

T.C.

YEDİTEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF PHYSIOTHERAPY AND REHABILITATION

**THE EFFECTS OF EXTREMITY WITH
LYMPHEDEMA ON POSTURE, UPPER
EXTREMITY FUNCTIONS, AND QUALITY OF
LIFE IN PATIENTS WITH LYMPHEDEMA AFTER
UNILATERAL BREAST CANCER**

MASTER THESIS

SİMLA TURAN, PT

ISTANBUL – 2023

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SUPERVISOR

Prof. Dr. Feryal SUBAŞI

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THESIS APPROVAL FORM

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Owner of the Thesis : Simla TURAN

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This study has been approved as a Master Thesis regarding content and quality by the Jury.

	Title, Name-Surname (Institution)
Chair of the Jury:	Doç. Dr. Fikret AKSOY
Supervisor:	Prof. Dr. Feryal SUBAŞI (T.C. YEDİTEPE ÜNİVERSİTESİ)
Member/Examiner:	Dr. Öğr. Üyesi Elif Tuğçe ÇİL SERTÖZ (T.C. YEDİTEPE ÜNİVERSİTESİ)
Member/Examiner:	Dr. Öğr. Üyesi Ebru AKBUĞA KOÇ (T.C. YEDİTEPE ÜNİVERSİTESİ)

APPROVAL

This thesis has been deemed by the jury in accordance with the relevant articles of Yeditepe University Graduate Education and Examinations Regulation. It has been approved by the Administrative Board of the Institute with a decision dated and numbered

Prof. Dr. Bayram YILMAZ

Director of Institute of Health Sciences

DECLARATION

I hereby declare that this thesis is my work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material that has been accepted for the award of any other except where due acknowledgement has been made in the text.

03.02.2023

Simla TURAN



DEDICATION

I would like to dedicate my thesis to my beloved and loving family...



ACKNOWLEDGEMENTS

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LIST OF SYMBOLS AND ABBREVIATIONS

AAA	Anterior Axillo-Axillary
AI	Axilloinguinal
AII	Anterior Inter-inguinal
ALND	Axillary Lymph Node Dissection
BCRL	Breast Cancer-Related Lymphedema
BMI	Body Mass Index
CDT	Complete Decongestive Therapy
Cm	Centimeters
CT	Chemotherapy
DASH	Disabilities of the Arm, Shoulder, and Hand Questionnaire
ISL	International Society of Lymphedema
IPC	Intermittent Pneumatic Compression
L	Liter
LLLT	Low-Level Laser Therapy
Lymph-ICF	Lymphedema Functionality, Disability and Health Questionnaire
LYMQOL-Arm	Quality of Life Measure for Limb Lymphedema-Arm
MLD	Manual Lymphatic Drainage
PAA	Posterior Axillo-Axillary
PII	Posterior Inter-inguinal
ROM	Range of Motion
RT	Radiotherapy

SLND	Sentinel Lymph Node Dissection
SPSS	Statistical Package for the Social Sciences
ULL-27	Upper Limb Lymphedema-27
%	Symbol of Percentage
°	Degree
±	Plus-Minus Sign



ABSTRACT

Turan, S. (2023). The Effects of Extremity with Lymphedema on Posture, Upper Extremity Functions, and Quality of Life in Patients with Lymphedema After Unilateral Breast Cancer, Yeditepe University, Institute of Health Sciences, Department of Physiotherapy and Rehabilitation, Master Thesis. Istanbul.

This study aims to examine the effects of lymphedema extremity on upper extremity function, posture and quality of life in patients who develop upper extremity lymphedema after unilateral breast cancer. Twenty-seven women volunteers (27F; 46.65 ± 3.44 years) diagnosed with upper extremity lymphedema after unilateral breast cancer treatment by a specialist physician between May 2022 and October 2022 were included in the study. Upper extremity circumference measurements of the individuals were performed on the healthy and affected sides. A goniometer measured both sides' upper extremity range of motion (ROM). The New York Posture Analysis (NYPA) was used for posture evaluation. Upper extremity functions were assessed by the Disabilities of the Arm, Shoulder and Hand (DASH) Questionnaire and the Lymphedema Functionality, Disability and Health Questionnaire (Lymph-ICF). Quality of life was assessed by Upper Extremity Lymphedema-27 (ULL-27) and Quality of Life Measure for Limb Lymphedema –Arm (LYMQOL- Arm). As a result of the study showed a significant positive correlation between the DASH and Lymph-ICF, ULL-27, and LYMQOL- Arm ($r=.618$, $r=.637$, $r=.529$, $p<0.05$). Significant correlations were found between Lymph-ICF and ULL-27, and LYMQOL-Arm ($r=.651$, $r=.867$, $p<0.05$). There was a significant correlation between ULL-27 and LYMQOL-Arm ($r=.557$, $p<0.05$). There was no significant correlation between posture and upper extremity functions (DASH, Lymph-ICF) and quality of life (ULL-27, LYMQOL-Arm) ($r=-.205$, $r=-.087$, $r=-.238$, $r=-.122$, $p>0.05$). There was a significant correlation between Lymph-ICF physical and mental, mobility, and life and social activities components ($r=.657$, $r=.632$, $r=.809$, $p<0.05$). There was a significant correlation between ULL-27 social, physical, and psychological components ($r=.519$, $r=.576$, $p<0.05$). Also, there was a negative and significant correlation between the LYMQOL-Arm total and the overall quality of life component scores ($r=-.448$, $p<0.05$). As a result, this study showed that upper extremity functions and quality of life were affected, but posture was not, in patients who developed upper extremity lymphedema after unilateral breast cancer.

Keywords: breast cancer, lymphedema, posture, upper extremity functions, quality of life.



ÖZET

Turan, S. (2023). Unilateral Meme Kanseri Sonrası Üst Ekstremitte Lenfödeminin Üst Ekstremitte Fonksiyonları, Postür ve Yaşam Kalitesi Üzerine Etkisi, Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Fizyoterapi ve Rehabilitasyon Anabilim Dalı, Yüksek Lisans Tezi. İstanbul.

Bu çalışmanın amacı, unilateral meme kanseri sonrası üst ekstremitte lenfödemi gelişen hastalarda lenfödemli ekstremitenin üst ekstremitte fonksiyonu, postür ve yaşam kalitesi üzerine etkilerini incelemektir. Çalışmaya Mayıs 2022- Ekim 2022 tarihleri arasında uzman hekim tarafından unilateral meme kanseri tedavisi sonrası üst ekstremitte lenfödemi tanısı almış olan, 27 kadın (27K; $46,65 \pm 3,44$ yıl) gönüllü dahil edildi. Bireylerin üst ekstremitte çevre ölçümleri sağlıklı ve etkilenen taraf olmak üzere yapıldı. Üst ekstremitte eklem hareket açıklıkları (ROM) gonyometre ile her iki taraf için ölçüldü. Postür değerlendirmesi için New York Postür Analizi (NYPA) kullanıldı. Bireylerin üst ekstremitte fonksiyonları; Kol, Omuz ve El Sorunları Anketi (DASH) ve Lenfödem Fonksiyonellik, Yetersizlik ve Sağlık Sorgulaması Anketi (Lymph-ICF) ile değerlendirildi. Yaşam kalitesi; Üst Ekstremitte Lenfödemi-27 (ULL-27) ve Lenfödem Yaşam Kalitesi-Kol (LYMQOL-Arm) ile belirlendi. Çalışma sonucunda DASH, Lymph-ICF, ULL-27 ve LYMQOL-Arm arasında anlamlı korelasyon bulunmuştur (sırasıyla $p=0.000$, $p=0.001$, $p=0.005$). Lymph-ICF ve ULL-27 ve LYMQOL-Arm arasında anlamlı korelasyon bulunmuştur (sırasıyla $p=0.000$, $p=0.000$). ULL-27 ile LYMQOL-Arm arasında anlamlı bir korelasyon bulunmuştur($p=0,003$). Postürün, üst ekstremitte fonksiyonları (DASH,Lymph-ICF) ve yaşam kalitesi (ULL-27, LYMQOL-Arm) ile arasında anlamlı korelasyon bulunamamıştır ($p>0.05$). Lymph-ICF fiziksel fonksiyon komponentinin mental fonksiyon,mobilite aktiviteleri ve yaşam sosyal aktiviteleri komponentleri arasında anlamlı korelasyon bulunmuştur ($p=0.000$, $p=0.000$, $p=0.000$). ULL-27 sosyal komponentinin fiziksel ve psikolojik komponentleri ile arasında anlamlı korelasyon bulunmuştur ($p=0.007$, $p=0.002$). LYMQOL-Arm total skor ve genel yaşam kalitesi skoru ile arasında anlamlı negatif korelasyon bulunmuştur ($p=0.22$). Sonuç olarak bu çalışma unilateral meme kanseri sonrası üst ekstremitte lenfödemi gelişen hastalarda üst ekstremitte fonksiyonları ve yaşam kalitesinin etkilendiğini ancak postürün etkilenmediğini göstermiştir.

Anahtar Kelimeler: meme kanseri, lenfödem, postür, üst ekstremitte fonksiyonları, yaşam kalitesi.



1. INTRODUCTION AND PURPOSE

Breast cancer is a significant problem that threatens the lives of women worldwide. It occurs due to the uncontrolled proliferation of cells in the breast tissue (1).

Cancer-related incidence and mortality rates, especially breast cancer, have increased for 50 years (2). In the United States, 15.0% of all newly diagnosed cancers in 2022 were female breast cancer (3). While lung cancer ranks first in the global cancer incidence, breast cancer occupied first place in 2020, surpassing lung cancer.

Approximately 1 in 4 of all cancer types seen among women constitute breast cancer. It is common in many developed and developing countries (4). Although its incidence is high, especially in developed countries, it has been observed that survival rates have been higher in recent years (5).

Breast cancer most commonly occurs in middle-aged women and is most commonly diagnosed in women between 40 and 55 (6).

The increasing survival times after treatments have caused health complications in the long term in patients depending on the treatments. After breast cancer, secondary pathologies occur in individuals. After breast cancer treatment of patients, complications such as pain in the upper extremity, limitation of joint movements, limitation of functional capacity, swelling, stiffness, risk of infection, and loss of sensation are seen. These include decreased quality of life and loss of upper extremity functions. In addition, some impairments occur due to breast cancer treatment. One of these impairments is lymphedema. Lymphedema is a significant problem that consists in patients with breast cancer.

Lymphedema is characterised by a generalised or localised accumulation of protein-rich interstitial fluid resulting from impaired lymphatic circulation due to some congenital or acquired causes (7,8).

The most frequent reason for secondary lymphedema is filariasis in developing countries; acquired lymphedema in developed countries is usually related to cancer treatment (9). Lymphedema is a typical impairment and complication of cancer treatment and is an important issue of survival reported by women after breast cancer (10).

The high prevalence of acquired lymphedema, which develops as a sequela of cancer treatment, is due to the increase in advanced examination methods and increased awareness of patient physicians. Breast cancer is significant regarding lymphedema risk. Cancer-associated lymphedema may develop immediately after cancer treatment or even months or years later (11). Every woman undergoing cancer treatment has a lifetime risk of developing lymphedema. Therefore, early diagnosis of secondary lymphedema is required for effective treatment (12).

In women with lymphedema, pain, pressure, heaviness and fullness, numbness, increased warmth in the lymphedema arm, redness, edema, limitation in physical activity, and skin changes can be seen. In addition, high body mass index, obesity, nodal radiation, mastectomy, chemotherapy, low physical activity, blood sampling and blood pressure measurement from the affected arm, exposing extreme temperatures. Also, plane travel increases the risk of lymphedema (12,13,14).

Although lymphedema is not a vital problem for individuals, it negatively affects lifestyle and quality of life. Due to cosmetic appearance, people's concerns about body image increase. Anxiety and depression are examples of psychological problems that can arise. In addition, this situation affects the daily life activities of individuals. It causes limitations in upper extremity movements. The patient's ability to use the affected arm is reduced, especially if the arm is the patient's dominant arm.

Abbasi et al. show that lymphedema can cause pathological changes not only in the lymphatic system but also in the musculoskeletal system. Apart from these, mood problems are accompanied by mood problems, depression, decreased belief in recovery and feeling inadequate due to decreased physical activity. These conditions significantly reduce their quality of life (15,16).

In addition, Taghian et al. found that breast cancer patients who developed lymphedema generally avoided using their arms. This situation causes complications such as limitation of movement in the upper extremity and increased edema. As a result, the patient's quality of life decreases (17).

Upper extremity function problems are a common side effect of breast cancer treatment and affect the patient's daily life. In the literature, it has been shown that there is a decrease in the joint's range of motion depending on lymphedema in the upper

extremity, which often occurs in shoulder movements. Therefore, patients experience severe losses in upper extremity functions (18).

In a study conducted after breast cancer, body asymmetry in the arm, lymphedema, and complications have been shown to affect spinal posture and whole-body balance (19).

No detailed study examines the relationship between multiple parameters such as upper extremity function, posture and quality of life in individuals who develop lymphedema. In addition, while these parameters are examined in studies in the literature, lymphedema duration and lymphedema stages are not evident in patients. Moreover, studies in the literature are limited, and there needs to be a consensus among studies.

For these reasons, our aim in planning this study is evaluation of the relationship between upper extremity function, posture and quality of life in patients with upper extremity lymphedema after unilateral breast cancer treatment.

The hypotheses of our study:

Hypothesis 0 (H0):

There is no relationship between upper extremity function, posture and quality of life in patients with upper extremity lymphedema after unilateral breast cancer treatment.

Hypothesis 1 (H1):

There is a relationship between upper extremity function, posture and quality of life in patients with upper extremity lymphedema after unilateral breast cancer treatment.

2. GENERAL INFORMATION

2.1. Breast Anatomy

The breast is a hemispherical structure inside the anterior chest wall. The breast extends from the second rib to the midclavicular line, to the seventh rib, and from the lateral edge of the sternum to the middle axillary line. The nipple is placed in the centre, and the areola surrounds the nipple. Cooper's ligaments, which are fibrous connective tissue strands, cover the skin of the breast and extend to the chest wall. Thus, these ligaments form a supporting structure. These are presented in Figure 2.1 (20,21).

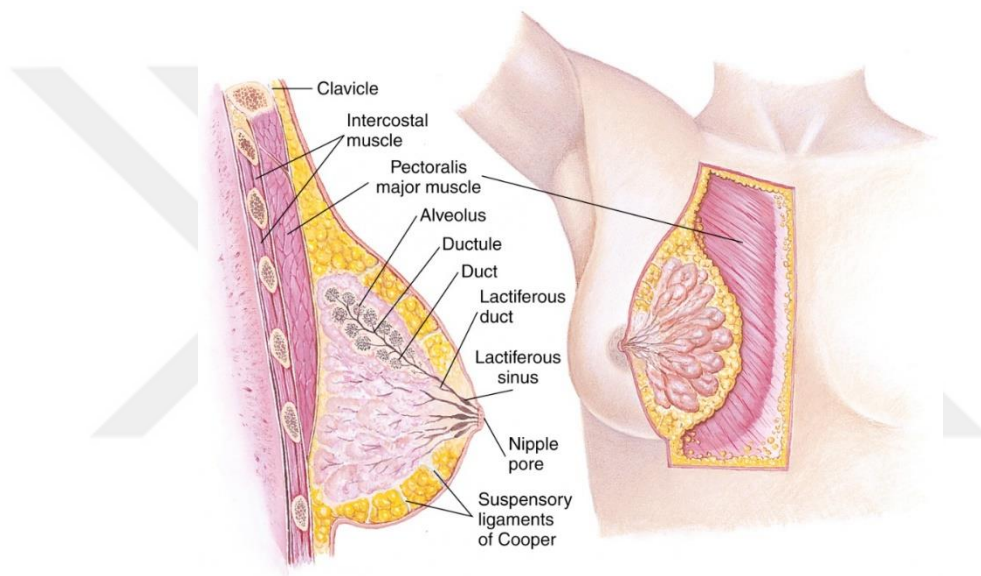


Figure 2.1. Anatomical structures of the breast (21)

The detailed view from the anterior view and the sagittal section is shown in figure 2.2 (22).

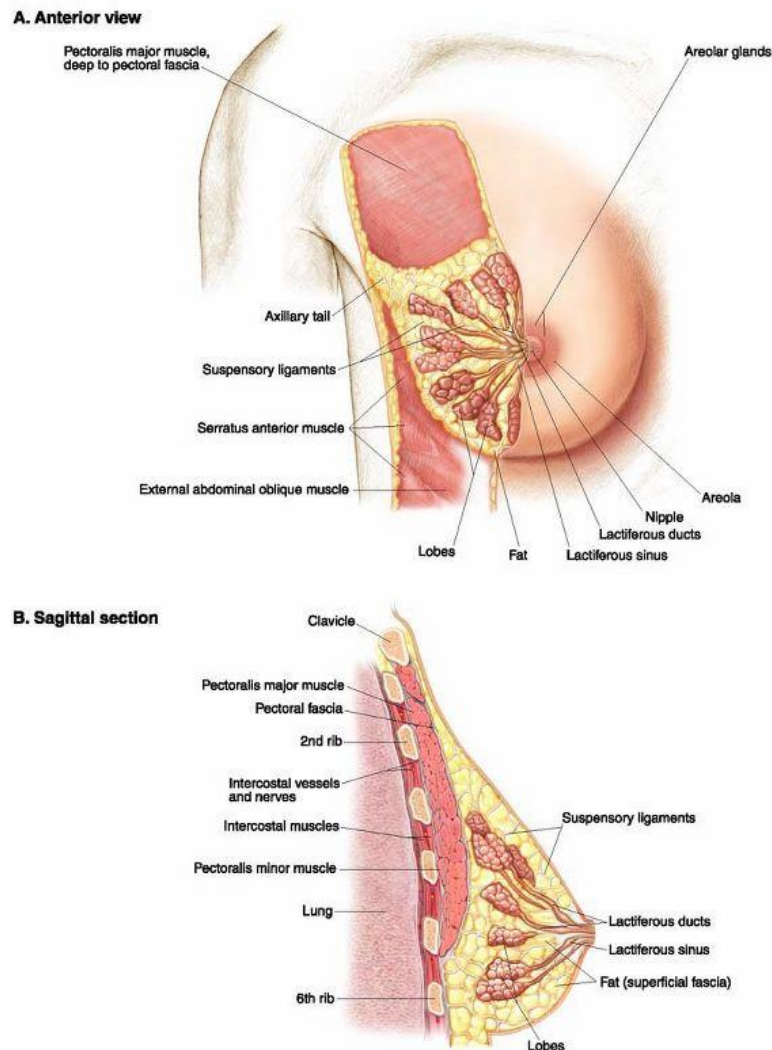


Figure 2.2. The anterior view and sagittal section (22)

It comprises glandular and fibrous tissue, including subcutaneous and retro-material adipose tissue. There is glandular tissue in the nipple, spread over 15-20 lobes. Each lobe contains 20 to 40 lobules of milk-producing acinar cells.

Clinicians perform a physical examination by dividing the breast into four quadrants and a tail. The upper outer quadrant has the most extensive granular tissue. In direct contact with the axillary lymph nodes, Spence's tail extends to the axilla and is also part of the upper outer quadrant (23,24).

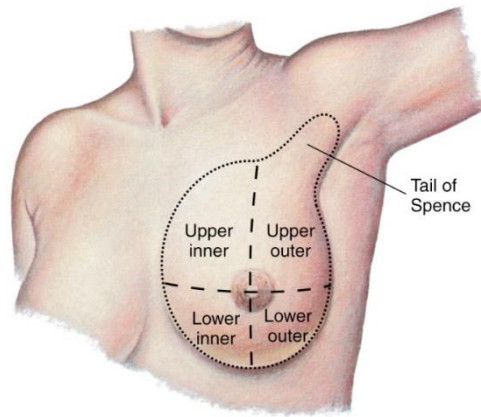


Figure 2.3. Quadrants and Spence's tail (23)

2.1.1. Breast Vascular Anatomy

The breast is supplied from the axillary, internal thoracic (or internal mammary) and intercostal arteries in Figure 2.4 (25).

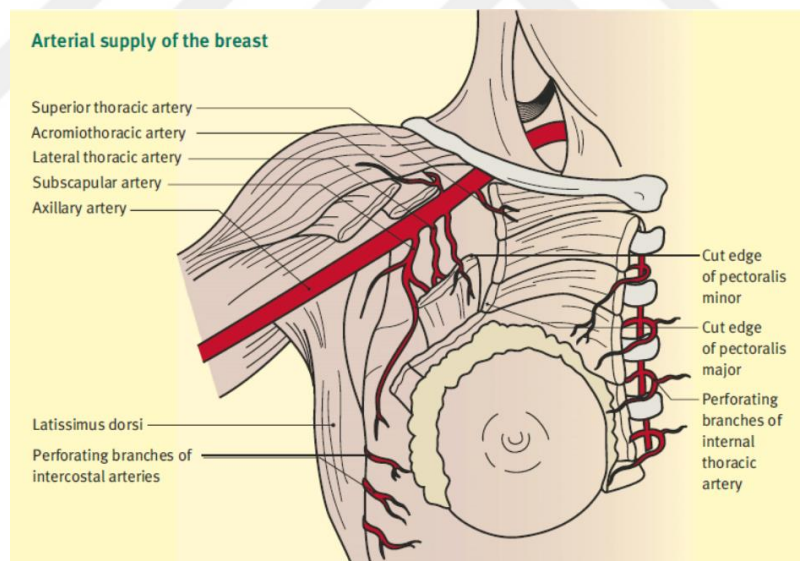


Figure 2.4. Arterial supply of the breast (25)

2.1.2. Breast Innervation

The breast and anterolateral chest wall are innervated by the lateral and anterior cutaneous branches of the second and sixth intercostal nerves. Thanks to the anterior branches of the supraclavicular nerve, which emerges from the cervical plexus, the skin

of the upper part of the breast are supplied (C3- C4). The fourth intercostal nerve branches innervate the nipple. The lateral and anterior cutaneous branches of the second to fifth intercostal nerves innervate the nipple and areola. These nerve branches merge into a plexus in the subdermal area. The nerves supplying the breast connect freely and unite towards the axilla (26).

2.1.3. Breast Lymphatic System

The breast tissue has a rich lymphatic network. The lymphatic drainage of the breast is only 80-97% to the axilla, 20-25% to both the axilla and internal mammary lymph nodes, and 3-6% to only the internal mammary nodes (27). It is shown in Figure 2.5 (28).

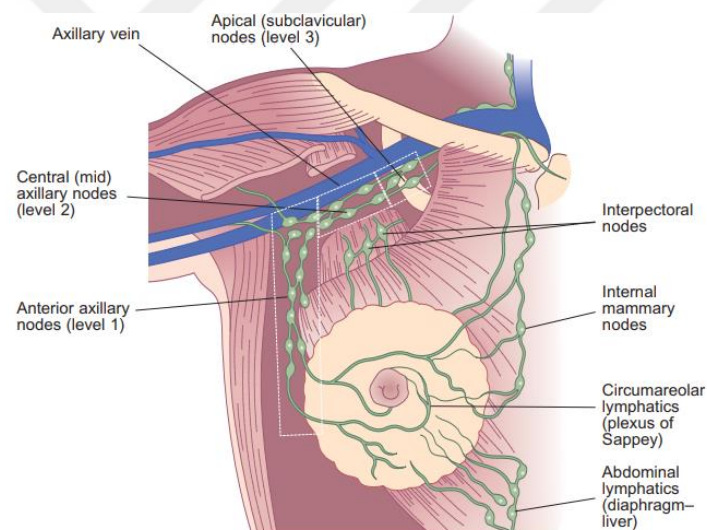


Figure 2.5. Lymphatic drainage of the breast (28)

The source of a rich breast lymphatic system is the walls of the mammary ducts and interlobular connective tissue. Deep lymphatic channels (especially around the nipple in the subareolar plexus) communicate with the more superficial cutaneous lymphatic network. Lymphatic drainage from the subareolar network is mainly to axillary lymph nodes. Superficial lymphatics drain the skin, while deep lymphatics drain the mammary lobules.

The number of axillary lymph nodes varies from 20 to 30 and is divided into five groups that are not entirely different anatomically in Figure 2.6 (29).

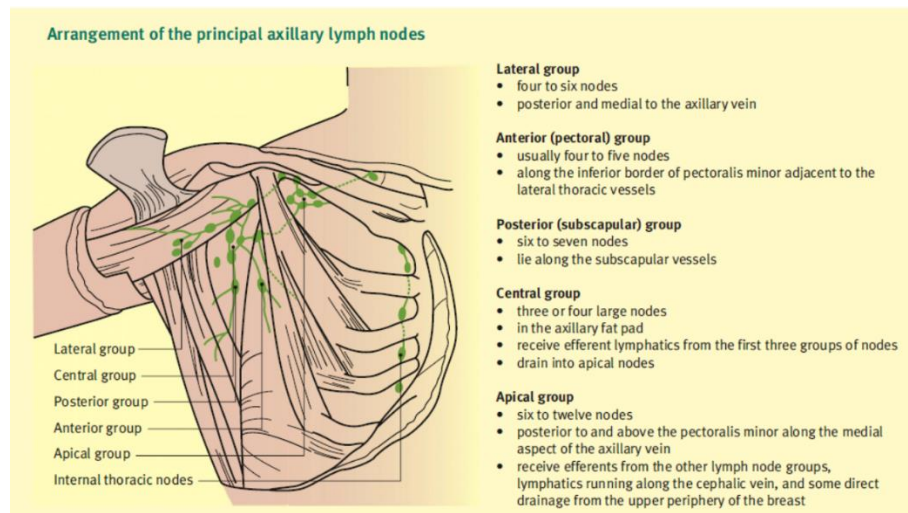


Figure 2.6. Axillary Lymph Nodes (29)

Axillary lymph nodes consist of five subgroups (29):

- Lateral (humeral) nodes; They drain all the lymph of the arm except for the lymphatic vessels that run together with the cephalic vein, which are 4-6 units.
- Anterior (pectoral) nodes; 4-5 units drain the supraumbilical region, the muscle and skin of the anterior outer part of the anterior chest wall, and the central and lateral aspects of the breast.
- Posterior (subscapular) nodes; 6-7 of them drain posterior to the neck and chest wall.
- Central nodes are 3-4 lymph nodes embedded in the fat tissue in the fossa axillaries. Since the drainage of the lateral, pectoral and subscapular lymph node groups is in this node, metastases are most common in these nodes.
- Apical nodes are the only axillary lymph node group placed above the pectoralis minor muscle and consist of 6-12. It receives lymph fluid from all axillary lymph node groups. Lymph vessels that run together with the cephalic vein and lymph vessels from the upper part of the breast open directly into this nodule.

Interpectoral (Rotter) nodes are 1-4 and are included in the axillary nodes. These nodules, which receive vessels straight from the breast and drain into the central and subclavicular groups, are situated between the pectoral muscles (30).

According to the location of axillary lymph nodes in the pectoralis minor muscle, they are divided into three groups (Figure 2.7) (31):

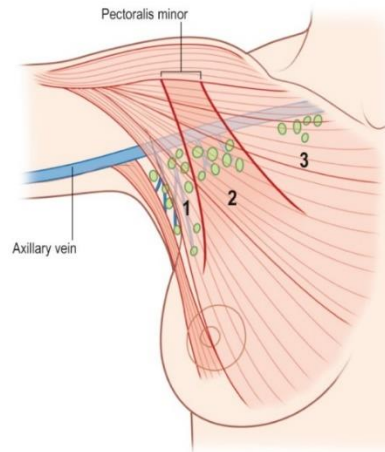


Figure 2.7. Axillary lymph nodes location according to the pectoralis minor muscle (31)

- Level I: nodes inferior to pectoralis minor.
- Level II: nodes behind pectoralis minor.
- Level III: nodes above pectoralis minor.

Small, typically 2-3 mm in diameter, are called internal thoracic (internal breast) lymph nodes, extending 2-3 cm from the sternal border along the internal thoracic vessels. These nodes are usually located three to five on each side. These nodes drain the anterior chest wall, the diaphragm's anterior part, the rectus sheath and muscle's upper part, the liver's inner surface, and the mammary gland's inner surface (32). Deep lymphatic vessels on the posteromedial side of the chest and the lateral end of the mammary gland drain into the intercostal nodes near the rib heads (33,34).

2.2. Lymphatic System Anatomy

The lymphatic system is a unidirectional drainage system distributed along the body and runs parallel to the venous network (35). It consists of anatomical structures such as lymphatic vessels, lymph nodes, lymph fluid, and lymphatic tissue (36).

This system, which surrounds our body like a net, carries the interstitial fluid centrally and transfers it back to the venous system (37). The lymphatic system has essential roles in maintaining the fluid balance of the normal tissue, immune response,

and absorption of digested fats (38). Because extravasated fluid and macromolecules flow in one direction, lymph flow is often defined as "lymphatic drainage ". The lymphatic system has multiple connections with the lymph nodes. These regions are called 'lymphatic stations' (39).

2.2.1. Lymph Vessels

Lymph vessels, in order of size, are called lymph capillaries, pre-collectors, collectors, trunks, and ducts (36).

a) Lymph Capillaries:

They arise as avascular in the superficial dermis. Unlike blood capillaries, they have a broader, more irregular lumen (39,40).

Its walls are composed of smooth endothelial cells. There is a gap between the endothelial cells facilitating the permeability of the interstitial fluid (41). A unique structure of lymphatic capillaries is the Anchoring filaments that adhere to the outer border of the endothelial cell at one end and the surrounding tissue at the other (42). When fluid accumulates in the interstitial space, the anchoring filaments are stretched to increase their absorption, and the endothelial cell ends, which act as caps, are opened. Fluid passes from the high-pressure interstitial space to the low-pressure lymph capillaries. As fluid increases within the capillary, the anchoring filaments relax, and the endothelial cell ends are closed. With increased pressure, the capillaries' lymph fluid moves towards the propellers (36,39,41).

b) Procollectors- Collectors:

Lymph capillaries are located in the deep dermal layer as pro-collectors (43). These vertical vessels join the subcutaneous layer's horizontally oriented superficial lymph-collecting vessels. The pro collectors fuse and deflect to move vertically from the deep dermis to the subcutaneous layer. Lymphatic vessels are shown in Figure 2.8. The superficial lymphatic collecting vessels are in the subcutaneous fat layer above the deep fascia. Deep lymphatic collecting vessels run along the major arteries below the deep fascia. Superficial and deep lymphatic collecting vessels are independent; they only converge in second-level lymph nodes such as axillary or intrapelvic (44,45,46).

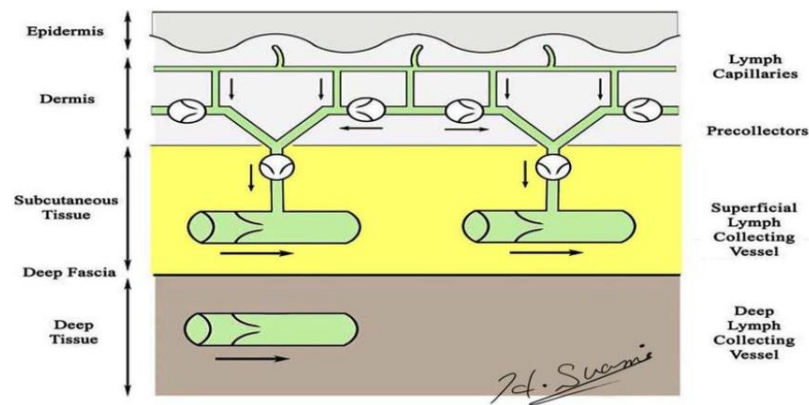


Figure 2.8. Lymphatic vessels (46)

In collectors, the segment between the proximal and distal valves is called the lymphangion (40). Lymphangions have their electrical activity. When the lymphangion fills with lymph, the posterior valve closes, and the anterior valve opens. The lymph passes to the next segment. The rate and amplitude of contraction of lymphangions are regulated by the volume of lymph flow and the increase or decrease of intravascular pressure (47).

Lymphedema develops when lymphatic fluid volume increases and adipose tissue proliferates (43,48).

c) Truncus- Ductus:

Lymph vessels unite to form trunks. Trunk drains larger lymphatic vessel channels into the thoracic and right lymphatic ducts (49).

They carry the lymph fluid collected from the whole body to the venous angle as two large ducts (50).

- Ductus thoracicus:

The ductus thoracicus is the most extensive lymphatic duct in the body, with an average length of 38-45 cm (51).

While most of the lymph fluid in the body passes from the left venous junction (52) through the ductus thoracicus, the lymphatics coming from the right upper body, arm, face, and neck open to the right venous angle through the right lymphatic duct (53,74).

It consists of four parts: ductus thoracicus pars abdominalis, pars thoracic, pars cervicalis, and arcus ductus thoracicus. They start above the cisterna chyli at the level of the first and second lumbar vertebrae (53,54).

- Cisterna Chyli :

It is created by combining truncus lumbaris dexter, truncus lumbaris sinister, and truncus intestinalis at the level of the first and second lumbar vertebrae (51).

Deep lymph vessels from the lower extremities, pelvic organs, kidneys, adrenal glands, and abdominal wall collect in the truncus lumbaris (76). The lymph vessels of most organs in the abdominal cavity collect in the truncus intestinalis (51).

2.2.2. Watersheds and Anastomoses

Watersheds and anastomoses, which are generally unnecessary, provide transport fluid from the congested area to the decongested site when there is a disorder in the lymphatic system (46). Watersheds divide the drainage areas into quadrants, and lymphatic drainage passes from these quadrants to the regional lymph nodes and the venous system. Watersheds form four quadrants on the trunk. It is shown in Figure 2.9. Anastomoses are called axillo-axillary anastomosis, inguino-inguinal anastomosis, axillo-inguinal anastomosis (50).

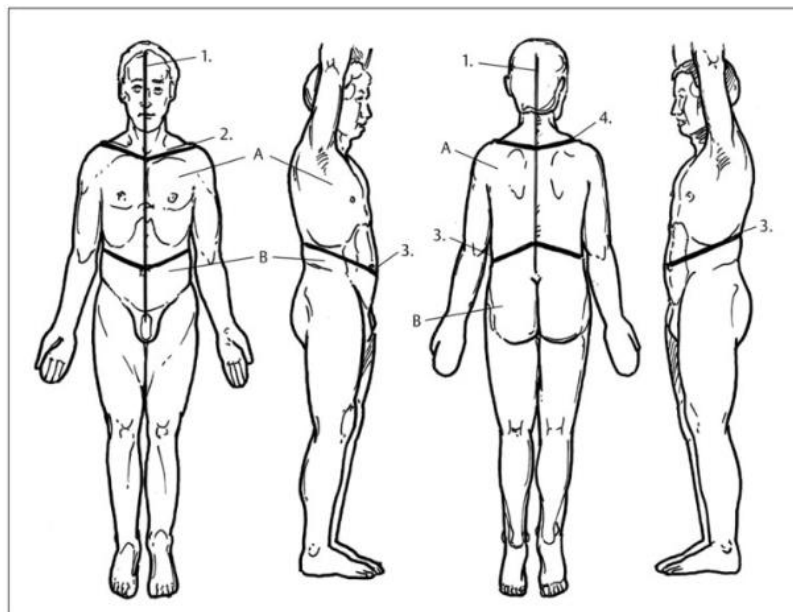


Figure 2.9. Lymphatic Watersheds. 1. Sagittal (median) watershed (anterior and posterior); 2. Upper horizontal watershed (anterior); 3. Horizontal (transverse) watershed (anterior and posterior) 4. Upper horizontal watershed (posterior); A. Upper quadrants (anterior and posterior); B. Lower quadrants (anterior and posterior) (50)

After lymphatic anomaly, lymph drainage cannot function as it should. Manual lymph drainage is used in the treatment of this problem. Anastomotic routes are used for manual lymph drainage. It is located anterior and posterior to the body.

As a result of secondary lymphatic anomaly, lymph fluid is drained to the healthy region with the help of anastomotic pathways (55).

It is shown in Figure 2.10 (50).

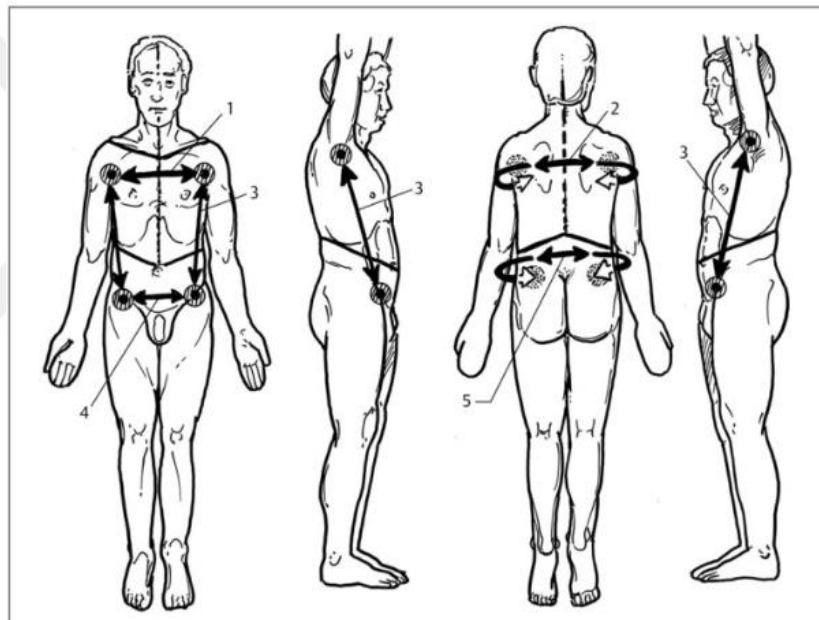


Figure 2.10. Lymphatic anastomoses. 1. Anterior axilla-axillary anastomosis (AAA) ; 2. Posterior axilla-axillary anastomosis (PAA) ; 3. Axilloinguinal anastomosis(AI) ; 4. Anterior inter-inguinal anastomosis (AII) ; 5. Posterior inter-inguinal anastomosis (PII)(50)

1. Anterior axilla-axillary (AAA) anastomosis. The collectors of this pathway, located between the right and left upper quadrants, connect the contralateral axillary lymph node groups on the anterior side of the trunk.

2. Posterior axilla-axillary (PAA) anastomosis. This pathway is the connection between the contralateral axillary lymph nodes of the upper quadrants on the posterior side of the trunk.

3. Axilla-inguinal (AI) anastomosis. In axillo-inguinal anastomosis, in other words inguinal axillary (IA) anastomosis. The ipsilateral upper and lower quadrant collectors connect the axillary and inguinal lymph node groups on the same sides and form a connection between them.

4. Anterior inter-inguinal (AII) anastomosis. This anastomosis is located over the mons pubis region and connects the contralateral inguinal lymph nodes on the anterior lower body quadrants.

5. Posterior inter-inguinal (PII) anastomosis. The collectors that make up this anastomosis are located in the sacrum and connect the contralateral groups of inguinal lymph nodes in the posterior lower quadrants of the body.

2.2.3. Lymph Node

Lymph nodes are encapsulated; generally, oval structures are arranged along the course of the lymphatics. The lymph nodes, whose number varies between 600-800, are found in every part of the body (56).

Lymph nodes create groups around the neck, axilla, inguinal region, mesentery, and great vessels (57).

There are two types of lymph nodes. These are interval and regional lymph nodes. Interval lymph nodes are found in the extremities (36). Regional lymph nodes are lymph nodes from which the skin or organs drain.

2.2.4. Physiology of Lymphatic System

The lymphatic system's primary function is facilitating interstitial protein transport by regulating the fluid balance of the tissues. It occurs when the fluid in the interstitial tissue passes into the lymphatic capillary lumen. Lymph fluid is clear, colourless, and composed of protein, glucose, urea, and white blood cells (51). The lymphatic and blood circulatory systems complement each other in maintaining body tissue homeostasis (58).

Lymph capillaries first collect interstitial fluid that passes through the tissues in the limbs. They don't have valvular structures and form a complicated network. The lymph capillaries merge to create larger pre-collectors with valves to provide a one-way flow direction. The lymph fluid is transferred by the pre-collectors to progressively larger lymph-collecting vessels in the subcutaneous tissue. A series of bicuspid valves are placed at intervals of a few millimetres along the lymph-collecting vessels regulating the one-way flow of lymph from distal to the proximal, then to the regional lymph nodes and eventually to the venous system (59,60). Since there is no pumping organ in the lymphatic system like the heart, it is not a complete circulatory system, and the lymph flow rate is slower than the blood vessel system (61).

The lymphatic collecting vessels surrounding smooth muscle cells consist of units called lymphangions separated by intraluminal valves. The lymphangions periodically create pressure to propel the lymph fluid throughout the lymphatic vessel (62). During rest, lymphangions make 10-12 autonomic contractions per minute (63). The lymphatic flow ends in the thoracic duct to protect the fluid equilibrium in the tissues (64). If this process loses functionality, fluid accumulates in the tissues, and edema emerges. If the lymphatic system is not working, protein, cells, fat, and non-absorbable fluids stay in the interstitium, resulting in death within 24 hours.

90% of the fluid filtered into the interstitium from capillaries is reabsorbed into the venous side. Small, terminal lymphatic vessels remove the remaining 10% of fluid and protein from the interstitium. It is shown in Figure 2.11 (65)

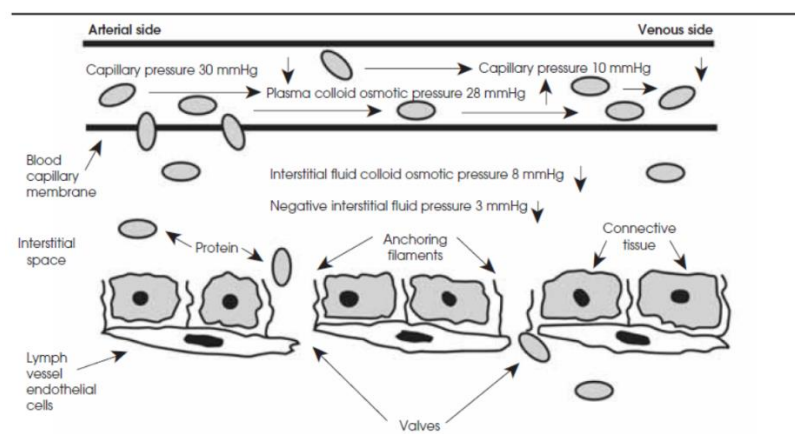


Figure 2.11. Diagram of the lymphatic vessels, interstitial space, and capillary membrane (65)

2.2.5. Lymph Vessels and Nodes of Upper Extremity

Lymph vessels are of two types deep and superficial. The superficial lymphatic vessels start from the thin lymphatic network. The vessels in the lymphatic network on the volar face of the fingers and palm are thinner. A pair drain the lymphatic network in the finger of lymph vessels. These veins first run on the sides of the fingers and move towards the back as they approach the head of the finger. The vessels that travel in different directions and separate from the lymphatic network in the palm merge with other vessels in the wrist on the proximal side and form a thickened vessel. These lymphatic vessels are collected in three sections median, radial, and ulnar. The lymphatic vessels in the upper extremity course with the arteria ulnaris, arteria radialis, and its branches in the forearm. During their period, they connect with superficial lymphatic vessels at specific intervals. Some lymphatic vessels terminate in lymph nodes next to the arteries, some in lymph nodes above the artery brachialis, and almost entirely in axillary lymph nodes. The axilla has five groups of 20–30 lymph nodes (29).

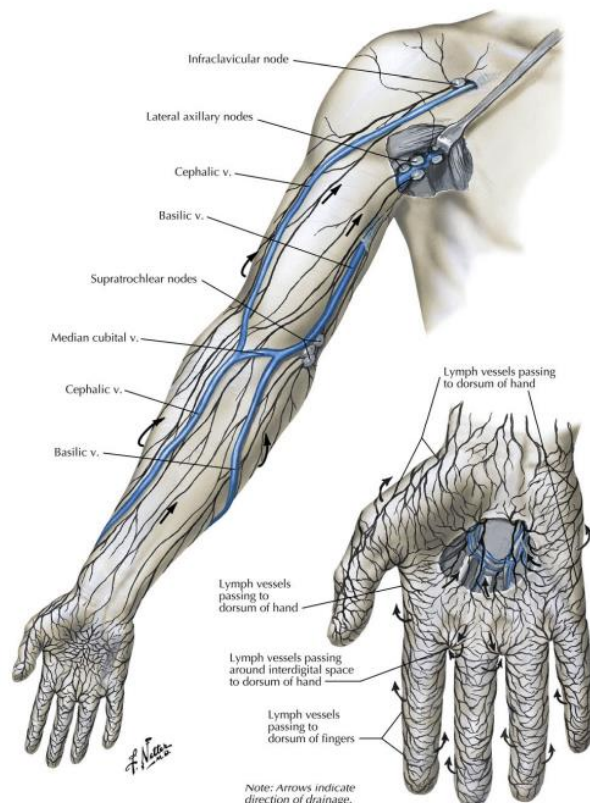


Figure 2.12. Lymph Vessels and Nodes of Upper Extremity (66)

Lymph nodes in the upper extremity are presented in Figure 2.13.

1. Cephalic lymph nodes
2. Cephalic bundle
3. Supraclavicular lymph nodes
4. Axillary lymph nodes
5. Cubital lymph nodes



Breast cancer spreads its metastases primarily via lymphatic routes. In the breast, lymphatic vessels form two plexuses.

1. The subareolar plexus is under the areola.
2. Deep plexus. It is behind the breast and in front of the musculus pectoralis major.

Acinus is surrounded by small plexuses formed by capillary lymphatic vessels in the stroma. Some lymph vessels emerging from these 11 plexuses merge, follow the breast channels as larger lymph vessels, and open the sub-areolar plexus. Another part of the lymph vessels opens into the deep plexus on the back of the breast. (Figure 2.14) The skin lymphatics draining the breast skin make many anastomoses with the subareolar plexus.

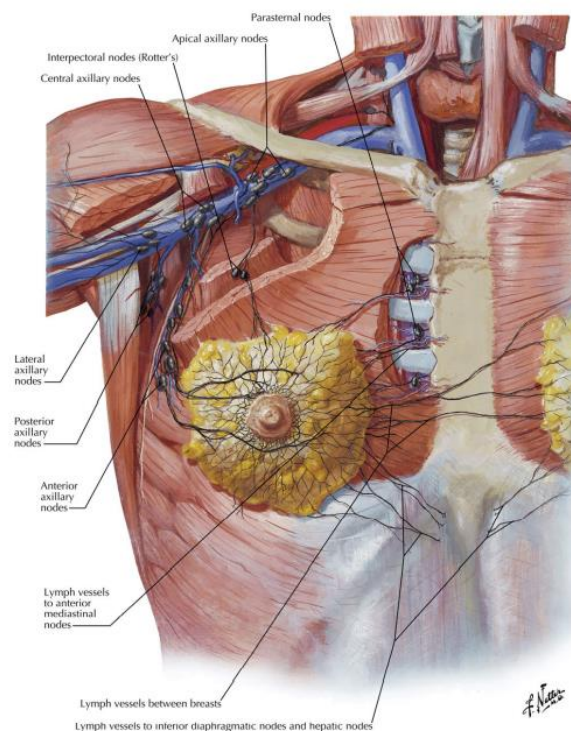


Figure 2.14. Lymph Vessels and Nodes of Breast (66)

The primary lymphatic vessels from the plexus reach the regional lymph nodes of the breast in three ways. It is shown in Figure 2.15.

1. Axillary Path: Lymph vessels emerge from the sub-areolar plexus throughout the outer border of the musculus pectoralis major and pour into the subpectoral, apical,

central, lateral, and sub-scapular groups located at various levels of the axillary lymph nodes.

2. Transspectoral Path: After the lymphatic vessels emerging from the deep plexus of the breast pierce the musculus pectoralis major, they pour into the interpectoral lymph nodes between placed the two musculus pectoralis major and some into the supraclavicular lymph nodes.

3. Mammaria Interna Path: The mammary internal lymph node group is placed on the posterior side of the chest wall, in front of the pleura, next to the arteria mammary interna, and in the 1st, 2nd, and 4th intercostal space close to the sternum. Some lymph vessels emerge from the central and medial regions of the sub-areolar plexus. Most lymph vessels arising from the deep plexus reach the internal lymph nodes of the mammary after passing the musculus pectoralis major, minor and intercostal muscles.

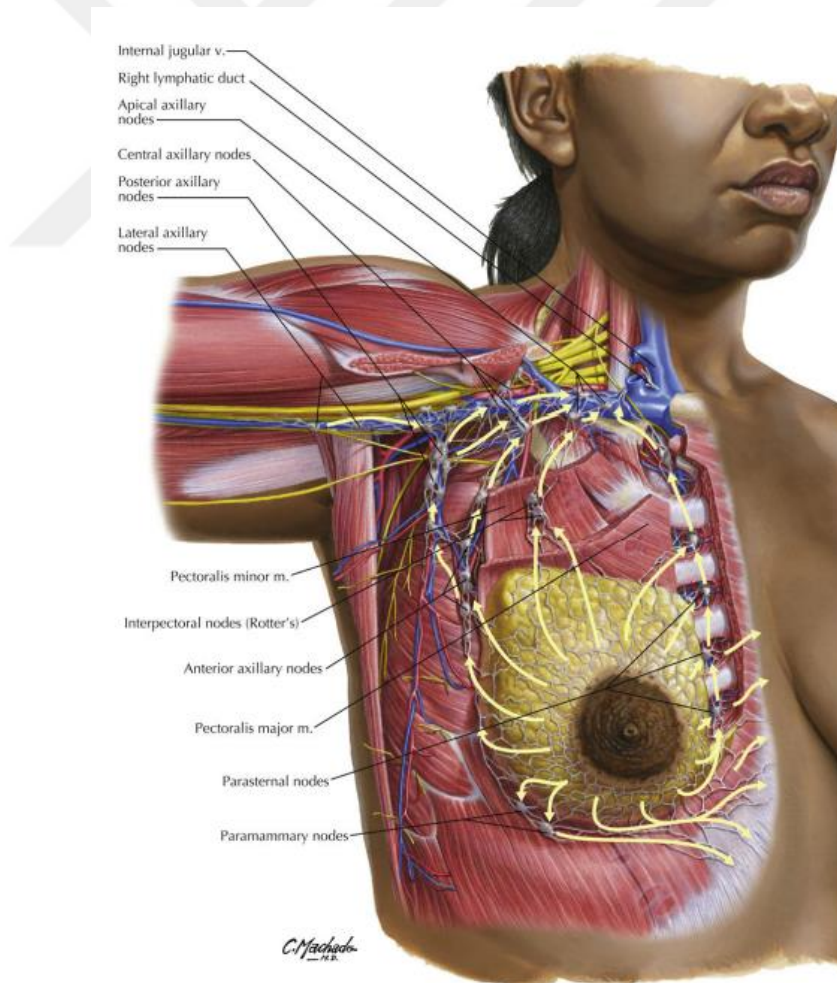


Figure 2.15. Lymphatic Drainage of Breast (66)

Secondary pathways of breast lymphatics;

- The mammary skin lymphatics unite with the opposite skin lymphatics. Thus, cancer that starts in one breast can spread to the other breast or armpit.

- The lower inner quadrant lymphatics of the breast opened into the peritoneal cavity through fine holes on the linea alba. Cancers of the lower inner quadrant of the breast can metastasise to the liver and pelvic organs in this way. Thanks to the good connections between the two mammary internal lymph chains, metastases on one side can easily pass to the other side.

2.3. Breast Cancer

Cancer occurs due to irregular and uncontrolled division and proliferation of cells in various parts of the body. Breast cancer occurs when breast tissue cells become abnormal due to an effect.

Generally, it is a hard mass (tumour, lump) with irregular borders and would like (67).

Ductal carcinoma begins in ductal cells. In contrast to other forms of breast cancer, lobular carcinoma begins in the lobes or lobules and affects both breasts. In inflammatory breast cancer, the breast becomes swollen, hot and red (68).

Breast cancer constitutes 25% of all cases of cancer. It accounts for 15% of all cancer deaths among women (69).

2.3.1. Risk Factors (70)

2.3.1.1. Non-modifiable Factors

- **Age:** It increases with ageing.
- **Gender:** Breast cancer has a higher incidence in women.
- **Genetic risk factors:** An inherited BRCA1 or BRCA2 mutation.
- **Family history:** The risk increases if there is a history of breast cancer in a first-degree relative (parent, sibling, child).
- **Race:** White people are more at risk than other racial groups.

- **Previous breast radiation:** Having radiation therapy to the chest area for another reason significantly increases the risk.

- **Breast density:** Dense or fatty breast tissue increases the risk.

2.3.1.2. Modifiable/Lifestyle Factors

- **Childbirth:** Breast cancer risk increases by never giving birth or having a first child later after age 30.

- **Hormone therapy:** Hormone replacement therapy (HRT) after menopause increases risk.

- **Alcohol:** Alcohol consumption increases the risk.

- **Obesity:** Obesity and excess adipose tissue increase the risk of breast cancer as they increase estrogen levels.

- **Lack of physical activity:** Being physically inactive increases the risk.

2.3.2. Clinical Signs and Symptoms

The typical main indication is a lump or mass in the breast. However, not every breast mass is cancer. Cancerous masses appear relatively complex, with irregular edges and rough surfaces, and cannot be moved easily within the breast tissue.

Other probable signs and symptoms are as follows:

- A breast that is completely or partially swollen
- Dimpling of the skin
- Pain in the breast or nipple
- Nipple retraction
- Nipple or breast skin that is red, dry, flaking, or thickened
- Nipple discharge not related to breastfeeding
- Lymph nodes that are swollen under the arm or close to the collarbone.

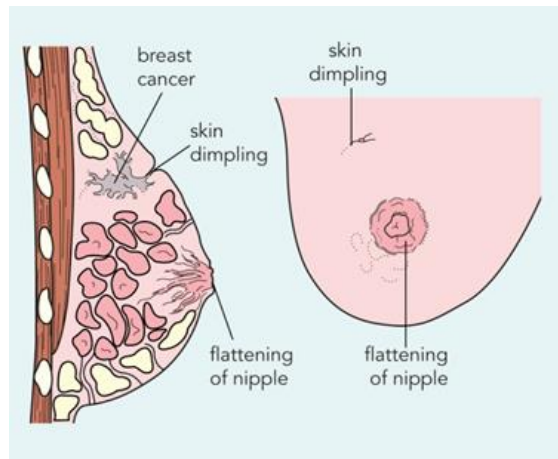


Figure 2.16. Clinical signs of breast cancer (70)

Complications After Breast Cancer Treatment

- pain,
- limitation of upper extremity movements,
- limitation in the functional capacity,
- swelling, stiffness, and sensory problems,
- loss of strength and mobility in the upper extremity,
- lymphedema,
- decrease in quality of life,
- psychological disorder (depression, mood disorder, insecurity, anxiety) (71).

2.4. Lymphedema

A chronic and progressive situation known as lymphedema is characterised by an abnormal accumulation of high-protein fluid in the skin and soft tissues. The main signs are soft tissue swelling and fibrosis, skin ulcerations, and chronic infections (72).

It is characterised by clinical findings such as chronic swelling, localised pain, atrophic skin changes and secondary infection, regardless of etiology (73). Patients with chronic lymphedema are predisposed to skin thickening, cellulitis, ulceration, fissure, and, in rare cases, cutaneous angiosarcoma (74,75). Patients are also at significant risk for soft tissue infections because of the lymphatic system's critical role in immune function (76). The physical, psychological, and economic burden of breast cancer-related lymphedema (BCRL) is high (77,78). Pain, heaviness in the extremity, decrease in

mobility and functions may occur after swelling (79,80). Volumetric and cosmetic changes in the skin texture of the extremities also negatively affect patients' quality of life and psychosocial state and continue to progress if not treated (81).

2.4.1. Lymphedema Epidemiology

The incidence of lymphedema in Turkey has not been estimated precisely. Still, it is estimated that approximately 200 million cases of lymphedema worldwide are filariasis, the most common cause (82). An estimated five million people in the USA have secondary lymphedema (83). 40% of the 2.9 million American women who have received breast cancer treatment are at risk of lymphedema over their lifetime (84).

In a study conducted in Turkey, lymphedema associated with breast cancer was estimated at 7-28% (85). Although the actual incidence of BCRL is unknown, the estimated incidence is approximately 20% (86). This rate varies between 2% and 65% according to the type of surgery, radiotherapy (RT), chemotherapy (CT), and the patient's risk factors (87,88).

Although most cases of lymphedema have been reported to develop within one year of breast cancer treatment (89), lymphedema can develop at any time after cancer treatment (90).

2.4.2. Lymphedema Risk factors

Although the causes of lymphedema are many, they are grouped into two groups primary and secondary. If a congenital defect prevents the flow of lymph fluid, it is called primary lymphedema. Secondary lymphedema is usually used when a possible cause of lymphedema has been identified. In the USA, breast cancer (91) is the most crucial determinant for developing lymphedema (92).

The factors that lead to the formation of secondary lymphedema are very diverse (93):

- Cancer surgery: Breast cancer surgery cause secondary lymphedema.
- Radiotherapy (RT): RT applied to the axillary and inguinal regions, where lymph nodes are dense, destroys the lymph nodes.
- Trauma: Trauma to lymph nodes and lymphatic vessels.
- Tumours: Direct tumoral invasion of lymph nodes.

- Infection: Filariasis due to *Wuchereria bancrofti*, cellulitis, wound infection, fungal infection, and Chronic venous return disorder.
- Other causes: Obesity, nutritional deficiency, protein uptake, absorption and excretion disorder, congestive heart failure, diabetes, and drug use.

2.4.3. Lymphedema Pathophysiology

In normal physiology, lymph fluid is absorbed by the lymphatic capillaries and returns to the thoracic duct and the heart through the lymphatic vessels and nodes. The lymphatic system transports approximately 5 L of fluid every day (94,95).

The lymphatic system is disrupted if local lymphatic structures are damaged or removed. Localised edema occurs. Lymphostasis triggers a chronic inflammatory response as lymph fluid in the interstitium increases. As a result, the local tissue architecture changes, leading to tissue fibrosis and triggering inflammation (96,97,98). The most likely cause of the pathogenesis of lymphedema is the lymph pump's failure. Loss of contractile function, valve failure, and vasodilation is the initial alterations in lymphatic vessels, and retrograde lymph flow into the dermis is observed in the chronic period (99). Edema starts as reversible at first and becomes irreversible over time.

This results in deformity and irreversible enlargement of the limb structure. In addition, the increasing risk of infection leads to the development of wounds and slowed healing (100). In addition, it results in chronic lymphedema status and progression of tissue fibrosis, decreased lymphogenesis, lymphatic leakage, and even more reduced lymphatic fluid pumping capacity (101).

Fibrosis of the dermis and underlying tissue presents clinically as a hardening of the skin that feels thick and woody. Hyperkeratosis, papillomas, ulceration, and chronic infection may develop if this condition is not treated (97).

In some malignant diseases, axillary or pelvic lymph node involvement will produce blockage and lymphedema. Malignant disease of the breast, uterus, prostate, skin, bones or other tissues may cause such changes. Lymphedema is the hallmark of lymphatic involvement. Chronic lymphedema is seen in more than one in five women after mastectomy and removal of the axillary nodes; it may occur after varying periods.

2.4.4. Breast Cancer-Related Lymphedema (BCRL)

Within an average of 9.5 years after breast cancer treatment, edema develops in 21% of lumpectomies without radiation therapy and 40% in modified radical mastectomies with radiotherapy (102).

Lymphedema may develop at any time after cancer treatment. Although the patient has risk factors, pathophysiology cannot definitively explain who will develop lymphedema (103).

2.4.5. Lymphedema Staging

The International Society of Lymphology (ISL) has established lymphedema staging, with the most recent revisions based on the 2019 ISL conference (104).

Lymphedema is divided into four clinical phases according to the most accepted staging system recommended by the International Society of Lymphology (105):

- Stage 0 (Subclinical stage): It is often called the latent stage. Despite the interruption of lymphatic transport, it is a subclinical situation that does not cause swelling. Significant edema may not appear for months or even years. Despite the decreased lymphatic carrying capacity, there are no clinically apparent symptoms of swelling because there are still enough functional lymphatics to manage the lymphatic load (106).

- Stage I (Reversible stage): Fluid accumulation occurs when the lymphatic load exceeds the carrying capacity. Swelling may decrease with the elevation of the affected extremity. The swelling is soft, and no fibrotic changes are observed. Stage I is often indicated by a slight volume measurement variation of 5% to 20%. Pitting edema may be present.

- Stage II (irreversible stage):
 - Early — When the edema no longer improves with limb elevation, there is pitting edema.
 - Late — Tissue fibrosis develops, and over time the tissue hardens, and non-pitting edema occurs. The Stemmer sign is positive.

A 20% to 40% increase in limb volume may occur.

- Stage III (Lymphostatic Elephantiasis): It is advanced lymphedema without pitting edema. Stage III is usually related to the secondary cause of lymphedema filariasis. Trophic skin alterations such as lipodystrophy and papillomas appear on the skin. It is typical at stage III to increase by 40% or more limb volume.

These staging systems are essential for classifying lymphedema, determining the severity of the condition, and determining treatment strategies.

Table 2.1. Lymphedema Staging System According to International Society of Lymphology (105)

Stage	Description
0 Latent / Subclinical	No evident swelling but damaged lymphatic transport. Minor changes in the tissue fluid.
1 Early / Reversible	High protein fluid accumulates early. Pitting edema. Swelling decreases with limb elevation.
2 Irreversible	Limb elevation does not reduce swelling. Pitting decreases with the development of subcutaneous fat and fibrosis.
3 Lymphostatic Elephantiasis	There is no pitting. Fat and fibrosis deposition is even more. The skin thickens and changes.

2.4.6. Diagnosis Of Lymphedema

Diagnosis is made through a detailed history and physical examination (107–109). The patient's history, age, gender, BMI, the onset of swelling, duration, factors initiating edema, affected limb, comorbid diseases, medications used, systemic treatments, and presence of infection should be questioned. Symptom assessment is vital since swelling and volume changes are not expected at the onset of lymphedema. Patients who develop

lymphedema report many symptoms, including swelling, heaviness, stiffness, pain, numbness, tingling, and limitation of movement in the affected extremity. These symptoms may be indicators of lymphedema (110). In addition, these symptoms also decrease the quality of life (111).

The Stemmer test is evaluated by pinching and lifting the skin (112). The test is negative if the skin is pinched and lifted, which means no lymphedema. The test is positive if it is impossible to pinch and lift the thickened skin due to fibrotic changes. Lymphedema is evaluated according to the Stemmer test result (113).

Volumetrics is an easily applicable technique to detect lymphedema and estimate the amount of fluid in the affected tissue (114). Volumetric measurement, circumferential measurement, optoelectronic perimetry, photoacoustic lymphangiography, and bioelectrical impedance are methods for measuring the increase in limb volume. Although there are various methods for assessing the stage and quality of lymphedema, circumferential limb measurement is the most widely used assessment method (115,116). It is recommended that specific anatomical points (metacarpophalangeal, wrist, olecranon) be selected and compared with the healthy extremity at particular intervals (4 cm, 10 cm) and measured by the same person (117). Simplified measurements can be made from four points (118): Metacarpophalangeal joint, wrist, olecranon below 10 cm, and olecranon over 10 cm. At any point, a difference of more than 2 cm from the healthy extremity is considered significant (119).

The most usual diagnostic criteria are a 2 cm or ≥ 200 ml difference in the affected extremity volume relative to the unaffected side or a 5% or 10% volume difference in the affected extremity (120).

2.4.7. Lymphedema Treatment

Lymphedema treatment is multidisciplinary in nature, costly, and time-consuming. The sooner lymphedema is recognised and properly treated, the better the outcome. Early diagnosis and treatment; This ensures that the swollen limb is almost back to normal and has a high chance of minimising significant complications.

In cancer patients, it is possible to determine the difference in circumference in intermittent measurements before the swelling becomes clinically evident. With the

initiation of treatment, further progression of edema and clinical manifestation can be prevented (121).

Current treatment for lymphedema; can be divided into pharmacological, rehabilitation, and surgical.

2.4.7.1. Pharmacological Therapy

There is no pharmacological agent recommended for the primary treatment of lymphedema patients. Drug selection is made according to additional conditions.

The most common complication of lymphedema is infection. Lymph stasis, a reduced immune system response, congested tissue, and protein accumulation trigger the infection (122). Prevention and treatment of infection are essential in lymphedema management.

2.4.7.2. Rehabilitation

Since secondary lymphedema is a chronic disease, there are different conservative treatments. The primary conventional treatment practices are Manual Lymphatic Drainage (MLD), compression bandage, compression garments, exercises, and skin care, which are widely promoted (123,124). The results are more successful with their application in combination.

2.4.7.2.1. Complete Decongestive Therapy (CDT)

The approved current international standard therapy for lymphedema is complete decongestive therapy, according to the International Society of Lymphology statement in 2001.

CDT is widely known for treating BCRL and is acknowledged as the standard gold treatment (117, 125, 126, 127). The purpose of CDT is to reduce the extremity volume, decrease fibrosis, stop the progression of the disease, prevent infections, and prevent complications and recurrences by ensuring the passage of lymph fluid through intact lymphatics (128,129).

CDT is a combined treatment program that is the basis of lymphedema treatment (130). Manual lymphatic drainage (MLD) consists of two phases: daily multi-layered short-tension bandaging, exercise, skincare, and compression garments (131).

The primary goal in phase 1 is to reduce lymphedema volume (132). It is an intensive phase applied by a certified therapist that involves manual lymphatic drainage (MLD), bandaging the affected limb with compression bandages, exercises, and skin care.

After the maximum swelling decreases, patients progress to a long-term phase 2 care program, mostly patient-oriented. This stage aims to reduce the likelihood of the edema returning, reduce limb volume, and inform the patient about changing a lifestyle that reduces infection (133). At this stage, self-MLD, self-bandaging, exercises, and skin care are recommended (134).

Compression therapy increases venous and lymphatic return and tissue pressure, thus promoting the filling of the lymphatic vessel (135). Short tension bandaging is the primary factor of this intense phase, which aims to reduce the volume of significant pitting edema rapidly (133).

The short tension feature of special bandages used for treating lymphedema is essential (127). These bandages apply a high “working pressure” that directs the flow of interstitial fluid with muscle contractions on the move and a continuous, lower “resting pressure” while resting (136). The short-tension bandage reduces capillary ultrafiltration, inhibits lymph aggregation, and increases the efficiency of the intrinsic muscle pump (137). It helps maintain reduced volume until the next MLD session. Bandages also reduce fibrosis in the skin (136).

Therapeutic exercise is used in various methods to affect lymphatic physiology and contributes to lymphedema reduction. Aerobic and lymphedema-specific exercises are essential components of CDT for BCRL (124). Aerobic exercises activate the sympathetic nervous system, pumping the lymph vessels powerfully. Lymphatic drainage exercises often called pumping exercises, move fluids through the lymphatic channels. Thus, lymphedema exercises enhance the return of lymphatic fluid to the venous system three to four times (133).

Therapeutic exercises, especially when combined with short tension bandaging, positively affect lymph flow through body movement and rhythmic muscle contraction (138). This also increases the effectiveness of the muscle and joint pump (139).

Wearing a compression garment is the standard treatment for lymphedema to prevent progression (140). Compression garments are necessary to reduce edema and skin elasticity after volume reduction (141).

It is essential that suitable compression garments are used to increase interstitial pressure, thereby reducing capillary filtration to prevent re-accumulation of fluid in the interstitial space (142), improving lymphatic flow, improving venous return, and protecting skin integrity and extremity from trauma. After completing the phase 1 treatment, the self-management phase begins with home skin care, exercise, self-massage, and compression garments (143). Education and skin care, critical to preventing and treating lymphedema, should be done at both stages of CDT. Lymphedema patients are advised to moisten their limbs and protect them from accidental trauma.

Studies have reported a 43% reduction in arm volume with CDT versus an 11% reduction with compression alone (123). In conclusion, MLD and compression bandages control symptoms and increase the quality of life of lymphedema patients (126).

2.4.7.3. Surgical Treatment

Decongestive therapy and compression garments are the first approaches to managing lymphedema. The goals of surgical treatment of lymphedema are to preserve or restore function, reduce the risk of infection, prevent disease progression, and limit deformity (144).

To increase the carrying capacity of the lymph fluid, new channels are created with physiological techniques (145). Lymphatic bypass procedures are the most commonly used. Surgical methods include lymphatic bypass procedures and lymph node transfers.

3. MATERIALS AND METHODS

The sample of the study consists of patients who applied to Istanbul Dr Nazif Bağrıaçık Kadıköy Hospital in Istanbul between May 2022 and October 2022 and were diagnosed with upper extremity lymphedema after unilateral breast cancer by the doctor.

Patients who developed upper extremity lymphedema at least one year after breast cancer treatment and those without metastases were included in this study. The study was conducted on 27 patients with upper extremity lymphedema.

3.1. Subjects

The study was carried out with 27 subjects. All of the participants are women, their age ranges vary between 39-50, and the mean age of our study is 46.65 ± 3.44 .

3.1.1. Inclusion Criteria

- Volunteering to participate in the research
- Be between the ages of 18-50
- Having had unilateral breast cancer
- At least one year since breast cancer treatment
- No active metastases

3.1.2. Exclusion Criteria

- Arthritis
- Fibromyalgia syndrome
- Neurological diseases
- Mental illnesses
- Myopathic diseases

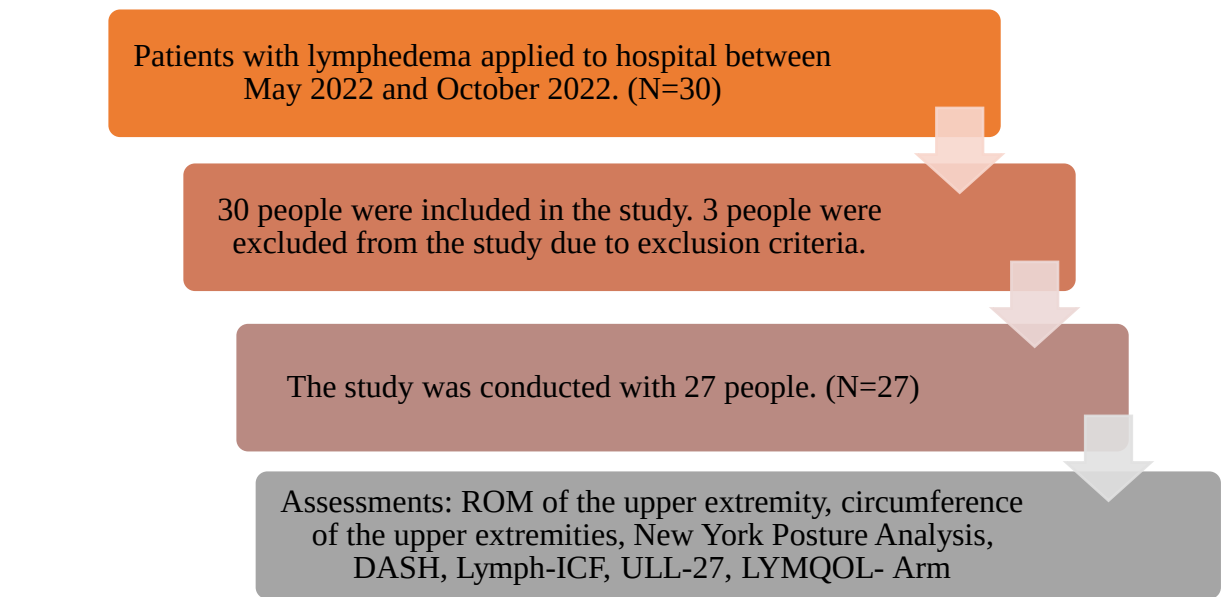
- Bilateral upper extremity lymphedema
- Inability to communicate and cooperate
- Presence of any orthopaedic disease in the affected upper extremity
- Having scoliosis
- Having cognitive problems

This study was designed as a descriptive cross-sectional study. This study will simultaneously investigate the cause-effect relationship between the variables in a certain period.

Ethics committee approval was obtained for the study from the Yeditepe University Non-Interventional Clinical Research and Ethics Committee with the decision number E.83321821-050.01.04-2906 (APPENDIX 1). Written informed consent was obtained by explaining the purpose and plan of the study to the participants (APPENDIX 2).

3.1.3. Study Flow Chart

A total of 27 lymphedema patients participated in the study according to the inclusion criteria. When measurements were completed, patients were asked questionnaires to answer (n=27). We excluded three volunteers with an orthopaedic disease in the affected upper extremity.



ROM: Range of motion, DASH: Disabilities of the Arm, Shoulder, and Hand, Lymph-ICF: Lymphedema Functionality, Disability and Health Questionnaire, ULL-27: Upper Limb Lymphedema-27, LYMQOL-Arm: Quality of Life Measure for Limb Lymphedema –Arm

Figure 3.1. Study Flow Chart

3.1.4. Study Protocol

Written informed consent was obtained by explaining the aim and plan of the study to the participants. Afterwards, the patients were evaluated for approximately 45-60 minutes. First, sociodemographic information about age, height, weight, and detailed medical histories were recorded. The researcher made upper extremity range of motion (ROM) and upper extremity circumference measurements on both sides of the participants. Participants were asked to answer questionnaires for upper extremity functions and quality of life assessments. Upper extremity functions were evaluated with DASH and Lymph-ICF, and the ULL-27 and LYMQOL-Arm questionnaires assessed the quality of life. Finally, the postures of the study group who completed the questionnaires were evaluated with the New York Posture Analysis.

3.2. Evaluation

3.2.1. Structured Questionnaire

The structured questionnaire prepared by the researcher applied face-to-face interviews. The questionnaire included the age, weight, height, body mass index (BMI),

lymphedema duration, lymphedema stage, dominant side, affected side, and orthopaedic disease of subjects (APPENDIX 3).



Figure 3.2. Lymphedema Extremity and Healthy Extremity

3.2.2. Upper Extremity Circumference Measurement

Circumference measurements were evaluated for both upper extremities. Markings were made every 4 cm, assuming the wrist pivot point. Upper extremity circumference measurements were made at 4 cm intervals up to the axilla. The difference between the affected and healthy sides was determined (APPENDIX 4).



Figure 3.3. Upper Extremity Circumference Measurement

3.2.3. Goniometric Measurements

The active range of motion (ROM) of both upper extremities (affected and healthy) was measured with a goniometer. Flexion and abduction were measured in the supine position and extension in the prone position. Internal and external rotations were measured in the supine position with the shoulder 90° abducted and the elbow 90° flexion. A difference of $\geq 20^\circ$ between the affected and unaffected sides was considered a limitation in the ROM of the affected side (APPENDIX 5).

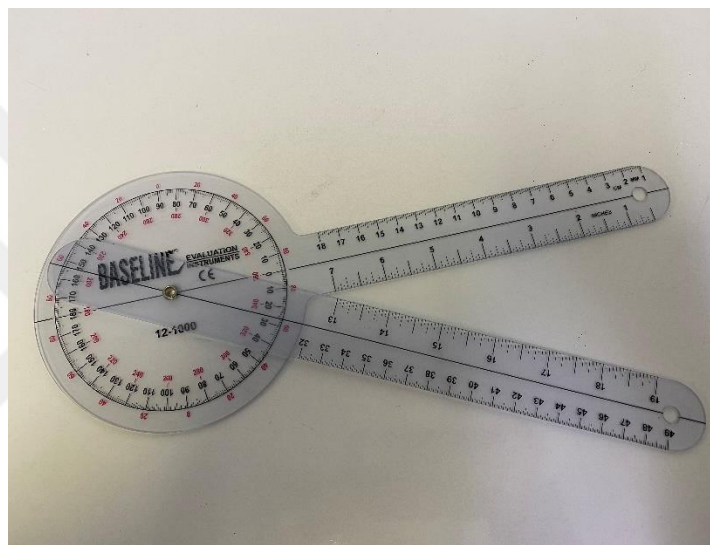


Figure 3.4. Goniometer Used to Measure Joint Range of Motion



Figure 3.5. Goniometric Measurements

3.2.4. Evaluation of Posture

Posture is the optimal form of all body parts about the whole body and the adjacent segment. The study participants' postures were evaluated using the New York Posture Analysis (NYPA) (APPENDIX 6). Posture analysis is done in an upright standing position.

This assessment test evaluates posture disorders that occur in 13 different body regions. The scoring of the test is as follows; A score of 5 is given if the person has a proper posture, 3 points if there is a moderate impairment, and 1 point if there is a severe disorder. The maximum score obtained at the end of the test is 65, and the minimum is 13. The standard evaluation criteria developed for the test are as follows for the total score;

≥ 45 : very good, 40-44: good, 30-39: medium, 20-29: weak, ≤ 19 : bad

3.2.5. Assessment of Upper Extremity Functions

3.2.5.1. Disabilities of the Arm, Shoulder, and Hand (DASH) Questionnaire

It is a disability/symptom scoring system based on a self-report system of 30 items developed to evaluate upper extremity-specific physical functions and symptoms. The DASH questionnaire contains 30 questions. Questions are scored from 1 to 5 (1: no difficulty, 2: mild difficulty, 3: medium difficulty, 4: extreme difficulty, 5: none at all). The total score is between 0-100. The DASH score is calculated using the formula $[\text{sum of answers}/(n-1)] \times 25$ (n =number of questions answered). The Turkish validity and reliability were carried out by Düger et al. (146,147) (APPENDIX 7).

3.2.5.2. Lymphedema Functionality, Disability, and Health Questionnaire (Lymph-ICF)

Lymph-ICF, a descriptive and evaluation tool, consists of 29 questions about the functional impairments, activity limitations, and participation restrictions reported by patients with breast cancer-related lymphedema. Physical function, mental function, home activities, mobility activities, and life and social activities are the five main components into which the questionnaire is subdivided. A visual analogue scale is next to each question, and the patient marks the answer that suits themselves. While calculating the survey score, the score of each subsection is found by summing and dividing by the number of questions answered. The total score is obtained by adding the scores of the subsections. A high score indicates that the effect on the quality of life is high. The Turkish validity and reliability study was performed by Kostanoğlu et al. in 2016 (148,149) (APPENDIX 8).

3.2.6. Assessment of Quality of Life

3.2.6.1. Upper Extremity Lymphedema-27 (ULL-27)

ULL-27 is a quality-of-life questionnaire evaluating upper extremity lymphedema as three components. The scale deals with physical, psychological and social components and consists of 27 questions. The first 15 questions evaluate the physical component, questions between 16-22 evaluate the psychological component, and questions between 23-27 evaluate the social component. A 5-point Likert score (1=strongly disagree, 5=strongly agree) is used in the scale. The lowest score is 27, and the highest score is 135. A high score on the scale indicates that lymphedema negatively affects the quality of life. The physical score consists of a total of fifteen questions, and this score of the person is between min 15 and 75. The psychological score consists of seven questions, with a

minimum of 7 and a maximum of 35 points. There are five questions for the social score, with a minimum of 5 and a maximum of 25 points. For a total score of 27 questions, 1 in all questions will receive a minimum of 27 points, and a person choosing 5 in all questions will receive a maximum of 135 points. The reliability and validity of the ULL-27 questionnaire in breast cancer-related lymphedema were performed by Ayşe Kayalı in 2017 (150,151) (APPENDIX 9).

3.2.6.2. Quality of Life Measure for Limb Lymphedema-Arm (LYMQOL-Arm)

The LYMQOL-Arm, primarily as a self-assessment report questionnaire assessing the symptoms of lymphedema in the upper extremity and the ability to perform functional activities in patients with breast cancer-associated lymphedema, was developed by Keeley et al. (152).

There are five subsections in the 21-question survey. These are upper extremity function (questions 1a-h,2,3), appearance (questions 4-8), symptoms (questions 9-14), emotional state (questions 15-20), and general quality of life (21st question). In the first 20 questions, there are four options for each question: none (1 point), a little (2 points), quite (3 points), and a lot (4 points). The scores of these subsections are summed up within themselves and divided by the number of questions answered. In the 21st question, the patient is asked to give a value between 0 and 10 for the quality of life. In this evaluation, patients indicate that their quality of life is poor when they mark 0 (zero) points and excellent at 10 points. The total score of the survey is calculated separately for the first 20 questions and the 21st question. High scores for the first 20 questions and low scores for the 21st question indicate poor quality of life.

The translation and validation of the scale into Turkish were done by Bakar et al. reported that the Turkish version of this questionnaire was valid and reliable in patients with breast cancer-related lymphedema (153) (APPENDIX 10).

3.3. Data Analysis

All statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS). SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 26.0 Armonk, NY: IBM Corp) program was used for statistical analysis. The Shapiro-Wilk test was used to test the numerical variables for normality. The summary

of numerical data showed mean $\pm$ standard deviation, and ratio n (%) was used for categorical data. Statistical analysis, Spearman correlation test (Whether there is a significant correlation between continuous variables was determined by this test.) was performed according to the evaluation results for non-parametric data. The Mann-Whitney U test was used to compare the non-parametric data. The statistically significant level of $p < 0.05$ was accepted.



4. RESULTS

The study included 27 lymphedema patients who have referred to the oncologist between May 2022 and October 2022; the study was conducted in the Dr Nazif Bağrıaçık Kadıköy Hospital in İstanbul.

The study group's demographic characteristics (age, weight, height and body mass index (BMI)) are presented in Table 4.1.

Table 4.1. The Demographic Characteristics of The Study Group

N (27)	Mean ± SD
Age (years)	46.65 ± 3.44
Weight (kg)	71.07 ± 13.80
Height (cm)	164.54 ± 7.51
BMI (kg/m²)	26.38 ± 5.52

Data expressed as mean ± standard deviation. BMI: Body, kg: kilogram, cm: centimetre, kg/m²: kilogram/meter², SD: Standard deviation, N: Patient Number.

Twenty-seven people participated in the study. In the study group, the dominant side was affected in eighteen participants, and the non-dominant side was affected in nine participants, as presented in Table 4.2.

Table 4.2. Distribution of The Affected Side of The Study Group

		N=27	%
Affected Side	Dominant	18	66.7
	Nondominant	9	33.3

N: Patient Number, %: Percent.

The study group included lymphedema patients got diagnosed between 1 to 5 years, and according to the International Society of Lymphology (ISL), the staging of lymphedema patients. The clinical characteristics of the study group are shown in Tablo 4.3.

Table 4.3. Distribution of Clinical Characteristics of The Study Group

		N=27	%
Lymphedema Duration	1-5 years	27	100
Lymphedema Staging	Stage 1	15	55.6
	Stage 2	12	44.4

N: Patient Number, %: Percent.

The range of motion (ROM) of the shoulder, elbow, and wrist joints was evaluated for the healthy and affected sides. Since the data were not normally distributed, the Wilcoxon Signed-Rank test was used to compare the shoulder, elbow, and wrist joint range of motion (ROM) between the study group's healthy and the affected side. A statistically significant difference was found between the healthy and affected sides' range of motion measurements in all parameters except wrist radial deviation ($p < 0.05$). These findings are presented in Table 4.4.

Table 4.4. The Measurement Values of the Shoulder, Elbow and Wrist Joint Range of Motion (ROM) of the Healthy Side and Affected Side of The Study Group

	Affected Side Mean±SD	Healthy Side Mean±SD	P Value Z
Shoulder Flexion (°)	133.26±17.31	173.88±6.55	p: 0.00 z: -4.468
Shoulder Extension (°)	35.96±12.16	55.55±5.60	p: 0.00 z:-4.21
Shoulder Abduction (°)	134.61±22.13	173.33±6.79	p: 0.00 z:-4.341
Shoulder Internal Rotation (°)	46.92±13.49	64.44±4.23	p: 0.00 z:-4.151
Shoulder External Rotation (°)	59.80±17.40	82.03±5.59	p: 0.00 z: -4.192
Elbow Flexion (°)	116.34±23.43	143.14±6.22	p: 0.00 z: -4.161
Forearm Supination (°)	55.00±11.48	75.55±4.23	p: 0.00 z:-4.387
Forearm Pronation (°)	55.38±11.65	75.37±4.14	p: 0.00 z: -4.40
Wrist Flexion (°)	58.26±15.48	75.55±4.23	p: 0.00 z: -3.954
Wrist Extension (°)	54.23±18.36	65.55±4.23	p: 0.012 z: -2.509
Wrist Radial Deviation (°)	16.15±4.22	17.51±2.56	p: 0.406 z: -0.831
Wrist Ulnar Deviation (°)	16.84±5.36	23.66±4.55	p: 0.00 z: -3.932

Data expressed as mean ± standard deviation. SD: Standard deviation, ROM: Range of Motion, °:degrees.

The study investigated a relationship between posture, upper extremity functions (DASH and Lymph-ICF), and quality of life (ULL-27 and LYMQOL-Arm). Since the data were not normally distributed, Spearman's correlation analysis was used.

These findings showed a significant positive correlation between the DASH and Lymph-ICF, ULL-27, and LYMQOL- Arm ($r=.618$, $r=.637$, $r=.529$, $p<0.05$). However, there was no relationship between the DASH and NYPA ($r=-.205$, $p>0.05$). Also, there was no correlation between NYPA and Lymph-ICF, ULL-27, and LYMQOL-Arm ($r=-.087$, $r=-.238$, $r=-.122$, $p>0.05$).

The results showed a significant positive correlation between Lymph-ICF and ULL-27, LYMQOL-Arm ($r=.651$, $r=.867$, $p<0.05$). There was a significant correlation between ULL-27 and LYMQOL-Arm($r=.557$, $p<0.05$) (Table 4.5).

Table 4.5. The Relationship Between Upper Extremity Functions, Posture, and Quality of Life Parameters of The Study Group

	DASH	Lymph-ICF	NYPA	ULL-27	LYMQOL-Arm
DASH					
r_s	1.000	.618	-.205	.637	.529
p		.001	.314	.000	.005
Lymph-ICF					
r_s		1.000	-.087	.651	.867
p			.671	.000	.000
NYPA					
r_s			1.000	-.238	-.122
p				.241	.552
ULL-27					
r_s				1.000	.557
p					.003
LYMQOL-Arm					
r_s					1.000
p					

DASH: Disabilities of the Arm, Shoulder and Hand Questionnaire, Lymph-ICF: Lymphedema Functionality, Disability and Health Questionnaire, NYPA: New York Posture Analysis, ULL-27: Upper Extremity Lymphedema-27, LYMQOL- Arm: Quality of Life Measure for Limb Lymphedema – Arm, P: p-value, r_s: Spearman's correlation coefficient.

Since the data were not normally distributed, the Mann-Whitney U test was used to compare upper extremity function, posture and quality of life according to the lymphedema staging of the study group. The findings are shown in Table 4.6. There was no statistically significant difference between the upper extremity function, posture and quality of life according to the lymphedema staging of the study group ($p>0.05$).

Table 4.6. Comparison of Upper Extremity Function, Posture and Quality of Life According to Lymphedema Staging of Study Group

	Lymphedema Staging	
	P	Z
DASH	0.185	-1.326
Lymph-ICF	0.917	-0.104
NYPa	0.958	-0.052
ULL-27	0.499	-0.676
LYMQOL-Arm	0.815	-0.234

DASH: Disabilities of the Arm, Shoulder and Hand Questionnaire, Lymph-ICF: Lymphedema Functionality, Disability and Health Questionnaire, NYPa: New York Posture Analysis, ULL-27: Upper Extremity Lymphedema-27, LYMQOL- Arm: Quality of Life Measure for Limb Lymphedema – Arm, P: p-value

Since the data were not normally distributed, the Mann-Whitney U test was used to compare upper extremity function, posture and quality of life according to the BMI classification of the study group. The findings are shown in Table 4.7. There was no statistically significant difference between the upper extremity function, posture and quality of life according to the BMI classification of the study group ($p>0.05$).

Table 4.7. Comparison of Upper Extremity Function, Posture and Quality of Life According to BMI Classification of Study Group

	BMI	
	p	Z
DASH	0.472	-0.719
Lymph-ICF	0.673	-0.422
NYPA	0.472	-0.719
ULL-27	0.544	-0.607
LYMQOL-Arm	0.331	-0.971

DASH: Disabilities of the Arm, Shoulder and Hand Questionnaire, Lymph-ICF: Lymphedema Functionality, Disability and Health Questionnaire, NYPA: New York Posture Analysis, ULL-27: Upper Extremity Lymphedema-27, LYMQOL- Arm: Quality of Life Measure for Limb Lymphedema – Arm, P: p-value

Since the data were not normally distributed, the Mann-Whitney U test was used to compare upper extremity function, posture and quality of life according to the affected side of the study group. The findings are shown in Table 4.8. There was no statistically significant difference between the upper extremity function, posture and quality of life according to the affected side of the study group ($p>0.05$).

Table 4.8. Comparison of Affected Side and Upper Extremity Functions, Posture, and Quality of Life Parameters of The Study Group

	Affected Side	
	p	Z
DASH	0.101	-1.642
Lymph-ICF	1.00	0.000
NYPA	0.238	-1.179
ULL-27	0.221	-1.224
LYMQOL-Arm	0.330	-0.974

DASH: Disabilities of the Arm, Shoulder and Hand Questionnaire, Lymph-ICF: Lymphedema Functionality, Disability and Health Questionnaire, NYPA: New York Posture Analysis, ULL-27: Upper Extremity Lymphedema-27, LYMQOL- Arm: Quality of Life Measure for Limb Lymphedema – Arm, P: p-value

The disabilities of arm, shoulder and hand (DASH) scores of the study group are presented as total, functional status and symptoms scores in Table 4.9.

Table 4.9. The Disabilities of The Arm, Shoulder and Hand (DASH) Scores of The Study Group

DASH	Mean±SD	Min-Max
Total Score	52.91±14.88	27.5-98.3 (0-100)
Functional Status	53.59±24.1	25-100 (25-125)
Symptoms	10.92±5.27	5-21 (5-25)

Data expressed as mean ± standard deviation. SD: Standard deviation, Min: Minimum, Max: Maximum.

The relationship between the DASH total score and its function and symptoms components was not statistically significant ($r=.128$, $r=.302$, $p>0.05$). Also, there was no correlation between function and symptom components ($r=-.048$, $p>0.05$, Table 4.10).

Table 4.10. The Relationship Between Disabilities of the Arm, Shoulder and Hand (DASH) Score and Its Components Scores of The Study Group

DASH		Total Score	Function	Symptoms
Total Score	r_s	1.000	.128	.302
	p		.524	.126
Function	r_s		1.000	-.048
	p			.812
Symptoms	r_s			1.000
	p			

P: p-value, r_s: Spearman's correlation coefficient.

The total score of Lymph-ICF and its components as physical, mental, household, mobility, and life and social activities scores are shown in Table 4.11.

Table 4.11. The Lymph-ICF Total Scores of The Study Group

	Mean±SD	Min-Max
Total Score	47.83±14.35	32.1-81 (0-100)
Physical Function	50.38±17.31	27.7-82 (0-100)
Mental Function	35.78±23.94	14.0-91.0 (0-100)
Household Activities	62.00±17.73	28.7-100.0 (0-100)
Mobility Activities	58.00±12.57	38.9-80.2 (0-100)
Life and Social Activities	35.00±13.24	19.2-70.0 (0-100)

Data expressed as mean ± standard deviation. SD: Standard deviation, Min: Minimum, Max: Maximum.

The relationship between the Lymph-ICF total score and its components scores was statistically significant ($r=.756$, $r=.902$, $r=.707$, $r=.841$, $r=.814$, $p<0.05$).

There was a significant correlation between physical and mental, mobility, and life and social activities components ($r=.657$, $r=.632$, $r=.809$, $p<0.05$). However, there was no correlation between physical and household activity components ($r=.367$, $p>0.05$).

There was a significant positive correlation between mental and household, mobility, and life and social activities components ($r=.651$, $r=.698$, $r=.755$, $p<0.05$). Also, there was a moderate correlation between household and mobility, life and social activities components ($r=.448$, $r=.523$, $p<0.05$). Furthermore, a significant correlation was found between mobility and life and social activities components ($r=.575$, $p<0.05$) (Table 4.12).

Table 4.12. The Relationship Between Lymph-ICF Total Score and Its Components Scores of The Study Group

Lymph-ICF		TS	PF	MF	HA	MA	LSA
TS	r_s	1.000	.756	.902	.707	.841	.814
	p		.000	.000	.000	.000	.000
PF	r_s		1.000	.657	.367	.632	.809
	p			.000	.065	.001	.000
MF	r_s			1.000	.651	.698	.755
	p				.000	.000	.000
HA	r_s				1.000	.448	.523
	p					.022	.006
MA	r_s					1.000	.575
	p						.002
LSA	r_s						1.000
	p						

P: p-value, r_s: Spearman's correlation coefficient, Lymph-ICF: Lymphedema Functionality, Disability and Health Questionnaire, TS: Total Score, PF: Physical Function, MF: Mental Function, HA: Household Activities, MA: Mobility Activities, LSA: Life and Social Activities

The total score of ULL-27 and its components as physical, social, and psychological scores are shown in Table 4.13.

Table 4.13. The ULL-27 Scores of The Study Group

ULL-27	Mean±SD	Min-Max
Total Score	67.19±20.55	46-128 (27-135)
Physically	41.84±14.09	27-75 (15-75)
Psychological	16.57±5.02	8-33 (7-35)
Social	8.80±4.01	5-20 (5-25)

Data expressed as mean ± standard deviation. SD: Standard deviation, ULL-27: Upper Extremity Lymphedema-27.

The relationship between the ULL-27 total and component scores was statistically significant ($r=.899$, $r=.662$, $r=.705$, $p<0.05$). There was a significant correlation between social, physical, and psychological components ($r=.519$, $r=.576$, $p<0.05$). However, there was no correlation between the physical and psychological components ($r=.372$, $p>0.05$.) (Table 4.14).

Table 4.14. The Relationship Between ULL-27 Total Score and Its Components Scores of The Study Group

ULL-27		Total Scores	Physically	Psychological	Social
Total Score	r_s	1.000	.899	.662	.705
	p		.000	.000	.000
Physically	r_s		1.000	.372	.519
	p			.061	.007
Psychological	r_s			1.000	.576
	p				.002
Social	r_s				1.000
	p				

ULL-27: Upper Extremity Lymphedema-27, P: p-value, r_s: Spearman's correlation coefficient.

The total score of LYMQOL-Arm and its components as function, appearance, symptoms, emotion and overall quality of life scores are presented in Table 4.15.

Table 4.15. The Quality of Life Measure for Limb Lymphedema-Arm (LYMQOL-Arm) Scores of The Study Group

LYMQOL-Arm	Mean±SD	Min-Max
Total Score	56.19±15.02	41-108 (0-118)
Function	25.07±5.80	17-40 (10-40)
Appearance	12.96±3.82	8-20 (5-20)
Symptoms	9.80±4.37	6-24 (6-24)
Emotion	7.84±3.44	6-24 (6-24)
Overall Quality of Life	6.69±1.28	3-8 (0-10)

Data expressed as mean ± standard deviation. SD: Standard deviation, LYMQOL- Arm: Quality of Life Measure for Limb Lymphedema –Arm.

The correlation between the LYMQOL-Arm total and its components as function, appearance, symptoms and emotion scores was statistically significant ($r=.899$, $r=.824$, $r=.641$, $r=.451$, $p<0.05$). Also, there was a negative and significant correlation between the LYMQOL-Arm total and the overall quality of life component scores ($r=-.448$, $p<0.05$). There was a significant correlation between function, appearance, and symptoms components ($r=.659$, $r=.556$, $r=p<0.05$). However, there was no correlation between function and symptoms and overall quality of life components ($r=.274$, $r=-.353$, $p>0.05$). A significant negative correlation was found between appearance and overall quality of life ($r=-.534$, $p<0.05$). In addition, a significant correlation was found between appearance and symptoms components ($r=.396$, $p<0.05$). However, there was no correlation between appearance and emotion components ($r=.316$, $p>0.05$).

A significant positive correlation was found between symptoms and emotion components ($r=.554$, $p<0.05$). In addition, a negative and significant correlation was found between emotion and overall quality of life components ($r=-.431$, $p<0.05$) (Table 4.16). However, no correlation was found between symptoms and overall quality of life components ($r=-.275$, $p>0.05$).

Table 4.16. The Relationship between LYMQOL-Arm Total Score and Its Components Scores of The Study Group

LYMQOL-Arm	Total Score	Function	Appearance	Symptoms	Emotion	Overall Quality of Life
Total Score						
r_s	1.000	.899	.824	.641	.451	-.448
p		.000	.000	.000	.021	.022
Function						
r_s		1.000	.659	.556	.274	-.353
p			.000	.003	.176	.077
Appearance						
r_s			1.000	.396	.316	-.534
p				.045	.116	.005
Symptoms						
r_s				1.000	.554	-.275
p					.003	.174
Emotion						
r_s					1.000	-.431
p						.028
Overall Quality of Life						
r_s						1.000
p						

LYMQOL- Arm: Quality of Life Measure for Limb Lymphedema –Arm, P: p-value, r_s: Spearman's correlation coefficient.

5. DISCUSSION

The main result of our study, in which we evaluated the effects of upper extremity lymphedema after unilateral breast cancer on upper extremity functions, posture and quality of life, found that upper extremity functions and quality of life were affected ($p<0.05$). In contrast, it was found that posture was not affected. ($p>0.05$, Table 4.5).

The mean age of the individuals included in our study was 46.65 ± 3.44 (Min: 39Max: 50). Participants' BMI results ranged from 17.30 to 39.06. According to the BMI classification of the study group, eight people had a healthy weight range body mass index. In comparison, the other eight people had overweight (>25), and 11 people had an obesity range body mass index (>30). Eighteen people in the study group were right-handed dominantly, and nine were left-handed dominantly. In the study group, the dominant side was affected in sixteen participants, and the non-dominant side was affected in eleven participants (Table 4.2). This study included patients diagnosed with lymphedema between 1 and 5 years after treatment. According to the International Society of Lymphology (ISL), the stages of lymphedema patients comprised 15 people with stage 1 and 12 with stage 2 (Table 4.3). The active range of motion of the participants was measured with a goniometer, and limitations were found at different levels in all of them. A statistically significant difference was found between the healthy and affected sides' range of motion measurements in all parameters except wrist radial deviation ($p<0.05$, Table 4.4). The correlation between posture and upper extremity functions (DASH and Lymph-ICF) and quality of life (ULL-27 and LYMQOL-Arm) was examined. There was a significant positive correlation between the DASH and Lymph-ICF, ULL-27, and LYMQOL- Arm ($r=.618$, $r=.637$, $r=.529$, $p<0.05$). However, there was no relationship between the DASH and NYPA ($r=-.205$, $p>0.05$). Also, there was no correlation between NYPA and Lymph-ICF, ULL-27, and LYMQOL-Arm ($r=-.087$, $r=-.238$, $r=-.122$, $p>0.05$). There was a significant positive correlation between Lymph-ICF and ULL-27, LYMQOL-Arm ($r=.651$, $r=.867$, $p<0.05$). There was a significant correlation between ULL-27 and LYMQOL-Arm($r=.557$, $p<0.05$, Table 4.5). However, the relationship between the DASH total score and its function and symptoms components was not statistically significant. Also, there was no correlation between function and symptom components ($p>0.05$) (Table 4.7). Lymph-ICF components found

a relationship between physical function, mobility and life-social activities (Table 4.12). There was a relationship between ULL-27's social, physical, and psychological components ($p < 0.05$, Table 4.14). In addition, these participants' general quality of life scores were 6.69 ± 1.28 out of 10 (Table 4.15). The results found a significant relationship between overall quality of life, appearance, and emotions ($p < 0.05$, Table 4.16).

In both our country and the world, breast cancer is a severe life-threatening problem (1). Middle-aged women are most likely to get female breast cancer. The age group of women diagnosed usually is 40 to 55 (6). Lymphedema is a key survivorship issue that women with breast cancer report experiencing and is a prevalent disability and side effect of cancer treatment. Even months or years after cancer therapy, cancer-associated lymphedema can appear. Every woman receiving cancer treatment risks developing lymphedema during their lifetime (11). Examining studies in the literature reveals that becoming older is one of the risk factors for lymphedema. In their research, Geller et al. (154) found that women under 50 had a considerably higher risk of getting lymphedema. Richard et al. (155) investigated the relationship between lymphedema and patient age, and age at the time of diagnosis is an important determinant in the development of lymphedema. With increasing age (>65), the risk of developing lymphedema decreases due to decreased physical activity. Still, advanced age is a risk factor for lymphedema due to non-use, according to a study by Vrieze et al. (156) that examined the relationship between physical activity level and age in 185 breast cancer surgery patients. According to our demographic data, the participants in our study ranged in age from 39 to 50. As a result, according to the age range of the participants, our study is similar to the literature (Table 4.1).

As the lymphedema stage progresses, the symptoms increase (105). In our study, no significant difference was found between the upper extremity functions, posture and quality of life of the participants according to the lymphedema stage (15 participant stage 1, 12 participant stage 2) ($p > 0.05$, Table 4.6).

According to the literature, women with breast cancer may experience lymphedema if their BMI is high. Due to the proliferation of fat cells and enhanced functions like the endocrine system, the increased fat mass caused by obesity will put more strain on the circulatory system and add to the load on the lymphatic and circulatory systems. In addition to the harm caused by breast cancer surgery, individuals may be more

susceptible to developing lymphedema due to increased lymphatic fluid volume that exceeds their body's carrying capacity. Increased awareness of high BMI as a risk factor for lymphedema. Recent research has revealed a strong link between lymphedema and a high BMI. Additionally, it has been discovered that a high BMI alters lymphatic function. According to Leray et al., lymphedema patients with a high BMI have a greater incidence of comorbidities (157). According to Ridner et al., obese people have a 3.6-fold higher risk of developing lymphedema than normal-weight patients (158). The participants' BMI ranged from 17.30 to 39.06 (Table 4.1). According to the BMI classification of this study, eight people had a healthy weight range body mass index. In comparison, the other eight people had overweight (>25), and eleven people had an obesity range body mass index (>30). As a result, our study is similar to the literature regarding the high BMI of most participants (Table 4.7).

Studies looking at upper extremity functions are constrained when lymphedema is present on the dominant and non-dominant sides, according to a literature analysis. Upper extremity functions may be impaired differently in those with afflicted dominant and non-dominant sides. Although it is controversial in the literature, Quiron (159), in his study, discovered that the severity of lymphedema increased if the dominant extremity was the side that was affected. However, no study examines the effects on upper extremity functions, posture and quality of life according to the dominant and non-dominant sides. In the study group, the dominant side was affected in eighteen participants, and the non-dominant side was affected in nine participants (Table 4.2). In our study, there was no statistically significant difference between upper extremity function, posture and quality of life according to the affected side of the participants ($p>0.05$, Table 4.8).

Belmonte et al. found that the joint ROM decline persists in the 5-year shoulder joint ROM examinations of patients with lymphedema (160). In a study investigating the magnitude of the effects on shoulder functions, Levangie et al. found that the abduction and flexion movements of the shoulder were affected, and there was a 10-20 degree or 10% limitation of joint motion when compared to the contralateral side (161). In the study of Isaksson et al., they found a 20-degree restriction in shoulder abduction and flexion after breast surgery (162). The healthy and affected side of the participant's upper extremities were measured with a goniometer (Table 4.4). Our study found a statistically significant difference between the healthy and affected sides' range of motion

measurements in all parameters except wrist radial deviation ($p < 0.05$). As a result, our study was similar to the literature.

Women with post-mastectomy lymphedema were shown to have asymmetries in posture in the study by Haddad C et al. (19). Babasaheb SS et al. discovered in the literature that those with lymphedema following breast cancer had poor posture (163). Our study is different from the literature in this regard. We believe this is because the upper extremity's poor posture does not affect the entire body. However, there was no correlation between the quality of life, upper extremity functions, or posture ($p > 0.05$). Studies that thoroughly assess posture in individuals with upper extremity lymphedema are necessary (Table 4.5).

Patients with breast cancer who experience lymphedema typically avoid using their arms. Complications brought on by this condition include increased edema and restricted movement in the upper extremity. Not only does lymphedema affect the lymphatic system, but it also affects the musculoskeletal system. When the dominant side is involved, it causes the individual to avoid using the affected side. According to the literature, the findings of our study support that patients with high DASH scores experience a decrease in upper extremity functions. Dawes et al., in a study on patients with lymphedema after breast cancer treatment, discovered that upper extremity functions were affected, and patients with lymphedema scored higher in DASH (164). Çolak et al. found that women with lymphedema had higher DASH scores (165). When Park et al. evaluated the upper extremity functions of individuals with lymphedema after breast cancer, they found that the upper extremities of those with lymphedema showed lower function (166). In our study, the mean DASH score of individuals who developed lymphedema after breast cancer was 52.91 ± 14.88 (Table 4.9).

In cases when lymphedema is the focus point, it is advised to employ the Lymph-ICF questionnaire, according to Jamshidi et al. Additionally, this scale includes questions specific to all arm symptoms. On the visual analogue scale, all questions are responded to. Because of this, findings have a wide range of scores and are highly sensitive (167). Although lymphedema is not life-threatening, it can impact a patient's physical, social, domestic, occupational, and emotional. It demonstrates that when used with the DASH questionnaire, this may be most helpful when patients with a range of upper extremity disorders, such as breast cancer survivors, are assessed in a clinical or research

investigation (168). According to the study, patients with upper extremity lymphedema related to treatment for unilateral breast cancer have a higher Lymph-ICF score (169). In Lymph-ICF components, a positive correlation was found between physical function, mobility and life-social activities (Table 4.12). Our study was found to be compatible with the literature.

Lymphedema affects people's quality of life. The ULL-27 and LYMQOL-Arm for quality of life were the most popular and most thoroughly validated in the study by Lim et al. (170). ULL-27 can be used in upper extremity lymphedema, according to Pusic et al. in a COSMIN criteria review (171). It was found that the quality of life decreased as the total score increased. It has been shown in the study that the ULL-27 total score and physical component are affected (Table 4.13). The components of ULL-27 showed a positive, significant correlation between social, physical, and psychological components ($p < 0.05$) (Table 4.14). While there was a relationship between ULL-27 and upper extremity functions ($p < 0.05$), no relationship was found with posture ($p > 0.05$, Table 4.5). Upper extremity functions were evaluated with DASH and Lymph-ICF, and their relationship was significant ($p < 0.05$, Table 4.5). As a result, the upper extremity functions of the participants were affected in our study, and it is compatible with the literature.

The first 20 items in the LYMQOL-Arm questionnaire are about the quality of life, while the last question rates overall quality of life on a scale of 0 to 10. Park et al. showed that breast cancer-related lymphedema negatively affects the quality of life and upper extremity function (77). Passik et al. reported that quality of life decreased significantly in their study evaluating the quality of life with LYMQOL-Arm (172). In the study, Rietman et al. found that upper extremity dysfunction, which may develop due to the treatment methods applied, causes difficulties in daily activities, and this situation negatively affects the quality of life of individuals (173). In addition, Ridner et al. found that although breast cancer was treated, the swelling in the arm reminded patients of breast cancer, so uncertainty about the future and fear that cancer would recur negatively affected the patients' lives (174). In addition, these participants' general quality of life scores were 6.69 ± 1.28 out of 10 (Table 4.15). The results found a significant relationship between overall quality of life and appearance and emotions ($p < 0.05$, Table 4.16). A positive correlation was found between LYMQOL-Arm and upper extremity functions (DASH, ULL-27) ($p < 0.05$, Table 4.5). This study shows that it is compatible with the literature.

5.1. Limitations Of Our Study

- The number of participants was minimal because our study occurred during the pandemic, and it was challenging to contact those who would participate.
- Given the small sample size, we believe there is no discernible difference in the influence of posture.
- Because the categorising of participants with lymphedema according to the degree of lymphedema could not be done uniformly in our study, posture, quality of life, and upper extremity functions could not be calculated according to the severity of lymphedema.
- Due to the study participants' unevenly distributed development times of lymphedema, posture, upper extremity functions, and quality of life could not be assessed about this factor.

5.2. Strengths Of Our Study

- The study's patients were assessed in various ways, and the relationships between these parameters were relevant.
- Future studies may benefit from examining how lymphedema in the extremities affects patients' posture, upper extremity functioning, and quality of life following unilateral breast cancer.

6. CONCLUSION

This study concluded that lymphedema extremities significantly affected upper extremity functioning and quality of life in individuals with unilateral breast cancer but not on posture.

As a result,

- Patients with lymphedema following unilateral breast cancer may decline their quality of life and upper extremity functions.
- In addition, patients should be educated about possible problems such as postural problems, impairment in upper extremity functions, and decreased quality of life.
- Evaluations should be taken to compare the healthy and patient sides and prevent lymphedema development.

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APPENDIXES

APPENDIX 1: ETHICAL COMMITTEE APPROVAL



T.C.
YEDİTEPE ÜNİVERSİTESİ REKTÖRLÜĞÜ
Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu

Sayı : E.83321821-050.01.04-2906
Konu : Girişimsel Olmayan Klinik
Araştırmalar Etik Kurulu Karar

Sayın Prof. Dr. Feryal Subaşı

Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kuruluna etik onay için başvuru yapılmış olan araştırma önerisinin başlığı, araştırmacılar, başvuru numarası, sunulan belgeler ve toplantı bilgileri aşağıda yer almaktadır. İlgili araştırma önerisi, etik kurulumuz üyeleri tarafından değerlendirilmiş olup, etik ve bilimsel açıdan UYGUN olduğuna karar verilmiştir.

Araştırma Başlığı:	Unilateral Meme Kanseri Sonrası Lenfödem Gelişen Hastalarda Lenfödemli Ekstremitenin Postür, Üst Ekstremitte Fonksiyonları ve Yaşam Kalitesi Üzerine Etkileri
Araştırmacılar:	Simla TURAN, Prof. Dr. Feryal SUBAŞI, Öğr. Gör. Elif Tuğçe ÇİL, Doç. Dr. Fikret AKSOY
Başvuru Numarası:	202206Y0261

TOPLANTI BİLGİLERİ			
Toplantı Tarihi:	10.06.2022	Toplantı Yeri:	Çevirim içi (Google Meet)

SUNULAN BELGELER	
Islak imzalı başvuru dosyası, CD veya USB belleğe kaydedilmiş başvuru dosyası ve elektronik başvuru	
Araştırma başlığı ve araştırmacıların isimleri	
Başvuru dilekçesi	
Başvuru formu	
Araştırmanın;	
• Niteliği	
• Önemi ve özgün değeri	
• Amaç ve hedefleri	
• Yöntemi	
• Yönetimi	
• Yaygın etkisi	
• Araştırma bütçesi (Mevcutsa)	
• Stresi ve uygunluğu (Zaman cetveli)	

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Caddesi 34755

Ataşehir / İSTANBUL

Telefon No: (0216) 578 00 00 Faks No : (0216) 578 02 99

İnternet Adresi www.yeditepe.edu.tr

Kep Adresi : yeditepeuniversitesi@hs03.kep.tr

Bilgi için: Sinem ARI

Unvan: Uzman Yardımcısı

Telefon No:



• Kaynakları
Bilgilendirilmiş Gönüllü Olur Formu (yapılan araştırmaya özel olarak hazırlanmış)
Taahhütname-1 Araştırmanın yapılacağı kurumdaki izin alma sorumluluğunun araştırmacılara ait olduğuna dair taahhüt
Taahhütname-2 Dünya Tıp Birliği Helsinki Bildirgesinin son versiyonunun ve Sağlık Bakanlığı'nın ilgili tüm kılavuzlarının okunmasına dair taahhüt
Taahhütname-3 Daha önce yapılmış etik kurul başvuruları mevcut olup olmadığına dair taahhüt
Taahhütname-4 Araştırma sırasında araştırma bütçesinde yer almayan ve gönüllünün kendisine veya Sosyal Güvenlik Kurumuna ek yük getirecek hiçbir işlem uygulanmayacağına dair taahhüt
Taahhütname-5 COVID-19 hastalarında tedavi yaklaşımları ve bilimsel araştırmalar genelgesi okunmasına dair taahhüt
Taahhütname-6 Millî Eğitim Bakanlığı Araştırma Uygulama İzinleri konulu yazının okunmasına dair taahhüt
Araştırmacıların her birisine ait özgeçmiş formu
Ek belgeler (Varsa kullanılan ölçek)

Prof. Dr. Didem ÖZDEMİR ÖZENEN
Başkan

Doç. Dr. Gökhan ERTAŞ
Başkan Yardımcısı

Doç. Dr. Elif SUNGURTEKİN
EKÇİ
Raportör

Doç. Dr. Mehmet Engin CELEP
Üye

Doç. Dr. Binnur OKAN
BAKIR
Üye

Dr. Öğr. Üyesi Elif Çiğdem KELEŞ
Üye

Dr. Öğr. Üyesi Emine Nur
ÖZDAMAR
Üye

Dr. Öğr. Üyesi Sevim ŞEN
Üye

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Caddesi 34755

Ataşehir / İSTANBUL

Telefon No: (0216) 578 00 00 Faks No: (0216) 578 02 99

İnternet Adresi www.yeditepe.edu.tr

Kep Adresi : yeditepeuniversitesi@hs03.kep.tr

Bilgi için: Sincem ARI

Unvan: Uzman Yardımcısı

Telefon No:



APPENDIX 2: INFORMED WRITTEN CONSENT

BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU

Araştırmanın Adı: Unilateral Meme Kanseri Sonrası Lenfödem Gelişen Hastalarda Lenfödemli Ekstremitenin Üst Ekstremitte Fonksiyonları, Postür ve Yaşam Kalitesi Üzerine Etkileri

Sayın katılımcı,

Yukarıda adı yazılı araştırmaya katılmak üzere davet edilmiş bulunmaktasınız. Bu araştırmada yer almayı kabul etmeden önce, araştırmanın ne amaçla yapılmak istendiğini anlamanız ve bu bilgilendirme sonucunda kararınızı vermeniz gerekmektedir. Aşağıdaki bilgileri lütfen dikkatlice okuyunuz, sorularınız olursa sorunuz ve açık yanıtlar isteyiniz. Bu çalışmanın temel amacı, unilateral meme kanseri sonrası lenfödem gelişen hastalarda lenfödemli ekstremitenin postür, üst ekstremitte fonksiyonları ve yaşam kalitesi üzerine etkilerini araştırmaktır. Araştırma için Yeditepe Üniversitesi Etik Kurul Komitesi'nden izin alınmıştır. Değerlendirmeler yaklaşık 45 dakika sürecektir. Herhangi bir girişimsel işlem uygulanmayacaktır. Bu çalışmaya siz dahil 27 kişi katılacaktır. Katılımın isteğe bağlı olduğu ve katılmayı reddetmenin herhangi bir cezaya veya herhangi bir menfaat kaybına yol açmayacağını belirtmek isteriz. Aynı şekilde istediğiniz zaman araştırmadan çekilebilirsiniz. Araştırmamızda katılımcılara uygulanan değerlendirmelerin bilinen herhangi bir zararı bulunmamaktadır. Araştırmamız katılımcı açısından herhangi bir risk teşkil etmemektedir. Araştırmaya katılmak size yardımcı olabileceği gibi araştırma sonuçlarımızın gelecekte hastalara veya bilim için faydaları olacağı umulmaktadır. Araştırmaya katılarak herhangi bir parasal yük altına girmeyeceksiniz ve aynı şekilde size bir ödeme yapılmayacak. Araştırmada yapılan değerlendirmelerin sonuçları yalnızca araştırma kapsamındaki çalışmalarda kullanılacaktır. Kişisel bilgileriniz herhangi bir amaçla, kurum yöneticileri veya üçüncü kişilerle kesinlikle paylaşılmayacaktır. Araştırma bir kongrede ya da bir dergide yayın olarak kabul edilse bile kimliğinizi ortaya çıkarabilecek kayıtlar gizli tutulacaktır. Katılımınız için teşekkür ederiz. Yukarıda yer alan ve araştırmaya başlanmadan önce katılımcılara verilmesi gereken bilgileri içeren metni okudum (ya da sözlü olarak dinledim). Araştırma kapsamında elde edilen şahsıma ait bilgilerin bilimsel amaçlarla kullanılmasını, gizlilik

kurallarına uyulmak kaydıyla sunulmasını ve yayınlanmasını, hiçbir baskı ve zorlama altında kalmaksızın, kendi özgür irademle kabul ettiğimi beyan ederim.

Gönüllü: Adı Soyadı/ Telefon Numarası / Tarih /İmza	
Araştırmacı: Adı Soyadı/ Telefon Numarası / Tarih / İmza	
Tanık: Adı Soyadı/ Telefon Numarası / Tarih / İmza	

APPENDIX 3: DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

DEĞERLENDİRME FORMU

Hasta No:

1. Adı –Soyadı:
2. Yaş:
3. Mesleği:
4. Eğitim Durumu:
5. Cep Telefonu:
6. Cinsiyet: ☐K ☐E
7. Boy: cm Kilo kg
8. Kullandığı İlaçlar:
9. Etkilenen ekstremiteler:
10. Dominant taraf:
11. Ödem ilk ne zaman ve nasıl ortaya çıktı tetikleyen faktörler nelerdir?
12. Ödeme yönelik daha önce tedavi gördünüz mü?
13. Hekim tarafından belirlenen evre :
14. Ödemi nasıl hissediyorsunuz ? 0 1 2 3 4 5 6 7 8 9 10
15. Ödem: Yumuşak () Sert ()
16. Gode: Evet () Hayır ()
17. Stemmer İşareti: Pozitif () Negatif ()
18. Fibröz Doku: Evet () Hayır ()
19. Ödem Yerleşimi: Distal () Proksimal ()
20. Ciltte Renk Değişikliği: Var () Yok ()

Var İse Kırmızı () , Mavi / Siyanotik () ,Kahverengi ()

21. Lenf sisti / Fistül: Evet () Hayır ()

22. Tırnak Değişiklikleri: Evet () Hayır ()

23. Ülserasyon: Evet () Hayır ()



APPENDIX 4: UPPER EXTREMITY CIRCUMFERENCE MEASUREMENT

KOL ÇEVRE ÖLÇÜMÜ DEĞERLERİ

Ad soyad:

Yaş:

Kilo:

Dominant Taraf:

Etkilenen Taraf:

EL BİLEĞİ (0)	SAĞ KOL	SOL KOL
0 CM		
4 CM		
8 CM		
12 CM		
16 CM		
20 CM		
24 CM		
28 CM		
32 CM		
36 CM		
40 CM		
44 CM		

APPENDIX 5: UPPER EXTREMITY RANGE OF MOTION MEASUREMENT

EKLEM HAREKET AÇIKLIĞI ÖLÇÜMLERİ

OMUZ

- FLEKSİYON:
- EKSTANSİYON:
- ABDUKSİYON:
- İÇ ROTASYON:
- DIŞ ROTASYON:

DİRSEK

- FLEKSİYON:

ÖN KOL

- SUPİNASYON:
- PRONASYON:

EL BİLEĞİ

- FLEKSİYON:
- EKSTANSİYON:
- RADİAL DEVLASYON:
- ULNAR DEVLASYON:

APPENDIX 6: NEW YORK POSTURE ANALYSIS

NEWYORK POSTÜR ANALİZİ

NEW YORK POSTÜR DEĞERLENDİRME TESTİ

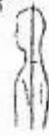
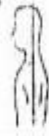
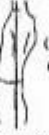
Adı Soyadı:

TARİH:

Yaşı:

Cins:

	5	3	1	1.	2.	3.
A	 Baş dik garibe hatı dırık. bozuktandı geçiyor	 Baş hafifçe yana eğilmiş veya dönmüş	 Baş ileri derecede yana eğilmiş veya dönmüş			
B	 Omuzlar yana paralel	 Bir omuz diğerinden hafifçe yukarıda	 Bir omuz diğerinden ileri derecede yukarıda			
C	 Omurga düz	 Omurga hafif yana eğilmiş	 Omurga ileri derecede eğilmiş			
D	 Kalkalar yana paralel	 Bir kalka diğerinden hafifçe yukarıda	 Bir kalka ileri derecede diğerinden yukarıda			
E	 Ayaklar düz	 Ayaklar dışarıya dönmüş	 Ayaklar içine dönmüş			
F	 Ayaklar yatacak	 Ayaklar hafif dışık	 Ayaklar dışık dışı taban			
	5 normal	3 orta seviyede	1 ileri seviyede Birinci sayfa toplamı			

	5	3	1	1.	2.	3.
G	 Boyun düz çene içeride, baş omuz seviyesinde dengede	 Boyun hafif önde çene hafif dışarıda	 Boyun ileri derecede önde çene ileri dere- cede dışarıda			
H	 Göğüs yukarıda sternum vücut önlüde ilerde	 Göğüs hafif derecede çökme	 Göğüs ileri dere- cede çökme (diz)			
I	 Omuzlar merkezi	 Omuzlar hafif ileride	 Omuzlar protrakte			
J	 Üst sırt normal	 Üst sırt hafif yuvarlak	 Üst sırt ileri dere- cede yuvarlak			
K	 Gövde dik	 Gövde hafif geniye açılı	 Gövde geriye ileri derecede açılmış			
L	 Karın düz	 Karın protrakte	 Karın protrakte ve sekilini			
M	 Alt sırt normal	 Alt sırt hafif çukur	 Alt sırt ileri derecede çukur			
	5 normal	3 orta seviyede	1 ileri seviyede	TOPLAM SKOR		

1. Eğer sol kolondaki açıklamaya uygun ise 5 puan
2. Eğer orta kolondaki açıklamaya uygun ise 3 puan
3. Eğer sağ kolondaki açıklamaya uygun ise 1 puan ekleyin.

APPENDIX 7: DISABILITIES OF THE ARM, SHOULDER, AND HAND (DASH) QUESTIONNAIRE

KOL, OMUZ VE EL SORUNLARI ANKETİ

DASH - T

AÇIKLAMA

Bu anket bazı bedensel etkinlikleri yerine getirmenizin yanı sıra hastalık belirtilerinizi sormaktadır.

Her soruyu son haftadaki durumunuzu göz önüne alarak uygun numarayı yuvarlak içine almak suretiyle cevaplayınız.

Son hafta içinde bedensel etkinliği yapma fırsatınız olmadıysa, lütfen hangi cevabın en doğru olacağına göre en iyi tahmininizi yapınız.

Hangi el veya kolunuzu kullandığınızı dikkate almadan sadece bedensel etkinliği yapabilme becerinize göre uygun cevabı verin.



KOL, OMUZ VE EL SORUNLARI ANKETİ

Lütfen son hafta içindeki aşağıdaki etkinlikleri yapma yeteneğinizi uygun cevabın altındaki numarayı daire içine alarak sıralayınız.

	Zorluk Yok	hafif derecede zorluk	orta derecede zorluk	aşırı zorluk	hiç yapamama
1-Sıkı kapatılmış yada yeni bir kavanozu açmak	1	2	3	4	5
2-Yazı yazmak	1	2	3	4	5
3-Anahtarı çevirmek	1	2	3	4	5
4-Yemek hazırlamak	1	2	3	4	5
5-Zor açılan bir kapıyı iterek açma	1	2	3	4	5
6-Yukarıdaki bir rafa bir şey yerleştirmek	1	2	3	4	5
7-Ağır ev işleri yapmak (duvar silmek, yer silmek, tamirat yapmak vs.)	1	2	3	4	5
8-Bağ bahçe işleri yapmak,odun kesmek	1	2	3	4	5
9-Yatak yapmak	1	2	3	4	5
10-Alişveriş çantası yada evrak çantası taşımak	1	2	3	4	5
11-Ağır bir cisim taşımak (4.5 kg'den fazla.)	1	2	3	4	5
12-Yukarıdaki bir ampulü değiştirmek.	1	2	3	4	5
13-Saçları yıkamak veya kurulamak.	1	2	3	4	5
14-Sırtını yıkamak.	1	2	3	4	5
15-Kazak giymek	1	2	3	4	5
16-Yiyecekleri kesmek için bıçak kullanmak	1	2	3	4	5
17-Az çaba gerektiren eğlendirici işler (iskambil oynamak, örgü örmek vs.)	1	2	3	4	5
18-Kolunuzdan, omuzunuzdan veya elinizden güç aldığınız veya darbe vurduğunuz eğlenceye yönelik etkinlikler (önünüzde yerde bultan bir konserve kutusunu veya küçük bir taşa iki elinizle kavradığınız bir sopayla yandan vurmak,tenis oynamak,masa tenisi oynamak)	1	2	3	4	5
19-Kolunuzu serbestçe hareket ettirdiğiniz eğlendirici işler (suda taş kaydırmak, meyve taşıma, çelik çomak oynama)	1	2	3	4	5
20-Ulaşım ihtiyaçlarını kendi başına giderebilmek (bir yerden başka bir yere gitmek)	1	2	3	4	5
21-Cinsel faaliyetler	1	2	3	4	5

	Hiç engel yok	Az engel	Orta derecede	Bir hayli	Aşırı
22-Son hafta süresince kol omuz yada el sorunuz aile arkadaşlar, komşular veya gruplarla normal sosyal etkinliklerinize ne ölçüde engel oldu	1	2	3	4	5
	Hiç kısıtlanmış Hissetmiyorum	Hafif derecede kısıtlı	Orta derecede kısıtlı	Çok kısıtlı	Bedensel etkinlik yapamıyorum
23-Son hafta süresince kol omuz yada el sorunuz nedeniyle işinizde yada diğer günlük etkinliklerde kısıtlandınız mı?	1	2	3	4	5
	Yok	Hafif	Orta derecede	Bir hayli	Aşırı
24-El, omuz ya da kol ağrınız	1	2	3	4	5
25-Herhangi belirli bir işi yaptığınızda el, omuz ya da kol ağrınız	1	2	3	4	5
26-El, omuz yada kolunuzdaki karıncalanma(iğnelenme)	1	2	3	4	5
27-El, omuz yada kolunuzdaki güçsüzlük	1	2	3	4	5
28-El, omuz yada kolunuzdaki hareket zorluğu	1	2	3	4	5
	Zorluk Yok	hafif derecede zorluk	orta derecede zorluk	aşırı zorluk	O kadar zorluk var ki uyuyamıyorum
29-Geçen hafta içinde el, omuz yada kol ağrınız nedeniyle uyumada ne kadar zorlandınız	1	2	3	4	5
	Kesinlikle Katılmıyorum	Katılmıyorum	Ne katılıyorum ne katılmıyorum	Katılıyorum	Kesinlikle katılıyorum
30-Kol, omuz veya el problemimden dolayı kendimi daha az yeterli, daha az yararlı hissediyor veya kendime daha az güveniyorum.	1	2	3	4	5

Ruhsal durum

Kolunuzdaki problemlerden dolayı :

	Hiç ↓	Çok ↓
8. Üzgün hissettiniz mi?	_____	_____
9. Bezgin hissettiniz mi?	_____	_____
10. Özgüven eksikliğiniz var mı?	_____	_____
11. Stresli hissettiniz mi?	_____	_____

Ev işi aktiviteleri:

	Çok iyi ↓	Hiç ↓	Uygulanmıyor
Ne kadar iyi yapabilirsiniz?			
12. Temizlik (fırçalama, süpürme, silmek)	_____	_____	O
13. Yemek pişirmek	_____	_____	O
14. Ütü	_____	_____	O
15. Bahçede çalışmak	_____	_____	O

Mobilite aktiviteleri

Ne kadar iyi yapabilirsiniz?

	Çok iyi ↓	Hiç ↓	Uygulanmıyor
16. Kolunuz yukarıda iken yapılan işler (ör, çamaşır asmak)	_____	_____	O
17. Ağır nesneleri kaldırmak yada taşımak (ör, dolu bir kova veya alışveriş çantası)	_____	_____	O
18. Etkilenmiş tarafın üzerinde uyumak	_____	_____	O
19. Bilgisayar işi yapmak (>30 dk)	_____	_____	O
20. Güneşlenmek	_____	_____	O

21. Araba kullanmak O
22. Yürümek (>2 km) O
23. Bisiklet sürmek O

Yaşam ve sosyal aktiviteler

Ne kadar iyi yapabilirsiniz?

- | | Çok iyi
↓ | Hiç
↓ | Uygulanmıyor |
|-----------------------------------|--------------|----------|--------------|
| 24. Tatile gitmek | | | O |
| 25. Hobilerinizi yapmak | | | O |
| 26. Spor yapmak | | | O |
| 27. Seçtiğiniz kıyafetleri giymek | | | O |
| 28. Mesleğinizi yapmak | | | O |
| 29. Sosyal aktiviteler yapmak | | | O |
- (ör, partilere, konserlere, restorana gitmek)



APPENDIX 9: UPPER EXTREMITY LYMPHEDEMA-27 (ULL-27)

ULL-27 YAŞAM KALİTESİ ANKETİ

ADI SOYADI:

Size uygun şikâyetleri işaretleyiniz.

	Hiç katılmıyorum	Katılmıyorum	Fikrim yok	Katılıyorum	Şiddetle katılıyorum
1. Yüksekteki objeleri almada zorlanıyorum	1	2	3	4	5
2. Kolumu belirli pozisyonlarda tutmada zorlanıyorum (başın üzerinde tutma gibi)	1	2	3	4	5
3. Kolumda ağırlık hissediyorum	1	2	3	4	5
4. Kolumda şişme hissediyorum	1	2	3	4	5
5. Giyinirken zorlanıyorum	1	2	3	4	5
6. Uykuya dalarken zorlanıyorum	1	2	3	4	5
7. Uyku sırasında sıkıntı yaşıyorum	1	2	3	4	5
8. Objeleri alırken zorlanıyorum	1	2	3	4	5
9. Objeleri tutarken zorlanıyorum	1	2	3	4	5
10. Ağır kol ile yürürken zorlanıyorum	1	2	3	4	5
11. Yıkanmada zorlanıyorum	1	2	3	4	5
12. Toplu taşıma araçlarını kullanırken zorlanıyorum	1	2	3	4	5
13. Kolumda sızlama ve yanma hissediyorum	1	2	3	4	5
14. Derimi şişmiş, sert ve gergin hissediyorum	1	2	3	4	5
15. İlişkilerimde ve görevlerde zorlanıyorum	1	2	3	4	5
16. Kendimi üzgün hissediyorum	1	2	3	4	5
17. Kendimi bezgin hissediyorum	1	2	3	4	5
18. Özgüvenimin azaldığını hissediyorum	1	2	3	4	5
19. Kendimi stresli hissediyorum	1	2	3	4	5
20. Kendimi iyi hissediyorum	1	2	3	4	5

	Hiç katılmıyorum	Katılmıyorum	Fikrim yok	Katılıyorum	Şiddetle katılıyorum
21. Kızgın olduğumu hissediyorum	1	2	3	4	5
22. Geleceğe karşı güvenim yok	1	2	3	4	5
23. Güzel havalarda evden dışarı çıkmada zorlanıyorum	1	2	3	4	5
24. Kişisel projelerde, hobiler veya tatillerde zorlanıyorum	1	2	3	4	5
25. Eşim/partnerim ile duygusal hayatımda zorlanıyorum	1	2	3	4	5
26. Sosyal hayatımda zorlanıyorum	1	2	3	4	5
27. Aynaya bakmaya korkuyorum	1	2	3	4	5



APPENDIX 10: QUALITY OF LIFE MEASURE FOR LIMB LYMPHEDEMA – ARM (LYMQOL- ARM)

LENFÖDEM YAŞAM KALİTE ÖLÇEĞİ (KOL)

	Hiç (asla)	Biraz	Oldukça	Çok
1. Şiş kolunuz günlük yaşam aktivitelerinizi ne kadar etkiler?				
a) Mesleğiniz				
b) Ev işi				
c) Saç taramak				
d) Giyinmek				
e) Yazı yazmak				
f) Yemek yemek				
g) Yıkanmak				
h) Diş temizliği				
2. Şiş kolunuz boş zaman aktivitelerinizi ne kadar etkiler? Lütfen buna örnek yazınız				
3. Diğer insanlara ne kadar bağlı kalmak zorundasınız ?				
4. Şiş kolunuzun görünümünüzü ne kadar etkilediğini hissediyorsunuz ?				
5. Kendinize uygun kıyafetler bulmakta ne kadar zorlanıyorsunuz ?				
6. Giymek istediğiniz kıyafetleri bulmakta ne kadar zorlanıyorsunuz ?				
7. Şiş kolunuz kendiniz hakkında nasıl hissettiğinizi etkiler mi?				
8. Şiş kolunuz diğer insanlarla olan ilişkinizi etkiler mi?				
9. Lenfödeminiz ağrıya neden oluyor mu?				
10. Şiş olan kolunuzda uyuşma var mı?				
11. Şiş olan kolunuzda iğne batması, sıkışma veya karıncalanma hissine sahip misiniz?				
12. Şiş kolunuzda güçsüzlük hissi var mı?				
13. Şiş kolunuzda ağırlık hissi var mı?				
14. Yorgun hissediyor musunuz?				
15. Geçen hafta içinde uyku sorunuz var mıydı?				
16. Geçen hafta içinde bir şeyler üzerine konsantre olmakta zorlandınız mı?				
17. Geçen hafta içinde gergin hissettiniz mi?				
18. Geçen hafta içinde endişeli hissettiniz mi?				

	Hiç (asla)	Biraz	Oldukça	Çok
1. Geçen hafta içinde huzursuz hissettiniz mi?				
2. Geçen hafta içinde depresyonda hissettiniz mi?				

Genel olarak yaşam kalitenizi şu anda nasıl değerlendirirsiniz? Lütfen aşağıdaki ölçekte puanınızı işaretleyiniz.

0 1 2 3 4 5 6 7 8 9 10
Kötü Mükemmel



APPENDIX 11: CV

Kişisel Bilgiler

Adı	SİMLA	Soyadı	TURAN
Doğum Yeri		Doğum Tarihi	
Uyruğu		TC Kimlik No	
E-mail		Tel	

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora			
Yüksek Lisans	Fizyoterapi ve Rehabilitasyon	Yeditepe Üniversitesi	2023
Lisans	Fizyoterapi ve Rehabilitasyon	Yeditepe Üniversitesi	2019
Lise			

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
Fizyoterapist		2021- Halen
Fizyoterapist		2020- 2021