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Exploring the Influencing Factors of Quality of Life During Maintenance Phase in Patients With Breast Cancer–Related Lymphedema

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This study aims to understand the degree of influence of the severity of lymphedema on quality of life in patients with breast cancer–related lymphedema during the maintenance phase.

Introduction

Breast cancer–related lymphedema (BCRL) is a common postoperative complication in patients with breast cancer. BCRL refers to swelling in the arm, breast, and chest wall on the side of the breast cancer and results from damage to the lymphatic system due to cancer or cancer treatment.[1] Different studies have different data, but all show that the incidence of lymphedema is relatively high, which deserves the attention of all medical staff. BCRL affects almost 1 in 5 breast cancer survivors, with an overall incidence ranging from 15.5% to 54%.[2] Nguyen et al have pointed out that the overall incidence of BCRL is 6% to 63%, 75% of cases occur within 1 year after the breast surgery, and 80% occur within 2 years after the breast surgery.[3] Currently, in clinical practice, sentinel lymph node biopsy or targeted axillary surgery is carried out to reduce the dissection of lymph nodes, thereby lowering the incidence of BCRL and minimizing the negative impact on quality of life (QOL).[4] BCRL not only affects upper-body function but also has an adverse influence on the QOL of patients with breast cancer.[5] QOL refers to how healthy and comfortable an individual is and to what extent they can participate in different life events or enjoy life events.[6] Wanchai et al have pointed out that the impact of lymphedema on work was incremental with increased severity of lymphedema and, when compared with breast cancer survivors without lymphedema, persons living with lymphedema were worse off in terms of work and career.[7] At the same time, after breast cancer surgery, lymphedema is usually accompanied by symptoms such as swelling, heaviness, pain, and impaired movement of the affected upper limb, which results in serious adverse reactions to the patient's body and reduces their quality of daily life. [8] Therefore, for patients, lifelong management of BCRL is a time-consuming and labor-intensive task, and it is necessary to attach importance to improving the QOL of patients with BCRL.

The International Society of Lymphology recommends complete decongestive therapy (CDT) as the international standard of care for lymphedema treatment, including manual lymphatic drainage, compression, exercise, skin care, and education.[9] For volume reduction in patients with BCRL, CDT consists of an intensive phase and a maintenance phase, with the intensity and duration of CDT varying depending on the severity or stage of lymphedema.[10] CDT has been shown to have lasting effects on the severity of lymphedema at all stages and to improve overall QOL among patients with lymphedema.[11]

C[illegible]equires lifelong patient adherence, and during the maintenance phase, patients with BCRL face significant physiological, p[illegible]ological, and social problems.[8] Some patients with BCRL suffer from sleep disorders because of the lymphedema management,

which further aggravates physical and mental fatigue and ultimately leads to decreased QOL.[12] At the same time, treatment costs need to be borne by patients with BCRL under conditions where returning to work and obtaining financial support are difficult due to the severity of lymphedema.[13] In addition, studies have indicated that lymphedema can negatively affect patient QOL, but QOL does not decrease as the severity of lymphedema increases.[14] Thus, the extent to which the severity of lymphedema affects QOL is not well defined. Understanding the impact of the severity of lymphedema on patient QOL is particularly important for future effective interventions. This study aims to understand the degree to which the severity of lymphedema influences QOL in patients with maintenance-phase BCRL, and to identify the influencing factors of QOL in order to identify targeted interventions to improve QOL for patients with BCRL.

Methods

Study Design

A descriptive cross-sectional survey was conducted at the hospital on a sample of 153 patients with BCRL who underwent intensive-phase CDT from January 2022 to December 2024.

Procedures

This study was approved by the Ethics Committee of Cancer Hospital of Shantou University Medical College (Ethics number: 2024021). The survey was conducted by 2 trained nurses. The investigators explained the purpose of the study, research methods, principle of anonymity, and voluntary participation to patients with BCRL. Patients were included in the study only after informed consent was obtained. Questionnaires were collected by face-to-face interviews or by telephone. Inclusion criteria were as follows: confirmed diagnosis of BCRL, age of at least 18 years, previously treated for BCRL in the lymphedema outpatient clinic of the Cancer Hospital of Shantou University Medical College, currently in the maintenance phase of CDT, had prior breast-related surgery therapies, and in the rehabilitation phase or the endocrine therapy phase. Patients who had cognitive impairment, bilateral breast cancer, or mental illness or exhibited distant metastasis were excluded.

Measures

Demographic data, comorbidities, personal history, and severity of lymphedema were collected from the medical history system. QOL was determined by interview. The general survey form included age, body mass index (BMI), number of children, educational level, marital status, work status, the degree of housework undertaken, comorbidity, tumor classification, clinical stage, radiotherapy, surgical procedure, stage of lymphedema, time from surgery to lymphedema, time from discovery of lymphedema to treatment, time from discovery of lymphedema to this investigation (duration of lymphedema), and severity of lymphedema. Stages of lymphedema from the International Society of Lymphology were used to grade the severity of lymphedema (stage 0, I, II, or III).[9] The QOL scale in upper limb lymphedema (ULL-27) was used to measure the QOL of patients with BCRL. ULL-27 is a patient-reported questionnaire that evaluates the QOL of patients with BCRL across 3 domains (physical, psychological, and social withdrawal); its content validity, internal consistency, and hypothesis testing are high.[15] Responses in the ULL-27 are presented in a Likert-type scale with choices for each item being “not at all,” “a little bit,” “somewhat,” “quite a bit,” and “very much” ranging from 1 to 5 (higher scores indicate poorer quality of life), and the 3 dimensions are physical with 15 items, psychological with 7 items, and social withdrawal with 5 items. The Chinese version of ULL-27 was translated by our team. The total score of the full scale ranges from 27 to 135.[15]

Statistical Analysis

Statistical analysis and processing were carried out using IBM SPSS (Statistical Package for Social Sciences) version 25. Means with SDs are reported for continuous variables, and frequencies with percentages are reported for categorical data. A one-way ANOVA or the Kruskal-Wallis H test was performed to compare QOL among patients with varying degrees of lymphedema. Multiple linear regression was used to analyze the factors affecting QOL.

Results

QOL Outcomes

The study included a total of 153 patients. The overall QOL score was 48.52 plus or minus 12.11, the physical domain score was 23.02 [illegible]r minus 7.31, the psychological domain score was 17.23 plus or minus 3.16, and the social withdrawal domain score was 8.23

plus or minus 3.80. The overall QOL score of patients with stage III breast cancer was 63.83 plus or minus 13.27, indicating that the patients at stage III had the lowest levels of QOL. The QOL results are shown in **Table 1**. All post hoc pairwise comparisons confirmed that patients with breast cancer with stage III BCRL had statistically significant differences in overall QOL, physical domains, and social withdrawal domains compared with all other BCRL severities. The pairwise comparisons for further post hoc tests are presented in **Table 2**.

General Data and Univariate Analyses

The general data and univariate analyses are presented in **Table 3**. More than half of the participants were 18 to 59 years old (64.05%), had normal BMI (63.40), had at least 2 children (81.7%), were married (81.04%), were unemployed (60.78%), had left breast cancer (55.56%), had at least 1 comorbidity (69.28%), had clinical stage II disease (68.63%), had luminal B disease (74.51%), had undergone radiotherapy (75.16%), had BCRL occurring within the first year after breast surgery (62.74%), and had accepted CDT within 1 year following BCRL diagnosis (76.47%). Results from univariate analyses indicated that marital status, clinical stage, tumor classification, time from discovery of lymphedema to treatment, and duration of lymphedema were associated with QOL in patients with BCRL during the maintenance phase.

TABLE 1. QOL Among Patients With Different Severities of Lymphedema

DOMAIN	TOTAL PATIENTS	STAGE 0	STAGE I	STAGE II	STAGE III	FISHER'S *F* STATISTIC	*P* VALUE
Overall QOL	48.52 ± 12.112	42.64 ± 12.574	44.82 ± 10.402	48.37 ± 10.784	60.83 ± 13.268	9.814	< .001
Physical	23.02 ± 7.307	19.29 ± 7.436	21.09 ± 6.598	22.77 ± 6.473	30.78 ± 7.456	10.452	< .001
Psychological	17.23 ± 3.155	16.64 ± 2.437	16.65 ± 2.922	17.22 ± 3.082	18.83 ± 4.018	2.146	.097
Social withdrawal	8.27 ± 3.798	6.71 ± 3.099	7.09 ± 3.269	8.38 ± 3.708	11.22 ± 4.152	6.085	.001

QOL, quality of life.

Table 1.

TABLE 2. Pairwise Comparison for Further Post Hoc Tests

DOMAIN	SEVERITY		MEAN DIFFERENCE	SE	*P* VALUE
Overall QOL	Stage 0	Stage I	−2.181	3.550	.540
		Stage II	−5.725	3.219	.077
		Stage III	−18.190[a]	3.984	.000
	Stage I	Stage 0	2.181	3.550	.540
		Stage II	−3.544	2.261	.119
		Stage III	−16.010[a]	3.259	.000
	Stage II	Stage 0	5.725	3.219	.077
		Stage I	3.544	2.261	.119
		Stage III	−12.466[a]	2.895	.000
	Stage III	Stage 0	18.190[a]	3.984	.000
		Stage I	16.010[a]	3.259	.000
		Stage II	12.466[a]	2.895	.000
Physical	Stage 0	Stage I	−1.803	2.130	.399
		Stage II	−3.484	1.932	.073
		Stage III	−11.492[a]	2.390	.000
	Stage I	Stage 0	1.803	2.130	.399
		Stage II	−1.682	1.357	.217
		Stage III	−9.690[a]	1.955	.000
	Stage II	Stage 0	3.484	1.932	.073
		Stage I	1.682	1.357	.217
		Stage III	−8.008[a]	1.737	.000
	Stage III	Stage 0	11.492[a]	2.390	.000
		Stage I	9.690[a]	1.955	.000
		Stage II	8.008[a]	1.737	.000
Psychological	Stage 0	Stage I	−0.004	0.991	.997
		Stage II	−0.576	0.898	.523
		Stage III	−2.190	1.112	.051
	Stage I	Stage 0	0.004	0.991	.997
		Stage II	−0.571	0.631	.367
		Stage III	−2.186[a]	0.909	.017
	Stage II	Stage 0	0.576	0.898	.523
		Stage I	0.571	0.631	.367
		Stage III	−1.615[a]	0.808	.047
	Stage III	Stage 0	2.190	1.112	.051
		Stage I	2.186[a]	0.909	.017
		Stage II	1.615[a]	0.808	.047
Social withdrawal	Stage 0	Stage I	−0.374	1.150	.745
		Stage II	−1.665	1.043	.112
		Stage III	−4.508[a]	1.290	.001
	Stage I	Stage 0	0.374	1.150	.745
		Stage II	−1.291	0.732	.080
		Stage III	−4.134[a]	1.055	.000
	Stage II	Stage 0	1.665	1.043	.112
		Stage I	1.291	0.732	.080
		Stage III	−2.843[a]	0.938	.003
	Stage III	Stage 0	4.508[a]	1.290	.001
		Stage I	4.134[a]	1.055	.000
		Stage II	2.843[a]	0.938	.003

[a]indicates that the difference is statistically significant. QOL, quality of life.

Multivariate Linear Regression Analysis

Multivariate linear analysis results are presented in **Table 4.** The results show that $R^2 = 0.134$, $F = 4.937$, and $P < .001$. These indicate that the time from discovery of lymphedema to treatment and the severity of lymphedema both affected QOL in patients with BCRL during the maintenance phase.

Discussion

This study focuses on the QOL among patients with BCRL during the CDT maintenance phase at home. We show that as the severity of BCRL increases, the QOL decreases. As the severity of the BCRL increases, the physical and social withdrawal impact on patients becomes more severe, leading to a decrease in QOL. Lymphedema has a large negative impact on the physical, psychological, and social withdrawal aspects of patients with BCRL with stage III disease. Compared with patients with other lymphedema severity levels, patients with stage 0 had the highest QOL. This may be because patients with stage 0 have no significant limb swelling and have only minor subjective discomfort symptoms, such as swelling, pain, and numbness. In our study, we had only 14 patients with stage 0 lymphedema. Stage 0 refers to a subclinical condition in which swelling is not yet evident despite impaired lymphatic transport, which may persist for months or years before overt edema occurs.[9] Thus, few patients came to our lymphedema outpatient clinic because of stage 0 lymphedema. We cannot exclude the possibility that this may have caused biased results in the present study. This study found that the QOL of patients with BCRL is at a moderate level, with the lowest QOL level being in the physical domain and the highest QOL level being in the social withdrawal domain. The overall QOL score in this study was 48.52 plus or minus 12.112, which is higher than previously reported by Kayali et al (42.54 ± 19.71).[13] This may be because the total number of patients with stage II (56.86%) and stage III (11.76%) cancer in this study was higher than in the study of Kayali et al, which had 33.3% of patients with moderate severity of lymphedema and 24.7% of patients with severe lymphedema.[16]

This study reports that the time from discovery of lymphedema to treatment and the severity of lymphedema both affect the QOL of patients with BCRL during the maintenance phase. In this study, the majority (76.47%) of patients with BCRL accepted an intensive phase of CDT within 1 year of BCRL diagnosis at our lymphedema outpatient clinic, which served as our primary source of patients with BCRL at stages 0 and 1. Active diagnosis and treatment of lymphedema can help prevent exacerbation and BCRL-related complications. Our results show that delays in lymphedema therapy can lead to decreased QOL, and patients with BCRL who delay more than 3 years from lymphedema diagnosis to treatment have the worst QOL. In addition, researchers have shown that the obstacles for patients with BCRL to receive lymphedema therapy include long distances for medical treatment, economic burden, poor treatment beliefs, and inadequate treatment knowledge.[17] Patients with head and neck lymphedema do not complete therapy consultation or lymphedema therapy after diagnosis.[18] Treatment delay is a common problem in patients with lymphedema.

At present, relatively few scholars have focused on the reasons for delayed medical treatment among patients with BCRL and the corresponding solutions. Previously, due to the lack of standardized diagnostic criteria and insufficient knowledge among health care professionals about the prevention and treatment of lymphedema, diagnosing lymphedema early was difficult. As a result, the diagnosis and treatment of BCRL were often delayed.[19] Now, with the continuous popularization of knowledge by lymphedema experts, more and more clinical health care professionals have received training on lymphedema, and the diagnosis and treatment of lymphedema have become standardized. In recent years, the delayed medical-seeking behavior among patients with BCRL has decreased significantly.

Furthermore, the subclinical stage of BCRL is characterized by the appearance of lymphedema-related symptoms. In the early stage, health care providers primarily assess lymphedema severity based on patients' self-reports. However, patients' lack of understanding of lymphedema symptoms and their failure to report them in a timely manner may delay lymphedema treatment.[20] Therefore, it is necessary for health care providers to enhance patient education and improve the self-awareness and prevention capabilities of high-risk patients with BCRL.

TABLE 3. Sample Characteristics and Univariate Analyses

ITEMS		N	MEAN	SD	FISHER'S *F* STATISTIC	*P* VALUE
Age (years)		153	48.52	12.112	1.111	.293
	18-59	98	48.30	12.700		
	≥ 60	55	47.15	10.965		
BMI			48.52	12.112	0.802	.495
	< 18.5	2	41.00	8.485		
	18.5-23.9	97	48.77	11.299		
	24-27.9	39	49.64	14.863		
	≥ 28	15	45.00	9.350		
Number of children			48.52	12.112	0.419	.658
	0	4	52.00	6.880		
	1	24	50.04	13.225		
	≥ 2	125	48.12	12.052		
Educational level			48.52	12.112	1.535	.195
	Illiterate	25	51.52	12.339		
	Primary school	72	46.97	10.623		
	Junior	34	47.82	13.615		
	Senior	6	45.17	12.828		
	College	16	53.56	13.677		
Marital status			48.52	12.112	3.800	.025
	Unmarried	16	43.06	10.149		
	Married	124	48.52	11.836		
	Divorced/widowed	13	55.31	14.285		
Work			48.52	12.112	0.195	.660
	No	93	48.87	12.087		
	Yes	60	47.98	12.234		
Degree of undertaking housework			48.52	12.112	1.036	.378
	A little bit	20	45.75	14.920		
	Somewhat	59	50.32	12.336		
	Quite a bit	46	48.63	10.740		
	All	28	46.54	11.542		
Diagnosis			48.52	12.112	0.145	.704
	Left breast cancer	85	48.19	12.548		
	Right breast cancer	68	48.94	11.623		
Comorbidity			48.52	12.112	0.001	.972
	No	106	48.50	11.807		
	Yes	47	48.57	12.907		
Clinical stage			48.52	12.112	4.121	.018
	I	10	38.80	10.086		
	II	105	49.82	12.837		
	III	38	47.50	9.132		
Tumor classification			48.52	12.112	3.804	.012
	Triple-negative	10	43.20	10.152		
	Luminal A	15	42.60	6.456		
	Luminal B	114	50.40	12.766		
	HER2 overexpression	14	43.36	7.782		
Radiotherapy			48.52	12.112	0.094	.760
	No	38	48.00	12.072		
	Yes	115	48.70	12.174		
Surgical procedure			48.52	12.112	1.381	.235
	Breast-conserving therapy	2	35.00	.000		
	Modified radical mastectomy	37	50.54	11.779		
	Total mastectomy	11	44.36	9.500		
	Breast-conserving therapy + axillary lymph node dissection	18	50.11	15.227		
	Modified radical mastectomy + axillary lymph node dissection	18	51.39	12.363		
	Total mastectomy + axillary lymph node dissection	67	47.30	11.588		
Time from surgery to lymphedema (years)			48.52	12.112	0.744	.527
	< 1	96	47.76	12.461		
	1-3	38	48.71	11.613		
	4-6	11	50.73	11.714		
	≥ 7	8	53.75	11.068		
Time from discovery of lymphedema to treatment (years)			48.52	12.112	2.984	.033
	< 1	117	47.08	10.829		
	1-3	17	50.94	14.042		
	4-6	10	56.90	16.141		
	≥ 7	9	53.44	15.549		
Duration of lymphedema (years)			48.52	12.112	3.004	.032
	< 1	63	50.22	11.469		
	1-3	54	45.98	10.831		
	4-6	24	46.21	11.985		
	≥ 7	12	55.67	17.458		
Severity of lymphedema			48.52	12.112	9.814	< .001
	Stage 0	14	42.64	12.574		
	Stage I	34	44.82	10.402		
	Stage II	87	48.37	10.784		
	Stage III	18	60.83	13.268		

BMI, body mass index.

Therefore, it is necessary to establish a more refined family and social support system that enables all patients with BCRL and their caregivers to access knowledge about BCRL across multiple forums, thereby decreasing delays in seeking medical attention, reducing disease burden, and improving their QOL. Medical staff can promote knowledge about BCRL through an online WeChat public account, other online media, or science lectures and community knowledge forums.

Obviously, the severity of lymphedema is highly relevant to the QOL of patients with BCRL. In this study, patients with stage 0 [illegible]edema, with subjective symptoms only and without altered arm circumference, have the highest QOL, with physical discomfort,

such as swelling, pain, and numbness, having the greatest impact on QOL. Therefore, medical staff should use extreme caution when patients have lymphedema-related physical discomfort and guide patients with stage 0 lymphedema to perform simple manual lymphatic drainage and to use prophylactic arm sleeves.[21] For breast cancer survivors with stage 0 lymphedema, persistent pain and lymphedema symptoms are cardinal symptoms of early-stage lymphedema because such symptoms often precede changes in limb size or girth, or a lymphedema diagnosis.[22] Thus, it is necessary to continuously monitor lymphedema symptoms in people at high risk of BCRL and intervene with high-risk patients in advance. In addition, the severity of lymphedema affects the social withdrawal aspect of QOL. More seriously, social withdrawal and decreasing QOL occur with increasing lymphedema in patients with BCRL. High social withdrawal and lack of social support have been associated with lower QOL in breast cancer survivors.[23] Similarly, breast cancer survivors with BCRL have greater difficulty in returning to society due to the management of lymphedema.[24] Therefore, it is important to hold peer support sessions in order to understand the needs of patients with BCRL and to provide support to facilitate a smooth return to society.

TABLE 4. Multivariate Linear Analysis

	B	SE	*P* VALUE	TOLERANCE	VIF
Constant	34.777	7.352	.000		
Marital status	2.001	2.306	.387	.825	1.212
Clinical stage	.376	1.775	.833	.940	1.064
Tumor classification	.917	1.403	.514	.976	1.025
Time from discovery of lymphedema to treatment	3.820	1.883	.044	.322	3.105
Duration of lymphedema	−3.029	1.597	.060	.373	2.681
Severity of lymphedema	3.901	1.330	.004	.753	1.329

VIF, variance inflation factor. B represents the coefficients of each independent variable in the regression equation

Interestingly, the time from surgery to lymphedema had no effect on QOL in patients with lymphedema; this may be related to patients' timely initiation of CDT to effectively control lymphedema during its early stages. Regarding the time frame, BCRL can manifest at different time points during the postoperative period, with the majority of cases occurring within the first 2 years after surgery.[25] In this study, 87.58% of patients developed BCRL within the first 3 years after surgery. It is important to note that BCRL can develop even several years after the initial treatment, emphasizing the need for long-term monitoring and support for breast cancer survivors.

A few limitations should be considered when interpreting our findings. Firstly, the small sample size could introduce bias in our analysis, especially for lymphedema patients with stage 0 and III breast cancer, because in the current clinical setting, patients with lymphedema at stages I and II were often seen in our lymphedema outpatient clinic. Secondly, the data for the severity of lymphedema were derived from data collected at the lymphedema outpatient clinic, which may not be completely consistent with the lymphedema status of patients during the stay-at-home period. Finally, convenience sampling was used in this study, which might limit the generalizability of our results.

Conclusion

This study found that the time from discovery of lymphedema to treatment and the severity of lymphedema affect the QOL of patients with BCRL during the maintenance phase. Long-term monitoring and timely treatment are necessary for patients with BCRL. Before the start of a maintenance phase, it is important for lymphedema therapists to treat BCRL as soon as possible.

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a availability statements

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

Conflicts of interest

The authors have no conflicts of interest to disclose.

Author contributions

Zebing Luo contributed to the conception of the study and the writing of the article. Zebing Luo, Manjia Xu, Weijie Gao, and Xinxian Lv contributed significantly to the collection and analysis of the data. Shuxian Yu and Chujun Chen contributed to guiding the study. All authors read and approved the final manuscript.

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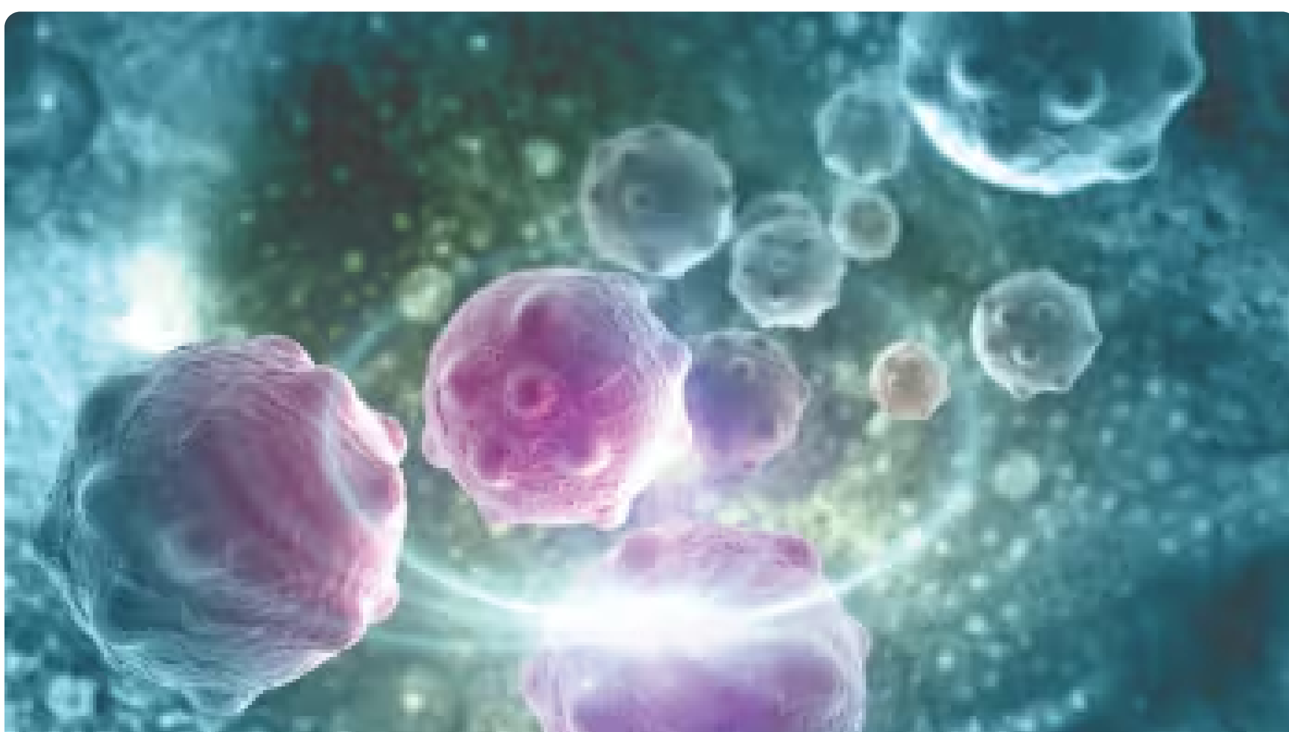

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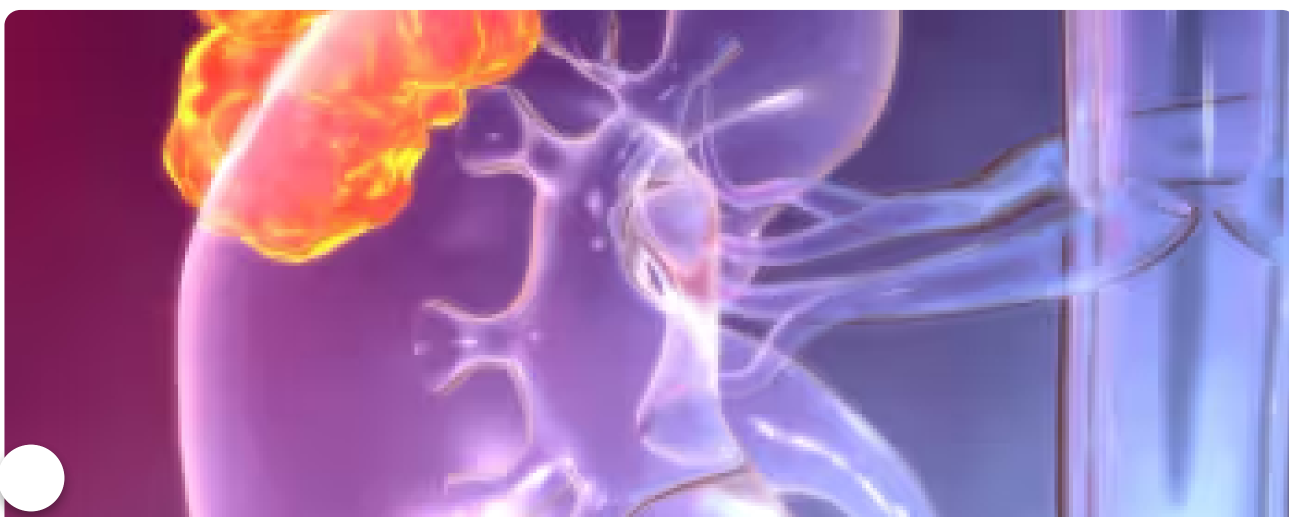

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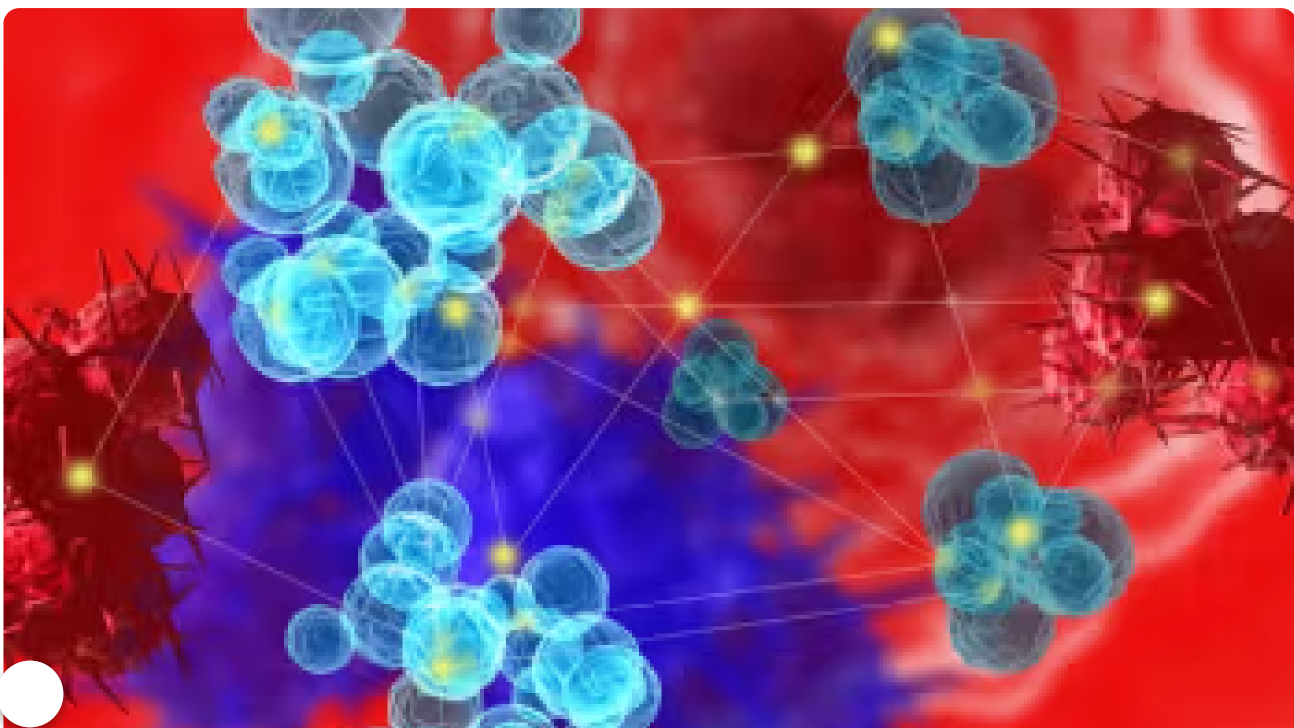

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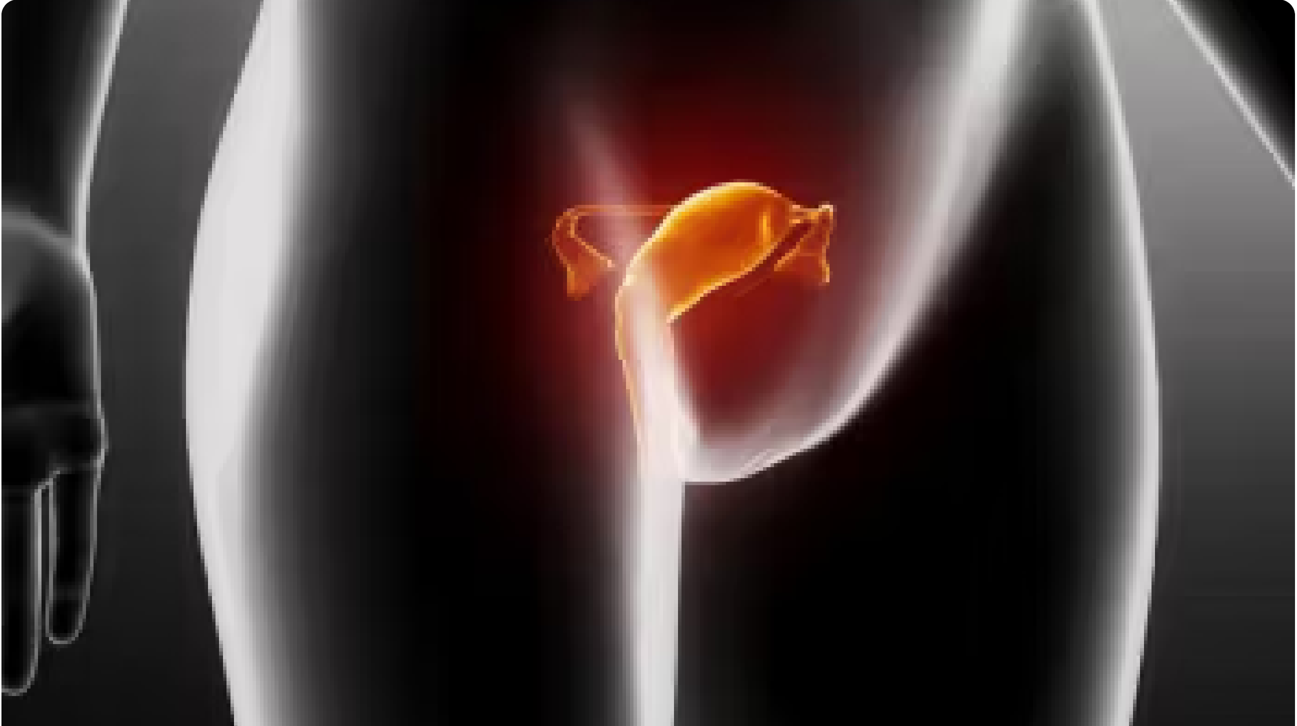

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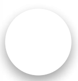

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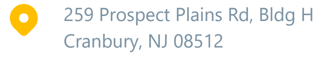

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