivitis levels between women taking oral contraceptives over a period of ½ years and age matched controls. [25] Subject's receiving hormones for more than 1½ years, however exhibited greater periodontal destruction than either of the two previous groups. It was suggested that is could be due to altered host resistance after long-term hormone intake.

Women using oral contraceptives showed increased pocket probing depth and sulcular bleeding index than controls while control group showed higher plaque index than test group. No correlation between the duration of OCP intake, age and periodontal parameters was observed. Authors concluded that the use of currently combined oral contraceptives can influence the periodontal conditions of the patients, independently of the plaque accumulation or total duration of medication intake, resulting in gingival inflammation. [26] On the contrary no difference in plaque index between the study groups was observed by few authors. They reported that OCP users had higher levels of gingival inflammation and bleeding on probing but no differences were found regarding probing depth and attachment loss between two groups. [27]

Mullay et al found OCP users had deeper probing depth, more severe attachment loss and more sites with bleeding on probing than controls. [28] Women using OCPs showed 16 fold increase in Bacteroides species. Higher number of Provetella species in oral microflora were found in OCP users. Increased female sex hormones substituting for the napthoquinones required by certain Provetella species most likely are responsible for this rise. [29]

Sialochemical analysis in OCP users showed some changes like decrease in concentrations of protein, sialic acid, hexaosaminefucose, hydrogen and total electrocytes. Change in salivary flow rate is also reported in few studies. Both parotid and submandibular salivary secretion rates increased in women using OCP. [30] On the contrary, persistent dryness of mouth was noticed in 30% of study participants using OC. [23]

Gingival crevicular fluid (GCF) is said to be an extremely sensitive indicator of gingival inflammation. Few studies have reported increased GCF flow rate in OCP users [7] but no significant difference of GCF flow rate was noticed in women using oral contraceptives and controls. [31]

Higher incidence of localized osteitis following extraction of mandibular third molars was reported in women using oral contraceptives. [32] This was attributed to estrogen content of the pill on the blood

clotting factors. The risk of postoperative localized osteitis can be avoided by performing extraction on non-estrogenic days of the oral contraceptive pill cycle (23 to 28 days). [33]

Gingival melanosis is reported in OCP users. Estrogen is known to induce secretion of high levels of cortisol binding globulin which leads to reduction in free cortisol level in plasma with resultant hypersecretion of ACTH and β-melanocyte stimulating hormone. The later may cause pigmentation of oral mucosa. [34]

Other side effects

OCPs are also known to affect general health. Common side effects like nausea, vomiting, headache, abnormal/break through bleeding, spotting, altered vaginal secretions, breast tenderness, swelling or edema of ankles and feet, mood disorders, depression, melasma, weight gain, decreased libido, bloating, tiredness have been reported. Serious effects like venous thromboembolism, pulmonary embolism, heat attack and stroke, risk of fractures, breast cancer and cervical cancer and hepatic adenomas are also reported in some women. It has been postulated that miscarriages, lower bone density, vaginal infections, fungal infections have been found. Depletion of important nutrients like Vitamin B2, B6, folic acid, Vitamin C, magnesium and zinc has been related to use of OCPs. However, there is controversial evidence in the literature to substantiate these effects. [1,35]

Benefits of OCP

Few benefits of using OCPs have also been reported such as reduced risk for developing endometrial and ovarian cancer.[1]

Contraindications for OCPs

Women aged above 35 years, smokers, history of blood clots, hypercoagulable disorders, cardiovascular disease, hyper cholesterolemia, uncontrolled hypertension, obesity, migraine and headaches, breast cancer, endometrial cancer, liver and kidney disorders. [1]

Drug interaction with other drugs

Antibiotic interference with contraceptive medication levels is controversial. Although results from animal studies support antibiotic interference with contraceptive levels, studies in humans have presented conflicting results. Also other drugs like antidepressants, anticonvulsants, antidiabetics are known to reduce efficacy of OCPS. [35] So patient education and referral to physician is indicated while prescribing these drugs otherwise it may possibly result in unwanted pregnancy. [36]

Newer Contraceptives

Alternative long lasting delivering systems like implants, injectable forms, patches, vaginal rings and intrauterine devices are available and are being developed to deliver low doses of sex hormones continuously. [1,35]

Conclusion

Numerous case reports and clinical studies available in the past have concluded that OCP have certain effects on oral health. Unfortunately these early studies had lot of methodological flaws which make their conclusions questionable. The finding of dose dependent effects led to the development of new generation OCPs with low dose formulations in recent years. [37] Though there are few studies to investigate their effects on oral health, it is said that

evidence strongly supports that they do not pose health risks. Thus OCP users are not at risk for gingiva and periodontal disease. [38]

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