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Breast Cancer:
Functional Implications and Physical Therapy Management

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September 4, 2019

Disclosures

- None

Learning Outcomes

After this course, participants will be able to:

- Identify at least four anatomical structures that may be impacted by breast cancer and its treatments.
- Identify at least three evidence-based outcome measures that are recommended to use for breast cancer survivors.
- Identify at least three evidence-based interventions for shoulder impairment secondary to breast cancer treatment.
- Outline at least two characteristics of patients who may be at increased risk of falls due to their history of breast cancer and treatment.
- List at least five strategies to minimize the risk of breast cancer-related lymphedema.

Breast Cancer

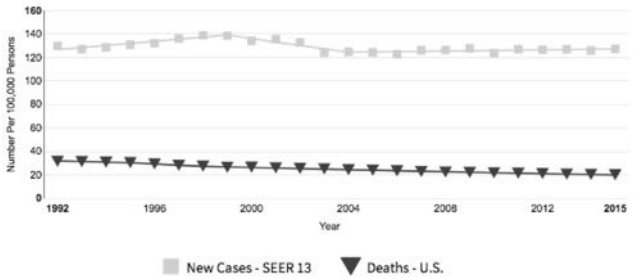
- Most common cancer in women (except for skin cancers)
- 1 in 8 women (12%) will develop invasive breast cancer
  - Versus 1 in 1000 men
- American Cancer Society's estimates for 2018:
  - ~266,120 women diagnosed with invasive breast cancer
  - ~2,470 men diagnosed with invasive breast cancer
  - ~63,960 new cases of carcinoma in situ (CIS) will be diagnosed
  - ~40,920 women will die from breast cancer
- Currently more than 3.1 million breast cancer survivors in US

American Cancer Society

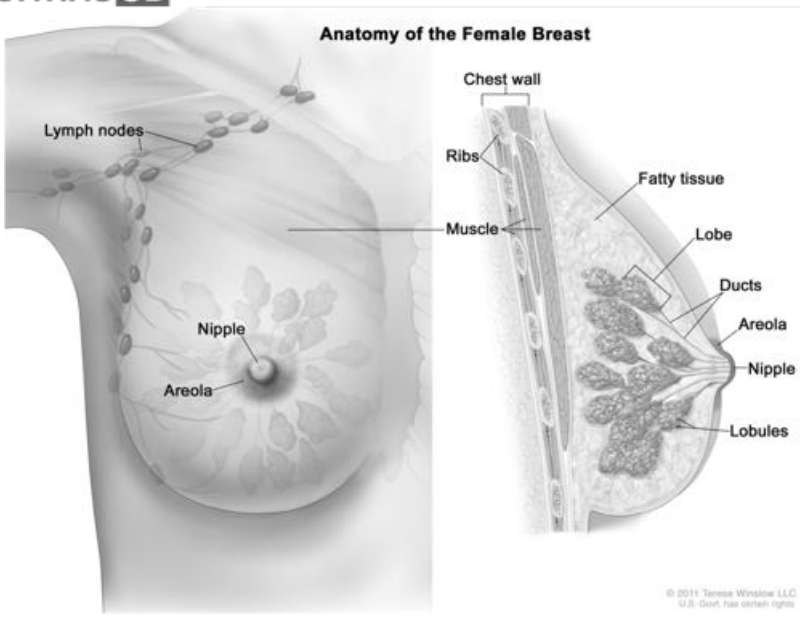
Estimated New Cases in 2018	266,120
% of All New Cancer Cases	15.3%

Estimated Deaths in 2018	40,920
% of All Cancer Deaths	6.7%

Percent Surviving 5 Years
89.7%
2008-2014



National Cancer Institute



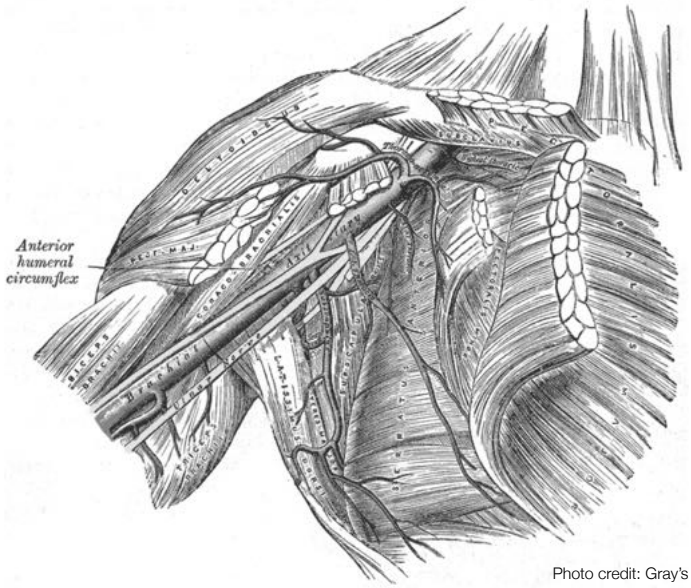


Photo credit: Gray's Anatomy

Types of Breast Cancer

- Location & Extent
  - Ductal vs Lobular
  - In situ vs Invasive
    - DCIS
    - IDC
    - LCIS
    - ILC

American Cancer Society

Credit: By Patrick J. Lynch, medical illustrator (Patrick J. Lynch, medical illustrator) [CC BY 2.5 (http://creativecommons.org/licenses/by/2.5)], via Wikimedia Commons

Breast Cancer Treatment Options

Surgery

- Breast conserving surgery
  - Lumpectomy
  - Partial mastectomy
- Mastectomy
- Sentinel lymph node biopsy (SLNB)
- Axillary lymph node dissection (ALND)
- Reconstruction

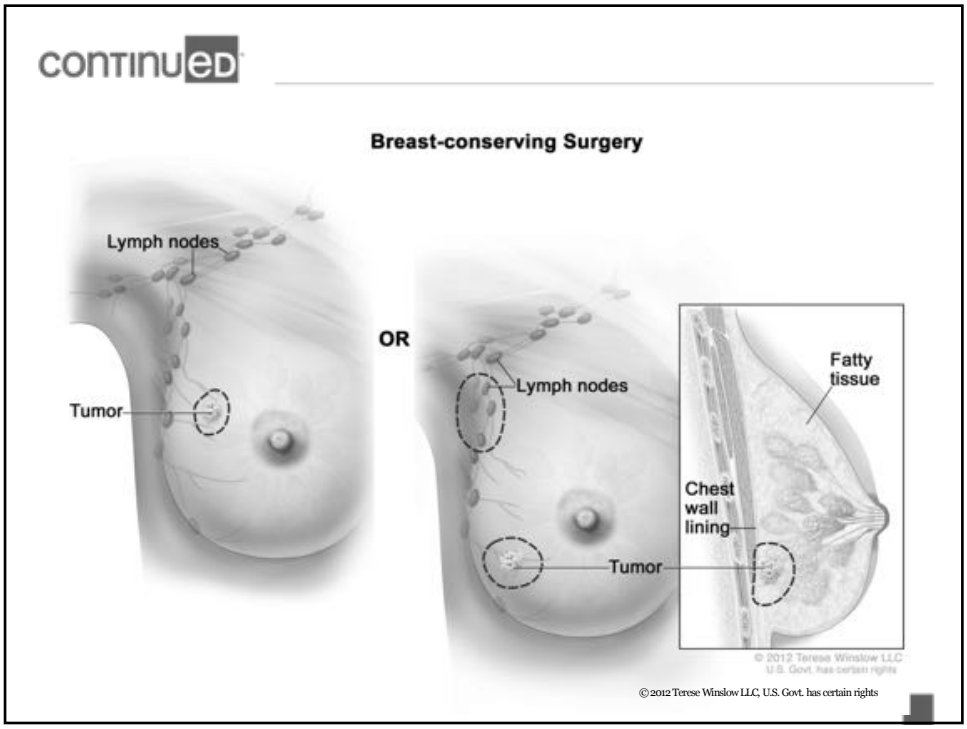
Adjuvant or Neoadjuvant

- Radiation
  - External beam
  - Internal (brachytherapy)
- Chemotherapy
- Hormone therapy

American Cancer Society

Surgical Treatments

Breast-Conserving
Mastectomy
Lymph Node Procedures
Reconstruction



Mastectomy

- Simple (total) mastectomy (TM)
- Skin/Nipple-sparing mastectomy
- Double mastectomy
- Modified radical mastectomy (MRM)
  - TM + lymph node procedure
- Radical mastectomy (RM)
  - TM + LN procedure + removal of chest wall muscles

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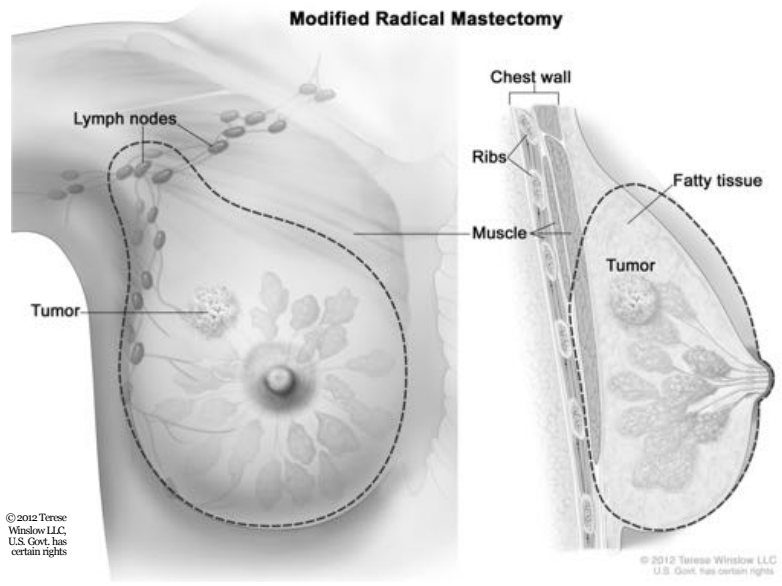
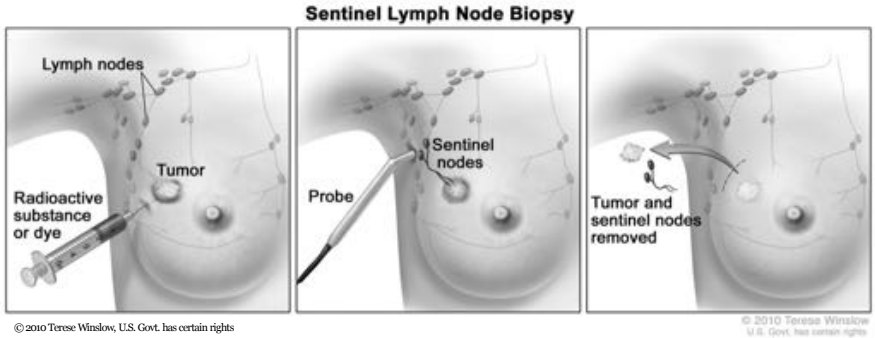


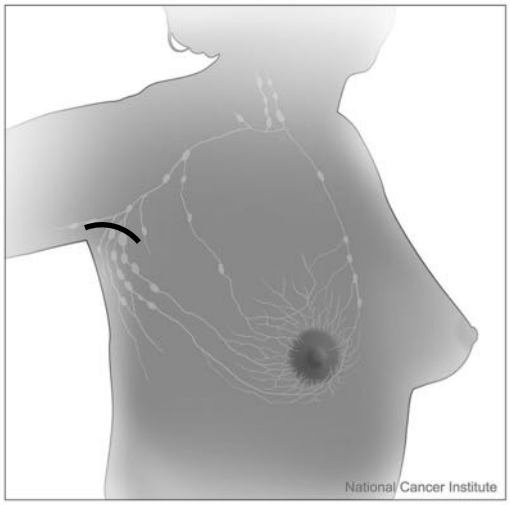
Sentinel Lymph Node Biopsy (SLNB)

- Removal of first lymph node(s) to which a tumor is likely to spread
- SLN is removed/biopsied intraoperatively
- Surgeon may elect to convert to an ALND



Axillary Lymph Node Dissection (ALND)

- May be done at same time or after primary surgery
- 10-40 lymph nodes removed



Don Bliss (Illustrator) [Public domain]

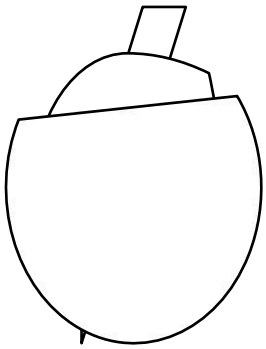
Breast Reconstruction

- Dependent on:
  - Type/extent of surgery
  - Additional treatments
  - Patient preference
- Types
  - Implant (silicone, saline)
  - Tissue flap procedures
  - Nipple/areola reconstruction
- Timing
  - Immediate
  - Delayed

American Cancer Society

Reconstruction: Implant

- Immediate (within primary surgery) or delayed
- Typically performed with tissue expanders (TE)
- Pec major may be utilized as a “sling”
- TE eventually exchanged for permanent implant
- Implant may have impact on various tissue levels



Reconstruction: Flap Procedures

- TRAM (transverse rectus abdominis muscle) flap
- DIEP (deep inferior epigastric perforator) flaps
- Latissimus dorsi flap
- GAP (gluteal artery perforator) flap
- TUG (transverse upper gracilis) flap

- **Free flap** versus **pedicled**

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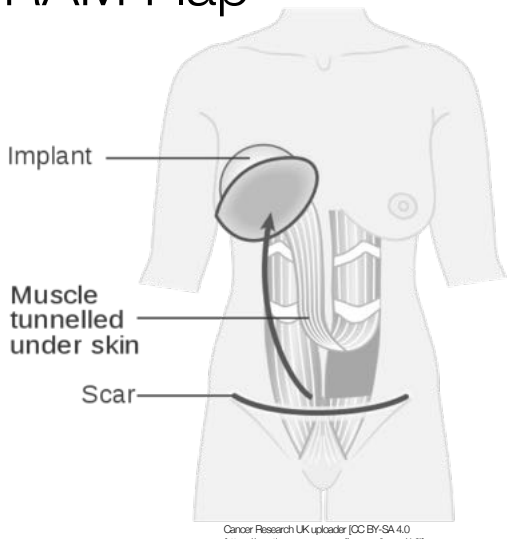
TRAM Flap



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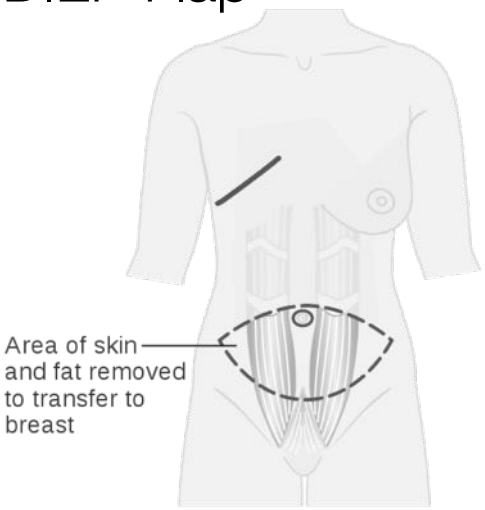
- Pedicled procedure pictured here
- Flap procedure may be combined with implant
- Must consider functional impact of flap harvesting

DIEP Flap



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- Performed as free flap procedure
- Microvascular surgery to transpose deep inferior epigastric perforator artery
- May have post-operative precautions
  - Limit manual therapy over flap
  - Limit abdominal strengthening

Lat Dorsi Flap

[[File:Breast reconstuction latissimus dorsi illustration.jpg|Breast reconstuction latissimus dorsi illustration]]

Surgery & Rehab Implications

- Pain, tenderness at surgical site
- Swelling
- Risk of infection
- Numbness
- Weakness - UE or donor site
- Neuropathic pain in axilla/chest wall
  - Post-mastectomy Pain Syndrome (PMPS)
- Postural impairments
- Limited arm/shoulder ROM

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Adjuvant & Neoadjuvant Treatments

Radiation Therapy
Chemotherapy
Hormone Therapy

Radiation Therapy for Breast Cancer

- Often recommended as adjuvant treatment with breast conserving surgery
- May be indicated in cases of mastectomy
  - To target residual cancerous breast tissue
  - To target potentially positive lymph nodes
- Timing may be dependent on reconstructive procedure

Radiation Therapy Side Effects

- Acute
  - Swelling
  - Skin changes
  - Fatigue
- Delayed/sub-acute/chronic
  - Soft tissue tightening/atrophy
  - Brachial plexopathy
  - Weakening of ribs
  - Lymphedema

Credit: National Cancer Institute; Rhoda Baer (Photographer)

American Cancer Society

Radiation Therapy & Rehab Implications

- Skin irritation -> desquamation, ulceration of skin/membranes
  - Precaution should be taken with red/tender/blistered skin
  - Usually limit to AROM/AAROM, gentle therapeutic exercise
- Radiation-Induced Fibrosis
  - Microvascular injury which may lead to ischaemic hypoxia and inflammatory changes in surrounding tissue
    - Loss of tissue compliance (muscle, skin, lung)
  - Typically 6 mo-5 yrs following treatment
    - Can progress indefinitely
  - Early initiation of active and passive intervention is key

Cancer Rehabilitation,
Stubblefield, O'Dell

Radiation-Induced Fibrosis Precautions

- Consider use of modalities
  - Decreased blood supply
  - Decreased sensation
- Limit manual techniques in areas of skin breakdown
- Observe lymphedema precautions when indicated

Stubblefield, 2011

Chemotherapy for Breast Cancer

- Techniques of administration:
  - Neoadjuvant: Prior to surgery/radiation
  - Adjuvant: After surgery/radiation
  - To treat primary, recurrent, or metastatic cancer
- Commonly used:
  - Taxol
    - Common rehab impact: Peripheral neuropathy, cardiomyopathy
  - Platinums (Cisplatin, Carboplatin)
    - Common rehab impact: Ototoxicity, peripheral neuropathy
  - Cytoxan
  - Doxorubicin (Adriamycin)
  - Vinorelbine

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CONTINUED

Hormone Therapy for Breast Cancer

- About 2/3 of breast cancers are hormone receptor-positive
  - High estrogen levels help the cancer cells grow and spread
  - Hormone therapy either reduces levels of estrogen in the body, or stops estrogen from acting on breast cancer cells
  - May be administered neoadjuvant, adjuvant, or as main treatment
- Commonly used:
  - Tamoxifen
    - *Selective* estrogen receptor modulator (SERM)
    - Blocks estrogen receptors in breast cancer cells
    - Increased risk of blood clot and bone loss
  - Aromatase Inhibitors
    - Stop estrogen production
    - Typically used in postmenopausal women
    - Letrozole, Anastrozole, Exemestane
    - Aromatase inhibitor-induced arthralgias (AIIA)

American Cancer Society

CONTINUED

Breast Cancer:
Functional Implications & PT Management

Treatment is often multimodal

Understand the physiological effects of each treatment

Timing of treatments may impact rehab POC

It's imperative to know what your client has been through or is currently going through

CONTINUED

Shoulder Impairment
following treatment
for breast cancer

Shoulder Impairment

- Commonly seen set of symptoms
- More prevalent s/p ALND and radiation
- Can significantly impact QOL

Incidence following ALND and XRT

- Impaired ROM: 15-30% at 5 years
- Pain: 30-40% at 5 years

Nesvold, 2011

- + ALND: 3.3 OR for developing symptoms
- + Radiation: 3.1 OR for developing symptoms

Kwan, 2002

Sensations following SLNB vs ALND

Sensation	Prevalence (%)				Severity (%)			
	Baseline		60 mo		Baseline		60 mo	
	SLNB	ALND	SLNB	ALND	SLNB	ALND	SLNB	ALND
Tender	88	93	33	40	20	37	4	10
Sore	83	89	27	30	23	37	3	4
Pull	61	78	23	32	11	24	3	9
Ache	62	65	27	19	9	19	5	6
Painful	62	70	16	15	7	20	2	4
Twinge	63	63	34	31	9	15	2	6
Tight	57	82*	27	47*	14	32	5	6
Stiff	48	78*	15	19	8	30	1	0
Prick	44	44	14	15	9	11	1	0
Throb	40	41	11	11	4	9	1	2
Shoot	42	43	17	13	8	19	3	2
Tingle	38	52	17	21	7	11	2	2
Numb	35	83*	22	55*	14	41*	5	14

Baron et al, 2007

Body Structure/Impairments

- Scar tissue/adhesions
  - Axillary web syndrome/cording
- Soft tissue/muscle imbalance
  - Impaired posture
  - Impaired rib cage mobility
- Impaired scapulohumeral rhythm
  - Functional impingement
- Lymphedema

Rehab Evaluation

- Active and passive ROM
  - Subjective pain/tightness/stiffness scores
- Qualitative observations of movement
- MMT/Functional strength test
- Postural assessment
- Soft tissue/fascial assessment
  - Axilla
  - Anterior and lateral chest walls
  - Sternum
  - Chest wall/scapulohumeral musculature

Outcome Measures

- Disabilities of the Arm, Shoulder, and Hand (DASH)
- SPADI
- Shoulder Rating Questionnaire (SRQ)
- Penn Shoulder Score (PSS)

Miale, Harrington, Kendig. **Oncology Section Task Force** on Breast Cancer Outcomes: Clinical Measures of Upper Extremity Function. *Rehabilitation Oncology*. 2013;31(1):27–34

Rehab Interventions

- Myofascial release
  - Effective to decrease pain intensity in UE

De Groef et al, 2017

- Exercise
  - Can result in a significant and clinically meaningful improvement in shoulder ROM

Galantino et al, 2013

Rehab Interventions

- Myofascial release & scar tissue mobilization
- Active and passive stretching
- AAROM -> AROM -> PREs
- Postural re-education
- Neurological re-education

Aromatase Inhibitors & Exercise

- Aerobic & Resistance training
- Healthy post-menopausal women versus women on AI
- Similar improvements:
  - Lower body strength
  - V02 max
  - Body fat mass

de Paulo et al, 2018

Breast Cancer:
Functional Implications & PT Management
Shoulder Impairment

Understand what has been done surgically

Communicate with surgeon regarding potential precautions

Understand impact of adjuvant treatments

Be confident in educating your patients

Movement towards prospective surveillance

Shoulder Impairment Secondary to Treatment for Breast Cancer

CASE STUDY

Patient is a 47 year old female diagnosed with stage II left-sided ER-positive IDC, now s/p L TM with SLNB and immediate reconstruction with TE, referred to PT for “decreased ROM”.

Per patient, she will not require chemotherapy, was started on Tamoxifen following surgery, and is meeting with a radiation oncologist this week to discuss initiation of XRT.

Chemotherapy-Induced Peripheral Neuropathy
Balance and Falls
following treatment
for breast cancer

Chemotherapy-Induced Peripheral Neuropathy (CIPN)

- Relatively common, potentially severe side effect
- Sensory > motor nerves
- Neuropathic symptoms can vary
- Comorbid conditions may predispose patients to CIPN

Seretny et al, 2014

CIPN Prevalence

- Some chemotherapy agents more prone to cause CIPN
  - Platinums
  - Taxanes
  - Vinca alkaloids
- Aggregate prevalence: 48%
- Prevalence in 1st month s/p chemo: 68.1%
- Prevalence 6 months s/p chemo: 30%

Tzatha et al, 2016

CIPN Clinical Presentation

- Symmetrical
- Stocking-glove (distal to proximal)
- Paresthesia
  - Positive symptoms: burning, tingling, itching, pain
  - Negative symptoms: numbness
- Impaired balance

Tzatha et al, 2016

Increased Risk of Falls

- Cancer survivors: Up to 2x fall rate

Stone et al, 2012

- + CIPN symptoms: 1.8-3x fall rate

Winters-Stone et al, 2017
Kolb et al, 2016

CIPN: Functional Implications

- Increased risk of falls
- Subjective “positive” symptoms affecting QOL
- Altered COG/weight bearing
  - Functional transfers, ambulation, stairs

CIPN: Evaluation

- Sensory testing
  - Light touch, protective, proprioceptive/vibration
- Ankle ROM and strength
- Balance assessment
- Gait and functional transfer assessment

Functional Transfer Assessment

Gait Assessment

Outcome Measures

- Recommended by Oncology Section Task Force on Breast Cancer Outcomes:
  - Fullerton Advanced Balance (FAB) Scale
  - TUG Test
  - 10 Meter Walk Test
  - Repeated Sit to Stand (5x)

- Static balance tests
- mCTSIB
- Rhomberg with eyes closed
- Neuropathy Pain Scale

CIPN: Interventions

- Desensitization for positive symptoms
- Proprioceptive training
- Balance training
- Gait training
- Assistive device assessment/prescription

Treadmill Push

Breast Cancer:
Functional Implications & PT Management
CIPN

Understand where patient is in their chemotherapy journey

Patient's subjective positive symptoms may be most distressing

Functional improvement may/may not correlate with subjective

Prioritize safety and fall prevention

Chemotherapy-Induced Peripheral Neuropathy

CASE STUDY

Patient is a 55 year old female 1 year s/p R sided TM and ALND and 6 months of chemotherapy (AC-T). Patient now considered NED and is referred to PT for "peripheral neuropathy and gait training".

Patient's chief complaint is burning pain, especially at night.

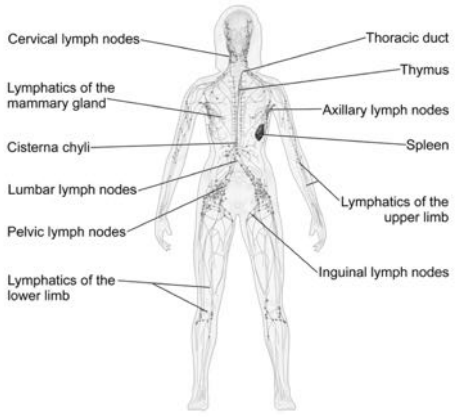
CONTINUED

Upper Extremity Lymphedema
following treatment
for breast cancer

CONTINUED

What is the Lymphatic System?

- Part of immune system
- Similar to circulatory system
  - Carries lymph
    - Protein-rich fluid carrying WBCs
- Organs:
  - Tonsils, thymus, spleen, liver



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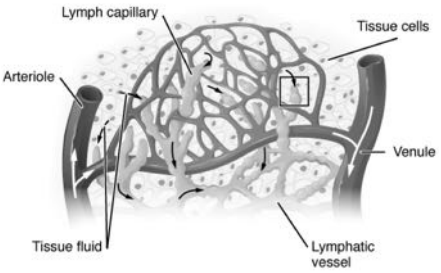
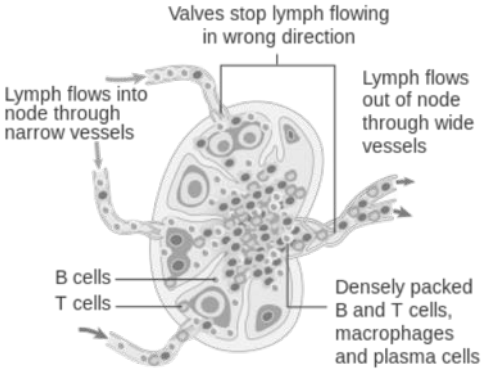
Lymphatic Flow

- As blood circulates, lymph leaks out from blood vessels into surrounding tissues
- Lymph carries food to cells, then collects waste products, bacteria, and damaged cells
- This fluid then drains into the lymph vessels -> lymph nodes -> larger vessels -> thoracic duct at base of neck -> returns into blood circulation



Lymph Nodes



- Lymph nodes act as filters
- Sometimes thought of as the “toll booths” of the lymphatic system
- Found in clusters:
  - Neck
  - Arm pits
  - Mediastinum
  - Abdomen
  - Groin
  - Pelvis

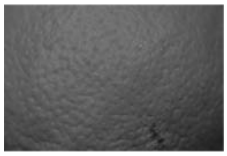
Cancer Research UK

Development of Lymphedema

- When the lymphatic system is damaged/disadvantaged, lymph fluid can accumulate in limbs or other parts of the body
  - Lymph node removal
  - Cancer involvement in lymph nodes
  - Radiation field including lymph nodes/vessels

Lymphedema Characteristics

- Slow, progressive, unilateral/asymmetric swelling
  - Unless lymphatic system is "damaged" bilaterally
- Described as "heaviness", "fullness", sometimes "achy"
- Clothes, shoes, rings may become "tight"
- Can present as weakness
- Enlarged pores - orange peel appearance
- Can present as pitting edema



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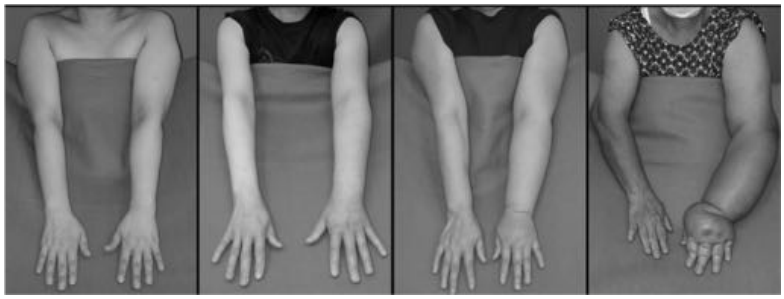
Lymphedema Stages

Stage 0	Stage 1	Stage 2	Stage 3
▪ Subclinical or latent stage ▪ Swelling is not evident despite impaired lymph transport	▪ Mild stage ▪ Gravity-dependent ▪ Pitting may occur	▪ Moderate stage ▪ Not gravity-dependent ▪ Tissue fibrosis develops	▪ Severe stage ▪ Trophic skin changes ▪ Fat deposits



Relative Risk of Treatment Factors

- Mastectomy vs. Lumpectomy: RR = 1.42
- ALND vs. none: RR = 3.47
- ALND vs. SLNB: RR = 3.07
- Radiation therapy: RR = 1.92

Tsai et al, 2009

CONTINUED

Risk Factors for Lymphedema

- Breast cancer and breast cancer treatment
- Surgical lymph node removal
- Radiation to lymph nodes

- Obesity or weight gain following diagnosis
- Injury, infection, trauma to affected limb/body area
  - Insect bites, sunburn, muscle overuse
- Increased age
- Heat/Ice modalities

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CONTINUED

Lymphedema Risk Reduction

- Minimize opportunities for infection/inflammation
- Skin care
  - Moisturize, avoid cuts/scrapes/burns and care for properly
    - Especially in areas of decreased sensation or skin folds
  - Careful shaving or use electric razor
  - Caution with nail care
- Avoid extreme temperatures
  - Sauna, hot tub, heat/ice modalities

Schmitz, 2010

CONTINUED

Lymphedema Risk Reduction

- Avoid tourniquet effect of tight clothing/accessories
- Weight control and diet
- Hydration
  - Low BP and dehydration can result in fluid retention
  - Excessive alcohol consumption can result in dehydration and inflammation
- Stay active
  - Careful progression with monitoring of symptoms

Schmitz, 2010

Role of Exercise Training

- Traditional approach was to limit lifetime lifting to 5-15 pounds
  - Gallon of milk weighs ~8lbs
  - This “precaution” could lead to deconditioning of affected limb
- Limb deconditioning -> ADLs could require near maximal work of the affected arm, potentially leading to injury and an inflammatory response that may overwhelm the damaged lymphatics

Schmitz, 2010

Role of Exercise Training

- Evidence indicates that upper body exercise is safe for survivors with and at risk for lymphedema
- Some evidence that QoL is improved by weight training in breast cancer survivors
- Weight-training program recommendations:
  - Controlled
  - Gradually fading supervision
    - Initially intensive with eventual transition to independence

Schmitz, 2010

PT Intervention for Lymphedema

- Complete Decongestive Therapy (CDT)
  - Manual Lymph Drainage (MLD)
  - Manual therapy for soft tissue restrictions
  - Bandaging
  - Compression garments
  - Exercise
    - Role of diaphragmatic breathing
  - Skin care
  - Patient education in self-care and risk reduction

Credit: Chemical Heritage Foundation

Breast Cancer:
Functional Implications & PT Management
Lymphedema

Risk for developing lymphedema is a lifelong consideration

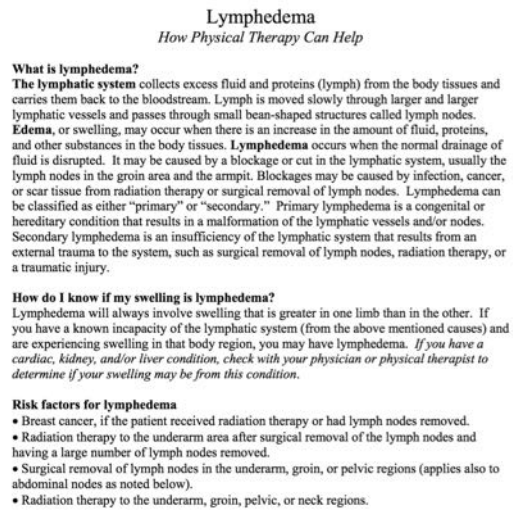
We are in a position to monitor and educate our clients

This is an opportunity to confidently refer

Requires interdisciplinary team approach

Lymphedema Fact Sheet

Available via the Academy of Oncologic PT's Website



Lymphedema

How Physical Therapy Can Help

What is lymphedema?

The lymphatic system collects excess fluid and proteins (lymph) from the body tissues and carries them back to the bloodstream. Lymph is moved slowly through larger and larger lymphatic vessels and passes through small bean-shaped structures called lymph nodes. **Edema**, or swelling, may occur when there is an increase in the amount of fluid, proteins, and other substances in the body tissues. **Lymphedema** occurs when the normal drainage of fluid is disrupted. It may be caused by a blockage or cut in the lymphatic system, usually the lymph nodes in the groin area and the armpit. Blockages may be caused by infection, cancer, or scar tissue from radiation therapy or surgical removal of lymph nodes. Lymphedema can be classified as either "primary" or "secondary." Primary lymphedema is a congenital or hereditary condition that results in a malformation of the lymphatic vessels and/or nodes. Secondary lymphedema is an insufficiency of the lymphatic system that results from an external trauma to the system, such as surgical removal of lymph nodes, radiation therapy, or a traumatic injury.

How do I know if my swelling is lymphedema?

Lymphedema will always involve swelling that is greater in one limb than in the other. If you have a known incapacity of the lymphatic system (from the above mentioned causes) and are experiencing swelling in that body region, you may have lymphedema. *If you have a cardiac, kidney, and/or liver condition, check with your physician or physical therapist to determine if your swelling may be from this condition.*

Risk factors for lymphedema

- Breast cancer, if the patient received radiation therapy or had lymph nodes removed.
- Radiation therapy to the underarm area after surgical removal of the lymph nodes and having a large number of lymph nodes removed.
- Surgical removal of lymph nodes in the underarm, groin, or pelvic regions (applies also to abdominal nodes as noted below).
- Radiation therapy to the underarm, groin, pelvic, or neck regions.

UE Lymphedema

CASE STUDY

Patient is a 34 year old female s/p R sided lumpectomy and adjuvant radiation therapy, referred to PT for “R UE weakness”.

Patient’s chief complaint is her R UE feeling “heavy” and “achy” with difficulty performing her normal work duties as a manager at a local restaurant.

Breast Cancer:

Functional Implications and Physical Therapy Management

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