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ENDOMETRIAL AND CERVICAL POLYPS: PATHOLOGICAL MECHANISMS AND PREVENTION

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Abstract:

Endometrial and cervical polyps are common gynecological conditions that frequently affect women and are often associated with hormonal imbalances, inflammatory processes, and mechanical damage. These polyps can arise due to multiple pathological mechanisms, including hormonal dysregulation, chronic inflammation, genetic mutations, and external factors such as medical procedures or infections. Hormonal imbalance, particularly estrogen dominance and progesterone deficiency, plays a key role in the formation of polyps, as it disrupts the normal regeneration of the endometrial lining. Additionally, chronic inflammatory responses contribute to the growth of both endometrial and cervical polyps by increasing cell proliferation and angiogenesis. Genetic factors, including mutations in oncogenes and tumor suppressor genes, can also drive the development of these polyps. The prevention of polyps relies on addressing the underlying risk factors, such as maintaining hormonal balance through diet, exercise, and stress management, preventing chronic infections, and managing metabolic health. Early detection and intervention are crucial for managing polyps and preventing potential complications such as malignancy. This article explores the mechanisms involved in the formation of endometrial and cervical polyps and provides an overview of preventive strategies to mitigate their occurrence.

Keywords: *Estrogen dominance syndrome; xenoestrogens; polycystic ovary syndrome (PCOS); genetic mutations; epigenetic; oncogenes; apoptosis*

INTRODUCTION

Endometrial and cervical polyps are common benign growths that occur in the uterine lining (endometrium) and the cervix, respectively, and are frequently encountered in gynecological practice. These polyps are often asymptomatic, but they can lead to a range of clinical issues, including abnormal uterine bleeding, pain, and infertility. Although the exact cause of polyp formation remains unclear, various factors are believed to contribute to their development. Hormonal imbalances, particularly involving estrogen and progesterone, play a central role in the pathogenesis of these polyps by promoting the excessive growth of the endometrial and cervical tissues. In addition to hormonal disruptions, chronic inflammation, mechanical trauma, genetic mutations, and metabolic disorders are implicated in the formation and progression of polyps. Understanding the pathological mechanisms underlying the development of endometrial and cervical polyps is crucial for the development of effective preventive measures and treatment strategies. This article aims to explore the key pathological mechanisms contributing to polyp formation and provide insight into preventive approaches that may reduce the risk of their occurrence.

Pathological Mechanisms

Several primary pathogenic mechanisms contribute to the formation of polyps:

• Hormonal Imbalance

Hormonal imbalance refers to the disruption in the ratio of hormones in the body, playing a key role in the development of endometrial and cervical polyps. The formation of polyps is often linked to the imbalance between estrogen and progesterone levels. Excessive production of estrogen leads to endometrial hyperplasia, increasing the risk of polyp formation. Progesterone deficiency disrupts the normal regenerative processes of the endometrium, leading to excessive growth, which can cause polyp formation.

1. Estrogen Dominance Syndrome

Estrogen dominance occurs when there is an excess of estrogen in the body, disrupting the balance with progesterone. This condition can lead to uncontrolled growth and hyperplasia of endometrial cells, resulting in polyps.

Causes of estrogen dominance:

- Environmental toxins (xenoestrogens found in plastics, cosmetics, lubricants).
- Hormonal changes in the diet (hormone-laden meat and dairy products).

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- Liver dysfunction (reduced estrogen elimination from the body).-
- Stress and high cortisol levels (excessive cortisol from the adrenal glands reduces progesterone production).
- Ovulation issues (lack of ovulation leading to progesterone decrease).

Symptoms:
- Menstrual irregularities (long or heavy periods).
- Tenderness and swelling of the breasts.
- Difficulty losing weight and obesity.
- Sleep disturbances and irritability.
- Decreased sexual desire.

2. Progesterone Deficiency and its Link to Polyps
Progesterone is the key hormone that balances the effects of estrogen. When progesterone levels drop, the physiological regeneration of the endometrium is disrupted, leading to excessive growth and polyp formation.
Causes of progesterone deficiency:
- Chronic stress (cortisol reduces progesterone levels).
- Age-related decline in progesterone production (especially after age 35).
- Absence or dysfunction of ovulation.
- High blood insulin and insulin resistance.
- Excessive cardio exercise or low physical activity.

Symptoms:
- Irritability and depression before menstruation.
- Sleep disturbances.
- Fluid retention and swelling in the face, hands, and feet.

3. Prolactin and Testosterone Imbalance
Hyperprolactinemia (high prolactin levels) reduces progesterone production and leads to estrogen dominance, which can promote polyp development. Testosterone, an important hormone in women, when imbalanced, may also contribute to hormonal disruptions. For example, polycystic ovary syndrome (PCOS) in women leads to estrogen dominance, ovulation disorders, and increased risk of polyps.

• Chronic Inflammatory Processes
Chronic inflammation is a long-lasting condition that triggers repair processes and includes immune system activation. Inflammation mediators such as prostaglandins, cytokines, and other inflammatory mediators (e.g., interleukins, TNF-alpha) can stimulate various cells, affecting the development of endometrial and cervical polyps.
1. Effect of Inflammation on Endometrial Polyps:
Chronic inflammation can promote the development of endometrial polyps. Polyps typically develop under the influence of inflammatory processes because:
- Inflammatory mediators (e.g., TNF-alpha, interleukins) can stimulate polyp growth. They promote cell proliferation and angiogenesis (formation of new blood vessels), supporting polyp development.
- Inflammation also affects the microcirculation and tissue repair processes in the endometrium, leading to polyp formation.
- Hormonal imbalance and endometrial immune responses can be intensified under inflammatory conditions, accelerating the formation of polyps.

2. Effect of Inflammation on Cervical Polyps:
Inflammatory processes similarly affect the development of cervical polyps:
- Urogenital infections or endometrial infections can induce inflammation, promoting cervical polyp growth.
- Inflammatory mediators (interleukins, prostaglandins) can increase cell proliferation in cervical polyps as well.
- The interaction between hormones and the immune system can enhance polyp development.
- Long-term inflammation in the cervix and endometrium can lead to polyp formation.

• Genetic Factors
1. Genetic Mutations:
Several genetic factors contribute to endometrial polyp development, including DNA methylation, genetic recombination, and activation of oncogenes. Mutations and abnormal gene expression, particularly of oncogenes like TP53, KRAS, PTEN, PIK3CA, and CTNNB1, can promote the growth of polyps. These mutations stimulate cell proliferation and prevent apoptosis.
2. Chromosomal Aberrations and Genetic Adhesions:
Chromosomal adhesions and genetic factors play a significant role in endometrial polyp development. Changes on chromosomes 16, 6, and 1 have been shown to support polyp growth and invasive behavior.
3. Hormonal Imbalance and Genetic Changes:
Hormones (especially estrogen) influence the growth of endometrial polyps. The genetic potential of endometrial cells, in conjunction with hormonal changes, can accelerate polyp development. This process is especially influenced by mutations in estrogen receptors and genes related to hormones.
4. Epigenetic Changes:
Epigenetic alterations, such as DNA methylation or histone modification, change gene expression and affect the development of endometrial cells, creating opportunities for polyps to evolve into tumors.
5. Oncogenes:
Similar to endometrial polyps, genetic changes in

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oncogenes and tumor suppressor genes in cervical polyps have been reported. For example, mutations in the KRAS and BRAF oncogenes can promote cervical polyp development. These genetic factors influence the development, aggressiveness, and invasiveness of polyps.

6. Role of PTEN Tumor Suppressor Gene: Mutations in the PTEN gene, a tumor suppressor, have been implicated in cervical polyp development. Under normal conditions, PTEN prevents cell growth. However, mutations in PTEN can lead to continuous cell proliferation and limited apoptosis, contributing to polyp growth.

7. Genetic Polymorphism and Hormonal Response: Genetic polymorphisms in hormone receptors, particularly estrogen and progesterone receptors, also play an important role in cervical polyp development. Variations in these genetic receptors influence the interaction and hormonal effects, facilitating polyp formation.

8. Chromosomal Anomalies: Chromosomal abnormalities, such as monosomy or trisomy, are additional genetic factors that influence the growth of polyps and inflammatory processes in the body.

- ***Mechanisms of Genetic Influence***

1. Cell Proliferation: Genetic mutations, especially changes in oncogenes and tumor suppressor genes, stimulate cell proliferation, leading to the enlargement, development, and formation of new blood vessels in polyps.

2. Prevention of Apoptosis: Genetic alterations in polyp cells may inhibit or reduce apoptosis, allowing the continuous growth of cells and promoting polyp formation.

3. Changes in Immune System Responses: Genetic factors can also modify immune system responses. Immunosuppression in cervical and endometrial polyps, influenced by genetic changes, can contribute to polyp growth.

• Mechanical Injury

- Medical interventions, such as abortions, diagnostic curettage, and improper use of intrauterine devices, can lead to mechanical injury to the cervix and endometrium, resulting in polyp formation.
- Polyp formation may occur due to improper tissue healing.

• Blood Sugar and Metabolic Disorders

- Obesity, insulin resistance, and diabetes are risk factors for polyp development.
- High insulin levels and metabolic disorders cause excessive growth of endometrial cells.

Prevention Measures

1. Natural Hormonal Balance:
- Eating vegetables like kale, broccoli, cauliflower, mustard greens, coffee, cumin, and turmeric helps the liver break down estrogen.
- Foods rich in plant fiber help expel excess estrogen through the intestines.
- Omega-3 fatty acids (found in fish, flaxseeds, chia seeds) should be consumed regularly.
- Reducing refined sugars and carbohydrates helps balance insulin and hormones.

2. Physical Activity:
- Regular walking or light exercises help maintain estrogen balance.
- High-intensity interval training (HIIT) helps reduce insulin levels.

3. Reducing Stress:
- Yoga and breathing exercises reduce cortisol, preventing progesterone deficiency.
- Getting 7-9 hours of sleep is crucial for proper hormone production.

4. Preventing Inflammatory Diseases:
- Adhering to proper intimate hygiene.
- Preventing sexually transmitted infections.
- Early detection and treatment of endometrial and cervical inflammatory diseases.

5. Metabolic Health Maintenance:
- Managing obesity and diabetes.
- Following a low-carb, balanced diet.
- Monitoring blood sugar levels.

CONCLUSION

The pathological mechanisms of endometrial and cervical polyps are mainly related to hormonal changes, inflammatory processes, genetic factors, and mechanical injuries. Preventing these conditions involves maintaining a healthy lifestyle, balancing hormones, treating inflammatory diseases promptly, and regular medical check-ups. Early treatment of polyps can prevent serious complications. Hormonal imbalance plays a key role in the development of these polyps. Estrogen dominance and progesterone deficiency lead to imbalanced growth of the endometrium. Proper diet, stress reduction, metabolic control, and routine medical check-ups are necessary to maintain hormonal balance.

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