

Research on the Correlations of Etiology with Thyroid Nodules, Breast Hyperplasia, and Uterine Fibroids



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Abstract: Thyroid nodules, breast hyperplasia, and uterine fibroids are common endocrine and reproductive system diseases, and their incidence is increasing annually, severely affecting women's health and quality of life. Although numerous studies have explored their pathogenesis, many mysteries remain unsolved. According to traditional Chinese medicine, these three diseases are all emotional disorders related to stagnation of the liver qi. Western medicine also recognizes certain commonalities in the etiology of these three diseases, especially in the interactions among hormone levels, genetic factors, and environmental influences. These diseases not only are independent pathological states but also may exhibit interactions and potential common mechanisms in certain patients. Understanding the etiology of these diseases is crucial for their management and clinical intervention. Genetic factors, environmental factors, and changes in hormone levels are considered the main influencing factors of these diseases, but the specific mechanisms of action still require in-depth research. A deeper understanding of the causes and interrelationships of thyroid nodules, breast hyperplasia, and uterine fibroids not only aids in promoting the development of personalized medicine but also provides important directional guidance for future research. The integrated perspective of traditional Chinese and Western medicine allows us to gain a more comprehensive understanding of these three diseases, thereby optimizing clinical management strategies and ultimately enhancing the quality of life of patients. This study aims to comprehensively analyze and explore the etiology and interrelationships of thyroid nodules, breast hyperplasia, and uterine fibroids from a combined traditional Chinese and Western medicine perspective, reveal the multiple factors that affect the development of these diseases, and discuss future research directions and their potential impact on clinical practice.

Keywords: Thyroid Nodules; Breast Hyperplasia; Uterine Fibroids; Etiology

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1 Background

With the acceleration of life and changes in lifestyle, the detection rate of nodular diseases is increasing. Thy-

roid nodules, mammary hyperplasia, and uterine fibroids are common benign tumors in women and, to some extent,

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are nodular diseases. The "female triad" refers to the collective term for thyroid nodules, mammary hyperplasia, and uterine fibroids in women, indicating the occurrence of nodular lesions, including benign nodules and malignant tumors, in the thyroid, breast, and reproductive systems either successively or simultaneously. This category falls under the categories of "goiter," "breast lumps," and "abdominal masses" in traditional Chinese medicine. The incidence of thyroid nodules can reach 36.5% in the female population, and the incidence of mammary hyperplasia continues to rise among young women, with approximately 50% of women of childbearing age experiencing uterine fibroids. Thyroid nodules usually have no obvious symptoms, although some patients may present with neck masses or compression symptoms. Mammary hyperplasia can manifest as breast pain, lumps, or tenderness, whereas uterine fibroids may lead to irregular menstruation, abdominal pain, or compression symptoms. These diseases not only affect the physical health of patients but also may lead to psychological health issues such as anxiety and depression.

The causes of thyroid nodules may be related to genetic and environmental factors and hormone levels [1]; breast hyperplasia is closely related to fluctuations in hormone levels, genetic factors, and lifestyle [2]; and the formation of uterine fibroids is associated with hormones, genetics, and reproductive history [3]. A deeper exploration of these causes not only helps in understanding the mechanisms of disease occurrence but also aids in developing effective prevention and treatment strategies, thereby improving the quality of life and health status of patients. From the perspective of modern medicine, these three types of diseases should be considered psychosomatic diseases, which aligns with traditional Chinese medicine's understanding of emotional factors causing disease. In Western medicine, thyroid nodules, breast hyperplasia, and uterine fibroids are classified as independent diseases of different organs, with certain interactions often occurring simultaneously. The sites of these three diseases correspond to the pathway of the liver meridian in traditional Chinese medicine. There is a relationship between meridians and organs, so diseases along the path of the liver meridian should also be related to the liver. The liver is responsible for regulation and plays an important role in emotional adjustment. Research on these three diseases through the theory of integrated traditional Chinese and Western medicine will help lay the foundation for their prevention and treatment.

2 Discussion of Causes

2.1 Causes of Thyroid Nodules

In traditional Chinese medicine, thyroid nodules are referred to as "goiters," with qi depression as the main pathological mechanism. Emotional distress and liver dysfunction hinder the transport of body fluids, leading to phlegm and blood stasis, which results in the development of the disease. Modern research supports this view, indicating a close relationship between emotional factors and the occurrence of thyroid nodules. The formation of thyroid nodules is a complex process involving the interaction of multiple factors.

2.1.1 Influence of Genetic Factors

Genetic factors are considered important contributors to the occurrence of thyroid nodules. Certain gene mutations are significantly associated with the formation of thyroid nodules. For example, PTEN gene mutations are closely related to the occurrence of thyroid tumors, especially in patients with PTEN syndrome [4].

2.1.2 Environmental Factors and Iodine Intake

Environmental factors, particularly iodine intake, have a significant effect on the formation of thyroid nodules. Both iodine deficiency and excess can lead to abnormal thyroid function, subsequently triggering the formation of nodules [5]. Maintaining an appropriate level of iodine intake is crucial for preventing the occurrence of thyroid nodules.

2.1.3 Effects of Hormone Level Changes on the Thyroid

Changes in hormone levels, especially fluctuations in thyroid hormones and sex hormones, may also promote the formation of thyroid nodules. Sex hormones, particularly in women during pregnancy and the menstrual cycle, may influence thyroid function and affect the formation of nodules [6].

2.1.4 Association of Autoimmune Diseases with Thyroid Nodules

Autoimmune diseases are closely related to the occurrence of thyroid nodules. The incidence of thyroid nod-

ules is significantly greater in patients with Hashimoto's thyroiditis than in the general population, and autoimmune responses may lead to the destruction of thyroid tissue and the formation of nodules [7]. Additionally, elevated thyroid antibody levels in patients with autoimmune thyroid diseases are also associated with the occurrence of nodules.

2.1.5 Other Potential Causes (such as Infections and Tumors)

In addition to genetic and environmental factors, other potential causes, such as infections and tumors, may also lead to the formation of thyroid nodules. Certain viral infections (such as mumps virus) may be related to the occurrence of thyroiditis, subsequently leading to the formation of nodules [8].

2.2 Causes of Breast Hyperplasia

Liver qi stagnation can affect the function of smooth flow, thereby impacting the secretion of breast milk and the circulation of qi and blood. Prolonged accumulation can lead to various breast diseases. According to relevant views in traditional Chinese medicine, breast hyperplasia falls under the category of "breast lumps." Traditional Chinese medicine holds that the main cause of breast hyperplasia is organ damage caused by emotional factors, which leads to the occurrence of breast hyperplasia. Western medicine describes the causes of breast hyperplasia from multiple aspects.

2.2.1 Hormonal Imbalance

The occurrence of breast hyperplasia is closely related to imbalances in hormone levels in the body, especially the concentrations of estrogen and progesterone. Fluctuations in hormone levels lead to excessive proliferation of breast tissue, resulting in hyperplastic lesions. An increase in estrogen levels or a decrease in progesterone levels may accelerate the proliferation of breast cells, thereby triggering the appearance of hyperplastic lesions [9].

2.2.2 Genetic Susceptibility and Family History

Women with a family history of breast diseases have a significantly greater risk of breast hyperplasia than those without a family history. This genetic susceptibility may be related to mutations or polymorphisms in specific genes that affect hormone metabolism and breast tissue

growth. For example, mutations in the BRCA1 and BRCA2 genes are associated not only with an increased risk of breast cancer but also with the occurrence of breast hyperplasia [10].

2.2.3 Lifestyle and Environmental Factors

Lifestyle and environmental factors also have important influences on breast hyperplasia. Dietary habits, body weight, and exercise levels are closely related to the occurrence of breast hyperplasia. Obesity and a high-fat diet are considered risk factors for breast hyperplasia, whereas regular exercise and healthy dietary habits may reduce this risk [10]. Exposure to environmental hormones (such as certain chemicals and pollutants) may also promote the occurrence of breast hyperplasia by interfering with the hormonal balance in the body.

2.2.4 Relationship Between Metabolic Syndrome and Breast Health

Metabolic syndrome is a group of disease states associated with obesity, insulin resistance, high blood sugar, high blood pressure, and lipid abnormalities. The risk of breast hyperplasia is significantly increased in patients with metabolic syndrome, possibly due to hormone imbalance and chronic inflammatory responses caused by insulin resistance [11].

2.2.5 Psychological Factors Affecting Breast Hyperplasia

Psychological factors such as stress, anxiety, and depression may also impact breast hyperplasia. Prolonged psychological stress can affect the secretion of hormones in the body by activating the hypothalamic–pituitary–adrenal (HPA) axis, potentially leading to abnormal proliferation of breast tissue [12]. Attention to mental health and providing psychological support are equally important for the prevention and management of breast hyperplasia.

2.3 Causes of Uterine Fibroids

The uterus, also known as the womb, female uterus, and blood chamber, plays a significant role in physiological functions. The liver, which governs the regulation and distribution of energy, directly affects uterine function. "Women rely on the liver for their innate health," indicat-

ing the important role of the liver in the development of uterine diseases. Western medicine has also provided detailed descriptions of the factors contributing to the onset of uterine fibroids.

2.3.1 Hormonal Dependency Growth Mechanism

Uterine fibroids are common benign tumors whose growth is closely related to hormonal influences. Estrogen and progesterone play crucial roles in the formation and growth of fibroids. Estrogen promotes the proliferation of smooth muscle cells and the synthesis of the extracellular matrix, facilitating fibroid growth. The expression levels of estrogen receptors within fibroids are positively correlated with their size and growth rate [13].

2.3.2 Genetic Factors and Gene Mutations

Genetic factors also play a significant role in the pathogenesis of uterine fibroids. A family history is associated with the occurrence of uterine fibroids, and certain genetic variations may increase a woman's risk of developing fibroids. Specific gene mutations, such as those in MED12 and HMGA2, are believed to be related to the formation of fibroids. Genetic susceptibility may interact with environmental factors, collectively influencing the occurrence of fibroids [14].

2.3.3 Environmental Influences (such as Obesity and Dietary Habits)

Environmental factors are also important causes of uterine fibroids. Excessive adipose tissue in obese patients can increase estrogen synthesis, thereby promoting fibroid growth. High-fat and high-sugar diets are associated with an increased risk of fibroids. Poor lifestyle choices, such as a lack of exercise and smoking, may also indirectly affect fibroid formation by influencing hormone levels [15].

2.3.4 Relationships Between Inflammation and Uterine Fibroid Formation

Inflammatory responses may be closely related to the formation of uterine fibroids. Chronic inflammation can activate various signaling pathways, promoting the proliferation and survival of smooth muscle cells and leading to fibroid formation. Certain inflammatory markers, such as

tumor necrosis factor α (TNF- α) and interleukin-6 (IL-6), are significantly elevated in fibroid tissues. These inflammatory factors not only promote fibroid growth but also may affect the microenvironment, further exacerbating this condition [16].

2.3.5 Impact of Age and Reproductive History on the Occurrence of Uterine Fibroids

Age and reproductive history are important factors influencing the occurrence of uterine fibroids. Uterine fibroids are more common in women aged 30--50 years. Women who have never given birth or have had fewer childbirths are more likely to develop fibroids, whereas childbirth and breastfeeding may have a certain inhibitory effect on fibroid growth [17].

3 Analysis of the Correlation of the Female Triad

The etiologies of thyroid nodules, breast hyperplasia, and uterine fibroids in traditional Chinese medicine (TCM) are similar and are caused mainly by emotional factors, disharmony of the internal organs, and damage to the meridians, leading to qi stagnation. According to TCM theory, the liver meridian runs through the neck, breasts, and uterus, establishing a connection among these three areas. Western medicine has focused on these three diseases in detail.

3.1 The Common Role of Hormones in the Three Diseases

Changes in hormone levels may be one of the common etiologies of these diseases. Hormone therapy may have good therapeutic effects on these three diseases, but the side effects of hormones need to be carefully considered during treatment.

3.2 Commonality of Genetic Background

Genetic background plays an important role in the occurrence of various diseases, especially when these diseases have complex polygenic inheritance characteristics. Exploring the genetic intersection between different diseases is important for understanding their etiology and developing individualized treatment strategies.

3.3 Interaction of Environmental Factors

Environmental factors such as diet, pollution, and lifestyle can interact with an individual's genetic background, affecting the risk of disease. Exposure to certain environmental toxins may increase the risk of disease by influencing gene expression. Psychosocial factors such as stress and social support may further exacerbate disease progression by affecting physiological responses and hormone levels [18].

4 Future Research Directions

4.1 Establishment of Multivariate Models

The establishment of multivariate models is an important direction in modern medical research, particularly in the assessment and prediction of disease risk. By combining various clinical features and biomarkers, researchers can more accurately predict the occurrence and progression of diseases. The application of machine learning and artificial intelligence technologies has made the establishment of multivariate models more efficient and capable of handling more complex datasets and providing more precise predictive results [19]. Future research should continue to explore the application potential of multivariate models in different disease areas and enhance the interpretability and clinical practicality of the models to improve clinical decision-making.

4.2 Clinical Applications and Prevention Strategies

With a deeper understanding of disease mechanisms, the formulation of clinical applications and prevention strategies has become increasingly important. Early interventions and preventive measures can significantly reduce the incidence of these three diseases. Personalized prevention strategies targeting specific populations, such as regular screenings and health education for high-risk groups, are also becoming a research hotspot [20]. Future research should focus on evaluating the effectiveness of different prevention strategies and exploring how to better integrate these strategies into routine medical practice to achieve broader public health benefits.

5 Summary

Through the analysis of the main causes and interrelationships of thyroid nodules, breast hyperplasia, and uterine fibroids, we can draw the following conclusions. According to traditional Chinese medicine, these three diseases are all emotional disorders related to stagnation of the liver qi. Western medicine also recognizes certain commonalities in the etiology of these three diseases, especially in the interactions among hormone levels, genetic factors, and environmental influences. These diseases not only are independent pathological states but also may exhibit interactions and potential common mechanisms in certain patients. Understanding the etiology of these diseases is crucial for their management and clinical intervention. For example, the occurrence of thyroid nodules is closely related to imbalances in thyroid hormones and changes in iodine intake, whereas breast hyperplasia is directly related to fluctuations in estrogen levels. The development of uterine fibroids is also associated with hormone-dependent mechanisms. This cross-disease understanding of etiology provides us with a new perspective, allowing us to more precisely target hormone levels during clinical interventions to improve patient outcomes.

In summary, a deeper understanding of the causes and interrelationships of thyroid nodules, breast hyperplasia, and uterine fibroids not only aids in promoting the development of personalized medicine but also provides important directional guidance for future research. The integrated perspective of traditional Chinese and Western medicine allows us to gain a more comprehensive understanding of these three diseases, thereby optimizing clinical management strategies and ultimately enhancing the quality of life of patients.

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