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Key Driving Pathways and Regulatory Mechanisms of Malignant Transformation of Mammary Gland Epithelial Cells under Long-Term Psychological Stress

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Abstract: *Objective*: This study primarily focuses on analyzing the inductive effects of emotional disturbances on the malignant transformation process of mammary gland epithelial cells. *Methods*: A total of 42 patients with malignant transformation of mammary gland epithelial cells (breast cancer, observation group) and 42 patients without malignant transformation of mammary gland epithelial cells (non-breast tumors, control group) were selected as research subjects. The earliest consultation time was January 2022, and the latest was January 2024. The extent of psychological stress impact on these patients was compared. *Results*: Compared with the control group, the observation group experienced a higher frequency and intensity (LEU value) of adverse life events, with $P < 0.05$. The intensity of adverse life events in the observation group, except for mild events, was significantly higher than that in the control group ($P < 0.05$). In terms of the content distribution of adverse life events, the proportion of marital and family problems in the observation group was significantly higher than that in the control group ($P < 0.05$). The negative coping score and positive coping score in the observation group were significantly different from those in the control group ($P < 0.05$). Regarding social support, the objective support score in the observation group was higher than that in the control group ($P < 0.05$). *Conclusion*: During the malignant transformation process of mammary gland epithelial cells, long-term emotional disturbances have a significant impact, indicating a close relationship between psychological stress and the occurrence of breast cancer.

Keywords: Psychological stress; Malignant transformation of mammary gland epithelial cells; Emotional disturbances; Inductive mechanisms

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1. Introduction

Clinically, malignant transformation of mammary gland epithelial cells is classified as a malignant tumor and is

a disease with a relatively high prevalence among women, namely breast cancer. The masses in such patients are predominantly located in the upper outer quadrant, and as the mass volume increases, the affected area will also locally protrude [1]. In recent years, the number of breast cancer patients has been continuously increasing, posing a severe threat to the physical and mental health of women. During the disease's occurrence and development, traditional Chinese medicine theory posits a close association with psychological factors, particularly the stimulation of the mind and body by emotional trauma, that is, prolonged emotional disturbances [2]. Among them, the concept of emotional stress as a pathogenic factor is a unique etiological idea in traditional Chinese medicine. Therefore, this concept will be applied in the following study on the mechanism promoting malignant transformation of breast glandular epithelium, aiming to provide assistance for in-depth research on the disease.

2. Materials and methods

2.1. Clinical data

The research subjects primarily consisted of patients with malignant transformation of breast epithelium (breast cancer) and patients without malignant transformation of breast epithelium (non-breast tumors), with 42 cases in each group, named as the observation group and the control group, respectively. All patients were female. The age range in the control group was from 22 to 68 years old, with a median age of (47.25 ± 3.33) years old. In the observation group, the oldest patient was 67 years old and the youngest was 25 years old, with an average age of (47.21 ± 3.26) years old. The basic conditions of the two groups were similar, with no statistical significance ($P > 0.05$), making them comparable. The study was approved by the hospital's ethics committee.

2.2. Methods

2.2.1. Instruments

The main focus was on investigating and analyzing the emotional stress factors of the participants, including negative life events, coping styles, and social support.

2.2.2. Survey methods

Before patients filled out the relevant questionnaires, relevant workers were arranged to provide detailed information about the research purpose and clinical value. On the basis of obtaining understanding and trust, patients were required to sign an informed consent form. Patients were asked to answer the questions based on their personal actual situation. Workers should explain to patients the objectives of each scale survey and the precautions for filling them out to ensure that patients can independently and truthfully fill them out based on their personal actual situation.

2.3. Evaluation indicators

(1) Conduct a systematic assessment of the number of adverse life events encountered between groups, the intensity of LEU values, scores for negative coping, scores for positive coping, and scores for social support.

(2) Compare the intensity of adverse life events and the distribution of content of adverse life events between the two groups.

2.4. Statistical analysis

The data obtained were analyzed using SPSS version 23.0 statistical software, with a *P*-value of < 0.05 indicating statistical significance.

3. Results

3.1. Study on the number and intensity (LEU value) of adverse life events encountered

A comparison of relevant indicators between the groups showed statistical significance, with $P < 0.05$ (**Table 1**).

Table 1. Comparison of the number and intensity (LEU value) of adverse life events encountered by the two groups of patients (*n*/%)

Group	n	Number of adverse life events (times)	Intensity (LEU Score)
Observation Group	42	2.84 ± 1.66	85.11 ± 47.85
Control Group	42	1.14 ± 0.13	44.58 ± 30.96
t-value		6.6166	4.6088
p-value		0.0000	0.0003

3.2. Analysis of the intensity of adverse life events in the two groups

Upon comparison, the observation group showed statistical significance in the absence, mild, and severe degrees of adverse life events compared to the control group, with $P < 0.05$ (**Table 2**).

Table 2. Comparison of the intensity of adverse life events in the observation group and the control group (*n*/%)

Group	n	None	Mild	Moderate	Severe
Observation Group	42	6 (14.29)	11 (26.19)	16 (38.10)	9 (21.43)
Control Group	42	23 (54.76)	10 (23.81)	7 (16.67)	2 (4.76)
χ^2-value		15.2201	0.0635	4.8496	5.1258
p-value		< 0.0001	0.8010	0.0276	0.0235

3.3. Comparison of the distribution of content of adverse life events between the observation group and the control group

The observation group had a higher proportion of marital and family issues compared to the control group, with $P < 0.05$ (**Table 3**).

Table 3. Distribution of content of adverse life events in the two groups of patients (*n*/%)

Group	n	Marital/Family issues	Social/Environmental issues	Work/Academic issues	Interpersonal / Health issues
Observation Group	42	22 (52.38)	8 (19.05)	9 (21.43)	3 (7.14)
Control Group	42	12 (28.57)	10 (23.81)	11 (26.19)	9 (21.43)
χ^2-value		4.9412	0.2828	0.2625	3.5000
p-value		0.0262	0.5948	0.6084	0.0613

3.4. Comparison of negative coping scores and positive coping scores between the two groups

All indicators in the observation group showed statistical significance compared to the control group, with $P < 0.05$ (**Table 4**).

Table 4. Analysis of negative coping scores and positive coping scores in the observation group and the control group (*n*/%)

Group	n	Negative Coping Score (points)	Positive Coping Score (points)
Observation Group	42	39.22 ± 3.09	28.79 ± 4.21
Control Group	42	30.88 ± 3.74	37.56 ± 5.22
t-value		11.1411	8.4752
p-value		0.0000	0.0000

3.5. Study on social support scores in the observation group and the control group

A comparison of relevant indicators between the groups showed a significant difference in objective support scores, with $P < 0.05$ (**Table 5**).

Table 5. Comparison of social support scores between the two groups of patients (*n*/%)

Group	n	Utilization Score (points)	Subjective Support Score (points)	Objective Support Score (points)	Total Score (points)
Observation Group	42	33.35 ± 4.42	18.88 ± 4.13	9.75 ± 3.29	35.74 ± 5.63
Control Group	42	33.33 ± 4.47	18.84 ± 4.15	7.74 ± 2.78	35.89 ± 5.68
t-value		0.0206	0.0443	3.0243	0.1216
p-value		0.9836	0.9648	0.0033	0.9036

4. Discussion

Currently, malignant transformation of breast epithelium, commonly known as breast cancer, poses a severe threat to women's physical and mental health after onset. It is also a malignant tumor with a relatively high clinical incidence rate, and the age of patients is tending to be younger. The vast majority of patients diagnosed with breast cancer experience significant psychological issues, particularly anxiety, inferiority, fear, and pessimism. Some patients even exhibit suicidal thoughts and behaviors, which severely impact the physical health and disease prognosis of the female population [3].

From the perspective of traditional Chinese medicine, breast cancer can be classified into various categories such as "Huahuashi" (flourishing stones), "Duru" (envious milk), and "Ruyan" (breast rock). However, in terms of predisposing factors, long-term emotional disturbances have always played a crucial role. In recent years, with the rapid advancement of technology, the pace of modern life and work has continuously accelerated, making individuals more prone to psychological and mental issues. Among these, social-psychological factors such as stressors and personality traits play a significant role in the occurrence and development of tumor diseases [4].

4.1. Negative life events

Life events are problems that modern individuals must confront and resolve in their social lives. These events are extensive and complex, encompassing aspects such as life, marriage, family, children, interpersonal relationships, daily work, learning, and unexpected incidents. Based on emotional experiences, life events can be further categorized into positive and negative events. Events that evoke pleasant emotions and contribute to positive emotional transformations are considered positive life events. Conversely, events that elicit negative emotional experiences are classified as negative life events. Additionally, negative life events can be further divided into major and minor events based on their intensity. Minor events are characterized by their cumulative and persistent nature. Based on long-term clinical research, it is understood that diseases triggered by negative life events are generally influenced by numerous factors, such as the intensity, quantity, timing, and nature of these events [5].

Combining the above research data, it was found that during the questionnaire survey conducted on 84 research participants, there were 42 cases in the observation group (malignant transformation of breast epithelium) and 42 cases in the control group (patients without malignant transformation of breast epithelium). No significant difference in age was observed between the two groups, with $P > 0.05$. However, in the survey of negative life events, it was found that the frequency and intensity of adverse life events experienced by patients in the observation group were significantly different from those in the control group, with $P < 0.05$. In particular, the number of negative events related to marriage and family was higher than that of other types of events. The reason for this is that all the research participants were women, who tend to be more emotionally expressive and sensitive. Compared to men, they pay more attention to marriage and family, making these the types of events that have the greatest impact on them [6].

4.2. Negative coping strategies

Coping strategies are generally considered to be the attitudes and behaviors adopted to address life events, consisting of both negative and positive components. Positive coping behaviors are more conducive to problem-solving and can significantly alleviate tension, thereby protecting one's physical and mental health to a certain extent. Negative coping behaviors, on the other hand, can exacerbate negative mental states, adversely affecting mental health and psychological well-being, and increasing the likelihood of illness. Based on the comparison of the aforementioned data indicators, it can be seen that the scores for positive coping in the observation group were significantly lower than those in the control group, while the scores for negative coping were higher. There were significant differences in scores between the two groups, with $P < 0.05$. This suggests that clinical breast cancer patients tend to adopt negative coping strategies when dealing with problems. In other words, when solving problems, if one chooses inactive means, they may fail to vent their inner emotions, thereby significantly increasing psychological pressure and adversely affecting the maintenance of internal balance in the body, thus making them more susceptible to illness. The analysis of the above indicators reveals that psychological stress, or emotional disturbance, significantly impacts the body's immune function. When subjected to intense mental stimulation, it inevitably leads to a continuous increase in the excitation level of the sympathetic nervous system, accelerating the formation of glucocorticoids and adrenal cortisol. Under the influence of stress hormones, various organs in the human body can be damaged, resulting in a higher risk of illness [7]. Therefore, even though negative life events may be unavoidable, the occurrence of diseases is still

somewhat related to the coping strategies employed. Actively coping can help reduce stress intensity, preventing adverse effects on the nervous system, immune system, and endocrine system, and facilitating quicker repair of damage.

4.3. Social support

Social support refers to the interaction between individuals, representing a behavioral process that promotes, assists, and provides support for various matters. Good social support encourages individuals to adopt a positive attitude when dealing with adverse events, thereby reducing psychological stress and ensuring the mental health of patients. However, being in unfavorable social relationships can increase psychological burdens and exacerbate the impact of adverse events. According to the research findings mentioned above, the observation group scored higher than the control group in terms of objective support, with $P < 0.05$. However, there were no significant differences between the groups in terms of subjective support, support utilization, and total scores, with $P > 0.05$.

In the aforementioned studies, although there is limited evidence linking social support to the occurrence and development of malignant transformation of breast epithelium, some reports still suggest a relationship between the two. In the study, all indicators (except for objective support) showed no significant differences between the groups compared to the control group, with $P > 0.05$. The reason is that currently, people have a strong sense of social belonging and mutual assistance, enabling patients to receive care from various sources. Meanwhile, the improvement in people's cultural literacy levels also allows them to make full use of support from multiple parties, enhancing the utilization of social support. Additionally, with the rapid development of modern healthcare, social and psychological factors have garnered attention. Medical professionals possess the ability to comfort and guide patients, and through emotional nursing, they can encourage patients to make rational use of assistance from various sources.

Generally speaking, long-term emotional stress plays a certain promoting role in the onset process of patients with malignant transformation of mammary epithelium, and the two are closely related. In the context of fierce social competition and the transformation of modern medical models, the importance of emotional factors has gradually become prominent. Therefore, it is essential to correctly understand the varying degrees of impact that emotions can have on diseases, and then actively take necessary preventive measures in clinical practice to provide valuable reference for disease prevention, diagnosis, and treatment.

5. Conclusion

In conclusion, this review underscores that long-term emotional disturbance acts as a significant contributing factor in the malignant transformation of mammary epithelial cells. The evidence strongly supports a close and potentially causal relationship between chronic psychological stress and the initiation of breast cancer. This highlights the critical importance of integrating psychological well-being and stress management into a holistic approach for breast cancer prevention and care.

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