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Construction of Early Risk Factors and Intervention Programs of Lower Limb Lymph-edema in Patients with Gynecological Malignant Tumors Combined with CT Images

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Abstract: Lymph-edema of lower limbs is one of the common complications of gynecologic cancer patients. Once lymph-edema of lower extremities appears after treatment, it is difficult to cure, which seriously affects the quality of treatment of patients. Lymph-edema early detection and timely intervention is important. In order to prevent and treat the lymph-edema of lower limbs in patients with gynecological malignancies in the early stage, this paper uses the computer-aided diagnosis method to scan the lower limbs of patients with gynecological malignant tumors by using CT imaging technology, and identify the location of lesions in patients with gynecological malignant tumors, and carry out image enhancement and denoising on the scanned CT images to mark the lesion sites. The incidence rate of incidence of lymph-edema in lower extremities was analyzed according to the patients' basic characteristics. The influence of different treatment methods on the incidence rate of lymph-edema and the incidence rate of lymph-edema in different stages of gynecologic malignancies were also analyzed. Finally, a drop of congestive therapy based on the research literature, three drugs therapy and surgical therapy for lower extremity lymph-edema intervention programs, through the patient's body recovery, lower limb swelling analysis of these three methods to effect the lower extremity lymph-edema, for patients to find a suitable intervention programs. The final results showed that the number of patients between the ages of 40-49 and 60-69 were the largest, reaching 427 and 417 respectively, and the heavier the patient, the higher the incidence. Radiotherapy, chemotherapy and pelvic lymph node dissection resulted in 89.73%, 89.76% and 86.96% of patients with lower limb lymph-edema, which is one of the risk factors for lower limb lymph-edema. Among the three intervention programs for lymph-edema of the lower limbs, decongestant therapy has a slower treatment speed but low cost and no side effects. Drug treatment can only be applied to some patients, and surgical treatment has good results but high cost.

1. Introduction

1.1. Background Meaning

Patients with gynecological malignant tumors often lead to complications of lymph-edema of the lower limbs during treatment and recovery. Lymph-edema of the lower limbs can affect the quality of life and daily activities of patients, resulting in patients not being able to receive treatment and recovery normally, and posing a huge threat to patients' physical and mental health. At present, our country has not found a treatment method for lower extremity lymph-edema, which has caused many patients with lower extremity lymph-edema caused by malignant tumor treatment to be unable to receive effective treatment and affect the recovery of the disease. However, early diagnosis and treatment of lymph-edema are easier to manage and operate, which greatly increases the possibility of successful treatment. Early diagnosis and treatment of lower extremity lymph-edema can facilitate medical staff to manage and control the condition, improve the success rate of treatment of lower extremity lymph-edema, and speed up the recovery of patients. Therefore, the early prevention and treatment of lymph-edema plays an important role in the patient's normal recovery and physical health.

1.2. Related Work

Tugral evaluated the effectiveness of a new tissue water-specific measurement technique for CDP in patients with lower limb lymph-edema. Tugral by the tape portions 9 of the two limbs measurement CM, lymph-edema limb and the contralateral limb skin moisture content using the Moisture Meter D Compact (MMDC) apparatus for measuring the affected area of the thigh, calf and ankle (PWC), by PWC value divided by the contralateral limb ipsilateral PWC to calculate the ratio between the limbs PWC [1]. Noori diagnosed women with ovarian cancer, endometrial cancer and cervical cancer, measured the circumference of the two lower limbs at the prefix, calculated the limb volume using the formula C2/pi, and obtained the baseline value before surgery. Patients were followed up every 3 months, and limb volume was calculated at each visit. An increase in limb volume> 10% was defined as lymph-edema. The incidence of lymph-edema after 1 year of follow-up was 43.5%. There is no significant correlation between known risk factors such as the scope of lymph node dissection, the number of pelvic or para-aortic lymph nodes removed and the type of adjuvant therapy. The final result showed that the incidence of LLL was 43.5%, and there was no statistically significant association between the development of LLL and risk factors [2].

1.3. Innovation in this Article

This paper uses computer-aided diagnosis methods to conduct experimental research, uses CT image processing technology to collect relevant data of the patient's body lesions, and uses image enhancement and denoising technology to process the CT images, and then uses feature extraction methods to extract and mark the lesions, finally transfer the relevant data of the lesion to the computer, and use the computer to calculate and analyze the data. Finally, the risk factors of patients with lower limb lymph-edema are analyzed through experimental data, and appropriate intervention programs are provided for patients.

2. Realization of Related Technologies for Lower Limb Lymph-edema

2.1. Computer Aided Diagnosis

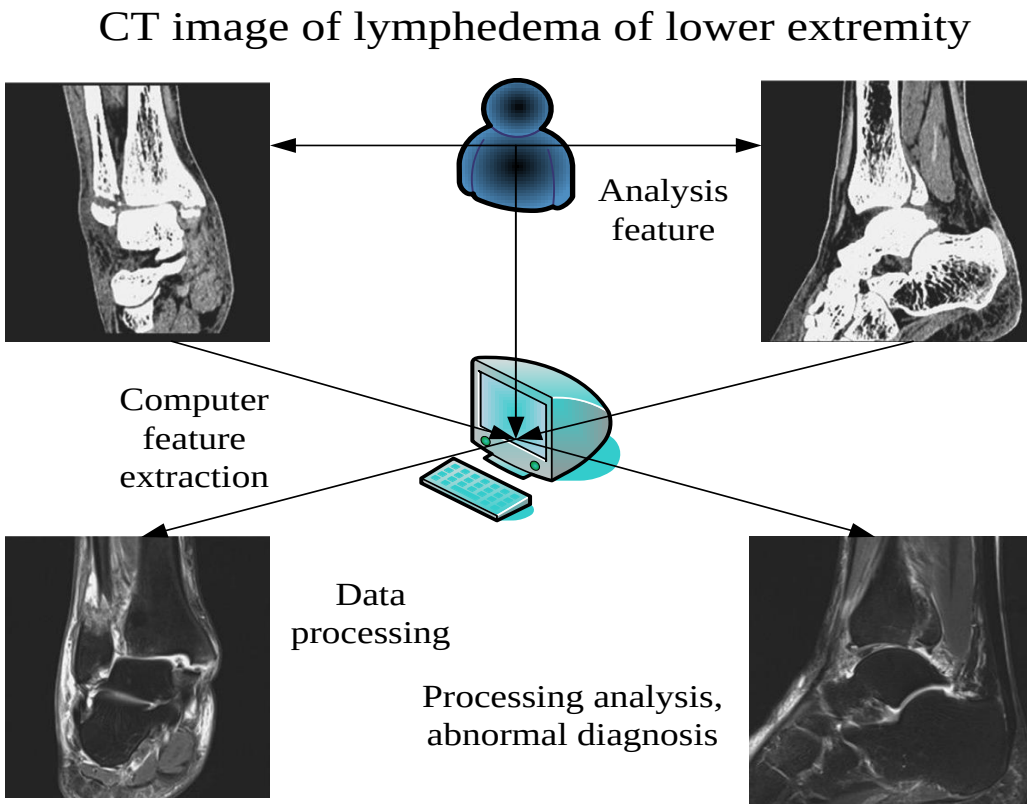

Figure 1. Computer-aided diagnosis steps

As can be seen from Figure 1, it is a computer-aided diagnosis flowchart.Refers to the use computer-aided diagnosis calculation function of the computer analysis, bio-medicine bonding method, using the CT imaging and image processing technology to help medical staff etiology issues such diagnostic method [3]. Computer-aided diagnosis and a computer-aided detection of extensions extending, computer-aided detection of abnormalities diagnosed just Laid patient label, and the medical image formed on simple image processing [4-5]. After the computer-aided diagnosis is based on computer-aided detection, and then the detected abnormality analysis and calculation, its etiology and diagnosis. Computer-aided diagnostics technology has in many areas corresponding wide range of applications, and it improves the accuracy of medical personnel to diagnose the disease, reducing the development of the missed diagnosis, reducing the work pressure medical staff, while improving medical treatment work efficiency, and have a certain role in promoting the development of health care [6-7].

Computer-aided diagnosis is generally divided into three steps in the application of medical imaging: First, the preprocessing process of medical imaging [8]. This process first uses a computer to identify the abnormality of the scanned part, and then separates and extracts the abnormality from the whole through image processing technology, and uses different image processing technologies and algorithms to enhance this part of the image. Second, the feature extraction process of medical images [9]. The extracted abnormal features are further quantified through calculation algorithms, and various features of the abnormal parts in the image are analyzed. Third, the data processing

process [10]. The characteristic data analyzed in step 2 is input into various mathematical algorithm systems, and the data is processed and analyzed by the computer to finally realize the diagnosis of abnormal parts.

2.2. CT Image Processing Technology

CT is an electronic computer tomography scan that uses the absorption and penetration of radiation by different tissues or parts of the human body and high-sensitivity detection equipment. In a specific part of the continuous scan of the human body, the specific situation of the patient's high-resolution scan results is used. Transmit the scan results to a computer and use the computer for editing to provide clear CT images [11-12]. CT imaging technology is a medical imaging technology based on four-dimensional angiography, and the preprocessing of scan results can make the patient's image clearer [13]. A CT image is a reconstructed image. The scanned information is processed and calculated by a computer, and the coefficients absorbed by each voxel x-ray are arranged into a digital square matrix, and then the numbers in the matrix are changed by a digital converter RGB gray value squares are formed and arranged in matrix order [14]. In practice, we usually used instead of the absorption coefficient CT value, the CT value is directly proportional to the material density, the specific formula is as follows:

$$CT\ value = s \times \frac{\mu_m - \mu_{water}}{\mu_{water}} \tag{1}$$

The s in formula (1) is the indexing factor. The use of CT images can correct the attenuation of medical images due to energy consumption during signal or current transmission, and can complement the information of functional pictures and anatomical pictures [15]. The most important thing in CT imaging technology is the image processing technology of CT images. When performing image processing on CT images, the image data is usually converted into DICOM format. The DICOM standard uses object-oriented technology in computers and its own related protocols to exchange information about medical images [16]. The existence of the DICOM standard promotes the development of medical image information systems and makes the operation of other systems easier and more efficient. However, the DICOM standard overlaps with related information in the field of medical information, so it is not applicable to this field.

CT images pretreatment: Pretreatment CT images is DICOM standard file to be processed, its first head movement correction, to unlock the movable head at it's translational and rotational both cases, the relevant equation is as follows:

$$\begin{bmatrix} a' \\ b' \\ c' \\ 1 \end{bmatrix} = P \times S_a \times S_b \times S_c \begin{bmatrix} a \\ b \\ c \\ 1 \end{bmatrix} \tag{2}$$

P denotes a parameter of the image is translated, S represents a parameter when image is rotated in three dimensions, a, b, c corresponding to the three-dimensional spatial coordinate points of the coordinate axes. After the head movement correction is completed, formula (2) is standardized, and formula (3) is solved by Gaussian iteration:

$$a^2 = \sum_m (f(Ga_n) - u_7 d(a_n))^2 \tag{3}$$

a is the position of the n measured object, G is the transformation matrix, $f(*)$ is the gray value of the unprocessed image, $d(*)$ is the gray value of the reference image, and u_7 is the gray equalization parameter of the two images. The last step of preprocessing is to smooth the image in the space, which can be expressed by Gaussian function:

$$F(x) = ce - \frac{(x-q)^2}{p^2} \tag{4}$$

CT image denoising: Using the CT image after noise reduction processing techniques pretreatment is complete CT imaging denoising [17]. Median filtering the gray value image is a point as a central point, looking for all its neighboring points within a certain range, and recording these points gradation value, using these last point that instead of the original intermediate value. Assuming an array u_1, u_2, Λ, u_n, arrange these values $u_{i1} \le u_{i2} \le \Lambda \le u_{in}$, then the middle value of the array:

$$v = med\{u_1, u_2, \Lambda, u_n\} = \begin{cases} u_{i\frac{(n+1)}{2}} \\ \frac{1}{2}[u_{i\frac{(n+1)}{2}} + u_{i(\frac{n}{2}+1)}] \end{cases} \tag{5}$$

Mean filtering is to use the average pixel value of a range of methods to replace the original pixel value, which is the following formula, n is the total number of pixels in the range:

$$f'(x,y) = \frac{1}{n}\sum_{f \in s} f(x,y) \tag{6}$$

Gaussian filter image denoising is performed by a weighted average of the entire image, in the formula which process one and two dimensional image is as follows:

$$G(z) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{z^2}{2\sigma^2}} \tag{7}$$

$$G(y,z) = \frac{1}{2\pi\sigma^2} e^{-\frac{y^2+z^2}{2\sigma^2}} \tag{8}$$

Morphological processing of CT images: Morphological processing of CT images is an important part of medical imaging [18]. When processing CT images, morphological analysis is generally used to segment the image to be processed, and then useful areas are studied. The main calculation methods of morphological analysis include expansion and corrosion, opening and closing calculations, and frame refinement [19]. In the expansion and corrosion calculation, X, Y is the set in Z^2, and the expansion and corrosion definitions of Y to X can be expressed by the following formulas:

$$X \oplus Y = \{Z \mid (Y)_Z \cap X \neq \varnothing\} \tag{9}$$

$$X \Theta Y = \{Z \mid (Y)_Z \subseteq X\} \tag{10}$$

The open operation and closed operation in morphological analysis can be expressed by the

following formulas:

$$X \circ Y = (X \Theta Y) \oplus Y \tag{11}$$

$$X \bullet Y = (X \oplus Y) \Theta Y \tag{12}$$

The refinement of Y to X in the morphological analysis method can be expressed as $X \otimes Y$, and the formula is as follows:

$$X \otimes Y = X - (X \# Y) = X \cap (X \# Y)^C \tag{13}$$

2.3. Lymph-edema of Lower Limbs

Lymph-edema of the lower extremities is localized edema caused by lymphatic drainage disorders [20]. For some reason, lymph fluid will accumulate in the subcutaneous tissues, and then cause fibrosis, fat hardening, swelling of the limbs, thickening and rough skin. Lymph-edema of the lower limbs is generally divided into primary lymph-edema caused by lymphatic vessel development problems and secondary lymph-edema caused by lymphatic obstruction caused by other causes [21]. The clinical manifestation of lower extremity edema is mainly swelling of one foot, starting at the ankle and then involving the entire lower extremity. Early protein-rich lymph fluid accumulates in the gaps, forming soft depressions and swelling, and the skin remains normal. In the last stage, due to the protein concentration accumulated in the gap, inflammation and fibrosis of the subcutaneous tissue, the swelling is not hollow, the skin becomes thick, dry, rough, pigmented and warts or thorns [22-23]. Mild lymph-edema can be repaired by lifting the limbs without damaging the skin. Moderate lymph-edema begins to show symptoms of moderate skin fibrosis, and enlarged limbs have no obvious recovery effect. Severe lymph-edema can cause swelling and thick and rough skin [24-25].

3. Data Collection

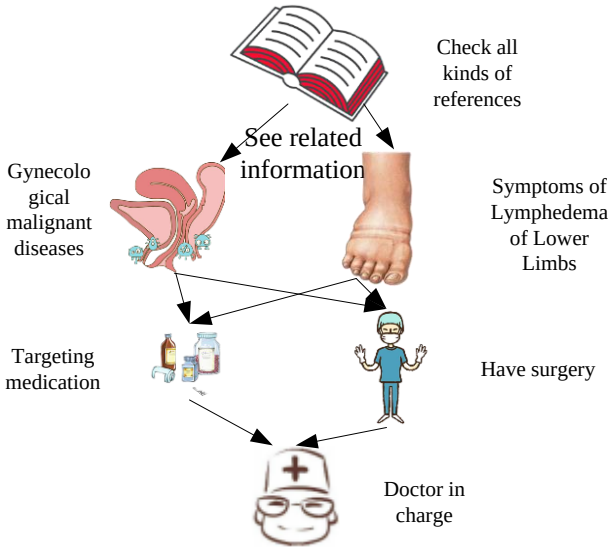

Figure 2. Data analysis part

It can be seen from Figure 2 that is the flow chart of the data processing part.In this study, read

and refer to a large number of domestic and foreign patients with gynecologic malignancy and lower extremity lymph-edema research literature on, combined with the specific circumstances of each hospital examined patients with gynecological malignancies lower extremity lymph-edema symptoms, patients with gynecological malignancies statistics lower extremity lymph-edema the incidence, morbidity, and the number of treatment and treatment rates. And from the patient's own characteristic factors, the incidence of different aspects of the disease and the treatment of patients with gynecologic malignancies, treatment rate statistics and analysis, lower extremity lymph-edema and understanding between age, weight, and treatment of patients with different diseases relationships, analyze the risk factors in patients with gynecological malignancies lower extremity lymph-edema. Finally three treatment of lower extremity lymph-edema intervention. According to the literature, and respectively lowering therapy congestion, for analysis of drug therapy and surgical therapy, three scenarios to know the therapeutic effect on lower extremity lymph-edema disease, patients find suitable lower extremity lymph-edema interventions.

3.2. CT Image Feature Extraction

CT imaging is performed after the pretreatment operation required by the feature extraction, feature data is extracted out of the lesion, so the post-analysis and diagnosis of the cause. Wherein the texture is a response characteristic phenomena homogenous image, including the important relationship information and the local structure surrounding areas, it has been widely used in feature extraction. For the extraction of texture features, many scholars have proposed a formula related. First, in the frequency domain statistical texture features extraction method, Fourier transform has been proposed the discrete two-dimensional image signal into spatial domain data into the frequency domain, Fourier transform formula is as follows:

$$F(a,b)=\sum_{x=0}^{I-1}\sum_{y=0}^{J-1} f(x,y)\exp[-d2\pi(\frac{ax}{I}+\frac{by}{J})] \tag{14}$$

In formula (14) $a=0,1,\Lambda\ ,I-1$, $b=0,1,\Lambda\ ,J-1$. $f(x,y)$ is the digital form of medical imaging, x,y is the horizontal and vertical coordinates of the image, $F(a,b)$ is the frequency domain image spectrum. Some scholars analysis using wavelet transform for texture feature extraction, continuous transformation which formula is as follows:

$$Hf=\int_{-\infty-\infty}^{+\infty+\infty} f(x,y)\Phi_{a,bx,by}(x,y)dxdy \tag{15}$$

In formula (15), $\Phi_{a,bx,by}(x,y)$ is a specific basis function scale, which can be expressed by the following formula:

$$\Phi_{a,bx,by}(x,y)=\frac{1}{|a|}\Phi(\frac{x-bx}{a},\frac{y-by}{a}) \tag{16}$$

Among them, Fast Fourier Transform is to enable the transformation process to be run on the computer in a numerical manner:

Let m be a sequence of finite length, the sequence length is N, the N-point discrete Fourier transform of m is defined as:

$$M_k = \sum_{i=0}^{N-1} m_i e^{-j\frac{2\pi}{N}ki} \tag{17}$$

Usually let W_N be the root factor of DFT, so DFT can be simplified as:

$$M_i = \sum_{i=0}^{N-1} m_i W_N^{ti} \tag{18}$$

The inverse discrete Fourier transform of M_i can be expressed as:

$$M_i = \frac{1}{N} \sum_{k=0}^{N-1} M_t W_N^{-tn} \tag{19}$$

The parity decomposition method is:

$$M_t = \sum_{x=0}^{N/2-1} m_{2x} W_N^{2xt} + W_N^t \sum_{x=0}^{N/2-1} m_{2x-1} W_N^{2xt} \tag{20}$$

3.3. Intervention Program Flow of Lower Limb Lymphedema in Patients with Gynecological Malignant Tumors

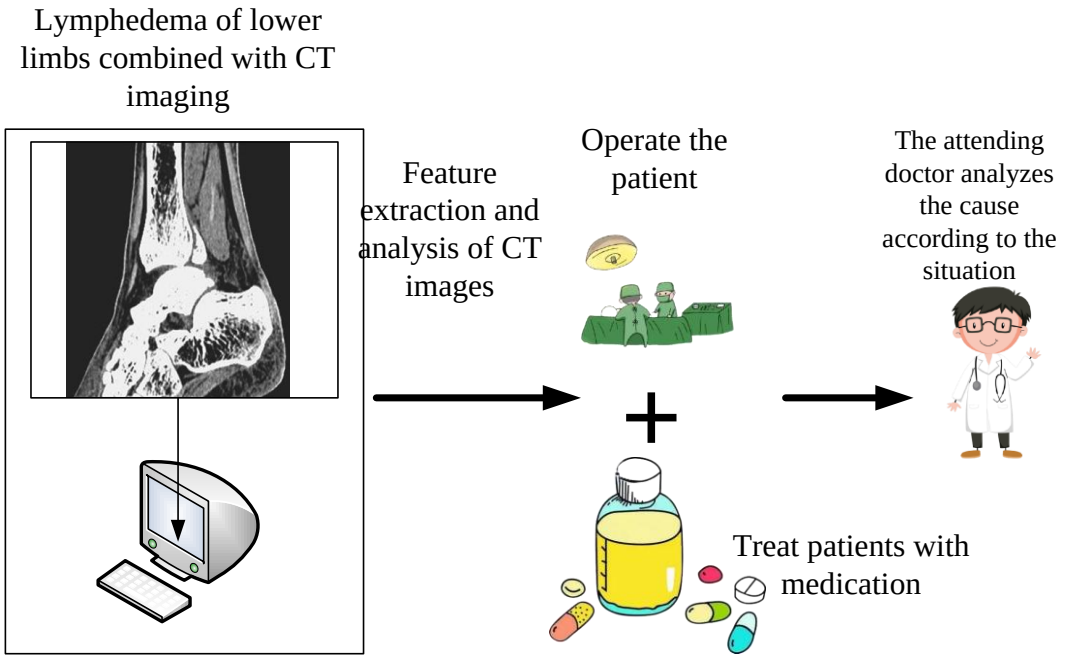

Figure 3. Flow chart of intervention program for lower limb lymphedema in patients with gynecological malignant tumors

As shown in Figure 3, it is the flow chart of the entire intervention plan for lower limb lymphedema in patients with gynecological malignant tumors. First, extract the features of the CT images of lower limb lymphedema, and analyze the features of the CT images, and use the final results to formulate the corresponding The countermeasures can be drug treatment or surgical treatment, recording data, and finally the doctor sorts out the entire process steps and data, and develops the final factor investigation plan.

4. Experimental Analysis of Lower Limb Lymph-Edema in Patients with Gynecological Malignant Tumors

4.1. Incidence of Lower Limb Lymph-Edema in Patients with Gynecological Malignant Tumors

The experiment first calculated the incidence and treatment of lower limb lymph-edema after treatment in patients with gynecological malignant tumors from 2016 to 2020 through the relevant data on the website. The statistical results are shown in Table 1.

Table 1. Incidence and treatment of lower limb lymph-edema

	Patients	Number of cases	Treatment cases	Incidence	Treatment rate
2016	398	251	75	63.07%	29.88%
2017	412	292	97	70.87%	33.22%
2018	374	284	83	75.94%	29.23%
2019	261	212	71	81.23%	33.49%
2020	327	260	96	79.51%	36.92%

According to the data in Table 1, we can see that from 2016 to -2020, the incidence rate of lymph-edema in the lower extremities of gynecologic malignancies reached over 60% and increased year by year, but the rate of lymph-edema treatment in the lower extremities was about 30%. We show the change of data in the table in the form of graph, and the final result is shown in Figure 4.

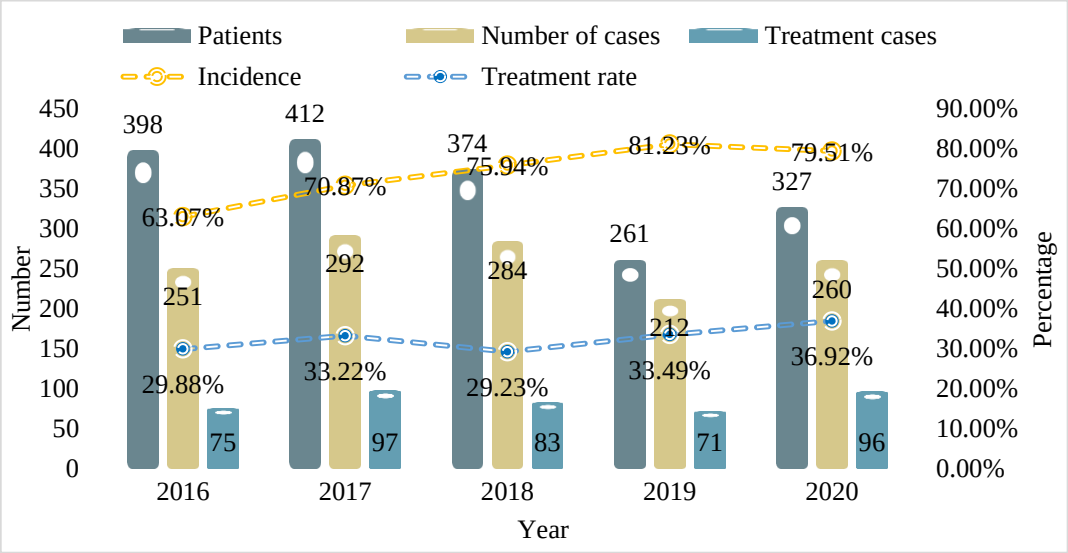

Figure 4. The onset and treatment of lymph-edema of the lower limbs of the patient

According to the data in Figure 4, we can see that the incidence of lower extremity lymph-edema in patients with gynecological malignancies is generally high, and it is increasing year by year. The incidence of lower extremity lymph-edema from 2016 to 2020 ranges from 60% to 85%. At the same time, the treatment of patients with lower limb lymph-edema has not changed much. The treatment rate of this disease basically fluctuates in the range of 20%-40% from 2016 to 2020. It can be seen that lower limb lymph-edema is a common complication among patients with gynecological malignant tumors, and it is not easy to cure. There is still no effective and perfect method to treat

lower limb lymph-edema.

4.2. Risk Factors for Lower Limb Lymph-Edema

(1) Characteristic factors of patients with gynecological malignant tumors

The age and body mass index of patients with gynecological malignant tumors were selected to carry out statistics on the incidence of lower limb lymph-edema, and the influence of age and weight on the complications of lower limb lymph-edema and the influence on the treatment of lower limb lymph-edema were analyzed. First, analyze the age factors of patients with gynecological malignant tumors. Every 10 years is an age stage. The incidence of lower limb lymph-edema in female patients between 20 and 69 years old is counted. The statistical results are shown in Table 2.

Table 2. Incidence and treatment of lower limb lymph-edema in patients of various ages

	Patients	Number of cases	Treatment cases	Incidence
<20	41	12	8	29.27%
20-29	102	75	34	73.53%
30-39	231	174	121	75.32%
40-49	427	351	277	82.2%
50-59	252	144	112	57.14%
60-69	417	337	207	80.82%
>=70	30	6	4	20%

According to the data in Table 2, we can see that there are more patients with lower limb lymph-edema in the age range of 40 to 50 years old and 60 to 70 years old, and lower limb lymph-edema before and after the age of 20. The number of patients with edema is the least. In order to make a more intuitive observation of the data in the table, we converted the data in Table 2 into the form of a graph, and the final result is shown in Figure 5.

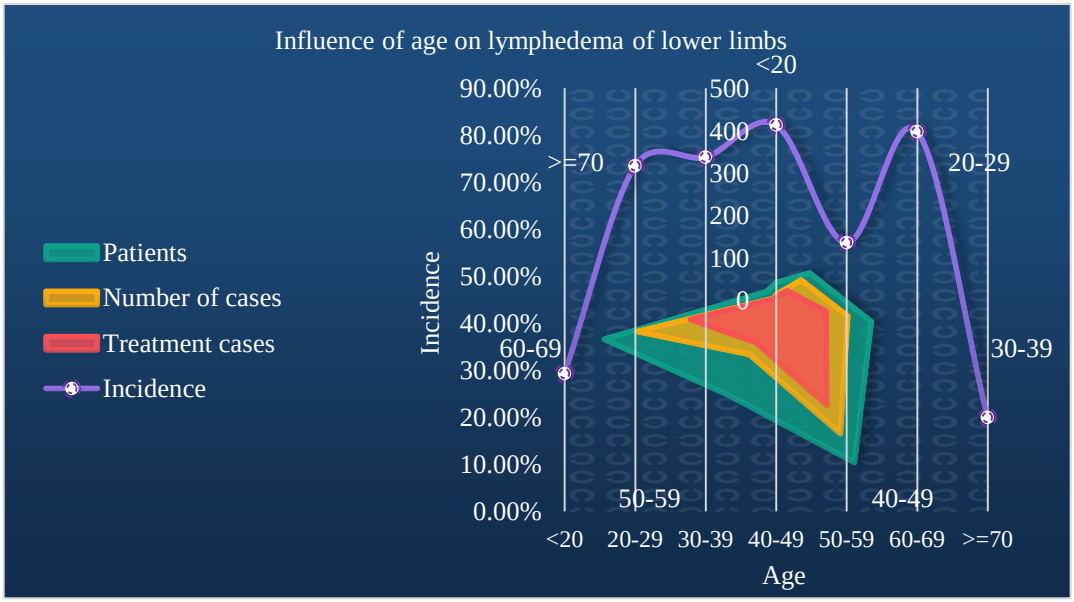

Figure 5. The effect of patient age on lower limb lymph-edema

According to the data in Figure 5, we can see the incidence of lymph-edema of lower limbs in patients of different ages. According to the trend of the data in the figure, we can see that the number of patients with lower extremity lymph-edema in the age group of 40-49 years old and 60-69 years old is the largest, reaching 427 and 417 respectively. The number of patients with lower limb lymph-edema before the age of 20 and after the age of 70 is less, and the sum of the two is only 71. It can be seen that patients with gynecological malignancies and lymph-edema of lower limbs are more common in patients aged 40-49 and 60-69 years.

Statistical analysis of gynecological cancer patients with weight on the incidence of lower extremity lymph-edema, the patient's weight is divided into < 50kg, 50-60kg, 60-70kg, 70-80kg, 80-90kg, 90-100kg and > 100kg. The number of patients with lower extremity lymph-edema in each stage was analyzed. The final statistical results are shown in Table 3.

Table 3. Statistics on the incidence of lower limb lymph-edema in patients at various weight stages

	Patients	Number of cases	Treatment cases	Incidence
<50	151	36	34	23.84%
50-60	143	43	41	30.07%
60-70-	156	57	50	36.54%
70-80	182	82	78	45.05%
80-90	287	147	133	51.22%
90-100	293	168	157	57.34%
>100	288	216	161	75%

According to the data in Table 3, we can see that the incidence of lower limb lymph-edema in patients with gynecological malignancies increases with the increase of body weight. According to the data in the table, we use the form of graphs to show the relationship between body weight and the incidence of lower limb lymph-edema. The final result is shown in Figure 6.

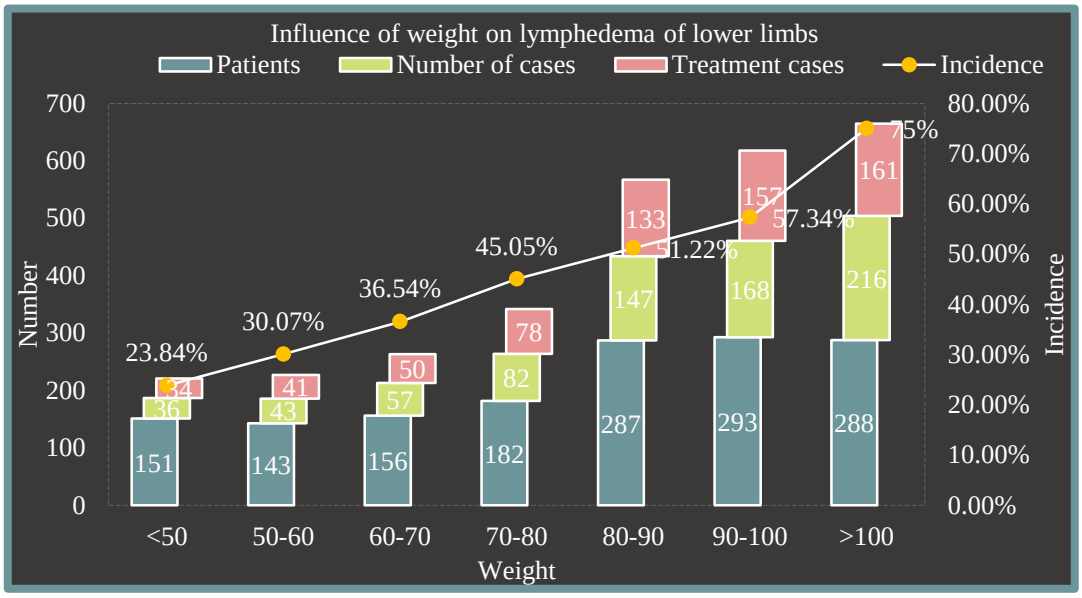

Figure 6. Patient weight and incidence of lower limb lymph-edema

According to the data trend in Figure 6, we can see that the incidence of lymph-edema of the lower limbs also shows an upward trend as the weight of patients increases. Starting from the

weight of patients with gynecological malignancies reaching 80kg, the incidence of lower limb lymph-edema has reached more than 50%, and the incidence continues to rise after this stage. It can be seen that the weight of patients with gynecological malignant tumors is one of the risk factors for inducing lymph-edema of the lower limbs. Patients with gynecological malignant tumors weighing more than 70kg should pay attention to their physical conditions and appropriately reduce their weight.

(2) The influence of treatment factors on lower limb lymph-edema in patients with gynecological malignant tumors

The incidence rate of lymph-edema in lower extremities is also affected by different treatments in gynecologic malignancies. We counted the or and P values of the patients with gynecologic malignant tumor after the treatment of laparotomy and laparoscopic treatment, and also the or and P values after radiotherapy, chemotherapy and pelvic lymph node cleaning. The statistical results are shown in Table 4.

Table 4. Incidence of lymph-edema of lower limbs after treatment of gynecological malignancies

	Patients	Number of cases	Incidence	OR	P
Laparotomy	150	112	74.67%	0.46	0.18
Laparoscopy	133	100	75.19%	0.48	0.17
Radiotherapy	146	131	89.73%	1.45	0.001
Chemotherapy	127	114	89.76%	1.14	0.005
Pelvic lymph node dissection	138	120	86.96%	1.39	0.03

According to the data in Table 4, we can see that the incidence of patients undergoing radiotherapy, chemotherapy and pelvic lymph node dissection is relatively high, and the P value is generally low. According to the references of other scholars, it can be known that when the P value is less than 0.05, the treatment factors have a higher correlation with lower limb lymph-edema. Convert the data in the table into a graph for observation, analyze the effect of treatment factors on lymph-edema of the lower limbs, and use abbreviations to replace the names of the treatment factors for data observation. The final result is shown in Figure 7.

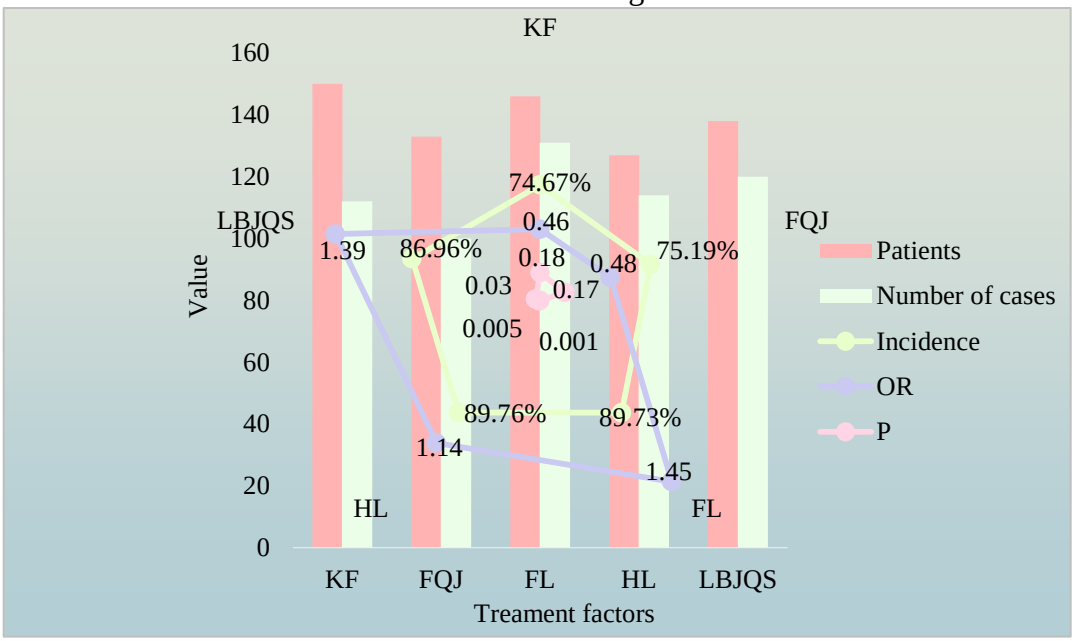

Figure 7. The influence of therapeutic factors on lymph-edema of lower limbs

According to the data in Figure 7, we can see that there are three treatment factors with a P value of less than 0.05, namely radiotherapy, chemotherapy and pelvic lymph node dissection, and their P values are 0.001, 0.005 and 0.03, respectively. These three treatment factors led to the incidence of lymph-edema in the lower limbs of patients with 89.73%, 89.76% and 86.96%, respectively. Therefore, radiotherapy, chemotherapy, and pelvic lymph node dissection have a significant correlation with lower extremity lymph-edema, which is one of the risk factors for inducing lower extremity lymph-edema.

(3) The influence of different types of gynecological malignant tumors on lower limb lymph-edema

Gynecological malignancy is a collective term for various gynecological malignancies, which include cervical cancer (SCC), endometrial cancer (EC), fallopian tube tumor (UTT) and ovarian cancer (OC), etc. Patients with different types of disease are treated the incidence of lymph-edema of the hind limbs is also different. We calculated the incidence of lower limb lymph-edema after treatment for different types of gynecological malignancies, and analyzed the relationship between these diseases and lower limb lymph-edema. The statistical results are shown in Table 5.

Table 5. The incidence of lymph-edema of lower limbs after treatment of different diseases

	Patients	Number of cases	Treatment cases	Incidence
SCC	234	132	96	56.41%
EC	161	97	81	60.25%
UTT	336	268	167	79.76%
OC	271	183	137	67.53%

According to the data in Table 5, we can see the incidence of lymph-edema of the lower limbs after treatment for these four types of diseases. According to the data in the table, patients with fallopian tube tumors have the highest incidence of lower limb lymph-edema after treatment. We finally observe the data in the table in the form of graphs, the results are shown in Figure 8.

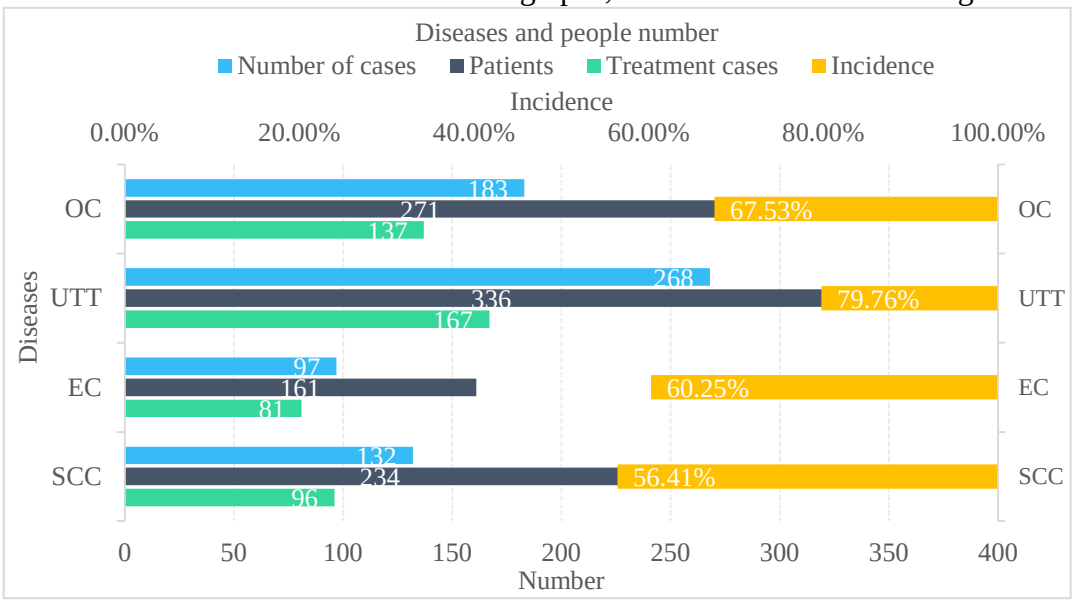

Figure 8. The incidence of lymph-edema of the lower limbs after treatment of different diseases

According to the data in Figure 8, we can see that the incidence of lower limb lymph-edema in

patients with Fallopian tube tumors is 79.76%, which is the highest among these four types of gynecological malignancies. The incidence of lower limb lymph-edema in patients with cervical cancer is 56.41%, which is the lowest among these four types of gynecological malignancies. It can be seen that patients with Fallopian tube tumors have the highest probability of developing lower limb lymph-edema after treatment, and the probability of other diseases causing lower limb lymph-edema is between 50% and 70%.

4.3. Intervention Program for Lower Limb Lymph-Edema

In order to solve the problem of slow treatment and difficulty in daily life of patients with gynecological malignant tumor due to lower extremity lymph-edema, we put forward some intervention programs for the treatment of patients with lower extremity lymph-edema, and then count the recovery situation of patients under different intervention schemes, so as to find an intervention scheme more suitable for gynecological cancer patients.

(1) Decongestant therapy

There are two main stages of decongestant therapy, which are divided into four parts: compression therapy, manual lymphatic drainage, exercise and skin care. We made statistics on the swelling of the five parts of the instep, ankle, calf, knee and thigh of the patient's lower extremities before treatment, after treatment, 3 months follow-up and 1 year follow-up, and analyzed the effect of decongestion therapy on lower extremity lymph-edema statistical results are shown in table 6, unit: cm.

Table 6. Swelling of lower limbs of patients under decongestant therapy

	Before therapy	After treatment	Follow up for 3 months	Follow up for one year
Instep	26.88	24.43	22.59	20.58
Ankle	33.25	26.87	23.57	21.36
Calf	43.17	38.62	36.24	34.24
Knee	53.36	48.87	45.27	44.22
Thigh	62.37	60.19	57.06	55.73

According to the data in Table 6, we can see that the swelling of the lower limbs has been significantly improved after the patient's lower limbs are treated with decongestant therapy. In order to better observe the experimental data, we converted the data in the table into graph form, and the final result is shown in Figure 9.

According to the data in Figure 9, we can see that the swelling degree of the five parts of the patient's lower limbs were 26.88cm, 33.25cm, 43.17cm, 53.26cm, 62.37cm before the treatment of decongestant therapy. After the decongestant treatment, the swelling of the five parts of the patient's lower limbs has alleviated, and the swelling of the patient's lower limbs has not rebounded three months and one year after the treatment, and has been well recovered. After one year of treatment, the swelling of the five parts of the patient's lower limbs were 20.58cm, 21.36cm, 34.24cm, 44.22cm and 55.37cm, respectively.

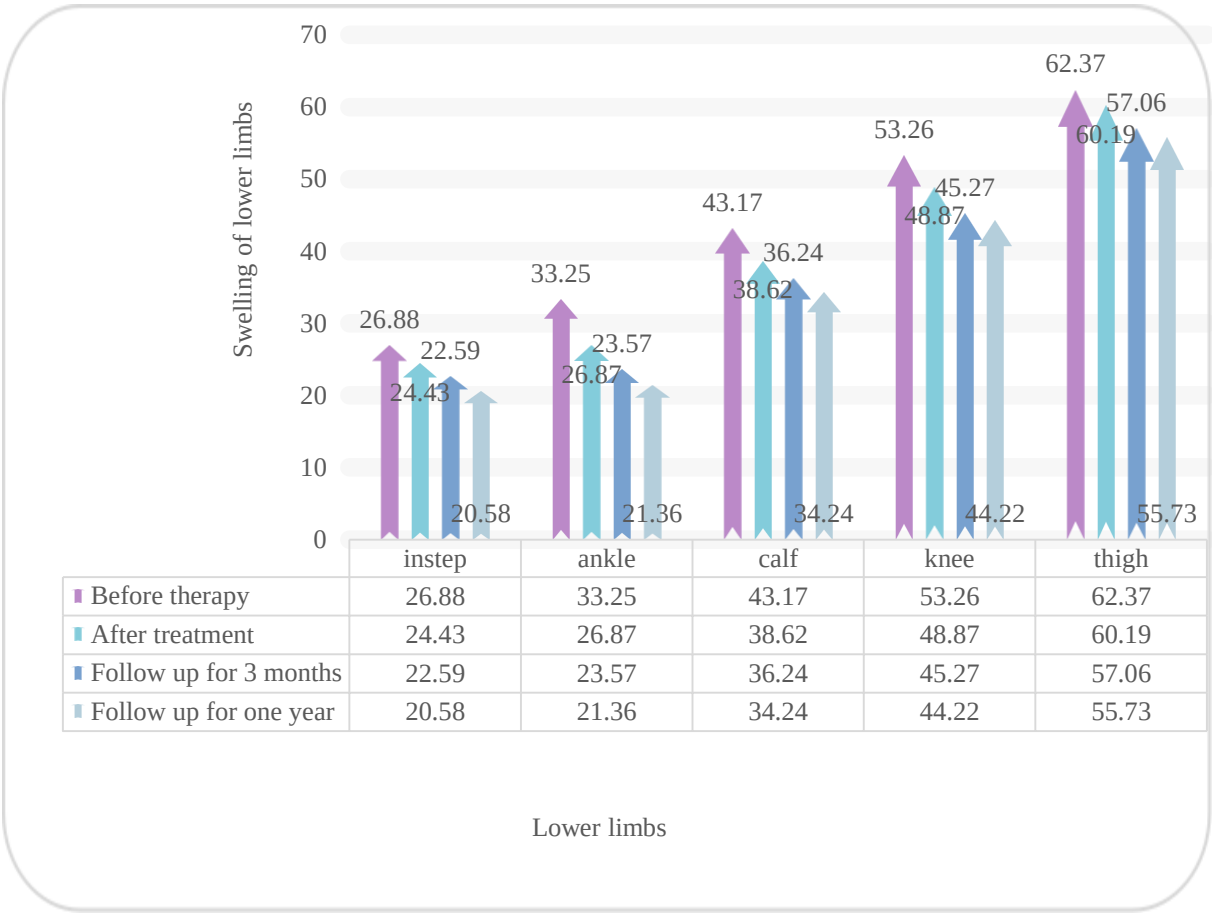

Figure 9. Swelling of the lower limbs after decongestant therapy

(2) Drug therapy

Drug therapy is a relatively common method to treat lymph-edema of the lower limbs. The experiment followed up 25 patients who had undergone drug treatment, and the efficacy of drug treatment on lower limb lymph-edema was counted. The statistical results are shown in Table 7.

Table 7. Treatment rate statistics of patients treated with drugs

	Get better	Unchanging	Get worse	Success rate
One week	80%	15%	5%	80%
One month	73%	24%	3%	73%
Three months	82%	17%	1%	82%
One year	72%	27%	1%	72%

According to the data in Table 7, we can see the specific conditions of the patient's medical treatment for lower limb lymph-edema for one week, one month, three months and one year and the success rate of the drug treatment. We use graphs to represent the data in the table so that we can observe and analyze the data. The final result is shown in Figure 10.

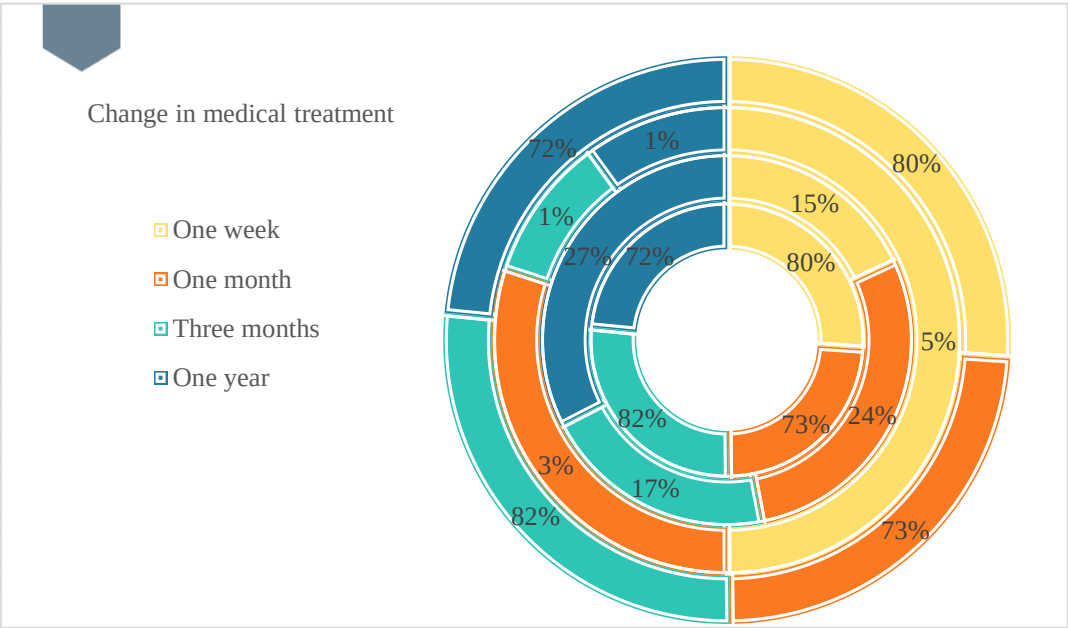

Figure 10. The specific situation of the treatment of lymph-edema of lower limbs

According to the data in Figure 10, we can see that the treatment of lower extremity lymph-edema with drug therapy has a certain effect. After one week of treatment, 80% of the patients' condition has been improved, 15% of the patients' condition has not been improved or deteriorated, and the remaining 5% of the patients have deteriorated due to drug treatment. One year after treatment, 72% of the patients' condition improved, the number of patients with deterioration decreased to 1%, but the number of patients with no change increased to 27%. It can be seen that drug therapy in the treatment of lower extremity lymph-edema can have a higher success rate, but the drug treatment method has no effect on some patients, so the drug treatment method is not applicable to all patients with lower extremity lymph-edema.

(3) Surgical treatment

When the lower extremity lymph-edema is more serious, surgical treatment is generally used to treat patients. The recovery degree of lower limbs, swelling of lower limbs and quality of life of patients after operation, as well as the expenses of patients in operation, dressing change and rehabilitation were counted. Q was used to replace the quality of life of patients. When Q value was 1, the quality of life was the highest. The statistical results are shown in Table 8.

Table 8. Statistical table of surgical treatment

	Degree of recovery	Swelling degree	Q	Cost
One month	20%	64%	0.26	8741
Three months	45%	100%	0.43	6634
One year	76%	100%	0.65	4722
Eighteen months	83%	100%	0.81	3710
Two years	90%	100%	0.94	1821
Thirty months	98%	100%	1	534

According to the data in Table 8, we can see that patients with lower extremity lymph-edema treated by surgical treatment can get better recovery, but the recovery cycle of surgical treatment is

longer and the cost is higher. In order to better observe the data in the table, we transformed Table 8 into graph form, and the result is shown in Figure 8.

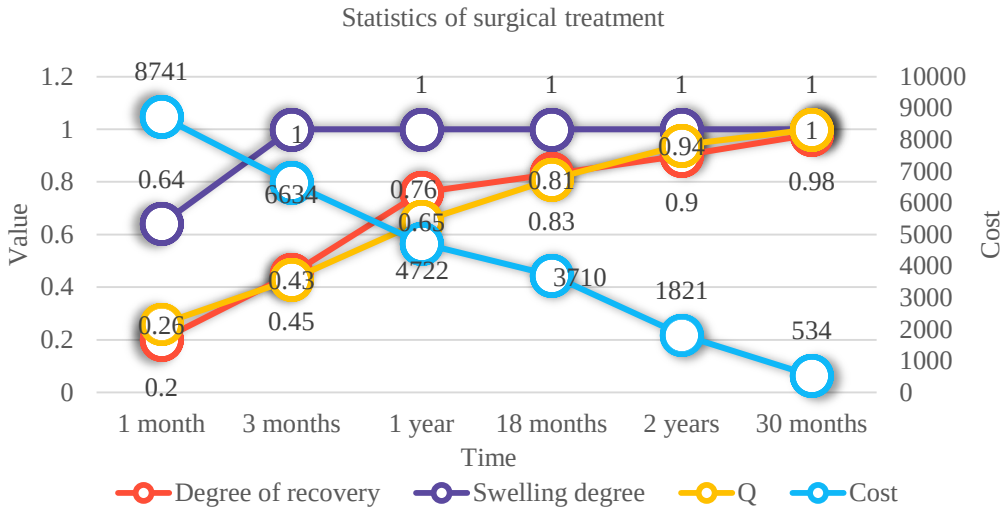

Figure 11. Statistics of patients after operation

According to the data in Figure 11, we can see that the recovery degree of the patient's body after surgery is growing, but the speed is slow, and the body only recovers to 98% 30 months after the operation. However, surgical treatment for patients with lower extremity lymphedema has a very good therapeutic effect, the third month after surgery, the lower extremity swelling situation reached 100%, and there will be no recurrence of the disease. And the quality of life of patients after surgery is constantly improving. Although surgical treatment has good detumescence effect, it also has its disadvantages. The recovery period of surgical treatment is slow, and patients need to spend higher costs.

4.4. Improvement of the Degree of Edema of the Affected Limb

Table 9. Perimeter value of each part before and after treatment

Location	x ±S	
	Before treatment	After treatment
instep	24.55 ±3.79	22.03 ±3.41
5cm above ankle	28.93 ±4.10	23.84 ±2.27
10cm below the knee	41.41 ±3.65	36.24 ±2.65
10cm above the knee	51.96 ±3.41	46.81 ±1.96
20cm above the knee	61.73 ±3.21	56.57 ±3.15

As shown in Table 9, the normality test analysis showed that only 20cm above the knee obeyed the normal distribution before and after treatment. The paired t test was used to calculate the mean, and the rank sum test was used for the remaining four parts. The circumference values after 2 courses of CDT treatment were lower than before treatment, and $P<0.001$, the difference was statistically significant ($P<0.05$). The lowering of the back of the foot is not very obvious, which may be related to the patient's usual long walk or standing.

Table 10. Lower limb circumference values at 3 months, 1 year and after treatment

Location	x ±S		
	After treatment	After 3 months of treatment	After 1 year of treatment
instep	22.03 ±2.34	21.15 ±1.65	20.87 ±1.46
5cm above ankle	25.83 ±3.24	23.96 ±1.54	23.62 ±1.28
10cm below the knee	37.26 ±2.61	35.37 ±2.23	35.01 ±2.01
10cm above the knee	46.79 ±1.96	45.73 ±2.21	45.21 ±2.03
20cm above the knee	57.51 ±3.18	56.58 ±3.01	55.86 ±2.57

From Table 10, it was found through follow-up that the circumference of the instep, 5cm above the ankle and 10cm below the knee were lower after 3 months and 1 year of follow-up compared with the 2 courses of treatment, the difference was statistically significant (P<0.05), and 10cm above the knee The value of lower extremity circumference at a follow-up of 20cm above the knee for 1 year was lower than that at 2 courses of treatment, and the difference was statistically significant (P<0.05). The value of lower extremity circumference at a follow-up of 5 parts for 3 months was compared with that at 1 year. , No obvious change, the same curative effect, no statistically significant difference (P> 0.05).

5. Conclusion

Malignant tumor is a threat to women's health, and its postoperative complications also bring many troubles to patients. Gynecological cancer patients after treatment often appear lower extremity lymph-edema, which seriously affects the recovery of patients and daily activities. At present, the treatment methods of lymph-edema of lower limbs include decongestant therapy, drug therapy and surgical treatment. These three methods have certain effect on the treatment and prevention of lymph-edema.

This study was conducted to analyze the risk factors of lymph-edema in lower extremities by statistical analysis of the impact of different age groups, weight, treatment methods and gynecologic malignancies on the incidence rate of lymph-edema. Then, according to the research literature, three intervention schemes, namely, decongestant therapy, drug therapy and surgical treatment, were proposed. By analyzing the efficacy of the three schemes on lymph-edema of lower limbs, the appropriate intervention scheme was found for patients.

The results showed that the incidence rate of lymph-edema was greater in the age group between 40 and -49 and 60 to 69 years old. The higher the weight of the patients, the greater the incidence of lymph-edema. The incidence rate of lymph-edema was significantly affected by radiotherapy, chemotherapy and pelvic lymph node dissection. Decongestant therapy is easy to carry out, easy to be accepted by patients, and its treatment cost is low, side effects are less, but the treatment speed is slow. Surgical treatment is easier to recover, can effectively control various adverse factors of the disease, but the cost is higher than physical therapy, need repeated diagnosis and treatment.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Tugral A, Viren T, Bakar Y. Tissue dielectric constant and circumference measurement in the follow-up of treatment related changes in lower limb lymphedema. International Angiology, 2018, 37(1):26-31.

[2] Noori K, Adarsh D, Satheeshan B, et al. The incidence and risk factors for development of lower limb lymphedema after treatment for gynaecological cancers. International Journal of Reproduction Contraception Obstetrics & Gynecology, 2018, 7(3):1168-1171.

[3] Sethi G, Saini B S. Computer aided diagnosis system for abdomen diseases in computed tomography images. Biocybernetics & Biomedical Engineering, 2016, 36(1):42-55.

[4] Agha M, Eid A F, Nouh M. 3T MRI of the breast with computer aided diagnosis, can it help to avoid unnecessary invasive procedures? Alexandria Journal of Medicine, 2016, 52(1):9-18.

[5] Mohebian M R, Marateb H R, Mansourian M, et al. A Hybrid Computer-aided-diagnosis System for Prediction of Breast Cancer Recurrence (HPBCR) Using Optimized Ensemble Learning. Computational & Structural Biotechnology Journal, 2017, 15(C):75-85.

[6] Amir G J, Lehmann H P. After Detection: The Improved Accuracy of Lung Cancer Assessment Using Radiologic Computer-aided Diagnosis. Academic Radiology, 2016, 23(2):186-191.

[7] Dai Y, Qiu D, Wang Y, et al. Research on Computer-Aided Diagnosis of Alzheimer's Disease Based on Heterogeneous Medical Data Fusion. International Journal of Pattern Recognition and Artificial Intelligence, 2019, 33(5):1-17.

[8] Fei, Gao, Yi, et al. Artificial intelligence in computer-aided diagnosis of abdomen diseases. ence China(Life ences), 2019, 62(10):128-131.

[9] Takahashi R, Kajikawa Y. Computer-aided diagnosis: A survey with bibliometric analysis. International Journal of Medical Informatics, 2017, 101(May):58-67.

[10] Hobson P, Lovell B C, Percannella G, et al. Computer Aided Diagnosis for Anti-Nuclear Antibodies HEp-2 Images: Progress and Challenges. Pattern Recognition Letters, 2016, 82(15):3-11.

[11] Wang P, Wang S. Computer-aided CT image processing and modeling method for tibia microstructure. Bio-Design and Manufacturing, 2020, 3(1):71-82.

[12] Cui X Y, Gui Z G, Zhang Q, et al. Learning-Based Artifact Removal via Image Decomposition for Low-Dose CT Image Processing. IEEE Transactions on Nuclear Science, 2016, 63(3):1-1.

[13] Yang W. Finite element model of concrete material based on CT image processing technology. Journal of visual communication & image representation, 2019, 64(Oct.):1-8.

[14] Chen S, Xu L, Yin J, et al. Quantitative characterization of grain internal damage and 3D reconstruction based on Micro-CT image processing. Nongye Gongcheng Xuebao/Transactions of the Chinese Society of Agricultural Engineering, 2017, 33(17):144-151.

[15] Torres F F E, Jacobs R, Ezeldeen M, et al. How image-processing parameters can influence the assessment of dental materials using micro-CT. Imaging ence in Dentistry, 2020, 50(2):161-163.

[16] Selvi C T, Amudha J. Automatic Video Surveillance System for Pedestrian Crossing Using Digital Image Processing. Indian Journal of ence and Technology, 2019, 12(2):1-6.

[17] Pelc N. TU-D-BRB-01: Dual-Energy CT: Techniques in Acquisition and Image Processing. Medical Physics, 2016, 43(6):3746-3746.

[18] Basak P, Nath A. Detection of Different Stages of Lungs Cancer in CT-Scan Images using Image Processing Techniques. International Journal of Innovative Research in Computer and Communication Engineering, 2017, 5(5):9708-9719.

[19] Kim C G. The effect of reducing exposure dose in neurocranium angiography CT scan based on 3D computer image processing. Journal of Advanced Research in Dynamical & Control Systems, 2017, 9(10):170-175.

[20] Taranto G D, Shih‐Heng Chen, Elia R, et al. Free gastroepiploic lymph nodes and omentum flap for treatment of lower limb ulcers in severe lymphedema: Killing two birds with one stone. Journal of Surgical Oncology, 2020, 121(1):168-174.

[21] Chang K, Xia S, Sun Y G, et al. Liposuction combined with lymphatico-venous anastomosis for treatment of secondary lymphedema of the lower limbs: a report of 49 cases. Zhonghua Wai Ke Za Zhi, 2017, 55(4):274-278.

[22] Yasunaga Y, Yanagisawa D, Ohata E, et al. Bioelectrical Impedance Analysis of Water Reduction in Lower-Limb Lymphedema by Lymphaticovenular Anastomosis. Journal of Reconstructive Microsurgery, 2019, 35(04):306-314.

[23] Zeng D, Huang J, Zhang H, et al. Spectral CT Image Restoration via an Average Image-Induced Nonlocal Means Filter. IEEE Transactions on Biomedical Engineering, 2016, 63(5):1044-1057.

[24] Winch C J, Sherman K A, Smith K M, et al. "You're naked, you're vulnerable": Sexual well-being and body image of women with lower limb lymphedema. Body Image, 2016, 18(SEP.):123-134.

[25] Sun D, Yu Z, Chen J, et al. The Value of Using a SkinFibroMeter for Diagnosis and Assessment of Secondary Lymphedema and Associated Fibrosis of Lower Limb Skin. Lymphatic Research & Biology, 2017, 15(1):70-76.